

Publication No. 320

# History of the Board

*Editors*

**V.K. Kanjlia**

**A.C. Gupta**



New Delhi  
ISO 9001:2008

**Central Board of Irrigation & Power**  
Malcha Marg, Chanakyapuri, New Delhi

**July 2013**

ISBN 81-7336-327-7

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भूपेन्द्र सिंह हुड्डा  
BHUPINDER SINGH HOODA



D.O. No. CMH-2013/...५५५.....

मुख्य मन्त्री, हरियाणा,  
चण्डीगढ़।

CHIEF MINISTER, HARYANA,  
CHANDIGARH.

Dated...२०-७-२०१३.....

**MESSAGE**

It gives me great pleasure to know that the Central Board of Irrigation and Power has compiled a very useful publication "History of the Board" which is to be released on the occasion of the inauguration of its new training centre "CBIP – Centre of Excellence" in Gurgaon on 26<sup>th</sup> July, 2013.

I congratulate the Board for bringing out its history of more than 86 years which I feel is a rare achievement and the Board should be proud of it. The Board which has come into existence in 1927 has contributed immensely in the field of irrigation and power development before as well as after independence.

I wish the Board all the success in future and look forward to their immense contribution as in the past.

(Bhupinder Singh Hooda)

हरीश रावत  
ہریش راوت  
Harish Rawat



जल संसाधन मंत्री  
भारत सरकार  
وزیر آبی وسائل  
بھارت سرکار

MINISTER OF WATER RESOURCES  
GOVERNMENT OF INDIA

### MESSAGE

I feel very much delighted that the Board founded in 1927, has published their unique history. An organisation which started as Central Board of Irrigation has contributed immensely in the field of irrigation before independence and in the fields of irrigation and power after independence. Its involvement in the field of research and development in the past and its close association with international technical bodies by having secretariat of their Indian chapters in the office of the Board has helped in bringing the Indian engineers in close proximity to the well known internationally recognised experts in the field of irrigation, power and renewable energy. Central Board of Irrigation and Power can look back with pride at its long meritorious record of service.

I wish memorable success to Central Board of Irrigation and Power.

  
(Harish Rawat)

ज्योतिरादित्य मा, सिंधिया  
JYOTIRADITYA M. SCINDIA



सत्यमेव जयते

MESSAGE

D.O. NO. MOSP (I/C) 2013

विद्युत राज्य मंत्री (स्वतंत्र प्रभार)

भारत सरकार

Minister of State (I/C) for Power  
Government of India

19 JUL 2013

The Central Board of Irrigation & Power which was established by Government of India in 1927, has completed more than eight decades of dedicated service to the cause of development, management of India's irrigation and power sectors and facilitating dissemination of latest knowledge and technologies in both the sectors.

I am glad to note that the Board is also bringing out a publication, "History of the Board", on the occasion of the inauguration of its "Centre of Excellence" which is being set up at Gurgaon with the state-of-the-art facilities for imparting specialized training to engineers and technicians.

I convey my best wishes for its efforts in extending the frontiers of knowledge in both water resources and power sectors.

( JYOTIRADITYA M. SCINDIA )

राजेश कुमार  
अध्यक्ष, के. ज. आयोग  
**RAJESH KUMAR**  
CHAIRMAN, CWC  
Ministry of Water Resources



भारत सरकार  
Government of India  
केन्द्रीय जल आयोग  
Central Water Commission  
कमरा सं. 315 (द), सेवा भवन  
रामकृष्ण पुरम, नई दिल्ली-110066  
Room No. 315 (S), Sewa Bhawan  
R. K. Puram, New Delhi-110066




## MESSAGE

It is a matter of great pleasure that on the occasion of the inauguration of 'CBIP Centre of Excellence', Central Board of Irrigation and Power (CBIP) is bringing out a publication named as "History of the Board" highlighting its achievements since inception. Although initially constituted as Central Board of Irrigation in the year 1927, it was renamed as Central Board of Irrigation & Power in year 1949 after inclusion of power engineers as members of the Board.

CBIP, as a pioneer organisation in the twin disciplines of Irrigation and Power, has contributed greatly towards development of the two sectors in the country. Its contribution in organising technical events of international standards is commendable. It provides an excellent platform for exchange and dissemination of experience and technical knowledge for the growth of irrigation and power sectors. I am sure the proposed 'Centre of Excellence' will provide the much needed boost to the capacity building and skill development of professionals/ personnel to expose them to the latest technologies and best practices.

I wish success to the 'CBIP Centre of Excellence' and other endeavours of the Board for growth and development of irrigation and power sector.

  
(Rajesh Kumar)

New Delhi  
22<sup>nd</sup> July, 2013

## FOREWORD



First January 1927 was an important day in the history of Indian irrigation when the then Government of India had set up Central Board of Irrigation and in 1949 with the inclusion of hydro power engineers as members of the Board, the Board was renamed as Central Board of Irrigation and Power (CBIP). Central Bureau of Information was set up and attached with the Board. All irrigation schemes to be funded by the Government were placed before the Board. Besides being Advisor to the Government of India, the Board was also acting as Arbitrator for the settlement of disputes between Provincial States or between Provincial States and Princely States. Another important function of the Board was to promote research in irrigation, power and allied subjects and to bring out valuable technical publications. The Board has grown from strength to strength by embarking upon new activities and enlarging existing activities so as to meet the changing demands of the water resources and power sectors.

Besides the technical events of national organizations, activities related to national chapters of international bodies increased significantly. At present, there are 11 such organizations housed in CBIP which are representing either national or international bodies. Indian chapter of International Hydropower Association (IHA) is also now being managed by CBIP. World Tunnel Congress, an important event of International Tunnelling and Underground Space Association was organized for the first time in India in 2008. ISRM International Symposium 2010 and 6th Asian Rock Mechanics Symposium was also held in October 2010, which is considered to be a prestigious event of International Society of Rock Mechanics. The Asian Regional Conference on Geosynthetic is also to be held in 2016. The Board is trying hard to have the Congress of ISRM and ICOLD in India shortly. National chapters of all the international bodies housed in CBIP are planning to organize an important event of each international body in India every year.

The Board is bringing out useful and valuable publications of international recognition. On this front also there has been tremendous progress. Very useful publications have been brought out in the recent past in the field of Water Resources, Tunnelling, Dam Engineering, Geosynthetics, Power Engineering, etc. A useful publication which has been commended by all concerned relates to the special publication on important projects, which provided details of projects from its inception till its completion, highlighting problems faced and how they have been resolved. Special publication on Tehri Project, Nathpa Jakhri Project, Indrasagar Project, and others have already been published.

Training and Consultancy are other fields where CBIP is working in a big way. Initially, short term training programmes were organized and thereafter mid-term programmes of 7-8 weeks and at present Board is conducting placement oriented training programmes of six

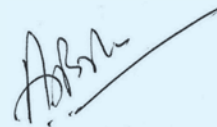
months as well as for one year duration. Keeping in view the growth of training activities of the Board, a new building “CBIP Centre of Excellence” has been constructed in Gurgaon (Haryana) which is being inaugurated on 26th July 2013. The Board’s building at Malcha Marg, Chanakyapuri, New Delhi has been renovated and modernized by adding training halls, committee rooms etc. with state of art facilities.

The technical activities of CBIP are very much recognized by the Engineers and Scientists in the field and appreciated by important dignitaries like President of India, Prime Minister of India, Union Ministers, Chief Ministers and Governors of States who have inaugurated events of CBIP.

On the occasion of the inauguration of “CBIP Centre of Excellence”, CBIP is bringing out a publication ‘History of the Board’. All the activities of CBIP, since its inception till date, have been brought out vividly in this publication. Even within the limited pages of this publication, efforts have been made to include all relevant and useful information comprehensively and I am sure Members of the Board, Research Workers and others will find this publication very informative and useful.

Without the contribution of all concerned in CBIP it would not have been possible to bring out this informative publication. However, a few are those whose sincere efforts and hard work needs to be appreciated. I would like to specially compliment Shri V.K. Kanjlia, Secretary; Shri A.C. Gupta, Director (Water Resources) and Shri M.L. Baweja, Advisor (Water Resources) for their untiring efforts in bringing out this publication.

It is hoped that the readers will find this publication Interesting, informative and useful.



**A.S. BAKSHI**

*President*

Central Board of Irrigation & Power  
&

*Chairperson*

Central Electricity Authority

New Delhi  
July 2013



## PREFACE



For quite some time we were looking for an opportunity to bring out an updated version of the History of the Board which was published for the first time in 1977 at the time of Golden Jubilee celebration of the Central Board of Irrigation and Power (CBIP). Activities of the Board during the period 1977 to 1986 were spelt out in another publication released at the time of Diamond Jubilee celebration of the Board in 1987. Since then the Board has enhanced its activities of the past and added a few more to remain updated with the changing scenario in the field of irrigation, power and renewable energy. CBIP is now closely associated with the renewable and mining sectors also.

We are in close touch with the international bodies whose national chapters are housed in CBIP building to organize international level events in India. Board, in close association with the Tunnelling Association of India have organized World Tunnel Congress in 2008 which was a prestigious event of International Tunnelling and Underground Space Association. The event was a grand success. Subsequently ISRM International Symposium 2010 and 6th Asian Rock Mechanics Symposium was organized in association with the Indian Chapter of International Society for Rock Mechanics and the International body of ISRM. I am happy to inform that the Board in association with the Indian Chapter of International Geosynthetics Society shall be organizing Asian Regional Conference on Geosynthetic Asia 2016 in India. Board's effort are to have the Congresses of ISRM and ICOLD shortly in India.

CBIP is also attaching lot of importance to impart training in the field of water resources, power and renewable energy which is need of the hour. A new building for imparting training has been constructed in Gurgaon called CBIP Centre of Excellence which is being inaugurated on 26th July this year.

Consultancy is another field where Board was involved in the past. Greater stress now is being laid to provide consultancy in new fields relating to water resources, power and renewable energy. The effort is to enhance it further and establish CBIP as a Centre of Excellence in true spirit. Though there is still much left to be talked about CBIP, I would like the reader to go through this publication and know in depth what is CBIP and its immense contribution in the field of irrigation, power and renewable energy sector.

Completion of this publication by itself is an achievement. Without the sincere and untiring efforts of the staff of CBIP, it would not have been possible to bring out this publication. I would specially like to convey my appreciation for the commendable job done by Shri A.C.Gupta, Director (Water Resources) and Shri M.L.Baweja, Advisor (Water Resources).

My deep appreciation is also for the hard work done by Shri S.K.Kapur, Advisor (P&A), Shri H.K.Aseeja, Deputy Manager, Mrs. Arti Bali, Deputy Manager and Shri Raj Kumar, Graphic officer in bringing out this publication.

It is hoped that the Members of the Board and other readers will find this publication interesting and useful.



**V.K. Kanjlia**  
*Secretary*

*Central Board of Irrigation & Power*

New Delhi  
July, 2013

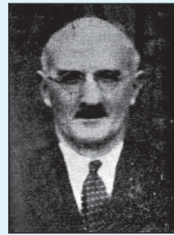
## PRESIDENTS OF THE BOARD



Mr. D.G. Harris  
C.E., (Govt. of India)  
1930



Sir Bernard Darley  
C.E, PWD, UP  
1931-32 & 1933-34



Mr. R.P. Hadow  
C.E. Punjab  
1932-33



Mr. C.M. Lane  
C.E. Bombay  
(Deccan)  
1934-35



Mr. W.L.C. Trench  
C.E. (Sind)  
1935



Mr. F. Anderson  
C.E. & Jt. Secretary,  
PWD, Irrigation, U.P.  
1935-36



Mr. G.M. Ross  
C.E., NWFP.  
1936-37



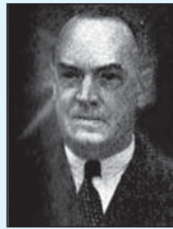
Mr. M.R. Richardson  
C.E., Western Canal,  
United Provinces  
1937-38



Mr. A. Gordon  
C.E., PWD, Sind  
1938-39



Mr. F.A. Farquharson  
C.E. & Secretary  
PWD, Punjab  
1939-40



Mr. C.E. Aitken  
C.E. & Secretary  
PWD, Bombay,  
1940-41



Rai Bahadur L.  
Venkatakrisna Ayyar,  
C.E., Irrigation, Madras  
1941-42



Mr. G.A.M. Brown  
C.E. & Secretary  
Govt. of NWFP  
1942-43



Mr. F.F. Haigh  
C.E. & Secretary  
Irrigation Punjab  
1943-44



Mr. F.H. Hutchinson  
C.E., United  
Provinces  
1944-46



Rai Bahadur  
A.N. Khosla,  
Consulting Engineer  
to Govt., 1946-48 &  
1950-51



Shri A.R.  
Vankatacharya,  
C.E. Irrigation,  
PWD, Madras,  
1948-49



Shri M.P. Mathrani  
C.E. , Irrigation  
PWD, Bihar  
1949-50



Shri M.S. Thirumale  
Iyengar, C.E.  
Tungabhadra Project  
Madras State  
1951-52



Shri Kanwar Sain  
Chairman,  
Central Water & Power  
Commission,  
1952-53



Shri A.C. Mitra  
C.E, Irrigation,  
PWD, U.P.  
1953-54



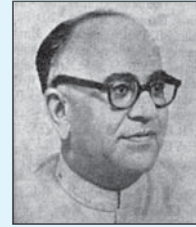
Shri D.R. Mehta  
C.E. Irrigation  
PWD, Bihar  
1954-55



Shri S.L. Malhotra  
C.E., Irrigation  
PWD & Secretary  
Govt. of Punjab  
1955-56



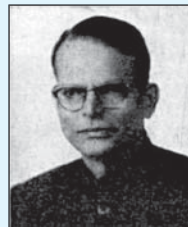
Shri U.N. Mahida  
C.E. Irrigation,  
PWD, Bombay,  
1956-57



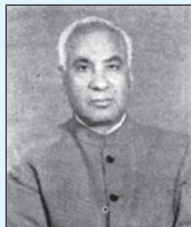
Prof. M.S. Thacker  
Director, CSIR,  
Govt. of India,  
New Delhi 1957-58



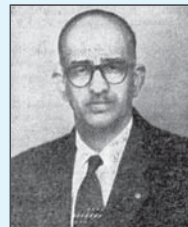
Shri M. Hayath  
Chairman, CWPC  
1958-59



Dr. K.L. Rao  
Member (D&R),  
CWPC 1959-60



Shri H.R. Bhatia  
Chairman, PSEB  
1960-61



Shri U. Ananda Rao  
CE, Irrigation,  
PWD, Madras  
1961-62



Shri K.P.S. Nair  
Member (HE),  
CWPC  
1962-63



Shri M.R. Chopra  
Chairman, CWPC  
1963-64



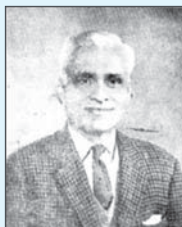
Shri U. Chandu Nair  
Chairman, KSEB  
1964-65



Shri C.L. Handa  
Member D&R, CWPC  
1965-66



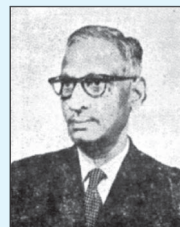
Shri G. Sambasiviah  
Chairman, Mysore State  
Electricity Board 1966-67



Shri N. G. K. Murti  
Chairman  
Bhakra Management Board  
1967-68



Shri B. V. Deshmukh  
Technical Member,  
Maharashtra State  
Electricity Board  
1968-69



Shri G.A. Narasima Rao  
Chairman, CWC  
1969-70



Shri T.C. Mahapatro  
C.E. Electrical & Member  
Technical  
Orissa SEB  
1970-71



Shri K.V. Sreenivasa Rao  
Chairman, APSEB  
1971-72



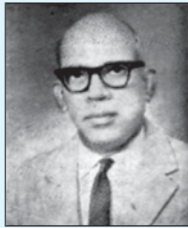
Shri H.V. Narayana Rao  
Chairman  
Mysore State Electricity  
Board  
1972-74



Shri N.C. Saxena  
E-in-C and Secretary,  
Irrigation Department,  
Uttar Pradesh  
1974-75



Shri K.S. Sivaparakasam  
Chairman, KSEB  
1975-76



Dr. N. Tata Rao  
Chairman, APSEB  
1976-78 and 1979-80



Dr. A. Ramachandran  
Secretary, DST, GOI  
1978-79



Shri E.C. Saldanha  
Secretary, Irrigation Deptt.  
Maharashtra  
1980-81



Shri T.R. Gupta  
Commissioner & Secretary  
PDD, Govt. of J&K  
1981-82



Shri Manohar Lal  
Secretary, Irrigation,  
Rajasthan  
1982-83



Shri B.S. Kochar  
CMD, NHPC  
July 1983-Nov. 1983



Shri A.K. Sah  
CMD, NTPC  
Dec.1983-July 84



Shri Pritam Singh  
Chairman, CWC  
Aug. 1984 - Jan. 1985



Shri P.A. Raj  
Addl Chief Secretary,  
Narmada Dev Deptt.  
Govt. of Gujarat  
Jan.- Dec.1985



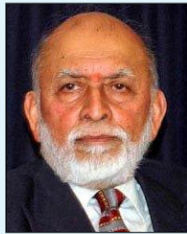
Shri T.K. Srinivasan  
Chairman, MPSEB  
Jan - April 1986



Shri N.S. Vasant  
Chairman, PESB  
1986-87



Shri C.G. Desai  
Advisor Planning  
Commission  
1987-88



Dr. M.R. Srinivasan  
Chairman, Atomic Energy  
Commission, 1989



Shri V.B. Patel  
Secy. Irrigation Gujarat  
1990



Shri J.K. Bhasin  
Chairman, CEA  
Jan. - May 1991



Shri R.C. Dave  
Chairman, RSEB  
June 1991-94



Shri V. P. Shimpi  
Secretary, Irrigation,  
Maharashtra  
Oct. 1994-96



Shri S.R. Sikdar  
Chairman, WBSEB  
1997-March 98



Shri Badal Sen Gupta  
Chairman, WBSEB  
April 1998-1999



Shri C.V. J. Varma  
Jan. -Feb. 2000



Shri J. Parthasarthy  
CMD  
AP Power Gen. Corp.  
2000-01



Maj. Gen. (Retd.)  
R.R. Oberoi  
Chairman, BBMB  
2001-02



Shri Yogendra Prasad  
CMD, NHPC  
May. 2004 April-2005



Shri A.K. Gangopadhyay  
CMD, NHPC  
May -.September 2005



Shri S.K. Garg  
CMD, NHPC  
Sept. 2005 - Jan 2006



Shri Rakesh Nath  
Chairperson, CEA  
Feb. 2006 - May 2010



Shri Gurdial Singh  
Chairperson, CEA  
May 2010 - June 2011



Shri A.S. Bakshi  
Chairperson CEA  
July. 2011 -Till Date

## SECRETARIES OF THE BOARD



Mr. A.M.R. Montagu  
(1930-31 to 1934-35)



Mr. M.T. Gibling  
(1935-36 to  
1938-39)



Mr. A.R.B.  
Edgecombe  
(1939-41)



Mr. A.R. Thomas  
(1941-45)



Shri N.D. Gulhati  
(1945-46 to 1948-49)



Shri S.L. Malhotra  
1949-50 to 1951-52



Shri M.L. Aggarwal  
(1952 to 1955)



Shri Baleshwar Nath  
(1956 to April 1960)



Shri P.H.  
Vaidyanathan  
(May 1960 to July  
1962)



Shri K.L. Bhatia  
(Nov. 1962 – 1966)



Shri S.N. Gupta  
(1967 – 1970)



Shri I.P. Kapila  
(1970 – 1972)



Shri C.V.J. Varma  
(1973 – 1999)



Shri S.P. Kaushish  
(2000 – 2002)



Shri S.L. Narasimhan  
(upto 31-10-02)



Shri G.N. Mathur  
(1-11-2002-  
31-10-2007)



Shri V.K. Kanjlia  
(01-11-2007  
till date)

# OFFICE BEARERS OF THE BOARD

## President



A.S. Bakshi, *Chairperson, CEA*

## Vice-President (WR)



A.B. Pandya  
*Member (D&R), CWC*

## Vice-President (RE)



Tarun Kapoor  
*Jt. Secretary, MNRE*

## Vice-President (Power)



Dr. H.R. Sharma  
*Chief Tech. Principal,  
Tractebel Engg.*



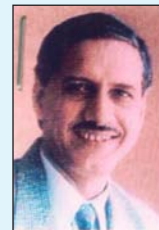
**Secretary**  
V.K. Kanjlia



**Director**  
P.P. Wahi



**Director (WR)**  
A.C. Gupta



**Director (E)**  
C.S. Malik



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# CHAPTER 1

## GENESIS AND GROWTH

### 1.1 INTRODUCTION

Irrigation has been practised in India from pre-historic times. Frequent references are found to wells, tanks, dams and canals, the importance to the community of their efficient maintenance & operation and the duties of the State in this respect in the Vedas and other ancient Indian literature. Rigveda mentions the terms 'avata' which signifies a 'well'. In another place reference is made to a reservoir in which a dry bucket is lying. Another passage mentions 'Kulya' an artificial river or canal, as reaching a lake. In Yajurveda, a river is mentioned as a cow and canal as a calf. Kausika Sutra described the rituals of the opening ceremony of letting water into a canal thus: -

*"A gold plate was laid at the mouth of the canal on which a frog tied with blue and red threads was made to sit. The frog was then covered with moss (sevela) and water was let in".*

According to an ancient writer, the digging of a tank was regarded as the greatest of the seven meritorious acts of a man aimed at providing water, viz., giving water, *Prapa, Kupa, Vapi, Kulya, Padmakara, Tataka* or dam. Brihaspati, another law giver states that the construction and repair of dams is a pious work and its burden should fall on the shoulders of the rich men of the land.

*Vishnu Purana* also enjoins merit to a person who effects repairs to wells, gardens and dams. *Rishi Narada* once came to the court of Emperor Yudhishtira and enquired about the welfare of his State. One of his questions was "Are the farmers sturdy and prosperous? Are there dams full of water and big enough and distributed in different parts of the Kingdom and does agriculture not depend on rains only?"

In Sanskrit literature, *Pranali, Kulya, Sarasi, Nika, Nala and Nalika* are used for different types of canals and channels. The word 'Tilamakd' denotes "a channel which leads the water from the hill side over the fields which rise in terraces one above the other". Similarly, the words 'Kunda' and 'Tala' are used for small and big tanks and the words 'Tataka' and 'Sarsi' for big dams. According to the Lexicographer *Amara* (1st century A.D.) Kulya is a small artificial stream.

Mortimer Wheeler of the Archaeological Survey of India in his book "Early India and Pakistan" remarks "that with the aid of some sort of irrigation system which is now deeply buried by post-Indus aggradations, but may in principle be assumed, it (the Indus Civilization) grew food crops and cotton..... Today Mohen-Jo-daro landscape is only preserved from disastrous inundation by large annual expenditure on a series of protective banks or bunds. So, no doubt, from the outset, considerable engineering was already needed when the new city rose from its far lower plain..... If at the same time energy and discipline were flagging and irrigation channels and bunds inadequately maintained, the total deterioration must have been appreciable.

*"It is not so difficult to infer that these people, who could build and maintain flood protection embankments, could align, grade and put up tanks for irrigation channels. Thus, the Indus Valley Civilization was essentially agricultural is borne out by the fact that huge granaries were put up for the storage of harvests."*

Shri O.P. Bhardwaj in his paper “The Arid Zone of India and Pakistan” remarks that: - “the development of cities in the Indus Civilization was probably due to large scale irrigation, which was also necessary for agriculture in the dry climate. Large scale irrigation works must have required for their control and management some sort of Government agencies and they must have also needed protective works to check the damage by floods. Such a complex irrigation system must have necessitated a large non-agricultural population lying in central places or ‘urban cities’. The growth of cities in the Indus Valley has, therefore, been intimately related to the development of an extensive irrigation system”.

Ruins of ancient irrigation works, mostly tanks and reservoirs are to be found scattered all over South India. A number of them which have been maintained properly are still in use. In *Cholamandala Satakam* we find a reference to the construction of a great dam, known as the Kal Anai or the Grand Anicut. This was a solid work of masonry laid in brick and stone. In the Southern India early Chola rulers (1st Century A.D.) were the pioneers in the construction of dams, etc. King Karikala I evinced keen interest in the irrigation methods and agriculture and was responsible for the construction of flood embankments for the Kaveri which used to cause heavy devastation on account of floods. Besides constructing the embankments of the Kaveri, he dug a number of channels, canals, tanks and bunds in some of which he took the help of other kings. Many of these irrigation works are functioning till today.

Under instructions of King Bukkaraya of the 1<sup>st</sup> Vijayanagar Dynasty, Singayya Bhatta, the Hydraulic Engineer or the **Jalasutradara**, who was also a master of ten sciences, “led the river Henne through a channel to the Siravera tank at Penugonda and gave it the name of Pratapa-Bukkaraya Mandala Channel.” A glowing tribute to the high engineering skill of those who were in charge of the construction of such colossal works has been paid by Horsley, the engineer of the Pandyan Canal, in the following words. “In other countries and in India also, an engineer generally works on his own lines in developing any large scheme of irrigation and naturally credits his own skill and perseverance with the success of his undertaking. Here, I have no hesitation in saying that it has been an unmixed pleasure to me, from a professional point of view to merely follow the lines of the original constructors of the Pandyan Canal and Pulpanabapoorum Poothenaur, because the evidence of their skill and almost super human perseverance was so marked; and I have in carrying out the works felt contended and fully satisfied to follow in the footsteps of those whom I cannot but consider to have been masters in their art and facile principles in Irrigation Engineering”.

The 19th and early 20th centuries witnessed the rapid growth of the art of irrigation in India. Many old canal systems were improved or renovated. New and more elaborate canal systems were constructed. Permanent headworks were put up on many of the great rivers.

With the constantly evolving political and economic patterns of India, the administration and financing of public works including irrigation projects during the last more than one century have undergone progressive changes and modifications. A brief account of changes in the administrative background and their effect on the developments of irrigation in India follows.

## **1.2 IRRIGATION ADMINISTRATION IN THE PRE-INDEPENDENCE PERIOD**

In the beginning of the British regime in India, right up to 1854, the construction and management of all public works, and the railways, were entrusted to army engineers. The

Public Works Department of the Government of India was organised in 1854, but on account of dearth of civil engineers in the country, the military engineers had to shoulder the burden of executing civil engineering works. In 1866, the Public Works Department was divided into two branches, viz., the Civil Works Branch including irrigation, roads, etc., and the Military Works Branch. By 1895 the Military Works Branch grew to such a size that it was organised into a separate Military Works Department, so that the Civil Works Branch became an independent entity.

Under the direction and control of the Public Works Department of the Government of India, there were Public Works Departments in each of the Provinces. The actual execution and management of irrigation works were the function of the State Governments. However, **until 1921, the Government of India and the Secretary of State in London exercised powers of superintendence, direction and control on all irrigation activities of the State P.W.Ds., whether technical or administrative, through an Inspector General of Irrigation and a Public Works Secretariat of the Government of India, with an engineer of experience as its Secretary. In 1921, i.e., after the introduction of the first instalment of constitutional reforms, irrigation became a provincial but 'Reserved' subject. Under the arrangements then introduced, it was necessary, for a provincial government to obtain the prior approval of the Secretary of State in Council through the Government of India, before the provincial government could sanction any irrigation project costing more than 5 million rupees or whenever the project materially affected the interests of more than one Province. From April 1937, i.e., with the inauguration of provincial autonomy, irrigation became a 'transferred' subject and the provincial governments got full powers over irrigation works and development.** The Central Government was no longer concerned with the development of irrigation except when a Province or a princely State would take objection to some development in an adjoining Province and the dispute could not be resolved by mutual agreement.

Irrigation development under British rule began with the renovation, improvement and extension of existing works. When enough experience and confidence had been gained, the Government ventured on new major works, like the Upper Ganga Canal, the Upper Bari Doab Canal and the Krishna and Godavari Delta Systems, which were all river diversion works of considerable size. The period from 1836 to 1866 marked the investigation, development and completion of these four major works. Thereafter, there was some slackening in tempo for a couple of decades. Attracted by the profitability of the first major irrigation works, two private companies planned irrigation development on a grandiose scale. The companies namely the East India Irrigation and Canal Company, and the Madras Irrigation Company were floated in England. The miserable failure of these two private enterprises to execute irrigation projects led, in 1866, to important and radical changes in the principles and policies governing the execution and financing of irrigation projects. Three major policy decisions were taken: (i) Irrigation projects would, in future, be constructed by the State through its own agency, (ii) Irrigation projects would be financed from public loans raised specially for the purpose, and (iii) Political boundaries would not be allowed to come in the way of the execution of irrigation projects, when the best possible utilisation of water of a river for irrigation purposes was being considered. These decisions gave a fillip to the construction programmes all over the country.

The First Irrigation Commission set up in 1901 in the context of two successive famines recommended definite lines of policy regarding the selection, financing and maintenance of irrigation works. On the recommendation of the Commission a large number of new works were undertaken. One of the tasks before the Commission was also to report on the desirability of extension of irrigation as a means of protection against famine. The Commission recommended a number of protective projects, some of which were undertaken. However, due to World War I and consequent paucity of funds, the emphasis remained on the remunerativeness of irrigation projects, rather than on the security they could afford to insecure and precarious areas.

### **1.3 FORMATION OF CENTRAL BOARD OF IRRIGATION**

As already indicated, **Government of India ceased to have any direct responsibility for Irrigation Works after 1921 and accordingly the Public Works Secretariat of the Government of India was abolished in 1923 and the post of Inspector General of Irrigation was converted into that of Consulting Engineer. The Government of India when dealing with new irrigation projects for submission to the Secretary of State or with matters of dispute between different political units, generally took the advice of the Consulting Engineer.**

One of the Local Governments pointed out one important defect of that system of control namely that **the Government of India was dependent entirely on the advice of a single officer, who, however able he might be, might have spent all his service in one Province and would not, therefore, be competent to deal with all the types of projects submitted for examination.** It was pointed out that conditions in various parts of India differed widely, and that no officer, whose experience had been confined to a single Province could be expected to have expert knowledge of every type of irrigation work. **It was suggested that a better procedure would be the establishment of an Irrigation Board before which all schemes submitted to the Government of India would be laid.**

The Government of India considered this suggestion of much value as it would on the one hand facilitate the exercise of control and on the other afford the Provinces whatever help or expert advice which the Provinces might require. The proposal was that all the Provinces should co-operate and that all their Chief Engineers (Irrigation) together with the Consulting Engineer to the Government of India should be regarded as Members of Central Board.

The Government of India, therefore, addressed the Provincial Governments vide their letter No. 1-39/51 dated 19 July 1926 proposing the establishment of such a Board of Irrigation (Appendix-1.1).

It would not, of course, be either necessary or practicable that projects submitted for sanction should be examined by the whole Board, but every project referred to the Government of India could be examined by a Sub-Committee of the Board selected by the Government of India, which would ordinarily consist of two Chief Engineers possessing the widest experience of works akin to the problem under consideration together with the Consulting Engineer to the Government of India. Not only would projects, requiring under the rules, to be submitted to the Government of India, be referred to such a Sub-Committee of the Board, but it would be open to any Provincial Government to ask for a Sub-Committee to advise on any difficult technical question connected with the irrigation project under preparation even though the project might not require, under the

rules to be submitted to the Government of India. Further, any dispute between two Provincial Governments or between a Provincial Government and an Indian State would be referred to a Sub-Committee of the Board for decision on the technical points involved in the dispute.

In response to the replies received from Provincial Governments, the Government of India vide their letter No. 1-39/51 dated 30 December 1926 (Appendix-1.2) conveyed their decision to constitute forthwith a Central Board of Irrigation with the composition and functions described in paragraphs 4 to 7 of letter No. 1-39/51 dated 19 July 1926 (Appendix-1.1).

**Thus the Central Board of Irrigation came into existence with effect from 1 January 1927.**

#### **1.4 PROPOSAL FOR CENTRAL BUREAU OF INFORMATION FOR IRRIGATION**

At this stage the British Government was seized of the problem of improving agriculture in India, and sent a Royal Commission to India in 1927 which toured the country for about six months and submitted a report in early 1928. In paragraph 285 of the Report which is reproduced below, the Commission recommended the formation of Central Bureau of Information for Irrigation.

*“285. Before the constitutional changes which followed the passing of the Government of India Act of 1919, the Government of India were the real owners of every major irrigation work in India, the position of the Provincial Governments being very much akin to that of managing agents. The capital required for the works was found by the Central Government and no original estimate could be sanctioned by any lower authority. After the Secretary of State or the Government of India had accorded sanction to a new major work, a term which included all productive and protective works, some of them costing even less than a lakh of rupees, the project was constructed by the local governments as agents of the Government of India, whose control was exercised through the medium of the Inspector General of Irrigation. The position was completely changed by the Reforms as a result of which, as already mentioned, irrigation became a Provincial subject, administered by the reserved side of the local governments. Although, under the new Constitution, the funds for all new works have to be provided by the local governments, a specific limitation has been placed on their powers. It is laid down that the sanction of the secretary of State is necessary to capital expenditure on irrigation and similar works, if the project concerned materially affects the interests of more than one local government, if the original estimate exceeds Rs. 50 lakhs; if a revised estimate exceeds by fifteen percent of an original estimate sanctioned by the Secretary of State or if a further revised estimate has been proposed after one revised estimate has been sanctioned by the Secretary of State. The effect of this limitation is to give the Government of India a greater measure of control over irrigation matters than they possess in regard to other reserved subjects. For the exercise of this control they rely upon the advice of their Consulting Engineer who has replaced the Inspector General of Irrigation. The position thus created has given rise to difficulties and we were informed by Mr. Harris, who, at the time gave evidence before us, was performing the duties of Consulting Engineer to the Government of India, that it had been ascertained that whilst Provincial Governments were agreed that it was very*

*desirable that they should be able to obtain a second opinion on their irrigation projects, they strongly objected to interference once a project had been sanctioned.*

*“Rivers and drainage lines do not respect provincial boundaries, and the evidence we received in the course of our enquiry convinced us of the urgent need for the creation of an organisation which would not only enable Provincial Governments to obtain a second opinion in regard to their irrigation projects but would also be in a position to give the Government of India authoritative advice in regard to the settlement of disputes between Provinces arising out of the claims to the same source of supply. In these circumstances, we welcome the recent Constitution by the Government of India of a Central Irrigation Board, of which the Consulting Engineer to the Government of India and all the Chief Engineers for Irrigation in the Provinces are members. The Board will work through Sub-Committees consisting of those engineers with recent experience of works akin to those to be discussed. These Sub-Committees will be convened by the Government of India at the instance of the local government concerned when a new project is about to be sanctioned or when a Province finds itself in difficulties in any technical matter. We understand that three such Sub-Committees have already been convened. This arrangement has many advantages, not the least of which is that as the Government of India have the right to convene Sub-Committees for their own purposes, they have now a ready means of obtaining competent advice on such central questions as irrigation schemes affecting two Provinces, or a Province and an Indian State, and on irrigation schemes which they are required to submit for the sanction of the Secretary of State in Council. The Consulting Engineer to the Government of India is not necessarily a member of all Sub-Committees and the incumbent of the post has, therefore, been required to take up, in addition to his technical work, the duties which formerly devolved on the Deputy Secretary to the Government of India in the Department of Industries and Labour.*

*“Whilst the constitution of the Central Irrigation Board and the manner in which it will function will result in the benefit of experience gained in one Province being placed at the disposal of other Provinces, we are of opinion that something more than this is required. We do not consider that it is, in itself, sufficient to secure that general dissemination of technical information throughout the provincial irrigation departments which we regard as desirable. We have been impressed in this, as in so many other directions, with the ignorance in one Province of what is going on in others. Unless steps are taken to remedy this defect, that ignorance will become even more marked with the establishment of the provincial stations for research into irrigation matters which we recommend in the following paragraph. We, therefore, propose the establishment of a Central Bureau of Information for Irrigation, the headquarters of which would be at Delhi and which might suitably be placed in charge of the Consulting Engineer to the Government of India. The main functions of the Bureau would be to establish and maintain a comprehensive library of irrigation publications, both Indian and foreign, which could be consulted by irrigation engineers and to act as a clearing house of information needed by provincial officers. It should, however, be something more than a mere repository of information and a centre for*



*answering enquiries. It should endeavour to reach a wider public than the irrigation departments and to keep agricultural officers, and the public generally, in touch with irrigation developments in India and abroad.*

*“An additional means of bringing the irrigation engineers in the Provinces into closer touch with each other would be provided by annual or biennial meetings and we consider it very desirable that such meetings should be arranged. They should be held in rotation in different Provinces and in localities which possess features of special interest to the irrigation engineer.”*

Mr. D G Harris, Consulting Engineer to the Government of India toured the country in June-July 1928 and discussed the issue with several Chief Engineers and found them unanimously in favour of the proposal. He recorded that *“we are drifting towards a dangerous state of what I may call technical decentralisation and there is a real desire on the part of every officer whom I have come in contact, that the process should be checked.”* He put forward detailed proposals regarding the function of the Central Board of Irrigation and Central Bureau of Information for Irrigation.

The Government of India vide their letter No. IR-72 dated 12 January 1929 (Appendix-1.3) invited the views of the various Provincial Governments as to the need of a Central Bureau and a copy of the note dated 22 September 1928 by the Consulting Engineer to the Government of India, was enclosed in which these proposals were detailed. It was suggested that the Bureau should be attached to the Central Board of Irrigation and not to the Central Government. It was also suggested that the cost of running the organisation should be distributed between the Provinces who would benefit from its activities.

Replies from various Provinces were received welcoming the proposal of establishment of Central Bureau of Information for Irrigation (Appendix-1.4).

#### **1.4.1 Central Bureau of Information for Irrigation attached with Central Board of Irrigation**

The proposed Central Bureau of Information for Irrigation was attached to the Central Board of Irrigation. The main functions of the Bureau were the collection and dissemination of technical information from all sources, both Indian and foreign, likely to be of value to irrigation engineers in the country. It was recognised that the work of irrigation engineers was becoming more and more complex as the simpler projects had been completed and that the progress in future depended both on properly tackling the more difficult and complicated schemes and on the extension of existing schemes with greater efficiency in distribution and economy in the use of water. The Bureau was thus organised to constitute a meeting ground for research officers, through which views could be exchanged, difficulties solved and overlapping avoided. **It was in this context that the Central Board of Irrigation took shape of an active committee to meet at intervals, with the Bureau functioning as the Committee’s office.** Thus, every Chief Engineer in the country was brought into close touch with each other and each one shared the responsibility in the working of the Bureau.

The Board and the Bureau were thus constituted as purely coordinating bodies designed to give each Province the benefit of experience gained elsewhere and to avoid committing the

same mistakes done elsewhere. As then proposed, the organisation consisted of the Central Board of Irrigation (comprising all Provincial Chief Engineers and the Consulting Engineer to the Government of India) as the controlling and directing authority, a Central Research Committee (comprising all Provincial Research Officers and the Consulting Engineer) to coordinate research and a Secretary, who would be also a Librarian functioning with a small office staff. The Central Board and the Research Committee would meet once a year. The meeting of the Provincial Research Officers enabled personal contacts, to ensure proper co-ordination of their work and to exchange ideas on a wider scale than was possible by mere writing to each other. One of the main functions of the Committee was to draw up a brief report on the work done and the results obtained by its members and to make recommendations as to the steps to be taken for the future and as to the nature and distribution of research work, to be undertaken during the following year.

### 1.5 FIRST SESSION OF THE BOARD — A LANDMARK

After due consultations with the Provincial Chief Engineers, the First Meeting of the Central Board of Irrigation was convened at New Delhi on 3rd and 4th November 1930. Members from Bombay, Bengal, United Provinces, Punjab, Burma, Bihar and Orissa, Central Provinces, Baluchistan and Government of India were present. Madras could not send its representative on account of a change over of the Chief Engineer.

While inaugurating the meeting, the Hon'ble Sir Joseph Bhore, K.C.I.E., I.C.S., Member of the Governor General's Executive Council said:

*“Gentlemen, I am very glad indeed to have this opportunity of meeting you here today and, on behalf of the Government of India, of welcoming you to New Delhi. I believe that this is the first occasion on which the Irrigation Chief Engineers in India have met together with a view to co-ordinating the work which is being done in the various provinces and, as such, it seems likely to prove a landmark in the History of Irrigation Administration in this Country. The fact that so many local governments have, no doubt, at very considerable inconvenience to themselves, been able to spare the services of their Chief Engineers for this purpose is, I think, itself a clear indication of the extent to which they recognise its importance and it is also, if I may say so, a very definite sign of that spirit of co-operation, the fostering of which will be one of the primary functions of the Central Bureau of Irrigation which you are here to inaugurate. Every irrigation Province in India is represented here today with one exception; that exception is Madras, and it is only the fact that a change of Chief Engineers in that Presidency is due to take place tomorrow which has prevented the Madras Government from sending its representative here to meet and confer with you.*

*“It may not be out of place for me to say a few words in regard to the origin of this Conference. Prior to the Reforms, irrigation was, in many respects and particularly as regards its financial aspects, akin to what now be described as a Central Subject. Although its day to day administration was conducted by the Provincial Governments, all funds necessary for the construction or extension of major works were provided direct by the Government of India who, in most cases, shared in the revenues derived*

from them. The interest of the Central Government in irrigation in the Provinces was thus a very real one as their own budget was liable to be materially affected by the success or failure of these projects.

*“With the introduction of the Reforms in 1920 the situation changed completely. Irrigation became a Provincial Subject and the Government of India ceased to be the owners of the works as heretofore to all intents and purposes they were. Their new position was that of bankers; they continued in most cases to find the money for large works, but the local government utilising it assumed responsibility for the payment of interest upon it, taking in return the whole of the revenues derived from the projects concerned. It is true that irrigation was classed as a Reserved Subject and as such was one over which the Government of India were charged with powers of superintendence, direction and control; it is also true that certain restrictions were placed on the financial powers of the local governments, works costing more than a prescribed amount having to be submitted for superior sanction. But the fact remained that the main financial responsibility for the works had passed from the Central to the Provincial authorities and it was clear that, having ceased to pay, the Government of India were no longer in a position to exercise control to the same extent as had previously been the case.*

*“As was perhaps not unnatural, the undefined nature of the powers of the Government of India of direction and control gave rise to some difficulty in the early years of the Reforms, and in 1924 they addressed local Governments in this matter. In particular, they asked for the views of those Governments on the question of the provision of suitable machinery designed, on the one hand, to facilitate the exercise of such control as might be necessary and, on the other, to afford the Provinces any help or expert advice which the latter might require. The creation of the Central Board of Irrigation was the direct outcome of this correspondence. As originally constituted, the Central Board was no more than a panel, consisting of all the Provincial Chief Engineers and the Consulting Engineer to the Government of India, from which, at the request either of the Central or any Provincial Government, Sub-Committees could be selected either to examine a particular project or to report on any specific technical question on which advice might be required. As examples of such Sub-Committees which have already been convened, I might mention the Committee appointed to examine the project for the Panlaung Dam in Burma, the Orissa Flood Committee and the Committee which sat last year to report on the accident to the Islam Weir in the Punjab.*

*“The next development was the recommendations made by the Royal Commission on Agriculture in India for the constitution of a Central Bureau for Irrigation in Delhi, the main functions of the Bureau being to establish and maintain a library of irrigation publications, both Indian and foreign, which could be consulted by irrigation engineers, and to act as a clearing house of information needed by provincial officers. When, however, this recommendation came under detailed examination, some doubt arose whether a Bureau constituted on the lines suggested by the Commission would, in practice, assure achievement of the objects aimed at. It has, I think, been generally recognized that, **under the existing system the Provinces are apt to work too much in watertight compartments with but little knowledge of what***

*is being done elsewhere in India, the result is that work is duplicated and that labour is often wasted in the consideration and solution of problems which have already been considered and solved in other places. To be really effective, the Bureau had to bridge this gulf between the Provinces. To enable it to do so, it seemed necessary to bring it into closer touch with the provincial organizations than a mere central library at Delhi was ever likely to achieve.*

*“It was this consideration which led to the alternative proposal which has come to fruition in today’s meeting. From being a mere panel, the Central Board of Irrigation has been transformed into an active Committee which will meet at intervals, the Bureau functioning as the Committee’s office. Thus every Irrigation Chief Engineer in India is not only brought into close touch with, but shares in the responsibility for the work of the Bureau. It is hoped that in this manner, information will be exchanged, experiences published and co-ordination definitely assured.*

*“The Commission’s scheme as thus modified, has been warmly welcomed by the majority of the Provincial Governments and it rests largely with you, gentlemen, who will have its operation in your hands, to see that it fulfils the anticipations which have been formed of its value. Its progress will be watched by the Government of India with the utmost interest; as an earnest of this interest they have already agreed to defray the whole cost of staffing and working the Bureau during this year and the next. It is, of course, impossible to say what rules will thereafter govern the financial relations between the Central and Provincial Governments.*

*“As regards the functions of the Bureau, I do not wish to say much as this is the principal matter which you have met here to-day to discuss. But I take it that one of its main duties must necessarily be the dissemination of technical information from all sources, whether Indian or foreign, likely to be of value to the officers of your department. It is impossible for every engineer to keep abreast, on his own account, with the multifarious developments which are taking place in engineering science throughout the world, and it should be extremely beneficial to have in operation a central institution which will sift all such information and communicate to officers such of it as is likely to have bearing on their work.*

*“I have already referred to the question of liaison between the Provinces ; it is here that, in my opinion, the main value of the Bureau will lie and I trust sincerely that you will be able to discover means of rendering such liaison real and effective. This applies not only to liaison in respect of the constructional activities of the department, but also in respect of research. The work of the Irrigation Branch is undoubtedly becoming more and more complex as the simpler projects are completed, and progress in the future will depend both on the more difficult and complicated schemes being properly tackled and on the extension of existing schemes by greater efficiency in the distribution and economy in the use of water. There is a vast field for research in connection with these matters, the number of officers qualified to undertake it is distinctly limited and it is all important that their efforts should not be wasted owing to lack of proper coordination of their work. **The Bureau will, if organized on the lines provisionally proposed, constitute***

*a meeting ground for research officers, through which views can be exchanged and overlapping avoided.*

*“There will be other matters which will probably engage your attention, such as the production and publication of technical papers, and I understand that you will also discuss the staffing of the Bureau and the best allotment of the funds available to the various objects which it is designed to serve. To these discussions I will now leave it to you. It is a promising feature of the whole scheme that no probable constitutional changes are likely to affect the results of your deliberations. There is no intention that either the Board or the Bureau shall in any way control or interfere with the actions of the local governments; it is purely a co-operative and coordinating scheme designed to give to each Province the benefit of experience gained elsewhere and to prevent waste of money owing to work being done in two places where it need only be done in one. Whatever may be said for independence in other directions, **Technical isolation can never be anything but costly and dangerous.** Gentlemen, I shall leave you to your discussions now and I hope you will have a very fruitful time while you are here”.*

Some decisions regarding the functions of the Board were taken in this First Meeting. All the Chief Engineers present expressed the unanimous view that the formation of the Board and the Bureau constituted the most important advance which had been made in the administration of irrigation in this country since the appointment of the Indian Irrigation Commission in 1901.

The first Secretary to the Board was appointed and the first Executive Committee was elected. In the Board's first letter vide No. 1 C.B.I, dated 5 January 1931 (Appendix-1.5), to the Secretary to the Government of India, Department of Industries and Labour, Public Works Department, the Executive Committee requested the Government to move the Provincial Governments to defray the cost of the Board in proportion to the irrigation systems they had. In response to the wishes of the Executive Committee, the Government of India, again took up this matter with the Provincial Governments.

**After this first meeting, the Executive Committee meetings of CBIP were being held periodically. These are listed in Annexure 1.1. The CBIP was also holding Annual Board Meetings/Sessions where important policy issues and problems relating to irrigation & power development etc. were being discussed. These Meetings/Sessions were considered to be great events from the very beginning, which were inaugurated by high dignitaries, VIPs, which included Viceroys, Members of the Executive Council of the Governor General during the colonial period. The Annual Board meeting held in 1945 was inaugurated by His Excellency Field Marshall Wovell and held in Rashtrapati Bhawan (then known as Viceroy House).**

**After Independence also the Annual Board Meetings/Sessions were being inaugurated by dignitaries like the Governor General, the President, Vice President, the Prime Minister, Deputy Prime Minister, The Governor/Chief Ministers of the state where the Sessions were being held.**

In addition to the Annual Sessions, the Research Sessions were also being held in important cities in different states by rotation. These sessions were being wholly devoted to presentations on

discussions of results of new advancements in research or design and in the practical solutions of important problems faced during construction of irrigation and power projects. These sessions provided an opportunity for research workers and design engineers to interact with each other and senior and experienced members of the Board in order to get the benefit of available expertise and knowledge.

## **1.6 THE BOARD - AN AUTONOMOUS ORGANISATION**

In their letter No. IR-72 dated 6 April 1932, (Appendix-1.6) the Government of India, Department of Industries and Labour informed the Board that the Provincial Governments had agreed to subscribe towards the maintenance of the Central Bureau of Information for Irrigation and it had accordingly been decided that with effect from the commencement of the financial year 1932-33, the Bureau would be supported by subscriptions from the Provinces, the contribution of the Government of India being limited to Rs. 2,500 per annum. The Bureau would then pass from the control of the Government of India and be an independent body functioning under the direct control of the Central Board of Irrigation. The Government of India, who was deeply interested in the efficiency of the organisation, also decided that the Bureau would be allowed to continue in possession of certain facilities which it enjoyed then, namely rent free office accommodation in Simla and free stationery and printing.

The activities of the Board have been steadily enlarging ever since its formation and with its good progress and monumental publications relating to irrigation development, it gained world-wide recognition.

## **1.7 MEMBERSHIP TO PRINCELY STATES**

With its pioneering work in the formative years, the usefulness of the Board became evident all over the country. It was felt that the Board's services could not be made available to the entire sub-continent if a section of the country, viz., the Princely States were not represented on the Board. The Board, therefore, resolved in 1943 to amend its Constitution to throw open its membership to individual engineers in charge of Irrigation Departments of Indian States also. Bahawalpur and Mysore were the first two Princely States to become members of the Central Board of Irrigation from 1944 which was until then confined to the Chief Engineers, P.W.D. (Irrigation Branch) of the Provinces of British India.

Immediately following this, many more Princely States joined the Board and on the eve of Independence all the major Princely States had become members of the Board.

## **1.8 FOREIGN MEMBERSHIP**

The Government of Ceylon now Sri Lanka approached the Board to enable their Chief Engineer to be a Member of the Board. The Constitution of the Board was duly amended to enable Ceylon and other foreign Governments also to become Members of the Board from 1945, after approval by the Government of India.

Burma (Myanmar) was also Member of the Board. However, just when the activities of the Board had sufficiently advanced after Independence, the Chief Engineer, Burma in his letter dated 4

April 1956 communicated his Government's decision to discontinue Burma's membership of the Board in which they were members from its inception.

## **1.9 MEMBERSHIP TO HYDRO POWER ENGINEERS**

In the post-independence period when the development of electric power was making headway in many Provinces and also the Princely States and separate departments of electricity were being created.

It was also felt that the development of waterways for irrigation and hydro-electric power were so interconnected and had so many technical subjects in common that it would be of mutual advantage if the hydro-electric engineers were members of the Board and so could take part in technical discussions. It was noted that hydro-electric engineering was already treated as one of the subjects allied to irrigation with which the Bureau of information deals and that the Board is already concerned with hydro-electric engineering. The inclusion of hydro-electric engineers in the Central Board of Irrigation was put up at the Nineteenth Annual Meeting of the Board held in November 1948 when it was resolved that the following officers shall become members of the Board:

- (a) Provincial Chief Engineers incharge of hydro-electric works.
- (b) Chief Engineers incharge of hydro-electric works in States to become members in each individual case after approval at the Board's annual meeting. The number of invitations to be limited to two.
- (c) Engineers dealing with matters concerning Indian waterways employed by the Government of India with the status of Chief Engineer or higher, subject to the Government of India making a suitable contribution to the Board.

It was also interalia suggested in this meeting that the Central Board of Irrigation should be designated as Central Board of Irrigation & Power. Government of India also approved in 1949 to change the name of the Board as Central Board of Irrigation & Power.

The inclusion of hydro-electric engineers as members of the Board was approved by the Government of India and membership was thrown open to power Chief Engineers also.

**In 1949, Power Engineers joined the Central Board of Irrigation and the Board was renamed as Central Board of Irrigation and Power**

## **1.10 SUBSCRIBING MEMBERS**

From the early years of its inception, a large number of former small Indian States used to take advantage, offered by the Board, by paying a small nominal subscription varying from Rs. 100 to Rs. 1,000 a year. These subscribing Members used to be supplied with literature issued by the Board.

For payments made to the Board two terms 'contribution' and 'subscription' had been used synonymously. It was proposed at the Eighteenth Annual Session of the Board held on 6th December 1947 that the Constitution should be amended suitably restricting the use of the word 'Contribution' to payments by full members of the Board and the term subscription to payment

by other authorities not represented by a Member as the Board. The Constitution of the Board was accordingly amended.

With a view to broad base the activities of the Board for the dissemination of knowledge in Irrigation and Power to private organisations, Technical Educational Institutions in the country, the enrolment of more Subscribing Members came up for discussion at a number of meetings of the Executive Committee. In addition to the supply of technical publications issued by the Board, it was decided that the subscribing members could send their representatives to take part in the technical discussions of the Board and can send their experiences in the Irrigation and Power Sectors in the form of technical articles or papers which can be printed in the 'Irrigation and Power' Journal or discussed in the Technical Sessions.

Consequently an appeal was sent by the President of the Board in February 1966 to a number of Engineering Firms, Constructional Organisations, both in Private and Public Sector, engineering educational institutions and others to become subscribing members of the Board and take mutual advantage of the technical know-how in the field of Irrigation and Power. As a result of this appeal, a number of engineering organisations both in Public and Private Sector, educational institutions enrolled themselves as Subscribing Members and started contributing to the Board as per rules framed for various categories of Membership. **Today the Board has 165 such organizations as members including 23 state irrigation departments. The irrigation department of Sri Lanka continues to be a member**

### **1.11 HONORARY LIFE MEMBERS**

On their retirement from the post of Chief Engineers, senior and experienced engineers cease to be Members of the Board. Thus, the country and the profession loses their valuable experience which would otherwise have been available had their association continued with the activities of the Board in some form or other.

To continue this association of the retired Chief Engineers with this Board it was decided to enrol them as Honorary Members on a nominal subscription a practice which is still in vogue.

### **1.12 THE BOARD AFTER INDEPENDENCE**

The partition of the country in 1947 had its repercussion on the Board also. The West Punjab, N.W.F.P., Sind, Baluchistan, East Bengal, Bahawalpur and Khairpur States which were parts of the composite India, withdrew their membership from the Board, since they formed part of the newly created Pakistan apart from the curtailment of its membership by their separation.

### **1.13 REGISTRATION OF THE CBIP UNDER "REGISTRATION OF SOCIETIES ACT"**

The Government of India, Ministry of Irrigation and Power informed the Secretary, Central Board of Irrigation and Power that the Government of India had decided that with effect from 1<sup>st</sup> April 1958 assistance from the Centre whether by way of loans or grants will not be available to organizations or undertakings unless they are incorporated under one or other of the special enactments or as a registered Society under Societies Registration Act, 1860. The constitution



of the Board was amended by the Board in June 1960 and was approved by Govt. of India, Ministry of Irrigation and Power vide letter dated 18/8/1960. The Board was registered under the Registration of Societies Act on 21/2/1975, based on Memorandum of Association and Rules & Regulation approved by Government of India.

### 1.14 HEADQUARTERS OF THE BOARD

Central Board of Irrigation after becoming an active organisation in May 1931, opened its office at Simla. Its venue was a small cottage at Simla called the Kennedy House. The meetings of the Board were held in a small room with about 20-25 members sitting across the table, exchanging notes and making discussion with an eagerness to find out solution for the complex problems experienced by them during the course of their work. The luminaries of the C.B.I. of that period comprised men like Mr. Gerald Lacey, Sir Claude Inglis, Mr. Hutchinson, Mr. Brown, Mr. Nicholson, Dr. McKenzie Taylor, Mr. Montagu, Mr. Haigh, etc. The Secretary of the C.B.I., After the Board moved from Simla to New Delhi in early 1952, the Board's office was housed in Old American Barracks on the Curzon Road and the library was shifted to Bikaner House in the office of the Central Water and Power Commission. From that place, the Library was again shifted to R. K. Puram where some of the offices of C.W.P.C. were also located but the Board's office still continued to function from the Curzon Road Barracks.

The need for a proper building of the Library was also stressed by the Irrigation Commission (1972) which also recommended that the Central Board of Irrigation and Power Library should be housed in a proper building and furnished with modern equipment and facilities. The Central Water Commission has now constructed a separate building at R.K. Puram for the library.

As the activities of the board increased considerably, acute shortage of accommodation



*Board Office at Simla*



*Board Office at Curzon Road Barracks, New Delhi*



*Board Office at Malcha Marg, New Delhi*

was felt and need to have adequate modern office building for the board was recognized. By persistent efforts, a small plot of land in Chanakyapuri area of New Delhi was got allotted for constructing the Board's office. In 1978, plans and designs for the construction of the building for the Board were finalized. The construction was entrusted to the Central Public Works Department and the work started in 1978. The construction of phase 1 of the building was completed in 1980 and the Board's Secretariat started functioning in the new office building from July 1980. A modern conference hall with a seating capacity of about 100 was subsequently constructed in the first floor of the building. All modern audio-visual facilities were provided in the Conference hall. The construction of the building was made possible by special contributions made towards the building fund by the various State Irrigation Departments, State Electricity Boards, etc. Even by the year 1982, the accommodation available was not found to be sufficient. Efforts were therefore made to expand the building plan and obtain the required clearances from the concerned authorities such as the Urban Arts Commission, New Delhi Municipal Committee etc. Phase II of the building was taken up and completed in 1985.

During the last few years, efforts have been made and steps taken for renovation and modernization of this building to meet the present day requirements. As a result, the building now has the facilities of a Board Room, Committee Rooms, four Training Halls, two Conference Halls besides other facilities. Presently, CBIP has also established its own "Institute of Excellence" for imparting specialised training and post graduate courses for which a 6-storeyed building has already been constructed at Gurgaon, Haryana, which has all the modern facilities for conducting specialized training courses under Power & Renewable Energy and Water Resources Sectors, with a back up of adequate laboratory facilities and library stacked with latest publications, books, and journals for reference of the trainees. Hostel facilities for the students are going to be arranged. CBIP has another vacant plot in Gurgaon which shall also be developed for enhancing the activities of CBIP.

### 1.15 SILVER JUBILEE CELEBRATIONS

The year 1952 saw the Board completing twenty-five years of its existence. This span of twenty-five years saw the Board as the **Indian National Committee for International Commission on Large Dams, International Commission on Irrigation and Drainage, National Committee for the International Society of Soil Mechanics and Foundation Engineering, Liaison body for International Association of Hydraulic Research, etc.** The Board also emerged as a major sponsor of large number of technical publications including the Quarterly Journal and Abstracts. Other achievements to its credit are given elsewhere.

**The Silver Jubilee Celebrations were held along with the Twenty-third Annual Meeting of the Board at New Delhi on 17 November 1952. The celebrations were inaugurated by**



Hon'ble Shri Jawahar Lal Nehru, delivering inaugural address

**Shri Jawahar Lal Nehru, the first Hon'ble Prime Minister of India and presided over by Shri M. S. Thirumale Iyengar, Chief Engineer, Tungabhadra Project.**

The Prime Minister, while inaugurating the Silver Jubilee celebration inter-alia observed as under:

*“I am happy to be present here today, not only because of the importance of the subject with which you deal but also, to pay a tribute to the work done by Indian Engineers. When I read the name of your board, the words “Irrigation and Power” excite my mind and all kinds of ideas come into my mind—ideas of history, long perspectives of human progress and the rest. I do not know what kind of history books are written nowadays for the schools but the real histories which should count should be histories which trace humanity’s progress and occasional set-backs; in other terms, the names of kings and big individuals in terms of development in various ways. The biggest development, I suppose, in the history of humanity was the discovery of agriculture and then later comes irrigation. I think it would be a fascinating subject to find out how the development of irrigation has affected human progress.....”*

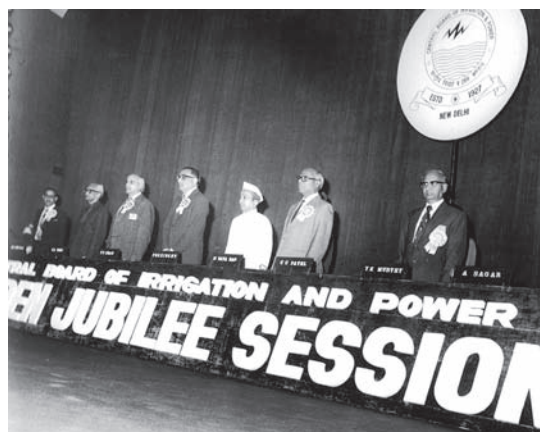
Messages received from the Hon'ble Dr. Rajendra Prasad, President of India and Hon'ble Shri Jawahar Lal Nehru Prime Minister of India on the occasion are reproduced in Appendix 1.8

The Board on this occasion issued a Silver Jubilee Commemoration Volume and distributed a Bronze Relief Map of India to guests and the Members.

## 1.16 GOLDEN JUBILEE CELEBRATIONS

The Second of March 1977 was a red letter day in the annals of the Central Board of Irrigation and Power, as it was on that day the Golden Jubilee celebrations of the Board were inaugurated by the Acting President of India, Hon'ble Shri B.D. Jatti at the Vigyan Bhawan, New Delhi; This was an occasion for the Members of the Board to look back and review the activities and achievements of the organisation during the earlier 5 decades, locate the lacuna, if any in its working and reorient the work as necessary and rededicate themselves to be of maximum service to the people of the country in the context of current developments.

Dr. N. Tata Rao, President of the Board, while welcoming the Guests and participants to the Golden Jubilee Session, reviewed in brief the activities of the Board during the earlier 5 decades as well as the programme of work before the Board. He also recalled the words of Pandit Jawahar Lal Nehru while inaugurating the Silver Jubilee celebrations in 1952 and said that Engineers were striving to live up to the expectations of the great leader and had built and were building



many more modern temples of the type Panditji had dreamt of. Dr. Tata Rao also referred to the effective contribution made by the Board in the development and management of the country's water and power resources, through continued research and a realistic appraisal of the basis of engineering design and execution of Irrigation and Power projects. He expressed his conviction that this contribution would continue to grow at an ever increasing pace in the years to come.

The then Hon'ble Prime Minister Smt. Indira Gandhi said in her message on the occasion:

*“On the occasion of fiftieth anniversary celebrations of the Central Board of Irrigation and Power, I give my greetings to the engineers and technicians of our country. They are truly our builders and I wish them further success”.*

On the occasion of the Golden Jubilee, the Central Board of Irrigation and Power brought out a number of special publications which included:

- (i) A special issue of the Irrigation and Power Journal
- (ii) A commemorative volume
- (iii) History of the Board
- (iv) Manual on Ground Water and Tubewells
- (v) Sedimentation Studies in Reservoirs
- (vi) Life of Reservoirs
- (vii) Reminiscences of former Members and office-bearers

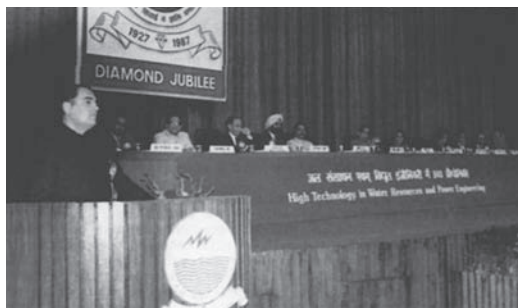
An Engineering exhibition was organised wherein Research Stations of the State Electricity Boards, State Irrigation Departments, Central Water Commission, Central Electricity Authority and Public Sector Organisations of the Power Sector participated. On this occasion in addition to messages received from the President and Prime Minister other dignitaries who sent their best wishes were:

- (i) Shri C. Subramaniam, Hon'ble Finance Minister of India,
- (ii) Shri K.N. Singh, Hon'ble Deputy Minister for Agriculture and Irrigation, India,
- (iii) Shri P.N. Baskar, Deputy Chairman, Planning Commission, New Delhi,
- (iv) Shri A.N. Khosla, Former Governor of Orissa, Chairman CWPC, President Honaire ICID and President CBIP
- (v) Dr. K.L. Rao, Former Minister of Irrigation Government of India and Vice President, IWRA
- (vi) Shri A. Ramachandran, Secretary, Department of Science and Technology, New Delhi
- (vii) Mr. Ven Te Chow, President, International Water Resources Association, Urbana, Illinois
- (viii) Mr. Flavio H. Lyra, President, International Commission on Large Dams ENGE-RiO, RUA MEXICO, 3-9 ANDAR
- (ix) Mr. Milos Holy, President, International Commission on Irrigation and Drainage, Prague

- (x) Mr. Gunnar Jancke, President, International Conference on Large High Tension Electric Systems, Paris
- (xi) Mr. R. Pelissier, Secretary General, CIGRE, Paris
- (xii) Mr. Gerald Lacey Former Chief Engineer U.P.
- (xiii) Shri Kanwar Sain, Former President CBIP and Chairman, CWC
- (xiv) Shri. M.R. Chopra, Ex-Chairman, CWPC
- (xv) Shri G.A.N. Rao, Special Technical Adviser, United Nations, New York
- (xvi) Shri B.V. Deshmukh, Ex-Chairman, Bhakra Management Board, Bombay
- (xvii) Shri H.V. Narayana Rao, Ex-Chairman, Karnataka Electricity Board, Bangalore
- (xviii) Mr. A.R. Thomas, England, Former Secretary of the Board
- (xix) Shri S.N. Gupta, Institute of Hydraulic Engineering, Indonesia
- (xx) Shri I.P. Kapila, Chief Engineer, Govt. of Punjab, Chandigarh

### 1.17 DIAMOND JUBILEE CELEBRATIONS

The year 1987 was another momentous year in the history of Board as it had completed 60 years of its service to the nation. The Board celebrated the Diamond Jubilee during the year in a befitting manner. The celebrations were spread over the entire year and were held in the different regions of the country. Five International Symposia were organised in different parts in the true spirit of character and composition of Board. The inaugural function held on 28<sup>th</sup> January 1987 at Vigyan Bhavan under the Chairmanship of the Hon'ble Union Minister of Water Resources Shri B.



Shankaranand was inaugurated by the **Hon'ble Prime Minister of India, Shri Rajiv Gandhi**. The Hon'ble Union Minister for Energy Shri Vasant Sathe also addressed the delegates. The Prime Minister presented the Diamond Jubilee Awards to Dr. M.R. Srinivasan, Chairman, Nuclear Power Board and to Shri P.A. Raj, Additional Chief Secretary, Narmada Development Department. Shri Kanwar Sain, Senior most member of the Board, was honoured by the Prime Minister. Commemorative Volume containing technical papers from eminent engineers was released by the Prime Minister during the inaugural session. Shri N.S. Vasant, President, CBIP pointed out:

*“It is a matter of pride for the Board that Pt. Nehru had inaugurated the Board Sessions on four occasions, namely, 1948, 1952, 1953 and 1958. Smt. Indira Gandhi had also inaugurated the Board Session in 1967. She was again with us in 1975. Today, the engineering fraternity feels greatly honoured by the presence of Shri Rajiv Gandhi amongst them on the historic Diamond Jubilee Celebrations of the Board”.*

Congratulating CBIP on the completion of 60 years of useful work, the Prime Minister said that he looks forward to the Board's next sixty years of contribution to India's development and progress.

International Symposium organised as part of Diamond Jubilee Celebrations:

- (i) International Symposium and Exhibition in High Technology in Water Resources and Power Engineering at New Delhi January 1987.
- (ii) International Symposium on New Materials and Techniques at Madras on 5-7th March 1987
- (iii) International Seminar on EHV/UHV AC, HVDC Transmission Systems at Bangalore on 6<sup>th</sup> and 7<sup>th</sup> May 1987.
- (iv) International Symposium on New Technology in Model Testing in Hydraulic Research at Pune from 24<sup>th</sup> to 14<sup>th</sup> November 1987.
- (v) Symposium on Adoption of New Techniques for Power Distribution System at Calcutta from 12<sup>th</sup> to 14<sup>th</sup> November 1987.
- (vi) International Conference on Expansive Soils at New Delhi from 1<sup>st</sup> to 4<sup>th</sup> December 1987.

Valedictory Celebrations ended with a Symposium on Quality Management, Quality Assurance and Quality Control in the fields of Water Resources and Power Engineering at New Delhi on 29-30 December 1987.

Following special publications were brought out during Diamond Jubilee Year 1987.

- (i) History of Cauvery Mettur Project
- (ii) Design and Construction Features of Selected Barrages in India.
- (iii) History of Chambal Project Vol. I and II
- (iv) Hydro Electric Power Stations in India Vol. II
- (v) Power Development in India
- (vi) Commemorative Volume
- (vii) Special Issue of Irrigation and Power Journal
- (viii) CBI&P Awards
- (ix) 60 Years CBIP, the 6<sup>th</sup> Decade 1977-87
- (x) Major Dams in India
- (xi) Irrigation Map 1986
- (xii) Power Map 1986
- (xiii) Power Atlas of India
- (xiv) Register of Dams
- (xv) Prevailing Practices in T&D Systems
- (xvi) Irrigation - Atlas of India
- (xvii) Design and Construction Features of Selected HEPS in India
- (xviii) Directory of R&D Stations
- (xix) Conclusions and Recommendations for 20 years.

Out of the above publications, first 9 special publications were brought out at the time of Inaugural Function of the Diamond Jubilee Celebrations.

Message from following dignitaries and engineers were received on the occasion.

- Shri Zail Singh Hon'ble President of India
- Shri R. Venkataraman, Hon'ble Vice President of India
- Shri Rajiv Gandhi, Hon'ble Prime Minister of India
- Shri J. Vengala Rao, Hon'ble Industry Minister, Govt, of India
- Shri Arjun Singh, Hon'ble Minister of Communications, Govt. of India
- Shri Bhajan Lal, Hon'ble Minister of Environment and Forests, Govt, of India
- Shri K.R. Narayanan, Hon'ble Minister of State for Science & Technology, Atomic Energy, Space, Electronics & Ocean Development, India
- Shri Ranvkrishna Hegde, Hon'ble Chief Minister of Karnataka
- Shri Harideo Joshi, Hon'ble Chief Minister of Rajasthan
- Shri S.B. Chavan, Hon'ble Chief Minister of Maharashtra
- Shri Farooq Abdullah, Hon'ble Chief Minister of Jammu and Kashmir
- Shri K. Karunakaran, Hon'ble Chief Minister of Kerala
- Shri Motilal Vora, Hon'ble Chief Minister of Madhya Pradesh
- Shri Amarsingh Chaudhary, Hon'ble Chief Minister of Gujarat
- Shri Hokishe Sema, Hon'ble Chief Minister of Nagaland
- Shri Nripen Chakraborti, Hon'ble Chief Minister of Tripura
- Shri Virbhadra Singh, Hon'ble Chief Minister of Himachal Pradesh
- Shri Prafulla Kumar Mahanta, Hon'ble Chief Minister of Assam
- Shri Nar Bahadur Bhandari, Hon'ble Chief Minister of Sikkim
- Shri Manmohan Singh, Deputy Chairman, Planning Commission
- Shri Hiten Bhaya, Member, Planning Commission
- Prof. Dr.-Ing. E.J. Plate, President, International Association for Hydraulic Research
- Mr. Peter J. Reynolds, President, International Water Resources Association
- Mr. Einar Broch, President of International Tunnelling Association
- Dr.Ing. Giovanni Lombardi, President, International Commission on Large Dams
- Shri Vasant Sathe, Hon'ble Minister of Energy, Govt, of India
- Mrs. Sushila Rohatgi, Hon'ble Minister of State for Power, Govt, of India

Dr. Kanwar Sain, Former Chairman, Central Water & Power Commission, New Delhi observed thus in his article for commemorative volume.

***“But for the continuing education provided by this Board, how ignorant would I have been of most of the Water Resources Developments in other States of India. Nor would have I kept abreast with the latest researches made in the numerous Research Laboratories in the country.***

*The Central Board of Irrigation and Power can justly be proud of its achievements. The Central Water Commission and even the International Commission on Irrigation and Drainage are its products. The Board has established a unique library. This library is perhaps the best library on the subject in the entire world. Even the USA and USSR do not have such a comprehensive library with the facility of bringing out a regular quarterly bulletin, giving summaries of the subjects dealt in the latest publications.*

*The fast changing demands of engineering and technology cannot be met without continuing education to maintain professional efficiency. The benefits of continuing education conferred by the Board by way of holding Research and Development Sessions, Seminars, Symposia, Workshops and Training Courses cannot be quantified. The CBIP can justly boast of active participation by its members at the meeting organised by it one measure of the quality and vitality of a profession is attendance at technical meetings and conferences”.*

### 1.18 PLATINUM JUBILEE

The Central Board of Irrigation and Power completed 75 years of dedicated service to nation in the year 2002 and decided to celebrate it as Platinum Jubilee year because the water resources and power development had been the core of development activities and CBIP had actively contributed to the task of nation building during all these years.

The celebrations included: -

- Organisation of events like seminars and conferences both national and international in twin sectors of water and energy;
- Institution and presentation of Awards both in Power and Water Resources;
- Bringing out special publications on this special occasion.

### 1.19 PRESENT ACTIVITIES

The CBIP, has greatly enlarged its sphere of activities of dissemination of technical knowledge through Publications, Training Programme, Consultancy, organising International and National conferences etc.

The Board has published Technical literature, Journals, Manuals, Guidelines etc. The Manual & guidelines prepared by CBIP have been highly appreciated. The CBIP has also started publishing monthly issues of its Journal “Water & Energy International” since April 2010, covering special features on development and management activities in Water Resources, Power and Renewable Energy sectors. Some special issues highlighting the details of the projects from inception to completion were also prepared. These are covered in a separate chapter.

CBIP has been very active in organising International and National Conferences since its inception, most of which have been discussed in detail in a separate chapter. A few of the recent Conferences organised by CBIP are listed below: -

- (i) 12<sup>th</sup> World Water Congress of IWRA was organised at New Delhi in 2005.
- (ii) Two Decades of Geosynthetics in India was celebrated at New Delhi during 2006.



- (iii) World Tunnel Congress was held at Agra on 19th - 25th September 2008. Her Excellency the President of India Smt. Pratibha Devisingh Patil addressed the participants (through recorded video) and appreciated the efforts of CBIP.
- (iv) Seminar on Solar Power Development in India and related techniques was inaugurated by Dr. Farooq Abdullah, Hon'ble Union Minister for MNRE on 9<sup>th</sup> February 2010.
- (v) International Conference on Accelerated Development of Hydropower in Bhutan – Opportunities and Challenges was held at Thimpu, Bhutan during 16-18<sup>th</sup> November 2010, which was inaugurated by Hon'ble Prime Minister of Bhutan, H.E. Lyonchhoen Jigmi Y Thinley.

CBIP had drawn up its programme for period 2002-2007 and then 2007-2012 in accordance with its Vision documents. Since then most of the targets, set there in, have been met. Salient activities completed by CBIP in recent years are listed below: -

- (i) Seminars, Conferences, Tutorials, Workshops have been conducted in the areas of Water Resources, Power and Renewable Energy sectors.
- (ii) Number of Publications have been brought out.
- (iii) Several Training Programmes have been conducted (a) Post Graduate Diploma course PGDC in Thermal Power. (b) Two Programmes in PGDC in Transmission & Distribution (T&D) of Power and other Training Programmes.
- (iv) Number of Consultancy assignments have been completed during this period.
- (v) Plot No. 21 Sector 32 Gurgaon allotted to CBIP in 1992 measuring 2135 sqm. was taken over from HUDA Gurgaon in 2010. Building having 6 stories with two Basements with a covered area of 60000 sq ft. has been constructed. The furnishing of the building is scheduled to be completed by mid July 2013. CBIP centre of Excellence has been set up for imparting training for adoption of the latest technologies and best practices to the engineering professionals.
- (vi) CBIP has been publishing various Journals since last 86 years. CBIP has produced about 1500 publications on various subjects. All the publications and Journals have been digitised to make them available to the professionals for their reference.

### **BOARD MEETING IN CABINET ROOM (COUNCIL ROOM)**

*It was 26th November 1945; the Rashtrapati Bhavan was still called Viceroy's House and the Cabinet Room was known as Council Room, where the Governor General and members of his council used to meet. The Chief Engineer, Irrigation, United Provinces, was the President of the Board for the year and, in that capacity, had been invited to stay in Government House during the Board's annual meeting. The Board was invited to have its meeting in the council room. Field Marshal Viscount Wavell, the Viceroy inaugurated the meeting at 11 am. in the council room where Dr. BR Ambedkar, the then Labour Member was also present as invitee. He advised that, after his address, the Board should continue to use the Council Room for their discussions, for the rest of the morning. This was obviously to enable members of the Board to spend the whole morning usefully.*

*In the evening, the Viceroy and Lady Wavell gave an 'At Home' to meet the members of the Board and Officers accompanying them to the meeting.*

**N.D Gulati**

*Former Joint-Secretary, Ministry of Irrigation & Power,  
Government of India*



**Board Meeting in 1930** – Sitting (L to R): Mr. C.S.C. Harrison, C.I.E. (Sukkur Barrage and Canals), Mr. R.P. Hadow, C.I.E. (Punjab), Mr. C. Addams Williams, C.I.E. (Bengal), Sir Bernard Darley Kt., C.I.E., President (United Provinces), Mr. D.G. Harris, C.I.E. (Government of India), Col. H. del Pollard-Lowsley, C.M.G., C.I.E., D.S.O. (Central Provinces), Mr. D.R. Satarawala (Sind).

Standing (L to R): Mr. F.A. Betterton (Bihar and Orissa), Brigadier W.H. Evans., C.I.E. D.S.O. (Baluchistan), Mr. C.M. Lane (Bombay), Mr. W.L. Stampe (United Provinces), Mr. J.M.B. Stuart (Burma).



**Board Meeting in 1952** – Sitting (L to R): Shri Moti Ram (United States of Rajasthan), Shri M.P. Mathrani (Bihar), Sri Kanwar Sain (Government of India), Shri R.L. Narayanan (Orissa), Shri M.S. Thirumale Iyengar, President (Madras), Shri M.L. Champhekar (Bombay), Sardar Man Singh (Government of India), Shri P. Papiiah (Hyderabad), Shri T.J. Mirchandani (Bombay).

Standing (L to R) (1st Row) : Shri S.S. Kumar (Punjab), Shri K.P. Sreedharan Nair (U.S. of Travancore and Cochin), Shri U.J. Bhatt (U.S. of Saurashtra), Shri P.V. Divatia (Madhya Bharat), Shri N.N. Chakarveti (U.P.), Shri B.P. Saxena (U.P.), Shri K.S. Gangadhara (Mysore), Shri D. Mehta (Bihar), Shri J. Kuriyan (Bihar), Shri K.R. Sud (Punjab).

(2nd Row) Shri P.N. Kumra (Deputy Secretary), Shri J.C. Hardikar (Hyderabad), Shri B.N. Sibbal (Madhya Bharat), Shri K.K. Kartha (U.S. of Travancore and Cochin), Shri M.L. Aggarwal, Secretary.



His Excellency the Viceroy of India Lord Linlithgow inaugurated the 7th (1936) and 11th (1940) Annual Session of the Board



His Excellency the Viceroy of India Lord Wavell inaugurated the 16th (1945) Annual Session of the Board



Pandit Jawaharlal Nehru, Hon'ble Prime Minister of India delivering the Inaugural Address at the 19th (1948) Annual Session of the Board



His Excellency Shri Chakravarti Rajagopalachari, Hon'ble Governor-General of India delivering the Inaugural Address at the 20th (1949) Annual Session of the Board



Sardar Vallabhbhai Patel, Hon'ble Deputy Prime Minister of India, arriving at Inaugural Session of the 21st (1950) Annual Meeting of the Board



Pandit Jawaharlal Nehru, Hon'ble Prime Minister of India delivering the Inaugural Address at the 23rd (1952) Annual Session of the Board



Pandit Jawaharlal Nehru, Hon'ble Prime Minister of India delivering the Inaugural Address at the 24th (1953) Annual Meeting of the Board



Shri Gulzaari Lal Nanda, Hon'ble Minister for Irrigation and Power delivering the Inaugural Address at the 25th (1954) Annual Session of the Board



Shri S.K. Patil, Hon'ble Minister for Irrigation & Power delivering the Inaugural Address at the 28th (1957) Annual Session of the Board



Hon'ble Prime Minister of India Pandit Jawarlal Nehru India arriving at Inaugural Session of the 29th (1958) Annual Meeting of the Board



Hon'ble President of India Dr. Rajendra Prasad delivering the Inaugural Address at the 30th (1959) Annual Session of the Board



Shri Lal Bahadur Shastri, Hon'ble Union Minister for Home Affairs delivering the Inaugural Address at the 33th (1961) Annual Session of the Board



Shri Gulzari Lai Nanda, Hon'ble Union Home Minister delivering the Inaugural Address at the 36th (1963) Annual Meeting of the Board



Dr. Zakir Hussain, Hon'ble Vice-President of India delivering the Inaugural Address at the 37th (1965) Annual Session of the Board



Shrimati Indira Gandhi, Hon'ble Prime Minister of India delivering the Inaugural Address at the 40th (1967) Annual Session of the Board



Hon'ble Shri V.V. Giri, the then Vice-President of India delivering the Inaugural Address at the 41th (1968) Annual Session of the Board



Shri Jagjivan Ram, Hon'ble Union Minister for Food, Agriculture, Community Development and Co-operation arriving at Inaugural Session of the 42nd (1969) Annual Meeting of the Board



Shri G.S. Pathak, Hon'ble Vice-President of India delivering the Inaugural Address at the 43th (1970) Annual Session of the Board



Shri Uma Shankar Dikshit, Hon'ble Union Minister for Works & Housing and Health & Family Planning delivering the Inaugural Address at the 45th (1972) Annual Session of the Board



Shri P. Ramachandran, Hon'ble Union Minister for Energy presenting the CBIP award at the Inaugural Session of the 48th (1978) Annual Meeting of the Board



Shri Surjeet Singh Barnala, Hon'ble Union Minister for Agriculture and Irrigation delivering the Inaugural Address at the 49th (1979) Annual Session of the Board



Hon'ble Chief Minister of Tamil Nadu, Shri M.G. Ramachandran delivering the Inaugural Address at the 51st (1981) Annual Session of the Board

*Appendix - 1.1*

**Letter from the Hon'ble Mr. A.H. Ley, C.S.I., CLE., C.B.E., I.C.S., Secretary to the Government of India, Department of Industries and Labour to Local Government (except the Government of the United Provinces and Assam) Public Works Department, No. 1.39/51 dated the 19 July 1926.**

*Subject: The Formation of a Board of Irrigation*

1. In my letter of 11 September 1924, the question of the degree of control to be exercised by the Secretary of State and the Government of India over irrigation works in the major provinces was discussed. Certain difficulties in the present system were explained in a note, dated 14 May 1924 by Mr. (now Sir) Frederick Gebbie, attached to that letter, and three possible courses of action were suggested, viz:
  - (a) To retain irrigation as a reserved provincial subject, with the limitations upon the powers of Local Governments imposed by rule 1 (6) of the Rules in the Audit Resolution, and with a tightening up of the Government of India's control.
  - (b) To include irrigation in the list of transferred subjects, and
  - (c) To retain irrigation as a reserved provincial subject, but to delete the limitations imposed by the Audit Resolution.

It is unnecessary to consider further at the moment the second possible course of action, namely, the inclusion of irrigation in the list of transferred subjects a suggestion to which Local Governments were practically unanimously opposed. It has now been ruled by the Secretary of State that the limitations imposed by the Audit Resolution must for the present be retained, and it has consequently become necessary for the Government of India to consider once more how far it is necessary to make any changes in their present organisation with a view to rendering their control as reasonable effective as circumstances will allow.

2. The proposal to adopt more restrictive rules referred to in Sir Frederick Gebbie's note already quoted, with a view to tightening up the control of the Government of India, was opposed by every Local Government except one. It was pointed out not merely that such a proposal would be contrary to the general policy of leaving to Local Governments the largest possible measure of autonomy in respect of matters of provincial concern which are financed from provincial revenues, but that further restrictive rules would result in inordinate delay, and probable increased expense in the execution of large irrigation projects. The Government of India recognise the force of these views and are not inclined to proceed with the proposal to impose the restrictive rules which some other measures which, while giving to Local Governments as much freedom of action as is desirable, will still enable the Government of India to exercise their general powers of superintendence, direction and control.
3. It was remarked in paragraph 8 of my letter, dated the 11 September 1924 that, if irrigation were retained as a reserved subject with the omission of the limitations imposed upon the powers of Local Governments by the Audit Resolution, the control of the Secretary

of State and of the Government of India would be of a general nature and would not involve the detailed and technical scrutiny of projects which the existing rules necessitate. The result would be that the advantages accruing from the examination of schemes by an independent expert would disappear, as there would be no room, under the system suggested, for the employment by the Central Government of a Consulting Engineer, whose responsibility would be mainly towards the Governments of the Provinces. The retention of the limitations imposed by the Audit Resolution must in any case involve the retention, in some form *or* another, of the post of Consulting Engineer to the Government of India, and indeed the retention of this post was urged by almost all Local Governments, even if the limitations imposed by the Audit Resolution were to disappear, on the ground that it was most desirable that Local Governments should have at their disposal some arrangements for obtaining independent technical advice.

4. It is not the purpose of this letter to discuss the precise form or the status of the office of the Consulting Engineer to the Government of India, a question which is receiving the separate consideration of Government, but rather to put before the Government (of Madras, etc.) a further proposal, which was advanced by one of the Local Governments in reply to my letter of 11 September 1924, for the establishment of an Irrigation Board. The Local Government in question pointed out that one important defect of the existing system of control is that the Government of India are dependent entirely on the advice of a single officer, who, however, able he may be, has spent all his service in one Province, and may not, therefore, be competent to deal with all the projects submitted for examination. They pointed out that conditions in the various parts of India differ widely, and that no officer, whose experience has been confined to a single Province, can be expected to have expert knowledge of every type of irrigation works. They therefore, proposed the establishment of an Irrigation Board, before which all schemes submitted to the Government of India would be laid.
5. The Government of India consider that this suggestion is one of much value, and that, if carried out, it will go a considerable way towards enabling the Government of India better to exercise their powers of control, when a major project is submitted for their consideration and for the sanction of the Secretary of State. The proposal is that all the Provinces should co-operate, and that all their Chief Engineers (Irrigation), together with the Consulting Engineer to the Government of India, should be regarded as members of a Central Board. *It* would not, of course, be either necessary or practicable that projects submitted for sanction should be examined by the whole Board, but every project referred to the Government of India would be examined by a sub-committee of the Board, selected by the Government of India, which would ordinarily consist of two Chief Engineers possessing the widest experience of works akin to the problem under consideration together with the Consulting Engineer to the Government of India. Not only would projects requiring under rule to be submitted to the Government of India be referred to such a subcommittee of the Board, but it would be open to any Local Government to ask for a sub-committee to advise on any difficult technical questions connected with an Irrigation project under preparation, even though the project itself might not require under rule to be submitted to the Government of India. Further any



dispute between two Local Governments, or between a Local Government and an Indian State would ordinarily be referred to a sub-committee of the Board for decision of the technical points involved in the dispute.

6. The arrangement suggested appears to the Government of India to possess several attractive features. It would be possible to convene a sub-committee of the Board which would be competent from personal experience to give valuable advice on almost any problem which could conceivably arise. Moreover, it would result in the General dissemination of technical information and the benefit of experience gained in one province being placed at the disposal of others. Nor, in the opinion of the Government of India would the establishment of such a Board involve any serious encroachment on the ordinary work of the Chief Engineer of any province. The number of cases which would have to be referred to a subcommittee would be small and, as the personnel would vary with the nature of each case, each Local Government would only be asked to lend the services of their Chief Engineers at infrequent intervals. It is intended that all papers in connection with the problem to be considered would be forwarded in advance to the members of the sub-committee by the Consulting Engineer to the Government of India, so that the actual meetings of the sub-committee would only be likely to occupy short periods of time.
7. It is suggested that the Local Government, whose project is under consideration, should pay the travelling allowance, of the members of the sub-committee and other incidental expenses in connection with the meetings, or when more than one Local Government is interested, these expenses might be divided between the Local Governments concerned. But it is thought that the pay of the Chief Engineers concerned should continue to be borne by the Governments to which they belong, which will obtain in return the right to call for a Board when they require it. In the case of the Consulting Engineer to the Government of India, his pay and allowances will continue to be borne by the Central Government.

Pending a decision on the question of the precise nature of the control to be exercised by the Government of India over Irrigation works and on the connected question of the form and status of the post of Consulting Engineer to the Government of India, matters which are still under consideration—I am to say that the Government of India would be glad to receive the opinion of the Government (of Madras, etc.) on the proposed formation of an Irrigation Board as outlined in this letter, and to request that a reply may, with the consent of the Governor in Council, be sent at the earliest possible date.

*Appendix 1.2***Letter from the Secretary to the Government of India, Department of Industries and Labour to Provincial Governments (Except Assam), No. 1.39, dated the 30 December 1926.**

1. I am directed to invite a reference to the correspondence ending with your  
 Madras — 1049-1, dated 17 August, 1926  
 Bombay — 6465 dated 25 October, 1926  
 Bengal — 4335-1, dated 23 August, 1926  
 United Provinces-N.T.-357-I-W/142-B.-36-W. dated 6 August, 1926  
 Punjab — 01488-N.I. dated 25 August, 1926  
 Bihar and Orissa — 775. I.R./X.C-9 dated 11 August, 1926  
 Burma — 578/143-1. (G) dated 9 August, 1926  
 Central Provinces — 342-A./E/I. dated 2 September, 1926  
 regarding the control of irrigation works in India, and to communicate to you the conclusions at which the Government of India have arrived in the matter.
2. Upon the question being referred to them most of the larger irrigation provinces have taken the view that, once a project has been sanctioned by the Secretary of State in Council, control on the part of the Central Government over the details of its execution is undesirable, while experience has convinced the Government of India that it is also ineffective. The Government of India, have, therefore, decided to discontinue the system at present in force, under which they purport to exercise a detailed technical control during the period of construction of major irrigation works.
3. The Government of India have further decided to constitute forthwith a Central Board of Irrigation of the composition, and with the functions, described in paragraphs 4 to 7 of Mr. Ley's letter No. 1-39/51 dated 19 July, 1926. This Board will, in future, be available for the purpose of giving independent advice to the Government of India and local Governments on such questions in connection with irrigation projects as may be referred to it.
4. Consequent on the constitution of this Board a material reduction of the work assigned to the Consulting Engineer to the Government of India will take place. He will no longer act as adviser to the Local Governments, except in so far as he may be required *to* do so as a Member of the Board. In the circumstances the Government of India have decided that it is possible for him to take over the secretarial functions at present discharged by the Deputy Secretary in this Branch of the Industries and Labour Department, and, with the sanction of the Secretary of State in Council, the latter appointment is being abolished.
5. The new system will necessitate the formation of a code of rules to govern the construction of irrigation works which, while leaving to local Governments the widest freedom of action within the amount sanctioned for the project, will ensure that timely notice will be given to the Government of India, and through them to the Secretary of State, both of intended modifications of the project as approved and of anticipated excesses over the estimated cost. Such rules are now in course of preparation.
6. Certain local Governments have expressed the wish that, even with the introduction of the new system, opportunities should continue to be afforded for periodical conversations between the Consulting Engineer to the Government of India and their local officers in regard to questions which concern both the Central and the Provincial Government. I am to say that the Government of India will be glad, at any time, to place the services of their Consulting Engineer at the disposal of any Local Government for this purpose.
7. The revised system described in this letter will come into force with effect from 1 January, 1927.

*Appendix 1.3***Letter to all Local Governments (Except Assam), No. I.R.-72, dated the 12 January, 1929.**

*Subject: Establishment of a Central Bureau of Information for Irrigation in Delhi*

1. I am directed to invite your attention to the recommendation made, in paragraph 285 of the Report of the Royal Commission on Agriculture in India, for the establishment of a Central Bureau of Information for Irrigation in Delhi, and to forward, for the consideration of the Local Government, a note, dated the 22 September, 1928, by the Consulting Engineer to the Government of India, in which certain proposals are made regarding the constitution and functions of such a Bureau.
2. The Government of India agree with the view taken in paragraph 18 of the note that it would be premature to discuss details either of the organization to be adopted or of the work to be done by the Bureau until the views of the Local Governments on the whole question are known. I am, therefore, to enquire whether the Government of Madras/Bombay/etc, agree as to the need for a Central Bureau. If so, the Government of India will be glad to learn whether the scheme put forward by the Consulting Engineer meets with their approval or whether, in their opinion, it requires alteration or modification in any direction.
3. If the proposals referred to above are adopted, the Bureau will be attached, at any rate for the present, to the Central Board of Irrigation and not to the Central Government. In these circumstances, it appears only reasonable that the cost should be distributed between the Provinces who will benefit from its activities. This cost is estimated at from Rs. 30,000 to Rs. 40,000 per annum, the latter figure being for the period during which the library is in course of formation. It is tentatively suggested that, for the purpose of assessing shares, the Provinces should be divided into three classes, the first class containing those the normal area annually irrigated in which exceeds a million acres, the second class those irrigating between half a million and a million acres, and the third class those irrigating less than half a million acres. Provinces of the first class might, it is thought, pay three shares, those of the second class two shares, and those of the third class one share. Although the area irrigated in minor Administrations would place the Government of India in the third class, that Government are prepared, in view of their general interests in the subject, to subscribe at the same rate as a first class Province and to permit their Consulting Engineer, working under the direction of the Board, to exercise a general supervision over the work of the Bureau, should the local Government so desire. The shares to be paid by each Province, under the system described above, would be:

4.	Shares per Province	Total Sahre
Government of India, Madras, Bombay, the United Provinces and the Punjab	3	15
Government of Burma, Bihar and Orissa	2	4
Governments of Bengal and the Central Provinces	1	2
		<b>21</b>

The amount of one share will vary from about Rs. 1,500 to Rs. 2,000 per annum. The maximum liability of a first class irrigation Province will thus be about Rs. 6,000 per annum, of a second class Province Rs. 4,000 per annum, and of a third class Province Rs. 2,000 per annum. If it is considered that the Bureau will be of real value to the Local Governments, the amount to be paid by each will probably be regarded as reasonable.

Should the proposals be approved, the Government of India suggest that a meeting of the Central Board of Irrigation be held at convenient opportunity to discuss the question in detail, to draft such regulations as may be necessary regarding the organization and functions of the Bureau, to frame a budget, to make proposals as to how its finances shall be dealt with and accounted for, to nominate a Secretary and to consider any other matter which any of its members may desire to place before it.

**Note: Dated the 22 September 1928 by Mr. D. G. Harris, C.I.E., Consulting Engineer to the Government of India, on the recommendation made by the Royal Commission on Agriculture in India for the establishment of a Central Bureau of Information for Irrigation.**

1. The recommendation made by the Royal Commission on Agriculture in India in favour of the establishment of a Central Bureau of Information for Irrigation is contained in paragraph 285 of their Report, and runs as follows:

*“We, therefore, propose the establishment of a Central Bureau of Information for Irrigation, the headquarters of which would be at Delhi and which might suitably be placed in charge of the Consulting Engineer to the Government of India. The main functions of the Bureau would be to establish and maintain a comprehensive library of irrigation publications both Indian and foreign, which could be consulted by irrigation engineers and to act as a clearing house of information needed by provincial officers. It should, however, be something more than a mere repository of information and a centre for answering enquiries. It should endeavour to reach a wider public than the irrigation departments and to keep agricultural officers, and the public generally, in touch with irrigation development in India and abroad.”*

The recommendation probably had its origin in the suggestion made by Mr. B. d’O. Darley, CLE., Chief Engineer, United Provinces, in his evidence before the Commission, that an All-India Irrigation Congress should be constituted with its headquarters at Delhi. A copy of the relevant portion of this evidence is appended.

2. I have had an opportunity, during my recent tours, of discussing the question at issue with several Chief Engineers, and have found them unanimously in favour of the proposal. But there is a very general feeling that it does not go far enough. It is beginning to be realized that we are drifting towards a dangerous state of what I may call technical decentralization and there is a real desire, on the part of every officer with whom I have come in contact, that the process should be checked.
3. I feel very doubtful whether the establishment of the Bureau will, in itself, solve the problem. If the Bureau is to be a live thing, it must be in much closer and more intimate touch with the Provinces than such an organization as is sketched in the Report would ordinarily be. What seems to me to be required is a Bureau attached not to the Central Government but to the Central Irrigation Board, which, in turn, should be converted into an active Committee, somewhat on the lines of the Indian Railway Conference Association, and not regarded merely as a panel from which technical sub-committees can be drawn to report on specific questions.
4. In order to attain, to the fullest degree, the objects which the Commission evidently had in view in making their recommendation we should, in my opinion, visualize the Central Irrigation Board as a Committee of Engineers, meeting at intervals, with the so-called Bureau as their office. In charge of this office, and acting under the general direction of the Consulting Engineer, will be a Technical Secretary, who will discharge the duties which, under the Commission's proposal, would have devolved upon the Librarian and Curator of the Central Bureau.
5. The first point to be considered is what work this office will have to do. One of its main functions will be that of keeping the irrigation engineers of India in touch with what is going on in other countries in the same and allied lines of work. No engineer can possibly find time to read more than a small fraction even of the most important technical journals and, consequently many new developments, new labour saving devices, and the like, which might well be applied to Indian conditions, are unnoticed and remain unknown. In the organisation now proposed it will be a duty of the Secretary to scrutinize the principal technical papers and to prepare brief digests of all articles likely to be of use or interest to Indian irrigation engineers. Such digests will be issued periodically, and it will be open to any officer, who discovers one which seems to have a bearing on his work, to apply to the office of the Board for the original article to be sent *to* him.
6. Contact will also be established between the office of the Board and the somewhat similar bureaus which exist in other countries where irrigation is practised, and more especially with those in Egypt and America, with a view to accounts of developments in those countries, in so far as they may be applicable to India also, being made available to all Indian engineers. Bureaus of this nature are usually only too glad to agree to an exchange of publications.
7. The office will also, as proposed by the Commission, maintain a technical library, of which the Secretary will be a Librarian. A technical library is of little or no use unless it is in the charge of a technical officer, as, in the majority of cases, an engineer cannot specify exactly the book which he wants. What he does know is the problem which

confronts him, and what he requires is an organization to which he can put his problem and which will look out and send him books or articles bearing upon it.

8. Perhaps the most important of all the duties which the office will have to undertake is the establishment and maintenance of liaison between the Provinces. The present position in this respect is most unsatisfactory. Very few Provinces have the least idea of what is being done in any areas except their own, and one finds the same experiments being made over and over again with a view to the solution of problems which have already been solved elsewhere, the same mistakes being made as were made years ago and rectified in other parts of India, and the same study being applied to questions which have already been studied and finally settled only a couple of hundred miles away. This all means waste of time, energy and money. The Consulting Engineer, during his tours, can do a little to carry information from one Province to another, but not nearly enough.
9. It is mainly the furtherance of a proper liaison between the Provinces which has dictated the organisation now suggested. There is not the slightest doubt that the respective Chief Engineers will take a much keener interest in the proper functioning of an organisation of which they are themselves members than in that of an independent Central Bureau in which they would have no direct concern. The submission of a paper for formal publication by the Central Government is a very different matter from the supply of information to a Committee of brother engineers. At present a vast amount of useful information is buried in the files of local Secretariats, and probably an even greater amount never gets put upon paper at all; it will be a function of the Central Board to say what type of information is required and for the members of the Board to see that their subordinate officers supply it. Considering the scope of the irrigation works of India, the technical literature regarding them is inadequate in the extreme, and this fact is, in my opinion, due far less to the unwillingness of officers to write up their experiences than to the fact that, in the past, there existed no ready means of ensuring that the records would be of use, when written. Under the proposals now made, all information collected will be presented to the Board, the members of which will bring such as may be relevant *to* their work to the notice of officers serving under them.
10. The Royal Commission have also mentioned publicity as one of the functions of the proposed Bureau, and it certainly seems desirable that something should be done in this behalf. For every ten persons, including engineers, outside India who have some knowledge at least of the development of irrigation works in Egypt and America, there will not be found one who knows anything of irrigation in India, although the total area irrigated in either of the former countries is less than that irrigated by a single one of our larger schemes. Everyone has heard of the Assuan Dam, for example, but how many people outside India (I might even go further and say outside the Bombay Presidency) have heard of the far bigger and bolder dams recently constructed at Bhatgarh and Bhandar-dara. This is entirely due *to* the fact that the Governments of other countries publish accounts of their works, whereas we do not. I have found engineers at Home astonished to hear of the size of the works constructed in India, especially works such as dams, which are in no way peculiar to this country. India can, at present, boast the

biggest dam in the world (measured by its masonry content) and even this will be far outdone by that now under construction at Mettur in Madras. Until last year, when it was surpassed by one in America, she could also boast the highest; if the Bhakra Dam in the Punjab, the scheme for which has recently been submitted for approval, is constructed, India will again take the lead. As regards the extent of her canal systems, with their 21,000 miles of main canals and branches and their 41,000 miles of distributaries, India is in a class by herself. A little publicity on the subject in other countries would certainly be wholesome, but it has been impossible to secure such publicity in the past owing to the preoccupations of the few officers with any general knowledge of what was actually being done throughout India. The office of the Board, working in conjunction with its members, will supply the Press with articles of general public interest; it might also, with advantage, take over the publication of the Annual Review of Irrigation in India and make it a rather more interesting production than it is at present.

11. Another very important subject in respect of which co-ordination is most desirable is research. Practically all the possible simpler and more obvious irrigation schemes have already been constructed, and future progress must depend, on the one hand, on the construction of new projects of far greater complexity and technical difficulty than those built in the past and, on the other, on the extension of existing systems by economy in the use of water. This spells detailed research; the Local Governments are beginning to recognize this fact and at least three of the major irrigation Provinces have now special officers engaged wholly on such research, an example which others are bound to follow in due course.
12. If waste of energy and money is to be avoided, it is essential that there should be some central co-ordination of these activities. There are certain matters which must be investigated locally with reference to local conditions, but there are others, particularly those connected with improvements in design, in regard to which investigation at one centre would be sufficient, at any rate in the earlier stages. It may be desirable to have a design, which is found generally suitable, experimented upon at different stations, with a view to a final form being evolved as nearly perfect as possible, but it is quite unnecessary for all the research officers to perform the initial spade work leading up to it. One officer only need do this; the others would enter the enquiry only at its more advanced stage. Co-ordination should be established not only between the Chief Engineers responsible for the general direction of the operations but also between the research officers themselves, who should be kept in close touch with one another and with the office of the Board. The office will act as the medium of exchange of information between them, which information will usually be of a somewhat different nature from that which will be exchanged between the various Chief Engineers.
13. The office of the Board, in addition to disseminating information which is of interest only in particular circumstances (which will be done through Chief Engineers and probably, in many cases, without incurring the expense of printing it up), will publish, at intervals, professional papers of general interest relating to works, to the management of works, to irrigation practice and to research. Such papers are occasionally, but all too rarely published by local Governments, but they obtain, as a rule, no real circulation. I

feel convinced that, with an organisation such as that now proposed, Chief Engineers will be ready to co-operate to see that such papers are written and, if publication by the Central Board comes to be regarded as giving a cachet to a paper, as it should *be*, it will probably stimulate engineers to write them. Where the paper is of such a nature that its supply to all officers is unnecessary, the office will circulate a digest, as in the case of technical periodicals; this is especially necessary in the case of papers dealing with research, where the paper itself may be long and difficult to read. *It* would be unnecessary for every officer to receive and read such a paper; from the digest he would see whether it affected his particular line of work and, if so, he would apply for a copy.

14. The complete organization which I propose will thus consist of the Central Board of Irrigation (comprising all provincial Chief Engineers and the Consulting Engineer to the Government of India) as the controlling and directing force, a Central Research Committee (comprising all provincial Research Officers and the Consulting Engineer) which will be purely a co-ordinating Committee reporting to the Central Board, a Secretary, who will be also Librarian, and a small office staff. The Central Board and the Research Committee will each meet once a year. It is very desirable that the provincial research officers should be given this opportunity of personal contact; it will not only ensure proper co-ordination of their work but will give them a chance to exchange ideas on a wider scale than is possible by mere writing. One of the main functions of this Committee will be to draw up a brief report on the work done and the results obtained by its members, and to make recommendations as to the lines to be adopted for the future and as to the nature and distribution of the work to be undertaken during the following year. I understand that a meeting of provincial research officers was actually held this year, largely for the purposes outlined above ; all that it is now desired to do is to make provision for such meetings being held periodically and to place their deliberations on a proper and regular footing.
15. At the annual meeting of the Central Board any special work to be undertaken by the office during the ensuing year will be prescribed, the papers to be published decided upon, the subjects upon which further papers are required settled, the distribution of research work among the various Provinces determined, after considering the report of the Research Committee, and matters of general interest connected with the practice or administration of irrigation discussed.
16. As regards the post of Secretary, it will be essential to secure for it a really keen and capable engineer with a taste for literary work. As Sir Thomas Middleton expressed it, the most important requirement is a "skilled and experienced editor of Indian experience". An Executive Engineer of some standing will probably be suitable ; he will have to be a man of considerable scientific ability and technical attainments, as much of [his work, especially the preparation of digests and his duties as librarian, will tax him highly. At first, at any rate, he will require very little clerical staff, probably only one clerk and one typist, to assist him, as the bulk of his work will have to be done by himself.
17. As regards the recommendation made in the last sub-paragraph of paragraph 285 of the Royal Commission's Report that annual or biennial conferences should be arranged so as to bring the irrigation engineers in the Provinces into closer touch with each other,



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such conferences being held in rotation in the different Provinces, the proposals made in this note meet it to some extent but not in full. What the Commission obviously had in mind was not a conference of Chief Engineers but one at which more junior officers could meet and exchange ideas. Such a conference was held in Simla in 1913; it was attended by officers from all Provinces and was most successful. It was then the intention to hold such conferences at regular intervals but owing to the war, and, subsequently, to the introduction of the Reforms, the matter was not pursued. A conference of this nature, held triennially under the auspices of the Central Board would, in my view, be most valuable to all concerned.

18. I have, in this note, stated what seem to me to be the more important duties which a Central Bureau might be expected to perform. But if the Bureau is to be of real value, its primary function must be to meet the needs of the Provinces and it would be premature to proceed with details either of the organisation to be adopted or of the work to be done by it until the views of the Local Governments on both subjects are known. I suggest, therefore, that the first step to be taken is to consult the Local Governments as to whether, in their opinion, the proposals outlined above are generally suitable and, if not, what modifications in them they would suggest.
19. I realize that an objection which may be levelled against the scheme is the imminence of further constitutional changes, which may entirely alter the present position of the Central Government vis-a-vis the Provinces in respect of such matters as irrigation. But I venture to doubt whether this objection can be sustained. In the whole scheme there is no element of control over or interference with the Local Governments ; it is purely a co-operative and co-ordinating scheme designed to give to each Local Government the benefit of experience gained elsewhere and to prevent waste of money owing to work being done in two places where it need only be done in one. Whatever may be the degree of provincial independence or of administrative decentralization which follows upon the next instalment of the Reforms, anything in the nature of technical isolation will be as dangerous and wasteful then as it is to-day.

*Appendix 1.4***Letter from the Secretary to Government, Central Provinces, Public Works Department, No. 37-A/E.A. dated the 29 January, 1929.**

1. I am directed to refer to the Government of India letter No. I.R.-72, dated the 12 January 1929, with which was forwarded, for the consideration of this Government, a note, dated the 22 September 1928, by the Consulting Engineer to the Government of India containing certain proposals for the constitution and functions of a Central Bureau of Information, which it is proposed to establish in Delhi.
2. The Governor in Council is convinced that it is most desirable that a Central Bureau, such as that proposed, should be established. This Bureau should, he considers, be of great value to all Provinces in which irrigation is of importance, and he contemplates that this Province will derive considerable benefit from its establishment. He regards the charge of Rs. 2,000 per annum that it is proposed should be paid as a maximum, by this province as reasonable.
3. I am to say that this Government has no remarks or suggestions to offer on the proposals made in the note by the Consulting Engineer, which it regards as generally suitable, and it agrees with the Government of India that a meeting of the Central Board of Irrigation should be held at a convenient opportunity to discuss this question in detail, to draft such regulations as may be necessary in connection with the organisation and functions of the Bureau and for the other purposes mentioned in para 5 of the Government of India letter under reply.

**Letter from the Secretary to Government, Bihar and Orissa, Irrigation Department, No. 1040/X C.-4 of 29-1., dated the 19 February, 1929.**

*Subject: Establishment in Delhi of a Central Bureau of Information on Irrigation matters.*

In reply to your letter No. I.R.-72, dated the 12 January 1929, I am directed to say that the Local Government fully agree that a Central Bureau of Information on Irrigation matters is a real need and consider that the general proposals for establishing one at Delhi as drawn up by Mr. Harris, Consulting Engineer, are very suitable.

The Local Governments are also in agreement with the suggestion of the Government of India that the cost of the Bureau would suitably be shared by the Provinces roughly in proportion to the area of irrigation in each, and that details of the proposals can best be worked out at a meeting of the Central Board of Irrigation.

**Letter from the Officiating Secretary to Government of Bengal, Irrigation Department, No. 847-1., dated 21 February 1929.**

*Subject: Establishment of a Central Bureau of Information for Irrigation in Delhi.*

1. I am directed to acknowledge the receipt of your letter No. I.R.-72, dated the 12 January 1929 forwarding for the consideration of this Government a note by the Consulting Engineer to the Government of India on the above subject.

2. In reply, I am to state that the Governor in Council agrees with the views of the Consulting Engineer to the Government of India that the establishment of a Central Bureau of Information for Irrigation is undoubtedly desirable for the dissemination of up-to-date information on engineering practice.
3. His Excellency in Council has no objection to bear the share of the cost of the establishment of such a Bureau as proposed in the letter under reference after making provision for it in the budget of 1930-31.

**Letter from the Secretary to Government, Punjab, Public Works Department, Irrigation Branch, No- 2521-E.L, dated 5 March 1929.**

*Subject : Establishment of a Central Bureau of Information for Irrigation in Delhi.*

In reply to your letter No. I.R.-72 of the 12 January 1929, I am directed to state that the Punjab Government are in favour of the proposal to establish a Central Bureau of Information for Irrigation in Delhi but desire to suggest that, while they agree that Irrigation Research in India is essential and that it should be treated as a Central subject—or in other words that research in the different Provinces should be under the control or guidance of a Central Bureau—they are of the opinion that the real work contemplated falls within the purview of the Government of India's functions. Accordingly, while they welcome the institution of the scheme they would respectfully suggest that the expenditure on it should be incurred by the Government of India.

**Letter from the Secretary to Government, United Provinces, Public Works Department, Irrigation Branch, No. N. T.-182-I.W. of 1929/92-B-1082-W., dated 13 April 1929.**

*Subject: Establishment of a Central Bureau of Information for Irrigation in Delhi.*

1. I am directed to refer to Mr. McWatters' letter No. I.R.-72, dated 12 January 1929, in which the views of this Government were invited on the proposals contained in Mr. Harris' note of 22 September 1928, regarding the constitution and functions of the proposed Central Bureau of Information for Irrigation. In reply, I am to say that this Government agree as to the need for the establishment of the proposed Bureau and also to the framework of the scheme as proposed by the Consulting Engineer. Details of the scheme could be worked out later when the Central Board of Irrigation meets but, in the meantime, it would be of the greatest assistance if, prior to this, the Consulting Engineer met and conferred informally with the provincial research officers, as this would place at the disposal of the Board their appreciation of the situation, which should be of value.
2. As regards the question of the cost of the Bureau, I am to say that this Government are willing to contribute their proposed share of Rs. 6,000 per annum, subject, of course, to the expenditure being voted by the local legislative council.

**Letter from the Secretary to Government of Madras, Public Works and Labour Department, No. 1353-1., dated 29 April 1929.**

*Subject: Establishment of a Central Bureau of Information for Irrigation in Delhi.*

I am directed to acknowledge the receipt of the Hon'ble Mr. McWatters' letter No. I.R.-72, dated 12 January 1929 on the above subject and to state that the Madras Government after

careful consideration of the proposal find themselves unable to accept it. They recognise that discussion amongst engineers might be of use but they consider that for the reasons set out below the objections to the scheme outweigh its possible advantages. In the first place, India is too diversified and too large an area for all factors to be rightly understood, as the conditions vary greatly in different provinces. Secondly, this Government does not consider that its engineers have any difficulty in keeping themselves in touch, so far as their leisure and keeness permit, with anything of real importance to them that is going on in engineering works or practice either abroad or in India. Again, these conferences would take officers away for a considerable period from their work, thus causing administrative inconvenience which outweighs the benefits likely to be derived from them. And finally, the proposed annual contribution and the cost of sending officers to conferences periodically would, in the opinion of this Government, be more profitably spent in expanding the P.W.D. reference libraries and equipping them better than in the past.

**Letter from the Secretary to Government of Burma, Revenue Department, to Secretary to the Government of India, Department of Industries and Labour, Public Works Branch, No. 166-I.W.-29(11), dated 11 May 1929.**

*Subject: Establishment of a Central Bureau of Information for Irrigation in Delhi.*

In reply to your letter No. I.R.-72, dated the 12 January 1929, I am directed to say that the Governor in Council agrees as to the need for a Central Bureau of Information for Irrigation. He concurs in the scheme put forward by the Consulting Engineer to the Government of India in his note, dated the 22 September 1928 and has no alterations or modifications to suggest. The Local Government is willing to bear its share of the expenditure involved, which is estimated at a maximum of Rs. 4,000 per annum.

**Letter from the Secretary to Government of Assam, Public Works Department, to the Secretary to Government of India, Department of Industries and Labour, Public Works Branch, No. 9274-N.E.D., dated 22 May 1929.**

*Subject: Establishment of a Central Bureau of Information for Irrigation in Delhi.*

I am directed to request that if there be no objection this Government may be informed as to the proposal for the establishment of a Central Bureau of Information for Irrigation at Delhi.

**Letter from A. Brebner, Esq., C.I.E., Officiating Consulting Engineer to the Government of India, to the Secretary to Government of Assam, Public Works Department, No. I.R.-72, dated the 6 June 1929.**

*Subject: Establishment of a Central Bureau of Information for Irrigation in Delhi.*

With reference to your letter No. 9274-N.E.D., dated the 22 May 1929, I am directed to forward a copy of a letter No. I.R.-72, dated the 12 January 1929, on the subject, which has been addressed to Governments of the Provinces where irrigation is of importance, together with a copy of a note, dated the 22 September 1928 by Mr. D. G. Harris, CLE., which fully explains the proposal for the establishment of a Central Bureau of Information for Irrigation.

**Letter from the Joint Secretary to Government of Bombay, Public Works Department, to the Secretary to Government of India, Department of Industries and Labour, Public Works Branch, No. 2654/27-1.W., dated 20 July 1929.**

*Subject: Establishment of a Central Bureau of Information for Irrigation in Delhi.*

1. With reference to the Hon'ble Mr. A. C. McWatters' letter No. I.R.-72, dated 12 January 1929 on the above subject, I am directed by the Governor in Council to state that this Government is wholeheartedly in favour of the scheme outlined in the note of the Consulting Engineer to the Government of India for the instituton of: (a) a Central Board of Irrigation, (b) a Bureau of Information for Irrigation (to be attached to the Central Board), and (c) a Central Research Committee. This Government is, however, of opinion that no part of the financial liability for this scheme should fall on the Local Government, but its cost should be met from Central revenues as in the case of the Public Health Commissioner, Board of Agriculture, etc., for the reason that such expenditure properly falls upon Central Revenues on account of the responsibility for "superintendence, direction and control" which is laid upon the Governor General in Council by the Government of India Act.
2. With the prospect of research of work being extended in all directions it seems doubtful whether one Secretary in charge of the Bureau, as proposed in the Consulting Engineer's note, will ultimately be able to deal with both general irrigation matters and research work. It may be found necessary eventually to have two Secretaries, one for the Central Irrigation Board (and Information Bureau) and a second one for the Central Research Committee, although initially one officer with the requisite qualifications should suffice. These two Secretaries should work independently but in close co-operation, under the general direction of the Consulting Engineer. The Secretary of the Central Board (and probably later the Secretary of the Research Committee also, if one be appointed) should, it is considered, be an irrigation engineer who has specialised in scientific work and research. He should be not only a man of considerable scientific ability and technical attainments, with a taste for literary work, but should also, if possible, have sound knowledge of the special subjects outside the general scope of the irrigation engineer with which he would be required to deal, e.g., agriculture, soil physics, land reclamation and the scientific treatment of statistics.
3. The scale of pay of these Secretaries should be sufficiently attractive to induce them to continue in the posts once they are appointed to them. Unless the salaries of these posts are suitably graded, the officers might be tempted to return to the ordinary line when nearing their time for promotion to administrative rank. The provision of a liberal scale of pay is considered essential for the success of the scheme to ensure continuity of employment of experienced officers in the posts.
4. It is suggested that these and other points can best be considered at a meeting of the Central Board of Irrigation when convened to discuss the scheme and give effect to it.
5. The proposal made in the Consulting Engineer's note that conferences of irrigation engineers should be held in rotation in the different Provinces, under the auspices of the

Central Board, meets with the approval of this Government. Such conferences may be either biennial or triennial, and they should be attended by selected engineers, of whom a sufficient number should be junior officers, who should be encouraged to meet for the interchange of ideas.

**Office Memorandum to the Auditor General in India, No. I.R.-72, dated 18 December 1929.**

*Subject: Proposed Establishment of a Central Bureau of Information for Irrigation*

1. The Government of India have under consideration the question of the establishment of a Central Bureau of Information for Irrigation, the proposed constitution and functions of the Bureau are explained in the note by the Consulting Engineer to the Government of India which forms an accompaniment to this memorandum.
2. It is proposed to sanction the scheme in question as a temporary measure for the next two years, during which period the cost of the organisation, which is expected to be about Rs. 40,000 per annum, will be borne by the Central Government.
3. It is presumed that provision for the scheme should be made in the Irrigation grant, but the Department of Industries and Labour will be glad of the advice of the Auditor General on this point and also as to the head of account to which the expenditure involved should be debited. The favour of a reply at a very early date is requested.

*Appendix 1.5***No. 1. C.B.I, dated 5 January 1931**

From

The Executive Sub-Committee of the Central Board of Irrigation

To

The Secretary to Government of India,  
Department of Industries and Labour,  
Public Works Branch,  
New Delhi

Sir,

1. We, the Members of the Executive Sub-Committee of the Central Board of Irrigation, have the honour to address you on the subject of the future of the Board.
2. As the Government of India are aware, the first meeting of the Board took place in Delhi in November last. We enclose, for their information, a copy of the minutes of that meeting. They contain a brief description of the work which the Board proposes to undertake through the agency of its office, the Central Bureau, and a list of the questions which are to be placed on the agenda for the next meeting, information as to which is already being collected by the Chief Engineers of the various Provinces.
3. A reference is made, in paragraph 8 of the minutes, to the question of the provision of funds in future for the maintenance of the Bureau and for the prosecution of its various activities. Our Sub-Committee understands that, although the Government of India have undertaken to defray the cost of the organization up to the end of the financial year 1931-32, they are not prepared to continue to do so after that date, with the result that the continued existence of the Bureau must depend upon the willingness of the Provincial Governments to contribute to its expenses. This contingency was in the mind of the Board when it expressed the view that it would be definitely advantageous that this method of finance should be adopted. The primary interest of the Central Government in the work of the Board and Bureau is identical with that of the Provincial Governments, namely, to ensure that officers administering irrigation within their own jurisdiction are kept abreast of the latest developments and experience, both in India and abroad; it is certainly not proposed that the organisation should function as an instrument to implement the powers of superintendence, direction and control vested in the Governor General in Council in respect of the subject of irrigation nor can the majority of its functions, as described in the minutes, be held to fall within the meaning of entry 33 of Part I of Schedule I to the Devolution Rules. The Government of India administer directly a smaller area of irrigation than do any of the major Local Governments except those of Bengal and the Central Provinces and their financial interest in the scheme is correspondingly less; even had they been prepared to consider a continuance of the existing system, the demand for the maintenance of the Bureau would never have attained any high place among the other competing demands upon the Central

Government's resources, and there would always have been genuine reason to fear a reduction in, if not, indeed, the complete excision of the item, whenever financial stringency was felt at the Centre.

4. In view of these considerations, the Board decided that it would be preferable that the amount required should be subscribed by all the Governments interested in the scheme, roughly in proportion to the extent of that interest. The underlying idea is one of co-operation and co-ordination, the project being designed to give to each Province the benefit of experience gained elsewhere and to prevent waste of money owing to work being done in two places where it need only be done in one. The main benefits anticipated from the project will thus accrue to the Provinces and it seems only right that they should bear the cost; so divided, the amount to be found by each will be very small.
5. We venture to hope, therefore, that the Government of India will be prepared again to address the Local Governments in the matter and ask them to contribute to the expenses of the Bureau with effect from the year 1932-33. We consider that the basis of subscription previously proposed was generally suitable and suggest that the Governments of Madras, Bombay, the United Provinces and the Punjab should be invited to contribute each three units, the Governments of Burma, Bihar and Orissa each two units, and the Government of India, Bengal and the Central Provinces one unit each. We suggest, further, that the maximum amount of a unit should, for the time being, be fixed at Rs. 2,500 ; the maximum subscription of any Province will then be Rs. 7,500 and the total maximum amount available Rs. 47,500. At each meeting of the Board the budget for the following year will be discussed and passed; it will then be incorporated in a Resolution and submitted to the Government of India for communication to the Provinces. It is possible that, during the earlier years of the Bureau, the full amount mentioned may not be required, with the result that the provincial contributions will be proportionately lower, but we have thought it preferable to leave a slight margin for reasonable extension so as to obviate the necessity for frequent requests for small additions to the contributions to enable such extension to take place.
6. We have considered whether we should ask the Government of India to subscribe on a scale in excess of that derived from the area of irrigation in the minor administrations, but have decided against such a course. In the first place, it seems to us desirable that all the Governments represented on the Board should be on the same footing. In the second place, the only reason which we could urge in favour of the proposal may become less applicable if and when a change in the constitution takes place, and we are anxious that any arrangements now to be made should be so designed as not to be materially affected by any such change. We see no reason why they should be, as the Board is the very embodiment of the federal idea; as stated by the Hon'ble Sir Joseph Bore in the speech with which he opened its first meeting, whatever may be said for independence in other directions, technical isolation can never be anything but costly and dangerous. We can conceive of no form of constitution which would render inappropriate periodical meetings between the engineers entrusted with the control of irrigation works throughout India and the



maintenance of machinery calculated to ensure that experience gained in one part is made immediately available to those doing similar work elsewhere.

7. Should the Government of India be prepared to put these proposals to the Provincial Governments, we trust that they will impress upon the latter the very real and tangible advantages which they will secure from the work of the Board and Bureau. It is to be remembered that the irrigation engineers in India are constantly being called upon to construct works far exceeding in size any which have been built elsewhere; often they have to act as pioneers with little or no experience to guide them. In the absence of such an organization as is not being formed, even such experience as has been gained is now generally available, with the result that mistakes are made which might otherwise have been avoided and designs are adopted which are inferior to and less economical than the best. We believe that every Chief Engineer who attended the first meeting of the Board was, as a result, convinced of the need for greater co-ordination; considerable differences between the Provinces, as regards both theory and practice, became evident during the discussions and in the light of these differences it was quite clear that, if one Province was working on correct and economical lines, others were not. We may, in this connection, mention one of the subjects which the Board has taken up for immediate consideration, namely, the preparation of a series of type designs for weirs on sand foundations. It is fairly certain that the theory usually adopted is imperfect and that the best and most economical type of structure for the purpose has yet to be evolved. Works of this kind are constantly being constructed in all parts of India, Ranging in size from the Sukkur Barrage to small river diversion works, and if, as we believe will be the case, the Board succeeds "in evolving a standard type which will incorporate the best features of the many different ones at present in use, it will probably save India, as a whole, lakhs of rupees a year. Similarly, their researches into the questions of the relative economy of flumed and unflumed works and of the best methods of preventing erosion below canal falls cannot fail to have an important bearing on the cost of such structures. When it is considered that the members of the Board are in charge of works having a capital value of Rs. 119 crores, irrigating nearly 29 million acres and producing Rs. 111 crores in revenue annually and that, in addition, they are responsible for an annual expenditure of Rs. 7 crores on the construction of projects and Rs. 6 crores on maintenance, the desirability of giving them every possible opportunity of profiting from the experience of their neighbours and of co-operating so as to achieve a maximum both of efficiency and of economy in the design and maintenance of the works in their charge will be evident. This aspect of the question is clearly illustrated in the statement which we append to this letter which gives a comparison between the financial interests which the irrigation works in each Province represent and the amount which it is proposed that each Province should subscribe to the upkeep of the Bureau. In our view, and we believe that this opinion will be endorsed by every Chief Engineer who was present at the recent meeting, the formation of the Board and Bureau constitutes the most important advance which has been made in the administration of irrigation in this country since the appointment of the Indian Irrigation Commission in 1901. Even if the value of the work of the organization is assessed solely in terms of rupees, annas and pies, we are

convinced that it will return a hundred-fold the small expenditure which it is proposed to incur upon it.

8. There is one other matter to which we would refer. In the list of Local Governments who, we have suggested, should be asked to contribute to the cost of the Bureau, we have included the Government of Burma. We are aware that the question of the separation of Burma from India is now under consideration but we see no reason why any action decided upon in that connection should affect the constitution of the Board. As already explained, the Board will be concerned wholly with technical issues and since conditions in Burma are analogous in some respects to those in certain parts of India, the presence of the Burma Chief Engineer on the Board will be of advantage to the other members, and vice versa. In these circumstances, and whatever the decision on the subject of separation, we trust that we may continue to have the Chief Engineer, Burma, as a colleague on the Board.

We have the honour to be,

Sir,

Your most obedient servants,

B. d'O. Darley

J.B. G. Smith

D. G. Harris

**Enclosures:**

1. The minutes referred to.
2. Statement showing the extent of the irrigation interests of each Government in India.

## Appendix 1.6

**Government of India**  
**Department of Industries and Labour**  
**Public Works Branch**

No. I.R-72  
 New Delhi, 6 April 1932.

From

The Hon'ble Mr. J. A. Shillidy, C.S.I., I.C.S.,  
 Secretary to Government of India.

To

The Secretary,  
 Central Board of Irrigation.  
*Future of the Central Board and Bureau of Irrigation.*

Sir,

1. I am directed to refer to letter No. 1 C.B.I., dated 5 January 1931, from the Executive Sub-Committee of the Central Board of Irrigation, in which it was proposed that the Local Governments may be invited to contribute to the cost of the Bureau.
2. I am now to inform you that the matter was placed before the Local Governments concerned, and a copy of the correspondence which has passed between the Government of India and the Provinces on the subject is enclosed for information. It will be observed that, subject to the vote of their Legislative Council, the following Local Governments have agreed to subscribe annually the sums noted against them for the future maintenance of the Bureau:

**Rs.**

Governments of Bombay, the United Provinces and the Punjab	7,500 each
Government of Bengal	2,000
Government of Burma	5,000
Government of the Central Provinces	2,500

It will also be observed that of the remaining two Governments, viz., the Governments of Bihar, Orissa and Madras, the former propose to place before their Legislative Council by August next a supplementary demand for the necessary funds to cover their contribution of Rs. 5,000 during the year 1932-33. It is expected that the Government of Madras will also agree to contribute towards the maintenance of the Bureau but they have not yet officially informed the Government of India of their intention to do so.

3. In view of the willingness of the Local Governments to subscribe towards the maintenance of the Central Bureau of Irrigation, it has been decided that, with effect from the commencement of the financial year 1932-33, the Bureau will be supported by subscriptions from the Provinces, the contribution of the Government of India being limited to Rs. 2,500 per annum. The Bureau will then pass from the direct control of the Government of India and be an independent body functioning under the direct control of

the Central Board of Irrigation. The Government of India, who are deeply interested in the efficiency of the organisation, have also decided that the Bureau shall be allowed to continue in possession of certain facilities which it enjoys at present, namely, rent-free office accommodation in Simla and free stationery and printing.

4. A copy of this letter is being forwarded to the Local Governments concerned with whom you may place yourself in communication in the matter of obtaining the payment of the provincial contributions. I am to add that the question of arrangements for the accounting of transactions of the Central Bureau of Irrigation is under the consideration of the Auditor General in India in consultation with the Accountant General, Central Revenues, and that a communication on the subject will be made in due course.

I have the honour to be,

Sir,

Your most obedient servant,

*Sdl-*

Secretary to Government of India.

Document accompanying: A copy of correspondence with the Local Governments referred to.

*Appendix 1.7*



**Rashtrapati Bhavan  
New Delhi  
7<sup>th</sup> October, 1952**

**MESSAGE**

The great need of India today is the proper harnessing and development of her irrigation and power resources. I believe that the Central Board of Irrigation and Power has been doing what it can for the fulfillment of this need. I am glad to learn that it is now completing its 25 years of useful existence and is celebrating its Silver Jubilee. I offer my congratulations and hope that with its past work as an inspiration it will be making a still greater contribution in the future.

*Rajendra Prasad*

## CHAPTER 2

# BOARD'S CONTRIBUTION TO IRRIGATION AND POWER DEVELOPMENT

Board was involved in settling many disputes in the Water Sector as referred to it by Govt. of India. Board was also responsible for setting up several important national organisations dealing with Irrigation and Power.

A brief history of such disputes and organisations is given in the following pages.

### 2.1 WATER DISPUTES REFERRED TO THE BOARD

As mentioned in Chapter 1, the Board was set, up inter-alia, to assist in the solution of any dispute between Provincial Governments or between a Provincial Government and an Indian State regarding technical points involved in the dispute. The first Constitution of the Board also laid down that *“the Government of India and His Excellency the Crown Representative will be entitled to call on the Board to select a Sub-Committee of the Board to advise them on the technical points involved in any dispute between Provincial Governments, Indian States or a Provincial Government and an Indian State.”*

#### 2.1.1 Distribution of Indus Waters

There was a long standing dispute about the share of waters of Indus system amongst the basin states/provinces. The distribution of the waters of Indus river and its tributaries was being done on the basis of a report of “Indus Discharge Committee” of 1929, which had been agreed to by Punjab & Sind provinces of British India. This arrangement, was reluctantly accepted by princely states of Bahawalpur and Khairpur. However, these princely states also became beneficiaries of Sutlej Valley Project and wanted a review of the existing arrangements to enable them to receive increased supplies for their irrigation systems constructed as part of Sutlej Valley Project. The Government of India also felt that there should be either agreement between the parties concerned or a definite decision be arrived at based on expert advice. Further it was also noted that princely state of Bikaner and N.W.F.P. had also laid claim to these waters.

As such during the year 1934-35, the Govt. of India felt that there was urgent necessity to settle this problem of distribution of the waters of Indus Irrigation system. Therefore the Government called upon the Central Board of Irrigation (C.B.I.) to furnish a Committee of the C.B.I., which could go into this issue of distribution of the waters of Indus and its tributaries. The Committee was convened in January 1935 and consisted of two Members of the Board, Messrs F. Anderson and F. A. Betterton, and a representation for each of the three Provinces and three States concerned. The Secretary, C.B.I., officiated as Secretary of the Committee.

The report of the Committee was submitted in 1935. The result of this special Committee greatly enhanced the prestige of the Board as a Body capable of arriving at a reasonable solution of a difficult problem.

### **2.1.2 Waterlogging by the Lloyd Barrage Canals**

The problem of water logging in the areas commanded by the canal systems of LLOYD Barrage, had been a matter of great concern to the Government of India. Accordingly, in 1935 a Sub-Committee of the Central Board of Irrigation was appointed to enquire into the problem and suggest suitable remedial measures. The Sub-Committee consisted of Mr. B. Darley, Chief Engineer, Bahawalpur and Mr. F.J. Walter, Chief Engineer, Punjab. The committee examined in great detail all aspects of the problem and recommended appropriate preventive & curative measures for tackling the problem.

### **2.1.3 Lloyd Barrage Dispute**

In 1938, H. E. the Crown Representative in consultation with the Governor General constituted a Court of Arbitration to report upon certain matters in dispute between Khairpur Darbar and Sind Government arising out of the construction and maintenance of the Lloyd Barrage Project. The Court of Arbitration composed of a single officer, Mr. F. Anderson, Chief Engineer, Bahawalpur State (now in Pakistan) nominated by the Board and with the approval of the President, C.B.I., Mr. M. T. Gibling, Secretary, C.B.I., acted as Secretary to the Court of Arbitration in addition to his own duties.

The court held several meetings and submitted their report to H. E. the Crown Representative in April 1939 in three volumes, which contained recommendations on six issues which were subject of arbitration.

### **2.1.4 Spin Karez Project**

In 1939 the Government of India sought the advice of Central Board of Irrigation on the Spin Karez Project for augmenting the Water Supply of Quetta. A Sub-Committee of the Board consisting of Messrs Farquharson and Gorden, Chief Engineers of Punjab and Sind respectively was appointed. The Sub-Committee submitted its report to the Government of India on 13 May 1940.

### **2.1.5 Dispute Concerning the Construction of Dam on the Machhu River**

In 1941 a dispute arose between the States of Wankaner, Morvi and Maliya regarding the construction of a dam across the Machhu River by the Wankaner State. The matter was referred to the Central Board of Irrigation. The Board appointed a Special Committee consisting of Mr. S.C. Mazumdar, Chief Engineer, West Bengal and Mr. Gerald Lacey, Chief Engineer, U.P. The recommendations of the Committee were forwarded to the Government of India in April 1942.

## **2.2 BOARD'S PROPOSALS FOR SETTING UP NATIONAL/ INTERNATIONAL ORGANISATIONS**

### **2.2.1 Central Research Station**

While discussing the subject "Tortuosity of rivers and their training by means of embankments" at the Sixth Annual Board Meeting held in November 1935, the President posed the question as to who was going to continue the research on this subject as he was informed that Bombay Government would not be able to carry on their Research Station at Poona and it was for the

consideration of the Board whether research with such large models should be continued and what arrangements could be made for the work to be done and whether it should be made a responsibility of the Board. He felt the necessity for an experimental station where large lengths of models could be installed. The members felt that no single Province could or should take experimental work of that nature and it should be the work of a special research station financed by the Centre. The members felt that Poona was admirably suited for such a research station as it provided the necessary facilities and the climate was good. The existing Research Station had an ample supply of water from Lake Fife with a good command. There was also an advantage in being close to the Meteorological Station at Poona. The Agricultural Commission had also favoured a Central Research Station. **The Board thereafter passed a resolution which stressed that the time had come to expand the work beyond the capacity of any one Province to finance, and that a Central Research Station was necessary. The conduct of such a station should be a special responsibility of the Central Board of Irrigation with a view to keeping the work in touch with practical considerations.** In the resolution, the special suitability of the present Research Station for such work was emphasised. It was pointed out that this research station was likely to be closed down immediately and hence there was urgent need to take action for making it a central station.

The Board at its Seventh Annual Meeting held in 1936 passed another resolution in which it expressed the opinion that much of the work of a Central Station for Irrigation and Hydraulic Research would be of a fundamental nature, and as such this station should be financed by the Government of India.



CWPRS Building

The resolution inter-alia mentioned the following reasons :

- (i) Irrigation was of all India importance and large revenues were accruing to the Central Government.
- (ii) The Government of India was not making any contribution towards irrigation research in India whereas they were extending support to the extent of many lakhs of rupees to forestry, agriculture, veterinary research and industries and on institutes like the Forest Research Institute at Dehradun, and the Agricultural Research Institute at Pusa.
- (iii) The Provinces were financing their own irrigation research entirely and received no contribution from Central Government as was being provided for research in other subjects.

The Central Board of Irrigation felt that for the continuity of research, stability of income was essential for which the central station should get central support and be not dependent on contributions and subscriptions from the Provinces.

**The research station at Khadakwasla and Lahore were considered for making one of them central station for irrigation and hydraulic research. After considering overall pros and cons and on the basis of the recommendation of the Board during its 8<sup>th</sup> meeting held in 1937. Government of India decided that the station at Khadakwasla should be continued for another five years.**

The Board at its 13<sup>th</sup> Annual Session held on 31<sup>st</sup> October 1942, resolved that:

*“The members of the Central Board of Irrigation having had the opportunity of inspecting the Central Irrigation and Hydrodynamic Research Station at Poona and being impressed with the very great value of the work being done by model experiments at the Station, the Board recommends that the station should be made permanent in order to ensure the continuance of the work and the accumulation of data and experience”.*

In response to the above, the Government of India decided to continue the Central Irrigation and Hydrodynamic Research Station, Poona (now Central Water and Power Research Station, Pune) on a permanent basis.

Starting with a small nucleus, the Central Water and Power Research Station today has expanded to become the premier Research Station in the country and it has earned the recognition as the regional laboratory for ECAFE. While the basic functions of the Research Station have been to evolve the engineering solutions to specific practical problems, the CBIP provided backing to the Research Station by providing support for Fundamental and Basic Research, by sponsoring a number of problems, the results of which had direct application to these practical cases.

The Central Water and Power Research Station, Pune has had very close association with the CBIP. As a result of this association, CWPRS was instrumental in the preparation of a CBIP Manual on “River Behaviour Training and Control” which is a comprehensive volume giving the various aspects to be considered in understanding and conducting studies on the Behaviour of Rivers.

## **2.2.2 Central Water & Power Commission (Now Central Water Commission)**

In its Eleventh meeting held from 2<sup>nd</sup> to 7<sup>th</sup> November 1940. The Board, interalia, resolved.

*“The Board considers that the sources of natural supplies of water in the river affecting more than one Province or State should be under the control of a Central Authority in the Government of India, and this alone will facilitate the settlement of most of the disputes over water rights which are likely to arise between Provinces and States in the future.*

In the Fourteenth Annual Meeting held in November 1943, the Board again strongly



CWC Building



urged the Government of India that in order to make the fullest and most economical use of waterways, one Central Technical Authority should exist which would assemble and collate the necessary data for the information and use of the Government of India and of the several Provinces and States concerned. This matter was also pursued vigorously in following years. Its efforts were ultimately successful and the Govt. of India, in accordance with CBIP recommendations set up a Central Authority, the Central Waterways, Irrigation & Navigation Commission (CWINC), in 1945. **The creation of CWC as a result of foresight and advance planning by CBIP, is an important contribution by CBIP as it could foresee the pace with which Irrigation & Water Resources Development Projects would be taken up in future needing an exclusive organisation under Govt. of India for clearance of projects etc.** It went through many changes after its formation. Subsequently, the Central Technical Power Board which had been set up soon after the conclusion of World War II, was also amalgamated with CWINC and the CWINC came to be known as Central Water and Power Commission (CWPC). Accordingly, the constitution of CBIP was revised and approved by Govt. of India in 1948. The revised constitution is given at Appendix 2.1.

In 1973, there was reallocation of works of various Ministries of Government of India, as a result of which Irrigation was attached with the Ministry of Agriculture and Power Development was merged with Ministry of Energy. Accordingly, Water Wing of the CWPC was attached with "Ministry of Agriculture and Irrigation" and come to be known as Central Water Commission and Power Wing was attached with Ministry of Energy and was renamed as Central Electricity Authority.

The Central Water Commission is now a premier Technical Organisation of Government of India, and is presently functioning as an attached office of the Ministry of Water Resources. It is headed by a Chairman and has full time Members heading Design & Research, River Management and Water Planning & Project wings.

### 2.2.3 International Commission on Irrigation and Drainage

In August 1946 a request was made to the President of the Board to initiate a proposal to form an International Commission on Irrigation and Canals. It was felt that time had come when International Co-operation on matters connected with irrigation research and technique would be highly profitable to all who may participate in such a Commission. It was also felt that it was up to our country to make a move in the matter.



ICID Building

The President of the Board put up this proposal to the Government of India and he was permitted to ascertain informally the response by engineers from other countries. Accordingly the proposal was put up to the Executive Committee Meeting of the International Commission on Large Dams by the President in September 1946. The suggestion was accepted unanimously. In the United States and other countries, the proposal was welcome. **Accordingly a request was made to the Government of India to approve the proposal. The Government of India approved the proposal made by the Board to invite the co-operation of all countries to**

**establish an International Commission on Irrigation and Canals with its headquarters in India, the main functions of the organisation being to encourage progress in the design, construction, maintenance and operation of large and small irrigation works and canals, to bring together information thereon and to study all questions relating thereto.** A number of countries responded favourably to the invitation issued by the Government of India and offered to co-operate in setting up the proposed Commission; others expressed their interest and liked to be kept informed of further developments. The need for international co-operation in the field of irrigation and drainage was universally accepted.

A meeting was called in June 1950 at Shimla of the representatives of all countries who had offered to co-operate or had expressed interest in the work of the Commission. At this meeting, it was decided to set up the Commission and a tentative Constitution was drafted. Shri A. N. Khosla President of CBIP was elected as the First President and Shri N. D. Gulhati Secretary CBIP as the First Secretary General.

It was also decided to hold the First Congress of the Commission in India in January 1951. At the Second Meeting of its International Executive Council, held in January 1951, a final Constitution for the Commission was adopted and it was renamed as International Commission on Irrigation and Drainage. The year 1975 marked the completion of 25 years of the founding of International Commission on Irrigation and Drainage. The celebrations were held in Moscow along with the 9th Plenary Session of the Commission.

Here in India, the occasion was celebrated with great enthusiasm. The Government of India issued a Commemorative Stamp on this occasion and the function was presided over by Dr. S. D. Sharma, Union Minister for Communications and the Stamp was released by Shri Jagjivan Ram, Hon'ble Union Minister for Agriculture and Irrigation. The first day covers and the stamps were distributed throughout the world.

After formation of ICID, CBIP functioned as the National Chapter of ICID in India and continued to function and co-ordinate the various activities as INCID till it was transformed to Central Water Commission.



Shri Jagjivan Ram, Hon'ble Union Minister releasing the stamp

#### **2.2.4 Regional Electricity Boards and National Power Grid**

In his Presidential address at the time of Thirty-Second Annual Meeting of the Board on 21st November 1960, Shri H.R. Bhatia emphasised that with the increasing dependence of the country's population on electric power due to increased industrial production and other uses, new conditions were being imposed on Power Systems requiring higher standards of efficiency and continuity of supply. These conditions required a new orientation in the planning of future Power Systems so as to increase their dependability. One of the suggestions to achieve this objective was the 'inter-connection of adjacent Power Systems for increased dependability and

flexibility of operation'. It was recognised that power cannot be developed in isolation and that contiguous power systems have to be interconnected and region-wise integration attempted for realising the various technical and economic advantages inherent in such operation.

The question of planning and establishment of regional grids gained nationwide interest following the Irrigation and Power Seminars in 1960 and 1962 organised by CBIP when the Government of India appointed a High Level Committee to examine the scope of regional agencies, powers to be exercised by them and other ancillary matters. In the light of the recommendations made by this Committee, the country was demarcated into five regions, viz., Northern, Western, Southern, Eastern and North Eastern, for purposes of planning and operation, and Regional Electricity Boards were formed for ensuring integrated operation of Power Systems in the respective regions. Since then systematic efforts were being made to unify the Power Systems in the country on a regional basis and the first Regional Grid of the country went into integrated operation in the Southern Region on 14th August 1972. The concept of a National Power Grid had been put forward to make maximum utilisation of the available power resources.

To discuss the various aspects involved in the operation of a National Power Grid, a Seminar on this subject was held at the time of the Forty-fifth Annual Session of the Board held in December 1972 at which 8 papers were accepted for discussion. The trend of the discussions at the Seminar was in favour of the establishment of an All-India Grid for Power. In the year 1981, **Government of India took a policy decision to form a National Power Grid which would pave the way for integrated operation of the Central and Regional Transmission Systems pursuant to this decision. National Power Transmission Corporation Limited was set up on October 23, 1989 with the responsibility of planning, executing, owning, operating and maintaining the high voltage transmission systems in the country. The name of the company was changed to Power Grid Corporation of India Limited with effect from October 23, 1992.**

### 2.2.5 Interlinking of Rivers

On the analogy of Super-Grids to supply electrical energy from one State to another, Interlinking of Rivers to form Water Grid both for irrigation and navigation facilities was proposed by the President of the Board as early as 1962-63. This idea was also advocated by Shri V. V. Giri, Vice-President of India while inaugurating the Forty-first Annual Session of the Board held in November 1968, wherein he observed that:

*“India is very fortunate in having great rivers like the Indus, Ganges, Brahmaputra, Mahanadi, Tungabhadra, Godavari, Krishna, Cauvery, Tambravarni, etc., but most of them have yet to be harnessed for avoiding floods resulting in great destruction of the crops and inundation of cities and towns and a greater portion of the water going into the sea. If this has to be avoided, it can only be through a system of interlinking all rivers in India, from Himalayas to Cape Comorin, thus giving fertility to all the lands, wet and dry, north, south, east and west. If this can be accomplished, though it may require many crores of rupees to effect the same, it will result in having not only irrigation equitably distributed throughout the country, but also become a source of navigation and allow goods and passengers to travel from one end of the country to the other thus providing yet another means of transport and communication. This may look*

*at the present moment Utopian; but if engineers throughout the country sit together and prepare a blueprint, this may not be impossible. If this can be accomplished, a time would come when India could become self-sufficient in the matter of food”.*

The Second Irrigation “Commission in its report also laid emphasis on the Inter-Valley Transfer of Waters and saw no reason why a country-wide irrigation grid should not be feasible. This view was endorsed by a U.N. Team of Experts also.

In view of many schools of thought on this very vital subject a suggestion was mooted to hold a National Water Grid Seminar. Accordingly, the Central Board of Irrigation and Power in conjunction with the Institution of Engineers (India)

and Indian National Science Academy held a Seminar at the time of Forty-fifth Annual Session of the Board held at New Delhi in December 1972 in which 21 papers authored by very eminent engineers of the country were discussed. The continued interest shown by many experts engaged in water resources development gave further impetus to study Inter Basin Water Transfer proposals in more detail. The then Ministry of Irrigation and Central Water Commission formulated a National Perspective Plan (NPP) for Water Resource Development, in 1980. The NPP comprised of two components viz (i) Peninsular River Development and (ii) Himalayan River Development.

Consequently in year 1982, Govt. of India set up National Water Development Agency (NWDA) as autonomous society to carry out the water balance and other studies on a scientific and realistic basic for optimum utilisation of Water Resources of the Peninsular River Systems. In 1990, NWDA was also entrusted with the task of Himalayan River Development Component of National perspectives. The functions of NWDA have been further expanded and the work of preparation of detailed project reports of various link proposals and pre-feasibility and feasibility reports of intra-state links have been included.

### 2.2.6 National Institute of Hydrology

Fundamental and Basic Research is of paramount importance for development in the field of Hydraulic Engineering, particularly in a country like India where water resources are yet to be exploited for a wholesome development of country’s economy. Shri Baleshwar Nath, Member, Irrigation Team, Committee on Plan Projects, Planning Commission in his letter dated 27th February 1962 had pleaded for the setting up of an organisation which should be devoted primarily to the pursuance of research for the advancement of scientific research and technology. He



suggested the setting up of National Institute of Hydraulic Research with the objective of pursuing that research in different branches of hydraulic engineering and allied subjects more vigorously than what had been possible so far.

This proposal was put before the Board at its Special Session held at Ooty in May-June 1962. On account of the emergency imposed in the country at that time, the



Building of NIH

discussion on the formation of the Institute was deferred. The formation of the Institute again came up for discussion at the Forty-first Board Session held at New Delhi on 19th November 1968 when a note prepared by Prof. N.S. Govinda Rao, Adviser, C.B.I.P. was circulated. After a lot of discussions, the Board generally approved the proposal put forward for starting a National Institute of Hydrology and Water Resources Development. **The Executive Committee at its 116<sup>th</sup> Meeting held on 5th April 1969 approved that an amount of Rs. 20 lakhs for setting up a National Institute of Hydrology and Water Resources Development may be met from the outlay of Rs. 170 lakhs proposed for Fundamental and Basic Research Scheme (Civil).**

The Government of India in the Ministry of Irrigation and Power and the Planning Commission approved the proposal and C.W.P.C. was entrusted to start the work. **Later in 1978, Govt. of India established the National Institute of Hydrology (NIH) as an autonomous society under Ministry of Water Resource with its headquarter at Roorkee.** Main objectives of the institute are to undertake, promote and coordinate systematic and scientific research work in all aspects of Hydrology and Water Resources.

## **GOVERNMENT OF INDIA**



## **MINISTRY OF IRRIGATION AND POWER**

As approved by the Board at its  
Meeting Held in November, 1951

## **CONSTITUTION OF THE CENTRAL BOARD OF IRRIGATION AND POWER**

*Appendix 2.1*

**Government of India**  
**Ministry of Irrigation and Power**  
**Constitution of the Central Board of Irrigation and Power Approved**  
**at the 22<sup>nd</sup> Meeting of the Board**

**PREAMBLE**

1. The Central Board of Irrigation was constituted on January 1, 1927 to examine and report on such irrigation, hydro-electric and river control projects or other problems on the subject, as might be referred to them by the Government of India or the Crown Representative; to advise any Provincial Government or any Indian State admitted to the full membership of the Board, on any difficult technical question connected with a water utilization or flood control project under preparation, on which their advice might be sought if required, to advise the Government of India on technical points involved in any dispute between Provincial Governments or between a Provincial Government and an Indian State; to coordinate research work; and to arrange for the publication of technical papers. As a result of the recommendations made by the Royal Commission on Agriculture in India, 1928, the following additional duties were entrusted to and assumed by the Board with effect from 1<sup>st</sup> May 1931:

- (i) To establish contact with institutions and individuals in other countries with a view to the exchange of publications and information.
- (ii) To maintain a library and collect and supply information on irrigation and allied subjects.
- (iii) To disseminate the results of research on irrigation and allied subjects.
- (iv) To contribute information on Irrigation and allied subjects for publication in the press.

2. In 1945 the Government of India established the Central Waterpower, Irrigation and Navigation Commission and, in accordance with the Government of India Resolution No. DW.XVI-1(1), dated the 16<sup>th</sup> January 1948, and which, in 1951 was changed to Central Water and Power Commission, vide their Resolution No. EL 1-201(5) DATED 21<sup>st</sup> / 24<sup>th</sup> April 1951, this body has been charged with the general responsibility of initiating, coordinating and furthering in consultation with the State Governments concerned, schemes for the control, conservation and utilisation of water resources throughout the country for purposes of waterpower generation, irrigation, navigation and flood control, and if so required the construction of any such schemes on behalf of the Government of India.

In exercise of the above responsibilities, it is the function of the Central Water and Power Commission, inter alia to

- (i) advise, and assist, when so required, the State Governments (or River Commissions, Corporations or Boards that may be set up) in the investigation, surveys and preparation of river valley development schemes;
- (ii) advise the Government of India in respect of water and waterpower rights and disputes as between States, of the effect which any schemes for the conservation and utilisation

of water may have on the interest of the concerned States and of the interpretation of any agreement in this regard between the said States;

- (iii) advise the Government of India in regard to any other matter that may be referred to the Commission in connection with river valley development;
- (iv) standardise instruments, methods of observations and record, materials of constructions design and operational features;
- (v) conduct and coordinate research on various aspects of river valley development schemes such as waterpower generations, irrigation, navigation, flood control, etc., and the connected structural and design features; and
- (vi) to collect, coordinate the collection of, publish and analyse data relating to waterpower, waterways, tidal rivers, rainfall, runoff and temperature, ground water resources, silting of reservoirs, behaviours, of hydraulic structures, etc., and to act as the Central Bureau of Information in respect of these matters.

3. In view of the above, the Government of India have now assumed full financial responsibility for maintaining the Library and the Information Bureau referred to in para 1(ii) above and have taken over, with effect from 1<sup>st</sup> April 1946, the Library and Information Bureau of the Board, to arrange for its expansion, maintenance and operation. The facilities previously offered by the Library to the States have not, however, been curtailed in any respect. The privileges and rights of the Board as in the Library are given in the Schedule appended to these rules.

4. In view of the constitution of the Central Water and Power Commission, as detailed above, some of the functions previously performed by the Central Board of Irrigation, now fall within the sphere of activities of the Central Water and Power Commission. It has, therefore, been found necessary to revise the constitution of the Board to avoid any confusion or overlap of functions between the two organisations. The following rules have, therefore, been framed to govern the constitution and activities of the Board. These rules supersede the existing rules on the subject.

## **RULES**

### **SECTION – I**

### **OBJECTS**

1. The functions of the Central Board of Irrigation and Power, hereafter called “the Board”, shall be to

- (i) establish contacts with institutions and individuals in India and abroad with a view to the exchange of publications and information;
- (ii) collect and supply information on irrigation, hydro-electric and allied subjects;
- (iii) co-ordinate research on irrigation, hydro-electric and allied subjects and to disseminate results of such research;
- (iv) contribute information on irrigation, hydro-electric and allied subjects for publication in the Press; and
- (v) to publish relevant literature.



The Board shall also work as:

- (i) Indian National Committee for the International Commission on Large Dams;
  - (ii) Indian National Committee for International Commission on Irrigation and Drainage;
  - (iii) Liaison Body for the International Association for Hydraulic Research;
  - (iv) Coordinating Body for Technical Organisations like Indian Standards Institution, Indian Council of Agriculture Research, etc.
2. The Board shall have a Research Committee attached to it; this Committee shall consist of:
- (a) The Executive Committee of the Board as hereafter prescribed in Rule 18, *ex-officio*;
  - (b) The Director, Central Water and Power Research Station, Poona, *ex-officio*;
  - (c) The Research Officers of such States or Unions of States as possess research organisations, *ex-officio*;
  - (d) The Head of the Power Engineering Section of the Indian Institute of Science, Bangalore, *ex-officio*;
  - (e) Such additional persons as the Executive Committee think it desirable to co-opt.

The object of the Research Committee shall be to co-ordinate research on irrigation, hydraulic and allied subjects; this committee shall also serve as the technical advisers of the Board on matters connected with research.

## SECTION – II CONSTITUTION

3. The Board shall consist of the following members whose names shall be entered on the Roll of the Board as they become eligible: —

- (i) Chief Engineers, P.W.D. (Irrigation and Hydro-Electric Branches) of the States and Unions of States and engineers dealing with matters concerning water and waterpower, employed by the Central Government with the status of Chief Engineer or higher, *ex-officio*;
- (ii) Chief Engineers, P.W.D. (Irrigation and Hydro-electric Branches) of such other countries or administrative units outside the Union of India as may like to join the Board, subject, in each case, to the approval of the Board and with the previous approval of the Government of India;

Provided that in all cases the Governments concerned contribute to the Board at the rates hereinafter prescribed.

4. A permanent Chief Engineer will retain his seat on the Board during periods of leave, until he ceases to be Chief Engineer of his State or Union.

## SECTION – III CONSTITUTION OF TECHNICAL SUB-COMMITTEES OF THE BOARD

5. The Government of India and a Government, State or other authority contributing under Rule 15 hereunder will be entitled to ask the Board to appoint a sub-committee of the Board to advise

them on any technical question and questions connected with any irrigation, river training, hydro-electric or allied work.

6. Technical Sub-Committees of the Central Board of Irrigation and Power shall be appointed on the recommendation of the Executive Committee, subject to the concurrence of the authority asking for the appointment of the Sub-Committee and shall consist of Members of the Central Board of Irrigation and Power. They shall ordinarily consist of two Members possessing the widest experience of works akin to the problem under consideration.

7. If a Sub-Committee so wishes and, with the concurrence of the authority asking for such Sub-Committee, a Special Technical Secretary and staff and/or an Assistant Technical Officer or officers may be appointed by the Sub-Committee.

#### **SECTION – IV**

#### **PRIVILEGES AND OBLIGATIONS OF MEMBERS OF THE BOARD**

8. All members of the Board will, on behalf of their Government or State or Union of States, be entitled to the privileges outlined in Rules 12, 13 and 14 below.

9. Each member of the Board will receive one copy each of each Administrative Report of the Board as it is published.

10. Members of the Board may be requested by the Board to serve on Technical Sub-Committees of the Board.

#### **SECTION – V**

#### **PRIVILEGES AND OBLIGATIONS OF GOVERNMENTS, STATES AND UNION OF STATES OR OTHER AUTHORITIES CONTRIBUTING OR SUBSCRIBING TO THE BUREAU OF INFORMATION**

11. The Government of India will be entitled to call on the Board to select a Sub-Committee of the Board to advise them on technical points involved in any dispute between State Governments, Unions of States, or between a State Government and a Union of States.

12. A State, Union of States Government or other authority contributing or subscribing to the Board will be entitled to receive all the publications, issued by the Board, with the exception of Administrative Reports.

13. The number of such individual publications sent to the Government or other authority shall be in accordance with the requirements of each case or as may be decided by the Executive Committee of the Board as hereafter prescribed in Rule 18.

14. Publications issued by the Board shall be supplied free of cost and postage, except in the case of parcels sent by rail when railway charges will be paid by the consignee. The Board may decide to place some copies of their publications for sale to public or to such other authorities as are not entitled to free supply of those publications. Copies of such publications shall be stocked by the Manager of Publications to the Government of India and shall be sold on payment of the price indicated on the publications.

**SECTION – VI**  
**CONTRIBUTIONS TO THE FUNDS**

15. Government, State or Union of States, which is represented by a member on the Board, shall contribute annually to the Board on the following basis:

- (a) Where areas irrigated annually plus area protected by drainage and embankments is:

	Contribution will be Rs.
Less than half a million acres	2500
Half million to one million acres	5000
1 to 2 million acres	7500
2 to 5 million acres	10000
5 to 10 million acres	12500
10 to 15 million acres	15000
Above 15 million acres, contribution will be Rs.2500/- extra for each additional 5 million or part thereof.	

- (b) For irrigation projects under construction, half of the area proposed to be irrigated from the projects under construction will be taken for assessment of contribution.
- (c) For electric generation upto:

	Contribution will be Rs.
100 million KWH generation	1000
101-200 million KWH generation	2000
201-300 million KWH generation	3000
301-400 million KWH generation	4000
401 upto 1000 million KWH generation, Rs.500 per 100 million KWH	
Above 1000 million KWH generation, Rs.250 per 100 million KWH or part thereof	

In any year, an administration will pay on the basis of the figures of area irrigated by Government controlled works and those of area protected by drainage in that administration relating to the latest year for which statistics are available. Although on the basis of the area irrigated in the Centrally Administered Areas, the Central Government are liable to contribute only Rs. 2,500 per annum, they have in view of their overall interest in the activities of the Board agreed to pay annually at the rate of Rs.17,500/- per annum and in addition have taken the responsibility to supply the Board with free accommodation, stationery and printing.

16. A State or Union of States, Government or other authority, which is not represented by a member in the Board, but wishes to take advantage of the facilities provided by the Board and the Library shall, if permitted, subscribe annually to the Board a sum not less than Rs.500/- the

exact amount to be determined by the Executive Committee. The Executive Committee may at its discretion, permit any commercial engineering organisation to subscribe to the Board. The minimum annual subscription for such organisation will be Rs.200/-, the exact amount to be determined by the Executive Committee.

17. The Board shall maintain a deposit account with the Accountant General, Punjab, Simla, or Accountant General, Central Revenue, New Delhi, for the time being into which subscribing and contribute authorities shall pay their annual subscriptions or contributions at the beginning of each financial year.

### **SECTION – VII CONSTITUTION OF THE EXECUTIVE COMMITTEE**

18. A standing committee of the Board to be known as the Executive Committee shall be selected annually from amongst members of the Board and shall consist of:

- (a) The President
- (a) The Vice-President
- (a) Members (Three)

Out of these five, one shall be the Chairman, Central Water and Power Commission, ex-officio, at least one Chief Engineer (Irrigation) and one Chief Engineer (Electricity).

### **SECTION – VIII PRESIDENT AND VICE-PRESIDENT**

19. The President shall take the chair at all meetings of the Board and of the Executive Committee and of the Research Committee at which he is present and shall regulate the proceedings. In the absence of the President such duties shall devolve on the Vice-President.

### **SECTION – IX DUTIES AND POWERS OF THE EXECUTIVE COMMITTEE**

20. The direction and management of the concerns of the Board are vested in Executive Committee subject to all resolutions of meetings of the Board which have been duly summoned and held in accordance with rules hereinafter laid down when such Resolutions have been duly entered in the Minutes and signed by the Chairman of the meetings and the Executive Committee shall take such action as may be necessary to implement such resolutions. Further, Board may delegate on a specific resolution such powers to the Executive Committee, the President, the Secretary and any Sub-Committee of the Board as may be deemed expedient.

21. The Executive Committee shall ordinarily meet half yearly but shall also meet at any time that the business of the Board require; and at every meeting too shall constitute a quorum. The Executive Committee may appoint Committees, for special purposes, to report to the Executive Committee.

22. The Executive Committee shall convene an annual meeting of the Research Committee not less than three months prior to the annual meeting of the Board for the express purpose of reviewing research work.

23. It shall be the duty of the Executive Committee to adopt every reasonable means for the advancement of the objects of the Board; to provide for properly conducting the business of the Board in all cases of emergency, and to arrange, subject to the approval of the Board, for the publications of such papers and documents as may be calculated to advance professional knowledge in the field of irrigation and hydro-electric science.

24. In the event of any matter arising, in regard to which a decision of the Executive Committee is required urgently, the Secretary shall prepare a note on the subject and circulate it to the Executive Committee for orders.

25. Subject to the general control of the Executive Committee or as otherwise provided in the schedule appended, the Secretary is empowered to employ additional temporary technical, clerical and menial staff as the exigencies of the work in the Secretary's office demand, and to grant honoraria or remuneration to such employees in accordance with the scale which it may approve, subject to this entailing no excess expenditure over the sanctioned budget.

26. The Executive Committee shall have full powers to authorize expenditure from the funds of the Board, within the limits of the budget sanctioned by the Board.

27. The office of the Board shall be inspected once a year by the President or a member of the Executive Committee nominated by him.

### **SECTION – X DUTIES OF THE RESEARCH COMMITTEE**

28. The Research Committee shall meet ordinarily once a year, and on at least one other occasion during the year to exchange views informally.

29. In the event of the absence of the President of the Board, the Vice-President shall take the chair at the meeting. In the event of the absence of the President and Vice-President, a member of the Executive Committee shall take the chair. In the event of the absence of all members of the Executive Committee, the meeting may elect any member of the Research Committee to take the chair at the meeting.

30. The Annual Meeting will be utilised to secure material for a report to the Board. The report will describe briefly research work during the preceding year and make suggestions for further research in the ensuing year.

31. Prior to the Annual Meeting, members of the Committee, who so desire may furnish the Secretary with advance notes on selected items of the agenda or allied subjects, for circulation among the other members. Members in receipt of such notes who desire to offer any criticism or comment shall address the author direct prior to the meeting in order, that, if possible, a measure of agreement may be reached before open discussion in the Committee.

32. At the Annual Meeting each officer present shall be asked to express briefly his opinion on the matter in hand. General discussion shall follow. At the close of the discussions, the Chairman will summarise the debate in a manner suitable for record. He may state the different points of view and if any unanimous agreement has been reached this shall be recorded in the form of a resolution.

33. One item of the agenda at the Annual Meeting of the Research Committee shall be the selection of subjects for discussion at the following Annual Meeting. To assist in the selection, the Secretary shall prepare a list of enquiries in regard to which he has been unable to satisfy the enquirer and upon which research appears to be indicated. The Research Committee may add further subjects to this list. The selection of the particular items for next year's meeting shall be guided by claims to general interest.

34. Other items on the agenda shall be a discussion on "Current Research Activities" and the "Co-ordination of Research work for ensuing year". Research and experiments desired by the Board shall be laid before the Research Officers, who will divide up the work, as far as possible, by mutual agreement.

35. Research Programme, revised as a result of discussion at the Annual Research Committee Meeting, shall be brought before the succeeding Meeting of the Board.

36. Research Officers shall communicate their annual reports and summaries thereof to the Secretary to the Board, not less than six weeks before the Annual Meeting of the Research Committee.

37. The Proceedings of all Research Committees shall be included in the Annual Technical Report of the Board. Printed copies of Proceedings of the Annual Meeting of the Research Committee shall be circulated only to the members of the Board and of the Research Committee.

## **SECTION – XI THE AUDITORS**

38. The Auditor General, India or any-other officer authorised by him shall carry out such audit as is necessary and the Secretary shall be responsible for carrying out the requirements of audit in this regard.

## **SECTION – XII THE SECRETARIES**

39. The Secretary to the Board shall be appointed normally for a period of four years by the Board at its annual meeting, but the appointment shall be subject to the approval of the Government of India.

40. It shall be the duty of the Secretary under the direction of Executive Committee, to conduct the correspondence of the Board; to attend the meetings of the Board, of the Executive Committee, of the Research Committee and such other sub-committees as may be appointed by the Board, to take minutes of the proceedings of such meetings; to read the Minutes of the preceding meeting and such communications as may be ordered to be read, to superintend the publication of such papers as the Executive Committee may direct; to direct the collection of the subscriptions and the preparation of accounts of the expenditure of funds, and to present all account to the Board for inspection and approval. He shall also engage and be responsible for all persons employed under him, and shall generally conduct the ordinary business of the Board.

**SECTION – XIII**  
**MEETINGS OF THE BOARD**

41. Annual Meeting of the Board shall be held ordinarily in November each year.

42. It shall be in the power of the Executive Committee to arrange for additional meetings of the Board if found desirable.

43. In the event of the absence of the President of the Board, the Vice-President shall take the chair at the meeting. In the event of the absence of the President and Vice-President, a member of the Executive Committee shall take the chair. In the event of the absence of all members of the Executive Committee, the meeting may elect any member of the Board to take the chair at the meeting.

44. All members shall have a right to attend and vote, and eight personally present shall constitute a quorum, and each such member personally present shall have one vote. In the event of a quorum not being present within thirty minutes of the hour fixed for the commencement of the meeting, the meeting shall stand adjourned. The accidental omissions to send notice of a meeting to or the non-receipt of notice by any members shall not invalidate the proceedings at the meeting.

45. At all Board Meetings questions shall be decided, according to the majority of votes properly given thereat, and in the case of equality, the Chairman shall have a second or casting vote. Where the question under consideration relates exclusively to the Union of India, members of the Board appointed under Rule 3 (ii) will not participate in the voting.

46. In the event of any matter arising, in regard to which a decision of the Board is required urgently, the Secretary, if he is so instructed by the Executive Committee, shall prepare a note on the subject and circulate it to the President and members for opinion.

47. At the Annual Meeting, the following business shall be transacted:

- (i) Election of President, a Vice-President and Members of the Executive Committee for the following year. They will take office after the Annual Meeting.
- (ii) Consideration of a report on the work of the Board for the past year.
- (iii) Consideration of a report on research work in regard to irrigation, *etc.*, in India and other administrations which contribute to the Board.
- (iv) Consideration of the accounts for the preceding financial year.
- (v) Consideration of the Budget for the ensuing year.
- (vi) Any other business requiring considerations by the Board.

48. The Board shall, further consider any professional or technical questions of which due notice has been given by the Government of India.

The Board shall also decide what special questions call for particular study during the ensuing year. The questions so decided upon shall be taken up for study only after the technical questions of which notice has been given to them by the Government of India have been considered, *vide* Rule 48.

50. To aid in the discussion of professional or technical questions the Executive Committee may invite Research Officers and any other officers to attend the Professional and technical discussions of the Board.

**SECTION – XIV**  
**FEEES OF THE MEMBERS OF THE SUB-COMMITTEES OF THE BOARD**

51. The members of the Board when serving on Sub-Committees of the Board will be entitled to a fee of Rs.200/- each per day.

**SECTION – XV**  
**SUBSCRIPTIONS TO SOCIETIES AND ASSOCIATIONS**

52. Subject to the general control of the Executive Committee, the Secretary is empowered to sanction subscriptions by the Board to Scientific and Engineering Societies and Associations or to reduce the number of such subscriptions, subject to the sanctioned budget.

**SECTION – XVI**  
**ENACTMENT OF RULES**

53. No additions, alterations or omissions in these rules shall be made except by the authority of a resolution passed at a Board Meeting which has been convened and conducted in accordance with the provision of Rules 41-46 and additions and alterations to the rules decided upon by the Board shall require the approval of the Government of India before they become operative. The Executive Committee when directed by a resolution of a Board Meeting to make a new rule or to alter or revoke an existing one, shall frame the new or altered Rule and shall, after final approval by a majority of members, submit the proposed addition, alteration or revocation to the Government of India. And in the event of the proposal for such addition, alteration or revocation being duly agreed to by the Government of India, the rules shall be amended accordingly.

**SECTION – XVII**  
**THE PROPERTY OF THE BOARD**

54. The property and the effects of the Board are vested in the Government of India for the furtherance of the objects of the Board.

55. Every paper, map, plan drawing, or model, presented to the Board shall be considered as the property of the Government of India, unless there has been some previous arrangement to the contrary, and the Board may publish the same in any way and at any time they think proper. But should the Board refuse or delay the publication of such paper beyond a reasonable time, the author thereof shall have a right to copy of the same, and publish it as he may think fit, having given three months notice of his intentions in writing, to the Secretary to the Board. Except as hereinbefore provided, no person shall publish or give his consent to the publication of any communication presented to and belonging to the Board, without the previous consent of the Executive Committee.

**SECTION – XVIII**  
**FUNDS**

56. The Executive Committee is empowered to invest any funds of the Board. Bonds representing investments by the Board shall be retained in safe custody by the Agent, Imperial Bank of India,



Simla or New Delhi for the time being and interest thereon shall be collected by the aforesaid agent, and paid in cash to the Secretary.

57. Withdrawals from invested funds shall be made only with the approval of the Executive Committee.

58. In case the funds at the credit of the Board are temporarily depleted in the beginning of a financial year, the Secretary to the Board, with the previous approval of the President of the Board, may raise a loan from the Imperial Bank of India, Simla or New Delhi for the time being against the investments of the Board held in safe custody, with that bank, subject to a maximum of one month's salary of the staff of the Board. The loan may be paid back to the bank either in whole or by instalments as soon as sufficient funds have been received from contributions, *etc.* A new loan may not be raised until the previous loan has been repaid in full.

## SCHEDULE

(vide Para 3 of the Preamble to the Rules)

In this Schedule:

- (i) The references to the Library are to the Library since taken over from the Board by the Government of India and maintained by the Central Water and Power Commission, and
- (ii) The references to the Board are to the Central Board of Irrigation and Power.

It has been agreed that the Board or any of its members as the case may be will have the following privileges and rights and the Central Water and Power Commission will have the obligations set forth in this Schedule.

1. The Library maintained by the Central Water and Power Commission will be organised on the Universal Decimal Classification system. Its aim will be to obtain and classify all useful information on irrigation, power engineering and allied science.
2. All contributing and subscribing Governments and other authorities will arrange to send to the Library in the Central Water and Power Commission, a copy of administration reports, new technical papers, flood reports, project reports, designs of important works and type designs, and legislative measures relating to irrigation, electricity, or allied subjects, issued by them or their research organizations. They will also send to the Library typescript copies of technical notes and reports of importance, as well as typescript copies of estimates and plans or new projects as soon as ready. The Library will be available to the Board and the latter may permit the issue of any paper as a general circular, which may be considered to be of sufficient importance.
3. The Chief Engineer or Chief Technical Engineering Officer of a Government, State or Unions of States, or other authority contributing and subscribing to the Board, will be entitled to consult the Library on any technical subject connected with irrigation, hydro-electric, river training or allied works, and to borrow books, publications, periodicals, and therefrom. Such information will be sent postage free, except in the case of railway parcels.

4. A Technical Officer below the rank of Chief Engineer of a Government, States or Unions of States, or other authority contributing and subscribing to the Board, may apply for information from the Library through an officer not below the rank of Superintending Engineer, on any technical subject connected with irrigation, hydro-electric, river training or allied works.
5. Any Gazetted Technical Officer of a Government, State or Union of States, or other authority contributing and subscribing to the Board, whose rank is not below that of Executive Engineer will have the privilege of borrowing books, publications, periodicals and maps from the Library by direct application to the Secretary to the Board.
6. In the management of the Library, the Chairman, Central Water and Power Commission shall be advised by a Committee comprising:
  - (i) The Chairman, Central Water and Power Commission;
  - (ii) The President or Vice-President of the Board for the time being; and
  - (iii) The Secretary of the Board.
7. Subject to such variation as the Library Advisory Committee may direct, the Library shall be open to all members, irrigation and other officers of contributing and subscribing Governments, States and Unions of States and authorities during such hours as may be determined by the Secretary from time to time when they shall be granted all facilities to peruse and inspect books, papers, plans, maps, *etc.*, and to make copies or extracts therefrom (doing no injury to the same) with the exception of such documents as the Library Advisory Committee shall order not to be inspected or copied but none of the documents of the Board and the Library shall be removed from the premises without the permission of the Secretary.
8. The Library shall be located at the same place as Central Board Irrigation and Power and will be under the general supervision of the Secretary to the Board. In lieu of the work done by the said Secretary for the Central Water and Power Commission Library, the Deputy Secretary (Central Water and Power Commission) Library will be the general assistant of the Secretary in Board matters.

## **CHAPTER 3**

# **RESEARCH AND DEVELOPMENT**

One of the important functions of the Board at the time of its inception in 1927 was to promote research on irrigation and allied subjects. Initially, there were only two research stations at Poona (now Pune) and Lahore catering to the needs of the then provinces of Bombay and Punjab. On the recommendation of CBIP, the Pune research station was upgraded to be a Central Government research station. After Independence, more research stations came up. A research committee having Directors or Research Officers, in-charge of research stations as members was established by CBIP to coordinate and guide the research work at these research stations. The meetings of the research committees were held every year to discuss the latest developments and research work being carried out in the country. The research committee would make its recommendation to the Board regarding technical problems under investigations, which used to be then ratified at the annual meetings of the Board. The details of the research work together with the discussions thereon at the meetings of the research committee and that of the Board were being published in the Annual Reports (Technical) of the Board.

As a result of coordination of research work at various research stations, notable achievements were made in almost all aspects connected with irrigation engineering like flow in open channels, flood flows and designs of channels etc. Application of physical models in finding appropriate solutions to problems relating to river training works, bank erosion, energy dissipation structures etc, helped in evolving economical and safe designs of hydraulic structures.

The Board also used to set up a number of research sub-committees. The deliberations in these research sub-committees and interaction of the members with other active research professionals resulted in the finalisation of CBIP Publications like Design of Weirs on Permeable Foundations, Manual on Falls, Design of Volute siphons etc. which resulted in the dissemination of the results of research work being done in the country. In addition CBIP was also publishing Irrigation and Power Research Digests containing the summaries of the studies being conducted at different research stations. These publications helped the field the Engineers to make use of the results of these researches in planning, design and execution of their projects.

CBIP adopted the practice of holding Annual Research Sessions either at their headquarters or in different states since 1930 where in all the research stations used to present papers highlighting their research activities and results which were then discussed in these sessions resulting in useful exchange of knowledge and experience amongst all the research workers and field engineers. This practice continued till 1995. Presently CBIP is holding International R&D Conferences. So far seven such conferences have been organised at New Delhi (1995), Vadodra (1997), Jabalpur (2000), Aurangabad (2003), Bangalore (2005), Lucknow (2007) and Bhubaneswar (2009).

### **3.1 THE NEED FOR FUNDAMENTAL RESEARCH**

The need for increased attention to Fundamental and basic research was stressed by Shri Kanwar Sain, President, Central Board of Irrigation and Power in his presidential address at the Twenty-

Third Annual Research Session held at Bangalore in June 1953. The research work being done till then was usually aimed at finding solution to particular/identified problem met with in design or construction. He however felt that the lessons learnt in the laboratories should be widely made known to all engineers in the field to get the best value out of research. He explained that the Fundamental Research was research which aimed at acquiring an understanding of the inner nature by physical phenomena without reference to any practical problem while the Basic Research aimed at studying physical phenomena to such a degree that the circumstances in which they would occur, and their nature and effects could be predicted, desirably in quantitative terms. The results of this type of research were, therefore, of quite a general nature and might find application to a wide range of future problems but were not inspired by any particular problem. He felt that both Fundamental and Basic Research were also the work of specialised laboratories which required greater freedom of thought and action, quite dissociated from immediate problems.

Explaining further, he said, that the Applied Research was the research which was directed towards the solution of a particular problem of practical importance. Any piece of work under this heading could therefore, be initiated only when the existence of a practical problem was perceived and it could be successfully concluded and that it was possible to see that the conclusion reached was a practicable one. For this purpose he felt that there must be free exchange of ideas between the laboratories which would be engaged on Fundamental Research and those which were primarily being used for Applied Research. He stressed that the systematic and integrated research on various fundamentals involved in the Applied Research, supplemented by some further Fundamental Research, could enable laying down of general broad principles for design and leave only the more complicated cases for actual testing on the models.

To give a further push to this suggestion of Shri Kanwar Sain, an editorial of the October, 1953 issue of the 'Irrigation and Power Journal' requested the Directors of Research Stations to draw out a list of problems coming under Basic Research and indicate items which could be handled by their Research Stations and discuss the problems at the meeting of the Board and the Research Committee. The Editorial explained that:

*“The Board will examine the proposals to decide the programme for Basic Research and allocate the subjects to the various Research Stations. It may be necessary that at least two and not more than three Research Stations should be allotted one and the same problem of Basic Research so that the results may be verified and corroborated. Every time a particular aspect of basic research is finalised and approved by the Research Committee and the Board, the recommendations can be brought out in the form of short popular leaflets as suggested by the President in the last Research Committee Meeting at Bangalore. This seems to be the best way of disseminating results of latest research as soon as definite advances are made without allowing the matter to drift from year to year and arriving at useful and practical conclusions.”*

As a follow up, a committee was formed to consider improvements in quality of research already being conducted and also to allocate specific problems to various research stations. The committee recommended the taking up of Basic Research on the following subjects:

- (i) Air-entrainment,
- (ii) Turbulence,

- (iii) Cavitation,
- (iv) Design of Channels in Alluvium,
- (v) Engineering Properties of Soils,
- (vi) Sedimentation Studies,
- (vii) Sub-soil Flow, with specific reference to Tube-wells,
- (viii) Standardisation of the Use of Surkhi and other Pozzolanic Materials in Mortar and Concrete,
- (ix) Principles of Concrete and Mortar Mix Design, and
- (x) Studies of Vibration in Soils under Machine Foundations.

The Research Committee at its meeting held in 1954, finalized various aspects of each problem and their distribution to various Research Stations. The procedure for monitoring and co-ordinating the research work to be conducted in the various Research Stations was also decided. For this purpose, a Standing Advisory Committee consisting of the President and Secretary CBIP, Directors of Research Stations of Uttar Pradesh, West Bengal, Punjab, Karnataka, CWPRS, CSMRS and Prof. N.S. Govinda Rao, of the Indian Institute of Science, Bangalore, was set up. Two more problems were also added to the above ten problems.

A proposal for carrying out Fundamental & Basic Research and details of the problems proposed to be studied together with a 'Note' explaining the significance of each problem was forwarded to the Government of India in August 1956, with the request that necessary provision of funds may be made in the Second Five-Year Plan

**After due scrutiny by an Expert Committee set up by the Government of India, the Government approved the first scheme of studies on Fundamental and Basic Research problems relating to River Valley Projects and those relating to Floods vide Government of India orders dated 30 August and 30 October 1957.**

### **3.2 RESEARCH SCHEMES APPLIED TO RIVER VALLEY PROJECTS**

**The "Research Scheme Applied to River Valley Project" was brought into operation in 1957-58 with 12 problems for study under the supervisory control of the Central Board of Irrigation and Power. The work was assigned to different Research Stations in the country. The Advisory Committee, already referred to, assisted the Board in scrutinising the projects, watching the progress of work under the research programme and deciding on the grants to be released to various Research Stations each year. The actual grant-in-aid was released by the Government of India, to the respective administrations under which the different Research Stations functioned. The Government of India was fully guided by the advice of the Board regarding the allotment of problems and release of grants. The centrally controlled Research Stations got their funds through their normal budgetary allotments.**

With the expansion in the activities in the Irrigation sector, the developments in Technology and sophistication in Instrumentation, the scope for research work under this scheme was extended. Accordingly, the scheme was modified at the beginning of the Third and Fifth Plans by addition of new subjects and deletion of completed aspects. At the beginning of 5<sup>th</sup> plan, 100 research projects were under progress in the various institutions.

As the demand for irrigation facilities showed a progressive increase, it became necessary to tackle and utilise more difficult sites for dam construction in hazardous terrain. These projects posed more complicated problems relating to hydrology, geology and construction materials to the design and construction engineers. With a view to promote research work to help in solving such problems which had a direct bearing on the economy of structures and their speedy execution, 15 new topics with a bias on design aspects of dams, barrages, tunnels and in lake structure etc. were introduced in the scheme, and 39 research projects were sanctioned for Rs. 44.85 lakh.

### 3.3 NCST SCHEMES

The Science and Technology Plan 1974-79 prepared by the National Committee on Science and Technology (NCST) had also identified 17 major areas where further research was required in the domain of Water Resources Development. But, in view of constraints of financial resources, it was decided initially to take up work on four priority areas only namely 'sedimentation studies in reservoirs', 'water quality observations', 'Instrumentation & Hydraulic structures'.

A scheme entitled "N.C.S.T. Scheme of Studies on Water Resources", comprising 44 research projects was sanctioned at an estimated cost of Rs. 141.00 lakhs.

Up to the end of the Fifth Plan, the research work was being conducted under the above three schemes. Although a good number of research projects covering a wide field of Civil Engineering were taken up for studies and successfully completed, it was found that some of the relevant topics had not yet been adequately covered. Further a number of new fields of research and technology had come into the forefront in foreign countries, but had not yet received adequate attention in our country. Therefore, during the Sixth Plan period, it was decided to enhance the scope of R and D activities and include additional problems as referred to above for study. After clearance by the Working Groups and the Central Water Commission, 116 research projects amounting to Rs. 320.33 lakhs under Research Scheme applied to River Valley Projects and NCST Scheme of studies were sanctioned by the Govt, in October 1979.

In 1980, the Planning Commission and the Govt, of India observed that there was basically not much of a difference between the research projects studied under the Research Scheme applied to River Valley Projects and those taken up for study under the NCST Scheme. They therefore suggested that these two schemes may be combined into a single scheme. This suggestion was accepted by the Standing Advisory Committee for Research Programme and Co-ordination at its meeting held on 11th March 1980 and all projects were taken up under one scheme only viz. Research Scheme Applied to River Valley Projects (RSRVP).

Upto the beginning of VI Plan all the research projects being studied were grouped under three main headings viz., Hydraulics, Soils and Concrete. However during the VI Plan period a more scientific and technical classification of research projects was introduced and the research scheme laid down that the studies be carried out under the following nine major topics/ subjects in the field of Irrigation:

1. Water Studies and Hydrology
2. Hydraulics (Storage and Flow of Water)
3. Irrigation, Drainage and Reclamation

4. Flood Control and River Training
5. Coastal Engineering, Tidal Hydraulics and Navigation
6. Soil Mechanics and Foundation Engineering
7. Rock Mechanics
8. Construction Materials and Practices
9. Design, Construction and Cost Analysis of River Valley Structures

A few more subjects were also added during 1982-83 and later years.

A complete list of topics (problems) which were covered under the Research Schemes applied to river Valley Projects (both continuing, new schemes and NCST schemes is given in Appendix 3.1.

### **3.4 RESEARCH SCHEME ON FLOOD CONTROL**

Recognising the fact that research in the field of flood control and river training was very limited and that too confined to model experiments for determining the location, spacing and length of spurs and other river control measures, the Central Board of Irrigation and Power had proposed that a research scheme on the lines of the Research Scheme applied to River Valley Projects may also be initiated for the Flood Control Sector. In view of the complex problems of river behaviour, it was felt necessary that a large programme of applied research should be undertaken by systematic collection of field data, carrying out various experimental works particularly for river training, evaluation of the performance of such works already carried out etc., in order to effect improvements in design and economy in future works. The Central Board of Irrigation and Power also realised the need for associating field engineers in charge of maintenance of river channels and other flood control works in the formulation of the needed research studies and accordingly requested the Chief Engineers of Flood prone states as well as Directors of Research Stations to send proposals for taking up research studies. Based on the research proposals received, the Research Scheme on Flood Control was initiated in the year 1982-83 with 8 research projects being taken up for study.

The ACRD for Management of Floods and the ACRD for River Hydraulics and Sediment Transport already constituted under the Research Scheme applied to River Valley Projects, scrutinised and reviewed the projects received for this scheme also.

During 1984-85 and 1985-86 ten research projects were under study. Six more research projects were submitted to the Govt, of India for sanction and 20 more research projects were under various stages of consideration.

It was felt that the scheme as such was just a beginning and that lot more research work would be taken up under this scheme in coming years.

### **3.5 EVOLUTION OF CO-ORDINATION & MONITORING ARRANGEMENTS**

Formulation of schemes for research and providing funds for research is not an end itself. It is essential to ensure that the actual research studies are carried out according to the plan of work originally envisaged and approved by experts when the scheme was sanctioned, the

results initiated and final outcome of the studies reported in detail to the profession also for proper incorporation in the design process. Recognising the need for such close monitoring, the Board appointed Dr. D.V. Joglekar, former Director, Central Water and Power Research Station, Poona as its first Adviser for guiding the studies relating to research in Fundamental and Basic problems. Foreign exchange released by the Government of India enabled some desired equipment being imported from foreign countries. The Adviser would visit the research stations where work was in progress and discuss with the research workers their problems and progress achieved, and at the end of each year would compile an Annual Review of work done at all the Research Stations under this scheme.

With a view to get better co-ordination and on the recommendations of the Adviser, Dr. Joglekar, the Central Board of Irrigation & Power also constituted three Working Groups, one each for Hydraulics, Soils and Concrete. These working groups comprised 3 or 4 members each. These Working Groups included Members from C.W.C., Senior Chief Engineers from States and Professors of I.I.T's. These Groups were consulted before any approval for taking up research programme communicated to the Research Stations. Reports on the work done at all Research Stations were placed before these Working Groups annually so that they could study the progress and suggest any modification or re-orientation required to meet the current day needs. Three Specialists Co-ordinators were nominated and requested to take up the following activities:

- (1) To ensure, during initial screening of the projects proposed to be started, that the results of the study would have application in water resources development projects and that the results could be brought to the stage of field application within two or three years.
- (2) To visit the various Research Stations and to assess the quantum of work carried out and guide the research workers in their research studies and also assist them whenever necessary, so as to ensure maximum applicability of the studies to project works.
- (3) To examine the PERT charts for various Research Stations to ensure that manpower, materials and equipment were properly utilised with proper co-ordination.
- (4) To review the quarterly and annual progress reports and monitor the progress of work at the various Research Stations to avoid any slippage in the achievement of the targets specified.
- (5) To propagate the results of the studies to the field officers by personal contact and discussion with the concerned authorities and to monitor the application of the results in the field as well as assess the benefits accruing from research findings.

For overall guidance, direction and control, a Standing Advisory Committee was constituted under the Chairmanship of the Chairman, Central Water Commission. This Committee laid down general policy and also controlled the distribution of funds to the various Research Stations after taking note of the projects in operation at each of the Research Station.

Results obtained from some of the studies have been and are being applied to the field with advantage. A few of the important investigations are mentioned below:

It was found that Lacey's equations for designing alluvial channels were not applicable for all soil types and under conditions of varying sediment transportation. Instead, statistical formulae had been evolved for the North Indian alluvial soils based on data collected on stable field channels.



A lot of work had been carried out on the errors in measurements of discharge and sediment charge in irrigation channels and based on a comprehensive study, detailed instructions were prepared and circulated to all concerned, for measurement of discharge and sediment charge in channels.

Systematic sedimentation surveys on 11 major reservoirs in the country revealed that silting occurring in half of them was in excess of the anticipated rate and modifications to existing design criteria were necessary.

For tube-wells, design criteria for gravel packs which ensured pumping of sand-free water was evolved based on actual researches conducted in U.P. and Bihar. Economic alternatives to stone for river protection works were developed for use in places where suitable stone was not readily available.

The suitability of rubble concrete as a strong and durable construction material was assessed and reported.

The efficacy of replacing a part of cement used in large hydraulic structures by fly ash was established and attempts were made to evolve standard methods for designing of fly ash mixes to enable a more intensive utilisation of this waste product.

It was felt that more and more complicated problems were likely to be faced in the design, construction and performance of river valley structures, and that the future projects were likely to be located in more difficult situations. In view of the important consideration of keeping the project costs as low as possible, new methods were necessary to be evolved to keep the cost low. These researches played a great role in achieving these objectives.

After some time it became apparent that a closer look at the work in progress was required along with an up to-date review of the state-of-Art in various aspects. On a suggestion from the Chairman, CWC, 13 Task Forces were formed, one for each selected topic. Suitable experts who had personal knowledge in the concerned topic were nominated as conveners' of these Task Forces. These Task Forces were entrusted with the primary task of compiling a State-of-Art report on the respective topic and try to identify the gaps in the existing knowledge so that the research work could be directed to filling these gaps. The experience with the Task Forces was not satisfactory and soon this exercise had to be given up.

It also became apparent that one adviser, however outstanding he may be, was not competent enough to guide the research activities over such widely differing aspects as River behaviour and training, Energy dissipaters, Design of channels, Sedimentation in reservoirs, Subsoil flow, Soil mechanics, Rock mechanics, Concrete and other construction materials, Instrumentation etc. The Central Board of Irrigation and Power therefore decided to abolish the system of a single Adviser and instead appointed Specialist co-ordinators, one for each compact group of topics. The working groups and Task forces were also wound up and instead Advisory Committees for Research and Development (ACRD.) were formed in 1982 one for each facet of Irrigation Engineering including such subjects as Application of Space Technology for Water Resources, Environmental effects of Water Resource Projects, Water Management including Socio-economic aspects. These Advisory committees had a broad based composition-including representatives of CWC, Educational Institutes including I.I.Ts., other related Central Govt. organisations and

Practicing Engineers in each of them.

Nineteen ACRDs were formed to cover the following subject areas:

1. Management of floods
2. Hydraulic structures
3. River hydraulics and sediment transport
4. Hydraulic machinery and equipment
5. Ground water
6. Coastal erosion and tidal hydraulics
7. Hydrology
8. Irrigation methods and water management
9. Environmental efforts of water resources projects
10. Socio-economic aspects of water management
11. Soil mechanics
12. Rock mechanics
13. Masonry and concrete structures
14. New materials and processes
15. Application of space technology
16. Instrumentation
17. Construction methods, planning and management
18. Education and Training
19. Plastic culture Development.

The ACRDs were entrusted with the task of identifying priority aspects for research under each of the subjects, identify problems requiring study, plan the research programme, scrutinise the research projects formulated by the Research Stations both in respect of technical content (as regards the results of the study proposed and whether the results could be brought to the stage of field application within a time frame of two to three years) as well as financial aspects and make recommendations to the Standing Advisory Committee, give necessary guidance and orientation to the research stations, monitor and evaluate the progress of studies. Three or four meetings of each of these ACRDs were being convened by the Member-Secretary, CBIP each year, and the ACRDs would make a thorough review of the work done, immediate programme of work, and further work to be taken up. The investigators carrying out the Research studies were brought face to face with the ACRDs Members so that a direct dialogue could take place. The experience showed that the ACRDs along with the specialist co-ordinators were exercising a close control on the programme of research work so as to make it meaningful and to ensure that the results would lead to useful application in the field.

To maintain a record of the work done each year under the Research scheme, all the research stations were required to furnish to the Central Board of Irrigation and Power an Annual Review of work done. These Annual Reviews from the Research stations were compiled

together and published by the Central Board of Irrigation and Power and were circulated widely all over the country.

Research Review meetings, especially devoted to the discussion of the work done under the scheme, results obtained and conclusions drawn were held every year, in which all research stations participated. This enabled a clear review of the research activities and cross-fertilisation of ideas from different workers, in addition to creating awareness among all the research workers engaged on Research Studies being carried out all over the country.

Overall improvements and progress in Engineering Technology is not possible without adequate two way communication between research workers/and technologists on the one hand and practicing engineers/designers on the other hand. The designers/practicing engineers need to appreciate in advance the problems generated by increased size of structures or severity of design criteria and identify the needed research and communicate the same to research organisations so as to influence their programmes. The research community in its turn must try to identify and resolve anticipated problems in advance of the actual need to apply those results. The researchers must also present their results, as far as practicable, as clear cut design recommendations. Thus a close interaction between practicing engineers, designers and research workers is necessary for worthwhile progress. The research and development sessions organised every year by the Central Board of Irrigation and Power served this important purpose. The completed research works of the various research stations were presented in the form of papers and these were discussed at the Research sessions.

Important researches on specific subjects carried out by research stations under this scheme which reached a certain stage of finality and the results of which had been accepted based on discussions were compiled as Technical Reports or Technical Publications. A large number of publications were issued by the Central Board of Irrigation and Power and these form authentic reference books for use of the members of the profession.

The results of a number of Research Studies were being implemented in the field. The achievement cum performance reports used to be issued at frequent intervals to give a factual record of the results of research studies which were implemented in the field and financial benefits that had been realised.

### **3.6 DISSEMINATION RESULTS AND ITS IMPLEMENTATION IN THE FIELD**

Adequate dissemination of the results of research is vital for the effective integration of research results into design procedures. Recent improvements in the relevant knowledge and the latest theories have to be 'assimilated to up-date conventional design procedures. The Central Board of Irrigation and Power attempted these tasks in a variety of ways. The Irrigation and Power Research Digest was brought out which presented a summary of the work currently in progress in different research centres, and was published quarterly. The main objective of the Irrigation and Power Research Digest was conveying information to the field Engineers as well as research workers, on the current activity in the various Irrigation and Power research stations so that they were kept posted with up to date information about the types of problems being studied at the research centres. This enabled them to keep abreast of the present work so that results of appropriate research studies were applied in the field as soon as they are finalised.

The results of research were also incorporated in design for various component parts of the river valley projects, in the Manuals issued by the Board and relevant ISI standards, thus ensuring their application in the field.

The details of the research work conducted at each of the Research Stations during a year were being compiled in the Annual Review which was also discussed at the Research Review Meetings. This fulfilled the primary purpose of keeping all the research community informed of the research work being carried all over the country under this scheme. Further, the methodology of the work was improved by mutual discussions and discussions with senior officers and working group members at these meetings. Further, when studies arrived at definite conclusions and these conclusions were generally found acceptable based on discussions at Research Meetings, etc., they were compiled in the form of technical reports and these were freely circulated to Irrigation Departments, Design Organisation, etc. Examples of such reports include—Design of Gravel Packs for Tube wells, Economic Alternative to Stone for River Protection Works, Rubble Concrete for Masonry, Manual on Canal Linings, Manual on Tube wells. Earlier, these reports were circulated to the members of the Board, Directors of Research Stations and Directors of Design Organisation. It was subsequently suggested that these research findings should also percolate down to the level of field officers. Therefore larger number of copies of the publications were being printed and circulated to the level of Superintending Engineers/Executive Engineers.

Results of the research studies were also being incorporated in the specifications and standards issued by the Central Board of Irrigation and Power for guidance of field officers. For example, the results of the study on the “Measurement of Discharge in Canals” were incorporated in the Central Board of Irrigation and Power. Note on “Instructions for Collection of Field Data for Measurement of Discharge and Sediment in Canals”.

Research studies to determine the reduction in evaporation losses from open water surfaces by covering them with a thin film of certain chemicals like cetyl alcohol were carried out by three Research Stations under this scheme. The results of these studies led to the formulation of an Indian standard ‘Recommendations for Minimising Evaporation Losses from Open Water Storages’ DOC: BDC 48(2744) PI (May 1976). IS 14654 – 1999, “Minimising Evaporation Losses from Reservoirs – Guidelines, a BIS” code was the next in the series.

Major research schemes which were completed were reported as Completion Reports by the concerned Research Stations. One such example is the report on “Design of Weirs on Permeable Foundations of Limited Depth”. Such reports were widely circulated for scrutiny and revised based on comments and criticism. The finalised reports were published as a Central Board of Irrigation and Power Publication for adoption and use in Irrigation Departments and River Valley Projects.

Periodical assessment of the impact of the research activities was also made by contacting the Research Stations, Design Organisations and field engineers. They were requested to report periodically to the Central Board of Irrigation and Power, as how far the research results had been implemented in the field and what had been the financial benefits achieved. From the reports received from the States and other organisations, achievement-cum-performance reports were prepared. In this connection, it can be mentioned that the financial benefits did accrue for many years after the research results were implemented. Many of the benefits were in the form

of improved designs for irrigation works, which involved savings in initial expenditure itself. It can safely be stated that the research studies were contributing to economy in the construction and operation of river valley structures by way of providing better and economical designs, improved materials and better quality control, and more efficient operation and maintenance.

A list of Technical Reports, Literature Reviews and Status Reports etc., published under the Research Scheme applied to River Valley Projects is at Appendix-3.2.

As mentioned earlier, till the beginning of second plan, research in water resources was largely confined to finding answers to specific problems. Thereafter, CBIP initiated a programme for Basic and Fundamental research for which substantial number of schemes were allocated, prepared, and studies carried out at allocated different research stations and monitored by CBIP for which an elaborate mechanism was set up and the results of the research suitably documented.

**It may be mentioned here that the research studies under water resources was not only being done under schemes sponsored by the CBIP at various research stations selected by it, but also at some Research Stations of the State Governments as well as Academic Institutes like IITs Universities etc.**

**In order to have an overview of the research projects under study in the country so as to avoid duplication of the studies and to fill up gaps, CBIP was asked by the Scientific Advisory Committee and National Advisory Committees on Education and Training in Water Resources, to prepare review reports covering all such scheme in Water Resources in 1987.**

As far as Research Studies under projects being sponsored and monitored by CBIP, the data for these projects was being well documented and presented for discussion in the Annual Reviews at the Research Stations of CBIP. It therefore became necessary to collect and compile data on research being done under the Non-CBIP schemes. Accordingly CBIP brought out comprehensive publications in 4 volumes giving details of about 700 research projects, both under CBIP and Non-CBIP research projects, being studied at 60 research stations of the country, classified under 14 subjects pertaining to Water Resources. A list of these projects is given in Appendix-3.3. Out of this, Technical Reports for 55 projects have been prepared. The list is given as Appendix – 3.4

### **3.7 HOLDING OF RESEARCH COMMITTEE MEETING OF THE BOARD, IN SRI LANKA**

As mentioned earlier, CBIP was holding annual research meetings either at headquarters or in member states. At the invitation of the Government of Ceylon, (now Sri Lanka) the 1956 Research Committee Meeting of the Board was held at Colombo, outside India for the first time in its history. Over 150 delegates with an equal number from Ceylon attended the Session. The inaugural address during the Research Committee Meeting, was given by the late Mr. S. W.R.D. Bandarnaike, the then Prime Minister of Ceylon. In his address Hon'ble Prime Minister of Ceylon said that :

*“It gives me very great pleasure indeed to declare open this, the Twenty-sixth Session of your Research Committee, which is being held in Colombo. May I at the outset welcome*

*you amongst us and express the gratification that we all feel at the decision to hold this Session here in our country. I trust that your stay with us will be pleasant and that your deliberations will be fruitful.....”*

Shri G. L. Nanda, the Union Minister for Irrigation and Power in his message on the occasion said

*“I am glad that the Central Board of Irrigation and Power is holding its Twenty-sixth Annual Research Session in Ceylon. It should enable a much closer association between the engineers of the two countries in the endeavour to promote economic and social progress by continually enlarging the benefits of irrigation and power.*

*“There are still so many unsolved problems in this field that the scope for research in its fundamental and applied aspects is almost unlimited. The rich experience in the field which we accumulate from year to year has to be harnessed for purposes of research more fully than is being done hitherto. I hope this Session will mark a useful stage in extending the boundaries of knowledge and in providing us with effective means of tackling our numerous problems. I wish the Session all success.”*

The delegates to the Session were taken round on a Study Tour of the country for four days. The arrangements made for the Session and the Study Tours were perfect and excellent.

The invitation was repeated for 1971 Session, but on account of certain difficulties it could not be availed of.

### **3.8 RESEARCH SCHEME ON POWER**

**In the beginning of the Third Five-Year Plan the Central Board of Irrigation and Power embarked upon a Planned Programme of research in the power sector to achieve economy, quality control and standardization in Generation, Transmission, Distribution and superior performance of power systems. In the Annual Session of the Board held in November 1959, it was resolved that:**

*“In view of the increasing activity in the power engineering field throughout the country, the Central Board of Irrigation and Power strongly recommends to all the State Governments and State Electricity Boards that research in the field of power engineering should be organised and intensified with a view to provide incentive to the industry as well as to Power Engineers. To achieve this objective, the Central Board of Irrigation and Power recommends upgrading of the existing Testing Laboratories, attached to Electricity Boards or Departments, to that of Research Units, by providing suitable personnel and additional equipment as required. These Research Units will also be able to study various other problems pertaining to the regional power system in their area and also act as liaison in furnishing data, etc., to the other Research Units and the Central Research Organisation for major power system studies and for standardisation of equipment, etc. Through coordination of this research work and standardisation of equipment in the Central Board of Irrigation and Power, the Board feels that very useful results could be produced for the benefit of the country.”*

This resolution was further discussed by the Chief Engineers of the Electricity Boards at the time

of the Thirtieth Research Session of the Central Board of Irrigation and Power held in June 1960. This meeting discussed the immediate need for studying the various problems of power systems in the context of the developmental programmes and decided that there should be some nucleus organisations in the State Electricity Boards for promoting studies or investigating problems of interest to power supply industry and also for maintenance of close liaison between the Central Power Research Institute, which was being set up by the Government of India with the assistance of UNESCO and also the Heavy Electrical Industries which was coming up in the country for the manufacture of power equipment. It was further decided that as most of the State Electricity Boards had been formed only recently, the Ministry of Irrigation and Power should assist the Electricity Boards in setting up these nucleus organisations or Research Units for investigating power system problems as had been done in the case of Irrigation Departments in respect of Fundamental and Basic Research. In order to approach the Government of India with specific proposals a Sub-Committee comprising the following was constituted:

Sarvashri K. R. Minocha (Madhya Pradesh), A. O. Oommen (Kerala), J. Kuriyan (Bihar), H. V. Narayana Rao (Mysore), V. Pappu (Andhra Pradesh), B. V. Deshmukh (Maharashtra), S. Swayambu (Power Research Institute, Bangalore), and K. Srinivasaraghavan (Madras).

The Sub-Committee was requested to report on the following:

- (1) List of applied and Associated Fundamental and Basic Problems of Power Engineering requiring intensive study, and
- (2) Problems which the State Electricity Boards would like to tackle immediately and the equipment required for the same.

The Sub-Committee after detailed consultation with the different State Electricity Boards identified the various problems requiring intensive study (Appendix-3.5). The rough details of equipment required and expenditure involved were also given. The Sub-Committee further recommended that a Standing Advisory Committee comprising Senior Chief Engineers of the various State Electricity Boards should be formed to advise in such matters and also to review the progress periodically.

In order to implement the recommendations for carrying out research on Power Engineering, the Ministry of Irrigation and Power was approached to make a budget provision of Rs. 50 lakhs on an ad hoc basis for the existing and proposed research units in different States during the Third Five-Year Plan. Based on the requirements of the different State Electricity Boards who agreed to take up research work, the Sub-Committee recommended a provision of Rs. 44.28 lakhs. The Ministry of Irrigation and Power conveyed their sanction for a total sum of Rs. 30 lakhs vide their letter No. EL-I-10(5)/60 dated 31 December 1960 (Appendix 3.6).

A Sectional Committee on Power of the Standing Advisory Committee for Research Programme and Coordination, was formed to advise the Board in the matters concerning Fundamental and Basic Research on Power. A modest beginning was made in 1961-62 with seven Research Units functioning under the Scheme. As the activity in the field of power increased rapidly, more and more State Electricity Boards came into the fold of the Research Programme and twenty Research Stations are functioning under the scheme. As on the irrigation side specialist research co-ordinators, Honorary Advisors were nominated for guiding the research workers visit to research station and discuss with the research officers and research workers on the

methodology being adopted for studies on the various problems the bottlenecks, if any, holding up the rapid progress of the studies and practical steps required for implementing the research results in the field.

The achievements under the Research Scheme on Power were impressive. Considering the huge outlay that was necessary for the construction of transmission lines and the imperative need for their functioning without interruption, a lot of attention was paid to transmission line problems. Pioneering investigations were conducted on vibrations in transmission lines and the optimum utilisation of damping devices for their control. The various factors which lead to insulator contamination and consequent flash-over were studied. New techniques such as Teflon coated disc insulators, silicon and special hydrocarbon grease coatings were tried and found to give excellent results. Hot-line washing techniques were also developed for this purpose. Indigenous magnetic links and klydonographs were developed for study of lightning phenomenon as they affected transmission lines. The feasibility and the economic viability of the elimination of aerial earth wire from transmission lines was also investigated and suggestions for adoption in selected localities was put forward. Based on the techniques developed for reclamation of used transformer oils, pilot plants were set up in a number of States and appreciable quantities of used transformer oil were reclaimed with consequent economy. Studies carried out by the research stations established the technical feasibility of using steel as the grounding conductor for earthing purposes. In view of the elimination of the use of copper, which is a scarce and costly material, the savings were enormous. However, steel used in grounding grids and in embedded structural portions was subject to corrosion. Therefore, studies were conducted to reduce corrosion hazards. A number of contributions were made to make rural electrification less expensive. Single wire earth return system for rural lines were developed. Jointed wood poles were developed for supports to rural lines. One of the major contributions of the research programme was the study of the pattern of power system losses. A detailed study enabled the breaking down of the total system losses into the various component parts so that close attention could be paid to each of these components to obtain higher overall efficiency. A number of instruments and materials were developed indigenously. HRC expulsion and drop-out fuses were developed with capacities up to 500 MVA out of indigenous materials and their successful use in the field achieved substantial savings in foreign exchange. Static relays which are quick-acting, versatile and reliable, developed for protection of transmission lines, generator transformers, etc. Further, time delay relays, over/under frequency relays were developed for industrial use leading to substantial savings in foreign exchange.

An Annual Review was published each year and circulated which gave the up-to-date progress on the problems under the scheme. The progress of the work carried out in each year was reviewed and discussed in the Research Review Meeting on Research Scheme on Power.

The results of the research study were incorporated in special technical reports prepared by the Board. These included: (i) Reclamation of Used and Unserviceable Transformer Oil, (ii) Corrosion in Earthing Equipment, (iii) Investigation of Problems with regard to the Use of Earth as Return on Single Phase Rural Distribution System, and (iv) Line Loss Reduction in Primary and Secondary Distribution. These reports were circulated throughout the country for implementation.



It was recognised that standardisation and variety reduction was the vital need of the day to achieve self-sufficiency in the quickest possible time and also effect economy by variety reduction and inter-changeability. Therefore, the Board did considerable work in standardisation and drawing up specifications for various power equipment.

The following were a few of the Standards issued by the Central Board of Irrigation and Power:

- (1) Manual on Layout of Sub-Stations.
- (2) Manual on Transformers.
- (3) Standardisation of Motors for Thermal Power Station Auxiliaries in India.
- (4) Generator Protective Relays.

A list of Publications brought out under Research Scheme on Power is given at Appendix 3.7.

Action was initiated to commercialise the following developments through small scale industries so that they may be available in bulk to user organisations.

1. Earth fault circuit breaker
2. High voltage expulsion-cum-dropout fuse
3. Auto transformer capacitor convertor
4. Distance relay testing kit
5. IDMT solid state earth fault relay

### **3.9 RESEARCH SCHEME RELATING TO THERMAL PROBLEMS**

During the late seventies and early eighties, there was considerable public attention on the performance of Thermal Power Stations of the country, especially in the context of the recurring power shortages. The low plant load factor at several power stations also came in for adverse comments. Recognising the fact that the problems faced by many of the Thermal Stations of the country had much in common, such as frequent boiler tube failures, difficulties with water chemistry, erosion of coal conduits, frequent failures of ID fans etc., a special co-ordinated study was initiated in a big way to examine these problems and evolve suitable solutions. Seven/eight Thermal Power stations where such problems were frequent were identified. At each Thermal station, a study team was formed. All required sophisticated equipment were centrally procured and made available to them. Outstanding Experts in the relevant field were identified and nominated as special co-ordinators for each study. These co-ordinators kept a close watch on the progress of the studies and guide the research workers in the proper conduct of the research work. These co-ordinated Research projects for solving the common problems faced in Thermal Power stations, was a new line of activity initiated by the Central Board of Irrigation and Power. The distinguishing feature of this scheme, was the identification of a specific problem faced in a number of locations and mounting a concerted effort to tackle this problem in a co-ordinated way at all the chosen localities. Adequate technical manpower and sophisticated equipment were deployed so that a comprehensive work programme got executed within a short time frame, so that definite conclusions could be arrived at within say 3/4 years. Depending on the degree

of success achieved in these efforts, a similar plan of action was planned to be adopted by the Central Board of Irrigation and Power for many more research projects in the future.

The following four problems were under study in 1987. The experts who were acting as project Co-ordinators were also indicated against the Scheme.

- |                                       |   |                        |
|---------------------------------------|---|------------------------|
| (1) Boiler Tube Failures              | - | Dr. Rajendra Kumar     |
| (2) Difficulties with Water Chemistry | - | Dr. K.S. Venkateswarlu |
| (3) Frequent Failures of I D Fans     | - | Shri. L.J. Sane        |
| (4) Erosion of Coal Conduits          | - | Shri. L.J. Sane        |

The co-ordination and monitoring arrangements for the Research Scheme on Power were generally analogous to that on the Irrigation side. Initially a Research Review Committee, a Standing Advisory Committee and a High Level committee were functioning for the purpose of selecting the problems to be studied and approving research proposals and grants-in-aid to be released etc.

Subsequently seven Sectional Advisory Committees one on each discipline were formed with experts like Members of Central Electricity Authority etc., as Chairman and about seven experienced engineers from various organisations connected with these disciplines as Members. The disciplines concerned were:

1. Generation - Thermal
2. Generation - Hydro
3. Transmission
4. Sub-Stations
5. Distribution
6. Power Systems - Planning, Operation and Control
7. Protection and General

To co-ordinate the work of these Sectional Advisory Committees and to make final recommendations to the Ministry for sanctioning research schemes, a Standing Advisory Committee was also constituted under the Chairmanship of the Chairman, Central Electricity Authority.

Details of Research schemes on Power (RSOP) projects taken up for nominations in different years by CBIP are given below:

Sl. No.	Year	No. of Projects
1	1961-62 to 73-74	82
2	5 <sup>th</sup> Plan (1974-79)	60
3	6 <sup>th</sup> Plan (1980-85)	33
4	7 <sup>th</sup> Plan (1985-90)	101
5	1990-99	109
	<b>Total</b>	<b>385</b>

The implementation of the Research scheme on Power (RSOP) has been transferred to CPRI in 1998-99. The CBIP is member of RSOP Committee of CPRI since 1998-99.

A complete list of problems studied from 1961-62 to 1999 under Research Schemes on Power is given in Appendix 3.8.

### 3.10 PRESENT RESEARCH ACTIVITIES

Even after the transfer of this programme to other Govt. of India organisations, CBIP is still actively involved in R&D activities both in Water & Power Sectors. For example, even after the transfer of Research Sector on Power (RSOP) to CPRI in 1998-99, CBIP is still a member of RSOP Committee of CPRI. CBIP has focussed attention on dissemination of latest R&D knowledge in all the three sectors, namely Water Resources, Power & Renewable Energy sectors because R&D plays a major role in taking decisions on the introduction and adoption of new and advanced technologies to tackle the complex problems. In addition CBIP is regularly taking up Research Projects under above schemes.

In order to provide a suitable platform for professionals to learn new developments in their field and to mutually exchange experience, CBIP has intensified its activities by organising R&D conferences, seminars, training programmes etc. As already mentioned seven such conferences have been organised at New Delhi, Vadodara, Jabalpur, Aurangabad, Bangalore, Lucknow and Bhubaneswar.

#### **1<sup>st</sup> International R&D Conference “Water & Energy-2001 Needs, Development, Utilisation”, October 9-12, 1995 at New Delhi**

Central Board of Irrigation and Power, New Delhi, organised the International R&D Conference “Water & Energy 2001 – Needs, Development, Utilisation”. On the occasion of the Diamond Jubilee Research & Development Session of CBI&P from 9 to 12 October 1995 at Hotel Taj Palace Intercontinental, New Delhi.



The conference was inaugurated by Dr. M.S. Swaminathan, an internationally renowned Agricultural Scientist and Former Member, Planning Commission, Government of India. Mr. Rajendra Singh, Chairman & Managing Director, National Thermal Power Corporation, India presided over the Inaugural Function.

About 450 delegates representing various Government Departments, Research Organisations, Power Utilities, Academic Institutions, Public and Private Sector Undertakings and Industry participated in the Conference.

Besides Indian participants, about 40 delegates from abroad representing 20 countries also participated in the Conference.

Mr. J. Lepecki, President International Conference on Large High Voltage Electric Systems (CIGRE), Mr. Y. Porcheron, Secretary General, CIGRE, and Mr. J. Cotillon, Secretary General, International Commission on Large Dam (ICOLD) graced the Inaugural Function. Mr. Lepecki and Mr. Cotillon also addressed the delegates.

During the 4-day Conference, 120 technical papers on Water Resources, 79 on energy and 8 papers on Water Resources & Energy Development – Inter-related Aspects were discussed. Out of a total 207 papers, 38 papers were from abroad.

The Valedictory Session was held on 12 October 1995, which was presided over by Mr. K.L. Zutshi, Chariman & Managing Director, Tehri Hydro Development Corporation Ltd., who also gave the Valedictory Address.

**Mr. V.N. Manohar of Tata Consulting Engineers, Bombay delivered a special lecture on “Integrated Study of Water and Electric Power for the Agriculture Sector” during the Valedictory Session.**

### **2nd International R&D Conference Water and Energy, October 21-24, 1997 at Vadodara (Gujarat)**

The Second International R&D Conference was held from 21-24 October 1997 at Vadodara (Gujarat), India with a view to provide an opportunity to engineers, scientists, researchers, academicians, project managers, policymakers, consultants and equipment manufacturers from various countries to deliberate on current technical, infrastructural, management, environmental and financial (including privatisation) issues of water and energy development. More than 400 papers including about 40 from countries other than India were received for the conference even though.



A majority of the papers were generally of good technical content and should have been accepted but owing to time constraint the number of papers accepted for inclusion in the conference programme had to be restricted to about 230. Besides, where the authors agreed, the papers were also accepted as communication papers for the information of conference participants. The papers accepted for the conference were printed in four volumes, two each on water resources and energy sides. The papers discussed in 19 sessions - nine each on water and energy subjects, and one session relating to both water and energy. The Board received full cooperation from the three host organisations, namely, the Narmada, Water Resources and Water Supply Department, the Gujarat Electricity Board and the Sardar Sarovar Narmada Nigam Ltd. But for whose strong organisational support and financial contributions it would not have been possible to hold the conference at Vadodara. The deliberation of the this 2<sup>nd</sup> International R&D Conference were very fruitful and purposeful helped to identify the research and development needs of the coming years.

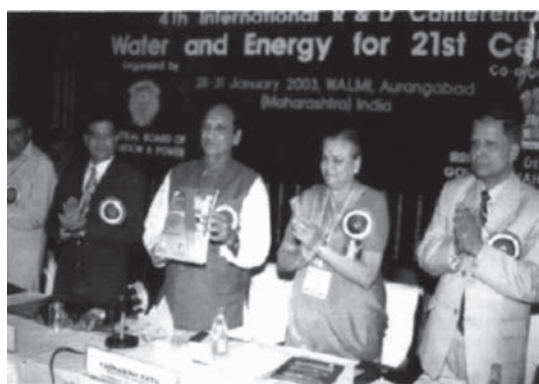
### 3<sup>rd</sup> International R&D Conference on Sustainable Development of Water and Energy Resources, February 29 – March 3, 2000 at Jabalpur, Madhya Pradesh

The Third International R&D Conference to be held from 29 February - 3 March 2000 at Jabalpur, Madhya Pradesh, India will provide an opportunity to engineers, scientists, researchers, academicians, project managers, policymakers, consultants, equipment manufacturers from various countries to deliberate on current technical, infrastructural, management, social, environmental and financial issues of water and energy development. In response to the call for papers, about 450 papers including 38 from countries other than India were received for the conference. A majority of the papers were generally of good technical content and should have been accepted but owing to time constraint the number of papers accepted for inclusion in the conference programme had to be restricted to about 185. Besides, where the authors agreed, the papers have been accepted as communication papers for the information of conference participants. The papers accepted for the conference were printed in three volumes, two on the water resources side and one on the energy side. The papers are planned to be discussed in 14 sessions - nine on water and five on energy subjects, and one session relating to both water and energy. The Board received full co-operation from the host organisation, the Madhya Pradesh Electricity Board who provided strong organisational support and financial contribution to hold the conference at Jabalpur. CBIP also got full co-operation of the Water Resources Department and the Narmada Valley Department, Government of Madhya Pradesh for their cooperation and financial support as co-organisers, as well as to the sponsoring, cosponsoring and supporting organisations. The deliberations at the Third International R&D Conference very fruitful and purposeful and were highly appreciated by the participants. The proceedings were subsequently brought out as CBIP publication which was highly rated by water resources professionals.



### 4<sup>th</sup> International R&D Conference on Water and Energy for 21<sup>st</sup> Century, 28-31 January, 2003, Walmi, Aurangabad, Maharashtra

The 4<sup>th</sup> International R&D Conference was jointly organized by Central Board of Irrigation and Power and Irrigation Department, Government of Maharashtra at WALMI, Aurangabad and sponsored by Maharashtra State Electricity Board, Government of Maharashtra. The conference was **inaugurated by Dr. Padamasinh Patil, Hon'ble Minister for Irrigation, Govt, of Maharashtra** on 28th January 2003. The Inaugural Session was **presided by Hon'ble Smt. Jayawanti Mehta, Minister of State for Power, Govt. of India.**



A souvenir on the occasion was released by **Smt. Jayawanti Mehta, Hon'ble Minister of State for Power, Govt, of India**. On the occasion, an exhibition related to water and energy sectors was also arranged. The exhibition was inaugurated by **Hon'able Minister of State for Power, Govt, of India**.

Abstract of more than 260 papers were received for discussion in the conference. A technical committee was formed for reviewing these abstract and selected 116 papers for oral presentation and 32 for communication. Out of 116 papers 32 papers were from energy side, 65 on water resources and 19 on common subjects. These papers were divided into different technical sessions for oral presentation. In addition, 9 keynote lectures were delivered.

On 29 January 2003 parallel sessions were held for water resources on Hydrology and Irrigation Water Management. Common session were also held on Environmental Issues, Contract and Project Management, Planning, Construction, Socio-economic and Financing of Projects. Total participants were 290 including two from foreign countries.

The exhibition stalls were visited by the delegates, student from locals Engineering Colleges as well as other visitors.

#### **5<sup>th</sup> International R&D / Conference on Development and Management of Water and Energy Resources, 15-18 February, 2005, Bangalore, India**

Water Resources and Energy sectors form the two vital sectors of a nations development. The experience and expertise thus gained in these sectors has to be properly pooled and disseminated so that it can be used throughout the country and benefits reaped by one and all. The Central Board of Irrigation and Power (CBIP), since its inception in 1927, has been playing pivotal role in discharging this responsibility.



The 5th International R&D Conference, on the theme Development and Management of Water and Energy Resources, was hosted by Government of Karnataka (Energy and Water Resources Departments) at Bangalore from 15-18 February 2005 at Bangalore.

550 delegates participated in the conference. 84 lectures/papers, contributed and presented by the engineers, scientists and administrators, pertaining to development and management of Water and Energy Resources were discussed, under 22 parallel Technical sessions on the following topics, including a Special Session on “Seismic Aspects of Dam Design with a Particular Focus on Bhuj Earthquake”.

- Infrastructure Needs for a Better Tomorrow
- Availability Options -Energy and Water
- Hi -Tech. Applications
- Environmental Issues

- Contract Management
- Power Systems
- Transmission and Distribution
- Energy Conservation
- Power Trading
- Reforms and Regulation
- River Behaviour, Training and Management
- Meteorology, Hydrology and Water Resources Development
- Hydraulic Structures
- Irrigation and Water Management
- Soils and Materials

The conference was **inaugurated by the Hon'ble Chief Minister, Government of Karnataka, Shri Dharam Singh, on 15th February 2005** at Hotel the Grand Ashok, Bangalore. The inaugural function was presided over by the **Hon'ble Minister for Water Resources and Transport, Government of Karnataka, Shri Mallikarjun Karge.**

After welcome address by Shri Yogendra Prasad, Chairman & Managing Director. NHPC Ltd. and President, CBIP, a souvenir highlighting the achievements and vision of Karnataka state in the field of Water Resources and Energy was released by the Hon'ble Minister for Water Resources and Transport, Government of Karnataka.

**The Manual on “Renovation, Modernisation, Uprating and Life Extension of Hydro Power Plants”, brought out by Central Board of Irrigation and Power, was released by the Hon'ble Chief Minister, Government of Karnataka.**

#### **6<sup>th</sup> International R&D Conference Sustainable Development of Water and Energy Resources – Needs and Challenges, February 13-16, 2007 at Lucknow (U.P)**

The 6<sup>th</sup> International R&D Conference, on the theme “Sustainable Development of Water and Energy Resources – Needs and Challenges” was hosted by the Government of Uttar Pradesh (Water and Energy Departments) in Lucknow from 13-16 February 2007. The last R&D Session was hosted by Government of U.P. in the year 1973. The conference was supported by Best & Crompton Engg. Ltd., Flow more Pumps Ltd. and Grand Polycoats Company Pvt. Ltd. 460 delegates from Australia, Bangladesh, Brazil, Finland, South Africa, Thailand, Turkey, besides India participated in the conference.



150 lectures/papers, contributed and presented by the engineers, scientists and administrators,

pertaining to development and management of Water and Energy Resources were discussed, under 29 Technical sessions on the topics pertaining to Water Resources, Energy and of common interest:

Awards, instituted by the Central Board of Irrigation and Power (CBIP) to recognise outstanding contribution in the areas of engineering, scientific and managerial aspects and to promote professional excellence in the fields of water resources, energy and allied disciplines, were also presented during the Inaugural Session, to the individuals for their excellent contributions in the twin disciplines of water and energy:

As is customary, a Souvenir was brought out on the occasion focusing on achievements of the host state, Uttar Pradesh, in the field of water resources and energy sectors. It also included the messages by H.E. President of India, Hon'ble Prime Minister of India, H.E. Governor of host state, Hon'ble Chief Minister of host state, ministers of concerned ministries of central and state (host) governments, and head of the water resources and energy departments and was released during the Inaugural Session jointly by Mr. A.K. Awasthi, Managing Director, U.P. Power Corporation Ltd. and Mr. B.L. Meena, Secretary, Irrigation Department, Government of U.P.

An exhibition was also organized during the conference as a technology showcase to meet the challenges of 21<sup>st</sup> century for the development and management of Water and Energy Resources. 15 exhibitors, including the state water and energy resources department, including construction & manufacturing companies, and research stations participated in the exhibition. The services being rendered by the Central Board of Irrigation and Power were also displayed in the exhibition.

### **7<sup>th</sup> International R&D Conference Development and Management of Water and Energy Resources, February 4-6, 2009 at Bhubaneswar (Odisha)**

CBIP has been organising R&D Conference since 1995 with a view to sharing the research results at global level.

The 7<sup>th</sup> International R&D Conference, on the theme "Development and Management of Water and Energy Resources" was hosted by the Government of Orissa (Water Resources and Energy Departments) in Bhubaneswar during 4-6 February 2009. 525 engineers, scientists, researchers, academicians, project managers, policy-makers, consultants and equipment manufactures from all over the country participated in the conference to deliberate on current technical, infrastructural, management, social, environmental and financial issues related to water and energy development.

The conference was inaugurated by **Shri Surjya Narayan Patro, Hon'ble Minister for Energy, Information Technology and Tourism & Culture, Government of Orissa**, and the





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following publications, especially brought out for the occasion, highlighting the achievements of Government of Orissa in the Water Resources and Power Sectors of Orissa (now Odisha), were released during the Inaugural Session:

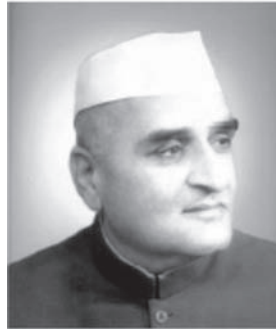
- Water Resources Scenario of Orissa
- Power Scenario of Orissa
- Water Resources and Power Maps of Orissa
- Special Issue of “Water Resources and Energy Research Digest, the quarterly journal of CBIP
- Souvenir
- Directory of Key Personnel in Water Resources and Power Sectors of Orissa

225 lectures/papers, contributed and presented by the engineers, scientists and administrators, pertaining to development and management of Water and Energy Resources were discussed, under 24 Technical sessions, including special sessions on “achievements of Orissa in Water and Energy Sectors”, “Extreme Events and Their Management”, “Applications of Geosynthetics in Water Resources Projects” and “Distribution of Power”.

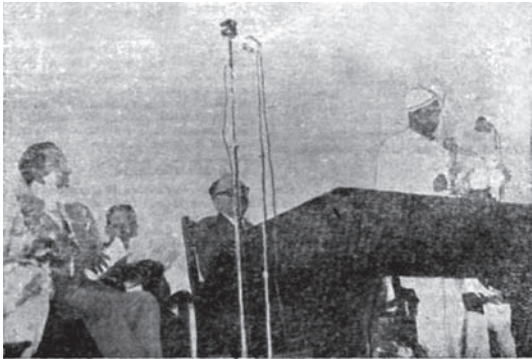
**Hon’ble Minister for Agriculture, Government of Orissa, Shri Surendra Nath Naik was the Chief Guest for the Valedictory Session on 6<sup>th</sup> February 2009.**



Shri Chandu Lal Trivedi, Hon'ble Governor of Punjab inaugurated the 21st (1951) Annual Research Session of the Board



Shri Bhim Sen Sachar, Hon'ble Chief Minister of Punjab inaugurated the 22nd (1952) Annual Research Session of the Board



Shri K. Hanumanthaiya, Hon'ble Chief Minister of Mysore delivering the Inaugural Address at the 23rd (1953) Annual Research Session of the Board



Shri Bakshi Ghulam Mohammed, Hon'ble Chief Minister of Jammu and Kashmir inaugurated the 25th (1955) Annual Research Session of the Board



Shri S.W.R.D. Bandaranaike, Hon'ble Prime Minister of Ceylon delivering the Inaugural Address at the 26th (1956) Annual Research Session of the Board



His Highness Maharaja Sri Jaya Chamaraja Wadiyar Bahadur, Governor of Mysore delivering the Inaugural Address at the 27th (1957) Annual Research Session of the Board



Shri Hafiz Mohammad Ibrahim, Hon'ble Union Minister for Irrigation and Power delivering the Inaugural Address at the 28th (1958) Annual Research Session of the Board



Shri Neelam Sanjeeva Reddy, the then Chief Minister of Andhra Pradesh delivering the Inaugural Address at the 29th (1959) Annual Research Session of the Board



Shri Pattom Thanu Pillai, Hon'ble Chief Minister of Kerala State delivering the Inaugural Address at the 30th (1960) Annual Research Session of the Board



Dr. B.C. Roy, Hon'ble Chief Minister of West Bengal delivering the Inaugural Address at the 31st (1961) Annual Research Session of the Board



Shri Bishnuram Medhi, Hon'ble Governor of Madras delivering the Inaugural Address at the 32nd (1962) Annual Research Session of the Board



Shri M. S. Kannamwar, Hon'ble Chief Minister of Maharashtra delivering the Inaugural Address at the 33rd (1963) Annual Research Session of the Board



Shri K. B. Sahay, Hon'ble Chief Minister of Bihar at the Inaugural Session of the 35th (1965) Annual Research Session of the Board



Dr. A.N. Khosla, Hon'ble Governor of Orissa delivering the Inaugural Address at the 37th (1967) Annual Research Session of the Board



Shri G. S. Pathak, Hon'ble Governor of Mysore delivering the Inaugural Address at the 38th (1968) Annual Research Session of the Board



Shri Sriman Narayan, Hon'ble Governor of Gujarat delivering the Inaugural Address at the 39th (1969) Annual Research Session of the Board



Shri B.K. Nehru, Hon'ble Governor of Assam & Nagaland delivering the Inaugural Address at the 40th (1970) Annual Research Session of the Board



Sardar Hukam Singh, Hon'ble Governor of Rajasthan delivering the Inaugural Address at the 41st (1971) Annual Research Session of the Board



Shri M. Kurananidhi, Hon'ble Chief Minister of Tamil Nadu delivering the Inaugural Address at the 42nd (1972) Annual Research Session of the Board



Shri Akbar Ali Khan, Hon'ble Governor of Uttar Pradesh inaugurated the 43rd (1973) Annual Research Session of the Board



Shri M.M. Chaudhury, Hon'ble Governor of Punjab delivering the Inaugural session at the 44th (1975) Annual Research Session of the Board



Shri Mohan Lal Sukhadia, Hon'ble Governor of Andhra Pradesh delivering the Inaugural Address at the 45th (1976) Annual Research Session of the Board



Shri Govind Narain, Hon'ble Governor of Karnataka delivering the Inaugural Address at the 47th (1978) Annual Research Session of the Board



Shri K. C. Abraham, Hon'ble Governor of Andhra Pradesh delivering the Inaugural Address at the 48th (1980) Annual Research Session of the Board



Shri A.N. Banerjee, Hon'ble Governor of Himachal Pradesh delivering the Inaugural Address at the 50th (1983) Annual Research Session of the Board



Shri Madhavsinh Solanki, Hon'ble Chief Minister of Gujarat releasing the CBIP publication at the 51th (1984) Annual Research Session of the Board



General K.V. Krishna Rao (Retd.) Governor of Jammu and Kashmir releasing the CBIP publication at the 55th (1989) Annual Research Session of the Board



Shri Bhairon Singh Shekhawat, Hon'ble Chief Minister of Rajasthan delivering the Inaugural Address at the 57th (1992) Annual Research Session of the Board



Shri M. Veerappa Moily, Hon'ble Chief Minister of Karnataka at the Inaugural Session of the 58th (1993) Annual Research Session of the Board



Shri K.V. Raghunatha Reddy, Governor of West Bengal delivering the Inaugural Address at the 59th (1994) Annual Research Session of the Board

*Appendix 3.1***LIST OF PROBLEMS UNDER RESEARCH SCHEME APPLIED  
TO RIVER VALLEY PROJECTS**

<b>Problem No.</b>	<b>Name of Problem</b>
*I	Air-entrainment.
*II	Turbulence.
*III	Cavitation.
IV	Design of Channels
V	Engineering Properties of Soils.
VI	Sedimentation Studies in Streams and Reservoirs
VII	Sub-soil Flow
VIII	Use of Surkhi and other Pozzolanic Materials in Mortar and Concrete
IX	Principle of Mortar and Concrete Mix Design.
X	Studies on Vibrations in Soils and Concrete.
**XI	Development of Economic Alternatives to Stone for River Protection Works.
XII	Instrumentation.
XIII	Utilisation of Isotopes in Sub-soil Investigations and Soil Compaction Control.
*XIV	Investigations on Soil Compaction of Different Soils in Wet Conditions and Standing Water with Particular reference to Construction of Earthen Dams.
XV	Development of Prestressed, Precast Techniques in Hydraulic Structures.
**XVI	Minimising Loss of Head Through Improvement of Trash-Racks, Pen-stock Gates, Spiral Chambers, Draft Tubes, Silt Disposal Structures and Conduits.
**XVII	Minimising Losses due to Absorption Percolation and Evaporation in Still and Flowing Water on Irrigation Channels.
XVIII	Studies on Concrete for Hydraulic Structures with particular reference on Selection, Processing and Specifications of Aggregates.
XIX	Experimental Methods of Stress Analysis in Hydraulic Structures.
**XX	Volute Siphon Studies.
XXI	Coastal Erosion.
XXII	Comparison and Correlation of Model and Prototype Behaviour and Results including Comparison of Design Assumptions and Prototype Behaviour.
XXIII	Rock Mechanics.
XXIV	Non-destructive Methods of Concrete Testing.
XXV	Creep and Shrinkage Studies on Concrete.

**New Schemes**

XXVI	Design of Dams
XXVII	Special Problems in River Hydraulics.
XXVIII	Design of Barrage.
XXIX	Sediment Exclusion.
XXX	Design of Tunnels and Intake Structures.
XXXI	Management of Irrigation Waters.
XXXII	Problems relating to Soil Pressure against Earth Retaining Structures.
XXXIII	Special Problems in Soil and Rock Mechanics.
XXXIV	Special Problems in Concrete.
XXXV	Flow in Open Channels and Conduits.
XXXVI	Discharge Measurement in Channels and Conduits.
XXXVII	Unsteady and Non-Uniform flow.
XXXVIII	Seepage Losses.
XXXIX	Special Problems in Instrumentation.
XXXX	Design of Drainage Channels in Deltaic and Tidal Areas.

**N.C.S.T. SCHEMES**

1	Sedimentation Studies in Reservoirs.
2	Sediment and Water Quality Observation.
3	Instrumentation.
4	Hydraulic and Hydraulic Structure.

\* Completed at the end of 1975-76

\*\* Completed at the end of Third Plan



*Appendix 3.2***LIST OF PUBLICATIONS BROUGHT OUT UNDER RESEARCH  
SCHEME APPLIED TO RIVER VALLEY PROJECTS****A. Annual Reviews**

- (a) Annual Reviews, Research Scheme Applied to River Valley Projects
- (b) Annual Review Summaries

**Literature Reviews (with Bibliography)**

1. Air-entrainment in High Velocity Flow.
2. A Review of Studies on Turbulence.
3. A Review on the Mechanics of Cavitation and Cavitation Damage.
4. Hydraulics of Stable Channels.
5. Review on Swelling Pressure in Clayey Soils.
6. Review and Bibliography on Effect of Remoulding Soils on Shear Characteristics.
7. Review on Soil Stabilisation with Admixtures.
8. Review on Soil Stabilisation by Electro-chemical Methods.
9. Review on Soil Stabilisation by Injection.
10. Density Currents in Estuaries and Tidal Rivers.
11. Review on Tubewells.
12. Review on Hydraulic Structures on Permeable Foundations.
13. Review on Canal Lining.
14. Review on Seepage Control Measures in Earth and Rockfill Dams.
15. Review on Waterlogging and Drainage.
16. Review on Aquatic Weeds and their Control.
17. Literature Review on Principle of Mortar and Concrete Mix Design.
18. Review on Investigations relating to Strength of Masonry at the 4.5 Million Pound Test Bed at Hirakud.
19. Review and Bibliography on Bond between Reinforcing Steel and Concrete.
20. Review and Bibliography on Quality Control of Concrete including Accelerated Tests.
21. A Review of Studies on Vibration in Soils under Machine Foundation.
22. Utilisation of Isotopes for Sub-soil Investigations and Soil Compaction Control.
23. Review on Soil Compaction of Different Soils in Wet Condition and Standing Water with Particular Reference to Construction of Earth Dams.
24. Review and Bibliography of Friction Losses in Fluid Flow through Pipes, Gates, Valves, Screens, Open Channels and Hydraulic Machines.

25. Review and Bibliography on Development of Economic Alternatives to Stone for River Protection Works.
26. Review on Selection, Processing and Specification Aggregates.
27. Literature Review on Rock Mechanics.
28. Review Report on Non-destructive Methods of Testing Concrete.
29. Literature Review on Creep and Shrinkage Studies on Concrete.
30. Review on Penetration Tests.
31. Review with Bibliography on Experimental Stress Analysis for River Valley Structures.
32. Correlation between Static and Dynamic Method of Testing Rocks.
33. Review on Study of Model Prototype Conformity for Scour below Stilling Basins.
34. Local Scour—A Review.

#### **C. Status Reports**

1. Present Status of Critical Tractive Force Studies.
2. Survey of Work Done on Pozzolana in India.
3. Hydraulics of Alluvial Streams.
4. Scour at Bridge Piers.
5. Status Report on Correlation of Mechanical & Mineral Composition and Clay Structures of Different Soils of India with their Engineering Properties.

#### **D. Miscellaneous**

1. Proceedings—Seminar on Testing of Concrete and Concrete Materials.
2. Instructions for Collection of Field Data for Measurement of Discharge and Sediment in Canals.
3. Achievements-cum-Performance Report on the Work Done by various Research Stations.
4. Pamphlet on Collection of Prototype Data on Spillways.
5. Irrigation Practices of Six Principal Crops of India.
6. Man-Made Lakes and its effects on Ecosystems.
7. Guide & Recommendations for Accelerating and Retarding Ad-mixtures for use in Concrete and Large Dams.

#### **E. Irrigation & Power Research Digest**

Vol. I – March 1976, May 1976, July 1976, September 1976, and November 1976.  
Vol. II – January 1977 and March 1977.

#### **F. Far and Near in Irrigation & Power**

Vol. I – August 1976, October 1976 and December 1976. Vol. II – February 1977.

*Appendix 3.3***LIST OF PROJECTS****Projects under CBIP Research Scheme (168)****MANAGEMENT OF FLOODS (36)**

1. Comparative and Comprehensive Evaluation of Flood Control Measures in North Bihar
2. Conducting Second Capacity Surveys and Watershed Studies for Manimuthar Reservoir
3. Crop and Soil Management in Flood Prone Areas of Allahabad
4. Crop and Soil Management in Flood Prone Areas of Varying Depth and Period of Submergence on Mahanadi Delta, Orissa
5. Determination of Channel Parameters of Selected Coastal Regions of Rivers
6. Developing a Methodology for the Estimation of Design Flood in the Southern Region of Karnataka
7. Developing Flood Design Manual for Northern Region Rivers
8. Development of Flood Forecasting Technique for Pennaiyaru River in Tamil Nadu
9. Development of Mathematical Models for Flood Forecasting in the Gomti River Basin
10. Development of Mathematical Models for Morphological Behavior of Alluvial Streams
11. Development of Sampling and Measurement Techniques of Crop Losses Due to Flood and Its Impact on Crop Yield Rate and Area under Crops
12. Effect of Flood Banks on the Regime of Pennaiyaru in Tamil Nadu
13. Effect of Unsteadiness and Stratification on Local Scour
14. Estimation of Crop Losses due to Flooding and Developing Recovery Measures
15. Estimation of Yearly Sediment Deposits in Rihand Dam Reservoir, U.P.
16. Evolving Rational Criterion for Spacing of Flood Control Embankments
17. Flood Behaviour of River Godavari Near Dowlaiswaram
18. Flood Moderation and Flood Control Study of River Adayar in Tamil Nadu
19. Flood Simulation and Multi-Objective Reservoir Operation for Adayar River System
20. Hydrologic Modelling of Flood Flows
21. Mathematical Model for Prediction of Sediment Within the Reservoir
22. Optimisation of Flood Control Operation and Water Resources Utilisation in DVC Projects
23. Real Time Forecasting on River Damodar
24. Repeat Hydrographic Surveys of Nizamsagar Reservoir, Andhra Pradesh

25. Research on Assessment and Evaluation of Various Flood Control Activities
26. Scientific Assessment of Flood Damages
27. Sedimentation Studies at Gandhi Sagar Reservoir
28. Sedimentation Studies at Tawa Reservoir
29. Sedimentation Studies in Pothundy, Malampuzha and Meenkara Reservoirs
30. Sedimentation Survey of Malaprabha Reservoir (Repeat Survey)
31. Sedimentation Surveys of Krishnarajasagara Reservoir
32. Studies of Morphology of Braided Streams
33. Study of Effects of Floods on Morphology of Incised Rivers in Madhya Pradesh
34. Study of the Applicability of the Available Flood Routing Techniques to Krishna River System
35. Study of the Scour Characteristics of Some Rivers in the Ganga Basin
36. Survey of Flood Prone Ganga River Areas for Collecting information on Crop Damage Due to Floods

**HYDRAULIC STRUCTURES (INCLUDING MASONRY AND CONCRETE STRUCTURES) (17)**

37. Added Mass of High Head Gates
38. Analysis of Seepage through Masonry Dams
39. Design of Air-Vents for Sluices and Down Stream Sluice Gates
40. Development of Strength with Varying Curing Period using Ordinary Portland and Portland Pozzolana Cement
41. Evaluation of Standard Discharge Curves for Radial Gates
42. Flushing Velocities in Conduits in Relation to Conduit and Sediment Parameters
43. Leaching of Lime From Kabini and Harangi Dams in Karnataka State
44. Leaching of Lime From the Masonry/Concrete Dams of Sri Sailam and Lower Maneru
45. Long Term Performance Survey of Finished Hydraulic Structures
46. Model Type Studies for the Spillways Having Roller Bucket Type Energy Dissipation Arrangement
47. Monitoring Safety of Dams
48. Performance of Spillway Aerators
49. Relation Between Strength of Control Cylinder Specimens and Cores From Hardened Concrete
50. Studies on Applicability of Wave Propagation Methods for Evaluation of the Conditions of Masonry and Earth Dams
51. Study of Colgrout Masonry With Various Admixtures

52. the Experimental & Theoretical Investigations on Vibration Characteristics of High Vent Lift Gates
53. Training of Small Streams / Rivers at Hydraulic Structures

### **RIVER AND ESTUARINE HYDRAULICS (12)**

54. Assessment of Rate of Coastal Erosion of Gujarat Coast Line
55. Bed Form Characteristics With Varying Discharge Intensities and Depth of Flow.
56. Collection and Analysis of Field Data of Bank Protective Works of Some Important Rivers of West Bengal.
57. Delineation of Monthly Changes in Beach and Under Water Profile Along Karnataka Coast Site at Bengra and Jali.
58. Detailed Study of Sediment Deposition Problems in Deltaic Rivers and Possible Remedial Measures.
59. Dynamics of Circulation and Mixing in the Beypore Estuary on the Malabar Coast
60. Numerical Modelling of Transient Flows in Alluvial Stream.
61. Salinity Control Studies in Tidal Estuaries.
62. Studies on Estuarine Behavior
63. Studies on the Wave Induced Sediment Transport Near Paradeep Port.
64. Studies to Assess the Littoral Drift in the Eastern Coast Between Kalpakkam and Madras
65. The Effect of Construction of Embankments on Aggradation Or Degradation of the River Bed, the Effect of Silt Load on the River Bed and to Study the Relationship Between Discharge Flood Level and Silt Load.

### **GROUND WATER (10)**

66. Augmenting Ground Water Resources Through Tank Recharges and Conjunctive Use of Surface and Groundwater in Tank Irrigation
67. Efficient Designs of Skimmer Tubewells for Saline Water Belts in Alluvial Basin.
68. Estimation of Ground Water Recharge By Tritium Tagging Method.
69. Estimation of Specific Yield of Different Aquifers By Radioactive Tracer Method.
70. Evaluation of the Extent and Pattern of Ground Water Utilisation in South Western India.
71. Field Study of Rejuvenation of Sick Tubewells.
72. Hydraulics of Well in Hard Rock Areas.
73. Pollution of Ground Water Due to Various Industrial Units and Their Preventive Measures.
74. Regional Simulation Model for Groundwater Resources Evaluation.
75. Study of Hydrology and Quality of Ground Water and Artificial Recharge.

**HYDROLOGY AND DROUGHT MANAGEMENT (12)**

76. Development of Data Base Management System for Hydrological Data for River Basins.
77. Development of Software Programmes for Preliminary Processing of Hydrological Data Using Micro Computers.
78. Digital Simulation for Prediction and Evaluation of Groundwater Resources in Parts of Hard Rock Areas Under Sriram Sagar Project Command Area.
79. Drainage of Agricultural Soil & Its Effect on Rainfall, Run Off Characteristics.
80. Erodability of Soils.
81. Estimation of Regeneration/Seepage from Perennial Rivers by Radio Active Tracer Method.
82. Flood Routing Studies with Special Reference to Indian Rivers.
83. Generation of Stream Flow Data using Generated Multistation Daily Rainfall Data and Runoff Deterministic Models.
84. Integrated Study of Water Balance and Management of River Catchment of Dakshina Kannada District, Karnataka State.
85. Rainfall, Runoff Correlations of Hydrological Studies in Selected Catchments in Rajasthan
86. Regional Relationship Between Evaporation and Evapotranspiration Over Irrigated and Cropped Areas
87. Water Salt Balance Study.

**IRRIGATION & DRAINAGE SYSTEMS AND WATER MANAGEMENT (10)**

88. Accelerated Test to Study the Life of Polythene Film.
89. Comparative Studies of Sprinkler and Drip Irrigation Methods With Conventional Surface Methods of Crop Production Under Eastern U.P. Conditions.
90. Comparative Studies of Sprinkler and Drip Irrigation Methods with Conventional Surface Methods.
91. Comparative Studies of Sprinkler Irrigation Methods with Conventional Surface Methods for Crop Production.
92. Evaluation of on-Farm Water Management Work at Cauvery Delta Thanjavur District, Tamil Nadu.
93. Performance Evaluation of Sprinklar and Drip Irrigation Methods of Agro-Climatic Region of Southern Rajasthan.
94. Performance Studies of Sprinkler and Drip Irrigation and Surface Irrigation Methods.
95. Studies on Integrated Water Management in the Command Areas of Kuttiyadi Irrigation Project.
96. Study of Black Soil Regions Around Adivalli in Pap Command Area with a View to Alleviate Salt and Water Logging Problems.

97. To Study Water use Efficiency of Paddy-Wheat Cropping System under varying Levels of Fertility and Water Regimes.

### **ENVIRONMENTAL IMPACT AND SOCIO-ECONOMIC ASPECTS OF WATER RESOURCES PROJECTS (20)**

98. A Study of Quality of Water in the Foreshore Area at Some Reservoirs and Immediately Down-Stream of Dam vis-à-vis Durgapur Barrage Project.
99. A Study of Water Quality and Remedial Measures for Pollution.
100. Analysis of Qualities of Water Affected By Reservoirs.
101. Base Line Study on Quality of Water of Ukai Reservoir of Gujarat State.
102. Effects of Sea Water Intrusion and Inundation on the Soil Plant Characteristics.
103. Evaluation of the Impact on Community Health and Environment of the River Valley Project, Kansabati.
104. Hazardous Effects of Salinity in Coastal Areas affecting Crop Yield.
105. Impact of Irrigation on Crop Productivity Costs, Income, Employment and Marketing in Canal and State Tubewells Command.
106. Intensive Study of Krishna River Waters on Upstreams at Nagarjunasagar Dam and on Downstream for Classification and Zoning.
107. Investigations Into Levels of Pollution in Water Bodies in and Around Water Resources Projects.
108. Leaching of Lime from Gandhi Sagar, Barna and Tawa Dams in Madhya Pradesh.
109. Mechanics of Pollution Dispersion in Wells and Rivers through Groundwater.
110. Performance Evaluation of Gandak Project.
111. Quality of Water in Fore-Shore Area at Reservoir and Immediately Downstream of (I) Tungabhadra & (II) Hemavathy Dams of Karnataka.
112. Quality of Water in the Foreshore Area of the Reservoir and Immediately Downstream of the Dams.
113. Studies on the Environmental Impact of the Trace Element Relevant To Water Quality
114. Studies on the Environmental Impact of the Utilization of Trace Element Contaminated Waters in Irrigation and Development of Relevant Water Quality Criteria.
115. Studies on the Water Quality Sediments & Aquatic Organisms in the Kuttiyadi Basin.
116. Study of Quality of Water in the Foreshore Area of Reservoir and Immediately Downstream of Dams; Jayakwadi and Ozar Khed
117. The Study of Quality of Water in the Fore-Shore Area at the Reservoir and Immediately Downstream of Dam.

### **SOIL AND MATERIALS (18)**

118. Application of Sub-Sonic Acoustic Emission Method for Determination of Soil Movements and Stability of Structures.

119. Behaviour of “Lime-Flyash Stabilised Soil” in Tension.
120. Correlation of Granulometry Tensile Strength and Critical Hydraulic Gradient of Cohesive Soils and Study on Safe Gradient Under Sustained Stresses.
121. Development of Chemical Grout Mixes to Reduce the Percolation Through Masonry in Dams.
122. Development Reinforced Soil Techniques Using Anchored Reinforcement for Design and Construction of Earthen Structures
123. Engineering Behaviour of Tropical Soils of Indian With Particular Reference to This Prediction
124. Integrated Studies on Core Materials and Protective Measures Against Piping.
125. Leaching of Lime From Lime Flyash Stabilised Soils.
126. Preparation of State of Art Report for Flow Properties and Yield Gradients of Various Particulate and Fine Grouts With Respect to Time.
127. Reinforced Earth Analysis Design and Construction for Soil Stability.
128. Roller Compacted Concrete (R.C.C.) for Dams.
129. Strength and Consolidation Characteristics of Some Type of Residual Soils in Karnataka.
130. Studies on Active Earth Pressure With Cohesive Non-Swelling Backing in Expansive Black Cotton Soils.
131. Studies on Classification of Tropical Soils.
132. Studies on Rust Prevention of Reinforcement Steel By Cathodic Protection and Use of Ca N<sub>2</sub>O<sub>3</sub> As Corrosion Inhibitor.
133. Studies on Shotcrete.
134. Studies on Super Plasticized Concrete.
135. Suitability of Locally Available Different Particulate Grout Materials for Alluvium With Particular Reference to Impermeabilization Aspect.

### **ROCK MECHANICS (9)**

136. Compressibility of Rockfill Dams.
137. Correlation of Compressive Strength With Point Load Index of Rocks of Karnataka.
138. Engineering Classification and Properties of Some Himalayan Rocks.
139. Engineering Classification of Basalt at Different Stages of Weathering Met within Gujarat.
140. Formulation of Approach for Predicting the Behaviour of Rock Masses for Support Design.
141. Quantitative Classification of Tunnelling Conditions
142. Sliding Shear on Rock Surfaces.
143. Strength Deformation, Modulus and Classification of Jointed Rocks



144. Studies on Certain Aspects of Tunnelling in Specific Deposits of River Valley Projects.

**APPLICATIONS OF HIGH TECHNOLOGY AND INSTRUMENTATION &  
MEASUREMENT TECHNIQUES (9)**

145. Development of Residual Shear Apparatus.
146. Hydrographic Surveys of Selected Reach of the River Ganga Using Landsat Data.
147. Mapping of Flood Plain and Zones Prone to Various Magnitudes of Floods and Development of Flood Damage Estimation.
148. Monitoring Changes in Surface Water Storages and Land Use in Krishnagiri Watershed.
149. Mud-Banks Along the West Coast of Kerala.
150. Multichannel Telemetry System for Seismological Data Transmission.
151. Remote Sensing Applications for Ground Water Studies in Bhabhar Zone Bounded By Ganga and Yamuna River.
152. Siltation Study of Kundha Reservoir in Tamil Nadu By Temporal Analysis of Watershed Land Cover By Remote Sensing Technique.
153. Use of Satellite Imageries for Assessment of Sriramsagar Reservoir Sedimentation.

**CONSTRUCTION METHODS, PLANNING AND MANAGEMENT  
(INCLUDING HYDRAULIC MACHINERY &  
CONSTRUCTION EQUIPMENT) (9)**

154. Detailed Studies on the Cavitation Behaviour of Radial Flow Pump With Special Reference to the Inlet Flow Variations.
155. Development of Agricultural Pumps.
156. Development of Pump Turbines Design and Analysis of 'S' Chambered Profiles for Fully Reversible Aerial Flow Pump Turbines.
157. Evaluation of Various Methods of Design of Radial Flow Pump Impeller Based on Performance and Cavitation Behaviour.
158. Influence of Silt / Sand Content of Water on Cavitation Pitting.
159. Investigation of Inlet Flow Into Centrifugal Pumps and Its Prediction by Theory.
160. Microcomputer Based Cad and Analysis Programme for Large Pumps.
161. Research on Flow through Axial Pumps.
162. Scale Effect in Hydraulic Pumps.

**EVAPORATION CONTROL (3)**

163. Assessment of Reservoir Evaporation By Observation of Evaporation Data on the Reservoir Water Surface.

164. Studies on Water Evaporation Retardants (WER) With Special Reference to Different Application Techniques and Methods of Spreading Under Different Environmental and Climatological Conditions
165. Estimation of Evaporation Losses and Study of Effect of Shape, Size, Depth, etc. and Shelter Belt (Wind Breaker) on Evaporation

### **PLASTICULTURE DEVELOPMENT (3)**

166. Setting up Plasticulture Development Centre
167. Setting up Plasticulture Development Centre (PDC) Irrigation.
168. Setting up Plasticulture Development Centre for Evaluating the Water Losses and Durability of Plastics in Canal Lining.

### **PROJECTS UNDER RESEARCH SCHEME OTHER THAN CBIP (523)**

#### **Management of Floods (39)**

169. Annual Sedimentation Rate in Minor Irrigation Schemes in Narmada Basin.
170. Benefit Cost Analysis of Lukhnauti Bund A Flood Control Measures.
171. Capacity Surveys of Tungabhadra Reservoir.
172. Channelisation of River Bata from RD 12500 to 17500 (H.P.)
173. Channelisation of River Bata from RD 8300 to 13400 (H.P.)
174. Collection and Study of Sediment Data of Hirakud Reservoir Under UNDP Programme
175. Dam Break Studies for Planning Flood Protection Measures.
176. Development of Mathematical Models for Flood Forecasting of Rivers Sone and Punpun
177. Development of Remote Sensing Based Watershed Models for Prediction of Runoff and Sediment Yield.
178. Effect of Porosity on Flow Past Fences.
179. Effectiveness of Impervious Type Groins Development of New Dagger Type Groin for Kosi River Bank Protection.
180. Flood Estimation using Regional Flood Frequency Analysis
181. Hydraulic Routing of Flood Towards Flood Management
182. Management and Conservation of Pookote Lake Ecosystem of Western Ghats Region.
183. Management of Flood
184. Meandering and Braiding of Alluvial Rivers.
185. Model Studies for Protection of Left Bank of River Sahibi in District Gurgaon (Haryana)
186. Model Studies for Training River Ghagra Upstream of Saryu Bridge Near Ayodhya.

187. Projection of Bridge on River Bhakla at 27 km on Baharaich BHINGA Road.
188. Protection of Jaunpur Town From the Floods of River Gomti.
189. Real Time Reservoir Operation.
190. Sediment Yield and Reservoir Sedimentation Studies.
191. Sedimentation Rate Determination Studies for Minor Tanks of Madhya Pradesh.
192. Sedimentation Study of Shivaji Sagar Lake of Koyna.
193. Silt Sedimentation and Survey of Bhadra Reservoir Project
194. Siltation Studies of 16 Reservoirs in Maharashtra
195. Special Studies and Allied Studies under Maharashtra Irrigation Technology Management Report, Silt Measuring Data.
196. Study of 1986 Flood in Assam
197. Study of Energy Dissipation-Arrangement Below Spillways
198. Study of River Training Works
199. Techniques for Capacity Computation and Optimal Reservoir Operation.
200. Training River Ganga at Gazipur.
201. Training River Ganga at Hasanpur Bund Near Garhmukteshwar (District Moradabad)
202. Training River Ganga Near Hadoi-Kannauj Road Bridge.
203. Training River Ganga Near Turtipar Srinagar Bund in District Ballia
204. Training River Ghagra Near Mahula - Garhwal Bund
205. Training River Ghagra Near Mahula-Garhwal Bund in District Azamgarh
206. Turtipar Srinagar Bund (Distt. Billia)
207. Urban Storm Water Runoff Modelling Using Remote Sensing Techniques: A Case Study in Rohini, Delhi.

#### **HYDRAULIC STRUCTURES (INCLUDING MASONRY AND CONCRETE STRUCTURES) (121)**

208. 2-D Photoelastic Model Study and Analysis of the Strengthened Section of Bhatsa Dam
209. 2-D Photoelastic Studies for the Design of Different Sub-Structures at Maneri Bhali Project, Stage-II.
210. A Study on Abrasion Resistance of Materials By High Velocity Water Jet Charged With Sediment.
211. Arkavathy Reservoir Project – Surplussing Works
212. Ascertaining the Tensile Strength of Masonry in Flexure
213. Bagur Navile Tunnel (Hemavathy Reservoir Project Left Bank Canal)
214. Beas Sutlej Link Project Punjab (Baggi Surge Tank)
215. Case Studies on Hydraulic Transients in Pumping Systems

216. Characteristics of Flow Over Cylindrical Weirs
217. Chettammagere Tunnel (Hemavathy Reservoir Project Left Bank Canal)
218. Complete System of Flushing Conduits of Sedimentation Chamber of Mansi Phali Stage-II
219. Conducting Model Studies for Spillway Layouts for Low Head Weirs
220. Design of Labyrinth Weirs for Minor and Medium Projects
221. Designing of Spillway and Dissipating Arrangement for the Re-Revised Spillway Discharge Bennethora Irrigation Project
222. Desilting Basin of Rangit H.E. Project
223. Development of Appurtenance for Economic & Efficient Design of Hydraulic Structures.
224. Dhom Hydroelectric Project (700 KW) Mahakali Earthen Dam, Irrigation Cum Power Outlet
225. Effect of Earthquake on Engineering Structures (Buildings)
226. Energy Dissipation Below Rangit H.E. Project
227. Energy Dissipation Studies for Khuga Dam Spillway
228. Escape Head at Khara T.R.C.
229. Estimation Seepage Through Clay Core Type Rockfill Dam By 2-1 Electro Hydrodynamical Analogue Model Method
230. Finite Element Technique for Seepage in Hydraulic Structures
231. Flood Wave Subsidence in Wide Prismatic Channels
232. Flow Characteristics of Hydrofoil Weirs, Hydrofoil Topped Weirs & Streamlined Triangular Profile Weirs
233. Flow Characteristics of Rectangular and Trapezoidal Finite Crest Width Weirs and Triangular Profile Weirs
234. Flow Characteristics of Sharp Edged Orifices, Quadrant Edge Orifices and Nozzels
235. Ghataprabha Left Banak Canal Head Regulator
236. Gola Pump House on River Kuwano
237. Gyanpur Pump Canal (Intake Works)
238. Gyanpur Pump House on River Ganga
239. Hardwar Barrage
240. Hemavathy Reservoir Project
241. Hipparagi Barrage Project
242. Hydraulic Transient in Pumping Systems
243. Improved Newton-Raphson Method for Pipe Network Analysis
244. Interference Effect of Bridge Piers on Scour Depth
245. Kerala State Electricity Board Idukki Dam Monitoring

246. Lakhwar Dam (Downstream Surge Tank)
247. Lakhwar Dam (Energy Dissipation Below Spillway)
248. Lakhwar Dam (Power Intake)
249. Lakhwar Dam Project
250. Larji Dam Spillway and intake Arrangement
251. Leaching and Seepage Water Quality Study of Ukai and Kadana Dam in Gujarat
252. Leaching of Lime From Masonry Structures of M.P. viz Gandhi Sagar, Barna, Tawa, M.R.P. Sandur etc
253. Linkage of PUGC with UGC Upstream of Pathri Power House
254. M.S. on Direct Reading Overshot Gate
255. Madhya Ganga Canal Project (Mat Branch Junction)
256. Maheshwar Dam Spillway Sectional Model Studies
257. Maneri Bhali Hydro-Electric Stage-II
258. Meja Dam - Spillway
259. Model Studies for Chute Spillway and Energy Dissipating Arrangements, Yegachi Project
260. Model Studies for Finalising the Sluice Trajectory Almatti Dam (UKP)
261. Model Studies for Masalga Project
262. Model Studies for Proposed Ranipur Syphon and PUGC.
263. Model Studies for Regulation of Madhya Ganga Barrage.
264. Model Studies for Srinagar Dam Spillway and Intake
265. Model Studies for Warna Irrigation Project Tail Channel Studies
266. Model Studies for Y.G. Gudda Irrigation Tank Project
267. Model Studies of Chulkinala Irrigation Project
268. Model Studies of Iggalur Anicut Project
269. Model Studies of Isapur Dam Spillway Upper Penganga Project
270. Model Studies of Kodalalli Dam Hydel Project – Kali Second Stage Spillway and Energy Dissipating Arrangements
271. Model Studies on Almatti Project-Revised Spillway Studies
272. Model Studies on Amaraja Reservoir Project.
273. Model Studies on Bennethora Project Surplussing Works
274. Model Studies on Eda and Silt Free Canal Intake of Tons Barrage, Bansagar Project, Madhya Pradesh
275. Model Studies on Hivra Dam Spillway
276. Model Studies on Irggalur Anicut Project: Surplussing Works
277. Modernisation of UGC (Asafnagar Regulator)

278. Monitoring and Controlling Reinforcement Corrosion in Concrete Structures.
279. Narmada Sagar Project Composite Model Structures
280. Narmada Sagar Project Power House Studies Model Studies for Tail Race Channel
281. Narmada Sagar Spillway at Punasa (M.P.) for the Study of Airation of Spillway Flow
282. Nodel Studies for Diversion Tunnel of Narmada Sagar Project
283. Omkareshwar Dam Spillway Composite Model Studies
284. Omkareshwar Dam Spillway Sectional Model Studies (M.P.).
285. Open Channel Transitions
286. Panchnad Dam (Energy Dissipation)
287. Parallel Upper Ganga Canal (Head & Cross Regulator at Km 12.8)
288. Parallel Upper Ganga Canal (Inter-Connecting Regulator at Km 19.2)
289. Parallel Upper Ganga Canal (Inter-Connecting Regulator)
290. Parallel Upper Ganga Canal (Pathri Bypass)
291. Parallel Upper Ganga Canal (Silt Ejector)
292. Patna Wier
293. Photoelastic Studies for Stress Analysis for Different Underground Power House Cavities of Tehri Dam Project.
294. Photoelastic Analysis for the Underground Power House Cavern
295. Profile of Partly Constructed Dam Structure Subjected to Flood Over Flows
296. Proportional Weirs
297. Prototype Studies of An Automatic Gate for Low Head Weirs
298. Railway Bridges on River Kosi and Bagmati (Bihar)
299. Rajan Kollur Tunnel (Upper Krishna Project Narayanapura Left Bank Canal)
300. Road Bridge on River Brahmaputra
301. Sakhwar Dam
302. Scour Due to Jets and Protection From Scour
303. Sholding Khad Drop Shaft of Nathpa Jhakri H.E. Project
304. Sholding Khad Trench Weir of Nathpa Jhakri H.E. Project
305. Side intake (Alternative-I) of Bener Hydel Project
306. Siting Barerage on River Ganga at Kanpur
307. Some Case Studies on Hydraulic Transient in Pumping Systems
308. Srinagar Dam - Intake Works
309. Srinagar Dam Spillway
310. Stage Discharge Curve of Gola River at Jamrani Dam Site
311. Steady Two Dimensional Seepage Flow Analysis by Analytical & Numerical Methods

312. Study of Characteristics of Phreatic Line
313. Study of Slow Sand Filters by Providing Horizontal Roughing Filter Phase-I
314. Submergence of Flowmeters
315. Tanakpur Hydro-Electric Project
316. Tanakpur Hydro-electric Project - Bypass Power House
317. Tanakpur Hydro-electric Project - Hoopa Type Ejector
318. Tanakpur Hydro-electric Project - Tail Race Tunnel Channel
319. Tehri Dam (Intake of Tunnel T-2)
320. Tehri Dam (Shaft Spillway)
321. Tehri Dam Project
322. Three-Dimensional Photoelastic Analysis of Fault in Foundation of Dam
323. Upper Wardha Project Composite Model Studies
324. Velocity and Resistance Models for Open Channels
325. Vibration Studies of Kolkewadi Dam and Power House
326. Vortex Characteristics of Scouring Horse Shoe Vortex
327. Vyasi Dam (Hathiari Surge Tank)
328. Water Hammer Problems in Hydroelectric Power Projects and Cooling Water Systems of thermal Power Projects

#### **RIVER AND ESTUARINE HYDRAULICS (20)**

329. An Approach to Assess Rate of Bed Load in Large Cable Rivers
330. Analysis of Waves Data By Computer
331. Assessment of Siltation in Artificially Developed Shipping Channel in Estuaries With Reference to Eastern Coast
332. Basic Research on Tidal Inlets
333. Development of System Analysis for Evolving (A) Mathematical and (B) Analogue Models for Study of Coastal Inlets, Estuaries, Littoral Areas and Open Seas
334. Further Model Study for Siting Gokul Barrage on River Yamuna (District Mathura)
335. Ghaggar Bridge at Panchkula in District Ambala
336. Longitudinal Bed-Lineations (Streaks) on Sand Beds
337. Mathematical Modelling of Coastal Engineering Problem
338. Mathematical Modelling for Coastal Engineering Problem 1988-89
339. Monitoring of Coastal Environment (MCD) and Coastal Mapping (COM).
340. Monitoring of Coastal Environment
341. Numerical Analysis of Wave Refraction along West Coast Line of Maharashtra
342. Pollution Studies in the Coastal Waters

343. Salinity Intrusion Models for Estuarine Rivers of Kerala
344. Simulation of Diffusion – Dispersion Process in A Tidal Approach Channel
345. Siting Railway Bridge Across River Great Gandak Near Chhitauni (District Gorakhpur)
346. Studies on Sediment Yields From Watersheds of Western Ghats
347. Study of the Problem of Seawater Intrusion in the Coastal Aquifers of Saurashtra & Kutch Regions of Gujarat State & Suggesting Remedies for Controlling / Preventing Intrusion of Seawater
348. Water Resources Management

### **GROUND WATER (47)**

349. “W” Curve Analysis for Hard Rock Wells
350. All india Coordinated Research Project on Optimization of Ground Water Utilization Through Wells and Pumps
351. Analog Simulation of Madras Aquifer
352. Assessment of Groundwater Balance Components.
353. Case Studies on Failed and Sick Wells
354. Cathodic Protection to Tubewell Using Sacrificial Anodes
355. Conjunctive Management of Surface and Groundwater
356. Conjunctive Management of Surface and Groundwater for Irrigation
357. Conjunctive use of Water in Alluvial Plains - Analysis and Techniques (With Special Reference to North Bihar)
358. Conjunctive use of Surface and Groundwater
359. Conservation of Surface and Groundwater.
360. Constructing HDPE Tubewells at Gotri Campus
361. Design Criteria and Economics of Dug-Cum-Bore Wells Including Spacing of Open Wells in Alluvial Formations.
362. Determination of Groundwater Potential for Kerala District Wise Study
363. Development and Evaluation of Low Coast Well Screens for Shallow Tube Wells
364. Development of Digital Model for Simulating the Behaviour of Multiaquifer Basin and Applying It to the Different Groundwater Basins of Gujarat.
365. Development of Technique and Criteria for Increasing the Yield of Open Wells
366. Evaluation of Aquifer Parameters by Discharging Well Methods.
367. Finite Difference Modelling of Ground Water Flows
368. Ground Water and Ganga River Interaction between Madhya Ganga and Narora Barrage
369. Ground Water Recharge Below Tanks, Ponds and Check Dams



370. Ground Water Systems Study Sabarmati - Banas Doab
371. Groundwater Based Water Supply Schemes in Selected Areas of Thekkumkara and Selected Tribal Pockets of Attappady
372. Groundwater Study of a Part of the Indian Institute of Science Campus.
373. Groundwater Systems Study of Pilot Area IGNP Command Stage II
374. Grounewater Modelling
375. Modelling Pollutant Movement in Aquifers
376. Multistage Modelling and Conjunctive Management of the Water Resources in a Canal Command Area
377. Optimization Technique for Evaluation of Aquifer Parameters
378. Pollution Control of Ground Water Sources From Surface Discharge
379. Problems and Prospects in Groundwater Utilization for Agricultural Development in North Bihar
380. Problems and Prospects of Ground Water Utilization for Agricultural Development in North Bihar Region
381. Quantification of Subsurface Summer Flows at Two Typical Locations in Punnurpuzha and Cherupuzha for Calicut Corporation Water Supply Scheme
382. Recharge in Lime Stone Area of Coastal Region of Saurashtra
383. Recycled Irrigation below Tanks
384. Research on Behaviour of Ground Water in Lateritic Area in Konkan Region
385. Simulation of Multiaquifer Basin of Mehsana District (Gujarat) By Digital Model using Finite Element Method.
386. Studies on the Hydrologic Environment of Tribals of South Wynad and Attappady Regions of Western Ghats
387. Study of Percolation Tanks (P.T.) for Deciding Domain of Ground Water Served by Percolation Tanks
388. Study of Underground Bandhara to Recharge the Ground Water
389. Stuy of Failed and Sick Tubewells in the Gujarat State
390. Sub Surface Drainage Study of Sarda Sahayak Command Area (Aquifer Modelling of Jamwari - Chauka Interstream Region)
391. Sub Surface Drainage Study of Sarda Sahayak Command Area (Aquifer Modelling of Kalyani - Ghagra Interstream Region)
392. Sub Surface Dyke for Ground Water Conservation
393. Sub-Surface Drainage Study of Sarda Sahayak Command Area (Aquifer Modelling of Kalyani-Ghara Interstream Region).
394. Surface Water - Ground Water interaction of River Ganga Between Kanpur and Allahabad

395. Use of Open Wells in the Coastal Belt of Kerala for Small Scale Irrigation: Open Well Project-Phase VII, VIII and IX (Ernakulam, Quilon and Alleppey District).

### **HYDROLOGY AND DROUGHT MANAGEMENT (49)**

396. A Case Study on Watershed Development & Management at (I) Ralegan Sindi District, Ahmednagar; (II) Adgaon District, Aurangabad- for Water Budgeting and People's Participation
397. A Study of Evaluation of Coefficients of Hydrological Models (Mathematical) for Bangalore Geographical Location
398. Analysis of Hydro-Meteorological Variables
399. Application of Digital Image Processing for Groundwater Exploration in Parts of Bhadra District, Maharashtra
400. Basic Research Studies in Physics Division during 1987-88.
401. Basic Research Studies in Physics Division during 1988-89
402. Behaviour of Monsoon Rainfall in Rajasthan
403. Centre for Water Resources Engineering and Management
404. Conducting Watershed Studies.
405. Derivation of Instantaneous Unit Hydrograph From Hyetograph and Corresponding Hydrograph and using the Same for Determination of the Hydrograph for other Hyetographs.
406. Design Flood Computation with Limited Data: Case Study of a Reservoir in Subarnarekha Basin.
407. Developing Mathematical Models to Study the Hydrology of Tanks.
408. Development of General Hydrologic Modelling for Indian Rivers.
409. Estimation on Monthly Runoffs.
410. Evaluation of Hydrological Parameters and Surface Water Potential of Deviar Watershed.
411. Expert System for Water Resources Management
412. Finding out the Equation of Hydrograph from the Available Field Data by using Correlation Technique
413. Flood and Hydrological Studies of Chandil Dam.
414. Flood Estimation and Frequency Analysis.
415. Flood Frequency Studies.
416. Flood Routing Studies
417. Hydrologic, Hydraulic and other Statistical Research Studies during 1986-87.
418. Hydrologic, Hydraulic and other Statistical Research Studies during 1987-88.
419. Hydrologic, Hydraulic and other Statistical Research Studies during 1988-89
420. Hydrological Aspects of Droughts

421. Hydrological Studies in Forested Catchments
422. Hydrology of Elasm of Kerala.
423. Impact of Deforestation on Hydrological Parameters in Western Ghats Region of Kerala.
424. Infiltration Characteristics of Catchment.
425. Measurement of Hydrological Variables Using Geophysical and Nuclear Techniques
426. Rainfall Run Off Study of Kosathalayar at Kesavaram Anicut and Poondi Regulator.
427. Regional Relationship Between Evaporation and Evapotranspiration Over Irrigated and Cropped Areas
428. Regionalisation of Watershed Parameters for Flood Estimation
429. Simulation Studies of Cauvery River Micro Power Plants.
430. Snow and Glacial Hydrology
431. Spread Sheet Applications in Water Resources
432. Statistical Modelling of Annual Peak Floods
433. Stochastic Hydrological Study of Tamil Nadu - Poondi Reservoir Spill Analysis.
434. Stochastic Modelling of Hydrologic Variables
435. Studies on Hydrological Processes and their Impacts on Nilgiri Biosphere Reserve Using Remote Sensing Techniques.
436. Study of Efficiency of Percolation Tanks (P.T.) and Its Effect on the Wells in the Command
437. Study of Extent of Regenerated Flow from Lift Irrigation Schemes, on Bhogawati River, Kolhapur District
438. Surface Water Potential Studies of Kuttiyadi Basin.
439. Use of Radioactive Tracer for Assessment of various Hydrological Parameters
440. Use of Unit Hydrograph in Flood Estimation for Small Basins
441. Watershed Characterisation
442. Watershed Modelling
443. Watershed Studies on Land use Effects in Western Ghats Region of Kerala.
444. Weather Availability and Drought Management

#### **IRRIGATION & DRAINAGE SYSTEMS AND WATER MANAGEMENT (54)**

445. All India Coordinated Projects for Research on Water Management, Mahatma Phule Agricultural University, Rahuri
446. Aquifer Stream Interaction of Ganga River from Raiwala to Raolighat
447. Comparative Studies of Flow Measurements in Small Channels.
448. Computer Aided Computation of Silting in Reservoirs Surveyed Under W.S.N.B. Adopting Grid Methods.

449. Computer Modelling for Water Distribution Systems.
450. Computerisation of Water Scheduling in Periar Main Canal, Tirumangalam Main Canal of Periar Vaigai Project.
451. Conjunctive use of Ground Water and Surface Water for Optimal Irrigation Management and Cropping Pattern in River Basin Projects under Different Rainfall Conditions.
452. Co-ordinated Project for Research on Water Management (ICAR).
453. Design of Drainage System for Agricultural Watershed
454. Design of Jajmau, Kanpur Water Distribution System
455. Determination of the Rugosity Coefficient for Channel under Different Conditions Using Locally Available Lining Materials.
456. Development and Evaluation of Water Lifts and Utilisation of Renewable Energy Sources for Irrigation Pumping.
457. Development of Guidelines for Water Resources Management in Irrigation Projects
458. Drainage Study of Mula Catchment Area.
459. Economics of Water use and Management : An Enquiry Into the Farmers Behaviour
460. Effect of Alley Cropping Systems on Nitrogen Cycling, Soil and Water Conservation in Western Ghats Area.
461. Evaluation and Improvement of Irrigation Technology in Tubewell Commands
462. Evaluation of Command Area Development Programme in IGNP Command
463. Evaluation of Effective Rainfall Under Different Land Uses.
464. Evaluation of Sanitary Diggies in Planned Abadis of IGNP Stage I and II
465. Farm Ponding Experiments in Gotri Campus.
466. Farmer's Participation & Organization in Irrigation Project (Ratapani).
467. Growth Trends in Forest Area and Its Impact on Rainfall in Different Divisions of Uttar Pradesh.
468. Impact of Drip Irrigation on Yield of various Agriculture and Forestry Crops
469. Installation of Photovoltaic Water Pumping System.
470. Irrigation Management and Crop Performance under Soil and Water Salinity
471. Irrigation Management and Training Project.
472. Land Drainage in Deep B.C. Soils
473. Maximization of Tea Production with Judicious Resources Management.
474. Modernisation of Tank Irrigation System.
475. Mohargong and Gulma Tea Estate District, Jalpaiguri, West Bangal
476. Monitoring and Evaluation of Tank Irrigation System under Modernisation.
477. Ozone and Hypochlorite for Water Purification.
478. Physical Modelling of High Ground Water Table and Suggesting under Drainage Measures

479. Plant Irrigation Using Porous FRP Tubes.
480. Plasticulture Development Centre.
481. Potential of Small Scale Life Technology with Special Reference to Access of Small and Marginal Farmers to Ground Water
482. Save Tree, Save Farmers Campaign By Saurashtra Farmers
483. Studies at Demonstration Plot at Kabini.
484. Study of Completed Drainage Schemes for Reducing Waterlogging and Salinity, in Deep Soil Areas
485. Study of Water Management Strategy for Indira Gandhi Nahar Project
486. Study Regarding Reducing Evaporation of Soil Moisture by using various Types of Mulching Materials
487. Techno-Economic Study for Utilising Village Tank as Borrow Areas for Construction of Canal Network
488. The Study of the Sprinkler and Drip Irrigation System with Comparison to Flow Irrigation System
489. To Evolve Integrated Water Management Technology for Stabilization of Water Table at Optimum Depth
490. Use of Biwall System for Sugarcane at Kashti and Phaltan Farm
491. Use of Spent Wash Molasses for Reclaiming Saline Soils
492. Water Balance Study for Agro-Climatic Zone V and Zone XII
493. Water Resources Development for Optimal Tea Production at Mohargong and Gulma Tea Estate.
494. Water Resources Management Centre
495. Water Resources Project Management
496. Water Resources Project Management
497. Water Use & Management for Agricultural Production.
498. Water Use Efficiency in Papaver Somniferum

#### **ENVIRONMENTAL IMPACT AND SOCIO ECONOMIC ASPECTS OF WATER RESOURCES PROJECTS (36)**

499. Ambient Air Anality Studies of Selected Cities in Maharashtra.
500. Biogas Pilot Study for the Production of Biogas From Various Organic Wastes.
501. Chemical Investigation of River Waters of India.
502. Defluoridisation of Water by Electrolysis.
503. Design of Outlets From Ground and Elevated Reservoirs.
504. Design of Simple and Cheap Gobar Gas Plants for Different Capacities.
505. Deterioration of Quality of Water in Distribution System.

506. Determination of Pollution Parameters of the Rivers and Coastal Waters.
507. Developing Fish Culture in Aerobic Lagoons and Oxidation Pond.
508. Developing Simple and Continuous Chlorine Solution Dosing Arrangements for Rural Water.
509. Development / Standardisation of Electrochemical Methods of Pollution Control.
510. Establishment of "A" Class Weather Bureau
511. Geodetic Surveys in Earthquake Affected Areas at South Gujarat
512. Improvements in Mixing and Closing Arrangements of Alum Solution Tank.
513. Ion Selective Electrodes and Electro Analytical Techniques for Process Control.
514. Leak Detectors for Chlorination Equipments.
515. Mathematical Models for Water Quality and Pollution Assessment
516. National Technology Mission on Drinking Water
517. Performance Evaluation of the Scheme of Right Marginal Embankment From Wazirabad Barrage to Bawana Escape of the Union Territory of Delhi.
518. Performance of Low Cost Pour Flush Water Seal Latrines in Rural and Semi Urban Areas.
519. Quality Surveying of River and Reservoir Waters of Tamil Nadu.
520. Scale and Geometry Effects in Aeration Studies Connected With Waste Water Treatment.
521. Studies on the Suitability of Drinking Water.
522. Study of Different Aerator for Aerated Lagoons.
523. Study of Different Types of Tube Settlers.
524. Study of Fluidic Vortex Device for Water Treatment Processes.
525. Study of Performance of Different Domestic Water Meters (Dia 15-50 Mm).
526. Study of Performance of Sluice Valves 80 Mm to 300 Mm Dia.
527. Study of Upflow Filters using Coconut Shell.
528. Study of Water Hyacinth Control in Lakes and Rivers Stage-II.
529. Terrain Evaluation of Irrigation Command Areas of Konkan for Environmental Monitoring
530. Utilization of Effluent From the Oxidation Pond and Aerated Lagoons for the Land Irrigation.
531. Utilization of Water Hyacinth Plants to Remove BOD, PO<sub>4</sub> and Other Organic Nutrients From the Oxidation Pond and Aerated Lagoons.
532. Water Quality Monitoring
533. Water Quality Monitoring in Chandigarh
534. Water Resources Management Study for South Madras Region.

**SOIL AND MATERIALS (68)**

535. A Study of Behaviour of Undulose Quartz in Concrete
536. A Study of Undulose Quartz in Natural Aggregates
537. A Study of Undulose Quartz in Rocks.
538. A Study of Zeolites From Basalt of Gujarat State for Alkali Aggregate Reactivity
539. Assessment of Damage to Concrete at various Temperatures.
540. Canal in Black Cotton Soil.
541. Canal Lining with Geosynthetic Material
542. Capacity of Steel Pipes (Pen-Stocks) in Sustaining External Load of Soil Backfill.
543. Clay and Fly-Ash As Ingredients of Cement Grout
544. Construction Material Survey of Gujarat State
545. Coordinated Project for Research and Management of Salt affected Soils and use of Sline Water in Agriculture
546. Correlation Studies for Accelerated Cured and Normal Cured Concrete
547. Corrosion of Reinforced Concrete.
548. Corrosion Study of Reinforcing Bars in Concrete.
549. Crab Activity in Konkan Region.
550. Degradation Resistance and Creep Behaviour of Polymeric Material
551. Detail Study of Ozarkhed Earth Dam
552. Determining Dynamic Properties of Soils and Performing Model Tests on Shacking Table Under Simulated Earthquake Condition for Kanher Dam in Maharashtra.
553. Development of Dynamic Cone Penetrometer for Subsoil Exploration in situ in Alluvial Deposits
554. Economics of Placement Density.
555. Effect of Admixtures on Cement Based Grout
556. Effect of Particle Size on Index Properties of Soils.
557. Effect of Repetitive Loading/Unloading on Rockfill Material.
558. Effect of Sand Filter (U/S) in Reducing Pore Water Pressure in Earth Dams in Konkan Region.
559. Effect of Various Parameters on Factor of Safety of Earth Dams.
560. Erodability Tests Pertaining to Tehri Dam
561. Evaluation of Concrete Aggregates for Alkali Aggregate Reactivity
562. Hydraulic Fracturing for Impervious Core Materials.
563. Identifying Areas of Expansive Soils and those of Cohesive Non Swelling (CNS) Material in Gujarat and Treating Expansive Soils with CNS Layer by Way of Some Performance Studies in Field for Canal Lining

564. Influence of Plasticity on Filter Criteria of Cohesive Soils
565. Influence of Various Factors on Shear Strength Characteristics of Compacted Soils.
566. Lime Column Foundation in Expansive Soils for Light Structures.
567. Lining for Canals in Expansive Soils.
568. Mix Design Studies
569. Prediction of Swelling Potential and Its Relationship with Activity of Soils in Tamil Nadu.
570. Prepacked Aggregate Concrete.
571. Prototype Studies in Reinforced Soil Retaining Wall using Different Fill Material, Reinforcements and Facing Elements.
572. Quality of Water for Construction Work.
573. Studies for Quality of Cement
574. Studies on Dynamic Properties of Soils.
575. Studies on Engineering Properties of Epoxy Resins.
576. Studies on Fibre Reinforced Concrete Using Polypropelene Fibres.
577. Studies on Landslides and Landslips in the Wynad District of Western Ghats Region.
578. Studies on Lateral Pressure Aspects of Expansive Clays.
579. Studies on Thermal and Creep Properties of Mass Concrete.
580. Study of Admixture and Water Proofing Compound
581. Study of Burnt Clay Tiles for Canal Lining.
582. Study of Epoxy Mortar.
583. Study of Expansive Soils in Reference to their use in Irrigation Storage Reservoir Structure
584. Study of Foundations of Karjan Dam (Gujarat) By Geomechanical Models.
585. Study of Improving Quality of Lime
586. Study of Limestone Deposits in Gujarat
587. Study of Microfractures in Rocks in Relation to Durability Test.
588. Study of Modular Bricks.
589. Study of Observational Data of Piezometers Installed in Earth Dam
590. Study of Quality of Flyash Available in Gujarat.
591. Study of Sudden Draw Down Pore Pressure in Earth Dam
592. Study of Use of C.N.S. Soils in Irrigation Works of Madhya Pradesh in Reference to Characteristics of Swelling Soils Found in Madhya Pradesh
593. Study of various Types of Materials for Canal Lining.
594. Study of various Types of Reinforcing Bars Used in the Concrete
595. Study of Zeolites From Basalt of Gujarat State for Alkali Aggregate Reactivity



596. Sub-soil Properties and Bearing Capacity along Upper Ganga Canal (Roorkee City)
597. Superplasticizer – A Multipurpose Admixture to Cement Concrete.
598. Survey of Expansive Soil of South Gujarat W.R.T. Design of Playfields & Rural Roads.
599. Testing of Reinforced Soil Wall Model
600. Thermal Properties of Micaceous Concrete.
601. To Evaluate the Bearing Capacity of Layered Foundation.
602. Use of Industrial Waste (Flyash) for Scarces Building Materials (Bricks, Tiles).

### **ROCK MECHANICS (11)**

603. Advise on Rock Mechanics and Ground Control Problems Including Instrumentation
604. Advise on Supporting Measures and Instrumentation of Lower Periyar Tunnel.
605. Advise on the Stability Problems, Support Requirements and Instrumentation of the Power House Cavity of Sardar Sarovar Project.
606. Engineering Geology and Petrographic Analysis Studies.
607. Himalaya Tunnelling Division.
608. Pull Out Tests on Inclined Anchors at Wan Project.
609. Studies on Engineering Properties of Rocks.
610. Study of Effect of various Parameters on Strength of Rock Cores
611. Study of Geomechanical Model to Understand the Behaviour of Jointed Rock Mass
612. Study of Stripping Value of Rocks for Road Works, in Relation to their Geological Properties
613. Study Size and Slenderness Ratio Effects on Strength and to Develop Correlatation Between Different Strengths of Rock Cores.

### **APPLICATION OF HIGH TECHNOLOGY AND INSTRUMENTATION & MEASUREMENT TECHNIQUES (63)**

614. Aplication of Digital Image Processing Techniques for Agricultural Land use / Land Cover Studies around Nagpur
615. Application of Remote Sensing Techniques to Himalayan Glaciers Study
616. Assessment of the Spread of Sandy Desert through Aravalli Gaps
617. Automated Collection and Transmission of Hydrometeorological Data
618. Calibration of Pendulum Vanes for Stream Flow Measurement.
619. Crop Acreage Estimation
620. Data Base Management and Information System
621. Development of Digital VHF Telemetry Links
622. Development of Directional Current Meter for Hydraulic Models.

623. Development of Electronic Water Current Meter.
624. Development of Force Balance Servo Accelerometer.
625. Development of Methodology of Environmental Impact Analysis of Multipurpose River Valley Projects using Satellite Remote Sensing Techniques
626. Development of Moving Boat Method Equipment for River Discharge Measurement.
627. Development of Short Period Sea Wave Height Sensor.
628. Development of Suitable Package Using Digital Techniques for District-Wise Landuse Mapping - Feasibility Study
629. Development of Tide Simulation System for Hydraulic Models.
630. Development of Ultrasonic Flow Discharge Measurement System.
631. Development of Vibrating Wire Type Pore Pressure Cell, Earth Pressure Cell and Water Level Sensor.
632. Development of Vibrating Wire Type Tiltmeter.
633. Displacement Effect in Pitot Tubes.
634. Drought Mission
635. Environmental Impact Assessment Studies of Mangalore City
636. Environmental Impact of Coastal Wetlands
637. Environmental Monitoring Instruments.
638. Generation of Biogas from Aquatic Weed With Special Reference to Utilization of *Salvinia*.
639. Geological Studies in Malanjkhanda-Taregaon Block, Balaghat District, M.P. using Image Processing Techniques
640. Geomagnetic and Geoelectric Studies in Earthquake Affected Areas of South Gujarat
641. Hydraulic Model Study for Tidal Power Generation at Durgaduani Creek, Sundarbans, West Bengal
642. Hydrofracturing Studies in Earthquake Affected Area of South Gujarat
643. Installation and Setting up of a Testing and Calibration Laboratory for Dam Instruments.
644. ISO Siesmal Surveys in Earthquake Affected Areas
645. Land Use Mapping Studies in Satara Region using Remote Sensing Technique under Indian Remote Sensing Satellite Utilization Programme (IRSSUP).
646. Landuse Mapping of Shivpuri Tawa Area in Madhya Pradesh for Central Mine Planning and Design Institute (CMPDI)
647. Mapping of East Coast in Tamil Nadu using Satellite Data
648. Mapping of Waterlogged Area Using Digital Techniques in Tawa Command Area of Madhya Pradesh
649. Monitoring Effectiveness of Salinity Ingress Prevention Schemes on Saurashtra Coast by Remote Sensing

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650. Monitoring of Coastal Environment Project by Remote Sensing
  651. Monitoring Recent Earthquake Activities in South Gujarat by Remote Sensing Studies
  652. Photoelastic Studies for Determination Optimum Anchorage Depth of Spillway Pier
  653. Preparation of Status Reports of Seven DPAP Districts to Implement Water Harvesting Structures
  654. Radon Gas Monitoring in Earthquake affected Areas of South Gujarat
  655. Reinforcement Covermeter.
  656. Remote Sensing Application to Hydrological Studies
  657. Seismic Exploration for Engineering Site Investigation.
  658. Seismological Studies in Valsad District of South Gujarat
  659. Solar Stills for the Desalination of Water.
  660. Some Studies on Open Channel Discharge Measuring Devices
  661. Studies on Landslides, Geotechniques and Mineral Survey
  662. Study of Environmental Effects in the Catchment Area Due to Construction of Jayakwadi Project With the Help of Remote Sensing Technique.
  663. Study of Environmental Effects of Jayakwadi Project with Remote Sensing Techniques
  664. Study of Groundwater Potential in Drought Prone Districts through Remote Sensing Techniques
  665. Study of Groundwater Potential of Districts of Tamil Nadu
  666. Study of Planimetric Accuracy of Different Sensor Data (TM, SPOT, IRS LISS-II)
  667. Study of the Earthquake Activity in South Gujarat, Western India.
  668. Suitability of IRS LISS-II Data As A Stereomate fore SPOT (PLA)
  669. Three-Dimensional Photoelastic Analysis of Fault in Foundation of Dam
  670. To Prepare a Computer Program for Determination of Stress, Strains and Displacements in an Earth Dam by Fem.
  671. Two-Dimensional Photoelastic Studies on Pelton Bucket Notch due to Centrifugal Force for its Optimisation
  672. Urban Land Use Mapping and Monitoring of the City and Part of Metropolitan Region, Nagpur, Maharashtra
  673. Urban Landuse Mapping of Nagpur City Using IRS LISS-II and SPOT PLA Data
  674. Volumetric Measures (Discharge Measuring Devices for Distribution).
  675. Wasteland Mapping Project By Remote Sensing
  676. Water Technology Mission

**CONSTRUCTION METHODS, PLANNING AND MANAGEMENT  
(INCLUDING HYDRAULIC MACHINERY &  
CONSTRUCTION EQUIPMENT) (4)**

- 677. Construction of Canal Culvert and Approach Embankment using Reinforced Soil Techniques to Observe Behaviour of a Hydraulic Structure in Reinforced Soil by Instrumentation.
- 678. Development of Different Types of Mixers for Laboratory Studies
- 679. Performance of Trainers Turbines under Cavitation Conditions and off Design Loads.
- 680. Two-Dimensional Photoelastic Studies on Pelton Bucket Notch due to Centrifugal Force for Its Optimisation.

**EDUCATION AND TRAINING IN WATER RESOURCES (2)**

- 681. Faculty of Agricultural Engineering Department of Irrigation and Drainage Engineering
- 682. Operational Research Project on Modernising the Command Area of Kuttiyadi Irrigation Project.

**EVAPORATION CONTROL (4)**

- 683. Regional Relationship Between Evaporation and Evapotranspiration over Irrigated and Cropped Areas
- 684. Seepage Analysis by Tracer Technique in M.R.B.C. System
- 685. To Study Evaporation Losses during Irrigation System for Different Crops in the State
- 686. Water Evaporation Retardant Experiments.

**PLASTICULTURE DEVELOPMENT (5)**

- 687. Demonstration of Micro Irrigation Techniques for High Value Crops.
- 688. Plasticulture Development Centre
- 689. Plasticulture Development Centre for Agricultural Sector
- 690. Water Resource Management and Training Centre
- 691. Study of Application of Plasticulture in Irrigation and Agriculture / Development of Plasticulture Centres.

*Appendix – 3.4***TECHNICAL REPORTS (WR)****Sl. No. Publication title**

1. Design of Gravel Pack for Tubewells (1967)
2. Statistical Design Formulae for Alluvial Canal System (1967)
3. Current Practices in Canal Design in India (1968) (Revised 1981)
4. Hydraulic Data of Upper Ganga and Eastern Yamuna Canal System in U.P. (1968)
5. Development of Economic Alternatives to Stone for River Protection Works (1970)
6. Rubble Concrete (1970)
7. Design Practice for Unlined Incised Canals (1976)
8. Procedure to work out Bulkage in Air-Entrained Flows in Chute Spillways (1970)
9. Manual on Evaporation for its Restriction from Free Water Surfaces (1973)
10. Study on the Position of Current Meter with Reference to Boat (1973)
11. Unlined Rubble Masonry Methods of Construction (1976)
12. Determination of Rugosity Coefficient for Lined and Unlined Channels (1974)
13. Efficiency of Suspended Sediment Load Samplers (1974)
14. Manual on Canal Linings (1975)
15. Library of Canal Data (1976)
16. Three-Dimensional Photoelastic Analysis of Anchorage Zone Stresses in Post Tensioned Concrete Members (1976)
17. Design of Structures on Permeable Foundations of Finite Depths (1976)
18. Manual on Ground Water and Tubewells (1977)
19. Life of Reservoir (1977)
20. Sedimentation Studies in Reservoir Vol.I (1980), Vol.II (1981)
21. Damping Characteristics of Soils (77)
22. Linear and Non-Linear Flow through Porous Media (1978)
23. Some Statistical Studies on Initial Phases of Cavitation Damage (Cyclostyled) (1978)
24. Strength Characteristics of Saturated Soft Sensitive Marine Clays (Cyclostyled) (1978)
25. Correlation of Mechanical and Mineral Composition and Clay Structures of Different Soils of India with their Engineering Properties (Cyclostyled) (1979)
26. Manual on Rock Mechanics (1979)
27. Marine Clays in India (1979)
28. Shear Strength Development in Expansive Black Cotton Soil Media with and without a Cohesive Non-Swelling Soil Surcharge, Application to Stability of Canals in Cuts and Embankments (1980)

29. Prototype Performance of Structures on Marine Clay (1980)
30. Sediment Transport in Channels (1980)
31. Proceedings of the Short-term Course on Flood Control (1982)
32. Lateral Pressure in Expansive Soil with and without a Cohesive Non-Swelling Soil Layer – Application to Earth Pressures on Cross Drainage Structures in Canals and Key Walls in Dam (Vol. I, 1983) (Vol. II, 1986)
33. Analysis and Interpretation of Electrical Resistivity Data from Hard Rock Areas for Ground Water Exploration (1984)
34. Loss of Head due to Change in Direction and due to Transitions and Bends Combined (1984)
35. Measurement of Hydrodynamic Forces and Flow Induced Vibrations in Bridge Piers (1984)
36. Studies for Foundations of Power Generators (1984)
37. Spillways and Hydraulic Energy Dissipators (1985)
38. Rock Bolting (1985)
39. Design of Spurs (Groyne) ((1987)
40. Workshop on Designing of Dams for Hydrologic Safety (1988), Vols.I, II and III (1991)
41. Fibre Reinforced Concrete (1990)
42. Development of Long Gange Extensometer (1990)
43. Engineering Classification and Properties of some Himalayan Rocks (Dolomites and Phylities) (1990)
44. An Instrument for Measurement of Progressive Scour Around Bridge Pier (1991)
45. Data Base Management System for Hydrological Data for River Basins (1991)
46. Evaluation of Stresses and Deformations Around Underground Openings (1991)
47. Research Needs in Reservoir Sedimentation (1992)
48. Change Detection in Watershed Characteristics Affecting Inflow Pattern in Krishnarajasagar Reservoir (1992)
49. Sedimentation Studies in Pothundy-Malampuzha – Meenakara Reservoirs (1994)
50. Sedimentation Surveys of Ukai and Kadana Reservoirs (1995)
51. Seepage/Regeneration from Perennial Rivers by Radio Tracer Techniques (1995)
52. Evolution of Standard Discharge Curves for Spillway Radial Gates (1995)
53. Sedimentation Surveys of Malaprabha Reservoir (1996)
54. Hydrological Studies of Flashy Rivers including Evaluation of Rainfall – Runoff Empirical Formula (1996)
55. Strength, Information Modulus and Classification of Jointed Rocks (1996)

*Appendix 3.5***LIST OF PROBLEMS SELECTED FOR STUDY UNDER  
RESEARCH SCHEME ON POWER****I. LIGHTNING STUDIES**

- (i) Study of incidence of storms and lightning on power systems.
- (ii) To record the frequency and measure the severity of lightning strokes.
- (iii) To collect all possible statistical data in connection with lightning outages of transmission system and comparative studies of different types of overhead lines and sub-stations of efficacy of different protective devices in relation to power outages.

**II. SOIL RESISTIVITY**

- (i) Study of soil resistivity.
- (ii) To collect geological data, measure resistivity of earth, seasonal variation of the same at different parts of the State.

**III. TRANSMISSION LINE PROBLEMS**

- (i) Study of insulator contamination.
- (ii) Study of vibration of conductors in transmission lines.
- (iii) To study the problems of relays.
- (iv) To study the design of transmission structures for economy.
- (v) Problems connected with 380 kV transmission.
- (vi) To collect data in regard to wind velocity, humidity and similar other factors which are essentially required for proper design of transmission structures and sub-station equipment particularly in coastal areas of West Bengal.

**IV. TRANSFORMER OIL DETERIORATION AND RECLAMATION**

- (i) Study of transformer oil deterioration and reclamation.

**V. CORROSION STUDIES IN CONDUCTORS, TOWERS, CABLE SHEATHS, PEN-STOCKS, ETC.**

- (i) Corrosion and tuberculation in penstocks.
- (ii) Study of effect of greasing on corrosion of transmission line conductors.
- (iii) Corrosion of lead sheath in U.G. Cables.

**VI. INSULATION STUDIES OF POWER EQUIPMENT**

- (i) To study insulation of equipments under operating conditions. (ii) Problems of insulation co-ordination.

**VII. RURAL ELECTRIFICATION**

- (i) Study of the application of shunt capacitors in rural lines.
- (ii) Prestressed concrete poles for transmission lines.
- (iii) Study of wood poles and jointed poles for rural lines.

**VIII. THERMAL STATIONS**

- (i) Study of feed water problem in thermal stations.
- (ii) Study of ash disposals in thermal stations.

**IX. DEVELOPMENT OF INSTRUMENTS**

- (i) Development of 2 million volts Van-de-Graaff Generator for Polymerisation studies on insulating materials.
- (ii) Operating duty tests of lightning arresters.
- (iii) Design, development and construction of a D.C. network analyser for study of power system problems like selecting circuit breakers, relay settings, short circuit stresses, etc.
- (iv) Design, development and construction of electronic differential analyser.

**X. PATTERN OF POWER SYSTEM LOSS**

- (i) To study the possibilities of augmenting transformer capacity by improved cooling.
- (ii) Periodic measurement of efficiency of hydraulic turbine and investigate the variation in the performance.

**XI. PROBLEMS OF EARTHING IN POWER SYSTEMS**

- (i) Study of earthing practices.



*Appendix 3.6*

No. EL-1-10(5)/60  
Government of India  
Ministry of Irrigation and Power

From

Shri N.S. Vasant,  
Officer on Special Duty.

To

The Secretary,  
Central Board of Irrigation and Power,  
New Delhi.

New Delhi, 31 December, 1960.

*Subject: Fundamental and Basic Research – Continuance of Scheme  
in the Third Five-Year Plan.*

Sir,

I am directed to refer to your letter No. 1856/F-98 (L) dated the 26th December, 1960 on the subject mentioned above and to say that a sum of Rs. 150 lakhs (Rs. 120 lakhs for the Irrigation and Flood Control Works and Rs. 30 lakhs for the Power portion) has been recommended to the Planning Commission for inclusion in the Third Five-Year Plan for the Basic and Fundamental Research Work on problems relating to Irrigation, Flood Control and Power Schemes. The above provision would be inclusive of the spillover of the amounts sanctioned to the various research stations for this Scheme during the Second Five-Year Plan. A detailed programme in respect of the research work on Basic and Fundamental problems to be carried on during the Third Five-Year Plan at the Central and State Research Stations, etc., may kindly be drawn up taking this fact into account and forwarded to this Ministry for approval.

I am also to forward herewith a copy of letter No. 78/60-SCM-1945, dated the 22nd December, 1960 from the Central Water & Power Commission (Flood Wing),\* for necessary action.

Yours faithfully  
Sd/- (N.S. Vasant)  
Officer on Special Duty

\*Not reproduced.

**LIST OF PUBLICATIONS UNDER RESEARCH SCHEME ON POWER****A. Annual Reviews**

Annual Reviews, Research Scheme on Power from 1963 to 1976. (Annual Review for 1971 also contains the work done during the year 1970).

**B. Reviews**

- (1) Review No. 1 – Review on Corrosion in Earthing Equipment.
- (2) Review No. 2 – Reclamation of used and Unserviceable Insulating Oils.
- (3) Review No. 3 – Single Wire Earth Return System for Rural Electrification.
- (4) Review No. 4 – Line Loss Reduction in Primary and Secondary Distribution.
- (5) Review No. 5 – Interference.

**C. Technical Reports**

- (1) Manual on Transformers:
  - (i) Section ‘A’: General
  - (ii) Section ‘B’: Rural Distribution Transformers.
  - (iii) Section ‘D’: Power Transformers up to 20 MVA and 132 kV.
  - (iv) Section ‘E’: Generator Transformers for Thermal Stations up to 220 kV.
  - (v) Section ‘F’: Power Transformers above 20 MVA and for voltage up to 220 kV.
  - (vi) Section ‘G’: Generator and Auto Transformers for 400k Systems.
  - (vii) Section ‘H’: Specifications for Earthing Transformers.
  - (viii) Section ‘J’: Test Manual for Transformers.
  - (ix) Section ‘K’: Erection, Maintenance and Commission Manual.
- (2) Maintenance Schedules for Distribution Systems.
- (3) Manual on Layout of Sub-stations.
- (4) Design, Development and Construction of Solid State Hybrid Computer.
- (5) Steel Grounding Systems.
- (6) Design and Development on Static Excitation System for Synchronous Machine.
- (7) Design and Development on Solid State Sensitive Protective Schemes.
- (8) Design and Development of 2 Me Volt Van de Graaff Generator.
- (9) Manual on Transmission Line Towers.

**D. Technical Papers**

- (1) A Thunderstorm Warning System using the Lightning Flash Counter.
- (2) Electricity Distribution on Sites.

- (3) Parameters of Lightning Flashes.
- (4) Lightning Protection of UHV Transmission Lines.
- (5) Synthetic Circuits for Testing under Conditions of Short Line Fault.
- (6) Field Test of H.V.D.C. Circuit Breaker Load Break and Fault clearing on the Pacific Intertie.
- (7) Breaker Testing
- (8) Three Terminal Operation of the Pacific H.V.D.C. Intertie for D.C. Circuit Breaker Testing.
- (9) A High Speed H.V.D.C. Circuit Breaker with Crossed Field Interrupters.
- (10) Concerning Standardisation of TRV for Circuit Breakers 110 kV and Higher.
- (11) Testing of Metal enclosed HV Sub-stations.
- (12) Detection of and Research for the Characteristics for an Incipient Fault from Analysis of Dissolved Gases in the Oil of an Insulation.
- (13) Conductor Galloping.
- (14) Teleprotection.

**E. Miscellaneous**

- (i) Memorandum on Power Line Carrier Systems.
- (ii) Achievements-cum-Performance Report.
- (iii) Assessment of Benefits.
- (iv) The Development of Electric Transmission Systems.

## RESEARCH SCHEME ON POWER

**A List of problems studied from 1961-62 to 1999 under Research Schemes on Power.**

### Sl. No. Project Titled

#### **A. List of problems studied from 1961-62 to 1973-74**

##### **Protection and General**

1. Study of incidence of storms and lightning on power systems.
2. To record the frequency and measure the severity of lightning strokes.
3. To collect all possible statistical data in connection with lightning outages of transmission system and comparative studies of different types of overhead lines and sub-stations of efficacy of different protective devices in relation to power outages.
4. To study insulation of equipments under operating conditions. - TR - 34
5. Operating duty tests of Lightning Arresters.
6. Design. Development and construction of Electronic Differential Analyser.
7. Functional evaluation of lightning protective facilities in 11 kV distribution system.
8. Study of limiters and upgrading of circuit breakers rupturing capacities.
9. Study of corrosion of ferrous and non-ferrous metals in natural and artificially treated soils.
10. Studies on liquid dielectrics (Natural ester like castor oil, cotton seed oil, etc.) - (TR-19)
11. Determination of number and location of lightning arresters in a multicircuit substation.
12. Lightning arrester application for E.H.V. – 400 kV.
13. Isolators using aluminium contacts.
14. Development of voltage time characteristics for rodgaps, bushings, insulator strings, etc.
15. Development of relays.
16. Design, development and construction of a solid state hybrid computer. - (TR – 4)
17. Development of solid state excitation system for synchronous machines. - (TR-6)

##### **Sub-Station**

18. Study of Soil resistivity.
19. To collect geological data, measure resistivity of earth, seasonal variation of the same at different parts of the State.
20. Study of transformer oil deterioration and reclamation.
21. Problems of insulation co-ordination.
22. To study the possibilities of augmenting transformer capacity by improved cooling.

23. Study of earthing practices.
24. Investigations of the amount and effects of heating produced in steel reinforcements in concrete structures supporting bus-bars carrying heavy currents.
25. Study of corrosion of buried steel work.
26. Design of earthing mat of power stations specially where soil resistivity is high.
27. Soil resistivity reduction by chemical treatment.
28. To study the efficacy regarding the performance with regard to resistance, and touch and step voltage of different types of configuration of grounding electrodes made of G.I. pipes.
29. Study of earthing practices/To study and evolve effective methods of E.H.T. substation grounding.

### **Transmission**

30. Study of insulator contamination. - (TR-31)
31. Study of vibration of conductors in transmission lines.
32. To study the design of transmission structures for economy.
33. Problems connected with 380 kV transmission.
34. To collect data in regard to wind velocity, humidity and similar other factors which are essentially required for proper design of transmission structures and sub-station equipment particularly in coastal areas of West Bengal.
35. Study of effect of greasing on corrosion of transmission line conductors.
36. Development of 2 million volts Van-de-Graaff Generator for Polymerization studies on insulating materials. - (TR-8)
37. Choice of insulation level on 400 kV transmission level and networks. - (TR-14)
38. Study of various methods of construction adopted for 33 kV lines with a view to reducing the cost without losing stability.
39. Temperature rise in overhead lines conductors.
40. Improvement of speech in telephone lines running along transmission lines.
41. Study of lightning surges and performance of lightning arresters.
42. 400 kV experimental line.
43. Transmission line support design.
44. Control of bushes and shrubs growing under transmission lines by chemical spray methods.
45. Corrosion of insulator fittings.
46. Use of insulated ground wire of high voltage transmission lines for single phase distribution and also for direct tapping of power.
47. Use of silicone controlled rectifiers for H.V.D.C. Transmission and protection of H.V.D.C. lines and equipment. - TR - 25
48. Radio interference measurements on insulators and hardware in the design of 400 kV lines.

**Power System**

49. To study the problems of relays.
50. Design, development and construction of D.C. network analyser for study of power system problems like selecting circuit breakers, relay setting, short circuit stresses etc.
51. Application of Digital computers for solving power system.
52. To collect the statistical data regarding the line interruption and study the improvement of power factor and system losses.
53. Study of losses in power systems.
54. Study of measures of minimising voltage dips and power supply interruptions caused by lightning in systems serving large industrial areas.
55. Evaluation of fault currents in different sections of power systems during outage conditions on vulnerable line sections.
56. Study of application of capacitors for improvement of voltage.
57. Development of computer programming for power system problems. - TR - 20
58. Development of instrumentation applied to power system studies and automatic control. - TR - 23
59. Control co-ordination for dynamic stability of an inter-connected system.
60. Transient stability studies of power systems by dynamic modelling.

**Generation (Hydro)**

61. Corrosion and tuberculation in penstocks.
62. Periodic measurement of efficiency of hydraulic turbines and investigate the variation in the performance.
63. Field study of cavitations in turbines and to suggest remedial measures.
64. Study of cavitations.

**Distribution**

65. Corrosion of lead sheath in U.G. Cables.
66. Study of the application of shunt capacitors in rural lines.
67. Pre-stressed concrete poles for transmission lines.
68. Study of wood poles and jointed poles for rural lines.
69. Design and development of high voltage out-door air-break switches, isolators and earth switches.
70. Development work on power fuses.
71. Development of simulated fault testing for standardisation of 11 and 33 kV H.G. and dropout fuses to be used where fault level is below 30 MVA.
72. Voltage regulation and improvement of voltage conditions in distribution systems.
73. Study of methods of cheap and reliable rural line construction.

74. Methods of economising in rural electrification works.
75. Study of measures to prevent or reduce pilferage of electricity by consumers.
76. Development of H.R.C. expulsion and dropout power fuses.
77. Study of the effects on distribution transformers up to and including 100 kVA capacity by elimination of breathing-cum-dehydrating devices.

#### **Generation (Thermal)**

78. Study of feed water problems in thermal stations.
79. Study of ash disposals in thermal stations.
80. Investigation of methods for elimination of harmful effects of H<sub>2</sub>S gas and clogging of cooling water system in hydro-electric power stations.
81. Development work relating to elimination of failure of condenser tubes in large power houses.
82. Study of burning of high ash content coal.

#### **B. List of Problems Studied during the V Plan under Research Scheme on Power (1974-79)**

1. Protection and General
2. Study of incidence of storms and lightning on power systems/To record frequency and measure the severity of lightning strokes.
3. Functional evaluation of lightning protection facilities on 11 kV distribution systems.
4. Study of lightning surges and performance of lightning arresters.
5. Corrosion and tuberculation in Pen stocks.
6. Study of corrosion of buried steel work/Study of the extent of rusting of embedded structures of towers and other metallic supports.
7. Study of corrosion of ferrous and non-ferrous metals in natural and artificially treated soils.
8. Corrosion in insulator fittings.
9. To study insulation of equipments under operating conditions.
10. Development of computer programming for power system problems.
11. Improvement of speech in telephone lines running along transmission lines/Inductive interference and corona on telephone lines and PLC equipment.
12. Development of H.R.C expulsion and drop out power fuses/Development of simulated fault testing for standardisation of 11 and 33 kV H.G. and drop out fuses to be used where fault level is below 30 MVA.
13. Development of relays & protection problems.
14. Radio interference measurements on insulators and hardware in the design of 400 kV lines.
15. Development of portable vacuum drying out set.
16. Communication and Telemetry.

### **Substations**

17. Study of soil resistivity.
18. To collect geological data, measure resistivity of earth and seasonal variation of the same.

### **Transmission**

19. Study of insulator contamination/Evaluating the performance of insulators and lightning arresters for operation in polluted atmosphere.
  20. Study of vibration of conductors in transmission lines.
  21. Temperature rise in over-head line conductors.
  22. Control of bushes and shrubs growing under transmission lines by chemical spray methods.
  23. Evaluation of fault currents in different sections of power system during outage conditions on vulnerable sections.
  24. Detection of incipient fault in power transformers and method of detection using solid state devices.
  25. Damage of A.C.S.R. conductors, hardware and line supports under chemical pollution.
  26. Distribution Transformer failures, causes and preventive action.
  27. Elimination of Earth wire for voltage upto 132 kV covering its entire aspects including that of protection.
  28. Reliability studies on power system.
  29. Distribution
  30. Study of wood and jointed poles for rural electrification.
  31. Investigation of problems with regard to the use of earth as return on single phase rural distribution system/Study of methods of cheap and reliable rural line construction.
  32. Improvement in continuity of power supply.
  33. Voltage regulation and improvement of voltage conditions in distribution system/Study of distribution problems, viz., losses, voltage regulation and application of capacitors.
  34. Study and development of cheap protective devices for 11 kV rural feeders.
- And
- Study of definite time current characteristics of out-door fuses for various weather conditions.
35. Methods of economising in rural electrification works.
  36. Use of insulated ground wire of H.V. transmission line for single phase distribution and also for direct tapping of power.

### **Generation (Thermal)**

37. Developmental work relating to elimination of failure of condenser tubes in large power houses.



38. Plant utilisation – Improvement of plant factor.

**Power System Planning, Operation and Control**

39. General study in system losses/To study the line interruptions and improvement of power factor and line losses.
40. Corona Studies on 400kV Transmission Lines - TR – 18

**Generation (Hydro)**

41. Induced melting of snow by spraying of coal dust.
42. Suppression of noise in under ground hydro power stations.

**Generation (Thermal)**

41. Improving the effectiveness of Electrostatic Precipitators.
42. Utilisation of flyash in the power station area of a linked mine.
43. Air-conditioning by using the waste heat from the flue gas by electrolux method.
44. Investigation of the possibility of utilising the coal mill rejects.
45. To investigate the outages in the Thermal Stations and the remedial measures to be taken.
46. Studies on extraction of chemicals from the flyash & utilisation of flyash for water treatment.
47. Development of chemicals as inhibitors required for acid cleaning of boilers
48. The frequency of conducting tests on the thermal units for improving the performance.
49. Problems relating to Instrumentation and control systems in thermal stations. - TR - 50
50. Study of failure of 6.6 kV Motors in Thermal Stations. -TR – 48
51. Study on failure of condenser tubes in large power stations.

**Generation (Hydro)**

52. Optimum Scheduling of generation in Bhakra Dam Power Station
53. Optimum Scheduling of generation in Sharavati Power Station.

**Transmission**

54. To maintain requisite clearance of transmission lines from jungle growth without resorting to laborious and expensive methods in practice for jungle clearing under the transmission line.
55. Study of distribution transformers failures, suggest preventive maintenance norms, evolve effective protective measures.
56. Anti-corrosion measures for lines, sub-station structures and equipments from atmospheric pollution (Pollutants comprising of sulphur dioxide, sulphur trioxide, chlorine, hydro-chloric acid and saline)
57. Minimum allowable IR values for transformers with change in Oil Characteristics and ageing of transformers. Deterioration of transformer oil characteristics with time minimum

limits upto which oil characteristics namely IR values, tan delta etc. can be permitted with reference to good performance of the transformers.

58. Induced voltages in control cables and communication circuits because of transferred potential and design of optimum grounding grids within EHV Sub-stations.
59. Electro magnetic and electrostatic induced voltages in control cables in the sub-station.
60. Interconnection of different material grounding mats and preventive measures recommended thereof. - TR - 43

### C. List of Problems taken up during VI Five Years Plan (1980-85)

#### Generation (Thermal)

1. Reduction of slag formation and coal ash deposits. -SEB(TN)16

#### Generation (Hydro)

2. Decreasing the noise level in the power station.
3. Studies on evaporation losses in storage lakes.
4. To demarcate the safe and most efficient operational regimes of turbines. - TR - 65

#### Transmission and Substation

5. Design of spacers for 400 kV Lines - TR - 68
6. Evaluation of condition of joints and clamps. - TR - 55
7. Over-loading of transmission lines and power transformers, limitations thereof. - TR - 74
8. Design and Development of composite insulators. -SEB(AND)44
9. Fabrication and field studies of hot-line washing kit. -SEB(AND)-9
10. Upgrading of existing lines utilising existing structures.
11. Increase in the incidence of faults in underground cables and joint boxes. - SEB(K)8
12. Studies on the Causes of failure of tertiary windings of power transformers and its protection. - TR - 38
13. Premature failure of H.T. Capacitors and circuit breakers controlling H.T. Capacitors - SEB(KAR)21 / TR – 33, SEB(PUN)28 / TR – 33, SEB(TN)12 / TR - 33
14. Study of field performance of tan delta equipment and neutralising transformer.
15. Techno-economic studies of providing cathodic protection for the power station steel grounding mats.
16. Studies to improve reliability in EHT bushings and sealed in EHT current transformers.

#### Distribution and General

17. Development of dry epoxy encapsulated distribution transformers of 63 & 100 KVA, 11/433 kV. -SEB(KAR)18 / TR - 67
18. Measures to increase the life of lamps and accessories in public lighting systems. - SEB(TN)4 / TR - 58

19. Effect of under frequency operation on generating plants and consumers equipments. - TR - 52
20. Development of pole mounted 11 kV, 75 MVA/150 MVA circuit breaker with local control and 100/50/5 C.T. and P.T. 11000/110 V arrangement for the purposes of the metering of rural H.T. services and 11 kV rural feeder lines. - SEB(AND)46
21. Insulation studies of power equipment. - SEB(KAR)5
22. Investigation into causes of failure of power transformer. - SEB(AND)-8 / TR - 72
23. Investigation into causes of failure of Power transformers - TR - 72
24. Investigation into causes of failure of Power transformers - TR - 72

#### **Transmission**

25. Sub-Conductor Oscillations in overhead bundle conductor transmission lines and remedial measures - SEB(PUN)20

#### **Substations**

26. Evaluation of concrete encased earthing electrodes and use of structural steel for earthing - TR - 78
27. Study of voltage surges in 220 kV system due to switching operations.
28. Techno-economic studies regarding application of synchronous condensers and static compensators.
29. Use of different inhibitors on insulating oil and prolonging their life and application of acidity test in determining the dielectric strength of transformer oil.

#### **Generation (Thermal)**

30. Investigation on Water Chemistry, Material Compatibility and Related Problems in Steam-Water Cycles of Thermal Power Stations. - SEB(TN)64 / PR-8
31. Investigation on Boiler Tube Failures in Thermal Power Stations - PR-9
32. Erosion of Pulverised Coal Pipes and Burners in Thermal Power Stations. - TR - 80
33. Improvement in Performance of Induced Draft Fans (ID Fans) and Electrostatic Precipitators (ESP's)

#### **D. List of Problems Studied During 7th Five Year Plan (1985-90)**

##### **Generation (Thermal)**

1. Effect of generating unit caused by loss of excitation - TR - 76
2. Study of noise and noise control in existing Thermal Plant Auxiliaries at Basin Bridge Power House and Ennore Thermal Power Station of Tamil Nadu Electricity Board - SEB(TN)7 / TR - 71
3. Effect of contamination of cooling water with harmful foreign materials discharged from industries situated nearby and fouling organisms (animal and plant) - SEB(TN)9 / TR - 75
4. Methods of chemical cleaning of Power Plant Equipments for effective removal of Iron Oxide and copper salts

5. Studies on the influence of material characteristics on flow behaviour of raw coal - TR - 109
6. Critical study of severe coal choking problems specially due to wet coal in Thermal Power Stations - SEB(MAH)3 / TR - 101
7. Study of L.P. Heater tube failure due to copper pick-up in the feed water system.
8. Study of minimum running of auxiliaries for safe running of power stations with best economy in power consumption. - SEB(MAH)4
9. Critical analysis of power station waste water treatment, recycling & reuse for economy - SEB(MAH)2

#### **Distribution**

10. Design and development of fault locators - SEB(AND)6
11. Conservation of Energy - SEB(AND)7, SEB(PUN)24
12. Development of good transporting devices for transportation of energy meters in rural areas to prevent danger of defects developing in internal mechanism during transport - SEB(HP)3
13. (a) To study the failure of energy meters and to suggest remedial measures to minimise the damage rate. Effect of ageing on performance of meters and to evolve norms to enhance the periodicity of checking from five years to seven or ten years.  
(b) Investigation of causes of burning of the meters and suggest remedial measures for prevention of the same. SEB(HAR)98, SEB(TN)6 / TR - 60
14. To carryout study regarding overloading of distribution transformers in relation to altitude. - TR - 82
15. Load management in urban and rural distribution system.
16. Protection on the L.T. side of the distribution transformers to reduce failures.
17. Minimisation of system loss.
18. Premature failure of H.T. Capacitors and circuit breakers controlling H.T. Capacitors.
19. Study of premature deterioration of RCC Poles and grills erected in coastal areas.
20. Techno-economic feasibility study of application of series capacitor for distribution system. - SEB(HAR)27
21. Protection of distribution transformers.
22. Study of development of right type of moulded case circuit breakers as a specific protection to distribution transformers and its effectiveness compared to the conventional protection.- SEB(HAR)19
23. Study of the use of low cost switchgear for rural sub-stations and distribution.
24. Desirability of resorting to single-phasing in the rural areas and its consequential effects on the life of distribution transformers and on system losses.
25. 11 kV single phase distribution system.
26. Failure of analysis of distribution equipment.

27. To study the causes of failure of underground HT/LT cables & cable joints and to suggest the remedial measures to prevent failure rate. -SEB(AND)10, SEB(PUN)35, SEB(TN)10 / TR - 89
28. Design & Development of high performance/Energy efficient Motors for Irrigation Pumps. - IIT-2
29. Standardisation of specification for distribution transformers.
30. Optimisation of line losses and techno-economic comparison with the existing system.
31. (a) Development of Digital Trivector Meter.  
(b) Study of Static meters over conventional electromagnetic meters. - SEB(HAR)35
32. Overfluxing of distribution transformer. - SEB(TN)13 / TR - 102
33. Assessing the suitability of pre-moulded equipment connectors and cable joints (11 kV & 33 kV class) for quick but reliable interconnections and disconnections.
34. Techno-economic comparison of phase to phase and phase to neutral single phase H.T. Distribution Systems.
35. Techno-economic feasibility study of applying Aerial Bundled conductor system in L.T. Distribution - SEB(KAR)10, CBIP(R )456, SEB (TN)62 / TR - 114

#### **Power System Planning, Operation & Control**

36. Study of the application of Static VAR Compensator to control reactive power and voltage of network. - TR - 41
37. System analysis of voltage quality harmonic contents, phase unbalance normal regulation, frequency variation, flicker and voltage dips at selected locations on an operating company sub-transmission system. - SEB(HAR)18, SEB(K)1
38. Short and long range forecasting techniques.
39. Study on the Generation of higher harmonics in case of traction load, their harmful effects on power system and remedial measures. - CPRI-43 / TR - 83
40. Development of a disturbance recorder to measure the over voltages in LV systems. - CPRI-31
41. Security Analysis and State Estimation of Power System.

#### **Generation (Hydro)**

42. Eradication of spider menace
43. Contamination of Cooling Water
44. Metallurgical solutions to the erosion problems in Hydroelectric Projects. - TR - 105
45. Optimal setting of Governors of Pelton Turbines. - SEB(KAR)9

#### **Transmission & Sub-Station**

46. Failure of HV bus bars and HV & EHV Circuit Breakers. - SEB(K) 9
47. Study of overheating phenomenon in clamps used in EHV lines and substations - CBIP(R) 455

48. Study and feasibility of applying series capacitor.
49. Electro-magnetic and Electrostatic phenomenon near EHV & UHV Installations. - TR - 84
50. To develop a device to measure the magnitude and rate of rise of lightning stroke current contacting transmission tower and to determine the equivalent induction of the tower for predicting the tower top voltage. - TR - 85
51. Creepage of ACSR Conductors.
52. Failure of lightning arresters at grid substations. - SEB(PUN)25
53. Customer service direct from transmission lines.
54. Study of System losses in interconnected Power System wheeling power.
55. Economic design of foundation of transmission lines.
56. Development of a device to indicate tower or pole on which power frequency flashover has taken place. - SEB(PUN)32
57. Ground Potentials in high voltage substations
58. Location of partial discharge in power transformers by computation and measurement of capacitively transmitted voltage surges. - TR - 100
59. Develop and design current transformers and potential transformer with no mechanical connections. - SEB(KAR)16
60. Model studies of earthing system in non-homogeneous soils. - SEB(PUN)15
61. To study the effectiveness of Bentonite as a backfill for ground rods in order to obtain a satisfactory rod/soil contact. - SEB(KAR)2, SEB(PUN)23 / TR - 86
62. Evaluation of shielding failures of transmission lines.
63. To study the vibration phenomenon on transmission lines with the help of vibration recorder and to find out the appropriate locations of installation of vibration dampers. Also to study the comparative advantages of using self damping ACSR Conductor/ Brittle damper. - CBIP(R)482
64. Diagnostic testing of transformer faults and evolving a programme for such testing.
65. Opening of tertiary winding and its effect on the power equipment and interference with communication system.- SEB(HAR)29
66. Effects of harmonics on the life of power Transformer/ Distribution Transformers. - SEB(HAR)36
67. Evaluation of Transient Recovery voltage (TRV) of high voltage systems at 245 KV sub-stations in and around Bangalore.
68. Prevention of failure of Lightning Arrestors.

#### **Protection & Control**

69. To study and investigate causes of electrical accidents including those caused by the snapped conductors and to evolve remedial measures for reducing the same. - SEB(MAH)7

70. Study of Insulation levels at Rod Gap/Horn Gap fuses and determination of Economical Composite Insulator Design.
71. Study of new alternating current testing methods for non-destructive insulation test.
72. To establish the methodology for determination of the useful life of PT and CT. - CBIP(R) 607
73. To study the variable speed drives.
74. Design of suitable 11 kV D.O.L.O. units to substitute the existing D.O.L.O. unit with fuse links.
75. Study on the feasibility of using distribution line for communication between line staff and sub-station.
76. Development of an equipment to indicate whether a 11 kV feeder is energised or not.

#### **Generation (Thermal)**

77. Condition Monitoring of Power Station rotating equipment by Ferrographics Method and its Integration with Conventional Monitoring System. - TR - 96
78. Studies on flow behaviour of Raw Coal from Bunkers.
79. Wear & Abrasion in Coal Components. - NTPC-5
80. Slagging and Fouling problem in Thermal Power Station -NTPC-26 / TR - 97
81. Use of Coal ash in road construction work

#### **Distribution**

82. Study of Tamper Proof Methods for Energy Meters - SEB(TN)1 / TR - 93
83. Study of Electronic Meters for Beneficial adoption & utilisation of power Boards. - SEB(TN)11 / TR - 94
84. To study the problems due to corrosion and loose contacts at joints between service mains and distribution lines.
85. Development of Improved distribution transformers with cost efficient protection & improvement in distribution Box.
86. To develop principles and methodology for collection and updating of data base related to distribution system at the level of Section Officers/Junior Engineers in Utilities. - TR -108
87. Investigation of Impulse Voltage Characteristics of Distribution Transformers.- TR- 95
88. Study, modelling and verification by Tests and Creation of Facility for Response of LT Electrical Equipment enclosures to impulse Energy Release caused by Gaseous explosion. -CPRI-42

#### **Transmission**

89. Methods & means to detect corrosion in metal embedded in concrete i.e. in tower legs of EHV Transmission lines, 33 kV steel support & stays etc. – Extensive literature survey and do documentation thereof. - CBIP(R)538 / TR - 87
90. A real time thermal rating monitoring scheme for transmission lines in U.P. Power System.

91. Customer service direct from EHV Transmission lines through the Capacitive Coupling.
92. Simulation Studies on TNA for 800 kV UHV Transmission. - CPRI-2 / TR - 91
93. Field Testing of Transmission lines & associated equipment.

#### **Protection and General**

94. Development of a Computer/micro-processor based relay test bench to study the behaviour of protective relays of all types under power system transients.
95. Reliability Evaluation of Transformers, Switchgears Transmission lines etc.
96. Development of high temperature thermostat materials for electrical applications - CPRI-33
97. Development and Evaluation of Five Retardant and Low Smoke Power Cables.
98. Development of new techniques for Evaluation of AC & DC High Voltage Power Capacitors.
99. Setting up of Mobile Vibration Laboratory
100. Diagnostic Studies on the pure SF6 gas using quadrupole Mass Spectrometer.

#### **Generation (Thermal)**

101. Study on Reswitching Transients and their effects on the Design and Operation of Large Induction Motor drives for Power Station Auxiliaries. - PR-10

#### **E. List of Problems Studied during 1990-99**

##### **1. 20 Projects sanctioned vide Ministry's letter no. 45/4/90-T&R dated 27-3-91 Generation (Hydro)**

- Arrangements for collection and disposal of floating trash by mechanical and hydraulic means in front of power intakes in hydro power plants.
2. Composite representation of a multi-reservoir Hydroelectric Power system & optimal operation of multi-reservoir system being composite representation
3. Development of epoxy coatings for runner blades to avoid erosion due to silt. - TR - 104
4. Predicting residual life of hydro turbine runners - SEB(MAH)5

#### **Substations**

5. To create infrastructure for field testes to investigate the effect of kick load phenomenon of steel rolling mills on the life of power transformers
6. Evaluation of performance of various types of breathers
7. Investigation of causes for failure of high voltage current transformers in service
8. Investigation on gas insulated system
9. Investigation of lightening & switching phenomenon and co-relation of the same with the performance & application of lightening Arresters
10. Evolving design of earth mat for a substation site of limited area and high resistivity - SEB(PUN)34 / TR - 103



11. A. Determination of pollution performance of metal oxide arresters (MOSA) under pollution condition for the purpose of evaluating ageing characteristics.  
B. Determination of the performance of external insulator under pollution ageing conditions, under both AC & DC voltage
12. Investigation of the fundamental properties of arcs i.e. arc resistance, arc time constant & other parameters relating to arc resistance, transport properties of the arc, arc time constant, behavior around current zero & quenching mechanism in different media.

#### **Transmission**

13. 132 kV Compact pole line design
14. Determination of swing angles for 800 kV transmission system by wind tunnel experiments. - CPRI-36 / TR - 92
15. Study of harmonics content present in the system and determination of permissible limits of harmonics - TR-124
16. Development of computer software package for short range load forecasting as applied to power system operation - SEB(AND)4, SEB(HAR)34/ TR - 110

#### **Protection and General**

17. To study electrical treeing behaviour in cross-linked polyethylene cables used for working voltage upto 33 kV and recommend remedial measures.
18. Studies on accelerated ageing of power capacitor dielectric systems consisting of indigenous and imported poly-propylene films & impregments - TR - 107

#### **Generation (Thermal)**

19. Microprocessor based programmable sequence of event recording system.

#### **Distribution**

20. Field trials of Amorphous core transformers for determining their tech-economical efficacy - SEB(TN)55

### **23 Projects sanctioned vide Ministry's letter no. 44/3/91-T&R dated 24-3-93**

#### **Transmission**

21. Prediction of Carona noise on HVAC power line carrier communication channels - SEB(HAR)30 / TR – 118

#### **22. Protection and General**

- Residual life assessment of auto/power transformers after their failures - SEB(TN)58 / TR - 113
23. Reliability modelling of generation system including unconventional energy sources - SEB(HAR)22 / TR - 117

#### **Power System Planning, Operational & Control**

24. Evaluation of harmonics level in distribution system due to usage of electronic equipment in industries
25. Development of expert system for security analysis

26. Advanced concepts in computer aided operation planning and protection of electric power systems

#### **Substations**

27. Study of the life and failure of station batteries in grid substation –analysis of premature failure of batteries & its preventive measure
28. Condition monitoring of reactors and transformers by dissolved gas analysis
29. Economic design of substation structures foundations and layouts - TR - 98

#### **Generation (Thermal)**

30. Characterisation of fly ash from 10 Thermal Power Station - CBIP(R)457 / TR - 106
31. Re-welding of coal mill grinding rollers

#### **Distribution**

32. Remote metering of H.T. consumers
33. Operational aspects of 11 kV voltage capacitors boosters, auto reclosures & sectionalisers
34. Communication needs for 33 kV Urban distribution system -TR - 116
35. Field verification of the computer programme for determination of optimal rating & location of shunt capacitors in a 11 kV distribution system
36. Techno-economic feasibility study of applying ABC system in HT Distribution
37. Develop a load forecasting techniques/model for estimating future demand of power in rural and urban areas - SEB(PUN)37
38. Development of expert system for security analysis
39. Pilot research project for improving the reliability of supply with improvement in available equipment & lines accessories - SEB(MAR)6
40. Setting up of an Arc Diagnostic Laboratory
41. Develop and test improvement designs for rotating electrical machines
42. Development of a work station for the design & analysis of power systems
43. Partial discharge investigation in transformer and other insulation systems

#### **23 Projects sanctioned vide Ministry's letter no. 45/2/93-T&R dated 31-3-94**

#### **Protection and General**

44. To study and investigate causes of electrical accidents and to evolve remedial measures for reducing the same
45. Development of flame retardant low smoke (FRLS) cable compounds by chemical modifications of Poly V.C.
46. Dispersion of pollutants in air emitted from multiple sources
47. Electricity tariff formulation based on marginal costing - SEB(KAR)22 / TR-123
48. To select the required hardware configuration & the appropriate system software available in the country & develop appropriate application software for building up a GIS data base for distribution system of Calcutta
49. Design and development and construction of a supervisory control and data acquisition system for obtaining pertinent information from and for controlling unmanned distribution stations from a remote manned station over two pilot wires

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50. Field evaluation of computer programme for optimum location of capacitors on radial distribution feeders
  51. Study of various method of giving supply to multi-storied complexes
  52. Effect of imperfect grounding of neutral wire on distribution line performance with special reference to neutral to earth voltage
  53. To carryout studies regarding failure of LA in relation to altitude in HPSEB
  54. Techno-economic comparison of FRP cross arms v/s conventional type cross arms - CBIP(R ) 496
  55. Prevention of tampering of name plates of motors -SEB(KAR)11

#### **Substations**

56. Evolving deign of earth-mat for a substation site with limited area and high resistivity soil

#### **Power System Planning, Operation & Control**

57. State estimation of power system and its implementation on MPEB system - CBIP(R)484
58. Co-ordination of protective relays in generating stations, transmission networks - TR - 115
59. Supervisory control and electric data link
60. Reliability evaluation of bulk power system software development of PC based package
61. Sub-transmission network planning using linear programming

#### **Generation (Thermal)**

62. Standardisation of methods for ash water treatment and developing economic methods for reuse
63. Electronic drum water level measurement
64. Study of effects on the life of the turbine rotor, bearing and last stage blades due to frequent variations in the speed of the turbine due to frequent variation in system frequency in the grid - TR - 112
65. Scheme for improving thermal power plant availability development of computer software packages for optimum maintenance schedule of thermal plant
66. Bench and pilot scale studies for pneumatic transportation of – 6 mm and –20 mm size coal and design of pneumatic pipe line of 80 tonnes/hrs. capacity for feeding into bunkers at a distance of 400M

#### **16 Projects sanctioned vide Ministry's letter no. 44/1/94-T&R dated 18-10-95**

##### **Protection and General**

67. To Recommend a Computerised and Quicker Method for Thermal Class Evaluation Of Insulating Materials

##### **Distribution**

68. To study the problem regarding disputing of 33kv sub-transmission lines on high altitude in snow bound area

69. Life expectancy of Aluminum wound distribution transformers and its effect on the capitalisation of losses vis-à-vis levy of penalty for the transformers having enhanced losses - CBIP@604
70. To examine The Healthiness/ Effectiveness of Lightning Arrestors Installed in the Distribution System and to Examine their Usefulness vis-a-vis Cost Involved and to Suggest Remedial Measures - SEB(PUN)17
71. Core balance test of power transformer and to evolve minimum acceptable value for various voltages range of power transformers - TR-125

#### **Substations**

72. To Study The Healthiness of Existing Grounding Grid and to review The Existing Design Practices and to suggest Remedial Measures for Existing Grids and Modify Design Practice, if necessary
73. Scheme for development of lattic type rigid aluminium tube bus bar for substations
74. Evaluation of the Existing Grounding System & Recommendations For Better Grounding System Design Procedures
75. Evaluation of minimum IR value of power transformers for its safe operation, effects of ageing on the I.R. Values of the transformers - CBIP(R)493 / TR - 120
76. To study the Effect of Atmospheric Pollution on Insulator Flashover and Remedial Measures thereof

#### **Power System Planning, Operation and Control**

77. Development of Flexible Power Factor and Harmonic Controllers

#### **Transmission**

78. To enhance power transmission capability and improve the dynamic performance of the power system through fast control
79. Ash disposal pond slurry transport and settlement
80. Evaluation of standards for cooling water treatment practices

#### **Generation (Hydro)**

81. Study of failure of stator air coolers and bearing oil coolers in Hydro generators
82. Study on failure of winding of hydro generator and suggesting remedial measures

#### **17 Projects sanctioned vide Ministry's letter no. 45/7/95-T&R dated 18-12-95**

#### **Protection and General**

83. Residual Life Assessment of Power Transformers by Lab. Simulation Studies - CBIP(R)561 / TR - 121
84. Field Evaluation of Non-Ceramic Insulator for use in Power Transmission under Indian Conditions
85. Electric Arc Heater

#### **Substations**

86. Field Monitoring of Surges on Transmission Line and Evolving a Lightning Model
87. Techno-economic Feasibility Study and Design of Earth-mat for EHV Substations
88. Arresting the Growth of Vegetation in Sub-stations Yards

89. Breaker Condition Monitoring by Auto Co-relation and Cross Co-relation Techniques Using Vibration and Noise Signatures

90. Development of In-situ Drying of Power Transformer by Resistive Heating

#### **Power System Planning and Operational & Control**

91. Study of Reactive Power Variation and Determination Permissible MW and MVAR Loading with respect to Short Circuit Levels - TR - 122

92. Development of a tool for Ascertaining Flow of Harmonic Power in Power System

93. Voltage Collapse Problem in Power Systems

#### **Transmission**

94. To study the effect of harmonics on Power Transformers and to take remedial measures thereof and to fix safe limits of harmonics in Power system - CBIP(R)562

95. The Design of Thyristor Controlled Series Compensators and their Associated Control for SSR Mitigation

96. Upgrading of Existing 132 kV Line to 220 kV by use of Insulated Cross Arms - Received

97. Biological Effects of Ultra High Voltage Fields

98. Evaluation of Effective Method for Assessment of the Capacity of the Motor of the Customer Premises

99. Study of communication requirements for improving the efficiency of distribution system

#### **10 Projects sanctioned vide Ministry's letter no. 45/4/96-T&R dated 31-3-97**

#### **Protection and General**

100. To study the Co-ordination between Drop out Fuses and MCCB's

101. Development of an Electronic Device for Overload Protection of Distribution Transformers of 63 KVA and 25 KVA Capacity on L.T. Side with Auto Reclosure Facility

#### **Distribution**

102. Design and Fabrication of Live Line Voltage Distribution and Resistive Leakage Current Measurement Equipment for Zinc Oxide (ZnO) arrestors

#### **Substations**

103. Effect of Ageing on Transformer Insulation and Mineral Insulating Oil in Service

104. Performance Analysis and Condition Monitoring of SF<sub>6</sub> and Vacuum Circuit Breakers in Substations - SEB(TN)25

#### **Power System Planning, Operation and Control**

105. Active Filter for Harmonic Elimination in Power System

106. Measurement of harmonic levels at non-linear loads with a view of creating a data base

107. Failure Analysis of EHV Circuit Breakers

#### **Energy Conservation**

108. Power conservation and consequently saving of power loss and energy conservation

109. Field Trials of Polymeric Coating in Runner Blades of Hydro-turbine

# CHAPTER 4

## LIBRARY AND INFORMATION BUREAU

### 4.1 LIBRARY & INFORMATION BUREAU

The Library and Information Bureau was created on 1<sup>st</sup> May 1931 on the recommendation of the Royal Commission on Agriculture and was attached to the Central Board of Irrigation. The main functions of this Bureau were to maintain a Library on irrigation and allied subjects; to establish contacts with Institutions in India and other countries engaged in irrigation etc., with a view to exchange publications, to collect and supply information on irrigation development and also to disseminate the results of research on these subjects. Subsequently, when Power Engineers joined the Board, the scope of the library was enhanced to cover Hydro electric engineering and its allied subjects.

In course of time, the Library began to grow. The annual intake of new literature and the number of books lent to provincial officers increased considerably and more and more technical enquiries had to be dealt with by the Secretary of the Board. The library endeavoured to obtain all useful literature on Irrigation, Hydropower and allied subjects. For this purpose contacts were established with engineering organizations not only in India but also in about 30 countries like U.S.A., U.K., Canada and Germany etc. Over the years these contacts increased at a fast pace and the library could get lot of literature, many on complimentary basis, and was able to keep itself informed of the activities of other engineering organizations both in India and abroad. The facilities of the Library were extended to Indian States.

As the original organisation and financial arrangements proved inadequate for the growing work, the Board was faced, in 1945, with the alternative either of cutting down the activities which it had undertaken to perform or to strengthen the organisational set-up and seek additional funds for the purpose. The Board decided to adopt the latter alternative and, keeping in view the anticipated tempo of the post-war reconstruction programme, it approved a major re-organisation of the Board's office and Library.

Therefore, the Board requested the Government of India to give the Board an additional grant of Rs. one lac per year. As mentioned earlier the Govt. of India, had established the Central Waterways Irrigation and Navigation Commission (CWINC) in 1945. This body was, inter alia, charged with the responsibility to collect, coordinate, publish and analyse data relating to Water, Power, Waterways, Tidal rivers, Rainfall and Temperature, Ground Water Resources, Silting of Resources, Behaviour of Hydraulic Structures etc., While agreeing to the need of strengthening the Bureau, and assisting the Board, the Government of India, however, decided to assume full financial responsibility for maintaining the Library and the Information Bureau by treating it as a part of the Central Waterways, Irrigation and Navigation Commission, who would arrange for the expansion, maintenance and operation of the Library.

As the CBIP was facing financial constraints and also lack of adequate space, it agreed to the proposed transfer of library and Information Bureau to CWINC. However the Board emphasised that the facilities then being offered by the Library to the provincial engineers and research officers, should not be curtailed in any respect which was agreed to. Accordingly, the Library and Information Bureau was taken over and formed part of the CWINC later Central Water and Power Commission w.e.f. from 1<sup>st</sup> April 1946.

**Necessary administrative arrangements were put in place in 1951 and a separate ‘schedule’ was drawn up which clearly mentioned that the Board or any of its members, as the case may be, would have the same privileges and rights as the members were already availing and that the Central Water and Power Commission will have the obligations as set forth in the Schedule.**

**As per the, “Schedule” it was agreed that in the management of library, the Chairman Central Water & Power Commission would be advised by a Committee comprising (a) the Chairman, Central Water and Power Commission (b) the President or Vice President of CBIP (c) the Secretary of the CBIP. This Committee therefore established the necessary liaison between the Central Water and Power Commission and the Central Board of Irrigation in respect of the Library.**

**Many improvements were carried out and some changes were made in Library procedure during the years 1946-48. All instructions and standing orders, etc., with regard to the upkeep of the Library were consolidated into the Library Manual, published by the Board in August 1948 as Central Board of Irrigation Publication No. 45, for the use of officers and staff of the Library. The Library and Information Bureau continues to be the main source for documentation facilities in the field of irrigation and power engineering for the whole country. It is the largest technical library in India covering the allied fields of Irrigation, Water Resources & Power.**

Until the middle of December 1951, the Library and Information Bureau was located at Shimla and later it was shifted to Bikaner House on Shahjahan Road, New Delhi and then to R.K.Puram. It is now housed in a separate independent building located at RK Puram where the main offices of Central Water & Power Commission (now bifurcated as Central Water Commission and Central Electricity Authority) are located.

The literature received in the Library consists of books, periodicals, maps, photographs, trade catalogues and films. The books include text-books, government reports, publications of official & non-official societies, type-written notes and pamphlets & manuals. Books have been procured / obtained on all branches of Civil and Electrical engineering and other allied subjects, viz., Irrigation, Hydro-Electric engineering, Water Power, Hydraulics, and Hydraulic engineering, Navigation, Soil Mechanics, and Foundations Engineering, Geology, Climatology, Mechanical Engineering, Rail & Road Engineering, Concrete, Engineering Materials of Construction, Town Planning, Water Supply & Sewage, Soil Erosion & Conservation, Law, Mathematics, Surveying and Architecture. Engineering and scientific periodicals are also being subscribed on the above subjects. The library had a valuable collection of books, reports and other publication totalling more than 2,21,000. In addition

it had about 2500 maps and 2000 photographs. A Book Selection Committee had been constituted for selecting books and periodicals for the purchase in each year. In addition, books and journals were also procured on the basis of suggestions received.

#### **4.2 LIBRARY AT THE HEADQUARTERS OF CBIP**

The Central Board of Irrigation and Power has in the recent years intensified its activities in respect of holding International & National Conferences, Seminars, Trainings and Consultancy activities for the convenience of participants and others. It has also setup a separate library of its own located at its headquarters in Chanakyapuri, New Delhi.

It has more than 9000 books including Journals and CBIP publications. The Library also receives a large number of Journals, Reports on research and other activities on 'Exchange Basis' from well known organisations from within the country and abroad. The Library and Information Bureau extends facilities to over 3,000 engineers & scientists of various Irrigation Departments, Electricity Boards of the States and Union Territories and Universities and Institutions in the country. Request for literature on various subjects and technical enquiries on specific problems on all aspects of work pertaining to irrigation and power fields are received regularly in the Library.

The library has digitised all the important publications, proceedings of the conferences and seminars etc. The Indian chapter of International societies having headquarters in CBIP have also digitised all their publications, proceedings etc. which are available in CBIP library for reference by the members.

With the setting up of its "Centre of Excellence" at Gurgaon in its newly constructed campus, another library is being set up to cater to the need of specialised training programmes of the centre.

#### **4.3 PUBLICATIONS**

As mentioned earlier the primary function of the Board is the dissemination of knowledge in respect of Irrigation and Power. This is being done through the Journals and Publications, bringing out of new publications, revision of old Manuals as well as the Proceedings of the International and National Conferences, Workshops, Seminars which have now become regular features of CBIP.

Activity of publication of maps which were being carried out regularly in the past decades has also been intensified as a result of which 'Irrigation Atlas', 'Power Map of India', Map containing 'Regional Power Grids and Generating Stations', 'Renewable Energy Map', 'Hydro power Map'



Shri Rajiv Gandhi, Hon'ble Prime Minister visiting the CBIP Publication Stall during Golden Jubille Celebrations



etc. have been published. These maps are regularly updated and have become very popular as they display latest data on Water Resources & Energy sector etc.

The Publications brought out by CBIP consist of Technical Books, Manuals, Reports, Journals etc. which are grouped as under:

S. No.	Category	Total
1	General Publication (Civil & Power)	324
2	Technical Reports (WR)	55
3	Literature Review / Status Report Misc. Report (WR)	52
4	Manual / Guidelines (WR)	07
5	International and National Conferences / Seminars / Workshops Proceedings (Water Resources)	169
6	Technical Reports Power	124
7	Literature Review / Status Report / Misc. Report (Power)	11
8	International and National Conferences / Seminars / Workshops Proceedings (Power)	164
9	Proceedings of International R&D Conferences	07
10	Publication of International Association on Electricity Generation, Transmission and Distribution (Afro-Asian Region)	11
11	Common Publications	77
12	Publications Printed by CBIP on Behalf of CEA	05
13	Maps / Atlas	35
14	Annual Reports	69
15	CBIP Journals	655
	Total	1765

Some of the important CBIP Publications which are very popular and in great demand are listed below.

#### List of Important Publications:

- Small Hydro Stations Standardisation (1985) (Revised in 1995) (Re-Revised in 1996)
- Manual on Sub-Station — Chapter on Design of Earthing Mat for High Voltage Sub-Station (1992)
- Meter and Relay Testing Practices in State Electricity Board (1992) (Revised in 1997)
- Reduction in Transmission of Distribution Losses and Remedial Measures (1994) (Revised and Enlarged October 1996)
- Modern Trends and Practices in Power Sub-Transmission and Distribution Systems, Vol. I & II (1996)
- Latest Trends in Control and Instrumentation (1997)
- Concrete Dams – Dr. H.D. Sharma (1998)

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| 8.  | Energy Conservation Guidelines – Shri Vijay Vihari (1998)  | 27. | Manual on Development of Small Hydroelectric Projects, 2009  |
| 9.  | Manual on Protection of Generators, Generator Transformers and 220 kV and 400 kV Networks (1998) | 28. | Design of Weirs on Permeable Foundations – Shri A.N. Khosla, Dr. N.K. Bose and Dr. E. Mckenzie Taylor (1936) (Reprinted 1954, 1962 and 1981) |
| 10. | Manual on Transformers (1999)  | 29. | Manual on Planning and Design of Hydraulic Tunnels (1984)  |
| 11. | Guide for Limiting Current Harmonic (1999)   | 30. | Manual on Barrages and Weirs on Permeable Foundations Vols. I & II (1985)  |
| 12. | Guidelines for Electrical Installations in High-Rise Buildings (2001)                            | 31. | Large Dams in India, Vol. I (1987) Vol. II (1998)  |
| 13. | Manual on Renovation, Modernisation and Life Extension of Thermal Power Plants, May 2003         | 32. | Planning and Management of Hydro Power Resources in India (1992) (Dr. B.S.K. Naidu)  |
| 14. | Hydroelectric Power Stations in Operation in India, July 2003                                    | 33. | Damage to Underwater Parts of Hydro Turbines and Metallurgical Solutions   |
| 15. | Manual on Renovation, Modernisation, Upgrading and Life Extension of Hydropower Plants, 2005     | 34. | Pumped Storage Schemes in India (1997)   |
| 16. | Manual on Commissioning Procedure for Transmission Lines, 2006                                   | 35. | Typical Dams in India (1998)   |
| 17. | Manual on Maintenance of Transmission Lines  | 36. | Manual on Design of Towers for Long Span River Crossing  |
| 18. | Manual on EHV UHV Substation Equipment Maintenance   | 37. | Earth Reinforcements – Design and Construction   |
| 19. | Manual on Transformer, 2006  | 38. | Manual of Rock Mechanics   |
| 20. | Manual on Reliable Fault Clearance and back up protection of EHV & UHV Trans. Networks           | 39. | Manual of Underground Works  |
| 21. | Manual on Substation Layout, 2006  | 40. | Dams in India – 2013   |
| 22. | Manual on Earthing of A.C. Power System, 2007  | 41. | Geosynthetics in Dam Engineering   |
| 23. | Manual on Specification for A.C. Static Energy Meters, 2008                                      | 42. | Instrumentation of dams  |
| 24. | Manual on Gas Insulated Substation   | 43. | Manual on River Behaviour Management & Training  |
| 25. | Manual on Earthing of A.C. Power System  | 44. | Sediment Management in Water Resources Projects  |
| 26. | Hydroelectric Power Station in India   | 45. | History of Irrigation Development and Management in India  |
|     |  | 46. | Water Resources Development Scenario in India  |

### 4.3.1 Leaflets

Every time a particular aspect of basic research was finalized and approved by the Research Committee and the Board, the recommendations were being brought out in the form of short popular leaflets in layman's language. Some important leaflets which have been issued are given below.

- (i) Irrigation Research in India
- (ii) New Projects for Irrigation and Power in India
- (iii) Hydro-electric Development in India
- (iv) Irrigation in India through Ages

### 4.3.2 Journals

CBIP has been publishing a number of Journals since its inception. The arrangements of contents, get up, scope, etc have also undergone some changes, in accordance with needs of time.

#### Special Issues on Important Projects

Special issues of Water & Energy International covering details of a particular project since its inception till completion are also being brought out by CBIP. These issues inter alia cover the details of special problems confronted during execution of the project and how they have been resolved. These publications have been very well appreciated as such detailed information of projects are no where available. Such special issues have been brought out for the following projects:

- (i) Nathapa Jhakri HEP (1500 MW)
- (ii) Tehri HEP
- (iii) Indira Sagar Project
- (iv) Omkareshwer Project
- (v) Chamera HEP Stage II (300 MW)
- (vi) Nangal Hydel Channel

#### • *Irrigation and Power Journal (now renamed as Water and Energy International)*

This Journal containing technical articles, news on irrigation and allied activities both at home and abroad, was being issued quarterly since 1945. The publication was changed to be a monthly one from 1960 to 1963 but later on quarterly issues were resumed. Further, this journal was renamed "Water and Energy International Journal" in 1995.

#### • *Central Board of Irrigation and Power Abstracts*

The CBIP had also undertaken the task of preparing the abstracts of important, useful and relevant articles on topics of water resources, power and allied fields covered in the literature received in the Library and Information Bureau to help the professionals of these sectors to take advantage of the CBIP library which is one of the biggest Libraries on Irrigation and Power Engineering. The abstracted material was being published as bi-monthly journal issued by the Board. Since April 2010 this is now a part of the Water and Energy International and not issued separately.

**• Irrigation and Power Research Digest**

The Board used to issue annual technical reports till 1966 covering the entire work carried out at the research stations. From 1967 onwards this practice was discontinued and the Board started inviting selected papers on specific research which formed part of the proceedings of the research sessions.

In order to bring the results of research in progress, a bi-monthly irrigation and power research digest containing the summaries and the studies on problems conducted at different research stations was started from early 1967 and continued till April 2010 when it was also amalgamated with the Water and Energy International.

As on date, the other periodicals which were also being brought out regularly by CBIP, namely Far & Near in Water and Energy (Quarterly) covering important relevant news and CBIP Newsletter also form part of the Water and Energy International. Thus CBIP is now publishing one monthly Journal covering all the topics of separate journals being issued before April 2010.

CBIP was also publishing the following Newsletters for the Indian chapters of International Societies for which CBIP acted as Secretariat:

INCOLD News (Half yearly)

IGS India News Bulletin (Half yearly)

Tunnelling News (Half yearly)

ISRM Newsletter (Half yearly)

IASH Newsletter

SPE Journal and Newsletter

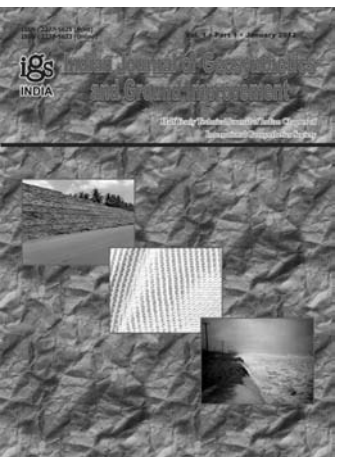
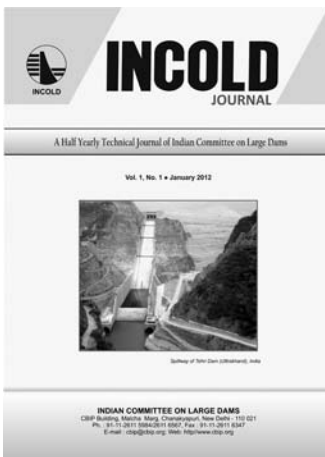
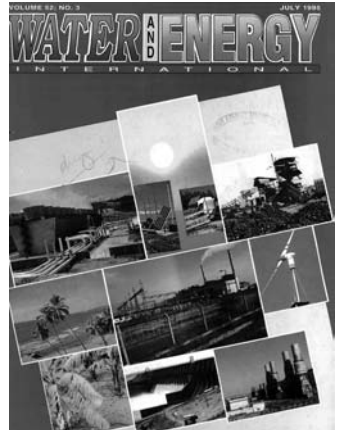
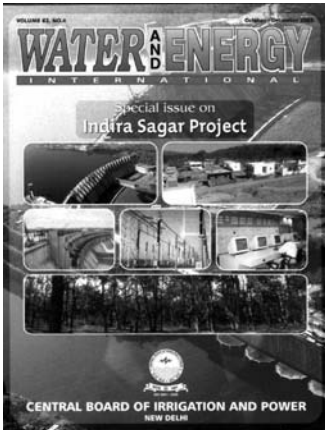
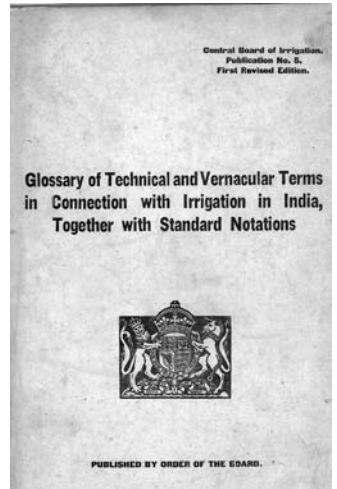
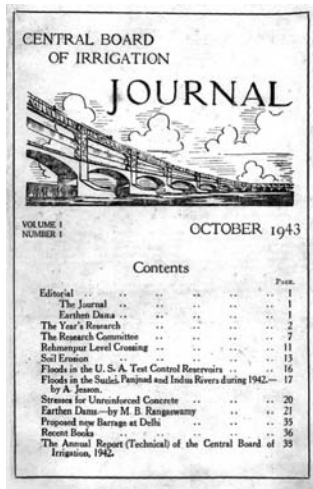
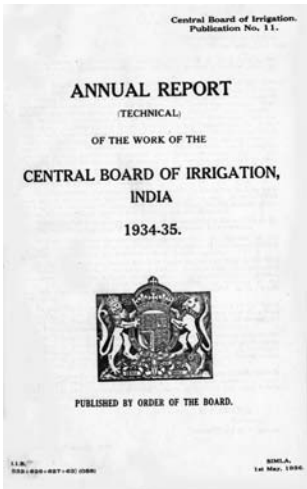
AARO Journal and Newsletter

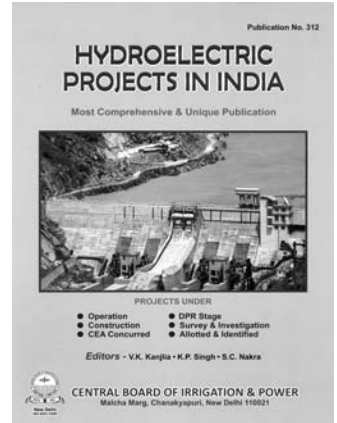
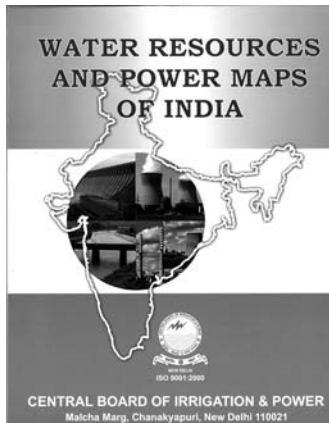
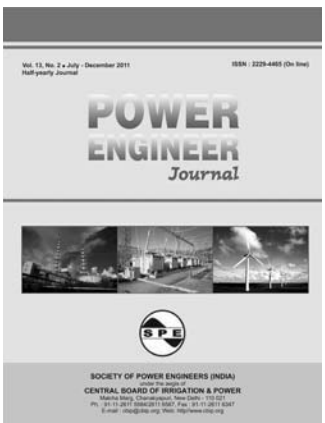
CBIP is now bringing out separate half yearly Journals for each of the Indian chapters of International organizations which are housed in CBIP.

*During my first two visits to Europe, U.K., U.S.A. and Canada in 1948 and 1951, I had visited all the major libraries at the place I had gone to in those countries – public and department – and had found that even though not housed as well as foreign libraries, the C.B.I. Library and Information Bureau offered the best service anywhere in the specialized field of water resource development.*

**N.D. Gulati**

*Former Joint-Secretary, Ministry of Irrigation & Power,  
Government of India*





# CHAPTER 5

## CBIP MEDAL & AWARDS

Recognition of merit and talent in one way or the other would not only give necessary encouragement to the concerned but also create a sense of awareness amongst others to promote advancement of knowledge. Therefore to encourage the engineering personnel for their contributions in enhancing the development of water resources and power sectors and for contributions in the research activities, the Board has been awarding medals and certificates of merit for best contributions in water resources power and allied fields . The Central Board of Irrigation in its 51st Executive meeting held on 5th December 1948 approved the proposal to institute a medal to be called the Central Board of Irrigation medal. The Central Board of Irrigation medal was instituted to encourage research relating to the technique and development of water resources of India and all devices and matters connected therewith. The medal was to be awarded at the annual meeting of the Board to a person (persons) whose contributions to research (basic or applied) technique or practice relating to the development of water resources of India was adjudged by the Executive Committee of the Board to be an outstanding original contribution of the preceding year. The contributions were supposed to be either in the form of a paper presented to the annual meeting of the research committee of the Board or to any other engineering institution in India or may be an article published for the first time in the Central Board of Irrigation journal or any other journal published in India.

In the 52nd meeting of the Executive Committee held on 11 February 1949, it was decided to award 22 ct. Gold medal weighing between 2 to 3 tolas and made in the mint in Calcutta. Subsequent to the creation of Central Board of Irrigation and Power, this medal was designated as CBIP Medal. In addition to this, other awards were also added from time to time along with Certificates of merit to encourage more professionals for contributing best papers in various fields such as

- |   |                            |
|---|----------------------------|
| (a) Hydraulics                            | (h) Power- Generation      |
| (b) Soils                                 | (i) Distribution           |
| (c) Concrete                              | (j) Transmission           |
| (d) Structures                            | (k) Protection and General |
| (e) Surface and Ground Water<br>Hydrology | (l) Energy Conservation    |
| (f) Irrigation and Management             | (m) Power System planning  |
| (g) Geotechnical Engineering              | (n) Operation and Control  |

Separate medals were awarded for contributions in each one of the above subjects.

At the time of Golden Jubilee Celebrations of the Board in 1977, a review was made with a view to identify the areas where rewards could be initiated by the Board as a token of recognition of the good work being done. It was decided that the phenomenal developments both in the fields of Water Resources and Power that were made all these years would not have been possible but

for the dedicated application of the senior engineers throughout their service time. Accordingly the Golden Jubilee Award was instituted which carried a cheque and a citation. Meanwhile an offer was received to institute an award in memory of Shrimati & Shri Shanti-Yadav Mohan, an eminent engineer and an amount of Rs. 50,000/- was provided for this purpose by their family members as the capital. Both the Golden Jubilee Award and Shanti-Yadav Mohan Award were instituted in 1977 and are given in each year to the senior engineers who have made valuable contributions in the development of Water Resources and Power Engineering. In addition, another award known as 'Cash Your Ideas' was also instituted to recognize persons from grass root level who through innovative ideas and development of indigenous solutions to practical problems faced in the field of water resources and power development resulted in benefits after their implementation.

On the occasion of the Diamond Jubilee, the Board decided to add Two Diamond Jubilee Awards to be given to the senior engineers who have made remarkable contributions in the development of Water Resources and Power sectors.

Over the years, the categories of awards increased. Many awards were instituted in the name of individuals/ institutions for which financial contributions were made for giving awards. With passage of time, cash awards were given instead of gold medals.

In totality following Medals/awards have been given in the past in the sectors of Water Resources and Power.

- |   |                                     |
|---|-------------------------------------|
| 1. Gold Medal   | 10. Young Engineers Award           |
| 2. Golden Jubilee Award                               | 11. Cash your ideas Award           |
| 3. Diamond Jubilee Award                              | 12. Bharat Singh Award              |
| 4. DCL award  | 13. Gujarat Electricity Board Award |
| 5. I.N. Sinha Award                                   | 14. National Hydrology Award        |
| 6. Shanti- Yadav Mohan Award                          | 15. R.C. Dave Award                 |
| 7. P.M. Ahluwalia Award                               | 16. Research Institution Award      |
| 8. Tag Corporation Award                              | 17. S. Rajagopal Award              |
| 9. Jawaharlal Nehru Birth Centenary<br>Research Award | 18. D.B. Anand Award                |
|   | 19. Certificates of Merit           |

## **GOLD MEDAL**

The first recipient of this coveted Gold Medal was Shri V. Ganesh Iyer of Mysore Engineering Research Station in 1953 for his invention of 'Volute Siphons' and none till 1961 when the award went to Dr. D.V. Joglekar, Director, C.W.P.R.S. for his contributions to Hydraulics followed by Prof. N.S.Govinda Rao of Indian Institute of Science in 1962 for his contribution on Cavitation - Its inception and Damage. These Gold Medals were given till 1980. Last recipient in Irrigation sector was Shri R.S.Varshney and Sh. C.K.Aggarwal of U.P. Irrigation Department and in power sector Shri V.R. Narasimhan and Sh. M.C.Mitra of CPRI, Bangalore and also Sh. R. Raghavan, Shri N. Doraiswamy, Shri R.K. Belapurkar Philip, Shri T.Adhikari and Shri M. Hanif of BHEL. A list of all those who received the coveted Gold Medal is given at Annexure 5.1.



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**CBIP GOLDEN JUBILEE AWARD**

CBIP Golden Jubilee award was given for notable and outstanding contribution applied or fundamental, in the harnessing of the water/power resources of the country for the benefits of its people. These awards were started at the occasion of Golden Jubilee celebration of CBIP in 1977 and were given till 1984. At the occasion of Golden Jubilee celebration of CBIP, this award was given to Shri S.N. Roy, Chairman, Central Electricity Authority and Shri H.R. Kulkarni, Member, Central Electricity Authority. Other important dignitaries who were graced with this award are Dr. N.Tata Rao, President CBIP in 1978, Shri A.N.Singh, Chairman, CEA in 1980. A list of all those who received the coveted CBIP Golden Jubilee Award is given at Appendix 5.1

**SHANTI- YADAV MOHAN AWARD**

Shanti- Yadav Mohan Award was given to a person who has made conspicuously important and outstanding contributions in the field of Water Resources Development including irrigation and flood control. The award was instituted in the year 1977. The first recipient of this award was Dr. Y.K. Murthy, Chairman, Central Water Commission in the year 1977 for his outstanding contributions in the field of Water Resources Development including Irrigation and Hydro Power Development and in Planning, Investigation and Design of River Valley Projects. Later it was awarded to Shri S.K. Banerjee, Chairman Central Ground Water Board in 1980, Shri C.C.Patel, Secretary to Govt. of India in the Ministry of Irrigation in 1981 and to Shri M.G. Padhye, Secretary to Govt. of India, Ministry of Irrigation in 1983. A list of all those who received the coveted CBIP Golden Jubilee Award is given at Appendix 5.1

**Other Awards and Certificate of Merit**

A list of all those who received other Awards and certificates of merit is given at Appendix 5.1



Presentation of CBIP Golden Jubilee Award in 1978 to Dr. N. Tata Rao



Presentation of Shanti-Yadav Mohan Award in 1981 to Mr. C.C. Patel



Presentation of CBIP Golden Jubilee Award in 1982 to Mr. Mata Prasad



Presentation of CBIP Golden Jubilee Award in 1983 to Dr. Prem Saran Nigam



Recipient of CBIP Golden Jubilee Award in 1977 to Mr. S.N. Roy



Recipient of Shanti Yadav Mohan Award in 1977 to Mr. Y.K. Murthy



Recipient of Shanti Yadav Mohan Award in 1983 to Mr. M.G. Padhye

## Appendix 5.1

## RECIPIENTS OF CBIP GOLD MEDALS

Name & Designation	Organisation	Year
Shri V. Ganesh Iyer	Krishnarajasagar	1953
Dr. D.V. Joglekar	C.W.P.R.S., Pune	1961
Prof. N.S. Govinda Rao	I.I.Sc. Bangalore	1962
Shri G.M Panchang	C.W.P.R.S., Pune	1963
Shri M.R. Vinayaka	Koyna Laboratory	1963
Dr. H.V. Gopalakrishna	I.I. Sc., Bangalore	1963
Shri B. Pant	C.W.P.R.S., Pune	1964
Shri I.K. Nihalani	C.W.P.R.S., Pune	1964
Shri B.N. Murthy	D.V.C., Maithon	1964
Shri R.L. Dewan	I.R.I., Patna	1964
Shri H.P. Oza	G.E.R.I. Baroda	1965
Dr. Bharat Singh	University of Roorkee	1965
Shri S.R. Agarwal	University of Roorkee	1965
Dr. S.V. Chitale	C.W.P.R.S., Pune	1966
Dr. Jagdish Narain	University of Roorkee	1966
Shri Bhawani Singh	University of Roorkee	1966
Dr. T.S.M. Rao	University of Roorkee	1966
Shri T. Subha Rao	University of Roorkee	1966
Shri N.G.K. Murti	Bkakra Management Board	1967
Shri P.S. Bhatnagar	Bhakra and Beas Design Organisation, New Delhi	1967
Shri I.P. Kapila	Bhakra and Beas Design Organisation	1967
Shri R.P. Sharma	Bhakra and Beas Design Organisation	1967
Shri C.V. Gole	C.W.P.R.S., Pune	1967
Dr. S.V. Chitale	C.W.P.R.S., Pune	1967
Shri M.C. Chaturvedi	I.I.T., New Delhi	1967
Shri B.K. Sharma	Pant College of Technology, Nainital	1967
Shri G. Krishna	I.I.Sc., Bangalore	1968
Shri T.P. Ramchandra	I.I.Sc., Bangalore	1968
Shri H.N Ramchandra Rao	I.I.Sc., Bangalore	1968
Shri M.C. Basavlingih	K.E.B., Bangalore	1968
Shri H.M.S. Lingaiah	K.E.B., Bangalore	1968
Shri D.Venkata Narayanappa	K.E.B., Bangalore	1968
Shri S.N. Gupta	U.P.R.I.	1968
Shri S.P. Sangal	U.P.I.R.I., Roorkee	1968

Shri H.R. Sharma	U.P.I.R.I., Roorkee	1968
Dr. S.V. Chitale	C.W.P.R.S., Pune	1968
Shri H.D. Sharma	U.P.I.R.I., Roorkee	1968
Shri D.N. Bhargava	U.P.I.R.I., Roorkee	1968
Shri B.N. Gupta	U.P.I.R.I., Roorkee	1968
Shri K.P. Shukla	U.P.I.R.I., Roorkee	1968
Shri P.N. Gupta	U.P.I.R.I., Roorkee	1968
Shri A.K. Mathur	U.P.I.R.I., Roorkee	1968
Shri R.V. Seshadri	A.P.E.R.L., Hyderabad	1968
Dr. H.L. Uppal	L R I P R I, Amritsar	1968
Prof. K. Seetharamiah	I.I.Sc., Bangalore	1969
Dr. N.S. Lakshmana Rao	I.I.Sc., Bangalore	1969
Dr. B.C. Syamala Rao	I.I.Sc., Bangalore	1969
Shri Jagaman Singh	Beas Dam Project	1969
Shri C.V. Gole	C.W.P.R.S., Pune	1969
Shri S.L. Mokashi	C.W.P.R.S., Pune	1969
Shri M.M. Chowdhary	C.W.P.R.S., Pune	1969
Shri H.N. Ramchandra Rao	I.I.Sc. Bangalore	1969
Shri K. Parthasarathy	I.I.Sc. Bangalore	1969
Shri N.M. Anil Kumar	I.I.Sc. Bangalore	1969
Shri D.S.M. Vishnu	H.E. Bhopal	1969
Shri R.M. Advani	Mallaviya Reg Engg College Jaipur	1969
Prof. K. Seetharamiah	I.I.Sc., Bangalore	1969
Shri K. Ranga	I.I.Sc., Bangalore	1969
Dr. Jagdish Bahadur	C.W.P.R.S., Pune	1969
Shri M.R. Vinayaka	M.E.R.I., Nasik	1969
Shri P.N. Sreekantiah	M.E.R.I., Nasik	1969
Shri N.G.K. Murti	W.A.P.C.O.S., New Delhi	1970
Shri P.M. Mane	Irr. Deptt., Maharashtra	1970
Shri V.R. Deuskar	Irr. Deptt., Maharashtra	1970
Shri D.N. Dutta	A.S.E.B., Shillong	1970
Shri K.C. Thomas	Ch. Engr. H.P	1970
Shri H.M.S. Lingaiah	K.E.B., Bangalore	1970
Shri F.C. Kohil	Tata Electric Co.	1970
Shri V.P. Thakor	Tata Electric Co.	1970
Dr. R.J. Garde	University of Roorkee	1971
Shri J.C. Malhotra	Beas Dam Project	1971
Shri N.S. Gill	Punjab Agro Industries	1971

Shri K.R. Deb	D.V.C., Maithon	1971
Shri L.C. Jain	C.W.P.C., New Delhi	1971
Shri P.M. Ahluwalia	C.W.P.C., New Delhi	1971
Shri V.P. Thakor	Tata Electric Co.	1971
Shri R.A. Kumar	Tata Electric Co.	1971
Shri J.C. Bahri	L.R.I.P.R.I., Amritsar	1971
Shri Mohinder Kumar	L.R.I.P.R.I., Amritsar	1971
Shri B.N. Ojha	B.S.E.B., Patna	1972
Shri B.N.N. Iyengar	I.I.Sc, Bangalore	1972
Shri D.K. Subramanian	I.I.Sc, Bangalore	1972
Shri K. Parthasarathv	I.I.Sc, Bangalore	1972
Shri H.P. Khincha	I.I.Sc, Bangalore	1972
Shri O.P. Thapar	B.D.O., Nangal	1972
Shri R.B. Saksena	B.D.O., Nangal	1972
Shri B.S. Kapre	M.E.R.I., Nasik	1972
Shri A.R. Kulkarni	M.E.R.I., Nasik	1972
Shri D.K. Joshi	M.E.R.I., Nasik	1972
Shri D.D. Karanjkar	M.E.R.I., Nasik	1972
Shri H.D. Sharma	U.P.I.R.I., Roorkee	1972
Shri A.S. Chawla	U.P.I.R.I., Roorkee	1972
Shri Harbans Lal	Beas Dam Project	1972
Shri H.K. Khosla	Beas Dam Project	1972
Dr. H.L. Uppal	L.R.I.P.R.I., Amritsar	1974
Shri S.V. Chitale	C.W.P.R.S. Pune	1974
Shri S.R. Sikdar	W.B.S.E.B	1974
Shri C.V. Gole	C.W.P.R.S., Pune	1974
Shri S.L. Mokhashi	C.W.P.R.S., Pune	1974
Shri S.L. Tarwadi	C.W.P.R.S., Pune	1974
Shri B.K. Saha	C.W.P.R.S., Pune	1974
Shri H.D. Sharma	U.P.I.R.I., Roorkee	1974
Shri A.S. Chawla	U.P.I.R.I., Roorkee	1974
Shri Narendra Mohan	U.P.I.R.I., Roorkee	1974
Shri R.R. Misra	U.P.I.R.I., Roorkee	1974
Dr. T.S.M. Rao	University of Roorkee	1974
Shri H.K. Verm	University of Roorkee	1974
Shri N.C. Rawal	C.S.M.R.S. New Delhi	1974
Shri H.R. Kulkarni	C.P.R.I., Bangalore	1974
Shri S.S. Murthy	C.E.A. New Delhi	1976

Shri G. Ramchandran	A.G., Andhra Pradesh	1976
Shri R.C.Guha	W.B.S.E.B	1976
Shri S.S. Lamba	Punjab Irrign. Deptt.	1976
Shri Awtar Singh	Punjab Irrign. Deptt.	1976
Shri P.S. Nigam	Ifrig. Dept., U.P	1976
Shri O.P. Jain	University of Roorkee	1976
Shri M.B. Kanchi	University of Roorkee	1976
Shri R.S. Melkote	C.S.M.R.S., New Delhi	1976
Shri S.B. Suri	C.S.M.R.S., New Delhi	1976
Shri H.D. Sharma	U.P.I.R.I., Roorkee	1976
Shri A.S. Chawla	U.P.I.R.I., Roorkee	1976
Shri B. Pant	C.W.P.R.S., Pune	1976
Dr. B. Thapar	Punjab Engg. College	1976
Shri Darshan Singh	P.S.E.B.	1976
Dr. Bharat Singh	University of Roorkee	1976
Shri R.S. Varshnev	Irrig. Deptt. U.P	1976
Shri H.M.S. Lingaiah	K.E.B.Bangalore	1976
Shri K.S. Katagihallimath	K.E.B.Bangalore	1976
Shri V.P. Thakor	Tata Electric Co.	1976
Shri L.V. Nagarajan	Tata Electric Co.	1976
Shri N.L. Khanna	Beas Sutlej Link Project	1976
Shri K.S. Prem	Beas Sutlej Link Project	1976
Shri B.S. Kapre	M.E.R.I., Nasik	1976
Shri S.B. Sohoni	M.E.R.I., Nasik	1976
Shri R.P. Sathe	M.E.R.I., Nasik	1976
Shri B.B. Patil	M.E.R.I., Nasik	1976
Shri S.S. Murthy	Central Electricity Authority, New Delhi	1976
Shri G. Ramachandran	A.G. Office, Andhra Pradesh, Hyderabad	1976
Shri R.C. Guha	West Bengal Elec. Board, Calcutta	1976
Shri P.S. Nigam,	U.P. Irrign. Deptt., Lucknow	1976
Shri O.P. Jain and M.B. Kanchi	University of Roorkee, Roorkee	1976
Shri Dr. B. Thapar	Punjab Engg. College Chandigarh, and Shri Darshan Singh Punjab State Elec. Board	1976
Shri H.M.S. Lingaiah and Shri K.S. Katagihailmath	Karnataka Elec. Board Bangalore	1976
Shri V.P. Thakor and Shri L.V. Nagarajan	Tata Power Co. Ltd., Bombay	1976
Shri R.L. Khanna and Shri H.S. Sehra	Central Elec. Authority, New Delhi	1976

Shri H.C. Chopra and Shri T. Sampath	D.E.S.U., New Delhi	1976
Shri T.V. Gopalan	Central Power Research Institute, Bangalore	1976
Shri A.E. Santhappan, Shri L. Venkatanarasimhan, Shri M.N. Raghuraman and Shri T.S. Krishnamurthy	Soil Mechanics and Research Division, Madras	1977
Shri J.F. Mistry and Shri V.N. Kulkarni	Central Design Organisation Irrign. Deptt., Gujarat	1977
Shri R.S. Melkote and Shri P. Bhanuprasada Rao	Central Soil & Material Research Stn., New Delhi	1977
Shri H.D. Sharma, Shri G.C. Nayak and Shri J.B. Maheshwari	U.P. Irrign. Res. Instt. Roorkee	1977
Dr. B.S. Ramakrishna Iyengar	Indian Instt. of Science, Bangalore	1977
Shri K.V. Rangaiah, Shri P. Seshachalapati Rao, Shri Mufallib and Shri S.A. T.V. Mohan Rao	A.P. State Elec. Board, Hyderabad	1977
Shri K. Parthasaratny and Dr. H.P. Khincha	Indian Instt. of Science, Bangalore	1977
Dr. P.S. Nigam, O.P. Jain and M.B. Kanchi	University of Roorkee, Roorkee	1977
Shri S.N. Roy	Central Electricity Authority, New Delhi	1977
Shri T.V. Subramanian	T.N. Elec. Board, Madras	1977
Shri Channa Keshava	Indian Instt. of Science Bangalore	1977
Shri N. Ranganajan, Shri A. Chintamani and Shri R. Shanmugam	T.N. Elec. Board, Madras	1977
Dr. R.J. Garde, Shri P.K. Swamee and Shri M.E. Dalvi	University of Roorkee Roorkee	1978
Shri T.V. Subramanian	T.N. Elec. Board, Madras	1978
Dr. B. Thapar and Shri B.R. Gupta	Punjab Engg. College Chandigarh	1978
Dr. R.J. Garde and Shri K.G. Rangaraju	University of Roorkee, Roorkee	1979
Shri R.C. Misra	Irrign. Deptt., Orissa	1979
Shri G.N. Tandon and Dr. R.S. Varshney	Irrign. Deptt. U.P. Dehradun	1979
Shri R.N. Garg and Shri Shah Alam	U.P. State Elec. Board Obra	1979
Shri M. Ramamoorthy	Hindustan Brown Boveri Baroda	1979
Shri S.N. Lall	College of Engineering, Goa	1979

Shri R.S. Varshney and Shri C.K. Aggarwal	U.P. Irrigation Department Dehradun	1980
Shri V.R. Narasimhan and Shri M.C. Ratra	Central Power Research Institute, Bangalore	1980
Shri R. Raghavan, Shri N. Doraiswamy, Shri R.K. Belapurkar Philip, Shri T. Adhikari and Shri M. Hanif	Bharat Heavy Electricals Limited, New Delhi	1980

### CBIP DIAMOND JUBILEE AWARDS

Dr. M.R. Srinivasan	Chairman, Nuclear Power Coprn.	1987
Shri P.A. Raj	Additional Chief Engineer, Govt. of Gujarat	1987
M.L Shishoo	Former C.M.D., NTPC Ltd.	1987
Shri K. Madhavan	Member (D&R) Central Water Commission	1987
Shri N.S. Vasant	Chairman, Punjab State Electricity Board and National Council of Power Utilities.	1988
Shri Z.S. Tarapore	Director. CE&PRS, Pune	1988
Shri A.P. Dhanda	Former Chairman, MSEB	1989
Shri V.A. Parkash	Executive Member, Narmada Control Authority	1989
Shri J.K. Bhasin	Chairman, CEA, New Delhi	1990
Shri R.B.Shah	Chairman (Rtd.), CEC, New Delhi	1990
Shri Krishna Swaroop	Chairman, CEA, New Delhi	1991
Shri M.A. Hai	CMD, NHPC Ltd. New Delhi	1991
Shri P.L. Nene	Chairman, Madhya Pradesh Electricity Board. Jabalpur	1991
Shri V.N. Rikh	Former Chairman, UPEB, Advisor, Nationaol Power Transmission Corporation, New Delhi	1991
Shri M.S. Reddy	Member, Central Water Commission, New Delhi	1991
Shri V.C. Kalandaiswamy	Vice Chancellor, IGNOU, New Delhi	1991
Shri D.R. Sikka	Former Secretary, Water Resources Deptt. MP, Chairman, National Project Construction Co. New Delhi	1991
Shri B.L Jatana	Executive Director, Tehri Hydro Dev. Corporation, New Delhi	1991
Shri T.R. Satish Chandran	Former Secretary, Govt, of India, Ministry of Energy, New Delhi	1992
Shri R.C. Dave	Chairman, Rajasthan State Electricity Board, Jaipur	1992
Shri R.K. Narayan	Chairman & Managing Director, Power Grid Corporation of India, New Delhi	1992
Shri A.Gavisiddappa	Chairman & Managing Director, BHEL Ltd., New Delhi	1992



Shri H.S. Baweja	Chairman, Punjab State Electricity Board, Patiala	1992
Shri R.V. Shahi	Director Operations, LTPC Ltd., New Delhi	1992
Shri I.N. Sinha	Engineer in Chief, Water Resources Department, Government of Bihar, Patna	1992
Shri N.R. Venkatesha Prasad	Secretary, Irrigation Department, Government of Karnataka, Bangalore	1992
Shri B.J. Parmar	Chief Engineer, Sardar Sarovar Narmada Nigam, Kavadia Colony, Bharuch, Gujarat	1992
Shri T. Ramasway	Professor of Civil Engineering, IIT, New Delhi	1992
Shri B.N. Bose	Chairman & Managing Director, Durgapur Project Ltd., Calcutta	1993
Shri S.K. Dasgupta	Chairman, West Bengal State Electricity Board, Calcutta	1993
Shri V.P. Gambhir	Chairman, Central Electricity Authority, New Delhi	1993
Shri D.N. Kulkarni	Secretary, Irrigation Department, Government of Maharashtra, Bombay	1993
Shri S.P. Singh	Chairman & Managing Director, Tehri Hydro Dev. Corporation, Rajendra Place, New Delhi	1993
Shri A.Sridharan	Prof, of Civil Engineering, Institute of Science, Bangalore	1993
Shri K.B. Rangaraju	Professor of Civil Engineering, University of Roorkee, Roorkee	1994
Shri Rajendar Singh	Chairman & Managing Director, NTPC Ltd. NTPC Bhavan, Lodi Road, New Delhi	1994
Shri K.L. Zutshi	Chairman & Managing Director, Tehri Hydro Dev. Corporation Ltd. Rajendra Place, New Delhi	1994
Prof. Dllip Biswas	Chairman, Central Pollution Control Board, Ml. of Environment & Forest, East Arjun Nagar, New Delhi	1996
Shri M. Gopalakrishna	C-II/21, Tilak Lane, New Delhi	1996
Dr. S.K. Sen	Ministry for Power, Science & Technology & Non Conventional Energy Sources, Govt, of West Bengal, Calcutta	1996
Dr. R.K.D. Shah	Chairman & Managing Director, BHEL, New Delhi.	1996
Shri Uddesh Kohlo	Chairman & Managing Director, Power Finance Corporation, Chanderlok, Janpath, New Delhi	1998-99
Shri R.P. Singh	Chairman & Managing Director, Power Grid Corporation of India, New Delhi	1998-1999
Shri Yogendra Prasad	Chairman & Managing Director, NHPC Ltd. Faridabad	1998-1999

Shri Proabhakar Keshaprao Kukde	Technical Director, Maharashtra State Electricity Bd., Mumbai	1998-1999
Shri G.L. Java	Executive Director, Sardar Sarovar Narmada Nigam Ltd. Gandhinagar	1998-1999
Shri S.Y. Shukla	Secretary (Irrigation), Irrigation Department, Government of Maharashtra, Mumbai	1998-1999
Maj. Gen. R.R. Oberoi (Retd.)	Chairman, Bhakra Beas Management Board, Chandigarh	1998-1999

**SHANTI YADAV MOHAN AWARD**

<b>Name &amp; Designation</b>	<b>Organisation</b>	<b>Year</b>
Shri Y.K. Murthy, Chairman	CWPC	1977
Shri D.K. Murthy	CWPC	1979
Shri S.K. Banerjee, Chairman	CGWB	1980
Shri C.C. Patel, Secretary	Ministry of Irrigation	1981
Shri S.S. Patel		1982
Shri Jagman Singh	Irrigation Department, Haryana	1982
Shri M.G. Padhya, Secretary	Ministry of Irrigation, Government of India	1983
Shri P.S. Nigam	Irrigation Department, U.P	1983-84
Shri H.V. Dhamdhare, Chief Engineer & Director	Water & Land Management Instt., Aurangabad	1984
Shri P.R. Gandhi, Secretary	Irrigation Department, Govt. of Maharashtra	1984
Dr. H.R. Sharma, Chief Engineer	Central Electricity Authority, New Delhi	1987
Shri R.K. Malhotra	Punjab Engineering College	1988
Shri T. Hanumantha Rao, Engineer in Chief & Director	WALMI, Hyderabad	1989
Dr. P.P. Vaidyaraman, Additional Director	CWPRS., Pune	1990
Ms. E. Divatia, General Manager	NTPC, Delhi	1991
Shri J.P. Gupta, Engineer in Chief	Irrigation Department, Haryana Chandigarh	1992
Shri P. Sampath, Sr Engineer in Chief & Director	Water and Land Mgt. Institute, Bhopal	1993
Shri A.S. Kapoor, Chairman	Indira Gandhi Nahar Board, Jaipur	1994
Shri K. Shiva Shankar, Secretary	Irrigation Government of Karnataka, Bangalore	1997
Shri S.V. Sodal		2003
Shri V.S. Verma	CEA, New Delhi	2005
Shri S.K. Dodeja, Director (Projects)	NHPC Ltd., Faridabad Haryana	2007

<b>CBIP GOLDEN JUBILEE AWARD</b>	
<b>Name &amp; Designation</b>	<b>Year</b>
Shri S.N. Roy	1977
Shri H.R. Kulkarni	1977
Dr. N. Tata Rao	1978
Shri A.N. Singh	1980
Shri L.R. Suri	1981
Shri Mata Prasad	1982
Shri A.K. Shah	1982
Shri P.M. Ahluwalia	1983
Shri T.K. Srinivasan	1983
Dr. Prem Saran Nigam	1983
Shri S.A. Subramanian	1984
Shri J.K.F Mistry	1984
Shri J. Parthasarathy	1984

<b>P.M. AHLUWALIA AWARD</b>		
<b>Name &amp; Designation</b>	<b>Organisation</b>	<b>Year</b>
Shri H.S. Bains, Chief Engineer	PEEB, Ludhiana	1987
Shri S.L. Kati, Managing Director	Nuclear Power Corporation	1988
Dr. B.S.K. Naidu, Chief Engineer	NHPC, New Delhi	1989
Shri V.B. Singh, Superintending Engineer Design Circle	UPS, Luncknow	1990
Shri K. Balrama Reddy, Member (Tech)	APSED, Hyderabad	1991
Shri M.L. Sachdeva, Chief Engineer	CEA, Delhi	1992
Shri K.V. Venugopala Rao, Chief Engineer (Transmission)	A.P. State Electricity Board Hyderabad.	1993
Shri D.Chowdhary, Dy General Manager (TL Engg.)	PGCIL, New Delhi	1994
Shri Bhanu Bhushan, Director Operation	PGCIL, New Delhi	1996

<b>D.C.L. AWARD</b>		
<b>Name &amp; Designation</b>	<b>Organisation</b>	<b>Year</b>
Shri Prabhakar Kesharao Kuke	MSEB	2000
Shri Vijay Kumar	Central Electricity Authority New Delhi	2003
Shri Dig Vijay Nath, ED	NHPC	2005
Shri D. Jaya Prakash, ED	Contracts (E&M) NHPC	2005

Shri V. Ramakrshina, Member Power Systems	CEA, New Delhi	2007
Shri P. Gopal Reddy, CMD	APHPDCL.	2007

### I.N. SINHA AWARD

Name & Designation	Organisation	Year
Shri N.S. Gill, General Manager	Ranji Sagar Dam Project Chandigarh	1994
Shri R.G. Kulkarni, Secretary	Irrigation Deptt., Govt. of Maharashtra Mumbai	1996
Shri V.V. Gaikwad		2003
Shri M.M. Madan	NHPC Ltd., Faridabad	2003
Shri D.M. More, Director General	Meri	2005
Shri D.K. Gupta, Engineer in Chief	Government of Uttar Pradesh, Lucknow	2007

### TAG CORPORATION AWARD

Name & Designation	Organisation	Year
Shri Krishan Swarup, Chairman	CEA, New Delhi	1991
Shri P.K. Dwivedi, General Manager (Engg.)	PGCIL, New Delhi	1993
Shri M.M. Babhunarayanan, Engineering Officer	CPRI, Bangalore	1994
Shri Sujatha Subhash, Engineering Officer Grade IV	CPRI, Bangalore	1994
Shri B.N. Sarkar, Joint Director	CPRI, Bangalore	1994
Shri N. Murugesan, Engineering Officer Grade 2	CPRI, Bangalore	1994
Shri M. Krishna Kumar, Chief Design Engineering	PGCIL New Delhi	1996
Shri Umesh Chandra, Additional General Manager	PGCIL, New Delhi	1998-99

### CBIP PT JAWAHAR LAL NEHRU BIRTH CENTENARY RESEARCH AWARDS

Name & Designation	Organisation	Year
Dr. R.S. Varshney, Engineer-in-Chief & Secretary General	ICID	1988
Dr. G.S. Dhillon, Chief-Engineer-cum Director	IPRI, Punjab, Amritsar	1988
Dr. C.D. Thatte, Chief Engineer	Govt. of Gujarat, Gandhinagar	1988
Shri J.K. Malhotra, Superintending Engineer	UPSED, Lucknow	1988

Shri Rajesh Chandra, Scientific Officer	Bhakra Automatic Research centre Nuclear Power Corporations, Bombay	1988
Dr. M. Rama Moorthy, Director General,	CPRI, Bangalore	1988
Shri Santosh Singh, Chief Engineer	Srinagar Hydroelectric Project, U.P. State Electricity Board, Dehradun	1989
Dr. D.B. Goel, Professor	Metallurgical University of Roorkee, Roorkee	1989
Dr. K. Keshva Murthy, Prof, of Civil Engineering	Indian Institute of Science, Bangalore	1989
Dr. S.P. Rajagopalan, Head, Ground Water Division	Centre for Water Resources Development And Management, Kozhikode	1989
Shri P. K.Lal, Chief Engineer	Electricity Board	1991
Shri CM. Sharma, Dy. General Manager	BHEL	1991
Dr. P.R. Krishna Moorthy	CPRI, Nagpur	1991
Shri Shanti Prasad, Addl. Chief Engineer	Rajasthan State Electricity Board	1991
Shri B.S. Mann, Manager	BHEL, Hyderabad	1991
Shri R.J. Garde, Province Chancellor	Indira Gandhi National Open University, New Delhi	1991
Shri U.D. Datir, Joint Director	Gujarat Engg. Research Institute	1991
Dr. Tirlok Singh, Research Officer	Irrigation and Power Res. Institute	1991
Shri S. Guha, Sr. Research Officer	Centre Water & Power Res. Station Pune	1991
Shri M.S. Vasudeva, Director	Deptt. of Electronics, New Delhi	1992
Shri A. Narayana Rao, Chief Engineer	APSEB	1992
Shri Arinjay Kumar, General Manager	UPSEB	1992
Shri V.J. Amberani, Executive Director	Gujarat Electricity Board, Vadodara	1992
Shri M.V. Krishna Rao, Dy. Chief Engineer	A P S E B	1992
Shri Sukhdev Singh Rana, Executive Director	NJPC Ltd., New Simla	1992
Shri C.K. Agrawal, Chief Engineer	U.P. Irrigation Department, Roorkee	1992
Shri S.H. Nagaraja	NT, Bombay	1992
Prof. S. Vadula	IIT, New Delhi	1992
Prof. T.S. Nagaraj	IIT, New Delhi	1992
Prof. G.V. Rao, Department of Civil Engg.	IIT, New Delhi	1993
Shri A.N. Basu, Director	River Research Institute, West Bengal	1993
Shri Rajni Grover, Head, Design & Dev. Section	Nuclear Power Corporation, Bombay	1993
Shri C. Radha Krishna, Prof. Electrical Engg	Jawahar Lai Nehru Technological University, Hyderabad	1993

Shri K. Ranganathan, Supdt. Engineer (Operation)	A.P. State Electricity Board, Tirupati	1993
Shri R.K. Verma, Supdt. (Sub-Station Design)	Madhya Pradesh Electricity Board Jabalpur	1993
Shri S.M. Zafarullah, Asstt. Divisional Engineer	A.P. State Electricity Board, Hyderabad	1993
Shri Amlandu Palit, General Manager	NTPC, New Delhi	1993
Shri S.K. Tyagi, Engineer Executive	U P S E B, Dehradun	1994
Shri S.V. Gokhale, Research Officer	Maharashtra Engg. Res. Institute, Nasik	1994
Shri K.V.S. Subramanyam, Supdt. Engineer	Gersoppa Project KRC Ltd., Kargal, Karnataka	1994
Shri Mohinder Kumar, Joint Director	Irrigation & Power Research Instt. Amritsar	1994
Shri L.H. Buch, Executive Engineer	Gujarat Electricity Board Vidyut Bhavan, Vadodara	1994
Shri P.K. Mandal, Dy. Manager (R&D)	NTPC, Noida	1994
Dr. N. Babu, Superintending Engineer	MPEB, Bhopal	1996
Shri M.V.S. Birinchi, Consultant	APSEB, Hyderabad	1996
Prof. H.S. Chandrasekharaiah	Indian Institute of Science, Bangalore	1996
Dr. S.K. Gupta, Principal Scientist	Central Soil Salinity Res. Institute Karnal, Haryana	1996
Shri T. Krishna Rao, Chief Engineer	APSEB, Hyderabad	1996
Dr. A.V. Shroff, Sr. Professor	M.S. University, Vadodara	1996
Shri Narayan Chandra Som, Former Chief Engineer	Govt. of West Bengal, Calcutta	1996
Shri S.M. Takalkar, Executive Engineer	GEB, Vadodara	1996
Shri M.R. Madhav, Professor (Civil)	Indian Institute of Technology Kanpur	1998-99
Shri S.N. Huddar, Chief Engineer	Koyna Projects, Pune	1998-99
Shri K.K. Guru, Asstt. Director	Punjab State Electricity Board, Chandigarh	1998-99

### CBIP YOUNG ENGINEER AWARDS

Name & Designation	Organisation	Year
Shri Chandramani Naik	NTPC	1991
Shri A.K. Prusty	NTPC	1991
Shri G. Ravichandran	BHEL	1991
Shri R. Mathiannal	BHEL	1991
Shri Y.N.R.N. Satva Kumar	BHEL	1991
Shri U.K. Choudhary	BHEL	1991
Shri M. Arumugam	BHEL	1991
Shri B.P. Muni, Sr. Engineer	BHEL, Hyderabad	1992

Shri T. Gurunathan, Sr. Quality Control Engineer	BHEL, Tiruchirapalli	1992
Shri Amit Kumar Parmanik, Engineer (O&M)	NTPC Ltd., Distt. Sidhi (M.P)	1992
Shri L.S.N.Murthy, Deputy Manager	Bharat Heavy Electricals Ltd. Hyderabad	1993
Shri Parvati Ramaswamy, Engineering Office II	Central Power Research Institute, Bangalore	1993
Shri Satyasachi Roy, Asstt. Manager	West Bengal State Electricity Board Calcutta	1993
Shri Rebati Oass, Asstt. Chief Design Engineer	National Thermal Power Corpn. Ltd., Nehru Place New Delhi	1993
Shri V. Venkatesh, Dy. Superintendent E.M. (Testing)	NTPC. Vindhyachal Super Thermal Power Station, Sidhi	1994
Mrs. Namita Shukla, Scientist	Nuclear Power Corporation, New Delhi	1994
Mohd. Mahmood, Sr. Engineer	Southern Regional Load Dispatch Centre Bangalore	1994
Dr. Mukesh Kumar Sharma, Senior Scientist	Electrical Res. and Development Association	1996
Shri Subir Sen, Dy. Chief Engineer	PGCIL, New Delhi	1998-99

### CASH YOUR IDEAS AWARDS

Name & Designation	Organisation	Year
Shri B.N. Murthy	DVC Maithon Dam, Dhanbad	1976
Shri T.V. Subramanian	Tamil Nadu Electricity Board, Madras	1976
Shri H.M.S. Lingiah	Karnataka State Elec. Board, Bangalore.	1976
Shri Akbar Aziz	APSEB, Hyderabad	1976
Shri M.D. Deshmukh	Maharashtra Irrigation Deptt., Pune	1977
Shri Suresh Ganesh Bagul	Directorate of Irrigation R&D, Pune.	1977
Shri Davendra Kumar	Irrigation Research Institute, Roorkee	1977
Shri Namadabhai Amrit Lai Mehta	Gujarat Electricity Board, Vadodara	1977
Shri T.V. Subramanyam	TNEB, Madras.	1977
Shri R.K. Malhotra	Loktak Hydroelectric Project, Imphal	1978
Shri S. Venkatramani	Tata Electric Co., Bombay	1978
Shri H.M.S. Lingiah	Karnataka State Elec. Board, Bangalore	1978
Shri Piyush Kumar	MPSEB, Korba	1980
Shri H. Shah	MPSEB, Korba	1980
Shri H.M.S. Lingiah	Karnataka State Elec. Board, Bangalore	1981
Shri K. Suresh	Karnataka State Elec. Board, Bangalore	1981
Shri B. Sridhar Rao	Karnataka State Elec. Board, Bangalore	1981

Shri Jagdish Mohan	UP Irrigation Research Institute. Roorkey	1981
Shri S.S. Tyagi	UP Irrigation Research Institute. Roorkey	1981
Shri D. Vasantha Kumar	TNEB, Madras.	1981
Dr. J. N. Kardile	Maharashtra Engg. Research Institute, Nasik.	1981
Shri N.C. Choudhari	Damodar Valley Corp., Dhanbad	1982
Shri Santipeda Gon Chaudhuri	Electricity Department, Govt. of Tripura, Agartala	1982
Shri CD Thatte	Gujarat Engg. Research Institute, Vadodara	1982
Shri S.D. Patel	Gujarat Engg. Research Institute, Vadodara	1982
Shri KR Vishwanathan	Gujarat Engg. Research Institute, Vadodara	1982
Shri V.R. Desai	Gujarat Engg. Research Institute, Vadodara	1982
Shri R.K. Malhotra	BBMB, Punjab	1982
Dr. V.M. Bapat,	Soil Survey Division, Gujarat	1983
Shri R.K. Saxena,	AP Engg. Research Laboratory Hyderabad	1983
Shri N. Nagaraja	AP Engg. Research Laboratory, Hyderabad	1983
Shri A.S. Ramanuja Swamy	AP Engg. Research Laboratory, Hyderabad	1983
Shri S.P. Agarwal	Hydel Yamuna Plan Dn., Dakpathar, Dehradun	1983
Shri S.L. Goyal	Punjab State Electricity Board, Punjab Engg. College Campus, Chandigarh	1983
Shri R.K. Malhotra	BBMB, Chandigarh	1984
Shri K.K. Julka	BBMB, Chandigarh	1984
Shri S.M. Goel	BBMB, Chandigarh.	1984
Dr. P.R. Rao	CWC, New Delhi	1984
Shri Ram Iqbal Singh	U.P. Irrigation Deptt. Lucknow	1984
Shri Brij Gopal Agarwal	U.P. Irrigation Deptt. Lucknow	1984
Dr. B. Thapar	Punjab Engg College, Chandigarh	1984
Shri S.L. Goyal	Punjab Engg College, Chandigarh	1984
Shri S. Krishnaraj	Electrical Maintenance Ennore Thermal Power Station, Madras	1984
Shri S. Sathyanathan	Tamil nadu Electricity Board, Madras	1984
Shri B.S. Bhawani Shankar	Irrigation Department, M.P	1988
Shri H.S. Grewal	Executive Engineer, BBMB	1988
Shri R.K. Malhotra	Chief Engineer, BBMB	1988
Shri M.N. Narakesari	Tata Elec.Co.	1988
Shri Santosh Singh	UPSEB	1988
Shri R.B. Gangadhar, SRO	CSMRS, New Delhi	1989



Shri Pritpal Singh, Assistant Research Officer	CWMRS, New Delhi.	1989
Shri Shallk Mohammad Zafarullah, Assistant DE,	APSEB	1989
Shri Kalish Choandra Govil		1990
Shri S.S. Kalsi		1991
Shri H.M. Kaura		1991
Shri Chandramani Naik		1991
Shri S.K. Tyagi, Executive Engineer	Hydro-electric Project, Dehradun	1990
Shri M.G. Raoot		1991
Shri S.C. Telegaonkar, Sr. Engineer	O & M	1991
Shri Chandramani Naik	NTPC, Bilaspur	1991
Shri K. Arun	NTPC	1991
Shri R.K. Mital	NTPC	1991
Shri A.K. Ashraf	NTPC	1991
Shri H.S. Mukhopadhyaya	NTPC	1991
Shri P.C. Chaturvedi, Senior Manager	BHEL	1992
Shri A.N. Sar	National Thermal Power Corp.	1991
Shri M.N. Paul	National Thermal Power Corp.	1991
Shri Ujagar Singh	National Thermal Power Corp.	1991
Shri Arun Kumar	University of Roorkee, Roorkee	1991
Shri J.S. Mani	Indian Institute of Technology, Madras	1991
Shri D.P Chirania, Executive Engineer	Rajasthan State Electricity Board	1991
Shri P.C. Chaturvedi, Senior Manager	BHEL, Haridwar	1991
Shri Devinder Kumar, Senior Manager	BHEL	1991
Shri M.P. Hedao, Executive Engineer	Maharashtra SEB	1992
Shri Subhash Kumar Joshi, Executive Engineer	MPEV	1992
Shri Nirmal Kumar Sinha, Assistant Manager	Water Resources Department, Patna	1992
Shri G.Balagangadharan Nair Executive Engineer	Ground Water Department, Kerala Trivandrum.	1993
Shri Manik De, Research Officer	River Research Institute, West Bengal, Calcutta.	1993
Shri N.C. Janodia, Executive Engineer,	Gujarat Electricity Board, Thermal Power Station	1993
Shri Atul Gupta, Depury Supterintendent (O&M)	Boiler Maintenance Division, Feroze Gandhi TPP, Unchahar (U.P)	1993.

Shri C.M. Naik, Superintending Engineer, (O&M)	Boiler Maintenance Division, Feroz Gandhi, TPP, NTPC, Unchahar (U.P.)	1993
Shri K. Prasad, Engineer(O&M)	Boiler Maintenance Division, NTPC, Unchahar (U.P.)	1993
Shri R. Sesharajan, Deputy Manager	BHEL, Tiruchirapalli	1993
Shri Y. M. Sesharajan	NTPC	1994
Shri B.L. Chouksey	Technician WTM, BHEL Piplani, Bhopal.	1994
Shri S.K. Mandal	NTPC	1994
Shri Mukesh Kumar	Research Scientist, Metallurgical Engineering Deptt. University of Roorkee	1994
Shri K.K. Sharma, Superintendent (O&M)	NTPC Singrauli Super Thermal Power Station	1994
Shri J.P. Srivastava, Superintendent (O&M)	NTPC Singrauli Super Thermal Power Station	1994
Shri Y.M. Basavarajan, Superintendent (O&M)	NTPC Singrauli Super Thermal Power Station	1994
Shri R.Srinivasan, Deputy Director	Central Scheme, PWD, Chennai	1994
Shri A.V.L. Bhujana Rao, Deputy Chief Engineer	Vishakhapatnam Steel Plant, Vishakhapatnam	1994
Shri S. K. Mandal, Senior Engineer	National Thermal Power Corp. Singrauli Super Thermal Power	1994
Shri J.P. Srivastava	NTPC	1994
Shri H.S. Grewal, Chief Engineer	BBMB, Nangal Town Ship, Punjab	1994
Shri R.B. Singh, Sub-Divisional Engineer	BBMB, Nangal Township, Punjab	1994
Shri N.V.R.S.S. Subrahmanyam, Senior Manager	Bharat Heavy Electricals Ltd., Tiruchirapalli	1996
Shri S.K. Sarkar	RRI, West Bengal	2001-02
Shri Jasmer Singh	NTPC	2001-02
Shri S.V. Sivaramulau, Senior Manager	BHEL	2005
Shri Vinod Kumar, Senior Manager	NTPC	2007
Shri A.K. Jain, Engineer	NTPC	2007

<b>BHARAT SINGH AWARD</b>	
<b>Name</b>	<b>Year</b>
Shri P. M. Ahluwalia	1983-84
Shri J. F. Mistry	1987

**GUJRAT ELECTRICITY BOARD AWARD**

<b>Name &amp; Designation</b>	<b>Organisation</b>	<b>Year</b>
Shri H.C. Mittal, Member, Power System	CEA, New Delhi.	1994
Shri C.R. Prasad, Chairman & Managing Director	Gas Authority of India, New Delhi.	1997

**R.C. DAVE AWARD**

<b>Name &amp; Designation</b>	<b>Organisation</b>	<b>Year</b>
Shri S. R. Narasimhan, Chairman & Managing Director	NHPC Ltd., Faridabad	1994
Shri S. J. Coelho	65B, IV Cross, HIB Colony, RMV Extension Part II, Bangalore.	1996

**CBIP DIAMOND JUBILEE AWARDS RESEARCH INSTITUTIONS**

<b>Organisation</b>	<b>Year</b>
U.P. Irrigation, Research Institute, Roorkee	1988
Tamil Nadu Electricity Board	1988
Gujarat Research, Institute, Vadodara Water Resources	1989
Andhra Pradesh State Electricity Board, Research & Development Wing in Power Engineering	1989
Centre for Water Resources College of Engineering, Anna University, Madras	1990
Nashik Thermal Power Station, Maharashtra State Electricity Board, Nashik	1990
Indian Institute of Science, Bangalore.	1991
Central Power Research Station, Bangalore	1991
Institute of Cooperative Management, Ahmedabad	1992
BHEL, Electronics Division, Bangalore	1992

**RAJGOPAL CHILDREN AWARDS**

<b>Name</b>	<b>Class</b>	<b>Year</b>
Ms. P.R. Vaidya Laxmi	Class VIII	1992
Ms. Kansoor Bano	Class VIII	1992
Ms. Walma Lopina Radri-Ques	Class VIII	1992
Ms. Shalini Joshi	Class VIII	1992
Ms. J. Irene Prescilla	Class VIII	1992
Ms. V.N. Santoshi	Class IX	1992
Ms. Sumakthi Bhardwaj	Class IX	1992
Mr. Chetan Gopal K.	Class IX	1992
Shri Vinay N.	Class IX	1992

Shri Urmi Banerjee		1993
Shri Survashree Maitra		1993
Shri Manu Jhav		1993
Shri Sharib Kansar		1993
Shri Shital Pagaria		1993

### D.B. ANAND AWARDS

Name & Designation	Organisation	Year
Shri G.V. Rao	Central Water & Power Research Station, Pune	1981
Shri MJ. Khurjekar	Central Water & Power Research Station, Pune	1981
Shri C.R. Marathe	Indian Institute of Technology, Bombay	1981
Shri B. Ramadoss	Indian Institute of Technology, Bombay	1981
Shri A.B. Joshi	Central Soil & Materials Research Station, New Delhi	1981
Shri S.B. Suri	Central Soil & Materials Research Station, New Delhi	1981
Mrs. Sushila	Central Soil & Materials Research Station, New Delhi	1981
Shri K.C. Reddy	Karnataka Power Corp., Bangalore	1982-1983
Shri Basavaraj	Karnataka Power Corp., Bangalore	1982-1983
Shri M.S. Rama Rao	Karnataka Power Corp., Bangalore	1982-1983
Shri C.D.Thate		1982-1983
Shri K.R. Vishwanathan		1982-1983
Shri V.R. Desai		1982-1983
Shri R.N. Ailani		1982-1983
Shri Jagdish Mohan	University of Roorkee	1982-1983
Shri O.P. Jain	University of Roorkee	1982-1983
Shri S.P. Malhotra, Retd., Chief Engineer	Haryana Irrigation Deptt., Karnal	1982-1983
Shri H. Anantharamaiah		1982-1983
Shri Channakeshava		1982-1983
Shri P.K. Lal		1982-1983
Shri S.B. Mehta		1982-1983
Shri P. Rangarajan		1982-1983
Shri B.R. Shankarnarayana		1982-1983
Shri H.V. Dhamdhare.	Water and Land Management Institute, Aurangabad	1984

Shri S.V. Balaraman.	Neyveli Thermal Power Station, Neyveli, Madras	1984
Shri R. G. Garde		1986-87
Shri U.C. Kothiyari		1986-87
Dr. Rajendar Kumar		1986-87

### CERTIFICATE OF MERIT

Name & Designation	Organisation	Year
Dr. R.C Hoon	CWPC, New Delhi	1955
Shri N.K.V. Narasimhan	A.P. Engineering Research Laboratory, Hyderabad	1955
Dr. R.C. Hoon	CWPC, New Delhi	1955
Shri N.S. Govinda Rao, Prof.	Indian Institute of Science, Bangalore	1955
Shri N.K. Aggarwal	CWPC, New Delhi	1955
Shri Bahadur Ali	A.P. Engineering Research Laboratory, Hyderabad	1961
Shri N.K. Dwivedi	Research Institute, Roorkee	1962
Shri P.N, Gupta	U.P. Irrigation Research Institute, Roorkee	1962
Shri P.M. Mane, Engineer	Koyna Project, Koyna Research Institute, Roorkee	1962
Shri M.R. Vinayaka	Maharashtra Research Institute, Nasik	1962
Shri R.N. Rajaratnam	University of Alborde Admentan, Canada	1962
Dr. S.D. Luthra	Ministry of Irrigation and Power, New Delhi	1962
Shri H.D. Sharma	Yamuna Hydel Project, Dehradun	1962
Shri C. Sudhindra	Ministry of Irrigation and Power, New Delhi	1963
Shri V.P. Aggarwal	Central Water & Power Research Station, Pune	1963
Shri G. Sinha	River Research Instt. West Bengal, Calcutta	1963
Shri J. Walter	Central Soil Research Laboratory and Central Water & Power Research Station, Pune	1963
Shri B. Thomas	Central Soil Research Laboratory and Central Water & Power Research Station, Pune	1963
Shri B. Pant	Central Water & Power Research Station, Pune	1963
Shri S.S. Patil	Central Water & Power Research Station, Pune	1963
Shri T.N. Idnani	CWPC, New Delhi	1963
Shri B.S.R. Iyengar	CWPC, New Delhi	1963

Shri S.N. Gupta	U.P. Irrigation Research, Institute, Roorkee	1964
Shri R.S. Varshney	U.P. Irrigation Research Institute, Roorkee	1964
Shri J. Walter	Central Soil Research Laboratory, Madras	1964
Shri K. Ganesan, Ramalingam	Central Soil Research Laboratory, Madras	1964
Shri T.S. Krishnamurthy	Central Soil Research Laboratory, Madras	1964
Shri B. Pant	Central Water & Power Station, Pune	1964
Shri I.K. Nihalani	Central Water & Power Station, Pune	1964
Shri A.S. Khot	Central Water & Power Station, Pune	1964
Shri J. Walter	Irrigation Research Station, Poondi, Madras	1965
Shri S.Shanmugham	Irrigation Research Station, Poondi, Madras	1965
Shri B.Thomas	Irrigation Research Station, Poondi, Madras	1965
Shri A.S. Bhatnagar	RDSO Ministry of Railway, Lucknow	1965
Shri S.K. Das Kaviraj	River Research Instt. West Bengal, Calcutta	1965
Shri B. Pant	Central Water & Power Research Station, Pune	1965
Shri S.K. Chaudhury	Central Water & Power Research Station, Pune	1965
Shri I.K. Nihalani	Central Water & Power Research Station, Pune	1965
Shri S.N. Gupta	U.P. Irrigation Research Institute, Roorkee	1966
Dr. H.R. Sharma	U.P. Irrigation Research Institute, Roorkee	1966
Shri Satish Chandra and Shri S.S. Tyagi	U.P. Irrigation Research Institute, Roorkee	1966
Shri D.K. Bansal	Power Research Institute, Bangalore.	1966
Shri J.R. Nanda	Power Research Institute, Bangalore	1966
Shri A.P. Seethapathy	Power Research Institute, Bangalore	1967
Shri A.P. Seethapathy	Power Research Institute, Bangalore.	1967
Shri C.S. Srinivasan	Power Research Institute, Bangalore.	1967
Shri P. Subramanaya Iyer	Power Research Institute, Bangalore.	1967
Shri Harbans Singh	PESB, Patiala.	1967
Shri H.S. Bains	PESB, Patiala	1967
Shri K.K. Puri	PESB, Patiala	1967
Shri H.P. Oza	Engineering Research Institute, Gujarat	1967
Shri M.N. Jathal	Ukai Project, PWD, Gujarat	1967
Shri I.J.F. Mistry	Ukai Project	1967
Shri D.T. Buch	Ukai Project	1967
Shri M.U. Purohit	Ukai Project	1967
Shri S.N. Gupta	U.P. Irrigation Research Institute, Roorkee	1967
Shri S.P. Garg	U.P. Irrigation Research Institute, Roorkee	1967

Shri B.N. Gupta	U.P. Irrigation Research Institute, Roorkee	1967
Shri D.N. Bhargava	U.P. Irrigation Research Institute, Roorkee	1967
Shri D. Doddiah	Mysore Engineering Research Station, Krishnarajasagar	1967
Shri M.C. Chaturvedi	Central Designs Organisation, Irrigation Deptt., Lucknow	1967
Shri J. Walter	Soil Mechanics Research Division, P.W.D., Madras	1967
Shri W.S. Winnfread	Soil Mechanics Research Division, P.W.D., Madras	1967
Shri S.S. Murty	Central Water and Power Commission, New Delhi	1967
S/ Shri S. Srinivasan and V.N. Sujeer	College of Engg., Madras	1967
Shri J.R. Murti	Regional Engineering College	1967
Shri T.K.S. Ramanujam	Soil Mechanics Research Division, P.W.D., Madras	1967
Shri R. Krishnamurthy	Soil Mechanics Research Division, P.W.D., Madras	1967
Shri S.N. Gupta and Shri C.M. Pant	U.P. Irrigation Research Institute, Roorkee	1967
Shri B.N. Gupta	Pant U.P. Irrigation Research Institute, Roorkee	1967
Shri V.N. Nagaraja	Ministry of Irrigation and Power, New Delhi	1967
Shri H.D. Sharna	U.P. Irrigation Research Department, Lucknow	1967
Shri M.L. N.Reddy	A.P. Engineering Research Laboratory, Hyderabad	1967
Shri S. Bahadur Ali	A.P. Engineering Research Laboratory, Hyderabad	1967
Shri V.K. Thakar	Central Water and Power Research Station, Pune	1967
Shri D.K. Vaid	Central Water and Power Research Station, Pune	1967
Shri B.N. Gupta	UP Irrigation Research Institute, Roorkee	1967
Shri K.P. Shukla	UP Irrigation Research Institute, Roorkee	1967
Shri M.R. Vinayaka	Maharashtra Engineering Research Institute, Nasik	1967
Shri S.P. Sangal	U.P. Irrigation Research Institute, Roorkee	1967
Shri Anil Kumar	U.P. Irrigation Research Institute, Roorkee	1967
Shri C.V. Gole	Central Water and Power Research Station, Pune	1968

Shri S.V. Chitale	Central Water and Power Research Station, Pune	1968
Ms. B.L. Kamat	Central Water and Power Research Station, Pune	1968
Shri J.A. Murray	Irrigation Deptt., A.P. Hyderabad	1968
Shri N.K. Sonaras	Irrigation Deptt., A.P. Hyderabad	1968
Shri S.K. Nag	Calcutta Port Commission, Calcutta	1968
Shri A. Sen	Calcutta Port Commission, Calcutta	1968
Shri B.N. Gupta	U.P. Irrigation Research Institute, Roorkee	1968
Shri S. Khalid	U.P. Irrigation Research Institute, Roorkee	1968
Shri P.S. Bhatnagar	Punjab Irrigation Department, Chandigarh	1968
Shri A.M. Singal	Punjab Irrigation Department, Chandigarh	1968
Shri Shamsheer Prakash and Shri Mani Kant Gupta	University of Roorkee, Roorkee	1968
Shri G. Ramakrishna	A.P. Engineering Research Laboratory, Himayayatsagar, Hyderabad.	1968
Shri M. Osman Ahmed	A.P. Engineering Research Laboratory, Himayayatsagar, Hyderabad.	1968
Shri S.H.R. Naqui	A.P. Engineering Research Laboratory, Himayayatsagar, Hyderabad.	1968
Shri A.N. Harkauli	U.P. Irrigation Department, Lucknow	1968
Shri M.M.I. Khanna	U.P. Irrigation Department, Lucknow	1968
Shri H.S.S. Singhal	U.P. Irrigation Department, Lucknow	1968
Shri N.N. Yokovlev	CWPC, New Delhi	1969
Shri Y.K. Murthy	CWPC, New Delhi	1969
Shri N.Viswanthan	CWPC, New Delhi	1969
Shri B.S. Kapre	Maharashtra Engineering Research Institute, Nasik	1969
Shri S.E. Bhelke	Maharashtra Engineering Research Institute	1969
Shri B.S Nigam	Maharashtra Engineering Research Institute	1969
Shri B. Pant	Central Water and Power Research Station, Pune	1969
Shri S.B. Kulkarni	Central Water and Power Research Station, Pune	1969
Shri K. Seetharamiah	Indian Instt. of Science, Bangalore	1969
Shri D. Doddiah	Mysore Engineering Research Station, Krishnarajasagar	1969
Shri S. Govindaraja	Mysore Engineering Research Station, Krishnarajasagar	1969
S/Shri A.N. Harkauli and P.N. Gupta	U.P. Irrigation Deptt., Lucknow	1969



Shri B.H. Rajan	Mysore Engineering Research Station, Krishnarajasagar	1969
Shri B.V. Ranganatham	Indian Instt. of Science, Bangalore	1969
Shri M.R. Madhav	Indian Instt. of Science, Bangalore	1969
Shri R.J. Srinivasan	Indian Instt. of Science, Bangalore	1969
Shri M.R. Vinayaka	Maharashtra Engg. Research Institute, Nasik	1969
Shri S.N. Sreekantiah	Maharashtra Engg. Research Institute, Nasik	1969
Shri P.V. Pawar	Maharashtra Engg. Research Institute, Nasik	1969
Shri A.B. Arage	Maharashtra Engg. Research Institute, Nasik	1969
S/Shri L.C. Jain and P.M. Ahluwalia	Central Water and Power Commission, New Delhi	1969
S/Shri B. Thapar and M.L. Chawla	Punjab State Electricity Board, Chandigarh	1969
S/Shri R.L. Mahajan and S.S. Sandhu	Punjab State Electricity Board, Chandigarh	1969
S/Shri S.N. Vinze and A.N. Singh	Central Water and Power Commission, New Delhi	1969
Shri A.R.N. Rao	A.P. Elec. Board, Hyderabad	1969
S/Shri T. Suba Rao and Jugal Kishore		1969
S/Shri H.N. Ramachandra Rao and D.K. Subramanian	Indian Institute of Science, Bangalore	1969
S/Shri H.M.S. Lingaiah and B.G. Satye	Karnataka State Elec. Board, Bangalore	1969
Shri V.N. Nagaraja	Ministry of Irrigation and Power, New Delhi	1970
S/Shri V.S. Thakar and D.K. Vaid	Central Water and Power Research Station, Pune	1970
S/Shri S.P. Sangal and Anil Kumar	U.P. Irrigation Research Institute, Roorkee	1970
S/Shri S.N. Gupta, B.N. Gupta and C.M. Pant	U.P. Irrigation Research Institute, Roorkee	1970
Shri H.D. Sharma	U.P. Irrigation Deptt., Roorkee	1970
S/Shri M.L.N. Reddy and S. Bahadur	A.P. Engineering Research Laboratory, Hyderabad	1970
S/Shri B.N. Gupta and K.P. Shukla	U.P. Irrigation Research Institute, Roorkee	1970
Shri M.R. Vinayaka	Maharashtra Engineering Research Institute, Nasik	1970
Dr. K.T. Sundara	Indian Institute of Science, Bangalore	1971
Shri Raja Iyengar	Indian Institute of Science, Bangalore	1971
Shri M.K. Prabhakara	Indian Institute of Science, Bangalore	1971

Shri B.R.R. Iyengar	Central Water and Power Commission, New Delhi	1971
Shri A.N. Singh	Central Water and Power Commission, New Delhi	1971
Shri P.M. Ahluwalia	Central Water and Power Commission, New Delhi	1971
S/Shri B.R. Palta and H.K. Khosla	Beas Project, Talwara Township	1972
Dr. K. Parthasarathy	B.K. Mukhopadhyay Indian Institute of Science, Bangalore	1972
S/Shri H.P. Khincha and B.K. Mukhopadhyay	Indian Institute of Science, Bangalore	1972
Shri A.R. Kulkarni	Maharashtra Engineering Research Institute, Nasik	1972
Shri D.K. Joshi	Maharashtra Engineering Research Institute, Nasik	1972
Shri G.D. Karanjkar	Maharashtra Engineering Research Institute, Nasik	1972
Shri S.L. Mokhashi	Central Water and Power Research Station, Pune	1972
Shri S.K. Chakraborty	Central Water and Power Research Station, Pune	1972
Shri B.D. Suryavanshi	Irrigation Circle, Indore, M.P.	1973
Shri R.S. Varshney	Water Resources Development Training Centre, University of Roorkee, Roorkee	1973
Shri B.B. Mathur	Water Resources Development Training Centre, University of Roorkee, Roorkee	1973
Shri S.K. Guha	Central Water and Power Research Station, Pune	1973
Shri Krishna Nand	Central Water and Power Research Station, Pune	1973
Shri A.V. Wedpathak	Central Water and Power Research Station, Pune	1973
Shri S.P. Agarwal	Central Water and Power Research Station, Pune	1973
Shri B.S. Kapre	Maharashtra Engineering Research Institute, Nasik	1973
Shri S.B. Sohoni	Maharashtra Engineering Research Institute, Nasik	1973
Shri T.W. Shurpal	Maharashtra Engineering Research Institute, Nasik	1973
Shri B. Pant	Central Water and Power Research Station, Pune	1973

Shri P.V. Mathew	Central Water and Power Research Station, Pune	1973
Shri B.N. Iyengar	Indian Institute of Science, Bangalore	1973
Shri K. Parthasarathy	Indian Institute of Science, Bangalore	1973
Shri H.P. Khincha	Indian Institute of Science, Bangalore	1973
Shri G.C. Kothari	Indian Institute of Science, Bangalore	1973
Shri B.S. Ashok Kumar	Indian Institute of Science, Bangalore	1973
Dr. R.P. Lohtia	Regional Engineering College, Kurukshetra and Shri P.S. Gahlot Govt. Polytechnic, Alwar	1974
Shri L. Venkatanarasimhan	Soil Mechanics and Research Division, Chepauk, Madras	1974
Shri T.K.S. Ramanujam	Soil Mechanics and Research Division, Chepauk, Madras	1974
Shri R. Rajaraman	Soil Mechanics and Research Division, Chepauk, Madras	1974
Dr. H. Raman	Indian Institute of Technology, Madras	1974
Shri T.C. Gopalakrishnan	Indian Institute of Technology, Madras	1974
Shri H.C. Chopra	Delhi Electric Supply Undertaking, New Delhi	1974
Shri T. Sampat	Delhi Electric Supply Undertaking, New Delhi	1974
Shri S.R. Sikdar	WB State Elec. Board, Calcutta	1974
Shri Nagin Singh Grewal	Punjab State Elec. Board, Chandigarh	1974
Shri S.L. Goyal	Punjab State Elec. Board, Chandigarh	1974
Shri Kripal Singh	Punjab State Elec. Board, Chandigarh	1974
Shri S.S. Lamba	Irrigation Deptt., Punjab Chandigarh Beas Dam Project, Chandigarh	1975
Shri N.K. Berry	Irrigation Deptt., Punjab Chandigarh Beas Dam Project, Chandigarh	1975
Shri I.C. Gupta	Beas Sutlej Link Project Sundernagar, Township	1975
Shri H.G. Joshi	Beas Sutlej Link Project Sundernagar, Township	1975
Shri Awtar Singh	Beas Sutlej Link Project Sundernagar, Township	1975
Shri P.C. Saxena	Central Water and Power Research Station, Pune	1975
Shri S.R. Gaikwad	Central Water and Power Research Station, Pune	1975

Shri V.V. Erande	Central Water and Power Research Station, Pune	1975
Shri A.N. Raju	Concrete and Soil Research Station, Pune	1975
Shri T.K.S. Ramanujam	Concrete and Soil Research Station, Pune	1975
Shri R. Krishnamurthy	Concrete and Soil Research Station, Pune	1975
Shri G. Manickam	Concrete and Soil Research Station, Pune	1975
Shri K.M. Kulkarni	Hindustan Construction Co. Ltd. Bombay	1975
Shri H.D. Sharma	U.P. Irrigation Research Institute, Roorkee	1975
Shri D.V. Varshney	U.P. Irrigation Research Institute, Roorkee	1975
Shri S.S. Tiagi	U.P. Irrigation Research Institute, Roorkee	1975
Shri O.P. Suri	Bharkra Management Board Dhultrote, Amhala	1975
Shri S.L. Goyal	Punjab State Elec. Board, Chandigarh	1975
Shri V.S. Thakar	Central Water and Power Research Station, Pune	1976
Dr. Bharat Singh	University of Roorkee, Roorkee	1976
Shri G.C. Nayak	University of Roorkee, Roorkee	1976
Shri N. Puri	University of Roorkee, Roorkee	1976
Shri R.L. Dewan	Irrigation Research Institute Patna	1976
Shri J.L. Pal	Irrigation Research Institute, Patna	1976
Shri B.K. Kumar	Irrigation Research Institute, Patna	1976
Dr. B. Pant	Central Water and Power Research Station, Pune	1976
Shri M.G. Surve	Central Water and Power Research Station, Pune	1976
Shri B. Thomas	Central Water and Power Research Station, Pune	1976
Shri J.C. Kalra	Haryana State Elec. Board, Faridabad	1976
Shri H.C. Mehra	Haryana State Elec. Board, Faridabad	1976
Shri P.P. Pamenja	Haryana State Elec. Board, Faridabad	1976
Shri R. Varadarajan	Kerala State Elec. Board, Trivandrum	1976
Shri I.V. Appa Rao	Kerala State Elec. Board, Trivandrum	1976
Shri V. Anantha Sheno	Kerala State Elec. Board, Trivandrum	1976
Shri K.P. Varghese	Kerala State Elec. Board, Trivandrum	1976
Shri K.R. Hariharan	Kerala State Elec. Board, Trivandrum	1976
Shri H.D. Sharma	U.P. Irrigation Research Institute, Roorkee	1977
Shri D.V. Varshney	U.P. Irrigation Research Institute, Roorkee	1977
Shri S.S. Tiagi	U.P. Irrigation Research Institute, Roorkee	1977

Shri B. Pant	Central Water & Power Research Station, Pune	1977
Shri A.S. Khot	Central Water & Power Research Station, Pune	1977
Shri K.R. Bhattacharjee	Central Water & Power Research Station, Pune	1977
Shri M.G. Bhutte	Central Water & Power Research Station, Pune	1977
Shri B.K. Rao	Gujarat Engineering Research Institute, Baroda	1977
Shri K.B. Gandhi	Gujarat Engineering Research Institute, Baroda	1977
Shri G. Ramakrishna	A.P. Engineering Research Laboratory, Himayatsagar, Hyderabad.	1977
Shri M. Osman Ahmed	A.P. Engineering Research Laboratory, Himayatsagar, Hyderabad.	1977
Shri S.H.R. Naqui	A.P. Engineering Research Laboratory, Himayatsagar, Hyderabad.	1977
Shri S. Parameshwaran	Central Power Research Institute, CPRI	1977
Shri V.M. Naik	Central Power Research Institute, CPRI	1977
Shri K.V. Rangaiah	A.P. Elec. Board, Hyderabad	1977
Shri A. Gururaja Rao	A.P. Elec. Board, Hyderabad	1977
Shri D.B. Ghare	A.P. Elec. Board, Hyderabad	1977
Shri A. Veeraraghavan	A.P. Elec. Board, Hyderabad	1977
Shri K.V. Rangaiah	A.P. Elec. Board, Hyderabad	1977
Shri S.A. Mutallib	A.P. Elec. Board, Hyderabad	1977
Shri T.V. Mohan Rao	A.P. Elec. Board, Hyderabad	1977
Shri K. Ramakrishna	Indian Institute of Science, Bangalore	1977
Shri J.P. Gupta	Tehri Dam Design Circle, Roorkee	1978
Dr. H.R. Sharma	Tehri Dam Design Circle, Roorkee	1978
Shri S. Kripandhi	Tamil Nadu Elec. Board, Madras	1978
Shri S. Sridharan	Tamil Nadu Elec. Board, Madras	1978
Shri N. Nath	The English Electric Co. of India, Madras	1978
Shri H.M.S. Lingaiah	Karnataka State Elec. Board, Bangalore	1978
Shri B.S. Tanwar	Haryana State Minor Irrigation Tubewells Corp., Karnal	1979
Dr. A.N. Harkauli	Central Water Commission, New Delhi	1979
Shri K. Madhavan	Central Water Commission, New Delhi	1979
Shri M.P. Parsuraman	Central Water Commission, New Delhi	1979

Shri Vijay P. Singh	Mississippi State University, U.S.A.	1979
Shri K.C. Jain	M.P. State Elec. Board, Jabalpur	1979
Shri S.N. Singh	EMC Stealal Ltd., Calcutta	1979
Shri P. Dutta	Delhi Electric Supply Undertaking, New Delhi	1979
Shri A.S. Chawla	U.P. Irrigation Research Institute, Roorkee Rishikesh	1980
Shri R.S. Melkote	Central Soil & Materials Research Station, New Delhi	1980
Shri A.K. Mohanty	Central Soil & Materials Research Station, New Delhi	1980
Shri K. Venkatachalam	Central Soil & Materials Research Station, New Delhi	1980
Shri R.S. Varshney	University of Roorkee, Roorkee	1980
Shri N.C. Rastogi	University of Roorkee, Roorkee	1980
Shri R.K. Misra	University of Roorkee, Roorkee	1980
Shri V.B. Patil	Gujarat Engineering Deptt., Gandhinagar	1980
Shri B.J. Parmer	Gujarat Engineering Deptt., Gandhinagar	1980
Shri P.M. Ahluwalia	CEA, New Delhi	1980
Shri R.B. Mathur	CEA, New Delhi	1980
Shri A.K. Kapur	CEA, New Delhi	1980
Shri P.M. Ahluwalia	CEA, New Delhi	1980
Shri S.R. Nair	CEA, New Delhi	1980
Shri Ashok Agrawal	CEA, New Delhi	1980
Shri P.M. Ahluwalia	CEA, New Delhi	1980
Shri V.D. Anand	CEA, New Delhi	1980
Shri Jatinder Singh	CEA, New Delhi	1980
Shri H.S. Sehra	CEA, New Delhi	1980
Shri S.G. Menon	Tata Consulting Engineers, Bombay	1980
Shri S.S. Sharma	New A.P.M. Designs Command Area Development Organisation, Suratgarh	1981
Shri Sudhakar Patri	Superfloods in Case of Dam, Hydraulic Research Division, Breaches Burla Orissa	1981
Shri M.K. Singhal	National Hydroelectric Power Corporation, New Delhi	1981
Shri H.S.S. Singhal	U.P. Irrigation Research Institute, Roorkee	1981
Shri J.B. Maheshwari	U.P. Irrigation Research Institute, Roorkee	
Prof. Bharat Singh	Water Resources Development Training Centre, Roorkee	1981

Mr. G. Al. Mashidani	College of Engg., University of Iraq.	1981
Mr. A.M. ALI	College of Engg., University of Iraq.	1981
Shri C.D. Thatte	Gujarat Engineering Research Institute, Vadodara	1981
Shri M.G. Raichur	Gujarat Engineering Research Institute, Vadodara	1981
Shri J.K. Patel	Gujarat Engineering Research Institute, Vadodara	1981
Shri K.A. Gandhi	Gujarat Engineering Research Institute, Vadodara	1981
Shri M.M. Shah	Gujarat Engineering Research Institute, Vadodara	1981
Shri R.C. Chauhan, Water Resources Development Training Centre	University of Roorkee, Roorkee	1981
Shri O.D. Thapar, Water Resources Development Training Centre	University of Roorkee, Roorkee	1981
Shri P.M. Ahluwalia	CEA, New Delhi	1981
Shri Ashok Aggarwal	CEA, New Delhi	1981
Shri J.C. Gupta	U.P. State Elec. Board, Lucknow	1981
Shri T.C. Goel	U.P. State Elec. Board, Lucknow	1981
Shri N.D. Gupta	U.P. State Elec. Board, Lucknow	1981
Shri M.K. Khan	U.P. State Elec. Board, Lucknow	1981
Shri R.D. Begamudre	Central Power Research Institute, Bangalore	1981
Shri R.S. Shivakumara Aradhya	Central Power Research Institute, Bangalore	1981
Shri P.C. Saxena	Central Water and Power Research Station, Pune	1982-83
Shri S.L. Mokhashi	Central Water and Power Research Station, Pune	1982-83
Shri B.K. Saha	Central Water and Power Research Station, Pune	1982-83
Shri K.A. Ismail	Central Water and Power Research Station, Pune	1982-83
Shri B.M. Rame Gowda	Central Water and Power Research Station, Pune	1982-83
Shri K.G. More	Gujarat Engineering Research Institute, Vadodara	1982-1983
Shri D.L. Shah	Gujarat Engineering Research Institute, Vadodara	1982-1983

Shri L.M. Shah	Gujarat Engineering Research Institute, Vadodara	1982-1983
Dr. M.V. Bapat	Gujarat Irrigation Department, Vadodara	1982-1983
Shri B.H. Rajan	Karnataka Engineering Research Station, Krishnarajasagar	1982-1983
Shri K. Chandrasekhara Gupta	Karnataka Engineering Research Station, Krishnarajasagar	1982-1983
Shri P. Satyanath	Karnataka Engineering Research Station, Krishnarajasagar	1982-1983
Shri S. Venkataramana	Karnataka Engineering Research Station, Krishnarajasagar	1982-1983
Shri M.U. Purohit	Gujarat Irrigation Department, Gandhinagar	1982-1983
Shri I.M. Patel	Gujarat Irrigation Department, Gandhinagar	1982-1983
Shri A.R. Jani	Gujarat Irrigation Department, Gandhinagar	1982-1983
Shri A.N. Chander	Soil Mechanics and Research Division, Madras	1982-1983
Shri T.K.S. Ramanujam	Soil Mechanics and Research Division, Madras	1982-1983
Shri R. Krishnamoorthy	Soil Mechanics and Research Division, Madras	1982-1983
Shri B.N. Mitra	National Thermal Power Corporation, New Delhi	1982-1983
Shri N.S. Veeraraghavan	Tata Consulting Engineers Bombay	1982-1983
Shri D.B. Mehta	Tata Consulting Engineers Bombay	1982-1983
Shri S.R. Narasimhan	CPRI, Bangalore	1982-1983
Shri M. Chander	Malvy Engg. College	1982-1983
Shri S.K. Calla	Rajasthan State Elec. Board, Jaipur	1982-1983
Shri V.N. Rikh	U.P. State Elec. Board	1982-1983
Shri N.N. Sur	DVC, Calcutta	1982-1983
Shri V. Anantha Sheno	Kerela State Elec. Board, Trivandrum	1982-1983
Shri T. Francis Paul	Kerela State Elec. Board, Trivandrum	1982-1983
Shri V. Vishwanatha Prabhu	Kerela State Elec. Board, Trivandrum	1982-1983
Shri M.S. Reddy	Central Water Commission, New Delhi	1984
Shri T.D. Sundarababu	Central Water Commission, New Delhi	1984
Shri M.M.N. Saxena	Central Water Commission, New Delhi	1984
Shri N.B. Desai	Narmada Project, Vadodara	1984
Shri S.G.V. Rao	Narmada Project, Vadodara	1984
Shri N.T. Mathew	Narmada Project, Vadodara	1984
Shri C.I. Joseph	Kerala Engineering Research Institute, Peechi	1984



Shri K.G. Babu	Kerala Engineering Research Institute, Peechi	1984
Shri K.M. Nabeesa	Kerala Engineering Research Institute, Peechi	1984
Shri R.P. Dhir	Central Arid Zone Research Institute, Jodhpur	1984
Shri E. Shanmukha Rao	Central Road Research Institute, New Delhi	1984
Shri R.K. Jain	Central Road Research Institute, New Delhi	1984
Shri J. Bhagwan	Central Road Research Institute, New Delhi	1984
Shri D. Mukherjee	Central Road Research Institute, New Delhi	1984
Shri P. Sen	CWC, New Delhi	1984
Shri Santokh Singh	Irrigation & Power Research Institute, Amritsar	1984
Shri Mahinder Kumar	Irrigation & Power Research Institute, Amritsar	1984
Shri P.J. Damany	Gujarat Elec. Board, Vadodara	1984
Shri Mata Prasad	U.P. State Elec. Board, Lucknow	1984
Shri V.P. Anand	Electrical Manufacturing Co. Ltd., Calcutta	1984
Shri A.K. Deb	Electrical Manufacturing Co. Ltd., Calcutta	1984
Shri P.K. Mukherjee	Electrical Manufacturing Co. Ltd., Calcutta	1984
Shri S. Parameswaram	CPRI, Bangalore	1984
Shri R. Arunachalm	CPRI, Bangalore	1984
Shri Arinjai Kumar	U.P. State Elec. Board, Dehradun	1984
Dr. H.R. Sharma	Central Electricity Authority, New Delhi.	1985
Shri T.P. Vats	Central Electricity Authority, New Delhi	1985
Shri Jang Bahadur	Central Electricity Authority, New Delhi	1985
Shri K.K. Kapoor	Rajasthan State Electricity Board, Banswara	1985
Shri S.C. Patodiya	Rajasthan State Electricity Board, Banswara	1985
Shri K.R. Datye	Rehem Mansion, No. 2,44 S. Bhagat Singh Road, Bombay and Maharashtra Indl Development Corpn., Bombay	1985
Shri G.R. Lele	Rehem Mansion, No. 2,44 S. Bhagat Singh Road, Bombay and Maharashtra Indl Development Corpn., Bombay	
S/Shri S.D. Ketkar and N.M. Joshi	Akola Irrigation Circle, Akola, Maharashtra	1985
Shri Subhash Chander	Indian Institute of Technology, New Delhi	1985
Shri T.K. Mukhopadhyay	Central Water Commission, New Delhi	1985
Shri Sarvashri N.R. Das	Bharat Heavy Electricals Ltd., Bhopal	1985
Shri M.P. Srivastava	Bharat Heavy Electricals Ltd., Bhopal	1985
Shri Sarvashri K.B. Mathur	U.P. State Elec. Board, Lucknow	1985

Shri J.K. Malhotra	U.P. State Elec. Board, Lucknow	1985
Shri Vireshwar Singh	U.P. State Elec. Board, Lucknow	1985
Shri G.V. Chelapathi Rao, Director of Audit	West Bengal	1985
Shri Sarvashri C.M. Shah	Gujarat Elec. Board, Vadodara	1985
Shri C.M. Dalal	Gujarat Elec. Board, Vadodara	1985
Shri K.H. Patel	Gujarat Elec. Board, Vadodara	1985

Dr. P.R. Krishnamoorthy	1986-87
Dr. B.K. Chaturvedi	1986-87
Shri P. Sivagnanam	1986-87
Shri J.V. Sastry	1986-87
Shri Brijendra Sen	1986-87
Shri J.K. Malhotra	1986-87
Shri A.K. Mitra	1986-87
Shri V.P. Tiwari	1986-87
Shri S. Cyahder	1986-87
Shri R.S. Moni	1986-87
Shri Bhaskar Sinha	1986-87
Shri G.P. Chaukiyal	1986-87
Shri A. Raja Rao	1986-87
Shri V.D. Anand.	1986-87
Shri D.L. Gulati	1986-87
Shri A.K. Aggarwal	1986-87
Shri Nagin Singh Grewal	1986-87
Shri K.K. Batta	1986-87
Shri S.N. Sharma	1986-87
Shri V.K. Pande	1986-87
Research Station BBMB Nangal Township, Punjab	1986-87
Dr. M. Ravindran	1986-87
Dr. H.C. Radhakrishna	1986-87
Shri Rajiv Tandon	1986-87
Shri Jayadev Chakravarty	1986-87
Shri R.H. Khatsuria	1986-87
Shri P.B. Dealalakar	1986-87
Smt. V-WBhosekar	1986-87
Shri CD. Thatte	1986-87

Shri B.K. Rao	1986-87
Shri B.K. Hare	1986-87
Shri S.P. Rajagopalan	1986-87
Shri U.V. Jose	1986-87
Shri A.V. Shroff	1986-87
Shri Piyush Parikh	1986-87
Shri T.S. Magaraj	1986-87
Shri K.T. Sundara Raja Iyengar	1986-87
Shri S.G. Shashi Prakash	1986-87
Shri C. Sudhindra	1986-87
Shri S.B. Suri	1986-87
Shri Murari Ratnam	1986-87
Shri H.C. Sandhi	1986-87
Shri M.J.S. Rajpal	1986-87
Shri S.V. Dixit	1989-90
Shri Anil Garg	1989-90
Shri H.V. Eswaraiyah	1989-90
Shri G. Purushotham	1989-90
Shri G.N. Rao	1989-90
Shri A.K. Mitra	1989-90
Shri Anil Chanana	1989-90
Shri S. Sellaratnam	1989-90
Shri N. Krishnamurthy	1989-90
Shri P. Chidambaram	1989-90
Shri V. Ganasabandam	1989-90
Shri B.S. Sharma	1989-90
Shri A.K. Mitra	1989-90
Shri J.K. Malhotra	1989-90
Shri P. Sivagnanam	1989-90
Shri M.V. Krishna Rao	1989-90

Shri C. Kamalalar	1989-90
Shri L. Radhakrishna	1989-90
Shri C. Radhakrishna	1989-90
Shri P.J. Ingle	1989-90
Shri P.K.Kognolkar	1989-90
Shri M. Bhatnagar	1989-90
Research Station, Bhakra Beas Management Board (Power Wing), Nangal Township	1989-90
Shri Santokh Singh Chhabra	1989-90
Shri R.K. Nagpal	1989-90
Shri Subhasis Nandi	1989-90
Shri V.N. Nanda Kumar	1989-90
Shri K.S.N. Murthy	1989-90
Shri R.K. Hedge	1989-90
Shri M.M. Babu Narayanan	1989-90
Shri S. Parameswaran	1989-90
Shri R.A. Iyer	1989-90
Shri S.M. Takalkar	1989-90
Shri S.A. Shah	1989-90
Shri M.T. Shah	1989-90
Shri M.C. Ratra	1989-90
Shri H.N. Nagamani	1989-90
Shri Satish Nayar	1989-90
Shri J.P. Agal	1989-90
Shri D.N. Kulkarni	1989-90
Shri S.Y. Kulkarni	1989-90
Shri R.R.Rasal	1989-90
Shri B.B. Singh Samant	1989-90
Shri K.C. Patra	1989-90
Shri K.S. Sital	1989-90

Shri Mahindere Kumar	1989-90
Shri Jagjit Singh	1989-90
Shri B.N Bhargava	1989-90
Shri C.K. Agarwai	1989-90
Shri V.K. Malhotra	1989-90
Shri Subhash Mitra	1989-90
Shri Rajan K. Sampath	1989-90
Shri V.K. Jyothi	1989-90
Shri S.C. Patel	1989-90
Shri M. Arora	1989-90
Dr. B. Pant	1989-90
Shri A. Sridharan	1989-90
Shri B.R. Srinivasa Murthy	1989-90
Shri Bindumadhava	1989-90
Shri M.U. Purohit	1991
Shri D.M. Pancholi	1991
Shri N.P. Mehta	1991
Shri T.S. Nagaraj	1991
Shri N.S. Pandian	1991
Shri G.L. Sivakumar Babu	1991
Shri M.M.Ali	1991
Shri T. Sankar Rao	1991
Shri K.V. Raghavachari	1991
Shri A.B. Palaniappam	1991
Shri R.J. Garde	1991
Shri P.N. Godbole	1991
Shri M.D. Dube	1991
Shri K.C. Govil	1991
Shri K.B. Sunder Ray	1991
Shri S. Mohan	1991
Shri Rama Prasad	1991

Dr. S. Mohan, Professor	Civil Engineering Deptt., IIT, Madras	1992
Shri R.Chalisagaonka, Asstt. Engineer	UPIRI, Roorkee	1992
Shri V. Gopala Krishnan, AGM	BHEL, Tiruchirapalli	1992
Shri R. Ravi Chandran, Manager (ECS)	Tiruchirapalli	1992

Shri N.K. Agrawal, Addl. Chief Engineer	Nuclear Power Corpn. of India Ltd., 500 MW PHWR Group Bhakra Atomic Res. Centre, Bombay	1992
Shri M.L. Malik, Advisor	NTPC Scope Complex Bhawan 7, Institutional Area, Lodi Road, New Delhi	1992
Shri S.S. Chajta, System Manager, Shri P.C. Sharma Director and Shri R.K. Kapoor, Ex-Member	H.P. State Electronics Dev. Corpn. Simla and (G&T), Simla	1992
Shri P.J. Ingle, Addl. Director	CPRI Bhopal	1992
Shri P.K. K. Kagnolkar, Jt. Dir	CPRI, Bhopal	1992
Shri Subodh Prakash, Engineer Officer	CPRI, Bhopal	1992
Shri R. Arunachalam, Chief Engineer	TNEB Anna Salai, Madras and Ex-Engr. (R&D)	1992
Shri N. Padmanabhan	TNEB Anna Salai, Madras and Ex-Engr. (R&D)	1992
Shri V. Ganesan, Asstt. Engr.	(R&D) TNEB, Madras	1992
Shri Sanjay Chandra, Gen. Manager	BHEL, Bhopal	1992
Shri A.K. Tripathy, Gen. Manager	BHEL, Bhopal	1992
Shri T. Adhikary, Gen. Manager	BHEL, Bhopal	1992
Shri S.C. Kapoor, Gen. Manager,	BHEL, Bhopal	1992
Shri P.K. Dubey	(R&D), MPEB, Jabalpur	1992
Shri M.N. Sarwale, Addl. CE	(R&D), MPEB, Jabalpur	1992
Ashok Bajpayee, Executive Engg., (T)	(R&D), MPEB, Jabalpur	1992
Shri P. Pathale, Executive Engineer	(R&D), MPEB, Jabalpur	1992
Shri S.R. Susendran, Jt. Director	CPRI, Bangalore	1992
Shri Afsar Ahmed	CPRI, Bangalore	1992
Shri T.Raghunatha, Officer	CPRI, Bangalore	1992
Shri P. Krishna Murthy, Engg. Officer	CPRI, Bangalore	1992
Shri D. Revanna, Engg. Engg. Officer	CPRI, Bangalore	1992
Shri Arinjay Kumar, Chief Engineer	UPSEB, Dehradun	1992
Shri S.S. Virmani, S.E. and Shri S.K. Tyagi, Executive Engr.	UPSEB, Dehradun	1992
Shri J.S. Sandha, Chief Engineer	Punjab Engg. College Campus, Chandigarh	1992
Shri S.K. Gupta, Asstt. Director	Punjab Engg. College Campus, Chandigarh	1992
Shri K.K. Guru, Asstt. Director	Punjab Engg. College Campus, Chandigarh	1992
Shri M. Rama Rao, Chief Engineer	APSEB, Hyderabad	1992
Shri K. Viswanath, Chief Engineer	APSEB, Hyderabad	1992
Shri V. Koteswara, Chief Engineer	APSEB, Hyderabad	1992
Shri H.C. Mittal, Secretary	UPSEB, Lucknow	1992

Shri J.K. Malhotra, Chief Engineer	UPSEB, Lucknow	1992
Shri A.K. Mitra, Superintending Engineer	UPSEB, Lucknow	1992
Shri P.K. Duhey Member (T&D)	MPEB, Jabalpur	1992
Shri A.J. Kale, Supdt.Engineer	MPEB, Jabalpur	1992
Shri M.N. Sarwate, Addl.Chief Engineer	MPEB, Jabalpur	1992
Shri P.P.Majumdar, Asstt. Professor	Deptt. of Civil Engineering, Indian Institute of Science, Bangalore	1993
Shri S.T. Nadkarni, Executive Engg.	Irrigation Department Panaji, Goa	1993
Shri G.L.Sivakumar, Babu Scientist	Geotechnical Engineer Div. Central Road Research Institute New Delhi	1993
Shri U.C.Kothiyari, Lecturer	Deptt. of Civil Engineering, University of Roorkee	1994
Shri Manoj Verman, Scientist	Central Mining Res. Station, Unit 54-B, Shankar Nagar, Nagpur	1994
Dr. C.P.S.Ojha, Asstt.Professor	University of Roorkee, Roorkee	1996
Shri Niwas Singh, Asstt.Professor	University of Roorkee, Roorkee	1996

### BEST PAPER AWARD

Name & Designation	Organisation	Year
Mr. M. Andrew Graettinger	Department of Civil Engineering, North Western University, 2145 Shendan Road, Evanstan, Illionois - 602 USA	1993
Shri M.C.Nebhani	NTPC	2003
Shri Gopal Dhawan, General Manager (Geology)	NHPC Ltd., Faridabad	2005
Shri V.K. Pandey, Group General Manager	Corporate Quality, BHEL	2005
Shri P.K. Tiwari	Head Desalination Division, BARC	2007

# CHAPTER 6

## NATIONAL AND INTERNATIONAL ORGANIZATIONS

There are number of International Organisations whose Indian Chapters and their Secretariat are housed in Central Board of Irrigation and Power. These Non Governmental and purely technical organizations promote international collaborations and co- operation and the Board plays a pivotal role in disseminating the information supplied by them. As on date Indian Chapters/ National Committees of following international organization are housed in CBIP.

1. International Commission on Large Dams (ICOLD)
2. International Tunnelling and Underground Space Association (ITA)
3. International Society for Rock Mechanics (ISRM)
4. International Geosynthetics Society (IGS)
5. World Water Council (WWC)
6. International Water Resources Association (IWRA)
7. International Conference on High Voltage Electric System (CIGRE)
8. International Council for Electricity Distribution (CIRED)
9. International Hydropower Association (IHA)

In addition to the above, following International/ National organizations started by CBIP are also under operation in CBIP.

1. International Association for Small Hydro (IASH)
2. International Association on Electricity Generation, Transmission and Distribution (AARO)
3. Society of Power Engineers (India) (SPE)

There are some other International organizations which were functioning from CBIP but on date have cease of to carry out these functions from CBIP.

1. International Commission on Irrigation and Drainage (ICID)
2. International Association for Hydraulic Research (IAHR)

The activities of the Board in relation to different international organizations and their Indian chapters are detailed in this chapter.

## 6.1 INTERNATIONAL COMMISSION ON LARGE DAMS

**The International Commission on Large Dams (ICOLD)** founded in 1928, having National Committees from more than 95 countries is a non-governmental International Organization which provides a forum for the exchange of knowledge and experience in dam engineering. The secretariat of ICOLD is in Paris (France). Its original aim was to encourage advances in the planning, design, construction, operation, and maintenance of large dams and their associated civil works. Since the late sixties, focus was put on subjects of current concern such as dam safety, monitoring of performance, reanalysis of older dams and spillways, effects of ageing and environmental impact. More recently, new subjects include cost studies at the planning and construction stages, harnessing international rivers, information for the public at large, and financing.

The present President of ICOLD is Mr. A. Nombre from Burkina Faso and Secretary General is Mr. Michel de Vivo.

### INDIAN COMMITTEE ON LARGE DAMS (INCOLD)

Indian Committee on Large Dams (INCOLD), the Indian Chapter of International Commission on Large Dams (ICOLD) set up in the year 1930 was formally registered under Societies Registration Act 1860 in the year 1991. INCOLD helps in promotion and implementation of the objectives of ICOLD.

INCOLD Secretariat is located in CBIP Building at Chanakyapuri, New Delhi and is guided by President, INCOLD (Shri A.S. Bakshi, Chairperson, CEA, Secretary General Shri V.K. Kanjlia, Secretary, CBIP and Treasurer Shri A.C. Gupta, Director – Water Resources. The President of CBIP is president of INCOLD. In the recent past Mr. Gurdial Singh and Shri. Rakesh Nath, both Chairperson of CEA were the president, of INCOLD.

#### INCOLD Journal

Initially INCOLD was bringing-out half-yearly Newsletter covering the issues related to the development of dam engineering in India as well as other member countries of ICOLD. Since January 2012, instead of Newsletter, INCOLD is bringing-out half-yearly Journal for dissemination of the latest technological developments taking place in the field of dam engineering and its related activities all over the world to the Indian dam/hydropower professionals.

#### Events Organized

1. Workshop – Instrumentation of Dams including Seismic Instrumentation, 19-21 April 2000, Rishikesh (U.P.)
2. Workshop on Role of Gates and their Control in Water Resources Projects, 28-30 June 2000, Belgaum (Karnataka)

3. Workshop on “Dam Safety including Instrumentation of Dams”, 15-17 November 2000, Thiruvananthapuram (Kerala)
4. Workshop on Remote Sensing and GIS Application in Water Resources Engineering, 29-31 August 2001, Lucknow
5. International Conference on Dam Safety Evaluation, 11-14 December 2001, Panaji, Goa
6. Seminar on Roller Compacted Concrete Dams, 21-22 May 2002, New Delhi
7. Workshop on Impacts of Bhakra Nangal Projects, 4 August 2005, New Delhi
8. Short Course on Finite Element Method for the Analysis and Design of Dam and Underground Structures of Water Resources Projects, 21-25 July 2003, New Delhi
9. Conference on Large Dams and Hydropower Development, 26-28 May 2004, New Delhi
10. Seminar on Roller Compacted Concrete Dams, 10-12 May 2006 at Pune, Maharashtra
11. Capacity Building and Training Programme for Different Stakeholders in India’s Hydropower Sector 23-24 November 2007, New Delhi
12. Capacity Building and Training Programme for Different Stakeholders in India’s Hydropower Sector 23-24 January 2008, Dehradun
13. 3<sup>rd</sup> International Conference “Siltng Problems in Hydro Power Projects”, 27-28 February, 2008, New Delhi, India
14. Capacity Building and Training Programme for Different Stakeholders in India’s Hydropower Sector 24-25 March 2008, Shimla
15. Capacity Building and Training Programme for Different Stakeholders in India’s Hydropower Sector 29-30 April 2008, New Delhi
16. National Seminar on Seismic Safety of Concrete Gravity Dams, 27 February 2009, New Delhi
17. Short Course on Seismic Design of Concrete Gravity Dams, 3-6 March 2009, IIT, Kanpur
18. One-day Conclave on “Model Contract Documents for Development of Hydropower Projects” 1<sup>st</sup> October 2009, New Delhi
19. Training Programme on Planning, Design & Construction of Earth & Rockfill, CFRD, Concrete, and RCC Dams, 18-20<sup>th</sup> May 2010, New Delhi
20. One day workshop on “Seismic Aspects of Dam Designs – Issues and Challenges, 02<sup>nd</sup> July 2010, New Delhi
21. Training Programme on Design & Construction of Underground works of Hydropower project, 17-19<sup>th</sup> August 2010, New Delhi
22. Training Programme on Civil Quality Aspects in Hydropower Project Construction 28-30<sup>th</sup> September 2010, New Delhi



23. Technical Presentation on “Synthetic fibre reinforced concrete and shotcrete for Hydraulic and Underground construction structures”, 12<sup>th</sup> November 2010, New Delhi
24. Seminar on Roller Compacted Concrete Dams, 13-15<sup>th</sup> April 2011, Nashik, Maharashtra
25. Workshop on Construction of Dams & Tunnels in Weak Rocks, 25-26 May 2011
26. CBIP – Workshop on Dam Safety Management, 29-30 September 2011, New Delhi
27. Short Course on Scour of Rock (downstream of overtopping dams and plunge pools), 19<sup>th</sup> October 2011, New Delhi
28. Lectures Session by ICOLD International experts on 25<sup>th</sup> November 2011, New Delhi
29. Seminar on Interlinking of Rivers: Issues and Challenges, 12<sup>th</sup> September 2012, New Delhi
30. Seminar on Survey and Investigations of Hydroelectric Projects Issues and Challenges, 28 March 2012, New Delhi
31. Workshop on Dam Safety Management, 25-26<sup>th</sup> September 2012, New Delhi
32. Dam India: 2013: Latest Technology in Planning, Design and Construction of Dams, 22-23 May 2013, New Delhi

### 6.1.1 Important Events

#### 1. Golden Jubilee Congress of the International Commission on Large Dams (ICOLD)

The Golden Jubilee Congress of the International Commission on Large Dams was organised at Delhi from 29<sup>th</sup> October to 2<sup>nd</sup> November 1979. Prior to the Congress, meetings of the Technical Committees of the ICOLD and the Executive Meeting were held. The Congress was inaugurated by **Shri K.C. Pant, Hon’ble Minister for Energy.**



Shri K.C. Pant, Hon’ble Minister for Energy, delivering the inaugural address during the Golden Jubilee Congress at New Delhi



Shri Nathu Ram Mirdha, Minister of State for Finance releasing a postage stamp of Hirakud Dam on the occasion of the Golden Jubilee Congress of ICOLD

Other dignitaries who participated in the session were **Mr. F.H. Lyra, President**, International Commission on Large Dams; **Shri Brahm Perkash, Hon'ble Union Minister for Agriculture and Irrigation** and **Shri Nathu Ram Mirdha, Hon'ble Minister of State for Finance**, Shri Nathu Ram Mirdha, released a postage stamp of Hirakud Dam on the occasion of the Golden Jubilee Congress of ICOLD



Shri Brahm Perkash, Union Minister for Agriculture and Irrigation, Government of India, addressing the Participants.

The Technical Committees discussed subjects of “Analysis and Design of Dams”, “Deterioration of Dams and Reservoirs”, ‘Sedimentation of Reservoirs’, “Materials for Concrete dams and Fill dams”, “Mine and industrial tailing dams”, ‘Hydraulics for Dams’, ‘Seismic Aspects of Dam Design’ and ‘Technology of Dam Construction’.

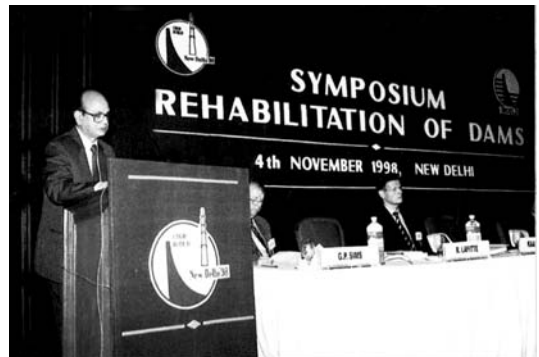
The technical questions discussed at Congress were related to :

(i) Interface Problems of Dams (ii) Deterioration or Failure of Dams (iii) Large Capacity Outlets and Spillways (iv) Seismicity and Aseismic Design of Dams

Nearly 1000 delegates participated in the Congress which included about 250 Indian participants. After the main Congress, the Indian National Committee arranged a number of study tours to afford an opportunity to the foreign participants to visit important dam sites.

## 2. 66<sup>th</sup> Annual Meeting of ICOLD, 1-6<sup>th</sup> November 1998 at New Delhi

The Indian Committee on Large Dams (INCOLD) hosted the 66<sup>th</sup> Annual Meeting of its parent body; International Commission on Large Dams (ICOLD) from 1-7 November 1998 at New Delhi. As is customary with the ICOLD Annual Meeting, a one day Symposium on “Rehabilitation of Dams” on 4<sup>th</sup> November 1998 was arranged to provide scope for exchange of experiences to facilitate exposure of state-of-art technology in all aspects of Rehabilitation of Dams. A half-day Workshop on Financing was also organized. The Symposium was inaugurated by Shri Z Hasan, Secretary, MoWR, Govt. of India. The other dignitaries who addressed the participants were Shri Kaare Hoeg, President, ICOLD and Shri C.V.J. Varma, Chairman, INCOLD. There were 291 delegates and 80 accompanying persons from abroad in addition to 185 Indians who participated in



the Symposium and Workshop. Out of 75 abstracts which were received from 22 countries, 33 were accepted and presentations were made in four technical sessions at the Symposium, which covered the following four themes:

1. Safety Inspection; Review of Hydrology; Spillway Capacity and Freeboard (Chaired by Shri E. Sundaraiya of India)
2. Leakage/Seepage Control, Seismic Design and Instrumentation (Chaired by Shri G.L. Java of India)
3. Structural Failures/Distress of Dams (Chaired by Dr. K. Venkatachalam of India)
4. Chemical Analysis of Deteriorated Dam Material and Risk Analysis (Chaired by Shri N. Visvanathan of India)

### Half Day Workshop on Financing

A half day Workshop on “Financing and Private Sector Participation in Water Resources Projects” was also arranged on 6th November 1998 to discuss the various issues connected with the Dam project financing, especially considering the participation of eminent experts from all over the world during the 66th ICOLD Annual Meeting. The topics included risk management and power purchase agreements.



Shri C.V.J. Varma, Chairman, INCOLD addressing the gathering

**Special Lecture :** The other important and special feature during the Annual Meet was a special lecture on the “**Necessity of Environmentally Sustainable Large Dams Projects in the 21st Century**” delivered by Shri P.N. Gupta, Consultant, World Bank Group, U.S.A.

On 6<sup>th</sup> November 1998 in the afternoon during the ICOLD Case Histories Illustrations, there were presentations of the case Studies of the following important projects:

- Sardar Sarovar Project from India
- Three Gorges Project from China
- Dam and Hydropower Development in Turkey



Shri P.N. Gupta, World Bank delivering the special lecture

**ICOLD, 98 Exposition:** To enrich the experiences of delegates by organization of demonstration, interactive programmes and exhibiting the latest advanced technology/practices being used in the construction of dam engineering all over the world, an International Exhibition was also arranged from 3-4 November, 1998 at the venue of the Annual Meeting, in which 23 leading organizations (15 foreign + 8 Indian) in dam and hydro station design and construction, participated.



Mr. Kaare Hoeg, President, ICOLD inaugurating the exhibition

### 66<sup>th</sup> ICOLD Executive Meeting

The 66<sup>th</sup> Executive Meeting of ICOLD was held from 6<sup>th</sup> to 7<sup>th</sup> November 1998, to review the progress of its work programme since the last meeting held in Florence (Italy).



### Children Awareness Programme on Rivers and Dams

The Indian Committee on Large Dams (INCOLD) had arranged an innovative children awareness programme on 4th November 1998 for half a day on “Rivers and Dams” to create awareness amongst the school children who are the future citizens about the importance and relevance of harnessing the water resources in judicious manner for meeting various needs of living beings besides the need for conservation of water and preservation of quality.



About 250 students from fifteen schools of Delhi besides the children from BBMB, Chandigarh and NHPC, Faridabad, Haryana schools participated.

### Pre and Post Study Tours

For the benefit of delegates participating in the Annual Meeting, Technical Visits (Pre and Post conference tours) were arranged to some of the dam projects like Sardar Sarovar, Kalinadi Project, Kulkheni Dam in Nepal. Good number of delegates participated in these tours.

## 6.2 INTERNATIONAL TUNNELLING AND UNDERGROUND SPACE ASSOCIATION (ITA)

**International Tunnelling and Underground Space Association (ITA)** was founded in 1974 by the initiative of nineteen Nations. At present it has **68 Member Nations** and **310 corporate or individual Affiliate Members**. The aims of the ITA are: to encourage new uses of underground space for the benefit of the public, environment, and sustainable development; to encourage studies of underground alternatives to surface construction, not only considering construction costs but also indirect life-cycle costs and savings as well as social and environmental advantages; to stimulate the development of guidelines for a positive public strategy to take advantage of sub-surface potential; to encourage the development of better and cheaper methods for planning, geo-investigation, design, construction, operation, maintenance and safety of underground structures by using improved methods such as new technical developments and risk management principles; to improve training of everyone, especially young professionals, by conducting workshops, by improving and coordinating academic programs worldwide, and by improved on-the-job training; to bring together engineers, owners and others involved in the development of underground space, such as architects, planners, authorities, economists, lawyers, insurers, financiers and politicians; to arrange international exchange on developments in underground technology and experience from its use.

To reach its objectives, ITA has set up 12 international working groups (WG) and 4 committees to study and report on specific topics.

### **Tunnelling Association of India (TAI)**

Tunnelling Association of India (TAI) is the Indian Committee of the International Tunnelling and Underground Space Association (ITA). Tunnelling Association of India (TAI) was registered as a Society under societies registration act 1860 in the year 1991. The society also addresses related contemporary issues such as environmental effects, safety and public awareness. TAI helps in promotion and implementation of the objects and mission of ITA. TAI Secretariat is located in CBIP Building at Chanakyapuri, New Delhi and is guided by President, TAI (Shri Mangu Singh, Managing Director, DMRC, and Secretary General Shri V.K. Kanjlia, Secretary, CBIP and Treasurer Shri A.C. Gupta, Director – Water Resources, CBIP.

Past President of INCOLD were Shri M.A. Hai, CMD, NHPC Ltd.; Shri S.R. Narasimhan, CMD, NHPC Ltd.; Shri Yogendra Prasad, CMD, NHPC Ltd. and also Executive Chairman, UJVNL

### **TAI JOURNAL**

TAI bringing-out half-yearly journal for dissemination of the latest technological development taking place in the field of tunnel and underground space engineering and its related activities all over the world to the Indian dam/hydropower professional since January 2012.

**Events organized**

1. Workshop on Design of Ventilation System for Long Tunnels Under Construction, 10 April 2003, New Delhi
2. Seminar on Productivity and Speed in Tunnelling, 26-27 June 2003, Dehradun
3. Tunnelling Asia' 2004 – Need for Accelerated Underground Construction – Issues and Challenges, 14-17 December 2004, New Delhi
4. Workshop, Tunnelling in Himalayan Geology, 6-9 June 2006, Katra, Jammu & Kashmir
5. CBIP - Training Programme on “Tunnel and Underground Works”, 16-18 January 2008 at New Delhi
6. ITA Training Programme on Tunnel and Underground Works, 19-20 September 2008
7. World Tunnel Congress & 34<sup>th</sup> General Assembly of ITA-AITES, 22-24 September 2008, Agra
8. Seminar on Tunnelling Techniques for Construction of Underground Structures for Army – 7-8 May 2009 at Udampur (J&K)
9. One day workshop on “Use of TBM/Road header in Underground Works – Issues & Challenges”, 06 April, 2010, New Delhi
10. Workshop on “Safety in Tunnel and Underground Construction”, 23-24 July 2010, New Delhi
11. Training Programme on Design & Construction of Underground Works of Hydropower projects, 17-19 August 2010, New Delhi
12. Workshop on Shotcreting and Grouting, 22 September 2010, New Delhi
13. Workshop on Use of TBM/Road header in Underground Works- Issues & Challenges, 23-24 October 2010 at New Delhi
14. Training Programme on “Health & Safety in Tunnel and Underground Construction”, 20-21 February 2012
15. Tunnelling Asia' 2012 – “Challenges and Risk management in Underground Construction”, 22-24 February 2012
16. Workshop on Drilling and Blasting for Surface and Underground Structures, 11-12 August 2011, New Delhi
17. Workshop on Waterproofing for Tunnel and Underground Structure – 29-30 August 2012, New Delhi
18. Workshop on Use of Steel Fibers for Underground Space, 17 October 2012, New Delhi
19. Workshop on Design, Construction and Risk Management in Underground Construction, 24-25 February 2013, New Delhi
20. Tunnelling Asia' 2013 – “Using Underground Space for Infrastructure Projects: Issues and Challenges”, 26-28 February 2013, New Delhi.

## Publications brought-out by TAI

Besides Proceedings of conferences, seminars, workshops, following publications have been brought out by TAI

1. Directory of Tunnels, 2008
2. History of Tunnels in India, 2008
3. Safe Working in Tunnelling, 2008
4. Souvenir of ITA -AITES World Tunnel Congress, 2008
5. Manual on Underground Works, 2012
6. Best Practices in Underground Construction Works, 2013

## Important events

### 1. International Symposium on Tunnelling for Water Resources and Power Projects

The International Symposium on Tunnelling for Water Resources and Power Projects, co-sponsored by International Tunnelling Association was organised by Central Board of Irrigation and Power from 19-23 January 1988 at New Delhi, India.

**Smt. Sushila Rohatgi, Hon'ble Minister of State for Power, Government of India** inaugurated the Symposium on 19 January 1988 and presented Diamond Jubilee Awards to (1) Shri M.L.Shishoo, Former Chairman and Managing Director, NTPC, (2) Shri K. Madhavan, Member (D&R), Central Water Commission, (3) Dr. H.R. Sharma, Chief Engineer, U.P. Irrigation Department and (4) Shri H.S. Bains, Chief Engineer, Punjab State Electricity Board. The directory of Tunnels in India brought out by the Central Board of Irrigation and Power was released by



**Prof. Einar Broch, President, ITA.** A special publication ‘Status Report on Rock Mechanics in India’ was brought out during the Symposium. About 300 delegates including those from Austria, Canada, China, France, India, Iran, Malaysia, Nepal, Norway, South Korea, Sri Lanka, Sweden, Thailand, United Kingdom and United States of America attended the Symposium. During the Symposium 74 papers covering the various aspects of Tunnelling were discussed. The Closing Ceremony of the Symposium was held on 23rd January 1988. Shri M.A. Chitale, Chairman, Central Water Commission delivered the Valedictory Address and released the Irrigation Atlas.

The highlights of the Conference were three special lectures delivered by invited speakers. The first lecture on “Unlined High Pressure Tunnels and Air Cushion Surge Chambers” was delivered by Dr. Einar Broch, Professor, Norwegian Institute of Technology, Trondheim, Norway, who

is also presently, the President of the International Tunnelling Association. The second lecture concerned the design of unlined and lined pressure tunnels and was delivered by Dr. Raymond P. Benson, President of Klohn Leonoft Vancouver, Canada, giving an exhaustive treatment to the subject. The third lecture was delivered by Mr. dean Francois Bougard, Executive Vice President SOFRETU, France who is also the Vice President of the International Tunnelling Association. His lecture was titled “A New Tunnelling Method - The Mechanical Pre-cutting”.

## 2. Tunnelling Asia’ 97

The Central Board of Irrigation and Power in conjunction with the Adhering Committee of International Tunnelling Association (India) organized “Tunnelling Asia’ 97” International Conference from 20-24th January 1997. at New Delhi, India as part of the Hydro Centenary Celebrations.

During the inaugural function of the conference, Key Note Address was delivered by Prof. B.B.Dhar, Director, Central Mining Research Institute on “Status of tunnelling in India - Need for National Policy. **Shri.**

**E. Sreedharan, Chairman Konkan Railway Corporation Ltd.** inaugurated the conference while Shri V.K. Agarwal, Member (Staff), Ministry of Railways and Ex-officio Secretary to Govt. of India presided over the inaugural function. The participants were also addressed by **Prof. S. Pelizza, President of the International Tunnelling Association** and Shri S.R. Narasimhan, President Indian Committee for ITA.

Totally 75 papers were received from all over the World which were compiled under 8 themes of the conference in the proceedings. Out of 75 papers, 59 were presented during the conference in different sessions. The Conference was attended by 225 delegates from 20 country. Apart from the above the Executive Council meeting of ITA was also held from 24-25th January 1997 at New Delhi.

## 3. International Conference on Tunneling Asia, 2000 - Need for Accelerated Underground Construction - Issues and Challenges

International Conference “Tunnelling Asia 2000”, with the emphasis on Need for Accelerated Underground Construction - Issues and Challenges was organized from 26-29 September 2000 at New Delhi by Central Board of Irrigation and Power and Adhering Committee of the International Tunnelling Association (India).





The conference was inaugurated by **Smt. Jayawanti Mehta**, Hon'ble Minister of State for Power. The participants were also addressed by **Mr. Willy De Lathauwer**, Past President, International Tunnelling Association and **Emeritus Prof. T. Ramamurthy**, Chairman, Technical Committee. **Mr. Yogendra Prasad**, Chairman, Organising Committee and President, Adhering Committee of the International Tunnelling Association (India) and Chairman & Managing Director, National Hydroelectric Power Corporation Limited.

About 250 delegates from sixteen countries participated in the conference. More than 60 papers contributed by experts actively involved in tunnelling are published in the proceedings. Out of 50 technical papers selected for oral presentation, 44 were presented during the 3-days deliberations of the conference. Besides, 10 keynote addresses and three special presentations were also delivered by the eminent experts.

To enrich the experiences of delegates by organisation of demonstration, interactive programmes and exhibiting the latest advanced technology/practices being used in the construction of underground projects all over the world, an International Exhibition was also arranged from 26-28 September 2000 at the venue of the conference, in which 20 leading organisations participated.



Smt. Jayawanti Mehta, inaugurated the Tunnel Expo.

#### 4. International Conference Tunnelling Asia' 2004 – Need for Accelerated Underground Construction - Issues & Challenges

The International Conference “Tunnelling Asia 2004” was organized by the Central Board of Irrigation & Power (CBIP), New Delhi, Adhering Committee of ITA (India), Committee of ISRM (India) from 14-17 December, 2004 at New Delhi (India) under the aegis of the International Tunnelling Association (ITA). 250 experts from 14 countries participated in the conference. 48 papers and 16 keynote addresses contributed by experts actively involved in tunnelling were presented in the 3-days deliberations.

The conference was inaugurated by **Hon'ble Union Minister for Power, Shri P.M. Sayeed** on 14th December 2004. In his address the Hon'ble Minister highlighted the role of tunnels in the development of infrastructure. While giving the brief background of the large number of tunnels that have been constructed in connection with multipurpose and hydroelectric projects in the Himalayan region he indicated that over 27 km long



Hon'ble Union Minister for Power Shri P.M. Sayeed addressing the participants, Mr. Harvey Parker, President, ITA, Mr. Yogendra Prasad, CMD, NHPC and Mr. G.N. Mathur, Secretary, CBIP also present on dais

tunnel with bore diameter of as much as 14m has been constructed in Nathpa Jhakri Project. He also mentioned about the Govt. of India's initiative to accelerate the hydropower development at the order of 50,000 MW to improve hydro thermal mix for which Central Electricity Authority has already finalized pre-feasibility reports for 162 schemes. These schemes would be mostly located in inaccessible remote areas involving complex geological problems.

During the inaugural function the participants were also addressed by Shri Yogendra Prasad, President, CBIP & ITA (India) and CMD, NHPC; and **Mr. Harvey W. Parker, President, International Tunnelling Association. Mr. Claude Berenguier, Secretary General, ITA** was also present on dais during inaugural function of the Conference. The Hon'ble Minister also inaugurated the Tunnel Exposition 2004 organized concurrent to the conference where more than 20 organizations from India and abroad displayed their products/state of the art technology for the benefit of the participants and professionals about the recent technological developments in underground construction.

A publication on "Instrumentation on Dams" was also released by Hon'ble Minister Shri P.M. Sayeed.



Hon'ble Union Minister for Power Shri P.M. Sayeed releasing the publication "Instrumentation on Dams"

## 5. Workshop on Tunnelling in Himalayan Geology

The "Workshop on Tunnelling in Himalayan Geology" was organized by Central Board of Irrigation and Power in association with the Tunnelling Association of India, from 6-9<sup>th</sup> June 2006 at Katra, Jammu & Kashmir.

More than 150 participants from all over India and abroad participated in the workshop. **His Excellency Lt. Gen. (Retd.) S.K. Sinha, PVSM, Governor of Govt. of the Jammu & Kashmir** the chief guest of function inaugurated the workshop. Other dignitaries on the dais were Mr. Jugal Kishore, Hon'ble Member of Legislative Assembly; Prof. N.K. Bansal, Vice Chancellor, Mr. Mata Vaishno Devi University; Mr. Vinod Kumar, Executive Director (Projects), Konkan Railway Corporation Limited, Mr. G.N. Mathur, Secretary, CBIP and Mr. V.K. Kanjlia, Director, Central Board of Irrigation & Power.



From Left Mr. G.N. Mathur, Secretary, CBIP, Prof. N.K. Bansal, Vice Chancellor, Shri Mata Vaishno Devi University, H.E. Lt. Gen (Retd.) S.K. Sinha, Governor of J&K, Mr. Jugal Kishore, Hon 'ble Member of Legislative Assembly, J&K, Mr. Vinod Kumar, Executive Director, Konkan Railway Corpn. Ltd., Mr. V.K. Kanjlia, Director, CBIP.

His Excellency Lt. Gen. (Retd.) S.K. Sinha, PVSM, Governor of Govt. of Jammu & Kashmir, in his address stated the need for tunnels in the state of Jammu & Kashmir for its real development. During the two and half days deliberations of the workshop, besides the Plenary Session there were 8 technical sessions where 20 experts made the technical presentations on the different aspects of planning, design and construction of tunnels and underground works in Himalayas. During the two days deliberations of the workshop a set of recommendations emerged which were circulated to all the Govt. as well as Private agencies for adoption and implementation.

## 6. World Tunnel Congress & 34<sup>th</sup> General Assembly of ITA-AITES

World Tunnel Congress and 34<sup>th</sup> General Assembly of ITA-AITES, was organized first time in India from 19th - 25th September 2008 at Hotel Jaypee Palace, Agra by International Tunnelling and Underground Space Association (ITA), Tunnelling Association of India and Central Board of Irrigation and Power, to deliberate on the important topic of “Underground facilities for better environment and safety.

**H.E. President of India, Smt. Pratibha Devisingh Patil through her recorded message** addressed the participants during the inaugural session.



Her Excellency the President of India, Smt. Pratibha Devisingh Patil addressed the participants through recorded video.

The Congress was inaugurated by the **Hon'ble Minister of Power Shri Sushilkumar Shinde** on 22<sup>nd</sup> September 2008. Other eminent speakers who addressed the gathering during the inaugural session were **Mr. Martin C. Knights, President, ITA**; Shri G.B. Pardhan, Addl. Secretary, Ministry of Power, Shri Rakesh Nath, Chairperson, CEA and Lt. Gen. A.K. Nanda, Director General, Border Roads. A total of 900 professionals including 500 international experts from 43 countries participated in the deliberations of the congress.

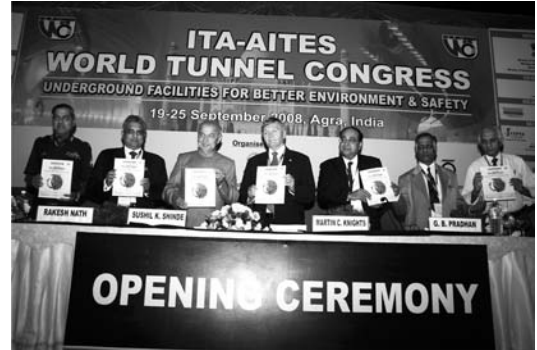


Hon'ble Union Minister of Power Shri Sushilkumar Shinde inaugurating the WTC 2008 by lighting the Lamp.

Hon'ble Minister mentioned that **“Our aim is to let free above ground space for the use of the citizens, taking the infrastructures underground. In order to do that, Underground Construction should be efficient, safe, with a complete social acceptance and with a minimum impact on the environment.”** In order to attain this vision the main challenges are **increased efficiency; Improved safety; Minimum impact on the environment and Complete social acceptance.** He mentioned that there is a huge scope for



Shri Sushilkumar Shinde, Hon'ble Union Minister of Power delivering inaugural address



Lt. Gen. A.K. Nanda, Rakesh Nath, Mr. Sushilkumar Shinde, Martin C. Knight, G.B. Pardhan, V.K. Kanjlia, A.C. Gupta

tunnelling activities in India for developers, designers, consultants, contractors, equipment manufacturers in the main areas as well as in the allied fields as about 1500 km of tunnels is planned to be constructed during the next 10-15 years and stressed to catch up with modern tunnel construction technologies

During the inaugural session, no. of special publications brought-out by TAI and CBIP to project India's expertise in tunnel and underground construction were released by the Hon'ble Minister of Power on 22 September 2008:

1. Directory of Tunnels
2. History of Tunnels in India
3. Safe Working in Tunnelling
4. Souvenir of ITA -AITES World Tunnel Congress

### Open House Session

The morning programme of the 2<sup>nd</sup> day (23<sup>rd</sup> September 2008) of the Congress deliberations consisted of the Open Session on “**Contractual Practice Worldwide**”. During the Open Session, seven presentations were made by eminent professionals viz

Mr. A. Assis and Mr. J.M. Barros, Brazil, Mr. H. Ehrbar of Alp Transit Gothard, Switzerland, Mr. Y. Leblais, ITA Vice President, Mr. C. Genschel from Bilfinger+Berger, Mr. Arnold Dix Animateur, ITA WG3, Shri H.K. Sharma, SJVNL Ltd, India and Dr. D.G. Kalkade, Jaypee Group, India



Open House during session on Contractual Practices Worldwide

## Plenary Session

The Opening Ceremony of the Congress, was followed by **Plenary Session** chaired by Mr. Rakesh Nath, Chairperson, Central Electricity Authority when four lectures were delivered by eminent experts, depicting the current state of the tunnelling industry in four areas, namely:

Risk Management, Procurements and Contracts – Mr. Martin C. Knights, President, ITA, Tunnelling Industry in India – Mr. K.B. Dubey, NTPC Ltd., Tunnelling in Himalayas – A Challenge – Mr. S.P. Sen and Urban Metros in India – Mr. Mangu Singh, DMRC.

## Tunnel Exposition

To enrich the experiences of delegates by organization of demonstration, interactive programmes and exhibiting the latest advanced technology/practices being used in the construction of tunnel and underground engineering all over the world, an International Exhibition was also arranged from 3-4th November, 1998 at the venue of the Annual Meeting, in which 35 leading organizations (25 foreign + 10 Indian) participated. Mr. Sushilkumar Shinde, Hon'ble Minister for Power inaugurating the Tunnel Expo.



Mr. Sushilkumar Shinde, Hon'ble Minister for Power inaugurating the Tunnel Expo.

## FIELD VISIT

The one-day **Field Visit** held 25<sup>th</sup> September 2008 was attended by more than 100 delegates. Besides, at the invitation of Robbins, ITA Prime Sponsor, Members of ITA Executive Council, had the opportunity to visit the Delhi Metro Construction site. It was on the section between Udyog Bhawan and Green Park areas. The Continental Engineering Corporation (CEC)/ Soma JV was in charge of this 5.3 km long extension for which two Robbins TBM are used.



## TUNNELLING ASIA 2013

### Using Underground Space for Infrastructure Projects: Issues and Challenges, 26-28th February 2013 at New Delhi

With a view to provide information available at international level and knowledge and experience gained in the large scale underground structures and tunnel projects for the benefit of future

projects, Tunnelling Association of India; Central Board of Irrigation & Power, and Delhi Metro Rail Corporation Limited organized Tunnelling Asia 2013 on the theme “Using underground space for Infrastructure Projects – Issues and Challenges” on 26-28th February 2013 at New Delhi.

The conference was inaugurated by Shri Harish Rawat, Hon’ble Minister for Water Resources, Govt. of India. The other dignitaries who addressed during the inaugural session were Shri Mangu Singh, President, TAI and Managing Director, Delhi Metro Rail Corporation Limited; Shri Rajesh Kumar, Chairman, Central Water Commission; Shri A.S. Bakshi, President,



Hon’ble Minister for Water Resources, Shri. Harish Rawat inaugurating the conference by lighting a lamp

CBIP and Chairperson, Central Electricity Authority; Shri Devendra Chaudhry, Additional Secretary to Govt. of India, Ministry of Power; Shri B.D. Garg, Chief Administrative Officer, Northern Railway and Shri V.K. Kanjlia, Secretary General, TAI and Secretary, CBIP. In addition, Tunnel Expo 2013 was concurrently organized which was inaugurated by Shri Mangu Singh, Managing Director, Delhi Metro Rail Corporation Ltd. 14 organizations involved with the construction of tunnel and underground works participated in the exhibition and displayed their products as well as expertise in the field.

During the inaugural session, Hon’ble Minister for Water Resources released a publication on “Best Practices in Underground Works”, prepared by CBIP covering the latest know how on the subject. Shri R.N. Khazanchi, Managing Director, Punatsangchu Hydroelectric Project Authority who has been honoured by Govt. of Bhutan with their Highest Civilian award- The Druk Thuksey, was also honoured by Hon’ble Minister for Water Resources for recognition of his exemplary work, deep involvement and sincerity towards the development of Hydropower sector in Bhutan in the past about 15 years and for bringing laurels to our country.

At the end, a Panel discussion was organized which was chaired by Shri A.P. Mishra, Former Member – Engg., Ministry of Railways. More than 350 delegates from India and abroad participated in the three days deliberations of the conference.

## 6.3 INTERNATIONAL SOCIETY FOR ROCK MECHANICS

The **International Society for Rock Mechanics (ISRM)** was founded in Salzburg in 1962 as a result of the enlargement of the “Salzburger Kreis”. Its foundation is mainly owed to Prof. Leopold Müller who acted as President of the Society till September 1966. The ISRM is a non-profit scientific association supported by the fees of the members and grants that do not impair its free action. The Secretariat of ISRM is in Lisbon (Portugal). ISRM has 50 National Groups, including India.

The field of Rock Mechanics is taken to include all studies relative to the physical and mechanical behaviour of rocks and rock masses and the applications of this knowledge for the better understanding of geological processes and in the fields of Engineering.

The main objectives and purposes of the Society are to encourage international collaboration and exchange of ideas and information between Rock Mechanics practitioners; to encourage teaching, research, and advancement of knowledge in Rock Mechanics and to promote high standards of professional practice among rock engineers so that civil, mining and petroleum engineering works might be safer, more economic and less disruptive to the environment.

The President of ISRM is Prof. Xia-Ting Feng from China and the Secretary General is Dr. Luis Lamas from Portugal.

### Important Positions held by Indians on ISRM Board

- Dr. T. Ramamurthy, Professor, IIT Delhi, served ISRM as its Vice President (Asia) during 1987-1991.
- Dr. Manoj Verman has been elected as ISRM Vice President at Large for the term 2011-2015
- Dr. V.B. Maji, Assistant Professor, Department of Civil Engineering, IIT Madras, has been selected for the ISRM Young Members Presidential Group.

### ISRM Commissions

In 1967 the Council decided to appoint **Commissions** for studying scientific and technical matters of concern to the Society, operating in accordance with specific rules. In total 40 Commissions have been set for a limited period from then on. The ISRM Board has appointed sixteen Commissions for the period 2011-2015 in order to study some scientific and technical matters of topical interest to the Society.

### Indian Representation on ISRM Commissions

- Dr. Manoj Verman is President on ISRM Commission on “Hard Rock Excavation”
- Dr. K.G. Sharma, Professor, Department of Civil Engineering, IIT Delhi is representing on ISRM Commission on “Education”

- Mr. Asutosh Acharya, SO (F), Bhabha Atomic Research Centre, is representing on ISRM Commission on “Radioactive Waste Disposal”

### **ISRM Awards**

Three awards have been instituted by ISRM, one in the memory of the founder of the Society (The Müller Award) the other in the memory of a recognized Past President. (The Rocha Medal) and the third is ISRM Lecture award

### **ISRM Fellows**

The ISRM Council decided at its New Delhi meeting in October 2010, to create the status of Fellow, as the highest and most senior grade of membership of the ISRM. It is conferred on individuals, affiliated with the ISRM, who have achieved outstanding accomplishment in the field of rock mechanics and/or rock engineering and who have contributed to the professional community through the ISRM.

The appointment of ISRM Fellows is made by the ISRM Board.

The first group of Fellows was inducted in Beijing, during the 12<sup>th</sup> International Congress held in October 2011 on Rock Mechanics.

### **Indian National Group of ISRM**

Indian National Group of ISRM was got registered as the Committee of the International Society for Rock Mechanics (ISRM), under Societies Registration Act XXI of 1860 in the year 1991 and it represents the International Society for Rock Mechanics (ISRM) as Indian National Group, and has its Secretariat at the Central Board of Irrigation & Power (CBIP), Malcha Marg, Chanakyapuri, New Delhi.

The Indian national Group of ISRM, presently designated as ISRM (India), has been involved in dissemination of information on rock mechanics, mining and tunnel engineering by organising symposia, seminars, workshops, and training courses, both at national as well as international level, in liaison with international organizations, since its inception in 1991.

The Society aims to fulfill the objectives of ISRM. ISRM (India) is administered by the General Body and the Governing Council.

The office bearers of the Governing Council of Indian National Group of ISRM, for the term 2011-2014 are its :

President, Dr. H.R. **Sharma**, Chief Technical Principal – Hydro, Tractebel Engineering Pvt. Ltd.

Vice President, Dr. R.K. **Goel**, Chief Scientist, Central Institute of Mining and Fuel Research, Regional Centre, Roorkee

Immediate Past President, Dr. K.G. **Sharma**, Professor, Department of Civil Engineering, IIT Delhi



Member Secretary, Mr. V.K. **Kanjlia**, Secretary, Central Board of Irrigation & Power  
Treasurer, Mr. A.C. **Gupta**, Director (WR), Central Board of Irrigation & Power

### **Past Presidents**

- Dr. T. Ramamurthy, Professor, Department of Civil Engineering, IIT Delhi
- Dr. A. Varadarajan, Professor, Department of Civil Engineering, IIT Delhi
- Dr. K.G. Sharma, Professor, Department of Civil Engineering, IIT Delhi
- Dr. H.R. Sharma, Chief Technical Principal – Hydro, Tractebel Engineering Pvt. Ltd. (since 2011)

### **ISRM (INDIA) JOURNAL**

The Indian National Group of ISRM is publishing a Technical Journal “**ISRM (India) Journal**”, on half yearly basis (January – June and July-December), since January 2012.

The aim of the journal is to encourage exchange of ideas and information among rock mechanics practitioners worldwide. The journal provides an information service to all concerned with Rock Mechanics about the development of techniques, new trends, experience gained by others to enable updating of knowledge. The original manuscripts that enhance the level of research and contribute new developments to the Rock Mechanics are encouraged. The journal is expected to exchange ideas and information between Rock Mechanics practitioners, help researchers, technologist and policy makers in the key sector of Water Resources, Infrastructure Development (including underground works), Hydro Power, Mining and Petroleum Engineering, etc. to enhance their understanding of it.

The Journal has both print and online versions.

### **Events Organised**

1. Workshop on Rock Mechanics, May 1980, IIT Delhi
2. Indo Soviet Workshop on Rock Mechanics, July 1984, New Delhi
3. Workshop on Engineering Classification of Rocks, March 1985, New Delhi
4. Workshop on Rock Reinforcement, September 1986
5. Workshop on Rock Mechanics, 17-21 September 1990, New Delhi
6. Workshop on Rock Mechanics, 21-23 November 1991, New Delhi
7. Regional Workshop on Rock Mechanics, 18-21 May 1992, Guwahati
8. Regional Workshop on Rock Mechanics, 16-19 September 1992, Kochi
9. **Regional Symposium on Rock Slopes, 7-11 December 1992, New Delhi**
10. Training Course on Landslide Hazard Mitigation & Management, 5-10 April 1993, Guwahati
11. Regional Workshop on Rock Mechanics, 1-4 November 1993, Udaipur
12. Workshop on Blasting in Opencast Mining, 28 February 1994, Nagpur

13. Training Course on Landslide Hazard Mitigation & Management, 19-23 April 1994, Kozhikode
14. Workshop on Shotcreting, 23-24 November 1994, Vadodara
15. Workshop on Rock Mechanics, 22-25 March 1995, Panaji (Goa)
16. Workshop on Rock Mechanics, 12-14 August 1996, New Delhi
17. Workshop on Rock Mechanics & Tunnelling Techniques, 14-17 April 1999, Shimla
- 18. Workshop on Rock Mechanics & Tunnelling Techniques”, September 2001, Kathmandu, Nepal**
- 19. ISRM Regional Symposium – Advancing Rock Mechanics Frontiers to Meet the Challenges of 21 Century, 24-27 September 2002, New Delhi**
20. Seminar on Productivity and Speed in Tunnelling, 26-27 June 2003, Dehradun
21. International Conference on Accelerated Construction of Hydropower Projects, 15-17 October 2003, Gedu, Bhutan
22. Conference on Development of Hydro Power Projects – A Prospective Challenge, 20-22 April 2005, Shimla
23. Workshop on Rock Mechanics & Tunnelling Techniques”, 10-12 October 2007, Gangtok
24. Workshop on Rock Mechanics & Tunnelling Techniques”, 24-26 April 2008, Manali
25. Workshop on “Applications of Rock Mechanics – Tools and Techniques”, 15-17 January 2010, Nagpur (Maharashtra)
26. Seminar on “Rock Engineering”, 8-9 March 2010, New Delhi
27. Seminar on “Meeting Rock Mechanics Challenge of Deep Underground Mining”, 22-24 April 2010, Dhanbad (Jharkhand)
- 28. ISRM International Symposium 2010 and 6<sup>th</sup> Asian Rock Mechanics Symposium, 23-27 October 2010, New Delhi**
29. Workshop on “Construction of Dams and Tunnels in Weak Rocks”, 25-26 May 2011, JUIT, Wagnaghat (Solan), Himachal Pradesh
30. Seminar “Grouting and Deep Mixing”, 25-26 August 2011, New Delhi
31. Seminar on “Slope Stabilization Challenges in Infrastructure Projects”, 20-21 October 2011, New Delhi
32. Seminar on “Geotechnical Challenges in Water Resources Projects”, 19-20 January 2012, Dehradun (Uttarakhand)
33. International Seminar on “Survey and Investigations of Hydroelectric Projects – Issues and Challenges”, 28<sup>th</sup> March 2012, New Delhi
34. Seminar on “Ground Control and Improvement”, 20-21 September 2012, New Delhi
35. International Seminar on “Minimizing Geological Uncertainties and Their Effect on Hydroelectric Projects”, 27-28 September 2012, New Delhi
36. Seminar on “Slope Stabilization Challenges in Infrastructure Projects”, 29-30 November 2012, New Delhi

37. Seminar on “Geotechnical Challenges in Infrastructure Projects”, 25-26 April 2013, New Delhi

### 6.3.1 Important Events

#### 1. Asian Regional Symposium on Rock Slopes

Asian Regional Symposium on Rock Slopes, sponsored by the International Society for Rock Mechanics and organised by the Committee of the International Society for Rock Mechanics (India) and Central Board of Irrigation and Power, New Delhi was held at New Delhi from 7th - 11th December 1992. More than 200 delegates, including twenty eight from foreign countries like China, Greece, Italy, Japan, Korea, Phillipines, Sri Lanka, and Thailand, participated. The inaugural session was chaired by Prof. T. Ramamurthy, President, the Committee for ISRM (India).

Lt. General Maharaj Singh from Border Roads, Mr. S.N. Chaturvedi, Director General, Geological Survey of India, Dr. H.R. Sharma, Advisor, Nathpa Jhakri Power Corpn. Ltd., Mr. B.C. Misra from Coal India Ltd. besides Mr. Tran Duc Phi. Oanh of Japan and Mr. Zhang Boting of China were the key speakers during the inaugural session. Six technical sessions under the following themes, were organised and concerned papers presented:

- Geotechnical Parameters, Investigations and Data Interpretation including Hazard Zonation.
- Slope Stability Analysis
- Slope Monitoring and Instrumentation
- Rock Anchoring, Other Stabilising Methods and Drainage.
- Drilling and Blasting, Techniques Innovative Approaches.
- Special Problems of Opencast Mining.

Totally sixty papers were accepted and included in the proceedings. Presentation of papers evoked lively discussions. A publication “State-of-the-art-report” was brought out on the basis of India experiences on the following topics:

- Drilling and Blasting
- Stability Methods and Drainage
- Problems of Opencast Mining
- Rock Slope Protection and Monitoring Slope
- Analytical Approach in Rock Slope Stability

#### 2. Workshop on Rock Mechanics and Tunnelling Techniques in Kathmandu, Nepal

With an objective to provide a forum for discussion and interaction amongst the participants regarding the measures that are needed for successful execution of projects, relating to mining, tunneling, underground cavern or metro, the Indian Group of International Society for Rock Mechanics and the Central Board of Irrigation and Power, organized a workshop on “Rock Mechanics and Tunneling Techniques” in Kathmandu during 10-12 September 2001.

More than 70 delegates from Bhutan, India and Nepal, participated in the workshop.

The workshop was inaugurated by Mr. S.K. Malla, Former Secretary, Ministry of Water Resources, His majesty's Government, Nepal. The inaugural session was presided over by Mr. D.B. Thapa, Chief (Development), Nepal Electricity Authority.

### 3. Conference on Development of Hydro Power Projects – A Prospective Challenge

The Central Board of Irrigation and Power (CBIP) as part of its activities and to focus on the difficulties and measures needed to be taken up for accelerated development of hydro potential of the country to meet the ever-growing demand of power, organized a Conference on “Development of Hydro Power Projects – A Prospective Challenge”, including a special session on “Small Hydro Power Development”, jointly with Himachal Pradesh State Electricity Board (HPSEB) in Shimla during 20-22 April 2005. The conference was sponsored by the Committee of the International Society for Rock Mechanics (India).



The Hon'ble Chief Minister, Government of Himachal Pradesh, Shri Virbhadra Singh, inaugurated the conference on 20<sup>th</sup> April 2005.

175 delegates from Bhutan, Nepal and from across the country, participated in the conference. 33 presentations, including three from Bhutan, on the various topics concerning development of hydropower projects, such as Hydro Power Policies and Development Strategies, Hydrology and Planning, Design Aspects, Instrumentation and Electro-Mechanical and Hydro-Mechanical Equipment, Small Hydro Power Development, Environmental Issues and Private Sector Participation, Construction Aspects, Silting and Sedimentation Problems and Rehabilitation and Resettlement, were made during the conference.

Following issues for the hydropower development emerged during discussions:

- Hydropower is a clean, renewable and environment friendly resource, besides having other inherent advantages. To meet electric power demand of our developing economy at a fast pace, it should be developed on priority basis. Development could be done by state agencies, central/state public undertakings or private agencies. There is a need to have a policy on power sharing and payback period for power development through CPSU's and IPPs based on economic consideration. A part of royalty should/may be earmarked for local area development.
- The draft hydropower policy in Himachal Pradesh is a base paper of proposed power policy 2005 for achieving interalia capacity addition of 6000 MW by 11<sup>th</sup> Plan. It is a three-pronged strategy for development of hydropower in Himachal Pradesh in the private sector, state sector and joint/central sector. The policy is a good document for accelerated development of hydropower; however, it has to be made attractive to all three concerned parties namely Power Producer, Local Population and State Government.

- The need of the hour is the speedy takeoff of hydropower projects in Bhutan, India and Nepal for mutual benefits.
- Important aspect of planning any water resources project is availability of correct data. Hence, correct assessment of floods with various return periods and water availability is basic requirement before planning of any water resources projects.
- Instrumentation is the best guide for assessing health of the structure and timely corrective action, adequate provision for which must be made in the detailed project report.

#### 4. Seminar on “Rock Engineering”, 8-9 March 2010, New Delhi

Dr. Abdolhadi Ghazvinian, Vice President (Asia) and Dr. Luis Lamas, Secretary General, International Society for Rock Mechanics (ISRM) visited New Delhi for discussions on the 6<sup>th</sup> Asian Rock Mechanics Symposium to be held in New Delhi during 23-27 October 2010. To have the benefit of their expertise, Indian National Group of International Society for Rock Mechanics (ISRM) and the Central Board of Irrigation & Power (CBIP) jointly organised a **Seminar on “Rock Engineering”** at CBIP Conference Hall, Malcha Marg, Chanakyapuri, New Delhi during 8-9 March 2010. The Seminar was attended by over 70 delegates from 23 organisations.

#### 5. ISRM International Symposium 2010 and 6<sup>th</sup> Asian Rock Mechanics Symposium

Indian National Group of International Society for Rock Mechanics (ISRM) hosted the ISRM International Symposium 2010 and the 6<sup>th</sup> Asian Rock Mechanics Symposium in New Delhi during 23-27 October 2010, jointly with the Central Board of Irrigation & Power.

The event was organised from 23-27 October 2010, New Delhi and inaugurated by Shri Gurdial Singh, Chairperson, CEA and President ,CBIP. There was an overwhelming



response from the Rock Mechanics Community for the Symposium. More than 150 papers from 27 countries were presented during the Symposium as oral/poster presentations. Sessions on “Underground and Opencast Mining” were also held during the symposium wherein more than 25 papers from Australia, Canada, China, France, India, Iran, Japan, Singapore, South Korea and USA were presented. 275 delegates from 35 countries participated in the Symposium.

Keynote Lectures by renowned experts on each day of the Symposium were especially held so that participants get an opportunity to interact with internationally known personalities in the field of Rock Engineering. Following keynote speakers made the presentations:

- Dr. Shinichi Akutagawa, Kobe University, Japan - On Site Visualization as a New Paradigm for Field Measurement in Rock Engineering
- Prof. Giovanni Barla, Politecnico di Torino, Italy - Progress in the Understanding of Deep-Seated Landslides from Massive Rock Slope Failure

- Prof. Maurice Dusseault, University of Waterloo, Canada - Deep Injection Disposal: Environmental and Petroleum Geomechanics
- Dr. C. Erichsen, WBI, Germany - Challenges in the Design and Construction of Tunnels in Jointed Rock
- Prof. Xia-Ting Feng, Institute of Rock and Soil Mechanics, China and ISRM Vice President at Large - Application of Intelligent Rock Mechanics Methodology to Rock Engineering
- Prof. Yossef H. Hatzor, Ben-Gurion University of Neger, Israel - Modelling Dynamic Deformation in Natural Rock Slopes and Underground Openings with Numerical DDA Method
- Dr. John A. Hudson, Imperial College, UK and President, ISRM - Underground Radioactive Waste Disposal — The Rock Mechanics Contribution
- Prof. Guowei Ma and Prof. Yingxin Zhou, Singapore - Rock Dynamics Research in Singapore: Fundamentals and Practices
- Dr. John Read, CSIRO LOP Project, Australia – The Large Open Pit Project
- Prof. Herb Wang, University of Wisconsin, USA – Deep Underground Instrumentation and Monitoring

In addition, the following Pre-Symposium Short Courses/Workshops were also organized on 23 and 24 October 2010:

- Two Days' Workshop on "Use of TBM/Road Header in Underground Works – Issues and Challenges"
- Short Course on "Carbon Sequestration in Sedimentary Basins"
- Workshop on "Rock Mechanics Methods and Tools for Mining Applications"

An exhibition, having 22 stalls, exhibiting the products/services by renowned companies, was organised as a technology showcase to meet the challenges of rock formations in various engineering activities in the field of Water and Energy Resources, Mining, Roads, Underground Works, etc.

In accordance with the traditions, following papers were selected for the ARMS Awards:

- ARMS Outstanding Paper Award for Young Scientist and Engineer was awarded to Mr. Tanapol Sriapai from Suranaree University of Technology, Thailand for his paper titled "Polyaxial Strengths of Maha Sarakham Salt". The paper was co-authored with Dr. Kittitep Fuenkajorn, Associate Professor at the Suranaree University of Technology
- ARMS Outstanding Paper Award was awarded to Dr. (Ms.) Gali Madhavi Latha from Indian Institute of Science for her paper titled "Prediction of Stress-Strain Response of Jointed Rocks using Artificial Neural Networks". The paper was co-authored with Dr. (Ms.) Arunakumari Garaga, presently Senior Engineer at Nauvata Engineering, Bangalore.

## **VISION**

- It is proposed to host ISRM Congress in 2019 in India

## 6.4 INTERNATIONAL GEOSYNTHETICS SOCIETY

The International Geosynthetics Society (IGS) was founded in Paris, on 10 November 1983, by a group of geotechnical engineers and textile specialists. The Society brings together individual and corporate members from all parts of the world, who are involved in the design, manufacture, sale, use or testing of geotextiles, geomembranes, related products and associated technologies, or who teach or conduct research about such products. The IGS is registered in the USA as a non-profit organization.

The IGS is dedicated to the scientific and engineering development of geotextiles, geomembranes, related products and associated technologies.

IGS has 38 Chapters, in total, including India.

### **The aims of the IGS are:**

To collect and disseminate knowledge on all matters relevant to geotextiles, geomembranes and related products, e.g. by promoting seminars, conferences, etc.; to promote advancement of the state of the art of geotextiles, geomembranes and related products and of; their applications, e.g. by encouraging, through its members, the harmonization of test methods, equipment and criteria; to improve communication and understanding regarding such products, e.g. between designers, manufacturers and users and especially between the textile and civil engineering communities

The President of IGS is Dr. Jorge G. Zornberg from the University of Texas at Austin, USA and its Secretary is Ms. Elizabeth Peggs.

### **INDIAN REPRESENTATION ON IGS COUNCIL**

- Dr. K. Rajagopal, Professor, Department of Civil Engineering, IIT Madras, has been co-opted as Member on IGS Council, in 2010, for four years.
- Dr. G.V. Rao, former Professor, Department of Civil Engineering, IIT Delhi was also co opted as Member on IGS Council, for the period 2002-2006.

### **IGS COMMITTEES**

IGS has following open Technical Committees:

- Technical Committee on Barrier Systems
- Technical Committee on Filtration
- Technical Committee on Soil Reinforcement

Dr. G.V.S. Suryanarayana Raju, Engineer-in-Chief, Andhra Pradesh Roads & Buildings Department. Mr. Satish Naik, CEO, Best Geotechnics Pvt. Ltd. Dr. (Ms.) Gali Madhavi Latha, Associate Professor, Department of Civil Engineering, Indian Institute of Science, Bangalore are the Indian representatives on TC on Soil Reinforcement.

Mr. Rohit Chaturvedi, Techfab (India) Industries Ltd. is representative from India on TC on Filtration.

Dr. G.V. Rao, Former Professor, Department of Civil Engineering, IIT Delhi and Dr. Dali Naidu Amepalli, Assistant Professor, Department of Civil Engineering, IIT Madras are representing from India on TC on Barrier Systems.

### **IGS Student Award Winners from India**

The IGS has established Student Paper Award to disseminate knowledge and to improve communication and understanding of geotextiles, geomembranes and associated technologies among young geotechnical and geoenvironmental student engineers around the world. The IGS student award consists of US\$1,000 to be used to cover travel expenses of each winner to attend a regional conference.

Dr. J.P. Sampath Kumar, National Institute of Fashion Technology, Hyderabad (Andhra Pradesh) (1999-2000), Dr. K. Ramu, JNTU College of Engineering, Kakinada (Andhra Pradesh) (2001-02), Mrs. S. Jayalekshmi, National Institute of Technology, Tiruchirappalli (2003-04), Dr. Mahuya Ghosh, IIT Delhi (2007-08) and Dr. S. Rajesh, IIT Kanpur (2011-12) have been honoured with IGS Student Paper Award.

### **Indian Chapter of IGS**

In the year 1985, Central Board of Irrigation and Power, (CBIP) as part of its technology forecasting activities identified geosynthetics as an important area relevant to India's need for infrastructure development, including roads. After approval of IGS Council for the formation of Indian Chapter in October 1988, the Indian Chapter of IGS was got registered under Societies Registration Act 1860 of India in June 1992 as the Committee for International Geotextile Society (India), with its Secretariat at Central Board of Irrigation and Power. The Chapter has since been renamed as International Geosynthetics Society (India), in view of the parent body having changed its name from International Geotextiles Society to International Geosynthetics Society.

The activities of the Society are governed by General Body and Executive Board.

### **Executive Board of Indian Chapter of IGS**

The Executive Board of the IGS (India) consists of President, elected by the General Body, two Vice-Presidents, with one elected by the General Body, and second Vice President being Vice President (WR) of the CBIP as Ex-Officio Vice President and 16 members. The Secretary and Director (WR) of the CBIP are the as the Ex-Officio Member Secretary and Treasurer, respectively, of the Society.

The office bearers of Executive Board of the Indian Chapter, for the term 2012-2014, are its, President : Dr. G.V.S. Suryanarayana Raju, Engineer-in-Chief, Roads & Buildings Department, Government of Andhra Pradesh; Vice-Presidents: Mr. M. Venkataraman, Geotechnical and Geosynthetic Consultant and Vice-President (Civil) of CBIP; Immediate Past President : Dr. K. Rajagopal, Professor, Department of Civil Engineering, IIT Madras; Member Secretary : Secretary, Central Board of Irrigation and Power (Presently Mr. V.K. Kanjlia); Treasurer : Director (WR), Central Board of Irrigation & Power (Presently Mr. A.C. Gupta)



**Past Presidents**

The presidents of the society in the past were :

Dr. R.K. Katti, Director, UNEECS Pvt. Ltd. and Former Professor, IIT Bombay; Mr. H.V. Eswaraiah, Technical Director, Karnataka, Power Corporation Ltd.; Dr. G.V. Rao, Professor, Department of Civil Engineering, IIT Delhi; Dr. D.G. Kadade, , Chief Advisor, Jaiprakash Industries Ltd.; Dr. G.V. Rao, Chief Consultant, Sai Master Geoenvironmental Services Pvt. Ltd. and Dr. K. Rajagopal, Professor, Department of Civil Engineering, IIT Madras

**Publications/Proceedings on Geosynthetics**

In addition to the proceedings of the events on Geosynthetics, following publications have been brought out since 1985:

1. Use of Geosynthetics – Indian Experiences and Potential – A State of Art Report (1989)
2. Use of Geotextile in Water Resources Projects - Case Studies (1992)
3. Monograph on Particulate Approach to Analysis of Stone Columns with and without Geosynthetics Encasing (1993)
4. Directory of Geotextiles in India – Vol. I (1994)
5. An Introduction to Geotextiles and Related Products in Civil Engineering Applications (1994)
6. Ground Improvement with Geosynthetics (1995)
7. Geosynthetics in Dam Engineering (1995)
8. Erosion Control with Geosynthetics (1995)
9. Directory of Geosynthetics in India. Vol. II (1997)
10. Bibliography – The Indian Contribution to Geosynthetics (1997)
11. Waste Containment with Geosynthetics (1998)
12. Case Histories of Geosynthetics in Infrastructure Projects (2003)
13. Geosynthetics – Recent Developments (Commemorative Volume) (2006)
14. Directory of Geosynthetics in India (2008)
15. Publication on “Earth Reinforcement-Design & Construction” (2012)

**INDIAN JOURNAL OF GEOSYNTHETICS AND GROUND IMPROVEMENT**

The Indian Chapter of IGS has taken the initiative to publish Indian Journal of Geosynthetics and Ground Improvement (IJGGI), on half yearly basis (January – June and July-December), since January 2012.

The aim of the journal is to provide latest information in regard to developments taking place in the relevant field of geosynthetics so as to improve communication and understanding regarding such products, among the designers, manufacturers and users and especially between the textile and civil engineering communities.

The Journal has both print and online versions.

**Events Organised/Supported**

1. Workshop on Geomembrane and Geofabrics, 1985
2. Workshop on Reinforced Soil, August 1986
3. International Workshops on Geotextiles, 22-29 November 1989, Bangalore
4. National Workshop on “Role of Geosynthetics in Water Resources Projects”, 20-24 January 1992, New Delhi
5. Short Course on “Recent Developments in the Design of Embankments on Soft Soils”, 30 November 2 December 1993
6. Short Course on “Recent Developments in the Design of Embankments on Soft Soils”, 31 January 1994, Calcutta
7. 2<sup>nd</sup> International Workshop on Geotextiles, 11-12 January 1994, New Delhi
8. Workshop on “Role of Geosynthetics in Hill Area Development”, 9-11 November 1994, Guwahati
9. Workshop on “Engineering in Geosynthetics”, 29-31 December 1994, Hyderabad
10. Short Course on “Recent Developments in the Design of Embankments on Soft Soils”, 1-5 May 1995, New Delhi
11. Seminar on “Geosynthetic Materials and Their Application”, 11 August 1995, New Delhi
12. Short Course on “Recent Developments in the Design of Embankments on Soft Soils”, 08 October 1995, New Delhi
13. Short Course on “Ground Improvement with Geosynthetics”, 13 October 1995, New Delhi
14. Workshop on “Environmental Geotechnology”, December 1995, New Delhi
15. Workshop on “Role of Geosynthetics in Hill Area Development”, February 1996, Gangtok (Sikkim)
16. Workshop on “Engineering with Geosynthetics”, March 1996, Visakhapatnam (Andhra Pradesh)
17. Workshop on “Ground Improvement with Geosynthetics”, March 1996, Kakinada (Andhra Pradesh)
18. Workshop on “Engineering with Geosynthetics”, 20-23 May 1996, Chandigarh
19. International Seminar and Technomeet on “Environmental Geotechnology with Geosynthetics”, July 1996, New Delhi
20. Seminar on “Fields of Application of Gabion Structures”, 05 September 1997, New Delhi
21. First Asian Regional Conference “Geosynthetics Asia’ 1997”, November 1997, Bangalore (Karnataka)
22. Short Course on “Waste Containment with Geosynthetics”, February 1998, New Delhi
23. Symposium on “Rehabilitation of Dams”, November 1998, New Delhi

24. Training Course on “Geosynthetics and Their Civil Engineering Applications”, September 1999, Mumbai
25. Seminar on “Coir Geotextiles-Environmental Perspectives”, November 2000, New Delhi
26. Second National Seminar on “Coir Geotextiles – Environmental Perspectives”, 27-28 April 2001, Guwahati, Assam
27. National Seminar on “Application of Jute Geotextiles in Civil Engineering”, 18 May 2001, New Delhi
28. International Course on “Geosynthetics in Civil Engineering”, September 2001, Kathmandu, Nepal
29. Workshop on “Applications of Geosynthetics in Infrastructure Projects”, 20-22 November 2003, New Delhi
30. Geosynthetics India 2004 – A Seminar Workshop on “Geotechnical Engineering Practice with Geosynthetics”, October 2004, New Delhi
31. Introductory Course on Geosynthetics, November 2006, New Delhi
32. International Seminar on “Geosynthetics in India – Present and Future” (in Commemoration of Two Decades of Geosynthetics in India), November 2006, New Delhi
33. Workshop on “Retaining Structures with Geosynthetics”, 13 December 2006, Chennai (Tamil Nadu)
34. Special Session on “Applications of Geosynthetics” during 6<sup>th</sup> International R&D Conference, February 2007, Lucknow (U.P.)
35. Workshop on “Applications of Geosynthetics – Present and Future”, September 2007, Ahmedabad (Gujarat)
36. International Seminar “Geosynthetics India’08” and Introductory Course on “Geosynthetics”, 19-21 November 2008, Hyderabad
37. Special Session on “Applications of Geosynthetics” during 7<sup>th</sup> International R&D Conference, February 2009, Bhubaneswar, (Orissa)
38. Seminar on “Applications of Geosynthetics”, July 2010, New Delhi
39. International Seminar on “Applications of Geosynthetics”, November 2010, New Delhi
40. Geosynthetics India’2011, 22-24 September 2011, IIT Madras
41. Seminar on “Slope Stabilization Challenges in Infrastructure Projects”, 20-21 October 2011, New Delhi
42. GEOINFRA 2012 – A Convergence of Stakeholders of Geosynthetics, 25-26 August 2012, Hyderabad
43. Seminar on “Ground Control and Improvement”, 20-21 September 2012, New Delhi
44. Workshop on “Geosynthetic Reinforced Soil Structures - Design & Construction”, 17-18 October 2012, New Delhi

45. Seminar on “Landfill Design with Geomembrane”, 27 November 2012, New Delhi
46. Seminar on “Slope Stabilization Challenges in Infrastructure Projects”, 29-30 November 2012, New Delhi
47. Seminar on “Applications of Geosynthetics in Infrastructure Projects”, 20-21 June 2013, Bhopal (Madhya Pradesh)

### 6.4.1 Important Events

#### 1. International Workshop on Geotextiles

International Workshop on Geotextiles was organised by IGS (India) and CBIP in Bangalore during the period 22-29 November 1989.

The event was inaugurated by **H.E. Governor of Karnataka, Mr. Venkatasubbaiah Pendekant**, and was attended by 250 delegates from India and abroad.

50 Technical Papers were discussed. Besides, Panel Discussions on “Standardisation” and “Cost, Costing and Cost Effectiveness of Geosynthetics” were arranged.

In addition, a Special Lecture on “Geosynthetics Overview”, was delivered by Mr. B.C. Rawes from Netherlands.

The special publication on “Use of Geosynthetics in India, Experience and Potential – A State-of-Art Report”, was released by H.E. Governor of State of Karnataka.



#### 2. First Asian Regional Conference “Geosynthetics Asia’1997”

First Asian Regional Conference “Geosynthetics Asia’1997” was organised by IGS (India) and CBIP in November 1997, Bangalore (Karnataka)

The Conference was inaugurated by **H.E. Governor of Karnataka, Mr. Khurshed Alam Khan**. The inaugural session was presided over by the Hon’ble Minister for Major & Medium Irrigation, Government of Karnataka, Mr. K.N. Nage Gowda.



H.E. Governor of Karnataka presented the Second Series of following awards:

- IGS India-Tenax: Excellence Award to Dr. G.V. Rao, Dean (Student Affairs), IIT Delhi

- IGS India-Tenax: Technology Award to Mr. M.N. Decate, Executive Engineer, PWD, Maharashtra

In addition, the following publications were released by H.E. Governor of Karnataka:

- Bibliography-The Indian Contribution to Geosynthetics
- Directory of Geosynthetics in India

More than 175 delegates from Bhutan, Canada, Germany, Hong Kong, Hungary, Italy, Japan, Malaysia, Netherlands, Sweden, Singapore, U.K., USA, besides India, participated in the conference.

### 3. International Seminar “Application of Geosynthetics”

An international Seminar on “Application of Geosynthetics” was organized by the Indian Chapter of IGS at New Delhi on November 12, 2010. More than 50 participants from various Geosynthetic industries in India, universities and Government organizations attended the seminar.

The following four lectures were presented to highlight the current trends of geosynthetics in USA, Japan and India.

1. Advances in Landfill Design Practice in the USA – *Prof. Jorge G. Zornberg, The University of Texas at Austin and President, IGS*
2. Recent Practice and Research of Geosynthetic-Reinforced Soil Structures in Japan – *Prof. Fumio Tatsuoka, Tokyo University of Science, Japan and Immediate Past-President, IGS*
3. Geosynthetics – Developments in India (1985-2010) – *Dr. G.V. Rao, Honorary Professor, Osmania University, Hyderabad, India and Immediate Past President, Indian Chapter of IGS*
4. Overview of Geosynthetic Constructions in India – *Dr. K. Rajagopal, Professor, Department of Civil Engineering, IIT Madras and President of Indian Chapter of IGS.*



Mr. A.C. Gupta, Director (WR), CBIP & Treasurer Indian Chapter of IGS, Prof. Fumio Tatsuoka, Prof. Jorge G. Zornberg President IGS and Dr. K. Rajagopal, President of IGS (India) during the inaugural session

After the seminar, an interactive session between the IGS officers (Prof Jorge Zornberg, Prof. Tatsuoka, Dr. Russel Jones, Mrs. Elizabeth Peggs and Mrs Diana Davis) and the office bearers of the Indian Chapter of IGS was held. Discussions were held on how to improve the membership of the Indian chapter and the different means of promoting the awareness of geosynthetics in India.

#### 4. Seminar “GEOSYNTHETICS INDIA’ 11”

To be abreast with the latest development in the field of Geosynthetics, a Seminar “**Geosynthetics India’11**”, was organised by the Indian Chapter of International Geosynthetics Society and the Central Board of Irrigation & Power (CBIP) at IIT Madras (India) during the period 22-24 September, 2011.

The event was preceded by An Introductory Course on Geosynthetics on 22 September 2011 during which the eminent speakers from the academic/research institutions and the industry shared their experiences about the possible applications of Geosynthetics.

In total 90 participants took active participation in the Introductory Course.

The Seminar was inaugurated on 23 September 2011 by Dr. G. Narayanan, Principal Chief Engineer, Southern Railway. Prof. V. Idichandy, Director, IIT Madras presided over the Inaugural Session. Prof. Jorge G. Zornberg, President, International Geosynthetics Society and Fluor Centennial Associate Professor, The University of Texas at Austin, USA also addressed the participants during the Inaugural Session.

In total 125 participants from India, besides from Germany, Israel, Japan, Thailand and USA participated in the Seminar.

12 organisations from India, besides Germany, Israel and Malaysia displayed their products/services in the Exhibition organized during the event.

#### Vision

While Silver Jubilee Celebrations of IGS (India) and Seminar on Geosynthetics Barrier Engineering by IGS Technical Committee on Barrier Systems are being held in October 2013 it is proposed to host Asian Regional Conference - Geosynthetics Asia’2016



Prof. Jorge G. Zornberg, President, International Geosynthetics Society, briefing the participants about IGS



Release of the Seminar Proceedings: (L to R): Prof. K. Rajagopal, President, Indian Chapter of IGS; Prof. V. Idichandy, Director, IIT Madras; Dr. G. Narayanan, Principal Chief Engineer, Southern Railway. Prof. Jorge G. Zornberg, Prof. S.R. Gandhi, Head, Department of Civil Engineering, IIT Madras and Mr. V.K. Kanjlia, Member Secretary, Indian Chapter of IGS

## 6.5 WORLD WATER COUNCIL

The World Water Council (WWC) is an international multi-stakeholder platform, established in 1996 as a Global Water Policy Think Tank with its headquarters in Marseille, France on the initiative of renowned water specialists and international organizations, in response to an increasing concern about world water issues from the global community. The World Water Council's mission is "to promote awareness, build political commitment and trigger action on critical water issues at all levels, including the highest decision-making level, to facilitate the efficient conservation, protection, development, planning, management and use of water in all its dimensions on an environmentally sustainable basis for the benefit of all life on earth". The World Water Council currently unites 342 active member organisations from more than 60 countries. They represent the world renowned international and intergovernmental institutions, public and private companies, Governments and local authorities, research centres and civil society organisations.

To focus on region specific issues, the WWC set up centres in Montreal, Canada; Cairo, Egypt; Bari, Italy; and New Delhi. The mission of the Thematic Center is to accelerate multidimensional sustainable water sector development through user-driven empirical research and knowledge dissemination on stakeholder participation and inter sectoral integration. At present Prof. **Benedito Braga** is the President; and Mr. **Henk Sterk**, Executive Director of the World water Council.

**World Water Forum:** The World Water Forum, organized every three years by the World Water Council in close collaboration with the authorities of the hosting country, is the largest international event in the field of water.

Starting in 1997, the World water Council has so far organized 6 WWFs in different countries such as 1<sup>st</sup> in Marrakech in 1997, Morocco in March 1997; 2<sup>nd</sup> in Hague, Netherlands in March 2000; 3<sup>rd</sup> in Kyoto, Japan in 2003; 4<sup>th</sup> in Mexico in 2006, 5<sup>th</sup> in Istanbul, Turkey in 2009, 6<sup>th</sup> in Marseille, France in 2012 and 7<sup>th</sup> WWF will be held in 2014 at Seoul, Korea.

### NEW DELHI CENTRE – WORLD WATER COUNCIL (NDC-WWC)

NDC-WWC has been registered on 7<sup>th</sup> May 2002 as a society under the Societies Registration Act 1860 to promote the objects and mission of WWC its secretarites located at CBIP office Chanakayapuri, New Delhi.

The activity of the centre are being administered by General Assembly and Governing Council.

Governing council consists of a President, a Vice President, secretary General, Treasurer and other members. Since 2009, Mr. M. Gopalakrishnan is the president, Dr. A.K. Singh, Vice President, Mr. V.K. Kanjlia, Secretary General and Mr. A.C. Gupta, Treasurer. Dr. C.D. Thatte, was the President of NDC-WWC in the past.

## NDC-WWC Journal

Just after the formation of New Delhi centre, the Governing Council decided to go in for publishing a Newsletter of NDC-WWC half yearly so as to take the message of the centre to the water stakeholders at large. Subsequently since January 2012 last two years instead of bringing-out a New Letter, the Governing Council decided to publish NDC-WWC journal which is being brought-out half yearly.

**Brainstorming Session:** An important current activity of the New Delhi Centre is the organization of a brainstorming session every month beginning May 2001. So far, 71 brainstorming sessions have been organised to deliberate on policy issues relating to sustainable and integrated development of water resources. Many of the international dignitaries such as Mr. Wang Shucheng, Hon'ble Water Resources Minister, PR China; Hon'ble Frederick Fidelis Gumo, Hon'ble Minister, Ministry of Regional Development Authority, Govt. of Kenya; Prof. Asit K. Biswas, President, Third World Centre for Water Management; Dato' Ir. Hj. Kaizrul Bin Abdullah, President, ICID Prof. Dr. Chandra A Madramootoo, President, International Commission on Irrigation and Drainage, Prof. Deepak Gywali, Former Minister from Nepal, Mr. Shiferaw Jarso, Former Minister, Govt. of Ethiopia, Prof. Dr. Ir. Bart Schultz, President Hon., ICID, Netherlands etc., visited New Delhi and shared their experiences under the banner of NDC-WWC, with the water professionals and members of NDC-WWC. The details of the Brainstorming Sessions organized by NDC-WWC are given as Annexure - I

The World Water Council appreciated the activities of the New Delhi Centre and agreed to allocate some space for putting-up the deliberations of the Brainstorming Sessions organized by NDC-WWC on the website of the World Water Council. NDC-WWC also organized few events which were well attended by the professionals from Utilities, private agencies, academic institutions, consultants, industry professionals etc. some of the events organized by the NDC-WWC are:

### 6.5.1 Important Events

#### 1. Workshop on Flood and Drought Management

A two day national workshop on Flood and Drought Management organized jointly by the Central Board of Irrigation and Power, New Delhi Centre of World Water Council, Ministry of Agriculture, Govt. of India, Irrigation Department, Govt. of Uttar Pradesh and Irrigation and Waterways Department, Govt. of West Bengal was concluded in New Delhi on 17 September 2004. It was inaugurated on 16 September by **Shri P.R. Dasmunsi, Hon'ble**



Shri P.R. Dasmunsi, Hon'ble Union Minister for Water Resources, addressing the participants



**Union Minister for Water Resources** and concluded by Shri R. Rangachari, Water Resources Engineering Expert. Keynote addresses were delivered by 9 eminent professionals covering overview and all aspects of the subject of workshop. In all, 20 papers on relevant topics were presented.

Mr. Yogendra Prasad, President, CBIP in his presidential address requested Ministry of Water Resources to accelerate implementation of Water Resources Development Schemes, to facilitate better management of Flood and Drought.

The workshop took note of the mega to micro scale Water Resources Development achieved in the country thus far and considered the need for continued and speedier investment on structural measures while taking urgent steps to activate non-structural measures.

## 2. Seminar on Water Resources

A Seminar on Water Resources – Future Options” was jointly organized by Central Board of Irrigation and Power and Water Resources Department, Govt. of Rajasthan, NDC-WWC and IWRS on 28-29<sup>th</sup> September 2006 in Hotel Clarks Amer at Jaipur, Rajasthan. The seminar was inaugurated by **Smt. Vasundhara Raje, Hon’ble Chief Minister, Govt. of Rajasthan** on 28<sup>th</sup> September 2006. The inaugural session was presided over by **Prof. Sanwar Lal, Hon’ble Minister of Water Resources Department, Govt. of Rajasthan**. Shri Rakesh Nath, President, CBIP & Chairperson, Central Electricity Authority was the Guest of Honour.



During the seminar, a session was exclusively devoted to discuss the requirements of Rajasthan, a water deficit state which is reorienting itself to make a very significant contribution and enrich the National agriculture produce.

## 3. Workshop on Reforms in Irrigated Agriculture Management for Effective IWRM

New Delhi Associate Centre of World Water Council (NDC-WWC); Central Board of Irrigation & Power (CBIP), Jain Irrigation Systems; International Commission on Irrigation and Drainage (ICID); Food and Agriculture Organization of the United Nations (FAO); Geographical Committee of the International Water Resources Association (India) (IWRA); Indian Water Resources Society (IWRS) have joined hands



in association with Water Resources Department, Govt. of Karnataka, and its subsidiaries Karnataka Neeravari Nigam Limited (KNNL), Krishna Bhagya Jal Nigam Limited (KBJNL), Cauvery Neeravari Nigam Limited (CNNL) to organize a three days seminar on “**Reforms in the Irrigation Management for Effective IWRM**” (Integrated Water Resources Management) on 18 -20<sup>th</sup> December 2008 in Hotel Orchid at Bangalore.

The seminar, attended by 200 participants from all parts of India was inaugurated by **Shri Basvaraj Bommai, Hon’ble Minister for Water Resources, Govt. of Karnataka** on 18<sup>th</sup> December 2008. **Shri Govind M. Karjol, Hon’ble Minister for Minor Irrigation, Government of Karnataka**, delivered the presidential address. Shri M. Gopalkrishnan, Chairman of the Technical Committee and Secretary General, International Commission on Irrigation and Drainage gave the overview of the technical contribution received from professionals on the various themes .

The seminar focused on options for institutional reforms and the outcome of pilot reform programs in several States, which have launched action on reforms e.g., Karnataka, Andhra Pradesh, Tamil Nadu, Maharashtra, Uttar Pradesh, Orissa and Rajasthan etc. The seminar provided an opportunity to review the efficacy of Institutional reforms and to identify what is needed to be done.

There were over 36 response papers besides seven key notes lectures covering the themes related to Integrated Water Resources Management with a particular emphasis to on Reforms in Irrigation Management.

In addition to having the important technical sessions and open discussion sessions during the seminar, a field visit on 20<sup>th</sup> December 2008 was conducted to **Krishnarajasagara Dam** in Mysore for the participants. The important speakers in the seminar were from ICID, FAO, CWC, Karnataka State Govt. agencies like KNNL, CNNL, KBJNL, and agencies from other States etc.

#### 4. Chinese Water Resources Minister’s visited New Delhi Centre of World Water Council Secretariat

The 26th Brainstorming Session of NDC-WWC was held on 22nd May 2004 in the Conference Hall of Central Board of Irrigation & Power at New Delhi. His Excellency Mr. Wang Shucheng, Minister of Water Resources, Peoples Republic of China on a visit to New Delhi to discuss the details of the next ICID Congress scheduled to be held in the year 2005 at China, had agreed to share his experiences with Indian water resources professionals and deliver the talk on “Resource-oriented Water Management in China” under the banner of New Delhi Centre of World Water Council. Accordingly, the Brainstorming Session was addressed by **His Excellency Mr. Wang Shucheng, Hon’ble Minister for Water Resources, People’s Republic of China**. Mr. M. Gopalakrishnan, Vice President of New Delhi Centre of World Water Council and Secretary General, ICID chaired the session.



### Mr. William Cosgrove , President, World Water Council visited the New Delhi Centre

President Mr. William Cosgrove during his visit to New Delhi to participate in field visits and attend meetings as the Council representative on the Millennium Project Task Force on Water also visited the Secretariat of New Delhi Centre of the World Water Council (NDC-WWC) housed in CBIP Building on March 3rd 2004. The President met Vice-President of NDC-WWC, Mr. M. Gopalakrishnan, Secretary General of ICID and their representative on the BOG; Secretary General Mr. G.N. Mathur, Secretary, Central Board of Irrigation and Power (CBIP); Treasurer Dr. A.S. Chawla, Director, (Water Resources), (CBIP)



L to R Dr. A.S. Chawla, Mr. M. Gopalakrishnan, Mr. William Cosgrove, Mr. G.N. Mathur

### Annexure 1

#### BRAINSTORMING SESSION

Brain-storming	Title of the Session	Speaker	Date
1st	Role of Dams in Socio-economic Development	Dr. C.D. Thatte President, NDC-WWC & Secretary General, ICID	22/05/2001
2nd	Integrated Water Resources Development and Management Rehabilitation and Resettlement Public Hearing on Environmental Issues Waterlogging and Salinization	S.C. Sharma, THDC R.K. Khanna, CWC Dr. S.A. Kulkarni, ICID	22/06/2001
3rd	Prospects of Hydropower Development in India Overview & Future Strategy Techno-economic Evaluation of Hydropower Projects Achieving Cost Effecting Implementation Role of Large Dams in Hydropower Sector	Pradeep Chaturvedi, IEI B.K. Aggarwal, CEA R.K. Sharma, NHPC M. Gopalakrishnan, CWC	27/07/2001
4th	Reforms in Water Sector pening Remarks and Overview Participatory and Inter-disciplinary Approach Financing and Return on Water Infrastructure	Mr. A.D. Mohile Mr. L.N. Gupta, WAPCOS Dr. R.P.S. Malik, Agriculture Economic Research Centre	31/08/2001

5th	Reforms in Water Sector Opening Remarks and Overview Driving for Professional Excellence Restructuring of Institutions	Mr. A.D. Mohile Mr. G.N. Kathpalia Mr. Suresh Chandra	29/10/2001
6th	Financing Water Sector River Basin Authorities Discussions were through Questionnaire prepared by	Dr. C.D. Thatte	29/11/2001
7th	River Basin Authorities	A Note compiled by Dr. C.D. Thatte	28/12/2001
	Lecture on Dams, WCD and Beyond	Prof. Asit K. Biswas President Third Water Centre of Water Management	07/01/2002
8th	Environmental Management of River Valley Projects Rehabilitation and Resettlement Catchment Area Treatment Carrying Capacity with Particular Reference to Wildlife, Flora & Fauna Dr. Nalini Bhatt, MOEF	Dr. Usha Bhatt, NHPC, Dr. Archana Godbole DD & Associates	25/01/2002
9th	Dialogue on Water for Food and Environment	Dr. C.D. Thatte	22/02/2002
10th	WTO and New International Trade Regime - Implications for Indian Agriculture	Dr. R.P. Singh, IARI	15/03/2002
11th	Scenario of Rural Water Supply in India - A Case Study	Dr. V.K. Verma, SIIR	30/05/2002
12th	National Water Policy - Shortage of Policies, Water Or Will Power ?	Mr. Ramesh Chandra Vice President Hon., ICID & Former Chairman, INCID	28/06/2002
13th	Dialogue on National Water Policy	Mr. M. Gopalakrishnan Chief Engineer (Design) Central Water Commission	28/08/2002
14th	Policy Action Dialogue — Action Plan for National Water Policy 2002	Mr. G.N. Kathpalia Sr.Adv., Alternative Futures Mr. R.S. Goel Director, CWC	30/09/2002
15th	Overview of Seven Workshops held by MOWR on National Water Policy Action Plan	Mr. Chetan Pandit Director (R&D), CWC	31/10/2002
16th	Interlinking of Rivers	Mr. Z. Hasan Former Secretary- Water resources Govt. of India	10/01/2003

17th	A Bridge Theme Paper on Inter-basin Transfer of water in India – Prospects and Problems	Mr. A.D. Mohile Former Chairman, CWC	11/02/2003
18th	Interlinking of Rivers	Dr. C.D. Thatte, Secretary General, ICID	25/04/2003
19th	Inter Linking of Rivers	Prof. Subhash Chander Tata Energy Research Institute	04/06/2003
20th	Issues related to economic and financial aspects of interlinking of rivers	Mr. S.K.N. Nair/Dr. D.K. Pant/Mr. Jai Pal Singh, NCAER, New Delhi	11/07/2003
21st	Basin Level (CPSP) Modelling in National Perspective	Mr. L.N. Gupta, Former Executive Director, WAPCOS	02/12/2003
22nd	Water Issues in context of urbanization in India	Mr. K.N. Agarwal, Director General, CPWD	24/12/2003
23rd	Application of artificial neural networks to water resources	Mr. S.K. Jain, Scientist, NIH	29/01/2004
24th	Experiences in Execution of 1500 MW Nathpa Jhakri Project in Himachal Pradesh	Mr. Vijay Chopra, General Manager – Designs, SJVNL	27/02/2004
25th	Issues involved in water pricing and irrigation in India	Dr. D.K. Pant and Ms. Mrinalini Kaur Sapra, NCAER	02/04/2004
26th	Resource Oriented Water Management in China	Mr. Wang Shucheng Minister of water Resources, People's Republic of China	22/05/2004
27th	Lessons Learnt from Tehri and Sardar Sarovar Project	Dr. C.D. Thatte, President, NDC-WWC	24/06/04
28th	Indian Water Scenario in Global Context	Prof. Asit K. Biswas, President, Third World Centre for Water Management, Mexico	20/07/2004
	More Crop Less Drop – Food Production in Humid Climatic Environments	Dato' Ir. Hj. Kaizrul Bin Abdullah, President, ICID	17/07/2004
29th	India's Water – Development and Management for the future	Prof. M.C. Chaturvedi	27/08/2004
30th	Environmental Database in India	Mr. Somnath Mukherjee, Project Director, Environmental Information Centre	29/09/2004

31st	Water Sensitive Urban Management	Mr. K.N. Agarwal, Director General Central Public Works Department	29/10/2004
32nd	Need to bring efficiency in irrigation system	Mr. A.S. Dhingra, Commissioner (WM&CAD), Ministry of Water Resources	25/11/2004
33rd	Issues and Challenges in Management of Water Resources Sector	Mr. A. Sekhar Adviser – WR Planning Commission	28/01/2005
34th	Reorienting Rural Development Programme Facilitate Restructuring of Water Sector	Mr. K.R. Datey Consulting Engineer, Society for Promoting Participative Ecosystem Management (SOPPECOM)	21/02/2005
35th	Recent Tsunami Impact on Peninsular Indian Coastline and Performance of Coastal Protection Works	Dr. T.G. Antony Balan, Chief Engineer (C&SR), Central Water Commission, Government of India, Coimbatore	27/05/2005
36th	ICID @ 55	Mr. M. Gopalakrishnan, Secretary General, ICID	28/06/2005
37th	Mangroves: A barrier against coastal hazards	Dr. B.P. Das, Former Engineer-in-Chief & Chief Adviser, Department of Water Resources, Government of Orissa	25/07/2005
38th	Thematic Contents of WWF4 and cross cutting Issues – An Overview	Mr. M. Gopalakrishnan, Secretary General, ICID	26/08/2005
39th	Reflections on the ICID 19th Congress in Beijing”.	Mr. Peter S Lee, President, ICID	27/10/2005
40th	Impact of climate change on water resources	Mr. R. Jeyaseelan, Chairman, CWC	23/12/2005
41st	Issues and challenges in water sector	Mr. S.K. Sinha, CE-BPMO, CWC	10/02/06
42nd	An Appraisal of 4th World Water Forum at Mexico	Mr. M. Gopalakrishnan President, NDC-WWC and Secretary General, ICID, New Delhi	31/03 2006
43rd	Chartering a New Course – A strategy for sustainable management of India’s water resources in the XXI Century	Mr. G.N. Kathpalia Chairman, Alternative Future, New Delhi	28 /04/ 2006

44th	The Syndrome of groundwater abstraction and irrigated agriculture	Mr. A. Sekhar, Adviser (Water Resources), Planning Commission, Govt. of India, New Delhi	16/06 2006
45th	Drainage for Salinity Control in India: Environmental and Socio Economic Issues	Dr. Gurbachan Singh Director, Central Soil and Salinity Research Institute (CSSRI) Karnal, Haryana	28/07/2006
46th	Emerging Law on International Watercourses and Indus Water Treaty	Prof. V.G. Hegde International Law School of International Studies, Jawaharlal Nehru University, New Delhi,	31/08/2006
47th	Role of Water Management for Global Food Production	Prof. Dr. Ir. Bart Schultz President Hon., ICID, Netherlands National ICID Committee (NETHCID) The Netherlands,	22/09/2006
48th	Recent advances in the technology of Roller Compacted Concrete	Mr. Francisco Andriolo Brazil	22/11/2006
49th	An Appraisal of the (next) World Water Forum 5 and key themes finalized in Istanbul during Kick-Off meetings	Mr. M. Gopalakrishnan President NDC-WWC and Secretary General, ICID	30/03/2007
50th	Global climate change and Irrigated agriculture	Mr. Mark Svendsen, Vice President, ICID & Chairman, USCID	12/06/2007
51st	Abu Dhabi initiative dialogue on rivers of Great Himalayas – Benefits of co-operation	Mr. M. Gopalakrishnan, Secretary General, ICID	31/08/2007
52nd	Ethiopian experiences in development and management of water resources	Mr. Shiferaw Jarso, Former Minister, Govt. of Ethiopia	25/09/2007
53rd	“Efficiency improvement and cost reduction in water resources sector by use of stainless steel – Scope and Opportunities”	Mr. Hachemi Loucif, Expert on Desalination Mr. Mikael Willfore, Expert on Oil & Gas, Pulp & Paper.	3/10/2007
54th	Policy Aspects of Integrated Water Resources Management”.	Dr. Bruce P. Hooper Principal, River Basin Management Water Policy Unit, DHI Water Environment Health, Honorary Research Consultant, University of Queensland, Australia	29/10/2007

55th	Recent International Event in Jakarta and Japan on Progress in Water Sector”.	Mr. M. Gopalakrishnan, Secretary General, ICID	25/01/2008
56th	“Water resources Management in Canada”.	Dr. Chandra Madramootoo Dean, Faculty of Agricultural & Environmental Sciences, McGill University, Canada	03/2008
57th	A Comparison of China and India: Resettlement Aspects (Case Study on the Three Gorges and the Sardar Sarovar	Dr. Parthasarathy Ramanujam, (a former IAS Officer of Gujarat Cadre), Hon Adviser Consultant, Govt. of Gujarat Corporations	11/04/2008
58th	Combating Land Degradation for Sustainable Agriculture	Dr. Sanjay Kumar, Deputy Inspector General, Govt. of India, National Afforestation & Eco-development Board, Ministry of Environment and Forests	24/06/2008
59th	Low cost spillways with concrete Fuse Plugs Reservoir Sedimentation Management – Recent Technologies and Innovations Revision of Dam Safety Guidelines in the light of Wenchud Eq	Mr. Francois Lemperiere, Chairman, Hydro Coop Mr. Sultan Alam, Consultant, Dr. Mirgui Feng, IWHR	06/11/2008
60th	Trading of Energy	Shri Rajesh K Mediratta, Vice President Business Development, Indian Energy Exchange Limited, New Delhi	30/01/2009
61st	Looking forward in respect of the Water Agenda of Indo-Nepal: Some Perceptions	Prof. Deepak Gywali, Director, Nepal Water Conservation Foundation and Pagya of the Royal Nepal Academy of Science and Technology	12/03/2009
62nd	Conflicts and Cooperation – Global Scenario in Water Sector	Ms. Naho Mirumachi, London Water Research Group, U.K.	14/05/2009
63rd	Advances in Micro Irrigation in India	Dr. T.B.S. Rajput, Project Director, Water Technology Centre, Indian Agriculture Research Institute	25/09/2009
64th	Safety in Design and Operation of Dams: Sedimentation, Scour and Instrumentation”	Dr. George Annandale Practice Leader, Golder Associates, Denver, USA	10/11/2009



65th	Co-operation in the water sector – Water Resources Assessment through Modern technologies	Mr. Job Nijman & Mr. Creg Street, Head-WR, GUGRO Holland	05/02/2010
66th	Lecture Smart Rain Water Harvesting And Multiple Uses - Pilot Project	Dr. J.R. Sharma, Scientist / Engineer ‘G’ Project Director (India-WRIS) & General Manager, National Remote Sensing Centre ISRO	04/06/2010
67th	Efficiency Improvement in Water Management – Provision in the National Water Mission Document	Mr. U.N. Panjiar, Former Secretary (WR), GOI, M. Gopalakrishnan, President NDC-WWC & Secy. ICID	30.12.2010
68th	“The role of irrigated agriculture in securing global food security”.	Prof. Dr. Chandra A Madramootoo, President, International Commission on Irrigation and Drainage	25/03/2011
69th	Need for a New Paradigm to Manage India’s Current and Future Water Problems	Prof. Asit K. Biswas, President, Third World Centre for Water Management	12/11/2011
70th	Interaction with Kenyan Delegation headed by Hon’ble Minister, Ministry of Regional Development, Kenya	Mr. Kahindi James Mangi, Managing Director, Coast Development Authority, Kenya Hon’ble Frederick Fidelis Gumo, Hon’ble Minister, Ministry of Regional Development Authority, Govt. of Kenya, Er.R.C.Jha, President, Indian Water Resources Society & Chairman, CWC, Er. P.K.Chatterjee, Member NDCWWC & Head (WR) Consulting Engineering Services	16/12/2011
71st	Moving from Water Problems to Water Solutions	Dr. Jeremy Bird, Director General of IWMI	08.02.2013

## **6.6 INTERNATIONAL WATER RESOURCES ASSOCIATION**

International Water Resources Association (IWRA), a non-profit, non-governmental, educational organization, was established in 1971. IWRA is an international network of multidisciplinary experts on water resources. IWRA provides a global, knowledge based, forum for bridging disciplines and geographies by connecting professionals, students, individuals, corporations and institutions who are concerned with the sustainable use of the world's water resources. The Executive Office of IWRA is in France. IWRA seeks to continually improve water resource decision-making by improving our collective understanding of the physical, ecological, chemical, institutional, social, and economic aspects of water. The activities of IWRA are governed by the Executive Board. Prof. Dogan Altinbilek from Turkey is the President of IWRA. Mr. V.K. Kanjlia, Secretary, Central Board of Irrigation and Power is one of the elected Directors of the Executive Board of IWRA for the term January 2013 to December 2015. Earlier, Mr. G.N. Mathur, the Former Secretary, Central Board of Irrigation and Power, also served as Director on the IWRA Executive Board.

### **IWRA AWARDS**

Since its creation, IWRA recognises the contributions towards water management and the excellence of water researchers, professionals and organisations. IWRA presents 5 main awards namely :

Crystal Drop Award, Ven Te Chow Memorial Award and Lecture, IWRA Distinguished Lecture Award, Water International Best Paper Award and Young IWRA Member Scholarship Award

### **WORLD WATER CONGRESS**

Since 1973, IWRA has held a World Water Congress every three years in various locations around the world.

The objective of the World Water Congress is to provide a meeting place to share experiences, promote discussion, and to present new knowledge, research results and new developments in the field of water sciences around the world.

### **Indian Geographical Committee of IWRA**

Indian Geographical Committee of IWRA, with its Secretariat at Central Board of Irrigation and Power (CBIP) is representing IWRA, in India, as its Geographical Committee, since 1991. The Indian Geographical Committee of IWRA (IGC-IWRA) has been involved in dissemination of information in the field of water resources through publications and training courses/seminars/conferences, both at National and International levels. The Indian Geographical Committee provides information regarding latest developments in the subject to its members. At present this society is designated on IWRA (India).

## **IWRA (India) Journal**

The Indian Geographical Committee of IWRA has taken the initiative to publish “IWRA (India) Journal”, on half yearly basis (January – June and July-December), since January 2012.

The aim of the journal is to provide latest information in regard to developments taking place in the field of water resources, besides making aware the readers about the activities being carried out in the field of Water Resources, such as technical papers, R&D Activities, and information regarding conferences, training programmes and important news.

The Journal is available both in print and online versions.

## **Events Organised/Associated**

1. **Second World Congress on Water Resources “Water for Human Needs”, 12-16 December 1975, New Delhi**
2. Hydrology of Rivers with Small and Medium Catchments, April 1978
3. Sedimentation Studies in Reservoirs, June 1978
4. Modernisation of Irrigation Systems, April 1979
5. Operation and Maintenance of Canal Systems, May 1980
6. Hydrology in Water Resources Development, May 1980
7. Strategy for Mass Mobilisation and Peoples Participation in Watershed Management Programme, October 1980
8. Flood Control, January 1981, Roorkee
9. Water Chemistry in Thermal Power Stations, May 1983
10. Water Management – Experiences of the Past & Directions for the Future, July 1983
11. Irrigation in Arid Lands, November 1983
12. Operational Water Chemistry, January 1984, Ennore
13. Modern Management Technique in Irrigation Projects, April 1984
14. Real Time Hydrological Forecasting, November 1984
15. Problems of Water Logging & Salinity in Irrigated Areas, November 1984
16. Flood Control Measures in the Salinity Irrigated Areas, November 1984
17. Application of System Analysis Techniques for Development of Water Resources, January 1985
18. System Engineering for Water Resources Development and Reservoir Operation
19. Workshop on Flood Estimation in Himalayan Regions, September 1986
20. Workshop on Flood Damage Assessment, October 1986, Guwahati

21. Seminar on Morphology of the Ganga River, November 1986
22. First National Water Convention, November 1987
23. International Workshops on Evaporation from Open Water Surfaces, November 1989, Vadodara
24. International Seminar on Education & Training in Water Resources in Developing Countries
25. Workshop on Environmental Impact Assessment of Water Resources Projects, January 1990, Kozhikode
26. Symposium on Monitoring and Management of Ecological Aspects in Development of Water Resources & Power Projects, January 1990
27. Workshop on Environmental Impact Assessment of Water Resources Projects, February 1990, New Delhi
28. Workshop on Environmental Impact Assessment of Water Resources Projects, March 1990, Maithon Dam
29. Workshop on European Hydrological System Model Applications, September 1990
30. National Workshop on Sediment Measurement Techniques, July 1991, Hyderabad
31. Workshop on Canal Lining, January 1993, Bikaner
32. Workshop on River Scour, April 1993, Varanasi
33. Workshop on Canal Automation, November 1993, Vadodara
34. Workshop on Sprinkler & Drip Irrigation, December 1993, Jalgaon
35. CBIP Zonal Workshop on Integrated Development of Irrigated Agriculture, December 1993, Madras
36. CBIP Zonal Workshop on Integrated Development of Irrigated Agriculture, December 1993, Bhopal
37. CBIP Zonal Workshop on Integrated Development of Irrigated Agriculture, April 1994, Bhubaneswar
38. CBIP Zonal Workshop on Integrated Development of Irrigated Agriculture, April 1994, New Delhi
39. Workshop on Reservoir Sedimentation, May 1994, Mysore
40. Workshop on Nuclear Hydrology, April 1995, Kozhikode
41. Seminar on Environmental Management of Water Resources & Power Projects, September 1995, Indore
42. Workshop on Integrated Development of Irrigated and Dry Land Agriculture in Maharashtra, December 1995, Aurangabad

43. Workshop on Challenges in Groundwater Development, January 1996, Madras
44. Workshop on High Technology in Hydro Meteorological Observations and Capacity Survey of Storage Reservoirs, February 1996, Pune
45. Workshop on Water Logging & Soil Salinity in Irrigated Areas, March 1996, Karnal
46. Workshop on Aquatic Weeds Problems and Management, June 1996, Bangalore
47. Workshop on Canal Automation, November 1996, Bhubaneswar
48. Workshop on Lift Irrigation, April 1997
49. Workshop on Canal Automation, April 1997, Kochi
50. Workshop on Remote Sensing & GIS Applications in Water Resources Engineering, September 1997, Bangalore
51. First International Specialized Conference on Water Quality & Its Management, March 1998
52. Workshop on Canal Automation, July 1998, Trichy
53. International Conference on Watershed Management and Conservation, December 1998
54. Workshop on Canal Automation, 27-29 April 1999, Aurangabad
55. Seminar on Natural Catastrophes and Disaster Management, 18-20 August 1999, Hyderabad
56. A Half-day Presentation on Role of Inmarsat in Canal Automation, 25 August 1999
57. Symposium on Development in Inland Dredging Technology, 22 October 1999, Chennai
58. One-day Seminar on Reservoir Sedimentation, 25 January 2000
59. Workshop on Role of Dredging and Aquatic De-weeding in the Management and development of Water Resources, 19 May 2000
60. Workshop on Challenges in Ground Water Development, 7-9 June 2000, Tirupati
61. International Conference on Innovative Technologies for Rural Water Supply and Environmental Sanitation (RUWATSS-2000), 12-13 October 2000, Roorkee
62. Seminar on Reservoir Sedimentation, 6-8 June 2001, Ooty
63. Workshop on Remote Sensing and GIS Applications in Water Resources Engineering, 29-31 August 2001, Lucknow
64. Seminar on Lift Irrigation Schemes, 24-26 April 2002, Hyderabad
65. **IWRA Regional Symposium on Water for Humana Survival, 27-30 November 2002**

66. Training Programme on Grounds Water Quality Management, 18-21 May 2004
67. Workshop on Flood and Drought Management, 16-17 September 2004
68. XII World Water Congress - Water for Sustainable Development – Towards Innovative Solutions, 22-25 November 2005
69. Seminar on Water Resources-Future Options, 28-29 September 2006, Jaipur
70. Third International Conference on “Water Quality Management”, 27-28 February 2008, Nagpur
71. Int. Seminar on “Reforms in the Irrigation Management for effective IWRM”, 18-20 December 2008, Bangalore
72. Seminar on “Canal Automation”, 24-25 February 2011
73. **Celebration of “World Water Day” - Swarnim Seminar on “Water for Inclusive Growth”, 22 March 2011, Gandhinagar**

### 6.6.1 Important Events

#### 1. Second World Congress on Water Resources “Water for Human Needs”

Invitation to hold the Second World Congress of the IWRA at Delhi was extended to the Association by Dr. K.L. Rao, Union Minister for Irrigation and Power and the Senior Vice President of the Association at its First Congress held in Chicago in September 1973. The invitation was readily accepted by the Executive Board of the Association.

The Second Congress which was held at New Delhi during from 12th - 16th December 1975 was attended by about 650 experts including more than 200 from 45 countries other than India. A number of world organisations such as the United Nations and its related agencies, World Health Organisation, World Meteorological Organisation, International Bank for Reconstruction and Development, etc., connected with the development and utilisation of water resources and related fields nominated their experts to the Congress.

“*Water for Human Needs*” was the theme of the Congress. More than 260 papers were contributed for the Congress and they were grouped under Energy, Food, Health and General. In the general group the papers dealt with various aspects of water resources planning, development, management, technology, ecology, education and meteorology.

**The Congress was inaugurated by Shrimati Indira Gandhi, Hon’ble Prime Minister on 12 December 1975 in the spacious hall of Vigyan Bhavan. Shri Jagjivan Ram, Hon’ble Union Minister for Agriculture**



and Irrigation and Shri K. C. Pant, Hon'ble Union Minister for Energy also addressed the inaugural session. Dr. Ven Te Chow, President, IWRA welcomed the participants on behalf of the Association. Shri N. C. Saksena, President, C.B.I.P. and Chairman of the Organising Committee and Shri Y. K. Murthy, Chairman, Central Water Commission and Chairman, Indian Committee for IWRA welcomed the participants on behalf of the Organising Committee.

## 2. IWRA Regional Symposium-Water for Human Survival

Regional Symposium on "Water for Human Survival" was organised under the auspices of the International Water Resources Association (IWRA) by the Geographical Committee of the International Water Resources Association (India) and Central Board of Irrigation and Power from 27-30 November 2002 at New Delhi. The symposium was inaugurated by the Hon'ble Minister of State for Power, Smt. Jayawanti Mehta. The Presidential Address was delivered by Shri A.K. Goswami, Secretary to Government of India, Ministry of Water Resources. IWRA was represented by Prof. Ramon M. Lamas, Vice President.



In all 160 delegates from 10 countries participated in the deliberations of the symposium. For greater interaction amongst all those involved in the entire spectrum of water sector development, 63 articles were included in the proceedings volume for focussing on issues and challenges faced by the water resources professionals to improve the existing water resources development and management practices.

In addition to IWRA Distinguished Lecture by Dr. Bharat Singh, 11 Keynote/ Special Lectures were delivered by eminent experts on various themes of the symposium.

The deliberations of the symposium gave a very wide exposure on the present state-of-the-art of the water resources development, water treatment and distribution, urban and rural water supply, sanitation, irrigation water management, etc. to the delegates.

## 3. XII World Water Congress of IWRA – Water for Sustainable Development-Towards Innovative Solutions

The XII World Water Congress of International Water Resources Association (IWRA) was organized by Central Board of Irrigation and Power and International Water Resources Association (IWRA) from 22-25 November 2005 at New Delhi. The Congress was well attended by 500 participants from more than 50 countries. Shri Santosh Mohan Dev, Hon'ble Union Minister of Water Resources, Government of India inaugurated the Congress. Several ministers and senior officials were in attendance. The Congress featured 8 Keynote speakers, the V.T. Chow Memorial Lecture, 9 special sessions, 30 technical sessions of oral presentations and 5 poster presentation sessions. The main theme of the Congress was: Water for Sustainable Development – Towards Innovative Solutions.

The August gathering of more than 500 water professionals (including 13 Water Resources and environment Ministers from 50 countries) were addressed by dignitaries like Dr. Kirit S. Parikh, Member, Planning Commission, Government of India; Mr. Aly M. Shady, President, International Water Resources Association; Shri J. Harinarayanan, Secretary to Government of India, Ministry of Water Resources, Dr. Olcay Unver, Chairman of International Steering Committee and Vice



President IWRA and Shri G.N. Mathur Organising Committee Secretary General and Secretary CBIP. Mr. Shady praised India's contribution to water management experience as the ideal backdrop for the Congress. Dr. Parikh delved into detail the poverty of water resources in India, and the need for greater management. Shri Santosh Mohan Dev, Hon'ble Union Minister for Water Resources, Government of India highlighted India's main water concerns, including the development of water infrastructure, and stressed the need for integrated water resources management, including measures for water conservation and rainwater harvesting to recharge the groundwater; increasing water efficiency, and creation of storage capacity for flood peak attenuation and sustenance during droughts.



## 6.7 CIGRE (INTERNATIONAL COUNCIL ON LARGE ELECTRIC SYSTEM)

The CIGRE founded in 1921, has its headquarters in Paris and has been established to facilitate and promote the exchange of technical knowledge and information in the general field of electricity generation and transmission at high voltages. Its activities are particularly concerned with (a) electrical aspects of electricity generation; (b) construction and operation of substations and transformer stations and their associated equipment; (c) construction, insulation and operation of high voltage electrical lines, and (d) interconnection of systems and operation and interconnected systems.

The activities of the CIGRE develop essentially within the study Committees and during the session held every two year in Paris. The work of these sessions is divided into discussion groups each corresponding to a study Committee. The CIGRE has so far held 44 sessions up to the year 2013.

### **CIGRE (India)**

CIGRE (India) was set up as a society in the year 1991 and its secretariat housed in main building of Central Board of Irrigation and Power at New Delhi. It functions as the National Committee i.e. CIGRE (India). The CIGRE (India) coordinates interest of Indian members and organises National Study Committee (NSC) meetings etc. It also recommends appropriate experts for CIGRE Study Committees. The National representatives constitute Indian committees and are instrumental in providing feed back to Cigre Study Committee. The aims and objectives for which the CIGRE (India) is constituted is to implement and promote objectives of the International Council on Large High Voltage Electric System (CIGRE) and accelerate its activities, which include the interchange of technical knowledge and information between all countries in the general fields of electricity generation, transmission at high voltage and distribution etc.

The activities of CIGRE (India) are administered by the General Body and the Governing Council. The Governing Council constituted for day to day administrative decisions comprises of a President; two Vice-Presidents; Secretary & Treasurer and Members.

The **President** Shri R.N. Nayak, CMD, POWERGRID

There are two **Vice-President** Shri N.N. Misra, Director, NTPC Ltd. and Mr. M.K. Dube, Director, BHEL

The **Secretary & Treasurer** is Shri V.K. Kanjlia, Secretary, CBI&P

These Office Bearers are for the period of 2012-2014

**Technical Sub-Committees:** The 16 Technical Study Committees at national level, as constituted by the Governing Council, meet minimum 2 times in a year or as and when found necessary, keeping in view the requirements of CIGRE/ problems of National interest. The study committees are the shadow committees of the CIGRE Study Committees.

The sub-committees collaborate amongst experts within the country and supports the concerned study group members.

About 250 members have been registered for the current year. (i.e. 2013)

## List of Past Presidents

**Mata Prasad**, Founder President CIGRE (India) (1991-1993) ; **R.K. Narayan**, Ex -CMD, Power Grid (1994 - 1995)

**S.C. Parakh**, Ex -CMD, Power Grid (1995 -1996); **C.V.J. Varma**, Ex Member Secy, CBIP (1996 - 2001)

**R.P. Singh**, Ex -CMD, Power Grid (2001 - 2009); **S.K. Chaturvedi**, Ex -CMD, Power Grid (2009 -2011)

### I. Indian Members in CIGRE administrative Council & Steering committee

- Shri C.V.J. Varma, former Secretary CBIP, has been on the administrative council from 1970 to 2000
- Shri R.P. Singh, CMD, POWERGRID was a member of Steering Committee of CIGRE during the year 2005-06

### II. CIGRE Award to Indian Professionals

**CIGRE Technical Committee Award for outstanding contribution to CIGRE has been awarded to Shri Mata Prasad**, Founder President CIGRE, India **in the year 1998 and Shri B.S. Palki**, Former Vice President, ABB Ltd. **in the year 2005**

**Recipient of CIGRE Distinguished Award was also given to**

Mr. Mata Prasad, Ex ED, NTPC, Mr. K.S. Madhawan, GEC Alstom and Mr. P.M. Ahluwalia, Ex Member, CEA in 1996; Mr. R.T. Chari, Tag Corporation in 1998; Mr. P. Bose, EMC, Kolkata in 2000; Mr. B.S. Palki, ABB and Dr. T. Adhikari, BHEL in 2002; Mr. Yogendra Prasad, NHPC and Mr. Bhanu Bhushan, CERC in 2004; Mr. N.N. Misra, NTPC; Mr. R.P. Sasmal, POWERGRID; Mr. Vijayakumaran, Alstom, 2012

### III. Honorary Membership of CIGRE :

Shri C.V.J. Varma, has been awarded Honorary Membership of CIGRE on 30<sup>th</sup> August 1994 in recognition of his outstanding contribution to the association. He is the only Indian till date in more than 85 years history of CIGRE given this rare honour.



### IV Membership in CIGRE Study Committee 2012-14

It is a matter of pride that India is represented in all the Sixteen Study Committee of CIGRE, following are the representatives in the year 2012-14 :

A.K. Gupta, ED, NTPC Ltd and member of CIGRE SC on Rotating Machine (A1); M. Vijayakumaran, Sr. Tech.Expert, Alstom T&D & member of CIGRE SC on Transformers (A2); N.N. Misra, Director, NTPC & member of CIGRE SC on HV Equipment (A3); Deepal Shah, Country Mgr, Brugg Kable and member of CIGRE SC on HV Insulated

Cables (B1); Rajesh Kumar, GM, Powergrid & member of CIGRE SC on Overhead Lines (B2) ; S. Victor, AGM, Powergrid & member of CIGRE SC on Substations (B3); R.P. Sasmal, Director, POWERGRID and member of CIGRE SC on HVDC (B4); S.G. Patki, Sr. VP, TATA POWER and member of CIGRE SC on Protection (B5); Y.K. Sehgal, ED, Powergrid & member of CIGRE SC on Planning & Development (C1); V.K. Agarwal, ED, POSOCO and member of CIGRE SC on Operation and Control (C2); M. Krishankumar, ED, Powergrid & member of CIGRE SC on System Environmental Performance (C3); Ravinder, Member (PS), CEA & member of CIGRE SC on System Technical Performance (C4); Sushil Kumar Soonee, CEO, POSOCO, & member of CIGRE SC on Electricity Markets and Regulation (C5); Alok Gupta, Former Member (Hydro),CEA and member of CIGRE SC on Distribution Systems And Dispersed Generation (C6), S.V.N. Jithin Sundar, GM, BHEL and member of CIGRE SC on Material For Electro technology (D1); N.S. Sodha, ED, Powergrid & member of CIGRE SC on Information Systems & Telecommunication (D2).

To increase the activities and membership CIGRE India has taken the initiative to publish its Journal initially with the frequency of six months Jan 2012.

The CIGRE India journal contains details about the activities of the association, technical articles, and data and is circulated to its members within the country. The journal serves an excellent purpose of disseminating the technological, innovative developments etc. amongst the concerned organizations of the energy sector, which are taking place at the national and international level. The journal is available both in print and online versions.

#### **Events organized by CIGRE India in the past:**

1. Meeting of CIGRE SC 36 on Interference and related working groups, 6-8 Oct. 1975, New Delhi
2. CIGRE Technical committee meeting in India, 4-7 April 1995, New Delhi
3. Regional Meeting on Power Pool Arrangements and Economical Load Despatch, 13-14 Oct. 1995, New Delhi
4. CIGRE WG 23.01 on Gas Insulated Sub station, 11-12 Nov. 1996, New Delhi
5. CIGRE Executive Committee & Administrative Council Meeting, 6-8 Sept. 1997, New Delhi
6. Tutorial on Power Quality Issues, measures, Sources and Analysis Power Quality Assessment and Solution techniques, and Harmonics in Power Systems, 9<sup>th</sup> Sept. 1997 and 12 Sept. 1997
7. CIGRE Regional meeting on Power Quality - Assessment of Impact, 10-11 Sept. 1997, ND
8. International Conference “Modern trends in the Protection Schemes of Electric Power Apparatus and Systems, 28-30 Oct. 1998 New Delhi

9. International Conference on Power Quality – assessment of Impact, 6-7 Nov. 2001, New Delhi
10. CIGRE RM on Bulk Power Transmission System integration in Developing Countries, 8-10 Nov. 2001 New Delhi
11. TUTORIAL I Planning Aspects of HVDC & FACTS – 17/18 Sept. 2005  
*B. Davies, Manitoba Hydro, Bangalore*  
TUTORIAL II HVDC Terminal Equipment – *Victor Lescale, ABB Sweden*  
TUTORIAL III New Development in HVDC/ FACTS Equip.- *Dr. D. Retzmann, Siemens, Gerny.*  
TUTORIAL IV AC/DC Harmonic Filters – *Ms Lin Jiang, ABB Sweden*  
TUTORIAL V VSC Transmission – *B. Andersen, UK*  
TUTORIAL VI HVDC Control & Protection – *Georg Wild, Siemens, Germany*
12. CIGRE Executive committee Meeting, 18.09.2005, Bangalore
13. CIGRE Administrative Council Meeting, 19-09-2005, Bangalore
14. CIGRE SC B4 Meeting, 22.09.2005, Bangalore
15. CIGRE SC B4 and Its WG Meeting India Day and Conference & 23- 24 September 2005 Tutorials CIGRE Colloquium on “Role of High Voltage Direct Current Bangalore (HVDC), Flexible AC Transmission Systems (FACTS) and Emerging Technologies in Evolving Power Systems”
15. International Symposium on Standard for Ultra High Voltage during Gridtech 2009, 29-30 Jan. 2009 New Delhi
16. workshop on “Latest Technologies in Power Transmission Sector” - 20May2010, New Delhi
17. CIGRE WG meeting and Conference on Development of 1200 kV 28, 29-30 Sept. 2010 National Test Station
18. International Colloquium on “Best Practices in Design & Maintenance Techniques for EHV Lines” 21-22 Oct 2010, New Delhi
19. Gridtech 2011 Exhibition and Conference on Transmission 19-21 April 2011, New Delhi
20. “Latest Trends in EHV Under Ground Cables & Accessories”, 6 - 7 Dec. 2011, New Delhi
21. CIGRE Tutorials with Elecrama - IEEMA at Mumbai, 20-21 Jan 2012 Mumbai  
B1 : Insulated cables; B3 : Sub Station B2 : Over Head Lines B5 : Power System Protection
22. CIGRE A3 29 WG Meeting & Colloquium on Management of ageing EHV equipments, 5 - 6 March 2012 New Delhi

- 23 CIGRE AORC B1 committee meeting and International Colloquium on EHV Cables, 22-23 Jan 2013 New Delhi
- 24 CIGRE International Colloquium on Ultra High Voltage Equipments – In conjunction with Gridtech 2013, 3-4 April 2013 New Delhi

**In addition to the above CIGRE India organizes at least one event per year at National level on subject of each of the 16 CIGRE Study Committees.**

Besides above CIGRE India regularly organizes Pre CIGRE and Post CIGRE conferences. Pre CIGRE conference is arranged one month prior to CIGRE Paris session with the aims To have the input and considered opinion from the experts within the country on the Technological Developments & Innovations in Power Sector to be discussed during CIGRE session at Paris.

Post CIGRE conference is organized by CIGRE India to review the proceedings of CIGRE session in Indian Context for implementation of the recommendations. Pre and Post CIGRE conferences being held by us in India have not only helped tremendously in boosting the activities of CIGRE in India but also increased the membership.

The recommendations of the above events are widely circulated for the benefit of the professionals in the country

### 6.7.1 Important Events

#### 1. Meeting of CIGRE Study Committee 36 on Interference

CIGRE India organized a Meeting of CIGRE Study Committee 36 on Interference and related working groups from 6 to 8 Oct. 1975, at New Delhi (India)



#### 2. International Colloquium on H.V.D.C. Power Transmission

An International Colloquium on HVDC Power Transmission was jointly organized by the Central Board of Irrigation and Power in its capacity as Indian National Committee for International Conference on Large High Voltage Electric Systems (CIGRE) and the CIGRE Study Committee 14: DC Links from 9-11 September, 1991 in New Delhi.



The International Colloquium was inaugurated by **Shri Vidyacharan Shukla, Hon'ble Union Minister of Water Resources**.

**Shri Kalp Nath Rai, Hon'ble Minister of State for Power and Non-Conventional Energy Sources**, (Independent Charge) presided over the Inaugural function.

The Conference was attended by about 230 participants including 60 from abroad.

### 3. Meeting of Technical Committee of CIGRE

The Technical Committee of CIGRE, which consists of the Chairman of all fifteen study Committees, in addition to the Secretary General and the representatives of the Administrative Council of CIGRE, is an extremely important high profile body. In spite of existence of CIGRE for over 70 years, a **meeting of this high power Committee** has never been held in India. However, after considerable efforts, it met from 4-7 April, 1995 at New Delhi.

### 4. Regional Meeting on Power Pool Arrangements and Economical Load Dispatch

Regional Meeting on Power Pool Arrangements and economical load dispatch was organized by CIGRE India on 13-14 October 1995.

The distinguishing feature of the meet was the presence of Mr. J. Lepecki, President of CIGRE from Brazil and Mr. Y. Porcheron, Secretary General of CIGRE from France. The meet was inaugurated by Shri M.I. Beg, Chairman, CEA and was presided over by Shri A.L. Jaggi, Director (Operation), Power Grid Corpn. of India Ltd. Mr. Y. Porchenron, Secretary General, CIGRE addressed the participants. There was a special lecture on Malaysian Experiences by Dr. Tan Sri Ani Arope. The Executive Chairman of Tenaga Nasional Berhad.



There were about 240 delegates, 31 of them from abroad. The countries from which delegates came included Nepal, Malaysia, U.K., U.S.A., France, Canada, Indonesia, Brazil etc.

The Key-Note addresses during the meet were presented by Mr. James V. Barker, Vice-President Management Services, KEMA – ECC Inc. Fairfax, Virginia and Mr. Kari Nyman, Sr. Energy Economist, World Bank, Besides the Key Note Addresses, 29 Papers were presented and discussed during the two days spread over six technical sessions.

### 5. Meeting of CIGRE WG 23.10 on “Gas Insulated Sub-station”

**CIGRE WG 23.10 on “Gas Insulated Sub-station** met in New Delhi for the 1<sup>st</sup> time on 11<sup>th</sup> & 12<sup>th</sup> Nov. 1996. The topics discussed included “User Guide for application of GIS”, “GIS Service Experience” “Handling of decomposition product and “control and supervision of GIS”.

## 6. CIGRE Administrative Council Meeting and International Conference on “Power Quality – Assessment of Impact”

The CIGRE regional meeting on Power Quality – Assessment of Impact was organized by CIGRE India & Central Board of Irrigation & Power on 10-11 Sept. 1997. This regional Meeting was preceded by **CIGRE Administrative Council Meeting on 8-9 Sept. 1997**. Three tutorials were also held on 9.9.97 & 12.9.1997 9Tutorial -1 – Power Quality Issues Measures Sources and analysis; Tutorial 2 – Power Quality Assessment and solution Techniques; Tutorial 3 : Harmonics in Power System.

About 310 delegates including 50 from the countries like Australia, Brazil, Canada, China, Croatia, Egypt, Finland, France, Germany, Greece, Hungary, Iran, Italy , Japan, Korea, Poland, Qatar, Romania, Russia, Slovenia, South Africa, Sweeden, Switzerland, Thailand, and USA besides India.

Mr. Y. Thomas, Secretary General, CIGRE from France, Dr. E.A.S. Sarma, Secrerary to Government of India, Ministry of Power, Mr. R.N. Srivastava, Chairman, Central Electricity Authority and Ex-officio Secretary to Government of India and Mr. Michal Chamia, President CIGRE graced the Inaugural session.



## 7. International Conference on Bulk Power Transmission System Integration in Developing Countries

The Committee for CIGRE (India) and Central Board of Irrigation and Power in association with Power Grid Corporation of India organised CIGRE Regional Meeting on “Bulk Power Transmission System Integration in Developing Countries” from 8-10 November 2001 at New Delhi. Participants from all over the world exchanged their concerns and experiences in rapidly changing technologies in transmission of power. Forty two technical papers on topics of special significance to power system of India

and other developing countries were discussed during the conference. A total of 125 participants took part in the conference including 20 from other countries like Bangladesh, England, France, Germany, Japan, Korea, Nepal, Sri Lanka, Sweden, Thailand, Iran.



**The Hon'ble Minister of State for Power Smt. Jayawanti Mehta, inaugurated** the conference on 8 November 2001. Shri R.P. Singh, President CIGRE - India and CMD, Power Grid Corporation of India delivered the keynote address.

Mr. Jean Kowal, Secretary General, CIGRE addressed the participants in the inaugural session.

## 8. CIGRE SC B4 and Its WG Meeting/ India Day and Conference & Tutorials and CIGRE Colloquium on “Role of High Voltage Direct Current (HVDC), Flexible AC Transmission Systems (FACTS) and Emerging Technologies in Evolving Power Systems”

The Committee for CIGRE India in association with Central Board of Irrigation and Power and Power Grid Corporation of India Limited and in cooperation with the Chairman and members of CIGRE SC B4 on HVDC and Power Electronics organised a colloquium on “Role of HVDC FACTS and emerging technologies in evolving power systems” on 23-24 September 2005 at Bangalore. It was preceded by 6 tutorials, CIGRE SC B4 working groups meeting and the meeting of SC B4 itself. In addition CIGRE India also hosted CIGRE Executive committee and Administrative council meeting on 19 September 2005 in conjunction with the above events.



Shri R.P. Singh, CMD power Grid was the Chief Guest and inaugurated the colloquium. Mr. Y. Filion, President CIGRE, Mr. Marcio Szechtman, Chairman CIGRE SC B4, Shri J. Haque, Director (Operation), Power Grid and Chairman of the Organising Committee, Mr. Mata Prasad, Founder President CIGRE India, were on the dais and addressed the participants during Inaugural Session.

About 250 persons attended the Colloquium including the members of CIGRE Adm. Council, CIGRE SC B4 and its working Groups. Technical Visit to SLDC controls Center and HVDC Terminal at Kolar was organized for the participants of the Colloquium.

## INDIA DAY

CIGRE India organized INDIA DAY on 20.9.05 with the idea to project India's achievements & development in Power Sector by the high profile Indian experts from Power Grid, NHPC, BHEL, CPRI and ABB before the members of CIGRE Administrative Council who are world-renowned experts in the field. There were about 100 participants in the India day celebrations including CIGRE Administrative Council members.





## 9. International Symposium on Standards for Ultra High Voltage during Gridtech 2009

The 2<sup>nd</sup> International Symposium on Standards for Ultra High Voltage (UHV) Transmission was organised jointly by International Electrotechnical Commission (IEC) and International Council on Large Electric Systems (CIGRE) on 29-30 January, 2009 at Pragati Maidan, New Delhi. The symposium was held in conjunction with GRIDTECH 2009, the International



Exhibition on New Technologies in Transmission & Distribution. M/s Power Grid Corporation of India; Bureau of Indian Standard (BIS) and CIGRE India (i.e. Central Board of Irrigation & Power) were the Indian hosts for the symposium.

The objective of the Symposium was to make recommendations for UHV standards required for the market and to develop strategies for international standardization of UHV technologies, in response to rapid needs for UHV.

The symposium was Inaugurated by Shri Rakesh Nath, Chairperson, Central Electricity Authority and Ex officio Secretary to GOI, Shri S.K. Chaturvedi, CMD, Power Grid Corporation of India, Shri A. Merlin, President CIGRE and Mr. J. Regies, President, IEC were the Guest of Honour and addressed the participants during Inaugural session. Mr. Jean Kowal, Secretary General, CIGRE and Mr. Gabriel Brata, Secretary General IEC also graced the occasion.

About 300 including 100 international Professionals participated in the above symposium and 26 International experts from countries like, AUSTRIA; CANADA; CHINA; FRANCE; GERMANY; ITALY; JAPAN; NETHERLANDS; RUSSIAN FEDERATION; SWEDEN; SWITZERLAND; and UNITED STATES etc, made lively presentations in technical session

## 10. CIGRE Tutorials with Elecrama - IEEMA at Mumbai

CIGRE India, Central Board of Irrigation and Power jointly with IEEMA in conjunction with ELECRAMA 2012, the world largest confluence of power transmission and distribution organized CIGRE Tutorials by CIGRE experts from 20-21 January 2012 at Mumbai. Eminent international experts from CIGRE



delivered lectures on HV transmission during following tutorials.

B1 : Insulated cables;    B3 : Sub Station  
 B2 : Over Head Lines    B5 : Power System Protection

The Tutorials started with the Inaugural session on 20<sup>th</sup> January 2012. Dr. Klaus Frohlich, Chairman CIGRE Technical Committee, Shri R.N. Nayak, President, CIGRE India and CMD, Power Grid Corporation of India Ltd., Shri V.K. Kanjlia, Secretary CIGRE India and Secretary, CBIP, Shri P.P. Wahi, Director, CBIP, Shri R. Chandak, President, IEEMA and Shri Murali Venkatraman, Past President, IEEMA were on the dais during Inaugural session

After the ceremonial lighting of the lamp, Shri R.N. Nayak, President CIGRE India who was the chief Guest during Inaugural session for the Tutorials on 20 Jan. 2012 in his inaugural address brought out that he has called a high-level meeting of CEOs of all concerned companies that will help build its dream project, Smart City.

Mr. Klaus **Frohlich**, Chairman of CIGRE Technical Committee also addressed the participants during Inaugural session. Mr. Klaus gave a brief introduction of CIGRE and its activities. He informed that CIGRE provides an international forum to engineers working in various fields of electricity generation & high voltage Transmission system with the objective to develop technical knowledge and exchange of information amongst countries.

Following Eminent International Experts from CIGRE; chairman of the respective CIGRE Study committee; attended and conducted various tutorials:

The four Tutorials were well attended, with participation from all Power Utilities/ Corporations, State Electricity Boards, State Governments, Independent Power Producers, Energy Planners, Private Entrepreneurs, Developers, Manufacturers, Consultants, Construction Companies, Industry Associations, Financial & Technical Institutions, Training Institutions, Testing and Certification Institutions etc.

## **11. CIGRE A3 29 WG Meeting & Colloquium on Management of Ageing EHV Equipments**

CIGRE-India, in its capacity as the National Committee for CIGRE, and Central Board of Irrigation and Power (CBIP) organized a two-day International Colloquium on the subject from 5-7 March 2012, with the aim to take advantage of the presence of International Experts of CIGRE in the country. The experts were in town for their Working Group Meeting. The colloquium provided a forum for open discussions and exchange of information on the 'State-of-the-Art' technology on the subject.



Both the days were well attended, and almost the entire period witnessed a constant lively interaction between the experts and the participants. A variety of case studies were shared and numerous queries were resolved. By

the end of the colloquium, the participants had a load of take-homes, and the experts had the satisfaction of a job well done.

The colloquium was initiated with the Inaugural Session, and continued with five Technical Sessions. The last technical Session also served as the concluding session. The first four technical sessions were devoted to the presentations by the invited CIGRE experts. The fifth and the last session saw presentations by two of the largest Public Sector Undertakings, which shared their relevant experiences.

## **12. CIGRE AORC B1 committee meeting and International Colloquium on EHV Cables**

The committee for CIGRE (India) and Central Board of Irrigation & Power (CBIP) Organised International Conference of CIGRE Asia Oceana Regional Council - HV & EHV Insulated Cables on 22-23 January 2013 in the Regency Ballroom, Hotel Hyatt Regency, Bhikaji Cama Place, Ring Road, New Delhi. M/s Brugg Cable were the Platinum Sponsor for the conference. M/s General Cables & Cable Tech Machines were the Gold sponsor and M/s Raychem were the silver sponsor for the conference.



The conference was attended by 175 participants from various Power Utilities, EPC Companies and Cable manufacturing companies. There were participants from the countries like AUSTRALIA, HONGKONG, THAILAND JAPAN, KOREA, etc.

The CIGRE Chairman of B1 from FRANCE delivered the tutorials on this subject. A meeting of AORC B1 was convened in the first half on 22<sup>nd</sup> Jan. 2013. And the conference started after lunch break at 1400 hrs.

Mr Ken Barbar, Convener of AORC B1 and Mr. A.K. Haldar, Director, DTL was also on the Dais during Inaugural session.

Mr. K.K. Agarwal, Member (GO) CEA and Addl. Secretary to GOI delivered the Inaugural address.

## **13. CIGRE International Colloquium on Ultra High Voltage Equipments – in conjunction with Gridtech 2013**

Central Board of Irrigation and Power (CBIP), in association with CIGRE India, had organised the above conference for the Power Engineering Community. Apart from the great local participation, the conference attracted a significant number of visitors from other countries, giving everyone a platform and the opportunity for a free and frank exchange of knowledge on the topic. Overall, the conference was a success and every participant was a net gainer. The aim of the event was fulfilled.

The period of the conference was organized as starting with an Inaugural Session, with six Technical Sessions, and a closing session at the end of the second day, to summarise the proceedings of the technical sessions and also to formally declare the end of the conference.

After the formal colloquium, interested participants visited the unique 1200 kV test station, located at Bina, Madhya Pradesh, India.



### Future Events Planned by CIGRE India

CIGRE- India has **submitted proposal to host the meeting of following CIGRE Study Committee and CIGRE HQ has already awarded the event at S. No. 1 & 4 below:**

- 1 CIGRE SC D2 on Telecommunication Meeting and Colloquium, 14-15-Nov. 2013 Mysore, India
- 2 CIGRE SC A3 High Voltage Equipment Meeting and Colloquium, 2015 New Delhi
- 3 CIGRE SC B2 on Over head lines, Sept. 2015, New Delhi
- 4 CIGRE SC B4 HVDC meeting and Colloquium, 21-26 Sep. 2015, Agra
- 5 CIGRE SC B5 on Protection and Colloquium, 2015 New Delhi
- 6 CIGRE SC B1 on EHV Insulated Cables, 2017, New Delhi

## 6.8 INTERNATIONAL CONFERENCE ON ELECTRICITY DISTRIBUTION (CIRED)

An international association is set up under the name of CIRED in Belgium. 'CIRED' is derived from "*Congrès International des Réseaux Electriques de Distribution*" in English '*International Conference on Electricity Distribution*'. Ownership and all rights to this name belong to AIM – Association des Ingenieurs de Montefiore, Belgium – and The IET – The Institution of Engineering and Technology, UK, who have granted the association the right to use the name 'CIRED'.

CIRED works for the purpose of increasing the business relevant competencies, skills and knowledge of those participating in CIRED's activities. CIRED is active in the technical field of Electricity Distribution Systems, including dispersed and embedded generation issues, but excluding transmission networks and centralized generation.

CIRED is dedicated to the design, construction and operation of public distribution systems and of large installations using electrical energy in industry, services and transport.

To support its objectives CIRED's Technical Committee provides technical structure and content including papers and speakers to a biennial conference on developments and best practices in technology and management of the technical side of electricity distribution. The conferences bring together engineers and experts from electricity supply, manufacturing, consulting and research. These conferences are open to participation by and contributions from experts from all over the world.

The conferences which include an exhibition by manufacturing and other companies supplying the electricity distribution industry are organised alternately by AIM – Association des ingenieurs de Montefiore, Belgium – and The IET – Institution of Engineering and Technology, UK – who also bear the financial responsibility of the conferences. The necessary structure set up by AIM or The IET to organise the conferences is from here on referred to as the 'Organising Committee', OC.

### ORGANISATION

#### Governing Structure

CIRED's governing structure consists of

- The Directing Committee, DC - which provides general governance for CIRED
- The Advisory Committee, AC - which prepares the meetings of the DC, and carries out tasks delegated to it by the DC
- The Technical Committee, TC - which governs technical activities in general, and provides technical structure and content to the biennial conferences

#### Supporting Structure

CIRED's supporting structure consists of

- The National Committees, NC, and The Liaison Committees, LC, - which are the links to local engagement in CIRED
- Session Advisory Groups – SAG - which advise the session chairmen and the rapporteurs in performing their tasks

**Directing Committee**

The DC is the directing body of CIRED and it governs CIRED as a whole. All main decisions must be taken by the DC so that whatever extension to the scope of CIRED will be desirable, it will remain a coherent body.

**National Committees**

A country represented by a member of CIRED in the DC is referred to as a ‘Directing Member Country’.

The NC should comprise representatives from all those involved in electricity distribution in that country, for example: representatives from manufacturing, electricity supply, installation, contracting, consulting, research and large consumers. The NC will exercise the following functions in the country concerned:

The DC will in its decision consider the size of the country, historical valuable contribution to CIRED from the country and other special circumstances. In its decision the DC must satisfy itself that the applying country has had an average of 15 regular participants and an average of 15 submitted abstracts over three consecutive CIRED conferences and that the applying country considers that this level will be maintained.

It is also expected from a Directing Member Country that they nominate national members who could take part in CIRED Session Advisory Groups and/or Working Groups.

**Liaison Committees**

A country co-operating with CIRED but not having a National Committee can have a Liaison Committee.

A country having a Liaison Committee is referred to as an ‘Associate Member Country’.

An Associate Member Country must:

- (a) Maintain a Liaison Committee
- (b) Encourage and promote participation in CIRED Conferences.

**Proposal to be the National Committee of CIRED**

With the aim of Govt to provide power for all major modernization and expansion of distribution system is taking place. This includes electrification of the balance villages. Modernisation of distribution system, Infrastructure, APDRP, includes smart grid solution / SCADA etc.

Govt of India is laying major thrust to the development and Modernisation of Distribution system.

CBIP has decided that distribution shall be the new thrust area of CBIP. CBIP had brought out a publication on Distribution system” in two volumes in 1987. CBIP now has set up a committee for revising the manual on Distribution System

CBIP also proposes to organize seminars/ conferences of national and International Level in the area of distribution

India is at present a associate Member. Of CIRED and is now proposing to become a national committee of CIRED.

## 6.9 INTERNATIONAL HYDROPOWER ASSOCIATION

The International Hydropower Association (IHA), established in 1995, under the auspices of UNESCO, works to build and share knowledge on the role of hydropower in renewable energy systems, responsible fresh water management and climate change solutions.

IHA, a non-profit organisation, is working with a network of members from more than 80 countries, and partners to advance sustainable hydropower.

IHA has a Central Office based in London, a regional office in South America and a national office in China. In addition, IHA has consultative and/or observer status with the United Nations agencies addressing water, energy and climate change.

Dr. Refaat Abdel-Malek from USA is the current President and Mr. Richard Taylor is the Executive Secretary.

The formation of Indian Committee of IHA was officially announced on **04 November 1998** at a special meeting convened at New Delhi during 66<sup>th</sup> Annual Meeting of ICOLD.

### Indian Representation on IHA Council/Board

- Mr. C.V.J. Varma, Member Secretary, Central Board of Irrigation and Power
- Mr. A.B.L. Srivastava, Director (Finance), NHPC Limited

### Indian National Hydropower Association

Indian National Hydropower Association (INHA), was established in June 2003, as a National Chapter of IHA, to provide a forum for the exchange of views and enhancement of knowledge on various aspects relating to hydropower in India, advocating the interests and representing the views of hydropower fraternity before all concerned agencies, and seeking to influence energy and environment policy of Government and profess the merits of implementing hydro policy in India. As per the present guidelines of IHA, national chapters cease to exist.

CBIP had initiated formation of INHA. However, subsequent to the election of the Chairman and Managing Director of NHPC, as President of INHA, its Secretariat started operation from NHPC Office Complex in Faridabad.

In October 2012, INHA decided to shift its Secretariat from NHPC Office Building to CBIP Building at Malcha Marg, Chanakyapuri, New Delhi, with Secretary, CBIP, being designated as Hon. General Secretary, till the time, new office bearers of INHA are elected through electoral process as per the constitution of the association.

The hydropower sector in the country is currently witnessing numerous challenges on various fronts. Some of the major issues hindering the hydropower development are land acquisition, environmental & forest clearances, financing of hydro projects, law and order, R&R, etc. Against this background it is the right moment to infuse impetus to the hydro development in the country. It is extremely important to address various issues impacting the sector. INHA can definitely provide a right platform for addressal of wide ranging issues.

**The Objectives of the Association are**

Provide a forum for exchange of views and enhancement of knowledge on various aspects relating to hydropower in India, to Advocate the interests and to represent the views of hydropower industry before government bodies, state agencies, interest groups and key policy makers and to Seek to influence energy and environment policy of government and profess the merits of implementing hydro policy of India, with true sense to serve the interests of hydropower industry.

**News Letter**

There is lot of propaganda and negative news from different quarters (including NGOs), which is hindering the development of hydro. Most of the time, this goes un-responded, although in many cases, wrong or distorted facts are given. There is urgent need to counter such propaganda and convey the benefits of hydro power development.

A monthly news letter, covering these aspects in electronic form, is being brought out since July 2013.

**Technical Journal**

A Technical Journal, initially on half yearly basis is being brought out, from July 2013, both in print and online versions, containing original research reports, review papers and communications screened by the Editorial Board, consisting of renowned experts.

**Events Organised**

- India Hydro 2004 – An International Conference-cum-Exhibition on “Accelerated Hydropower Development-Need of the Day”, March 2004
- India Hydro 2005 – An International Conference-cum-Exhibition on “Sustainable Development of Hydro & Pumped Storage Schemes-Strategies & Road Map” and One Day International Workshop on “Sediment Management in Hydro Projects”, February 2005
- Stake holder Meet INHA stake Holder’s Meet, 11 June 2013.

**Publications**

- Proceedings of India Hydro 2004
- Proceedings of Hydro India 2005
- Myths & Realities Related to Hydropower
- Hydropower-Reckoning the Reality
- Operation & Maintenance Manual for Hydropower Stations

**Vision Statement**

- To become the representative voice of Indian Hydro Sector across the National and International spectrum for promotion of its sustainable development
- To organize an annual event “Hydro India”, on the key areas to take hydro development forward in India



## 6.10 INTERNATIONAL ASSOCIATION OF SMALL HYDRO (IASH)

International Association of Small Hydro (IASH) is an international forum of experts & organisations engaged in the various technical activities related to the field of Small Hydro projects development the world over. IASH has been formed to promote development of small hydro plants up to 25 MW station capacity including Mini and Micro Hydro Plants. IASH has been registered under the Societies Registration Act of 1860 on 15<sup>th</sup> September, 1994. The Association has its headquarters at CBIP, New Delhi.

The main objectives of IASH are:

Promote research, planning, consultancy, construction, operation of small hydro projects including Mini and Micro, to provide a suitable forum for interaction on latest developments of SHP sector through organising workshops and international conferences, to provide information service by publishing course material/ manuals/ reference proceedings/ half yearly Newsletters etc.

### **The activities of the association are being administered by the General Assembly and Governing Council**

The Governing Council of IASH consists of a President, one Vice President, Secretary General, Treasurer and other members. At present Shri Debashish Majumdar, Chairman & Managing Director, IREDA is President, Dr. Praveen Saxena, Adviser, MNRE is Vice President, Shri V.K. Kanjlia Secretary, CBIP is Secretary General and Shri P.P. Wahi, Director, CBIP is Treasurer of IASH.

The President of the association in the past was Shri K. Balaram Reddy Chairman, APSEB and Dr. V. Bakthavatsalam Managing Director, IREDA.

### **IASH Journal**

The Association brings out a half yearly International Association of Small Hydro (IASH) Journal on the developments in the field of Renewable Energy sector especially on Small Hydro which are taking place at the National and International level. The journal serves excellent purpose of disseminating the technological, innovative developments etc. in field of Small Hydro amongst the concerned Organizations of the Renewable Energy Sector.

### **Publications/Manuals on Small Hydro Power**

Besides the above CBIP have brought out various publications including Manuals on development of Small hydropower and Compendium of State Government Policies and Compendium of Regulation and Tariff Orders issued by Regulatory Commissions for Renewable Energy Sector which also includes details of policies and tariff orders on Small hydro. The last Manual on development of Small hydro was brought out by CBIP in the year 2009. This manual intends to provide basic knowledge to a planner/designer about various steps while formulating a small hydroelectric scheme. The manual familiarizes the

engineers and technical personnel with various components of small hydro power projects and also provide good working knowledge and guidance on data collection, investigation and essential computation for project report etc. The manual covers various techno-economic aspects and recent developments in financing such as CDM and carbon credits. This manual is a guidebook and a ready reckoner for a range of stakeholders in the development of small hydropower

### **Following are their Publication**

1. Compendium of State Government Policies on Renewable Energy Sector including Small Hydro in India
2. Compendium of Regulation and Tariff Orders issued by Regulatory Commissions for Renewable Energy Sector including Small Hydro in India
3. Workshop on Development of Small, Mini & Micro Hydro Power Plants - Challenges and Related Issues, 16 June 2006, New Delhi
4. 1st International Conference on Renewable Energy, 6-8 October 2004, New Delhi, Vol. I & Vol. II - CD Rom
5. 3rd International Conference on Small Hydro Development, 21-25 April 2003, New Delhi
6. Manual on Planning and Design of Small Hydroelectric Schemes
7. Small, Mini & Micro Hydro Power Stations in India
8. 2nd International Conference on Small Hydro Development, 10-14 November 1997, Nepal
9. International Course on Small Hydro Development, 7-11 October 1996, New Delhi
10. Course of Small Hydro Development, 21-26 August 1995, New Delhi
11. Best Practice Manual on Small Hydro (Support to IREDA)
12. Small Hydro Stations Standardisation (1985) (Revised in 1995)
13. Small - Mini – Micro Hydro Power Stations in India
14. Programme for Small Hydro Developers under World bank Line of Credit, 30<sup>th</sup> July 1993, Hyderabad
15. Manual For Small Hydro Power Developers, Oct. 1993 (IREDA)
16. Model Tender Document for Small Hydro Power Developers, Oct. 1993 (IREDA)
17. Guidelines for Small Hydro Power Developers, Oct. 1993 (IREDA)
18. Small Hydro Stations Standardisation (1985) (Revised in 1995) (Re-Revised in 1996)
19. Seminar on Small Hydro Stations, Vol. I (1983)

### **Events organised**

CBIP have organised following events from the year 1983 onwards in the field of Renewable Energy Sector with **main focus on development of small hydro power**. Many of these events

were organised in association with IREDA.

- Seminar on Small Hydro Stations, 20-21 January 1983, New Delhi
- Programme for Small Hydro Developers under World Bank Line of Credit, 30-31 July 1993, Hyderabad (**IREDA**) (To introduce/discuss the Project Manual for Small Hydro Developers, prepared by IREDA)
- Small Hydro Developers Meet, 27 October 1993, Madras (**IREDA**)
- Small Hydro Developers Meet, 26 November 1993, Thiruvananthapuram (**IREDA**)
- International Course on Small Hydro Development, 21-26 August 1995, New Delhi (**IREDA**)
- Business Meet with Chinese Small Hydro Power Experts, 20 March 1996, New Delhi (**IREDA**)
- Business Meet with Chinese Small Hydro Power Experts, 23 March 1996, Hyderabad (**IREDA**)
- International Course on Small Hydro Development, 7-11 October 1996, New Delhi (**IREDA**)
- First International Conference on Renewable Energy – Small Hydro, 3-7 February 1997, Hyderabad (**IREDA**)
- 2<sup>nd</sup> International Course on Small Hydro Development, 10-14 November 1997, Kathmandu
- 3<sup>rd</sup> International Course on Small Hydro Development, 21-25 April 2003, New Delhi (**IREDA**)
- First International Conference on Renewable Energy, 6-8 October 2004, New Delhi (**IREDA**)
- Seminar on “Small Hydro Power Development, 8-9 July 2010
- Investor meet on Hydro Development in the State of Madhya Pradesh, Sep. 2010 New Delhi

### **6.10.1 Important Events**

#### **1. Seminar on Small Hydropower Development**

To focus attention on various issues for accelerated development of India's hydropower, the International Association of Small Hydro (IASH) in association with Central Board of Irrigation and Power organized a Seminar on 'Small Hydro Power Development' on 8-9 July 2010 at CBIP Conference Hall which was addressed by Chairmen of Uttarakhand Electricity Regulatory Commission & Bihar State Electricity Regulatory Commission, Advisor-MNRE, CMD-IREDA besides other experts in the field of SHP.

## 2. Investor's Meet on Hydropower Development in the State of MP

An Investor's Meet on 'Hydropower Development in the state of Madhya Pradesh' was also organized in CBIP Conference Hall in September 2010 by Govt. of MP, Narmada Valley Development Authority (NVDA), Bhopal in association with CBIP with the support of MNRE & IREDA. Hon'ble Minister of New & Renewable Energy (NVDA) who was the chief guest explained the incentives available to Developers in the Policy issued by Govt. of MP for development of SHP in Narmada Basin and interacted with the developers individually also for the purpose. Secretary, Ministry of New & Renewable Energy, Government of India also addressed the august gathering in the Inaugural session of the Investors Meet.



Name of the persons sitting on the Dais (Left to Right) Shri Neeraj Mandloi Managing Director, Urja Vikas Nigan, GoMP, Shri O.P. Rawat Vice Chairman NVDA, Shri Ajay Vishnoi, Hon'ble Minister New & Renewable Energy, Govt. of M.P., Shri Deepak Gupta, Secretary MNRE, GOI and Shri Debashish Majumdar, CMD, IREDA

*I am categorically of the opinion that the functions of CBI&P cannot be performed by any other body. The CBI&P is a democratic body representing the views of States. Its democratic and autonomous character must be maintained.*

*Dr. Kanwar Sain  
Former Chairman CW&PC*

## **6.11 INTERNATIONAL ASSOCIATION ON ELECTRICITY GENERATION, TRANSMISSION AND DISTRIBUTION (AFRO ASIAN REGION)**

International Association on Electricity Generation, Transmission and Distribution (Afro Asian Region) a Regional non – Governmental organization was formed in 1990 with headquarters in CBIP, New Delhi, India to provide a forum for specialists to meet and share their experiences and knowledge for mutual benefit. This Association has been created for the benefit of all the developing countries in the Afro – Asian region, with their mutual help and cooperation. This Association has been registered as Society under the Indian Societies Act 1860 on 8-1-1990.

The objectives of the Association are : to take special note of the aspirations, problems of the developing countries in the field of power; to provide information service to all concerned with power development by publishing conference proceeding/half yearly journal etc.; to provide a suitable forum to the specialists in the various disciplines for interaction by organizing seminars/conferences; to encourage the development of techniques for multidisciplinary planning of generation, transmission and distribution of electricity.

The activities of the Association is administrated by the General Assembly and the Governing Council.

The Governing Council consists of a President, two Vice Presidents, a Secretary General, a Treasurer and other Members of the Council.

The Present Office bearers for the period 2013-2015 are:

Mr. Rameshwar Yadav, Managing Director, Nepal Electricity Authority, Kathmandu, Nepal as President; Mr. P. Varshney, Executive Vice President, PTC India Ltd. as Vice-President; Shri V.K. Kanjlia, Secretary, CBIP as Secretary General ; P.P. Wahi, Director, CBIP as Treasurer

The Presidents of the association in the past were:

Shri N.S. Vasant, Chairman, PSEB, Patiala, 1991; Shri R.K. Narayan, Chairman and Managing Director, Power Grid Corporation of India Ltd., 1992-1996; Shri M. Maher Abaza, Minister of Electricity & Energy, Cairo, Egypt, 1996-99; Shri R. P. Singh, Chairman and Managing Director, Power Grid Corporation of India Ltd., 2000-2003; Dr. J.L. Karmacharya, Managing Director, Nepal Electricity Authority, Darbar Marg, Kathmandu, Nepal, 2004-2005; Shri Arjun Kumar Karki Managing Director, Nepal Electricity Authority, Kathmandu, Nepal, 2007-2010 and Shri J. Jha, MD, Nepal Electricity Authority; 2011-12

### **AARO JOURNAL**

The Association brings out a half yearly Journal on the developments of Power in and around countries in Afro-Asian Region. The journal is circulated within the country as well as abroad to all the members of the association. The journal serves excellent purpose of disseminating the technological, innovative developments etc. amongst the concerned Organizations of the

Energy Sector, which are taking place at the National level and International level in India and also in the Afro-Asian Region.

### **Publications**

Besides the proceedings of the conferences/seminars following publications have been brought out by the Association

1. Status of Power Developments in Afro-Asian Countries Vol.I, December 1991
2. Status of Power Developments in Afro-Asian Countries Vol.II, May 1993
3. Directory of Power Utility in Afro-Asian Region, 1991
4. Directory of Power Utilities in Afro-Asian Region, May 1993
5. Energy Conservation Case Studies (94)
6. Updated Directory (1996) of Power Utilities in Afro-Asian Region by International Association on Electricity, Generation, Transmission and Distribution (Afro-Asian Region)(1996)
7. Hydropower Development in Afro-Asian Countries (1996)

### **Events Organised**

Following conferences/Seminars were held since formation of the Association :

- (i) 1<sup>st</sup> International Conference on Power Development in Afro-Asian Countries, 10-14 December 1990, New Delhi, India
- (ii) 2<sup>nd</sup> International Conference on Power Generation, Transmission and Distribution, 5-8 September 1994, Kuala Lumpur, Malaysia
- (iii) 3<sup>rd</sup> International Conference on Power Development Strategies for the 21<sup>st</sup> Century, 4-7 March 1996, Kathmandu, Nepal
- (iv) 4<sup>th</sup> International Conference on Regional Power Development and Energy Trading through interconnections, 12-15 December 1998, Cairo, Egypt
- (v) International Seminar on Telecommunication for Utilities in the New Millennium, 19-20 April 2001, New Delhi, India
- (vi) 5<sup>th</sup> International Conference on Resource Mobilization and Corporatization of Power Sector to Achieve Commercialization and Efficient Management, 20-22 November 2002, New Delhi, India
- (vii) 6<sup>th</sup> International Conference on “Development of Hydro Power – A Major Source of Renewable Energy”, 7-9 June 2005, Kathmandu, Nepal.
- (viii) Seminar on “Investment in Hydro Power Projects – Issues & Challenges” – 6-7 March 2007 at Kathmandu, Nepal
- (ix) Seminar on Earthing Systems, 21-22 May 2008, New Delhi, India

- (x) National Seminar on the Challenges of Power Sector of Nepal – 18-19 March 2010, Kathmandu, Nepal
- (xi) International Conference on Accelerated Development of Hydropower in Bhutan – Opportunities and Challenges – 16-18 November 2010, Thimpu, Bhutan
- (xii) 7<sup>th</sup> International Hydro Conference on Speedy Development of Hydropower in Developing countries – 3-5 March 2011, Kathmandu, Nepal
- (xiii) Interactive Workshop on “Earthing Systems” – 15-16 September 2011, New Delhi, India
- (xiv) Interactive Workshop on “Earthing Systems” – 17-18 September 2012, New Delhi, India

### 6.11.1 IMPORTANT EVENTS

#### 1. 1<sup>st</sup> International Conference on Power Development in Afro-Asian Countries

The International conference on Power Development in Afro-Asian Countries held at New Dehli was **inaugurated by the Hon’ble Union Minister of Energy, Govt. of India, Mr. Kalyan Singh Kalvi**. About 250 delegates including delegates from 11 foreign countries participated in the conference. An exhibition was also arranged alongwith the international Conference. 19 leading manufacturers, Power Utilities/Boards, Consultant etc. participated in the Exhibition.



#### 2. 2<sup>nd</sup> International Conference on Power Development in Afro-Asian Countries

The theme of the conference was ‘Managing the Challenges of Power Sector Development in a Rapidly Expanding Economy’. It was held from 5-8 September 1994, Kuala Lumpur, Malaysia. The Conference was **inaugurated by HE Dato Seri Dr. Mahathir Mohamad, Prime Minister of Malaysia**. Two publications titled, ‘Energy Conservation, Case Studies’ and Special issue of the Journal were released on the 2<sup>nd</sup> Day of the conference by Mr. Y.B. Dato Seri Samy Velu, Hon’ble Minister of Energy, Telecoms & Posts, Malaysia.



### 3. 3<sup>rd</sup> International Conference on Power Development in Afro-Asian Countries

The 3<sup>rd</sup> International Conference on Power Development in Afro-Asian Countries was held on 4-7 March 1996 at Kathmandu, Nepal. The conference was inaugurated by His Excellence Pashupati Shamshere JBR, Minister of Water Resources, His Majesty's Govt. of Nepal. Key note address was presented by His Excellency Eng. M. Maher Abaza, Minister of Electricity & Energy, Egypt. A total 329 delegates from 32 countries including 171 delegates from Nepal participated in the conference. 185 papers were presented. The conference concluded with Valedictory Session, chaired by Vice Chairman of the Nepal Planning Commission, His Excellency Mr. Privithi Raj Ligal.



H.R. Pashupati Shamshere JBR, Minister of Water Resources, HMG Nepal releasing the publication "Hydro Power Development in Afro Asian Countries"

### 4. International Seminar on 'Telecommunication for Utilities in the New Millennium'

The Association and Power Grid Corporation of India Ltd. jointly organized an International Seminar on 'Telecommunication for Utilities in the New Millennium' on 19-20 April 2001 at New Delhi. About 150 delegates from Bulgaria, France, Germany, India, Malaysia, Nepal, Sweden and Switzerland participated in the Seminar. Shri R.P. Singh, CMD, POWERGRID inaugurated the Seminar. Twenty six papers were presented and discussed in 2 days seminar in 6 sessions. Shri R.V. Shahi, CMD, BSES, Mumbai delivered the Valedictory Address.



Inaugural address by Mr. R.P. Singh, President of Association & CMD, PGCIL

### 5. 5<sup>th</sup> Afro-Asian International Conference on 'Resource Mobilization and Corporatisation of Power Sector to Achieve Commercialization and Efficient Management'

5<sup>th</sup> Afro-Asian International Conference on 'Resource Mobilization and Corporatisation of Power Sector to Achieve Commercialization

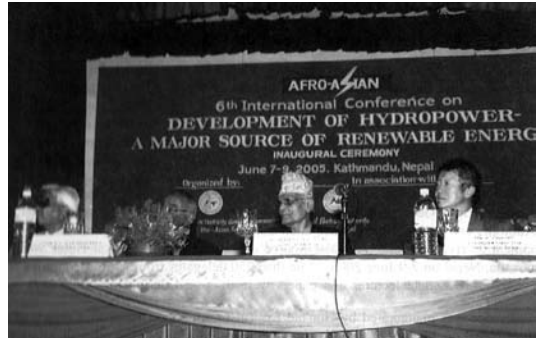




and Efficient Management’ was jointly organized by the Association and Power Grid Corporation of India Ltd. at New Delhi on 20-22 November 2002. The conference was supported by Power Finance Corporation. **Shri R.P. Singh, CMD, POWERGRID inaugurated the International Conference.** About 175 delegates, invitees & gussets from different part of the world participated in the conference. Total 31 quality papers were presented and discussed in the conference.

## 6. 6<sup>th</sup> International Conference on “Development of Hydro Power - A Major Source of Renewable Energy

6<sup>th</sup> International Conference on “Development of Hydro Power – A Major Source of Renewable Energy”, 7-9 June 2005, Kathmandu, Nepal was **inaugurated by Hon’ble Dr. Tulsi Giri, Vice Chairman, Council of Ministers, Royal Government of Nepal.**



## 7. Seminar on Investment in Hydro Power Projects – Issues & Challenges

The International Association on Electricity Generation, Transmission and Distribution (Afro-Asian Region) jointly with Nepal National Committee, organized a Seminar on “Investment in Hydro Power Projects – Issues & Challenges” – 6-7 March 2007 at Kathmandu, Nepal. The Seminar was inaugurated on 06.03.07 by **Hon’ble Gyanendra Bdr. Karki, Minister of State, Water Resources, Government of Nepal.**

## 8. Seminar on ‘Challenges of Power Sector of Nepal’

Nepal National Committee of International Association of Electricity Generation, Transmission and Distribution (Afro-Asian Region) in association with Nepal Electricity Authority organized a two-day seminar on 18-19 March 2010 at Kathmandu on the topic ‘Challenges of Power Sector of Nepal’. The seminar was **inaugurated by the Hon’ble Minister of Energy, Dr. Prakash Saran Mahat, Govt. of Nepal.**



(L-R) [Dr. S.N. Mishra, Member Secretary, Nepal National Committee, AARO; Dr. Prakash Saran Mahat, Minister, Energy GON; Dr. Jivendra Jha, MD, NEA; Mr. C.S. Malik, Director, CBIP; Er. Dipak Prasad Upadhyay, GM, Transmission & Substation, NEA; Dr. Dambar Bdr. Nepali, Vice President, NNC, AARO

## 9. Conference on “Accelerated Development of Hydro Power in Bhutan

The Central Board of Irrigation & Power, Department of Energy, Ministry of Economic Affairs, and Punatsangchhu Hydro Power Project Authority in association with International

Association on Electricity Generation, Transmission and Distribution (Afro-Asian Region), - AARO organised an International Conference on “Accelerated Development of Hydro Power in Bhutan – Opportunities and Challenges” on 16-18 November 2010 at Convention Center, Royal Banquet Hall, Thimpu, Bhutan.

The aim of the conference was to provide an opportunity to gain an insight of experience in the development of hydro power, problems faced and measures adopted to surmount them.



Hon’ble Prime Minister RGoB, Hon’ble Minister of Economic Affairs of RGoB, Shri R.N.Kazanchi, MD, PHPA, Shri V.K. Kanjlia, Secretary, CBIP, and other dignitaries of the conference

The Conference was **inaugurated by Hon’ble Prime Minister of Bhutan, H.E. Lyonchhoen Jigmi Y. Thinley.**

## 10. 7<sup>th</sup> Afro-Asian International Conference on ‘Speedy Development of Hydropower in Developing Countries - Issues and Challenges’

To mark the 100<sup>th</sup> year of **HYDROPOWER GENERATION in Nepal**, International Association on Electricity Generation, Transmission and Distribution (Afro-Asian Region), - AARO in association with Nepal Electricity Authority organized 7<sup>th</sup> Afro-Asian International Conference on “Speedy Development of Hydropower in Developing Countries- Issues and Challenges” at Hotel Soaltee Crowne Plaza, Kathmandu on March 3-5, 2011. This Conference gathered about 299 participants from Nepal and other countries. Very renowned power sector experts from Hydro Tasmania, Australia, Electricity de France, Sikkim / India, Bhutan made Key- Note Speeches in the sessions.



From L to R: Dr. S.N. Misra, Secretary, Nepal National Committee of AARO, Mr Shital Babu Regmee, Secretary, Ministry of Energy, Govt. of Nepal, Hon’ble President of Nepal Dr. Ram Baran Yadav, Mr. P. P. Wahi, Director, CBIP and Dr. Jivendra Jha, MD, NEA

**Rt. Hon’ble President of Nepal, Dr. Ram Baran Yadav was the Chief Guest of the function and inaugurated this Conference** on March 3, 2011 at Hotel Soaltee Crowne Plaza, Kathmandu.

## 6.12 SOCIETY OF POWER ENGINEERS (INDIA)

The Society of Power Engineers (India) is an apex body engaged in the activities of technological upliftment of the power engineers of this country by making available latest technological developments all over the world to the members. Publication & distribution of information through Journal, Workshops/Seminars, group discussion are regular features of the society. The Headquarter of the SPE is at New Delhi and is operated from CBIP New Delhi.

It was constituted in the year 1947 and has presently about 2400 experts and eminent engineers on its strength who share their rich experience, express their views and give suggestions for sustainable growth of power sector with state of art technology.

The main objectives of the SPE are to propagate and share the latest power technologies by arranging Meetings, Lectures, Seminars, Workshops and bringing out useful publications besides encouraging the operation of facilities to promote research and invention in power engineering.

In order to ensure power development across the country, following chapters have been opened at various places in the country:

1. J&K Chapter – this chapter was inaugurated by Shri R.K. Narayan, CMD, National Power Transmission Corporation Ltd. on 21<sup>st</sup> December 1991 at Hotel Asia, Jammu.
2. Bombay Chapter - this chapter was inaugurated by Shri M.V. Dhekne, Technical Member, MSEB on 11<sup>th</sup> October 1993.
3. Delhi Chapter - this chapter was inaugurated by Shri R.K. Narayan, CMD, POWERGRID on 24<sup>th</sup> June 1994 at CBIP Conference Hall, New Delhi.
4. Vadodara Chapter - this chapter was inaugurated by Shri S.J. Coelho, Chairman, GEB on 3<sup>rd</sup> October 1996 at Community Hall, Vidyut Nagar, Vadodara.
5. Lucknow Chapter - this chapter was inaugurated by Shri G.P. Singh, Chairman, UPSEB on 8<sup>th</sup> January 1998 at Lucknow.
6. Bangalore Chapter - this chapter was inaugurated by Shri K.P. Singh, Chairman, KEB on 14<sup>th</sup> May 1998.

Apart from the above, chapters at Jabalpur, Hyderabad, Kolkata, Gwalior and Bangalore were also opened.

The Vadodara Chapter of the Society of Power Engineers (I), is one of the most active chapter and has now become a significant group of power engineers hailing from GEB, GIPCL, GSFC, M.S. University, Power Equipment Manufacturing companies, (like ABB, Jyoti Ltd., Alstom, Siemens etc.) ERDA & Consulting Firms. In addition to this many individual consultants and retired senior officers from Govt. / Semi-Govt. organizations are also members of this chapter of society. There are some institutional members also. The membership from Vadodara chapter has more than 1200 members on its rolls. The chapter has also opened a library cum information centre keeping various publications including

those of Central Board of Irrigation and Power (CBI&P) New Delhi for day to day use by the members.

### **Governing Council**

The Governing Council consists of a President, two Vice Presidents, a Secretary General, a Treasurer, a joint secretary and other Members of the Council.

The Present Office bearers for the period 2013-2015 are: Shri T.N. Thakur, Former CMD, PTC India Ltd. as President; Shri Karan Singh, VP, Reliance Energy Transmission Ltd. as Vice President; Shri V.K. Kanjlia, Secretary, CBIP as Secretary General; P.P. Wahi, Director, CBIP as Treasurer; Shri R. Saxena, AGM, POWERGRID as Joint Secy.

The Presidents of the association in the past were : Shri V.N. Manohar, C.o Tata Consulting Engineer, Mumbai, Shri C.V. J. Varma Member Secretary, CBIP, Dr. BSK Naidu, DG, NPTI and Shri T.N. Thakur, CMD, PTC India Ltd.

Important events organized :

1. Seminar on EHV Substations, 24<sup>th</sup> June 1994, Bombay Chapter
2. Seminar on Safety in Power Systems, 29-30 May 1998, Mumbai Chapter
3. Seminar on Role of Power Engineers towards Electricity Consumers, 12-13 August 1998, Mumbai Chapter
4. Workshop on Switchgear and Ancillary Deign, Manufacturers, Testing Operation and Maintenance, 8-9 January 1999, Vadodara Chapter
5. Seminar on Power Transmission System, 7-8 June 2002, Vadodara Chapter
6. Seminar on Energy Conservation Techniques, 13 June 2004, Vadodara Chapter
7. Work shop on six sigma in Power Industries, 6.10.2006, New Delhi
8. NATIONAL SEMINAR ON Maintenance of Electrical equipment and Energy Management, 29th & 30th May 2009, Vadodara, Gujarat
9. National seminar on “Non Conventional Energy / Renewable Energy & Nuclear Energy Resources- issues and Challenges”, 17-18 May 2008, Jabalpur
10. Workshop on Energy Conservation & Demand Side Haridwar Management & Programme on “Stress Management and Art of Living”, 23-24 Feb. 2008, Shantikunj, Load
11. Workshop on Rotating Electrical Machines, 8.09.2012, Shantikunj, Haridwar
12. Lecture on art of living 09.09.2012, Shantikunj, Haridwar
13. National workshop on “Condition Monitoring of Substation Equipment including Power & Distribution Transformers and Emerging Trends in Transmission System”, 10.09.2012, Shantikunj, Haridwar
14. National Seminar and Tutorial on Power System Protection and Automation, 7-8 June 2013, Gandhinagar

### 6.12.1 Important Events

#### 1. Seminar on “Energy Metering”

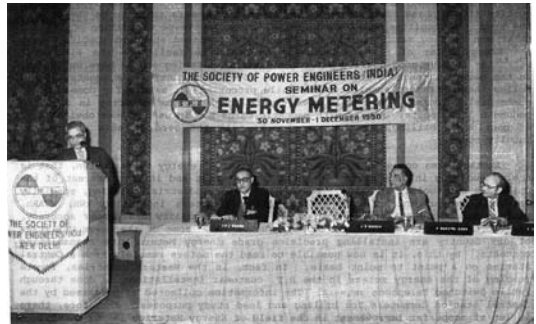
The Society of Power Engineers (I) organized a **Seminar on “Energy Metering” on 30<sup>th</sup> November & 1<sup>st</sup> December 1990** in Hotel Maurya Sheraton, New Delhi. Shri J.K. Bhasin, Chairman, Central Electricity Authority inaugurated the Semihar. The Seminar was attended by more than 100 delegates from various Electricity Boards; Central Electricity Authority; Central Board of Irrigation and Power (CBI&P); Delhi Electric Supply Undertaking; National Thermal Power Corporation; Tata Consulting Engineers; CESC India Ltd.; Rural Electrification Corporation Ltd.; Power Finance Corporation; National Hydroelectric Power Corporation; Consultancy Firms and Energy Meters Manufactures, etc. The Seminar was co-sponsored by A.P.S.E.B.; B.S.E.B. O.S.E.B.; P.F.C.; and Secure Meters Pvt. Ltd., Udaipur.



Shri J.K. Bhasin, Chairman, Central Electricity Authority delivering the Inaugural Address

#### 2. Seminar on Power Transmission System

Seminar on “Power Transmission System” was organized by The Society of Power Engineers (SPE) Vadodara Chapter on 7th and 8th June 2002 at Vasvik Auditorium of Institution of Engineers, Vadodara local centre, Vadodara. In this Seminar, more than 150 delegates participated. This seminar ‘was arranged by SPE to celebrate the centenary year in Power Transmission System in India. The first Transmission line of 78KV was laid in Mysore State in 1902.



Shri P. N. Upadhyay, Executive Director GEB was the chief guest of the seminar. Shri R.K. Tillan, Vice President (Technical), Surat Electricity Company, Surat was Guest of honour.

#### 3. Seminar on “Energy Conservation Techniques” conducted at Gandhidham (Kachchh Region)

On 13<sup>th</sup> June, 2004, the Society of Power Engineers (India), Vadodara Chapter organized a one day seminar on “Energy Conservation Techniques” at the auditorium of Gandhidham Chamber of Commerce & Industries (GCCI). The Chairman of Kandla Port Trust Shri A. K. Joti presided over the function. Shri S. P.



Yadav, Senior General Manager of Indian Farmers Fertilizers Co. Ltd. (IFFCO), Kandla and Shri A. C. Sharma, Chairman, GCCI were the Guests of Honour.

**Journal:**

To increase the activities and membership of the association, SPE publishes its journal titled “Power Journal” six monthly and is distributed free of charge to all members of the society. The journal contains details about the activities of the Society, technical articles, News and notes.

*It is very heartening to see the C.B.I.P. which started 50 years back with a humble beginning in the telegraph building at Simla is now a very great organization, highly developed in extent and scope comparable to any like it in other parts of the country, its membership extends to several hundreds. Any subject concerning irrigation and power is on the list of investigation. It is a beacon light to engineers, young and old and is a source of inspiration and pride of the country.*

*Dr. H.L. Uppal  
Former Director  
Land Reclamation,  
Irrigation & Power Research Institute, Amritsar*

## 6.13 INTERNATIONAL COMMISSION ON IRRIGATION AND DRAINAGE (ICID)

ICID was established on 24 June, 1950 as a Scientific, Technical and Voluntary Not-for-profit Non-Governmental International Organization (NGO) with headquarters in New Delhi, India. The Commission is dedicated to enhancing the worldwide supply of food and fibre for all people by improving water and land management and the productivity of irrigated and drained lands through appropriate management of water, environment and application of irrigation, drainage and flood management techniques.

The objects of this Commission are to stimulate and promote the development and application of the science and technique of irrigation, drainage, flood control and river training in the engineering, economic and social aspects. Shri A. N. Khosla was elected as the First President and Shri N. D. Gulhati as the First Secretary General.

India is one of the Eleven Founder Member Countries of ICID. India is represented on the ICID Committee on 'Irrigation and Drainage Construction Techniques'.



The Commission celebrated its Silver Jubilee in 1975, at the time of its Ninth Congress in Moscow. The Board arranged the release of a Commemorative Postage Stamp on this occasion. Here in India, the occasion was celebrated with great enthusiasm. The Government of India issued a Commemorative Stamp on this occasion and the function was presided by **Dr. S. D. Sharma, Union Minister for Communications** and the Stamp was released by Shri Jagjivan Ram, Union Minister for Agriculture and Irrigation.

### **INCID (Indian National Committee on Irrigation and Drainage)**

INCID is the National Committee for India for the International Commission on Irrigation and Drainage (ICID), set up by Government of India in the year 1950 with its headquarter in CBIP office at New Delhi for furthering the objectives of ICID and coordination of various activities. Subsequently, it has also been entrusted with the work of appraisal and monitoring of Research and Development (R&D) schemes funded by the Ministry of Water Resources. At present INCID office is in Central Water Commission.

## ICID events organized by INCID in India

### 1. Sixth Congress of I.C.I.D. — 1966

Sixth Congress of ICID was held at Vigyan Bhawan, New Delhi, during the period 6-14<sup>th</sup> January 1966 excluding 11<sup>th</sup> and 12<sup>th</sup> January 1966. The session was inaugurated by the **Rashtrapati, Dr. S. Radhakrishnan** at Vigyan Bhawan on Thursday the 6 January 1966. The President of the Indian National Committee Shri C. L. Handa and the Chairman of the Organising Committee Shri M. R. Chopra welcomed the delegates.



The other dignitaries who addressed the participants during the inaugural sessions were **Dr. K. L. Rao, Union Minister of the**

**Irrigation and Power** and Chairman of the Advisory Committee for the Sixth Congress; Mr. R. J. Tipton, Acting President of the Congress and Mr. G. Papadopoulos, Vice-President of the Congress. Messages from the President, Vice President, Prime Minister, Governors, Chief Ministers and other dignitaries were received on the occasion.

The Sixth Congress was attended by about 600 delegates from 56 countries of the World.

Reclamation of saline lands under irrigation, Sediment *in* irrigation and drainage channels, Development of deltaic area, and Integrated operation of reservoirs for irrigation, flood control and other purposes were the question on which discussion were held.

A special session on new developments in the field of Irrigation, Drainage and Flood Control was also held. Unfortunately with the heart-rending news of the sudden demise of the beloved Prime Minister of India, Shri Lai Bahadur Shastri at Tashkant (USSR), the whole country was thrown into gloom and mourning and most of the social functions and local visits were spontaneously cancelled. The special session passed the following resolution:

*“The sixth Congress of the International Commission on Irrigation and Drainage is deeply shocked and pained at the sad demise this morning, the 11 January 1966 of the beloved Prime Minister of India, Shri Lai Bahadur Shastri, whose loss will be internationally felt and mourned throughout the world. The Commission respectfully convey their condolences to the members of his bereaved family and to the Government and people of India in their irreparable loss.”*

After passing the Resolution, the Congress adjourned for two days, viz., 11 and 12 January 1966. Special tours to Agra and Jaipur were arranged for the visiting delegates. The closing session of the Congress was held on Saturday the 14 January 1966. After the Congress, the Indian National Committee arranged two study tours: (1) New Delhi to Bangalore, and (2) New Delhi to Poona.



## 2. Third Afro-Asian Regional Conference of the ICID

The Third Afro-Asian Regional Conference of the ICID was held from 23-28 October 1980 at New Delhi. The theme of the conference was Management of Water in Irrigation Systems including conjunctive use of surface and ground water and Command Area Development. 58 papers were discussed in 5 Technical Sessions spread over 4 days of the deliberations on different topics.

President of the ICID, Mr, Darves - Bornos, President Honorarire Pappopoulos, President Honoraire Milos Holy, Vice President Honoraire Kanwar Sain, Vice President Honoraire Fukuda, Vice-President in charge Pritam Singh, Vice President Zankar, Dr. K.L. Rao, Former Union Minister for Irrigation and Power, His Excellency Nayet Jorbon, Minister of Public Works and Water Resources, Syria, Eng. Mahmoud Tuggar, Deputy Minister, Eng. L. Alkhas, Deputy Minister, Public Works, Syria were among the high dignitaries who attended this conference. More than 270 delegates from 25 countries participated in the conference, including 49 participants from abroad.



**Dr. Darves - Bornos,-** President, ICID, addressing the participants

**“While addressing the participants during the inaugural session Dr. Darves Bornos, President, ICID mentioned that it is in fact proper that this meeting should take place in India, one of the high places of world civilization, one of the original cradles of a large family of languages, one of the countries with a more than thousand year old experience of irrigation and the modern achievements of which cover very wide areas, one of the countries where the magnitude of research, the quality of the training of engineers, and the complexity and diversity of the problems constitute an invaluable international contribution. It is perhaps in India that the development of a suitable technology has progressed to the maximum, combining ancestral experience with the most modern techniques.”**

**Shri Kedar Panday, Union Minister for Irrigation** inaugurated the 33<sup>rd</sup> IEC meeting and Third Afro-Asian Regional Conference of the International Commission on Irrigation and Drainage. He mentioned that “this is indeed a happy augury and reflects a wide recognition of the need to pool our experiences and have a free exchange of ideas and knowledge as many of the present day problems in the field of irrigation and drainage are common to the countries of the region”.

### 3. Thirty-third International Executive Council Meeting and Special Technical Session of the ICID, 4-9<sup>th</sup> October 1982 at new Delhi

The Thirty-third International Executive Council Meeting and Special Technical Session were held at the Vigyan Bhawan, New Delhi on 4-9 October, 1982. The subject of the Special Technical Session was “Identification of remedial measures to mitigate the adverse effects of irrigation, drainage and flood control projects”. Thirteen papers were contributed for discussion on this topic. 160 delegates from 33 countries and international organisations participated in the Council Meeting and Special Technical Session. A galaxy of engineers, included eight out of the ten present office bearers of the ICID, two Presidents Honoraire and six Vice-Presidents Honoraire of the ICID participated.

The Session was inaugurated by **Shri Kedar Pandey, Union Minister for Irrigation.**

Addressing the delegates Shri Kedar Pandey said that the International Commission on Irrigation and Drainage has been striving hard to stimulate and promote the development and application of improved techniques for Irrigation, Drainage and Flood Control and the present meet will be a further step in this direction. Every one of us is keenly aware of the need to increase food production to meet the ever increasing demands of the growing world population. There is considerable scope for increasing food production in almost all parts of the developing world. In the new 20-point programme being executed under the inspiring leadership of our beloved Prime Minister, the pride of place has been given to Irrigation development.



### 4. 60<sup>th</sup> IEC Meeting and 5<sup>th</sup> Asian Regional Conference, 6-11 December 2009 at New Delhi

**In the Diamond Jubilee Year of ICID, the 60<sup>th</sup> International Executive Council (IEC) Meeting and 5<sup>th</sup> Asian Regional Conference (ARC) of the International Commission on Irrigation and Drainage (ICID) were held during 6-11 December 2009 at Vigyan Bhawan in New Delhi. The event was organized by MOWR, CWC, INCID and managed by Central Board of Irrigation and Power. The main theme of the 5<sup>th</sup> Asian Regional Conference was “Improvement in Efficiency of Irrigation Projects through Technology Upgradation and Better Operation & Maintenance”.**



Hon'ble Prime Minister, Dr. Manmohan Singh Inaugurating the 5<sup>th</sup> ARC by lighting the lamp

During the above event, 32 ICID Workbody meetings and 8 Special Sessions were held. The papers received for 5<sup>th</sup> Asian Regional Conference were presented in 20 Technical Sessions. The event was organized by the Indian National Committee of ICID (INCID), Central Water Commission and Ministry of Water Resources and the Event was managed by Central Board of Irrigation & Power (CBIP).



More than 850 delegates from 43 countries, including about 440 Indian delegates and representatives from International Organizations participated in various events to make it a great success.

The 5<sup>th</sup> Asian Regional Conference was inaugurated by The **Hon'ble Prime Minister of India Dr. Manmohan Singh**, in the presence of **Hon'ble Union Minister**

**of Water Resources, Mr. Pawan Kumar Bansal, Hon'ble Minister of State for Water Resources, Mr. Vincent H. Pala, Dr. Chandra A. Madramootoo, President, ICID and others.** During his inaugural address Dr. Manmohan Singh mentioned that The Water Mission will seek to develop new regulatory structures, combined with appropriate entitlements and pricing of water. It will seek to optimize the efficiency of existing irrigation systems. Incentive structures will be designed to promote water-neutral or water positive technologies, recharging of underground water sources and adoption of large- scale irrigation programmes that rely on sprinklers, drip irrigation and ridge and furrow irrigation. The target of doubling the annual rate of growth of agriculture in India to 4% during the Eleventh Plan Period of 2007-2012 is a top priority for our government. It is equally important that developed technologies reach the farmers particularly the poorest farmers. I am very happy that the Ministry of Water Resources has launched a "Farmers' Participatory Action Research Programme" through Agriculture Universities and Agriculture Research Institutes with a view to demonstrate available technologies for increasing productivity and profitability of agriculture. Such programmes need to be expanded.

On the dais (L to R) : ICID President, Dr. Chandra A. Madramootoo, Secretary, Govt. of India, Ministry of Water Resources, Mr. U.N. Panjiar, Hon'ble Union Minister of Water Resources, Mr. Pawan Kumar Bansal, Hon'ble Prime Minister, Dr. Manmohan Singh, Hon'ble Minister of State for Water Resources, Mr. Vincent H. Pala, Chairman, CWC /INCID, Mr. A.K. Bajaj, and Secretary General, ICID, Mr. M. Gopalakrishnan

I would like to emphasize that water-related issues need to be addressed with the full involvement of the local communities and take into account specific local conditions and concerns. Farmers as principal stakeholders, should be consulted in any agricultural water management initiative. Women play a key role in food production activities in a large number of countries. Therefore, a special effort should be made to involve women in process of decision-making.

## EXHIBITION

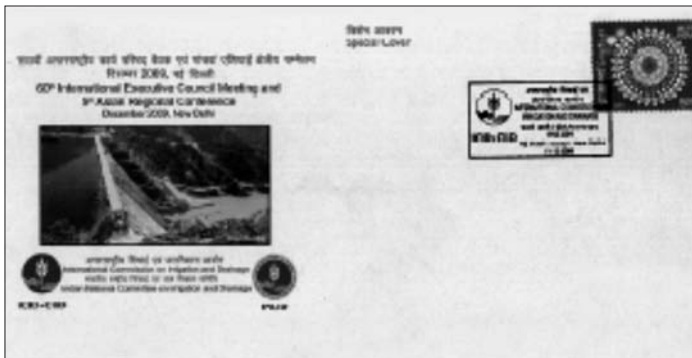
An exhibition of products and services related to irrigation, flood control and drainage was also organized from 9-11 December 2009 in conjunction with the 5<sup>th</sup> Asian Regional Conference. The Exhibition was inaugurated by Mr. P.K. Bansal, Hon'ble Union Minister of Water Resources, Govt. of India on 9<sup>th</sup> December 2009. More than 30 exhibitors from national and international agencies participated in the exhibition.



Hon'ble Union Finance Minister Mr. Pranab Mukherjee was the Chief Guest for the Closing Ceremony. Mr. Pawan Kumar Bansal, Hon'ble Union Minister of Water Resources, Dr. Montek Singh Ahluwalia, Deputy Chairman, Planning Commission, Mr. Vincent H. Pala, Hon'ble Minister of State for Water Resources, Mr. Sachin Pilot, Hon'ble Minister of State for Communications & Information Technology, were among others who addressed.



Special Postal cover marking the '60th Anniversary (1950-2009) of ICID was released during the Closing Ceremony.



## 6.14 INTERNATIONAL ASSOCIATION FOR HYDRO-ENVIRONMENT ENGINEERING AND RESEARCH (IAHR)

Originally this organization was known as the International Association for Hydraulic Structures Research. At the Grenoble Meeting in 1949, the name was changed to the International Association for Hydraulic Research (IAHR). Later it was re-designated as The International Association for Hydro-Environment Engineering and Research (IAHR). Established in 1935 in Brussels IAHR is an independent organization of engineers and water specialists working in fields related to the hydro-environmental sciences and their practical application. Activities range from river and maritime hydraulics to water resources development and eco-hydraulics, through to ice engineering, hydro-informatics and continuing education and training. IAHR stimulates and promotes both research and its application. The headquarter of the IAHR at present is in Madrid, Spain. Individual membership of the Association, although not especially large in the year 1950, is numbered by eminent Engineers in 36 nations throughout the world. IAHR publishes three international scientific journals:

- (i) Journal of Hydraulic Research ,
- (ii) Journal of River Basin Management
- (iii) Journal of Applied Water Engineering and Research

In addition, the **International Journal of Hydro-Environment Research** (JHER) is published by the IAHR Asia Pacific Division. IAHR publishes a quarterly magazine for its members called **Hydrolink**, and a series of monthly **News Flash** e-Newsletters for the international water community.

World Congress being organized by IAHR is one of the most important activities of the International Association for Hydro-Environment Engineering and Research. IAHR is governed by a Council comprising of the President, three Vice-Presidents, the Secretary General forming the Executive Committee) and other elected members.

The Central Board of Irrigation and Power was functioning as the liaison organization for the International Association for Hydraulic Research. Under the auspices of the IAHR, the following events were organized in India:

1. 4th IAHR World Congress, 2-5 March 1951 at Bombay
2. International Seminar on Hydraulics of Alluvial Streams, 15-19 January 1973 at New Delhi
3. XIX Congress of the International Association for Hydraulic Research, 2-7 February 1981, New Delhi

### 1. 4th IAHR World Congress, 2-5 March 1951, Bombay, India

The fourth meeting of the IAHR was held at Bombay, from 2th to 5th January 1951. About 300 hydraulic experts from 22 'countries attended the session. The session was inaugurated by **Shri B. G. Kher, Chief Minister of Bombay and presided over by Dr. Lorenz G. Straub, President, IAHR of U.S.A.** Dr. A. N. Khosla, Consulting Engineer to the Government of India and Chairman, Central Waterpower, Irrigation and Navigation Commission welcomed the delegates with the words "This was the first time that International Association meeting is being held in India—the first outside of Europe.



Shri B.G. Kher, Chief Minister of Bombay, Inaugurating the Fourth Meeting of the International Association for Hydraulic Research at Bombay on 2 January 1851.

30 papers were contributed. The session was followed by a study tour to the Central Water and Power Research Station and Meteorological Institute at Poona, the Vaitarna Dam and Tata Hydro-electric Works and some other interesting sites in and around Bombay.

### 2. International Seminar on Hydraulics of Alluvial Streams, 15-19 January 1973, New Delhi

To review the state of knowledge of the characteristics and behaviour of alluvial channel flow, and the advances made as a result of the researches and to evolve the future research strategy for a more complete understanding of the flow phenomena, its effect and related problems, an invitation was extended to the IAHR at its Tenth Conference held at Kyoto (Japan) to hold an International Seminar on Hydraulics of Alluvial Streams. This invitation was readily accepted and the seminar on the above subject was organised by the CBIP from 15-19 January 1973 with the support of UNESCO and Government of India.

More than 250 hydraulic engineers and scientists from India and abroad participated in the Seminar. In his inaugural address, **Shri C. Subramaniam, Union Minister for Industrial Development, Science and Technology** referred to the commendable work done by the IAHR in disseminating, on a wide front, advances in knowledge and technology in hydraulics. **Dr. K. L. Rao, Union Minister for Irrigation & Power** in his Presidential address pointed out the importance of the subjects to be discussed at the Seminar and brought out the deficiencies which still existed in the science of hydraulics.

### 3. XIX CONGRESS OF THE IAHR

The XIX Congress of IAHR was hosted by the Central Board of Irrigation and Power in New Delhi from 1st to 7th February 1981. The Congress was attended by 342 participants from 33

countries including 171 from India. The theme of the Congress was “Hydraulic Research for Improved Water Resources Utilisation”.

The Congress was followed by two Study Tours. 183 papers were discussed :

Another noteworthy feature of the Congress was three general lectures delivered by international experts namely Mr. Z. R. Darves-Bornoz, Professor R.L. Wiegand and Dr.J .S. Tarapore.

The Congress was inaugurated by **Shri N. Sanjiva Reddy, President of India**, on 1st February 1981 at the Ashoka Hotel, New Delhi. **Shri Rao Birendra Singh, Union Minister for Agriculture, Rural Construction and Irrigation and Shri Z.R. Ansari, Union Minister of State for Irrigation and Mr. John F. Kennedy, President, IAHR** participated in the function. Dr. Sanjiva Reddy mentioned that Hydraulic research, particularly applied research, can improve the economics of various projects and give large benefits at low costs. Moreover,

schemes which were considered uneconomical earlier, can also be taken up with improved water technology.

Shri Rao Birendra Singh, Union Minister for Agriculture, Rural Construction and Irrigation also addressed the participants.

Mr. John F. Kennedy while delivering his address expressed the gratitude of the International Association for Hydraulic Research, and especially that the Congress participants, to the Central Board of Irrigation and Power for organizing and hosting this, the XIX IAHR Congress at New Delhi, India.



# CHAPTER 7

## IMPORTANT EVENTS OF THE BOARD

### 7.1 INTRODUCTION

The Central Board of Irrigation & Power has been organising conferences (both International & National), Seminars, Symposia, Workshops, Brain Storming Sessions, Trainings and other Meetings during its existence of more than 8 decades. CBIP has organised more than 1700 such events which were attended by more than 3 lacs participants.

CBIP was also organising seminars / symposium on current important subjects as a part of the Annual Sessions / Meetings, Annual Research Sessions. Some of the important conferences which were organised by CBIP pertaining to Indian chapters of International organisation as well National organisations, whose secretariat are housed in CBIP such as ICOLD, IWRA, INHA, ITA CIGRE etc., have already been covered. A few of the other major events organised by CBIP are described below:-

### 7.2 HOSTING OF FOUR INTERNATIONAL CONFERENCES FOR THE FIRST TIME IN INDIA

Prior to the attainment of Independence in 1947, the Indian engineers played practically no part in the activities of International Organisations. India was usually represented on these bodies only as a 'sleeping member' by some retired engineers from India living in England. Soon after Independence, Indian engineers headed by Dr. A. N. Khosla, for the first time, attended the "Third Congress on Large Dams" at Stockholm, where they personally realised the benefits of these International Conferences, especially to the host country. It was then that Dr. Khosla with the approval of the Government of India, decided to invite International Association for Hydraulic Research, International Commission on Large Dams, International Commission on Irrigation and Drainage and World Power Conference to hold their meetings in India.

The then Prime Minister of India, Late Pandit Jawahar Lal Nehru invited all the nations of the world to participate in the conferences observing that the activities of these International Organisations were of the greatest importance to mankind especially at a time when all Nations of the World had launched many projects to step up food production and power generation with a view to raising the standard of living of the people. He further observed that the meetings of such bodies provided an excellent opportunity for the study and development of technique in the planning and execution of projects for the conservation and utilisation of natural resources by pooling the knowledge and experience of all Nations of the World for the ultimate benefit of the human race.

The response to our invitation was very encouraging and about 800 delegates joined the Conferences, out of which the foreign delegates numbered 310 from almost all countries of the world including U.S.A., U.K., U.S.S.R., Mexico, France, Italy, Finland, Sweden, Norway,



Egypt and Germany. The response from the Asiatic countries was also very good and the Asian delegates hailed from Japan, Thailand, Indonesia, Burma, Ceylon, Pakistan, Iraq, Syria and Israel. In addition to delegates from 34 nations UNESCO and ECAFE were also represented. These Conferences enabled the Indian engineers to play their due role in the International field of engineering and placed India on the engineering map of the world. Such conferences had in the past been held in Europe or America and India got the privilege to be their venue for the first time in the East. The programmes for the conferences included technical meetings, social functions and finally, study tours to important engineering works and scenic and cultural places.

Along with these Conferences one at Bombay and three at New Delhi, an 'Indian International Engineering Exhibition' was also organised in New Delhi. Details of the events organised in New Delhi are given here.

### 7.3 CONFERENCES HELD AT DELHI

- (i) **Fourth Congress on Large Dams**
- (ii) **World Power Conference Sectional Meeting**
- (iii) **First Congress on Irrigation and Drainage**

The above three conferences were held concurrently at New Delhi in the historic hall of Parliament House from 11<sup>th</sup> to 16<sup>th</sup> January 1951. The conferences were jointly inaugurated by **Shri C. Rajagopalachari, Hon'ble Home Minister of India** in the absence of the Prime Minister who had to attend the Commonwealth Prime Ministers' Conference in London during these very days. Messages welcoming the delegates were received from the President of India and the Prime Minister and other dignitaries. The president of India in his message interalia mentioned that:

*"Such meetings provide the best opportunity of collecting the findings and pooling the experience of all participating countries for the greater benefit of humanity. Indeed such international collaboration in the matter of advancement on scientific technique and knowledge is bound to unite the various nations with ties of good-will and understanding and help to establish an easing influence on the international political field".*

The Prime Minister in his message, while regretting his absence, interalia, wrote that:

*"These conferences are of value to many countries because of the great importance of irrigation. To India they are of peculiar value. We have a widespread irrigation system, and yet we want much more of it and we want it quickly. Our food problem revolves round it and power, which we need so much for development, is a product of these schemes.*

*"I hope that these conferences will lead to a widening of human knowledge in regard to these vital problems and will result in decision which will help to solve some of the problems that confront us today".*

Sir Vincent de Ferranti, Chairman, International Executive Council, World Power Conference, Shri. A. Coyne, President, International Commission on Large Dams and Shri. Begemann, Vice President of the International Commission on Irrigation and Drainage also addressed the delegates. The Hon'ble Shri C. Rajagopalachari, Home Minister, Government of India, while delivering the inaugural address, interalia, observed that:

*“An Engineer should have intellectual and moral honesty, courage, independence of thought, fairness, good sense, sound judgement, perseverance, resourcefulness, ingenuity, orderliness, application, accuracy and endurance. An engineer should have ability to observe, deduce, to correlate cause and effect, and to apply the principles discovered.*

*“He should be a man of faith, one who perceives both difficulties and ways to surmount them. He should not only know Mathematics and Mechanics, but should be trained in methods of thought based on these fundamental branches of learning. He should have extensive knowledge of the sciences and other branches of learning besides knowing intensively those things which concern his specialities. He must be a student throughout his career and keep abreast of human progress.”*

After detailing the desired qualities of an Engineer, he also mentioned that:

**Well, if we could only get engineers of this type in India, there could be no difficulty in giving them not only all the public works of the country to be done, but the whole Government of India, lock, stock and barrel.**

Drawing the attention of delegates from abroad about the great heritage of India in respect of water related structures he concluded his address as under:

*“Gentlemen from abroad, there is a great deal in India to furnish interesting material for archaeologists and for architects to marvel at. But I am also sure the international engineers gathered here will find good enough proofs of genius and professional zeal in the irrigational works of India. The Cauvery Delta System in the south was originally planned and executed under Tamil Kings who ruled 1700 years ago. The great dam of Bhopal was built nine hundred years ago by a Hindu King. The Yamuna Canal was built during the times of the Moghul Emperors. All these have been maintained and improved in recent years.*

*“In the British period the names of Sir Arthur Cotton, Sir Thomas Cautly, Shri. Lieut. Dyas, Capt. Orr, and other well-known names are associated with great irrigation works in India which they took up in the old tradition.*

*“I believe we have, in more recent days, done some very good work in hydraulic engineering also.”*



Presidents of the three International Conferences. From Left: Mr. Gail A. Hathaway, Chairman, U.S. Committee on Large Dams, Mr. Andre Coyne (France), President, International Commission on Large Dams; Mr. A. N. Khosla (India), President, International Commission on Irrigation and Drainage ; and Mr. Vincent de Ferranti (U.K.), Chairman, International Executive Committee of World Power Conference.

After the inaugural address by the Hon'ble Home Minister of India the Conference was also addressed by Dr. Shen Yi (ECAFE, Bangkok), Shri. Gail A. Hathaway (Chairman, U.S. Committee on Large Dams), Shri. A. N. Voznesensky (USSR), Shri. Aurelio Benassini Vizcaina (Mexico), Shri. Mohsin Ali (Pakistan), Shri. G. Westerberg (Sweden) and Shri. Henri Gicot (Switzerland). This was the first time that the great international engineering organisations of the world were meeting in Asia to discuss their problems.

Separate sessions for technical discussions for the three conferences were held.

#### **7.4 THE FOURTH CONGRESS ON LARGE DAMS**

The Fourth Congress on Large Dams included 4 questions dealing with subjects of present day importance to the engineers employed on design and execution of multipurpose river valley schemes. These were (i) Design and Construction of Earth and Rockfill Dams, (ii) Methods for Determining Maximum Flood and Surplussing Works at Dam Site, (iii) Sedimentation of Reservoirs and Concrete for Large Dams.

In all one hundred & eleven papers were contributed including 17 from India. Lively and exhaustive discussions took place and very helpful conclusions emerged from these. Necessity for further research in almost all the questions was highlighted.

#### **7.5 WORLD POWER CONFERENCE SECTIONAL MEETING**

For the World Power Conference Sectional Meeting, the subjects selected were as under:

- (i) Utilization of Electricity in Agriculture
- (ii) Coordination in the Development of Power Resources & Development of Industries

In all 47 papers, drawn from different nations were submitted. Very enlightened discussions took place and Indian engineers gained a lot, especially from the discussions on application of electricity to irrigation, fertilizers, farm, home and processing of agricultural products. It was brought out that there was a great field for expansion in India both for increased comforts in the home and for increased production in the farm by the use of electricity. It was also impressed that with the increasing power supply facilities in India, there was a great scope for the development of cottage and light industries for the general benefit of the country. The discussions on power load planning were also very instructive.

#### **7.6 FIRST CONGRESS OF THE INTERNATIONAL COMMISSION ON IRRIGATION AND DRAINAGE**

At the First Congress of the International Commission on Irrigation and Drainage, the subjects selected for discussion were (i) National Review of Irrigation Development and Practice, (ii) Present Day Problems on Irrigation and Drainage. In all 24 papers were contributed including 7 from India. It was considered necessary that detailed information about the practices, methods and technique employed for irrigation and drainage by different countries of the world should be collected and circulated to all member countries for co-ordinating and pooling of knowledge on these subjects.

## 7.7 INDIAN INTERNATIONAL ENGINEERING EXHIBITION 10<sup>TH</sup> JANUARY TO 9<sup>TH</sup> FEBRUARY 1951

As an aid to promoting the objectives of these three International Conferences, and also to make known to the common man the immensity of wealth which lies hidden in the shape of land, water power, and mineral resources and the vast opportunities which modern planning and technology can offer for their exploitation, Central Board of Irrigation and Power as the Indian National Committee arranged an Indian International Engineering Exhibition at New Delhi. Invitations for participation in the Exhibition were issued to all countries of the world through diplomatic channels. In addition, the Board invited all the National Committees of these three International Bodies to participate in the Exhibition.

The Exhibition was planned to show and as far demonstrate as possible to by means of live and still models, the latest developments in the sciences and techniques covered by the International Conferences. As many as 22 nations of the world, 36 research and technical organisations from India and numerous commercial and industrial concerns participated in the Exhibition. This was for the first time that an International Exhibition on such a big scale was held in the country. The Exhibition premises, located in between the historical Delhi and Turkman Gates covered an area of 80,000 sq. m. The visitors included delegates to the Conference, diplomats, foreigners, engineers and engineering students, business and common men. The Exhibition was opened by the **Hon'ble Shri N. V. Gadgil, Minister for Works, Mines and Power.**

The exhibits related to dams, power and irrigation engineering research and engineering industries. A Relief Map of India and the spectacular gate designed as a working model of a dam were the masterpieces that attracted large crowds of visitors.

The Exhibition was visited by over 12,00,000 persons from various parts of India and other countries of the world. Among the visitors were the President of the Indian Republic, Prime Minister and other Cabinet Ministers of the Government of India, Diplomats in Delhi, Members of Indian Parliament, Governors and Chief Ministers of States, students of Engineering Colleges and Technical Institutions. The Exhibition was planned in the first instance for one month only, viz., 10<sup>th</sup> January to 9<sup>th</sup> February 1951. On the persistent demands from the public it had to be extended twice and was closed on 18<sup>th</sup> March 1951.



View of the front gate of the Indian International Engineering Exhibition.



Dr. Rajendra Prasad, Hon'ble President of India, at the Indian International Engineering Exhibition.

At the suggestion of the Prime Minister, some of the attractive exhibits and models were collected and were displayed in a hall specially constructed in New Delhi in the compound of the office of the Central Water and Power Commission. The temporary hall has been the nucleus of a Engineering Museum of the CWPC.

The President of India and the Prime Minister recorded the following impressions:

***Dr. Rajendra Prasad, Hon'ble President of the Indian Republic***

*When on 22<sup>nd</sup> January last I went to the Indian International Engineering Exhibition I was most agreeably surprised to find that the reports that had reached me about it had not exaggerated it in any respect. The majestic scale of its layout, the picturesque arrangements made, the variety and value of the exhibits, the visible incarnation of modern engineering science and the embodied representation of the Indian irrigation projects that one saw there all made it not only most instructive and educative but also a matter of sheer delight and wonder. It dramatically engraved on the mind of the visitors the great power-gifts which Mother Nature had placed at the feet of the Indian people and the steps that were being actively taken by their government to make them available to banish want and darkness from their lives.*

*It was also very pleasing to find how engineers of all the countries of the world had extended their co-operation to its success. I would wish very much that such Exhibitions could be held periodically to give our people a glimpse of the great developments that are taking place in the world and in India.*

***Pandit Jawahar Lal Nehru, Hon'ble Prime Minister of India***

*The International Engineering Exhibition recently held in Delhi was visited by me on several occasions. I must have spent seven or eight hours there altogether. I wish I could have gone there oftener and spent more time. The Exhibition was fascinating and I learnt a great deal from it. For the general public, who crowded to it in large number, it must have been of immense value. The Exhibition showed us not only the various aspects of our river valley schemes but so much else that was being done in India, which was of permanent value, that one's faith in the future was greatly enhanced.*



Pandit Jawahar Lal Nehru, Hon'ble Prime Minister of India, at the Indian International Engineering Exhibition.

*Hundreds of thousands of persons saw this Exhibition in Delhi. I wish that it had been possible for millions of people in various parts of the country to see this or some such similar Exhibition and thus to realise not only the potentialities of India but the exciting and fascinating process of translating the potential into the actual.*

*I must congratulate all those concerned who made this Exhibition such a great success.*

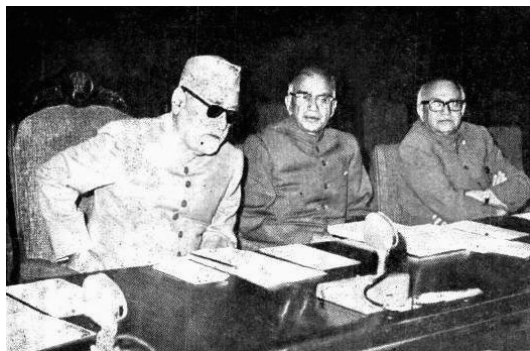
## 7.8 STUDY TOURS FROM 16<sup>TH</sup> JANUARY TO 1<sup>ST</sup> FEBRUARY 1951

As an adjunct to the conferences, the Central Board of Irrigation (The Indian National Committee) organised study tours after the technical conferences at Delhi. Because it considered it necessary to acquaint the delegates from abroad with India and its achievements in the field of engineering and the multifarious problems facing her in the execution of new projects. The tours afforded them on in-sight into our ancient culture, and civilisation which is the oldest in the world. The study tour included visit to manufacturing and industrial centres, Hydraulic Research Laboratories, River Valley Projects, old monuments, temples and places of scenic beauty.

Two special trains, equipped with everything that would be needed by the delegates for their fortnight stay in the trains, left Delhi on 16<sup>th</sup> January 1951 with 145 and 133 delegates. The total mileage covered by each train exceeded 4,500 miles (about 6,500 km) and in addition the delegates travelled more than 800 miles (1,280 km) by road. The timings were so arranged that the nights were occupied in Journeys while days were devoted to visiting works and places. The delegates were taken to Pathankot, AShriitsar, Bhakra Nangal Project, Hardwar, Banaras, D.V.C., Calcutta, Tatanagar, Hirakud, Khaperkheda Power Station at Nagpur, Ajanta, Poona Research Station, Tungabhadra Dam, Mettur Dam, Bangalore and Mysore. From Mysore the delegates were taken to the famous Jog Falls, a lovely drop of 800 ft (244 m). The delegates returned to Mysore where the closing session was held on 1<sup>st</sup> February 1951.

## 7.9 INTERNATIONAL SYMPOSIUM ON STEAM POWER STATIONS AT DELHI

Along with the 37<sup>th</sup> Annual Session of the Central Board of Irrigation and Power, an International Symposium on Steam Power Stations was organised at New Delhi from 5<sup>th</sup> to 9<sup>th</sup> January 1965 under the joint auspices of the Board and the Indian Journal of Power and River Valley Development. The symposium along with the Board session was inaugurated by the Hon'ble **Vice President of India Dr. Zakir Husan**. A large number of International experts in the field of steam power attended the symposium and had an occasion to compare notes with the experiences of top ranking engineers working in this field in India. About 100 papers came up for discussion at this symposium and nearly 75 of these papers came from U.S.A., U.K., Canada, France, Belgium, Sweden, West Germany, Switzerland, Poland, Czechoslovakia and Japan. Most of the authors of these papers were present at the occasion.



**Dr. K. L. Rao, Hon'ble Union Minister for Irrigation and Power** while speaking about the symposium said

*"In the context of our present power programme of this country, these deliberations are of immediate use. As we have large amounts of low grade coal and washer middlings and in view*

*of the development of the technique of long distance economic transmission of power, steam generation attains a certain amount of significance in this country. The vagaries of rainfall as experienced this year in Chambal system and last year in Madras and Kerala have shown that it is necessary to back up hydro-power with sufficient steam power. Thus the importance of steam power is becoming more and more impressive and I am glad that this symposium is being organised at a very opportune moment. It will give us a good amount of literature based on field experience I only hope that this symposium will enable us to accelerate our production of power in this country which is growing rather very slowly I hope that this symposium will help remove difficulties in our way, and accelerate the growth of steam power production. We need power very much for modernisation of our production methods, and increased productivity, whether it be in agricultural or industrial sector."*

This symposium brought Indian engineers for the first time into close contact with the manufacturers and designers from the more advanced countries. The discussions brought a new awareness in the designers about the problems faced by the Indian engineers, especially in the stations burning low grade coal. Broad recommendations were made regarding equipment most suitable for Indian conditions and the methods to be adopted for future plans.

#### **7.10 SYMPOSIA ON 'PRE-CAST TECHNIQUES IN IRRIGATION AND POWER STRUCTURES' AND 'FORECASTING THE FUTURE' AT NEW DELHI**

Two Symposium on 'Pre-cast Techniques in Irrigation and Power Structures' and 'Forecasting the Future' were organised by the Central Board of Irrigation and Power from 20<sup>th</sup> - 21<sup>st</sup> November, 1968 during the 41<sup>st</sup> Annual Session of the Board held at Vigyan Bhawan, New Delhi. The symposia were inaugurated by **Shri Fakkruddin Ali Ahmed, Hon'ble Union Minister for Industrial Development and Company Affairs. Dr. K.L. Rao, Hon'ble Union Minister for Irrigation and Power** also graced the occasion.

During his inaugural address Shri Fakkruddin Ali Ahmed, inter alia, said:

*"In a number of fields we have acquired considerable experience, namely, irrigation, river control, land reclamation, hydro-generation and a number of basic industries."*

Dr. K.L. Rao, Union Minister for Irrigation and Power while addressing the distinguished gathering, which included scientists and engineers from all parts of the country, inter alia, said:

*"Central Board of Irrigation and Power is built upon a sound foundation of integrity, objectivity and faith - Its principal frame-work has the ageless strength and character imparted to it by the wisdom and devotion of its builders."*



## 7.11 SECOND INDO-GERMAN POWER PLANT SYMPOSIUM AT NEW DELHI

The Second Indo-German Power Plant Symposium was held at Vigyan Bhawan, New Delhi, from 27<sup>th</sup>—29<sup>th</sup> January, 1982. The Symposium was inaugurated by **Shri A.B.A. Ghanikhan Choudhary, Hon'ble Union Minister for Energy**, Government of India. **Shri Vikaram Mahajan Hon'ble Minister of State for Energy**, Government of India also graced the occasion. About 450 delegates including 38 specialists from Germany attended the Symposium. The Symposium discussed the various aspects of design, construction, operation and maintenance of thermal power plants.

The Symposium stressed the urgency for understanding beneficiation of low grade non-coking coals to ensure at least reasonable consistency in the quality of coal used for the boilers. In order to utilise the large quantities of the rejects which are produced as a result of beneficiation, the Symposium recommended introduction of fluidized bed combustion boiler for generation of power at pitheads. The symposium also made many other useful recommendations.



The difficulties encountered in the burning of high ash, high moisture low volatile coals interspersed with extraneous materials supplied to power stations in large lumps were appreciated. It was recognised that Indian coals as mined and supplied were one of the most difficult to burn. The Symposium recommended urgent steps for despatch of 75 to 100 mm size crushed coal to power stations. Selective beneficiation was recommended to improve quality and reliability of operation. Further, sustained R & D efforts were necessary to determine the various burning characteristics of coal with reference; to its slagging, erosion and abrasive properties and to give feed-back for evolving proper design parameters and selection of suitable materials.

In view of the urgent need to adopt suitable pollution control measures for environmental protection and the fact that the Indian coal flyash was most difficult to precipitate on account of its high ash low moisture and low sulphur content, it was necessary to specify the various design criteria for procurement of the right type of the precipitators for new installations and adequately dimensioned precipitators should be selected and gas-conditioning may be resorted to for retrofitting in existing installations.

The need for updating technology in the field of control and instrumentation with selective use of microprocessor systems was recognised. With the increase in display of parameters on the control Board with larger size units. Computerised data acquisition system for monitoring/ alarming, assistance on efficient control by operator, maintenance aid and performance evaluation was recommended.



## 7.12 FIRST NATIONAL WATER CONVENTION AT DELHI

The First National Water Convention sponsored by the Ministry of Water Resources was organised by the Central Board of Irrigation and Power from 12<sup>th</sup> -14<sup>th</sup> November 1987 at I.I.T, Delhi.

The Convention was inaugurated by **Dr. Y.K. Alagh, Member, Planning Commission** on 12<sup>th</sup> November 1987. Shri Naresh Chandra, Secretary to the Govt., of India, Ministry of Water Resources; Shri M.A. Chitale, Chairman, Central Water Commission also addressed the gathering.



Dr. Bharat Singh, Professor Emeritus, WRDTC, Roorkee delivered a Special Lecture on “Role of Water Resources in National Development” on 12<sup>th</sup> November 1987.

**Hon’ble Minister of State for Textiles and Water Resources, Shri Ram Niwas Mirdha** addressed the delegates of the First National Water Convention on 13<sup>th</sup> November 1987.

About 500 delegates belonging to the various disciplines of Water Resources attended the Convention. The Convention provided a common forum for the engineers, hydrogeologists, hydrometeorologists, agriculturists, scientists, economists, sociologists and administrators for exchange of ideas on the development and management of water resources.

A separate Science and Technology Session was also arranged to discuss the S&T in use and requirement in the field of Water Resources. The Lead Paper of the Theme 6-Hydraulic Machinery Group- was also discussed as a part of S&T Session.

## 7.13 6<sup>TH</sup> INTERNATIONAL CONFERENCE ON EXPANSIVE SOILS AT NEW DELHI

The 6<sup>th</sup> International Conference on Expansive Soils was organized by the Central Board of Irrigation and Power (CBI&P), sponsored by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE), as a part of its Diamond Jubilee Celebrations on 30<sup>th</sup> November to 4<sup>th</sup> December 1987 at Ashok Hotel, Chanakyapuri, New Delhi. The Conference was inaugurated by **Shri Ram Niwas Mirdha, Hon’ble Minister of State for Textiles and Water Resources, Govt. of India.**

About 300 delegates including those from Argentina, Canada, China, France, Greece, India, Poland, Spain, Sudan, United Kingdom and United States of America attended the Conference.

During the Conference 81 papers under the four Technical Sessions were discussed:



The following four invited lectures were also delivered during the conference:

1. The Stress State for Expansive Soils – Prof. D.G. Fredlund, Canada.
2. Constitutive Milling with Extension to Expansive Soils – Prof. C.S. Desai, U.S.A.
3. Shrinkable Soils – Dr. R.H.G. Parry, U.K.
4. Cohesion Approach to Mechanics of Saturated Expansive Soil Media – Prof. R.K. Katti, India.

In addition, a Poster Session was arranged in parallel on 1<sup>st</sup> and 2<sup>nd</sup> December 1987.

### 7.14 INTERNATIONAL SYMPOSIUM ON TIDAL POWER DEVELOPMENT AT NEW DELHI

An International Symposium on “Tidal Power Development” was held at Vigyan Bhawan, New Delhi, from 16<sup>th</sup>-18<sup>th</sup> February 1988. The Seminar sponsored by Central Electricity Authority was organised by Central Board of Irrigation and Power.

The Symposium was **inaugurated by Hon’ble Union Energy & Communications Minister, Shri Vasant Sathe, and presided over by Hon’ble Minister of State for Power, Smt. Sushila Rohatgi.** After the welcome address

by Shri J.C. Gupta, Member (H.E.), Central Electricity Authority & Chairman, Organising Committee, Shri Bhahadur Chand, Chairman, Central Electricity Authority delivered the keynote address. Shri M.M. Kohli, Secretary, Power, and Chairman Project Review and Advisory Committee for Tidal Power, also addressed the audience.



132 delegates, including 17 from France, U.K., Canada, Netherlands, Korea, Japan, Finland participated in the Symposium. There were five technical sessions. In the concluding session, the valedictory address was delivered by the Chief Engineer (Tidal), Central Electricity Authority and Chairman Technical Committee, who gave an over-view of the Symposium.

### 7.15 SYMPOSIUM ON QUALITY ASSURANCE, QUALITY MANAGEMENT AND QUALITY CONTROL IN WATER RESOURCES AND POWER ENGINEERING AT NEW DELHI

The Symposium on Quality Assurance, Quality Management and Quality Control in Water Resources and Power Engineering organised on April 25-27, 1989 was inaugurated by **Dr. Shankar Dayal Sharma, Hon’ble Vice-President of India.**

In the Symposium 22 papers covering Water Resources Engineering and 12 covering Power Engineering were discussed. Important recommendations arrived at during the Symposium are as below:



- (i) The quality control personnel should fully understand the philosophy based on which the design of structure is made, and the behaviour of materials used for construction. If some changes have taken place in the conditions between the time when sampling/testing was done and the time when construction was going on, these should be properly accounted for.
- (ii) The Central Board of Irrigation & Power should lay down guidelines for assuring quality in procurement of materials, installation and construction.
- (iii) A model of the set-up required for quality assurance on water resources construction projects may be spelt out.

### 7.16 REGIONAL SEMINAR ON COMPUTER AIDED DISTRIBUTION MANAGEMENT AT HYDERABAD

A Regional Seminar on Computer Aided Distribution Management was organised jointly by CBIP, and Asian Development Bank, for the benefit of the Asia Pacific Region at Hyderabad from 19<sup>th</sup> November to 23<sup>rd</sup> November, 1990. As a major concomitant to the Regional Seminar, an International Exhibition on the same theme was also organised. The Seminar was inaugurated by the Hon'ble Chief **Minister of Andhra Pradesh** whereas the Exhibition was inaugurated by Shri J.K. Bhasin, Chairman, Central Electricity Authority and Ex-officio Secretary to Govt. of India. The Seminar was attended by the resource speakers, participants and observers. The resource speakers were specialists in the field of Distribution Technology who were invited by the organizers to deliver State of Art Lectures. Participants were senior officials from Electric Power Utilities in Asia Pacific Region, Observers were senior Executives from Power Utilities, academic institutions and manufacturers of distribution equipment.



Eight resource speeches and 24 papers on the eight themes were discussed during the Seminar viz Computer Aided Tools, Distribution System Reliability, System Disturbances and Harmonics, Network Configuration, Capacitors and Regulators, System Expansion Planning, Distribution Automation and Application of Expert Systems.

There were 8 Resource speakers, 35 Indian participants, 35 participants delegates besides 17 observers.

### 7.17 REGIONAL SEMINAR ON ENERGY CONSERVATION IN ELECTRICITY SECTOR AT MADRAS

The Regional Seminar on Energy Conservation in Electricity Sector was jointly organised by the Central Board of Irrigation and Power and Asian Development Bank, Manila from 11<sup>th</sup>-

14<sup>th</sup> November 1991 at Madras. Participants included resource speakers, delegates and observers. The Seminar started with Inaugural Session on 11<sup>th</sup> November 1991 at Hotel Park Shereton, Adyor, Madras.

The Chairman of the Organising Committee Shri R.C. Dave welcomed the distinguished guests and the participants which was followed by an Address by the Manager, Asian Development Bank, Shri. A.D. Burell, **Shri S. Kannappan, Hon'ble Minister of Public Works, Tamil Nadu**, delivered the



Presidential Address. **Shri Kalpnath Rai, Hon'ble Union Minister for State for Power and Non-Conventional Sources of Energy** inaugurated the Seminar and delivered the Inaugural Address. A pamphlet on Energy Conservation was released by the **Hon'ble Minister of Public Works, Tamil Nadu Shri. S. Kannappan**.

69 delegates from utilities in Asia and Pacific Region participated in the Seminar which included 26 delegates from outside India, 10 observers including 2 observers from outside India participated in the Seminar.

About 50 papers were received on the Seminar theme which included status papers of some of the countries on the subject. 32 papers were presented and discussed. A key note address was also given by Dr. N. Tata Rao, Ex. Chairman, APSEB.

A Technical Tour to Kalapakkam Nuclear Power station was arranged for the participants on 15<sup>th</sup> November 1991.

### **Exhibition**

Concomitant to the above Regional Seminar on Energy Conservation in Electricity Sector, an Exhibition was also organised. Thirteen Organisations participated in the Exhibition. As a special feature of the Exhibition, school children were invited for visiting the Exhibition and participate in the essay competition on Energy Conservation with specific reference to the exhibits displayed. Eleven best essays were rewarded on 14<sup>th</sup> November 1991, the children's day, by the Chairman, Tamil Nadu Electricity Board, Shri Ramachandran.

The best three stalls in the Exhibition were given awards by Shri. Krishna Swarup, Chairman, CEA.

### **7.18 CBIP ZONAL WORKSHOP ON INTEGRATED DEVELOPMENT OF IRRIGATED AGRICULTURE (EAST ZONE) AT BHUBANESWAR**

The East Zone Workshop on Integrated Development of Irrigated Agriculture was organised from 21<sup>st</sup>-22<sup>nd</sup> April 1994 at Hotel Kalinga Ashoka, Bhubaneswar by Central Board of Irrigation & Power, New Delhi. 130 delegates from the Eastern States representing State Irrigation and Agriculture Developments, Agriculture Universities, Engineering Colleges and Industry including 10 farmers attended the Workshop.

The Workshop was **inaugurated by Shri Bijoy Mohapatra, Hon'ble Minister for Water Resources and Parliamentary Affairs, Orissa**, Shri R.K. Bhujbal, Additional Chief Secretary, Government of Orissa presided over the function and addressed the gathering.

There were four Technical Sessions in which 50 papers on various aspects of Irrigated Agriculture were discussed.



### 7.19 INTERNATIONAL SEMINAR ON UPRATING / UPGRADATION OF TRANSMISSION LINES AT NEW DELHI

The above one-day Seminar was inaugurated on 23<sup>rd</sup> March 1995 by **Smt. Urmila Ben Patel, Hon'ble Minister of State for Power**. Shri H.C. Mittal, Member, CEA gave a key note address. Shri P. Abraham, Special Secretary, Ministry of Power, Shri M.I. Beg, Chairman, CEA, the chairpersons of many State Electricity Boards and Heads of Power Utilities graced the inaugural function. On the conclusion of the Seminar, suitable recommendations were made.

### 7.20 SIXTH INTERNATIONAL SYMPOSIUM ON “RIVER SEDIMENTATION IN INDIA” AT NEW DELHI

The Sixth International Symposium on River Sedimentation (ISRS) was organised by Central Board of Irrigation and Power (CBIP) under the patronage of International Research and Training Centre on Erosion and Sedimentation (IRTCE) from 7<sup>th</sup>-11<sup>th</sup> November 1995 at New Delhi, India.

Ministry of Environment and Forests and Ministry of Science and Technology, Govt. of India were co-organisers of the event while International Association for Hydraulic Research (IAHR) sponsored. The symposium was co-sponsored by Indian Space Research Organisation, UNESCO and Cottage Industries Exposition Ltd.

During the inaugural function of the symposium, keynote address was delivered by **Shri. Tan Ying, Deputy Director and Secretary General, IRTCES on River Sedimentation and Flood in China**.

About 200 delegates from 30 countries participated in the deliberations of the



symposium. The 114 papers were included in the Proceedings volume which were categorised under six themes.

The Valedictory function was held on 11<sup>th</sup> November 1995. Prof. P. Natarajan presented the overview and summarised the discussions that took place during four days in 11 technical sessions.

### 7.21 INTERNATIONAL SEMINAR ON “NUCLEAR POWER IN THE 21<sup>ST</sup> CENTURY: CHALLENGES AND OPPORTUNITIES” AT MUMBAI, MAHARASHTRA

An International Seminar on “Nuclear Power in the 21<sup>st</sup> Century: Challenges and Opportunities” was organised from 21<sup>st</sup>-22<sup>nd</sup> April 1999 at Multipurpose Hall, BARC, Training Hostel, Mumbai by the Council of Power Utilities and Central Board of Irrigation & Power in association with the Nuclear Power Corporation, Mumbai. The inaugural function of the seminar was held on 21<sup>st</sup> April 1999. Dr. R. Chidambram, Chairman, Atomic Energy Commission and Secretary (Department of Atomic Energy) inaugurated the seminar. Dr. Y.S.R. Prasad, Chairman, CPU and Chairman & Managing Director, NPCIL delivered the presidential address and Dr. V.J. Madden from World Association of Nuclear Operators, England delivered the keynote address.



About 150 delegates participated in seven technical sessions spread over two days. In all forty technical papers were accepted for presentation in the seminar. The seminar ended with the concluding session on 22<sup>nd</sup> April, 1999 with summing of the deliberations made during the seminar.

### 7.22 2<sup>ND</sup> INTERNATIONAL CONFERENCE ON FLY ASH DISPOSAL AND UTILISATION AT NEW DELHI

2<sup>nd</sup> International Conference on “Fly Ash Disposal and Utilisation” was organised by Central Board of Irrigation Power and Fly Ash Mission, TIFAC, Ministry of Science & Technology at Hotel Le-Meridien, New Delhi.

1<sup>st</sup> International Exhibition on Fly Ash (Fly Ash Expo 2000) was also successfully organised on 2<sup>nd</sup>-4<sup>th</sup> February 2000 at Hotel Le Meridien, New Delhi. Exhibition was inaugurated by the **Hon’ble Minister for Environment & Forests Shri T.R. Baalu**.

The conference was **inaugurated by the Hon’ble Minister for Environment & Forests Shri T.R. Baalu**. Prof. V.S.



Ramamurthy, Secretary to Govt., of India, Ministry of Science & Technology delivered the Keynote address.

300 delegates from India and abroad participated in the conference. More than 70 papers were presented and discussed during three days of the conference spread over ten technical sessions.

### 7.23 INTERNATIONAL CONFERENCE ON POWER TRANSFORMERS AT NEW DELHI

Power transformers are vital links in the chain of components constituting a power system, starting from generating station and terminating in consumers' premises. Failures of transformers affect the supply of electric power to consumers causing inconvenience to the consumers on the one hand and avoidable expenditure on its replacement by the utilities on the other.

The reasons for failure of power transformers are manufacturing problems, material defects, abused operation, poor maintenance practices, sub-standard input materials, inconsistency of the design parameters with the practical field environment, design deficiencies, over-voltages and short-circuits, etc.

With the privatization of transmission and distribution, the quality and reliability of power transformers assumes great significance.



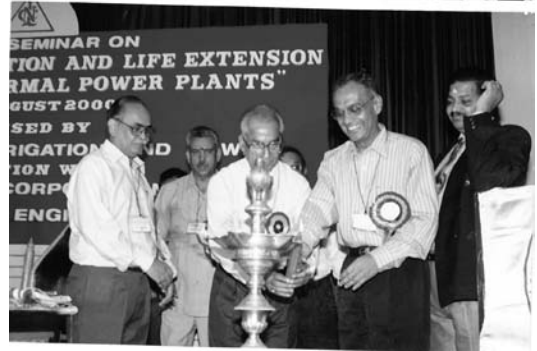
With a view to familiarize the executives from utilities, industries and R&D organizations as well as teachers and research engineers from academic institutions with recent development as well as future trends in the field of power transformers, an International Conference on Power Transformers was organized by Central Board of Irrigation and Power in April 2000 at Hotel Taj Palace, New Delhi.

The conference is co-organised by Power Grid Corporation of India Ltd., New Delhi. The conference was inaugurated on 6<sup>th</sup> April 2000 by Shri R.P. Singh, CMD, Power Grid Corporation of India Ltd. Shri. K.G. Ramachandran, CMD, BHEL presided over the function. Dr. Reinhart Baehr, ABB Transformatoren GmbH, Germany and Chairman, CIGRE SC 12 Transformers delivered the key note address during the inaugural function.

More than 350 delegates from various State Electricity Boards, R&D Institutions, Equipment Manufacturers, Engineering Colleges and Private/Public Sectors (Power) participated in the conference. In addition to these delegates from Bangladesh, Bhutan, Canada, Germany, Norway, Singapore, South Africa, Sri Lanka, Sweden, UAE, UK and USA also participated in the conference. Total 38 papers were presented in the five different Technical Sessions.

## 7.24 SEMINAR ON “RENOVATION, MODERNISATION AND LIFE EXTENSION OF COAL BASED THERMAL POWER PLANTS” AT NEYVELI

The Central Board of Irrigation and Power, New Delhi in association with Neyveli Lignite Corporation Ltd. and the Society of Power Engineers (India) organised a two-day Seminar on “Renovation, Modernisation and Life Extension of Coal based Thermal Power Plants” from 27<sup>th</sup>-28<sup>th</sup> August 2000 at the NLC Training Complex, Neyveli.



About 120 delegates from Central Government Departments, SEBs, Corporations, Private Companies and eminent personalities in the field participated in the seminar. Shri N.T. Shanmugam Hon’ble Minister for Coal could

not inaugurate the function due to some prior urgent engagement at that time. The inaugural speech of the Hon’able Minister was read out in the inaugural function.

Total 28 papers were presented by the authors in six different technical sessions. During the seminar the participants also visited plant I (6 x 50 + 3 x 100 MW) of units and lignite mines.

Based on the deliberations and apprehensions expressed in the seminar, recommendations were finalised.

## 7.25 INTERNATIONAL SEMINAR ON COMPACT SUB-STATIONS AND GAS INSULATED SWITCHGEARS AT NEW DELHI

The Central Board of Irrigation and Power organised an International Seminar on “Compact Substations and Gas Insulated Switchgears” on 18<sup>th</sup>-19<sup>th</sup> January 2001 at Hotel Ashok, New Delhi. The seminar was **inaugurated by the Hon’ble Union Minister for Power, Shri Suresh P. Prabhu**. Shri Yogendra Prasad, Chairman & Managing Director, National Hydroelectric Power Corporation presided over the function. In his inaugural address he appreciated the relevance of the subject and importance of introduction



of latest technology for achieving reliability and efficiency in the power system. He desired that the participants should take full advantage of presentations being made to achieve the above designed objectives.



## 7.26 INTERNATIONAL CONFERENCE ON RENEWABLE ENERGY AT NEW DELHI

Energy is one of the main basic inputs for the accelerated economic development and the fossil fuels have – “powered” the tremendous industrial and economic development so far in the world. The oil crisis of 1973 served the warning that fossil fuels were neither inexhaustible nor cheap any longer.

Considerable worldwide efforts have since continued in the search for viable energy alternatives based on renewable and non-conventional energy sources. Apart from its renewable nature that does not deplete the natural resource, renewable energy is also

environment friendly and meets the rising concern of potential change and CO<sub>2</sub> emission and require comparatively less gestation period to start functioning.

Considering the rapid advances in technology for harnessing these resources, the Central Board of Irrigation and Power (CBIP), jointly with National Power Training Institute and International Association for Small Hydro, organized the International Conference on “Renewable Energy” in New Delhi from 6<sup>th</sup>-8<sup>th</sup> October 2004.

There were 70 keynote lectures, articles and case histories, contributed by experts from Australia, Bangladesh, Colombia, Denmark, Egypt, Germany, India, Nigeria and Tunisia.

The papers as well as subsequent discussions were highly educative and informative for the participants.



## 7.27 CONFERENCE ON ‘DEVELOPMENT OF HYDRO POWER PROJECTS - A PROSPECTIVE CHALLENGE’ AT SHIMLA

The Central Board of Irrigation and Power (CBIP) organized a Conference on “Development of Hydro Power Projects - A Prospective Challenge”, including a special session on “Small Hydro Power Development”, jointly with Himachal Pradesh State Electricity Board (HPSEB) at Shimla from 20<sup>th</sup>-22<sup>nd</sup> April 2005. **Hon’ble Chief Minister, Government of Himachal Pradesh, Shri Virbhadra Singh** inaugurated the Conference.



Delegates from across the country as well as from Bhutan and Nepal attended the Conference. Shri G.N. Mathur, Secretary, CBIP made a presentation on the national scenario of hydropower and elaborated the activities of the Board.

## 7.28 SEMINAR ON “SAFETY IN CONSTRUCTION” AT CHANDIGARH

Safety during construction is of paramount importance not only to ensure stability of structures but also to ensure safety of the work force and the machinery at sites. Safety in tunnels and cavities may be endangered due to sudden rock falls, water and or gas inflows, geological failures, inadequacy of ventilation, etc. Failures at excavation sites may take place due to slope failure, inflow of water, inadequate measures taken during blasting, etc.

There is a need to focus on strategic issues of how to prevent and avoid accidents on sites and preventive measures to be taken during the entire construction period. Experience shows that often construction accidents are poorly investigated and the primary cause of the accident to why the situation was allowed to develop and accident happened is left out.

Realising the importance of the subject, the Central Board of Irrigation and Power (CBIP), The Institution of Engineer (India), Punjab and Chandigarh State Centre & Safety and Quality Forum, IEI jointly organized the Seminar on “Safety in Construction” from 30<sup>th</sup>–31<sup>st</sup> May 2005 to exchange information and experiences on the subject.

The seminar was **inaugurated on 3<sup>rd</sup> May 2005 by Shri K.C. Pant, Hon’ble Former Defence Minister, Govt. of India** and Ex-Deputy Chairman, Planning Commission.

There was excellent response both from authors and participants. More than 100 delegates from various government organizations, manufacturers and academic institutions participated in the seminar. Seven Keynote addresses were delivered by the eminent engineers in the field during the seminar.



## 7.29 WORKSHOP ON CLEAN DEVELOPMENT MECHANISM: APPLICATION TO HYDRO-POWER IN INDIA AT NEW DELHI

The Central Board of Irrigation and Power (CBIP) in association with a Central Electricity Authority (CEA); CDM India, GTZ, National Hydroelectric Power Corporation Ltd. and The Energy and Resources Institute (TERI) organised a Workshop on “Clean Development Mechanism: Application to Hydropower in India” in New Delhi from 24<sup>th</sup>-25<sup>th</sup> May 2007.

The objective of the workshop was to exchange experiences and improve understanding of CDM requirements and good practices in CDM methodology and project preparation to identify areas in need of further clarification and guidance, besides to discuss options for streamlining and simplifications enabling implementation of CDM in hydro projects.



More than 100 professionals, policy and decision makers from India and Germany participated in the stimulating debate on the various issues relating to implementation of CDM in hydro projects during the two days deliberations.

The workshop was **inaugurated by Shri Sushilkumar Shinde, Hon'ble Minister of Power, Government of India. Shri S. Regupathy, Hon'ble Minister of State for Environment & Forests, Government of India, presided over the inaugural function.** Following publications were jointly released by the Hon'ble Minister of Power and Hon'ble Minister of State for Environment & Forests during the workshop.

### **7.30 CONCLAVE ON “KEY INPUTS FOR ACCELERATED DEVELOPMENT OF INDIAN POWER SECTOR FOR 11<sup>TH</sup> PLAN AND BEYOND” AT NEW DELHI**

To deliberate the issues involved in accelerating the development of power sector, the Ministry of Power and Central Electricity Authority in partnership with CII, organized a two-day International Conclave on “Key Inputs for Accelerated Development of Indian Power Sector for 11<sup>th</sup> Plan & Beyond” on 4<sup>th</sup> – 5<sup>th</sup> July, 2007 at Hotel Ashok, New Delhi. The Central Board of Irrigation & Power was the Co-organizer for the Conclave.

The Conclave was aimed to apprise the Equipment Manufacturers, EPC Agencies, Civil/Mechanical/ Electrical Contractors, Industry Associations, Power Utilities and Training Institutes about the capacity addition programme during the 11<sup>th</sup> Plan & Beyond and to discuss the key inputs required for implementing various generation, transmission and distribution projects.



The conclave was **inaugurated by Hon'ble Minister of Power, Shri Sushilkumar Shinde, Shri B.K. Chaturvedi, Member (Planning Commission)** was the Guest of Honour. Other eminent speakers who addressed the gathering during the inaugural session were Shri Anil Razdan, Secretary, Ministry of Power, Shri Rakesh Nath, Chairperson, Central Electricity Authority and Shri V. Raghuraman, Principal Advisor, CII, **Dr. Kirit S. Parikh, Member, Planning Commission chaired the Valedictory Session** of the Conclave on 5<sup>th</sup> July 2007.

About 85 industries including BHEL, Dong Fang, L&T, MHI, Ansaldo, Alstom, VA Tech and Toshiba, 125 Nos. Research Institutions, State Governments, CERC and State Regulatory Commissions, Ministry of Heavy Industries, PSUs and 25 other organizations participated in the Conclave. A detailed paper giving the Key Inputs for Accelerated Development of Indian Power Sector for 11<sup>th</sup> Plan and Beyond was circulated. It was emphasized that the power sector was poised for long term capacity addition and the industry should take steps to the increase production and project execution capacity to meet the targets.

### 7.31 INTERNATIONAL CONCLAVE CONTRACT MANAGEMENT FOR ACCELERATED DEVELOPMENT OF INDIAN HYDROPOWER PROJECTS AT NEW DELHI

Many projects in the Himalayan Region are affected by unforeseen site conditions, which necessitate changes in design or construction methodology. Such changes often lead to contractual problems between owners and contractors, resulting in delayed project completion. To focus on the need to develop an equitable contract system and mechanisms for quick dispute resolution, and to address the potential for unforeseen calamities at hydropower construction sites, as well as to foster synergy among developers, consultants and contractors for timely completion of



hydropower projects, the Ministry of Power, the Central Electricity Authority with the Central Board of Irrigation & Power as Co-organizer, organized a one-day International Conclave on “Contract Management for Accelerated Development of Indian Hydropower Projects” on 16<sup>th</sup> November, 2007 at New Delhi.

The conclave was **inaugurated by the Hon’ble Minister of Power Shri Sushilkumar Shinde.**

While inaugurating the conclave, the Hon’ble Minister complimented the MoP, CEA and CBIP on their prompt action to organize the conclave in view of the implementation constraints faced during 10<sup>th</sup> Plan period. He also referred to the conclave organized in July 2007 to assess and plan for the requirements for key inputs and human resources for implementation of 11<sup>th</sup> Plan projects and beyond. The Hon’ble Minister opined that hydropower is the best choice in view of rising prices of LNG/Natural Gas and stated that India now has very low total carbon emissions. He suggested that a group of experts be formed to advise the MoP on the subject of contract management for hydro projects. He assured the audience that suggestions and recommendations that emerge from this conclave would be seriously considered by the Government. He expressed the hope that a model contract document would be formulated as a result of deliberations at this conclave.

Other eminent speakers who addressed the gathering during the inaugural session were Shri Anil Razdan, Secretary, Ministry of Power, and Shri Rakesh Nath, Chairperson, Central Electricity Authority.

Shri Rakesh Nath, Chairperson, CEA stated that contractual problems have been identified as a major reason for time and cost overruns in hydro projects. Due to deficiencies in contract documents, ambiguities and deficiencies in contract administration, project implementation is often unduly delayed. He stated that all contracts should incorporate detailed and reasonable provisions for dispute resolution. He informed the audience that MoP and CEA were holding regional conferences to sensitize the industry to the needs of power sector in the 11<sup>th</sup> Plan and

beyond. These conferences also help the Ministry of Power to understand the problems being faced by the industry. Efforts are under way to ensure that the capacity of new vendors is developed for manufacturing and implementation of power projects, to augment the existing capacity of the industry in India. Human resource development has been identified as another area which requires attention during the 11<sup>th</sup> Plan period, as shortages of trained manpower are being faced by the entire Indian power sector.

A total of 275 professionals and senior officers from Central and State Government agencies, developers, power utilities, hydropower development corporations, SEBs, manufacturers, design and development consultants, construction companies, industry associations, financial institutions, arbitrators and insurers participated in the deliberations of the conclave.

### 7.32 NATIONAL CONCLAVE ON ACCELERATED DEVELOPMENT OF POWER SECTOR IN THE NORTH EASTERN REGION AND SIKKIM AT GUWAHATI

“National Conclave on Accelerated Development of Power Sector in the North Eastern Region and Sikkim” was organized by MoP and CEA in partnership with Ministry for Development of North Eastern Region (DoNER), North East Council & States of North East and Sikkim. The Central Board of Irrigation & Power was the co-organizer. The conclave was inaugurated by **Hon’ble Union Minister of Power, Shri Sushilkumar Shinde**. Other eminent speakers who



addressed the gathering during the inaugural session were **Shri Tarun Gogoi Hon’ble, Chief Minister, Government of Assam; Shri D.Y. Sema, Hon’ble Minister of Power, Government of Nagaland; Dr.(Shris.) I.K. Barthakur, Member, North East Council; Shri Anil Razdan, Secretary, Ministry of Power, Shri Rakesh Nath, Chairperson, Central Electricity Authority.**

The conclave was attended by Central Ministries, North East Council, representatives of all the North Eastern states including Sikkim, State Regulatory Commission, PSUs, Border Road Organization and various other industries including BHEL, JP Hydro, KSK Energy Ltd. etc.

A detailed base paper giving the overview of power sector and major issues was circulated. It was emphasized that North Eastern Region is rich in energy resources and has a major role in meeting the energy requirement of the country in future. The region has huge hydro potential and is called powerhouse of the country. Despite the region being rich in natural resources and substantive mineral and hydrocarbons deposits, the region has been facing energy shortages.

### 7.33 WORKSHOP ON METERING DATA EXCHANGE – INTERNATIONAL STANDARDS & PROTOCOLS AND CONFERENCE ON ADVANCE METERING INFRASTRUCTURE AT NEW DELHI

Central Board of Irrigation & Power (CBIP) had organized a One day Workshop on ‘Metering Data Exchange -International Standards & Protocols [IEC 62056 (DLMS/ COSEM)]’ on 17<sup>th</sup> February 2009 and Conference on ‘Advanced Metering Infrastructure’ on 18<sup>th</sup> -19<sup>th</sup> February, 2009 in Desire Hall of Hotel Le Meridien, New Delhi. The Conference was inaugurated by **Shri. Jairam Ramesh, Hon’ble Minister of State for Commerce and Power**. Hon’ble Minister narrated in detail about improving distribution sector in this country.



A wide range of topics were covered by eminent faculty and experts during the deliberations. Technical papers were presented during the Conference covering many facets of AMI.

### 7.34 INTERNATIONAL CONCLAVE ON “KEY INPUTS FOR ACCELERATED DEVELOPMENT OF INDIAN POWER SECTOR FOR 12<sup>TH</sup> PLAN AND BEYOND AT NEW DELHI

Long-term planning is required for Power Sector in view of large gestation period of the projects. Ministry of Power and CEA therefore decided to take advance actions for the 12<sup>th</sup> Five Year Plan. Studies carried out in Central Electricity Authority indicate requirement of about 100,000 MW generation capacities in the 12<sup>th</sup> Plan Period. Out of this, a capacity of about 32,000 MW is presently under construction. It was considered expedient to have interaction with all the stakeholders to enable them to gear up and take advance action commensurate with the magnitude of the expansion proposed.



With the objective to sensitize the industry, utilities and State Governments about the requirement of 12<sup>th</sup> Five Year Plan, to review their preparedness and to identify constraints and road blocks experienced by the stakeholders for taking necessary remedial action an International Conclave on ‘Key Inputs for Accelerated Development of Power Sector for 12<sup>th</sup> Plan & Beyond’ was organized by Ministry of Power and CEA with CBIP as Co-organizer and IEEMA and CII as Industry partner from August 18<sup>th</sup>-19<sup>th</sup> 2009.

The Conclave focused on the Key Inputs, including Human Resource Development measures, required for implementing various generation, transmission and distribution projects targeted for completion during 12<sup>th</sup> Plan and beyond. The Conclave was inaugurated by the **Hon'ble Union Minister of Power, GoI, Shri Sushilkumar Shinde**.

In the Inaugural address, Shri Shinde informed that in order to bridge the existing gap between demand and supply and to meet the future requirements, there is a need to increase the existing Installed capacity of 1,51,000 MW to about 2,10,000 MW by 2012. A capacity of 80,610 MW is being monitored for the 11<sup>th</sup> Plan and the capacity addition requirement for the 12<sup>th</sup> Plan is likely to be about 1,00,000 MW. A systematic and realistic planning and aggressive monitoring of projects as well as substantial augmentation of manufacturing capacity of Main as well as Balance of Plant equipment would make the task easier. Availability of Key material and inputs does seem to be the crucial factors in fulfilment of the plan targets **Hon'ble Shri Montek Singh Ahluwalia, Deputy Chairman, Planning Commission and Shri Bhartsinh Solanki, Hon,ble Minister of State for Power** and Shri H.S. Brahma, Secretary to GoI, Ministry of Power also addressed the august gathering during the inaugural session.

The conclave was attended by about 500 participants from equipment manufacturers, contractors, private entrepreneurs, Power Utilities, financial institutions and training institutes.

A Base Paper containing the details of the proposed plan, issues involved and inputs required for implementation of the Plan, detailed requirements of equipments and materials was also prepared and circulated. A booklet containing details about equipment and key input requirement for 12<sup>th</sup> plan and beyond was also prepared and circulated.

### 7.35 60<sup>TH</sup> IEC MEETING AND 5<sup>TH</sup> ASIAN REGIONAL CONFERENCE AT NEW DELHI

In the Diamond Jubilee Year of ICID, the 60<sup>th</sup> International Executive Council (IEC) Meeting and 5<sup>th</sup> Asian Regional Conference (ARC) of the International Commission on Irrigation and Drainage (ICID) were held during 6<sup>th</sup>-11<sup>th</sup> December 2009 at Vigyan Bhawan, New Delhi. The event was organized by MoWR, CWC, INCID and managed by Central Board of Irrigation and Power.

The 5<sup>th</sup> Asian Regional Conference was inaugurated by the **Hon'ble Prime Minister of India Dr. Manmohan Singh**. in the presence of **Hon'ble Union Minister of Water Resources, Shri Pawan Kumar Bansal, Hon'ble Minister of State for Water Resources, Shri Vincent H. Pala, Dr. Chandra A. Madramootoo, President, ICID** and others. More than 850 delegates from 43 countries, including about 440 Indian delegates and representatives from International Organizations participated in various events to make it a great success.



## Exhibition

An exhibition of products and services related to irrigation, flood control and drainage was also organized from 9<sup>th</sup>-11<sup>th</sup> December 2009 in conjunction with the 5<sup>th</sup> Asian Regional Conference. The Exhibition was inaugurated by **Shri P.K. Bansal, Hon'ble Union Minister of Water Resources, Govt. of India** on 9<sup>th</sup> December 2009. More than 30 exhibitors from national and international agencies participated in the exhibition.



## Valedictory Session

**Hon'ble Union Finance Minister Shri Pranab Mukherjee** was the Chief Guest for the valedictory session. **Shri Pawan Kumar Bansal, Hon'ble Union Minister of Water Resources, Dr. Montek Singh Ahluwalia, Deputy Chairman, Planning Commission, Shri Vincent H. Pala, Hon'ble Minister of State for Water Resources, Shri Sachin Pilot, Hon'ble Minister of State for Communications & Information Technology**, were among others who addressed. Special Postal cover marking the 'Diamond Jubilee Year' (1950-2009) of ICID was released during the Valedictory Session.



## 7.36 SEMINAR ON SOLAR POWER DEVELOPMENT IN INDIA AND RELATED TECHNOLOGIES AT NEW DELHI

With an objective to bring together all the stakeholders and to give them first hand information about the Guidelines for development of grid interactive solar power generation, grid connectivity including metering arrangements and guidelines for development of solar plants through NVVN, Ministry of Power and Central Electricity Authority, in partnership with Ministry of New and Renewable Energy organized a One day seminar on "Solar Power Generation in India and Related Technologies" on 9<sup>th</sup> February 2010 at Nehru Memorial Museum, Teen Murti, New Delhi with Central Board of Irrigation and Power as Co-organizer.

The Seminar was inaugurated by the **Hon'ble Union Minister for New and Renewable Energy Dr. Farooq Abdullah** on 9<sup>th</sup> February 2010. The eminent speakers who addressed the



gathering during the inaugural session were **Shri Bharatsinh Solanki, Hon'ble State Minister of Power, Government of India**, Shri Rakesh Nath, Chairperson, CEA and Shri G.B. Pradhan, Addl. Secretary, Ministry of Power.

About 400 professionals attended the Seminar which included senior officials of MNRE, Secretaries of States, Chairmen of Electricity Regulatory Commissions, various Renewable development agencies, developers, power utilities, manufacturers, design and development consultants, construction companies, industry associations, financial institutions from various corners of the country. A few participants from countries like Korea and China also participated.



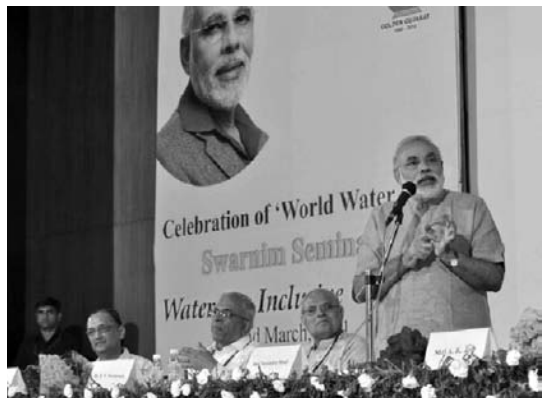
A Compendium of the regulations and tariff orders issued by regulatory commissions for renewable energy sector in India for the various sub-sectors, i.e., Small Hydro Projects, Solar Energy, Wind Power, Bio-mass Energy, Bagasse based co-generation plant etc. prepared by CBIP and sponsored by MNRE and IREDA was also got released from **Dr. Farooq Abdullah, Hon'ble Union Minister by CBIP** during the inaugural function.

One of the highlight of the seminar was the presentation by representative of KPCL who have done a wonderful job in completing the construction work for two solar projects of 3MW each i.e., Yalesandra solar plant in Kolar district and Itnal solar plant in Belgaum district. The cost per MW for both these project has come out to be about Rs. 19 crores / MW. They have undertaken the work on third project of the same capacity i.e., 3 MW at Raichur PV Plant at Yapaladinni. In this case, the cost per MW has come down to Rs. 14 crores per MW. The total cost works out to be about Rs. 42 crores. This is an excellent example of Solar Power Development in India and other stakeholders must emulate this example in the days to come.

### 7.37 WORLD WATER DAY - SWARNIM SEMINAR ON 'WATER FOR INCLUSIVE GROWTH' AT GANDHINAGAR, GUJARAT

Sardar Sarovar Narmada Nigam Limited, in association with Central Board of Irrigation and Power (CBIP), organised the Swarnim Seminar on "Water for Inclusive Growth" on 22<sup>nd</sup> March, 2011- World Water Day at Gandhinagar, Gujarat. **Hon'ble Chief Minister of Gujarat Shri Narendra Modi** inaugurated the seminar.

International Hydropower Association (IHA), International Commission on Irrigation and Drainage (ICID), International Water Resources Association (IWRA), Indian



National Commission on Large Dams (INCOLD), Gujarat State Centre of the Institution of Engineers (India), Confederation of Indian Industries, McKinsey & Company and The Association of Hydrologists of India joined as “Knowledge Partners” for this Seminar.

‘Marvel of Engineering’, a three-volume compendium documenting the history of the Sardar Sarovar Project entitled ‘Sardar Sarovar Project on the River Narmada’ was unveiled by Hon’ble Chief Minister on this occasion.

### 7.38 NATIONAL CONCLAVE ON BALANCE OF PLANTS – ISSUES AND CHALLENGES AT NEW DELHI

A National Conclave on ‘Balance of Plants - Issues and Challenges’ for the Power Plants was organised by Ministry of Power and Central Electricity Authority in association with Central Board of Irrigation and Power on 12<sup>th</sup> July 2011 in New Delhi. The aim of the Conclave was to review the indigenous capacity of the industry for manufacture of BoPs and the requirement of BoPs during 12<sup>th</sup> Plan onwards. Discussions were held during the Conclave, on the various issues impacting the building up of indigenous thereby facilitating timely execution of various generation projects.

The Conclave was inaugurated by **Hon’ble Minister of Power, Shri Sushilkumar Shinde** and was also addressed by **Shri K.C. Venugopal, Hon’ble Minister of State for Power**, Shri P. Umashankar, Secretary (Power) and Shri A.S. Bakshi, Member (Planning), CEA.

The Hon’ble Minister of Power in his key note address mentioned about the progress made by the Power Sector in the Country which had improved considerably during the past years and the capacity addition of more than 50,000 MW was expected during the 11<sup>th</sup> five year plan which was highest during any of the earlier plans and was highly commendable. He added that though 11<sup>th</sup> Plan was still not over and 12<sup>th</sup> Plan was yet to commence, around 80,000 MW capacities was under construction, which was remarkable. The likely capacity addition during 12<sup>th</sup> Plan was expected to be around 75,000 MW plus including the slippages from the 11th Plan and as the country was in the final year of the 11th Plan and had embarked on the finalisation of the 12<sup>th</sup> Plan, it was necessary to introspect and learn from one’s experience of the past and plan more effectively to achieve the targets. He exhorted the stake holders that this large capacity must not suffer on account of issues related with BoPs. He added that action had already been taken for a NTPC-BHEL Joint Venture for BoPs in the first phase; however more similar efforts for capacity building of BoPs were required. He requested the developers to be more careful in executing their projects, as problem in one sub system could lead to overall delay of the Project. He appreciated the suggestion of Hon’ble Minister of State for Power to engage the local industry more actively in development of execution of BoPs and not solely rely on JVs. He hoped that the Conclave would deliberate the associated issues and find out the solutions to the BoP related matters.



Hon'ble Minister of State of Power in his address mentioned that while recognising the crucial role of BoPs in the capacity addition of the power sector, emphasis needs to be accorded to indigenous capacity building for BoPs. This could be achieved by actively engaging the medium scale industry of the country and by training the existing BoP Vendors in a Public Private Partnership model.

Secretary (Power) in his address recounted that during the review of the implementation of the 10<sup>th</sup> plan capacity addition, the requirement of limited vendor base of BoPs, lack of standardisation of BoPs, etc were identified as inhibiting factors in timely capacity addition endeavour. Even though efforts have been made to overcome these constraints, however in view of the need to realise the capacity addition programme for the 12<sup>th</sup> plan, a lot needed to be done on the BoP front, in terms of widening vendor base, technological innovations, rigorous monitoring, more stringent levy of penalty for delays etc. The last mile was very critical, he stressed.

The One day Conclave was attended by a large number of Balance of Plant vendors such as Ash handling, Coal handling, Water treatment Plant etc. as well as EPC contractors and Civil constructing Agencies. A number of suggestions also emerged and it was agreed that all out efforts would be made to remove the constraints being experienced in order to give a further boost to timely generation capacity addition programme of the country.

### **7.39 INTERNATIONAL SEMINAR ON SURVEY AND INVESTIGATIONS OF HYDROELECTRIC PROJECTS – ISSUES AND CHALLENGES AT NEW DELHI**

The slippages in capacity addition for power sector, in general, and hydro, in particular, have been a matter of great concern. Environmental concerns, land acquisition, social issues, contractual issues and geological uncertainties are listed as major causes amongst the reasons cited for the delays. To overcome the problem of geological uncertainties, the role of Survey & Investigation amongst many other factors cannot be under estimate. Accordingly to study and analyze the situation and also gain first hand information about the International practices followed in this regard, an International Seminar on “Survey and Investigations of Hydroelectric power Project – Issues and Challenges” was organized by NHPC Limited in association with CBIP on March 28<sup>th</sup>, 2012 at CBIP Conference Hall, New Delhi.



The Seminar was inaugurated by the Chief Guest, Secretary to Government of India, Ministry of Power, Shri P. Umashankar.

Shri A.B.L. Srivastava, CMD, NHPC Limited, explained the background of Seminar. Shri S.P. Kakran, Member, CWC expressed concerns on the present status of Survey and Investigations

work and opined for the need to further improve upon Survey and Investigation of Projects by adopting modern technology.

Shri A.S. Bakshi Chairperson, CEA stressed the fact that 103 HE Projects expected to generate 27372 MW were under investigation at present. As such work of Survey and Investigations required sincerity and dedication. He also stressed that instead of tight schedules of Survey and Investigations there was need to give sufficient time for this important work.

On the sidelines of the Seminar, an exhibition to showcase investigation capabilities of NHPC was organized as well. The exhibition was also inaugurated by Secretary, Ministry of Power, Government of India.

There was very wide participation in the Seminar as senior representatives from Government Departments such as Central Electricity Authority, Central Water Commission, CSSHRIS, Geological Survey of India, BIS, besides from Public Sector Utilities namely NHPC, NTPC, SJVNL and THDC India Limited participated in the Seminar. The private sector was represented by senior functionaries from LANCO, GSHRI, SNC, ICCS Ltd, Bhilwara Group etc. The seminar also attracted a large representation and presentations from International community with delegates from U.K., China, Switzerland and Italy.

The recommendations as framed by a committee of senior executives were read out by the Chairman and after discussion and modifications the same were approved by the house.

#### 7.40 INDIA WATER WEEK – 2012 AT NEW DELHI

The first international event in the series of India Water Week was organized by the Ministry of Water Resource through Central Water Commission and National Water Development Agency during 10<sup>th</sup> - 14<sup>th</sup> April, 2012 at Vigyan Bhawan,

New Delhi, with support by CBIP. The event was inaugurated by **Hon'ble Prime Minister of India Dr. Manmohan Singh**, **Hon'ble Union Minister of Water Resources, Shri Pawan Kumar Bansal**, **Hon'ble Union Minister for Agriculture, Shri Sharad Pawar**, **Hon'ble Minister for Culture, Housing and Urban Poverty Alleviation, Smt. Sailja**, **Hon'ble Minister of State for Environment and Forests, Smt. Jayanthi Natarajan**, **Hon'ble Minister of State for Water Resources, Shri Vincent H. Pala** and **Shri Mohammad Ismael Khan**, **Hon'ble**



**Minister for Energy and Water, Govt. of Afghanistan and Deputy Chairman, Planning Commission, Shri Montek Singh Ahluwalia** also graced the occasion.

Two important publications on 'Water Resources Development Scenario in India' and 'History of Irrigation Development and Management in India' and a Map of 'Water Resources Development in India' especially brought out for the occasion were also released by Hon'ble Minister for



Water Resources, Shri. Pawan Kumar Bansal and Deputy Chairman, Planning Commission, Shri Montek Singh Ahluwalia. In all, there were 15 parallel technical sessions during the event covering various issues/challenges being faced in the water sector. An exhibition 'Water Expo 2012' was also organized at Pragati Maidan, New Delhi during the 'India Water Week' which was inaugurated by Shri Pawan Kumar Bansal.

#### 7.41 DIALOGUE ON INTERLINKING OF RIVER: ISSUES AND CHALLENGES AT NEW DELHI

**Shri Pawan Kumar Bansal, Hon'ble Union Minister of Parliamentary Affairs and Water Resources** inaugurated a Dialogue on Interlinking of Rivers – Issues and Challenges on 12<sup>th</sup> September 2012, organised jointly by Central Board of Irrigation & Power and National Water Development Agency (NWDA) in the conference hall of CBIP at New Delhi. Delivering the inaugural address Shri Bansal said that inter-basin transfer of water from surplus basins to deficit ones with a view to minimize the regional imbalances and optimally utilize the available water resources has become all the more important looking at realities on the ground. For that a general consensus and Cooperative Federalism is need of the hour for sharing of Waters, he emphasized. Regional variations in the rainfall lead to situations when some parts of the country do not have enough water even for raising a single crop. On the other hand excess rainfall occurring in some parts of the country creates havoc due to floods. One of the most effective ways to increase the irrigation potential for increasing the food grain production, mitigate floods and droughts and reduce regional imbalance in the availability of water is the Inter Basin Water Transfer (IBWT) from the surplus rivers to deficit areas. Lot of benefits by way of additional irrigation, domestic and industrial water supply, hydropower generation, navigational facilities etc. would accrue. Shri Bansal, also stressed that hurdles, if any, are to be removed with the consensus of all concerned. With a view to remove doubts or hurdles, if any, in implementation



of such schemes, Hon'ble Minister was of the view that close interaction is required among different stakeholders. He also desired that Central Board of Irrigation and Power, in association with National Water Development Agency, should do such conferences in all the States and also address the Hon'ble Members of Parliament to obtain willing support of the concerned State Governments and also other stakeholders which will help in speedy implementation of the schemes for interlinking of rivers. He opined that main issues related to resettlement and rehabilitation are to be looked at carefully so that the concerned are given maximum possible benefits which should facilitate acceptance of the R&R package. Environmental concerns are also to be looked into.

NWDA is required to prepare detailed project report of river link proposals under National Perspective Plan for Water Resources Development after concurrence of the concerned States.

During the first technical session, three presentations were made. One, on "Genesis of Interlinking of Rivers in India" by Shri A.B. Pandya, Director General, NWDA; second, on "Legal and Constitutional Aspects of Implementation" by Shri Videy Upadhyay, Advocate, Supreme Court, and the last, on "Political Views on Interlinking of Rivers" by Shri L. Rajagopal, Hon'ble Member of Parliament and Chairman of Organising Committee.

During the second technical session, Shri CM. Pandit, former Member, CWC gave a presentation on "Inter-basin Water Transfer - Myths and Realities". Subsequently, views of State Government participants who were directly concerned with the matter were also obtained.

**Valedictory session was addressed by His Excellency Shri Devanand Konwar, Governor of Bihar.**

More than 150 participants from fifteen States, Central Government organizations, retired Chairmen and Members of Central Water Commission and high dignitaries from other organizations participated in the event.

#### **7.42 INTERNATIONAL SEMINAR ON "MINIMIZING GEOLOGICAL UNCERTAINTIES AND THEIR EFFECT ON HYDROELECTRIC PROJECTS" AT NEW DELHI**

There is a broad feeling that hydroelectric projects take longer time than the schedule and the delays are commonly attributed to uncertainties in geological prognostication, without considering the inherent limitations of such studies and the applied methodologies. Accordingly, in order to minimize delays, it is mandatory that the geological and geotechnical assessments are made with greater reliability & precision towards establishment of safe and economic projects. It is therefore important to hold technical forum to deliberate upon the critical issues in addressing problems related to geological & geotechnical concerns towards finding appropriate solutions to overcome the challenges.



finding appropriate solutions to overcome the challenges.

In this context, NHPC Limited, in association with Central Board of Irrigation and Power (CBIP), organized an International Seminar on “Minimizing Geological Uncertainties and their Effect on Hydroelectric Projects” from 27<sup>th</sup>-28<sup>th</sup> September 2012 at CBIP Conference Hall, Malcha Marg, Chanakyapuri, New Delhi.

The seminar focused on the issues and challenges in integration of exploratory techniques for improving the reliability of geological assessment, and provided a forum to discuss matters of adoption of appropriate construction methodologies supplemented by contractual provision related to geological information and sharing of risks that are generally issues of concern. During the seminar, issues related to generating structural geological models for mechanized tunnelling sites as well as the selection of TBM types, specific for the site conditions, were discussed.

More the 140 delegates from India and abroad participated in the Seminar.

Shri A.S. Bakshi, Chairperson, Central Electricity Authority, mentioned that geological uncertainty and unexpected strata encountered during construction of tunnels and underground work of hydropower project, especially the large ones, result in unforeseen problems, increased quantities of execution, and time & cost overruns. He expressed the hope that project developers, contractors, consultants, engineers, suppliers, researchers who were attending the seminar would be greatly benefited from deliberations regarding the state-of-art technology and modern methodology in overcoming challenges occurring due to geological uncertainties during the construction of hydroelectric projects and thus minimize the cost overruns.

Shri Devendra Chaudhry, Additional Secretary to Government of India, Ministry of Power, mentioned that Hydro Electric Projects having about 6000 MW potential were affected by geological problems at present, and expressed hope that the very purpose of the Seminar would be not just to address a very large interesting and wider range of issues, but the focus should be to address what were the problems in those projects.

The keynote address on “Minimizing Geological Uncertainties and their Effects on Hydroelectric Projects” was delivered by Shri M. Gopalkrishnan, Former Secretary General, ICID, before the commencement of the technical sessions. Shri M. Gopalkrishnan emphasized the need for issues like cost of investigations, time frame required for planning to Design stage nature of tender documents. He mentioned that the Hydro Power sector should not be singled out for failures as failures had been observed all over the world and in case of tunnels in other sectors such as transportation sector.

Subsequent to various deliberations in the open house, draft recommendations were made.

### **7.43 INTERNATIONAL SEMINAR ON HYDRO POWER & SUSTAINABLE DEVELOPMENT, BHUBANESWAR**

The International Seminar on Hydro Power & Sustainable Development which was first of its kind in the state of Odisha was inaugurated by **Shri Naveen Patnaik, Hon’ble Chief Minister of Odisha** at Hotel Swosti Premium, Bhubaneswar on 21<sup>st</sup> February 2013.

He emphasized that although the initial cost of hydro power is very high but it is renewable, green & non-polluting source and act as peak power. The state govt. is trying to have a positive mix of hydro & thermal power in the state and identified 12 new medium/major sites for

development of 2000 MW of hydro power. He also declared that the state govt. has plan for pumped storage schemes at Indravati, Upper Kolab & Balimela.

Further he stressed upon development of small hydro projects which has a huge potential in the state to avoid submergence. He also declared that the state govt. has decided to establish a Green Energy Development Corporation for development of solar, wind & other green power.



**Shri Arun Kumar Sahoo, Hon'ble Minister, Energy and I & PR** presided over the function. He said the Govt. is giving priority to energy sector and several policy decisions have been made for development of hydro power. As compared to last year, a 40% increase has been made for energy sector in this year's budget. To fulfil the energy demand of the state, the govt. is encouraging establishment of more small & medium hydro electric projects.

He stressed on the fact that in the present scenario, power generation from sources other than hydro like thermal, etc create an adverse effect on the environment. Hence hydro power generation has become a light of hope for everyone.

The two days International Seminar was organised by Odisha Hydro Power Corporation Ltd. in association with Central Board of Irrigation & Power (CBIP), New Delhi. Deptt. of Water Resources Development & Management, IIT, Roorkee was the knowledge partner of the seminar.

**Prof. Asit Kumar Biswas from Lee Kuan Yew School of Public Policy, Singapore & Founder of Third World Centre for Water Management, Mexico** delivered the key note address.

Experts from Austria, Singapore, Mexico, Russia, United Kingdom, Bhutan & India attended the seminar as speakers. Delegates from different organisations including Central/ State PSUs/ Organisations have attended the seminar & took part in the deliberation. A total of 135 nos. of paid delegates attended the seminar & 48 nos. of delegates were sponsored by the sponsors.

During technical sessions, it was overwhelmingly opined that hydro power should be given utmost importance and Govt. should take pro-active steps for establishment of hydro power plants. MD, OHPC requested all stake holders to come forward for supporting establishment of hydro power plants & pumped storage plants in Odisha.

**Shri Arun Kumar Sahoo, Hon'ble Minister, Energy and I & PR, Govt. of Odisha** was the Chief Guest for the Valedictory function of the seminar & Shri B.K. Mishra, Member, OERC & Shri R.N. Khazanchi, MD, PHPA-I, Thimpu, Bhutan were the Guest of Honour.



# CHAPTER 8

## TRAINING PROGRAMMES

### 8.1 IMPORTANCE OF TRAINING

In today's scenario of competitive world when our country is passing through a critical phase of reforms, every infrastructure sector or industry is striving hard to give the best of its mandated services in a focussed way so as to achieve the customer satisfaction to an optimum level. The same is applicable for Power, Water Resources and the Renewable Sectors, to whom CBIP is rendering its dedicated services for their development.

### 8.2 TRAINING NEEDS OF POWER SECTOR

The main objective of Power Sector is to achieve customer satisfaction through generation of electricity of the right quality and quantity at an affordable cost and supply to the consumers efficiently whenever and wherever required. This involves planning, design, engineering, procurement, handling and storing, construction, commissioning, operation and maintenance of power plants, equipment, transmission and distribution, sale of energy and collection of revenue, management of personnel and finance etc., each a critical task in its own right.

Trained manpower is required at every stage of the above mentioned tasks. Fast advancement of technology is making every sphere of the electricity supply industry more and more sophisticated, requiring specially skilled engineers, supervisors, artisans, managers etc. to manage the industry. The growing concern over environmental degradation and depletion of the conventional energy sources has made the task more challenging. The technical knowledge acquired from engineering colleges, polytechnics, industrial training institutes and other technical institutions needs to be supplemented with applied engineering and managerial skills. These skills are to be regularly updated to cope with the ever progressing and rapidly advancing technologies being introduced in the power sector where the speed of obsolescence often overtakes the pace of acquisition of a particular skill. Due to the introduction of more sophisticated technology and automation, the Man/MW ratio is declining. The overall Man/MW ratio in power sector in India has declined from 9.42 in 9<sup>th</sup> plan to 5.63 in 11<sup>th</sup> plan and further decrease is projected to 4.74 and 4.23 in 12<sup>th</sup> and 13<sup>th</sup> plan respectively.

This indicates the increasing importance of each individual, i.e., the man behind the machine, which in turn makes manpower quality criteria more demanding. Added to this, is the fact that Power industry is a highly capital intensive industry. This all necessitates the operation of the plants and equipment in the most safe and efficient manner to minimise the cost of supply.

Power sector reforms in India have gained momentum with the initiative of most of the State Governments in establishing State Electricity Regulatory Commissions (SERC) and restructuring the SEBs. The reforms are expected to change the way the Indian Electricity Supply Industry has been functioning for the last six decades and therefore demands major changes in the roles of technical/managerial personnel at various levels. As power sector reforms involve a number of

complex and intricate issues, the people involved will need to be equipped with specific inputs in terms of knowledge, skills and attitude to enable them to play their changed roles effectively. This policy document is expected to help the stakeholders concerned in discharging the training responsibilities in a more effective manner.

### 8.2.1 Manpower Availability

On the basis of the total number of technical institutions operational in our country, it can be seen that at all the three levels i.e. graduation, diploma and ITI, there are sufficient number of students passing out each year. Based on the report of working group for power of 12<sup>th</sup> plan following table shows the manpower availability vs. additional requirement of manpower in the power sector

Manpower Availability vs. Additional Requirement

Colleges	Total Colleges	Annual Intake in lakhs	Total for 5 years (lakhs)	Manpower Requirement for 12th Plan (lakhs)
Engineering	3617	11.30	56.50	0.58
Management	4058	4.15	20.75	-
Polytechnics	540	0.93	4.65	0.56
ITI	8039	11.15	55.75	1.99
<b>Total</b>	<b>16254</b>	<b>27.53</b>	<b>137.65</b>	<b>3.13</b>

From the above analysis it is observed that sufficient number of Engineers, Managers and Diploma holders are available but as explained above the skill set required in the power sector in a few of the areas do not match the need of the industry. The Engineers and Diploma holders need to be groomed through practical oriented programs so as to make them available off the shelf for the power industry.

The working group has estimated that during the 12th plan the overall training load would be 2473 thousand man- weeks/year and the available training infrastructure is for only 1945 thousand man- weeks/year thus there is a deficit for training infrastructure for 528 thousand man- weeks/year.

### 8.3 TRAINING NEEDS OF WATER RESOURCES SECTOR

Training in Water Resources Sector by CBIP covers vast spectrum of activities. The water resources development of Irrigation involves planning, design, construction and operation of water storage structures like dams, diversion structures like barrages and weirs, conveyance structures and systems, canals with its regulation and distribution system, traditional & modern techniques of water application. Structural & non-structural methods of floods and drought management. Ground water development for use in irrigation, and management of coastal erosion also comes under Water Resources Sector besides the water diversion and conveyance systems (open channel or tunnels) of Hydro-projects.

As in other sectors, there has been continual emergence and development of newer and sophisticated techniques in Water Resources sector also. In Hydrology one has to deal with several

climatic parameters and components of hydrological cycle in highly uncertain manners. Attempts are constantly being made all over the world to revise and improve traditional hydrological practices for estimating rainfall and consequent response of a catchment for estimating accurately the runoff etc. With many areas already experiencing the water stress, and worsening prospects in near future due to climate change, better estimation & efficient management of our surface as well as ground water resources for multiple needs has already become a priority area. For this purpose, it has also become necessary to promote and apply emerging state of art technologies like Remote Sensing GIS and other soft tools for managing water resources in most scientific manner.

In the existing irrigation schemes, the regulation of flows in canal systems and automation of canal regulation & distribution is now being considered as an essential requirement for achieving efficient use of water. Projects like Sardar Sarover Canal have already drawn up an ambitious programme of computer based automatic regulation and distribution system not only for canal network but also at field level.

The use of drip and sprinkler system for achieving water use efficiency and water savings coupled with increased potential of output of crops is becoming not only necessary but also popular amongst all progressive and enlightened farmers.

Propagation of the concept of farmers participation in management, operation & maintenance of irrigation systems has assumed urgency for which 'water users associations' have been formed. The farmers in general and office bearers in particulars have to be sensitised and trained in all aspects of the above activities.

There have been highly significant technological developments in some areas of the Water Resources sector in the past few years which have to be integrated with our existing systems & practices. For example, Tunnelling techniques like use of TBM & other Boring machines are being used extensively these days. Similarly, Geosynthetic materials are being used for seepage control and slope stabilization of earth structures.

In view of the above, there is urgent need for capacity building and training of professionals dealing with the subject. Acquiring latest knowledge of new techniques and technologies will enable evolving better and more cost effective designs, as well as speedy execution of all hydraulic structures. There is also need for acquiring and use of modern tools such as satellite based telecommunication, facilities, computer based systems of acquiring, transmitting, dissemination and processing for flood management, flood forecasting & warnings as well as other water related disasters like drought.

The same applies to all types of civil engineering construction involved in irrigation, hydro electric projects.

Besides training of professionals, there is also acute need of capacity Building at grass root level, i.e., farmers for water application in their fields. Similarly general public has to be made aware about use of non structural methods of flood management and sensitizing them about the limitations of structural measures like embankments which many a times create false sense of security leading to indiscriminate encroachment & development of flood plain resulting in extensive and very high damages.

There is also need of removing the general impression amongst people, at large, about abundant availability of water in India due to plenty of rains and vast network of rivers. For this purpose awareness programmes for water saving and conservation and prevention of pollution of waters of our rivers and water bodies is essential.

## 8.4 TRAINING BY CBIP

### 8.4.1 Past History & Current Scenario

Besides its other activities like publication of journals, manuals, technical reports, guidelines etc. organizing conferences/seminars in the thrust areas/advance technologies, conducting of training programs has also remained as the strength of CBIP since its inception. Up to the year 2007 not much emphasis could be given on training to fresh engineers by conducting long term training programme for them. Whatever training programs were conducted by CBIP those were targeted for experienced senior personnel from power, water resources and renewable energy sectors. These training programmes received excellent response from Central / State Government Departments/ public and private sector organizations / construction agencies. CBIP has so far imparted training to nearly 19000 professionals officers in various fields. List of Tutorials conducted under Power Sector is at Appendix 8.1.



*Shri S.N. Verma, MD, TVNL during the valedictory session of the training program of TVNL executives*

### 8.4.2 Training Programmes under Power Sector

Keeping on view the massive requirements of trained manpower in Indian Power Sector as explained above, CBIP also took initiative to start long term training programs for fresh engineers (sponsored as well as non sponsored) so as to groom them as per the requirement of the power sector. Since then it has conducted number of training programs ranging from 7 to 14 weeks for NTPC, TVNL etc. Electrical / Mechanical Executives/ in the area of Thermal and Hydro Power.

CBIP also initiated conducting of job oriented long term programs fulfilling mandatory training requirements for operation & maintenance of power stations and associated to transmission as per CEA regulations 2010.

- 26 Week Post Graduate Diploma Course in O&M of Transmission & Distribution System - Two batches have already been completed and third batch is in progress
- 52 Weeks Post Graduate Diploma Course in Thermal Power Plant Engineering – One batch already completed and second batch is in progress



*Shri A.S. Bakshi, Chairperson, CEA, during the inaugural session of the PGDC in Thermal Power Plant Engineering (1<sup>st</sup> Batch)*

Till December 2012 CBIP has completed 3 long term programs and trained 136 engineers.

Almost all the engineers of the above courses, which have been completed, have found placement in power sector utilities/companies.



*Group photo of 2<sup>nd</sup> Batch of 26 weeks PGDC in O&M of T&D System (from 14<sup>th</sup> May, 2012 to 09<sup>th</sup> November, 2012)*

- **Linkages with Other Institutes/Organisations**

To make the above training courses practical oriented and to provide the applied engineering knowledge to the engineers through on-job training, scheme tracing, plant visits, manufacturer visit, simulator training etc. CBIP has made tie ups with following organisations of power sector

- **Utilities**

National Thermal Power Corp. (NTPC) , Powergrid, Bhakra Beas Management Board (BBMB), Indraprastha Power Generation Co. Ltd.(IPGCL), Haryana Power Generation Co. Ltd. (HPGCL), Dakshin Haryana Vidyut Vitran Nigam Ltd. (DHVVNL), West Bengal Power Development Corp. Ltd. (WBPDC), Delhi Transco. Ltd. (DTL) etc.

- **Educational and Research Institutes**

National Power Training Institute (NPTI), Excellent Enhancement Centre (EEC), Central Power Research Institute (CPRI), Ajay Garg Engineering College, Ghaziabad

- **Manufacturers**

Bharat Heavy Electricals Ltd. (BHEL), Skipper India Ltd., Hythro Power Corp. Ltd. (HPCL), Cable Manufacturing Unit, Insulator Manufacturing

- **Simulator Training/Visits**

West Bengal Power Development Corpo. Ltd. (WBPDC), National Power Training Institute (NPTI)



*PGDC students during on-job training at Palla sub station of DHVNL*

## 8.5 TRAINING PROGRAMME UNDER WATER SECTOR

In view of the vast needs of training in various areas of Water Resources Development and Management, CBIP has been very active in organising Workshops / Training programmes to cover large number of topics, with a view to expose the participants to latest advances in those topics. Training under irrigation, covered topics like canal lining, canal regulation including automation, use of micro irrigation methods, Environmental Impact Assessment of the Water Resources projects, Problem of Water logging, Salinity in irrigation commands, Command Area Development, weed problem in canals etc. Training programmes also covered design and construction of dams and tunnels. Assessment of design floods, dam safety, instrumentation in dams and other structures like Tunnels, use of Hydrological Models, use of new materials like Geo synthetics for seepage control of water, flood embankments, slope stabilisation etc, new construction technology of dams likes Roller Compacted concrete use of TBMs in boring tunnels and many other topics. CBIP also conducted a number training programmes for freshly inducted trainees of NTPC which were highly popular.

A list of Workshops / Training Programmes conducted under Water Sector is at Appendix 8.2.





## 8.6 INTERNATIONAL TRAINING

- **High End Programs**

CBIP has trained Nationals from Zimbabwe, Iraq, Oman, Bhutan, Bangladesh, Sudan, Ethiopia, Syria, Malaysia, Philippines, Cambodia, Myanmar, Zambia, Mexico, Nigeria, Kenya, Afghanistan, China etc., through various international training programs / seminars / conferences / conclaves etc. which were widely acclaimed by the participants and reflected through their encouraging feedback. CBIP has also conducted programs on the thrust areas in Nepal, Bhutan etc.

- **Short Term Training Programs**

CBIP has also conducted the following training programs for the International participants



- **Training Program for Engineers from Nigeria**

Training Program on Transmission System for 11 nos. Sr. Engineers from TCN, Nigeria was conducted from 10 September 2012 to 18 September 2012 and the feed back was quite encouraging



*Participants of training program on Transmission System from, TCN, Nigeria*

- **Training Program for Engineers from Sri Lanka**

Training Program for Engineering Assistant for 16 nos. engineers from Sri Lanka is to be conducted from 5 August 2013 to 10 August 2013.

## **8.7 TRAINING INFRASTRUCTURE AVAILABLE**

- **Corporate Office, Malcha Marg, New Delhi**

### **Library**

CBIP has a strong Publications Resources Unit which has produced more than 1000 manuals covering a wide range of activities in Operation, Maintenance and Managerial practices in the Water Resources and Power Sectors and some of these are being used as text/reference books in technical institutions and design offices.

### **Class Rooms**

CBIP has five class rooms of total seating capacity around 240 students with state of the art facilities viz. AC, Audio Video aid, furniture etc.

**Conference Hall**

A conference hall of seating capacity around 100 participants with state of the art facilities is functional and is extensively used for conducting the high end activities like seminar/conference/workshop etc

**Board Room**

A Board room is also available in CBIP having a seating capacity of 30 persons.

**Office Space**

There is total covered area of 20,000 Sq. ft. having all the modern facilities of A/C, Full sealing, tile flooring, good office furniture, wi-fi connectivity, DG set etc. for the office of Secretary, his Secretariat, Directors, faculty, other technical administrative and account department.

**Hostel Facilities**

As far as hostel is concerned CBIP has made tied up with various agencies for providing lodging and boarding facilities to the students

**CBIP, Centre of Excellence, Gurgaon**

CBIP is setting up CBIP CENTRE OF EXCELLENCE having multi storied complex of six floors and two basements with covered area of 60,000 sq. feet (approx.) at Sector 32 in Gurgaon. This Centre shall be operational from 1<sup>st</sup> August 2013. This centre shall be developed as State-of-the-Art Centre of Excellence with following facilities.

**Class Rooms**

6 state-of-the-art class rooms, 3 having seating capacity of 70 students each and 3 having seating capacity of 50 students each. All the class rooms are air conditioned have audio video facilities, projector, screen white Board modern furniture with good ambience. 100% DG back up and Central server with UPS back has been provided.

**Library**

A Library of about 1000 Sq. feet covered area with digitized version of books and journals. It has been about 6000 titles on Technical, Management and Other related topics and 50 National & International journals to give an over view of latest happenings in the technical and other related fields.

**Office Space**

Office facilities shall include Director Room, Syndicate room, examination office, faculty room, HOD room, reprography facilities, placement office, cafeteria, seminar hall etc.

**Parking Facility**

Parking facility for cars is available in the lower most basement and around the building.

## Laboratories

For imparting training to the trainees at different levels, following laboratories have been planned.

- Control & Instrumentation Lab
- Thermal Lab
- Transmission & Distribution Lab
- Hydro Lab

The above laboratories will support the long, medium and short duration programmes and will give a better understanding of the equipments and systems. It is proposed to set up laboratories having Power Plant equipments for making the trainees understand the basic concept of equipments, their working principle and their model shall also be displayed for better understanding of the systems/equipments. The details of the equipments proposed for each of the laboratories are identified as per the latest requirements in the field of Power plant engineering, Transmission, Distribution, Control and Instrumentation.

Most of the equipments for the labs shall be obtained from the Power Plants, Transmission and Distribution Utilities.

Working models of some of the equipments shall be got prepared from the experts and specialists under the supervision of CBIP experts.

Those equipments, tools, tackles and instruments which are not available from other plants and substations shall be procured from the market.

## Computer Lab

It is planned to set up two no. computer labs each labs suitable for imparting training to 30-40 students. Each computer shall be equipped with required operating system software and other supporting equipments. All the computers shall be connected through LAN with wi-fi facilities.

## Demonstration Sub -Station

It is planned to set up a small transmission line and a distribution line with all the elements to give a feel of the actual system installed in the field. These systems shall be set up on the roof of the institute buildings where sufficient space is available.

## 8.8 FUTURE TRAINING PROGRAMMES UNDER POWER SECTOR AT CBIP CENTRE OF EXCELLENCE

CBIP shall be shifting all activities related to long term training programs to CBIP, Centre of Excellence at Gurgaon w.e.f. August, 2013. In addition to 2 long term training programs it also plan to conduct the long terms training programs for fresh engineers/diploma holders.

- 26 Week Post Diploma Course in O&M of Sub Transmission & Distribution System
- 52 Weeks Post Diploma Course in Thermal Power Plant Engineering

- 39 Weeks Post Graduate Diploma Course in O&M of Hydro Power Stations
- 26 Weeks Post Graduate Diploma Course in Construction of Hydro Power Projects for Civil Engineers
- 52 Weeks Post Graduate Diploma Course in Geographical Information System and Remote Sensing
- 52 Weeks Post Diploma Course in Construction of Hydro Power Projects for Civil diploma engineers
- 26 Weeks Post Graduate Diploma Course in Renewable Energy
- 12 Weeks Training Program In Thermal Power Generation
- 6 Weeks Distribution Management System
- Tailor made training program as per the requirement of each organisation

### **8.9 FUTURE TRAINING PROGRAMMES UNDER WATER SECTOR**

In view of the multiple needs of training, it has also been planned for providing training to water resources personnel as well as to the farmers in CBIP's Centre of Excellence.

It is planning to address essential training needs of water resources engineers of States and Central agencies in the fields of planning, design, evaluation, construction, operation and monitoring of water resources projects. It is going to concentrate on conducting training courses for all water sector personnel, in the specialized and emerging areas, for which the existing state or other institutes are not adequately equipped.

#### *The Institute plans*

- To organise refresher and specialized courses for officers of Central and State agencies public sector undertakings, private sector companies
- To develop and maintain linkages with leading institutions in India and abroad dealing with training related activities in water resources sector for sharing of experience and expertise.
- To conduct training in advanced methods of structural analysis and design of Water Resources Development
- To develop training modules / case studies on new emerging Technology in water resources.
- To organize Induction Training Programmes for civil engineers on request by Public & Private Sector organizations.
- To organize training programme for trainees from foreign countries in respect of topic of Civil Engineering / Water Resources.

The core faculty for CBIP Institute of Excellence comprise of its in house specialists who have long practical experience in Water Resources Development and Management. The guest faculty would comprise of academicians and scientists of eminence from Premier Research Centers of Water Resources and universities in India, as well as practicing professionals and specialists drawn from other professional organizations and agencies engaged in Water Resources

Development in the field of design and construction and also members of CBIP from different parts of India. As CBIP is associated with the Indian chapters of International organisations like International Tunnelling and Under Ground Space Association (ITA), International Geosynthetic Society (IGS), International Hydropower Association (IHA) etc. International Commission on Large Dams (ICOLD), International Society for Rock mechanics (ISRM), International Water Resources Association (IWRA), and World Water Council (WWC). Well known experts who are members of these societies and who have helped CBIP to organise training programmes, in latest developments in their specialised areas in the past will also be requested to cooperate in future also.

The training programmes are envisaged both for Water Resources professionals as well as farmers.

### **(A) General Training / Refresher Programmes**

- Planning for Water Resources Developments
- Planning & Designs of various types of dams viz Gravity dams, Embankment dams, Arch & Bultress dam and Roller Compacted Dams etc.
- Design of Spillway, dam outlets & sluice ways.
- Planning and design of Diversion structures
- Silt exclusion & other appurtenant structures
- Planning & design layout of surface distribution system i.e. canals, cross drainage works etc.
- Irrigation practices
- Methods of surface application of water
- Subsurface methods Sprinkler & Drip Irrigation
- Design of Lift Irrigation systems, design and operation
- Reservoir Planning
- Flood Management & Forecasting other flood forecasting and warning systems
- Coastal erosion & application
- Design of tunnel and Under Ground Works

### **(B) Specialised Training**

In addition to above basic training courses, specialized training programmes are also planned.

- Construction Contract Management
- Water Quality Management for lakes & reservoirs
- Modernisation and Automation of canal systems
- Environment Aspects of Water Resources Projects
- Instrumentation of Dams
- Application of IT & Hydro-informatics in Water Sector

- Decision Support System
- Use of geosynthetics in Water Resources projects
- Modern Tunnelling Techniques
- Rock slope stabilization
- Flood forecasting Techniques including Inflow forecasts
- Preparation of Detailed Project Reports
- Design & Operation of Sprinkler & Drip Irrigation System

The Training programme for farmers will cover the following topics.

- Micro Irrigation (Drip & Sprinkler) in command & Non Command Areas
- Efficient methods of filed application of surface waters
- Soil Moisture conservation methods
- Rainwater Harvesting Techiques
- Conjunctive use of surface and ground water
- Drainage of irrigated fields including Bio-drainage methods
- Low cost drip Irrigation methods
- Use of simple, manually operated Treadle Pumps in shallow Water Table Areas
- Use of solar pumps for irrigation
- Efficient maintenance of Irrigation Pumps
- Methods of flood proofing for reducing flood damages.
- Participatory Irrigation Management

In addition to above, it is also planned to launch mass awareness programes on water saving, prevention of pollution of water bodies, environmental issues of water resources development Disaster Prevention and Management etc by involving schools colleges, and the NGOS and other stakeholders.

## **8.10 FUTURE VISION**

### **• Setting Up of State-of-the Art Learning Facilities**

CBIP also plans to establish following state-of the art learning facilities which would function as stand alone or in supplement to the technical knowledge acquired by the students in the formal class room

### **• Computer based Training Packages/Open Leaning Centre**

To give a better understanding of various equipments and systems in the power generation, transmission and distribution systems, computer based training packages shall be developed by the experts. The students would be able to learn at their own place and convenient time in an open learning centre having latest computers with multimedia facilities. Subsequently these packages shall also be used in Web based course delivery.

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**• Simulators**

Newer Technologies are being introduced regularly in all areas of Power generation, transmission and distribution systems. In order to give the trainees a feel of the actual operation of the various systems and equipments, their training on Simulators shall be very helpful. Although simulators are very costly, the training on simulators is also mandated in regulations issued by the Central Electricity Authority. Increase in size of generating units like super critical units of upto 800 MW Capacity, higher voltages in transmission and smart grid applications in Distribution are the latest trends. It is proposed to set up the following simulators:

- Thermal Simulators of Capacity 210 MW, 500 MW, 660 MW and 800 MW
- Hydro Generation Simulator
- Transmission Line Simulator
- Load Despatch Simulator
- Smart Grid and Distribution Simulator

**• Virtual Class Rooms/Video Conferencing Facilities**

Through virtual class rooms/video conferencing CBIP plans to conduct various training sessions by the faculties who are stationed at far off place or through webinars.

**8.11 POWER SECTOR SKILL COUNCIL PROGRAMMES**

CBIP is actively involved in setting up Power Sector Skill Council with headquarter in CBIP Building at Malcha Marg. Power Sector Skill Council is promoted by Power Sector Renewable Energy Sector and Power equipment manufacture sector. For imparting training to the trainees, facilities are being created in Gurgaon Centre of Excellence of CBIP.

Power Sector Skill Council aims to carrying out research and development in the latest fields of skill development where information regarding the best practices being adopted in skill development is collected and transmitted to the various professionals and organizations. Literature and publications on latest aspects of skill development shall also be collected for further distribution. CBIP shall be playing a key role in assisting Power Sector Skill Council in this regard.

**8.12 EXTENSION OF CBIP CENTRE OF EXCELLENCE**

In 1992, CBIP had purchased two plots from HUDA Gurgaon located in Sector-32 Institutional area. Possession of ½ acre Plot No. 21 was taken over from HUDA Gurgaon in 2010 over which CBIP Centre of Excellence is being set up. Possession of second plot located nearby of size ¼ acre is yet to be taken over from HUDA. It is planned to take over this plot from HUDA after CBIP Centre of Excellence is operational. After taking over, the building as per requirement of CBIP shall be set up on this plot. After utilizing the space available in Excellence Centre on Plot No. 21, further extended facilities shall be developed and provided in the new building proposed on ¼ acre plot.

### **8.13 SETTING UP OF CBIP TECHNICAL UNIVERSITY**

The requirements for education, training and Research in Power System, Renewable Energy and Water Resources Sectors are likely to go up manifold in the foreseeable future. Many new technologies are likely to come in the power generation, transmission & distribution and renewable sector. Groomed and trained manpower shall be required at various stages i.e. design, planning, erection & commissioning, operation, maintenance etc. of the development of sub disciplines of these areas. To develop this man power a dedicated technical university is required which would have national and international linkages and networking with the industries, training & research institutes, and with the reputed experts in each specialized area of the above sectors. CBIP plans to have this technical university in 15-20 acres of land having all the state-of –the art facilities like labs, demo units, research facilities including hostel, recreational facilities etc. as per the need of the day. The proposed University shall also have an international centre for linkages of Indian Engineers with their counter parts in other countries for exchange of knowledge, experience and best practices.

### **8.14 FACULTY AT CBIP**

- **In-house Faculty**

CBIP has a strong base of about 30, highly qualified and experienced in-house faculty in the area of Water Resources, Power (Generation, Transmission & Distribution) and Renewable having 30-40 years of rich experienced in many of the variants of these sectors.

- **Visiting/Guest Faculties**

Apart from in-house faculty Sr. professionals having rich experience in the area of their expertise are invited from various organisation like Central/Sate Govt., developers, power utilities, energy planners, private entrepreneurs, manufacturers, designers , consultants, construction companies, financial institutions, training & research institutions, industry associations, contractors and suppliers etc. to provide & share the applied engineering knowledge to the students.



*Appendix 8.1***List of Tutorials conducted under Power Sector**

1. Tutorial Course on Distribution Automation, 29 June 1994
2. Tutorial Course on Distribution Optimisation for loss Reduction, 28 June 1994
3. Tutorial I Power Quality Issues Measures, Sources and Analysis, Sept. 1997
4. Tutorial II - Power Quality Assessment and Solution Techniques, Sept. 1997
5. Tutorial III – Harmonics in Power System, Sept. 1997
6. Tutorial Course on Management of Power Distribution and loss Reduction, 19 January 2000
7. Tutorial Course on Life Management Techniques for Transformer, 28-29 May 2004
8. Tutorial Course on Understanding Technology Used in Numerical Relays and IEC 61850, 16th Nov. 2004
9. Tutorial No.1 Planning Aspects of HVDC & FACTS, Sep. 2005
10. Tutorial No.2 HVDV Terminal Equipment, Sep. 2005
11. Tutorial No.3 - New Development in HVDV / FACTS Equipment, Sep. 2005
12. Tutorial No.4 AC/DC Harmonics Filters, Sep. 2005
13. Tutorial No.5 VSC Transmission, Sep. 2005
14. Tutorial No.6 HVDV Controls and Protection, Sep. 2005
15. Tutorial by Experts - Power Transformers – Thermal Modelling Installation – O&M, failure Investigation and Phase Shifting Transformers, 11th October 2006
16. Tutorial on Wide Area Protection by Experts, 19-20 Nov. '07
17. Tutorial on Diagnostic tests on Power Transformers & Transformer Procurement Process, Nov. 2009
18. Tutorial on Reliability Based Condition Assessment of Power Transformers / Incipient Fault Detection, Nov. 2009
19. Training Course on Electrical and Firesafety in Power Industry, 25-26th March, 2010
20. 3 Days Training Program Erection & Commissioning of Hydro- Mechanical and Electro Mechanical Equipment of HE Project, 06- 08th July, 2010
21. Tutorials and 5th International Conference on Power System Protection and Automation, 6-9 Dec. 2010
22. Training program on “Diagnostic Approach for Maintenance of Electrical Rotating equipments in power stations and Industries”, 17-18 March 2011
23. 26 Week Long Term Training Program on O&M of Transmission & Distribution for Non Sponsored Candidates (Placement oriented) - 1st Batch, 08/08/ 2011 – 03/02/ 2012
24. 14 Week Training program on Thermal Power Development for NTPC Executives (Electrical & Mechanical), 08/09/2011 – 11/11/2011
25. CIGRE Tutorial with Elecrama-IEEMA at Mumbai, 20-21 Jan 2012

B1: Insulated

B2: Over Head Lines

B3: Sub station

B4: Power System Protection,

26. 52 Week Long Term Training Program on Thermal Power Plant Engineering for Non Sponsored Candidates (Placement oriented) -1st Batch, 26/09/2011 – 21/09/2012
27. 26 Week Long Term Training Program on O&M of Transmission & Distribution for Non Sponsored Candidates (Placement oriented)- 02nd Batch, 14/05/2012 -09/11/2012
28. 7 days Training Program on Transmission System for Engineers from TCN, Niegeria, 10/09/2012 – 18/09/2012
29. 52 Week Long Term Training Program on Thermal Power Plant Engineering for Non Sponsored Candidates (Placement oriented) – 2nd Batch, 08/10/2012 - Running
30. 7 Week Training Program on Hydro & Thermal Power Development, 08/11/2012 - 26/12/2012
31. Training Program on Advanced Super-Critical Technology, 29/11/2012 – 30/11/2013
32. 26 Week Long Term Training Program on O&M of Transmission & Distribution for Non Sponsored Candidates (Placement oriented) - 03rd Batch, 21/01/2013 - Running
33. Tutorial Course on Transformers, 22-23 Jan. 2013
34. Training Programme on “Failure Analysis of Electrical Equipments, 28/01/2013 – 30/01/2013
35. 12 Weeks Training Program on Thermal Power Development for TVNL Executives, 17/02/2013 – 04/05/2013
36. Training Programme on Coal Characteristics, Mill Performance and Combustion, 29/05/2013 – 31/05/2013

*Appendix 8.2***LIST OF WORKSHOPS / TRAINING PROGRAMMES  
CONDUCTED UNDER WATER SECTOR****From 1984 onwards**

- Workshop on Practical Geotechnical Instrumentation-RSRVP, 19-24 January, New Delhi
- Indo-Soviet Workshop on Rock Mechanics, 24-28 July 1984, New Delhi
- Workshop on Engineering Classification of Rocks, 15-16 March 1985, New Delhi
- Workshop on Flood Damage Assessment, October 1986, Guwahati
- Workshop on Use of Plastics for Lining of Canals, 7-8 May 1987, Vadodara
- Workshop on Silting Problems in Hydro Electric Power Systems, 25-26 June 1987, New Delhi
- Workshop on Strengthening of Dams, May 1988, Periyar Dam
- Workshop on Designing of Dams for Hydrological Safety, October 1988, Nagpur
- Workshop on Strengthening of Machhu Dam, January 1989, Ukai Dam
- Workshop on Unusual Storm Events and their Relevant to Dam Safety, 11-12 May 1989, Bhubaneswar
- Workshop on Unusual Storm Events and their Relevant to Dam Safety, 25-28 July 1989, Srinagar
- Workshop on Unusual Storm Events and their Relevant to Dam Safety, 27-28 September 1989, Narmada Sagar Dam
- Workshop on Environmental Impact Assessment from Water Resources Projects, 16-20 January 1990, Kozhikode (Kerala)
- Workshop on Environmental Impact Assessment from Water Resources Projects, 6-10 February 1990, New Delhi
- Workshop on Unusual Storm Events and their Relevant to Dam Safety, 19-20 February 1990, Nagarjunasagar
- Workshop on Environmental Impact Assessment from Water Resources Projects, 5-9 March 1990, DVC Maithon
- Workshop on European Hydrological System Model Applications, 10-11 September 1990, New Delhi
- Workshop on Rock Mechanics, 17-21 September 1990, New Delhi
- Workshop on Canal Automation, 27-29 April 1991, Aurangabad
- National Workshop on Sediment Measurement Techniques, 8-10 July 1991, Hyderabad
- Workshop on Rock Mechanics, 21-23 November 1991, Shimla
- National Workshop on Role of Geosynthetics in Water Resources Projects, 20-24 January 1992, New Delhi
- Regional Workshop on Rock Mechanics, 18-21 May 1992, Guwahati

- Regional Workshop on Rock Mechanics (Southern Region) 16-19 September 1992, Cochin
- National Workshop on Instrumentation Dams and Tunnels, 12-14 October 1992, Vadodara
- Workshop on Canal Lining, 21-22 January 1993, Bikaner
- Training Course on Landslides Hazard Mitigation Management, 5-10 April 1993, Guwahati
- Workshop on River Scour, 28-29 April 1993, Varanasi
- Workshop on Silt Damages in Hydro Power Plants and Remedial Measures, 4-8 October 1993, Roorkee
- Regional Workshop on Rock Mechanics, 1-4 November 1993, Udaipur
- Workshop on Canal Automation, 22-24 November 1993, Vadodara
- Short Course on Recent Developments in the Embankments of Soft Soils, 30 November - 2 December 1993, New Delhi
- Workshop on Sprinkler and Drip Irrigation Systems, 8-10 December 1993, Jalgaon (Maharashtra)
- South Zone Workshop on Integrated Development of Irrigated Agriculture, 14-15 December 1993, Madras
- West Zone Workshop on Integrated Development of Irrigated Agriculture, 20-21 December 1993, Bhopal
- One day short course on Recent Development in the Design of Embankments on Soft Soils, 31 January 1994, Calcutta
- Workshop on Tunnelling India, 22-26 February 1994, Pune
- Workshop on Blasting in Opencast Mining, 28 February 1994, Nagpur
- Training Course on Landslide Hazard Mitigation and Management, 19-23 April 1994, Kozhikode (Kerala)
- CBIP Zonal Workshop on Integrated Development of Irrigated Agriculture (East Zone), 21-22 April 1994, Bhubaneswar
- CBIP Zonal Workshop on Integrated Development of Irrigated Agriculture (North Zone), 28-29 April 1994, New Delhi
- Workshop on Reservoir Sedimentation 17-19 May 1994, Mysore
- Workshop on Rock Mechanics, 22-25 March 1995, Panaji
- Workshop on Nuclear Hydrology, 24-28 April 1995, Kozhikode (Kerala)
- Short Course on Recent Developments in the Design of Embankments on Soft Soils, 1-5 May 1995, New Delhi
- Workshop on Hydraulic Gates and Hoists in Water Resources Projects, 6-8 June 1995, Bangalore
- 2<sup>nd</sup> Course on Roller Compacted Concreted Dams, 10-15 July 1995, Roorkee
- Workshop on Dam Safety, 4-8 August 1995, Bhopal

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- Workshop on Integrated Development of Irrigated and Dry Land Agriculture in Maharashtra, 21-22 December 1995, Aurangabad
  - Workshop on Challenges in Ground Water Development, 23-25 January 1996, Madras
  - Workshop on Role of Geosynthetics in Hill Area Development, 22-24 February 1996, Gangtok
  - Workshop on Waterlogging and Soil Salinity in Irrigated Agriculture, 12-15 March 1996, Karnal
  - Workshop on Engineering with Geosynthetics, 14-15 March 1996, Visakhapatnam
  - Short Course on Dynamics of contract Management, 9-10 April 1996, New Delhi
  - Workshop on Engineering with Geosynthetics, 20-23 May 1996, Chandigarh
  - Workshop on Aquatic Weeds Problems and Management, 5-7 June 1996, Bangalore
  - Workshop on Dam Safety – Assurances and Rehabilitation, 18-21 June 1996, Bhubaneswar
  - Workshop on Silt Damages to Equipment in Hydro Power Stations and Remedial Measures, 25-26 July 1996, New Delhi
  - Workshop on Rock Mechanics, 12-14 August 1996, New Delhi
  - Training Course on Construction of Earthen Dam, 9-18 September 1996, Port Blair (Andaman)
  - Workshop on Dam Safety, 8-11 October 1996, Jaipur
  - Workshop on Canal Automation, 20-22 November 1996, Bhubaneswar
  - Workshop in Lift-Irrigation, 23-25 April 1997, New Delhi
  - Workshop on Canal Automation, 28-30 April 1997, Kochi
  - Short Course on Dynamics of Concrete Management, 11-14 August 1997, New Delhi
  - Workshop on Remote Sensing & GIS Applications in Water Resources Engineering 17-19 September 1977, Bangalore
  - Workshop on Micro Irrigation and Sprinkler Irrigation System, 28-30 April 1998, New Delhi
  - Workshop on Micro Irrigation and Sprinkler Systems, 25-27 May 1998, New Delhi
  - Workshop on Austrian Hydel Power Construction Methodology, 25-27 May 1998, New Delhi
  - Workshop on Canal Automation, 29 June-1 July 1998, Trichy
  - Short Course on Finite Element Method for the Analysis and Design of Dams and Underground Structures of Water Resources Projects, 20-24 July 1998, New Delhi
  - Half day Workshop on Financing and Private Sector Participation in Water Resources Projects, 6 November 1998, New Delhi
  - Workshop on Dam Safety, 15-17 March 1999, Burdwan (West Bengal)
  - Workshop on Rock Mechanics & Tunneling Techniques, 14-17 April 1999, Shimla
  - Workshop on Canal Automation, 27-29 April 1999, Aurangabad

- Seminar on Natural Catastrophes and Disaster Management, 18-20 August 1999, Hyderabad
- Role of Inmarsat in Canal Automation, 25 August 1999, New Delhi
- One-day Seminar on Reservoir Sedimentation, 25 January 2000, New Delhi
- Workshop – Instrumentation of Dams including Seismic Instrumentation, 19-21 April 2000, Rishikesh
- Workshop on Role of Dredging and Aquatic De-weeding in the Management and Development of Water Resources, 19 May 2000, New Delhi
- Workshop on Challenges in Ground Water Development, 7-9 June 2000, Tirupati (Andhra Pradesh)
- Workshop on Role of Gates and their Control in Water Resources Projects, 28-30 June 2000, Belgaum (Karnataka)
- Workshop on “Dam Safety including Instrumentation of Dams”, 15-17 November 2000, Thiruvananthapuram
- Workshop on Remote Sensing and GIS Application in Water Resources Engineering, 29-31 August 2001, Lucknow
- Workshop on Rock Mechanics and Tunnelling Techniques, 10-12 September 2001, Kathmandu (Nepal)
- International Course on Geosynthetics in Civil Engineering, 13 September 2001, Kathmandu (Nepal)
- Workshop on Design of Ventilation System for Long Tunnels Under Construction, 10 April 2003, New Delhi
- Short Course on Finite Element Method for the Analysis and Design of Dam and Underground Structures of Water Resources Projects, 21-25 July 2003, New Delhi
- Workshop on Applications of Geosynthetics in Infrastructures Projects, 20-22 November 2003, New Delhi
- Training Programme on Ground Water Quality Management, 18-21 May 2004, New Delhi
- Workshop on Flood and Drought Management, 16-17 September 2004, New Delhi
- Workshop on Safety in Construction, 30-31 May 2005, Chandigarh
- Workshop on Impacts of Bhakra Nangal Projects, 4 August 2005, New Delhi
- Workshop on Tunnelling in Himalayan Geology, 6-9 June 2006, Katra, J&K
- Seminar on Water Resources Future Options, 28-29 September 2006, Jaipur
- Workshop on Retaining Structures with Geosynthetics, 13 December 2006, Chennai
- Workshop on Clean Development Mechanism – Application to Hydro Power in India, 24-25 May 2007, New Delhi
- Workshop on Applications of Geosynthetics – Present and Future, 20-21 September 2007, Ahmadabad
- Workshop on Rock Mechanics and Tunnelling Techniques, 10-12 October 2007, Gangtok

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- International Conclave on “Contract Management for Accelerated Development of Indian Hydropower Projects”, 16 November, 2007, New Delhi.
  - Capacity Building and Training Programme for Different Stakeholders in India’s Hydropower Sector, 23-24 November 2007, New Delhi
  - Training Programme on Tunnel and Underground Works, 16-18 January 2008, New Delhi
  - 8 Week Training Program on Hydro Power Development, 21 January – 14 March 2008, New Delhi
  - Capacity Building and Training Programme for Different Stakeholders in India’s Hydropower Sector, 23-24 January 2008, Dehradun
  - 8 Week Training Program on Hydro Power Development, 17 March – 09 May 2008, New Delhi
  - Capacity Building and Training Programme for Different Stakeholders in India’s Hydropower Sector & Special Session on Contract Management Settlement of Claims, 24-25 March 2008, Shimla
  - Workshop on “Rock Mechanics & Tunnelling Techniques, 24-26 April 2008, Manali
  - Capacity Building and Training Programme for Different Stakeholders in India’s Hydropower Sector, 29-30 April 2008, New Delhi
  - Training Programme on Tunnel and Underground Works, 19-20 September 2008, Agra
  - 7 Week Training Program on Hydro & Thermal Power Development, 13 October – 05 December 2008, New Delhi
  - An Introductory Course on Geosynthetics, 19 November 2008, Hyderabad
  - 7 Week Training Program on Hydro & Thermal Power Development, 08 December 2008 - 23 January 2009, New Delhi
  - 7 Week Training Program on Hydro & Thermal Power Development, 27 January 2009 - 13 March 2009, New Delhi
  - National Seminar on Seismic Safety of Concrete Gravity Dams, 27 February 2009, New Delhi
  - Short Course on Seismic Design of Concrete Gravity Dams, 3-6 March 2009, IIT Kanpur
  - 3 Days Training Program on Construction of Hydro Power Projects, 02 – 04 July 2009
  - 7 Week Training Program on Hydro & Thermal Power Development, 09 November – 24 December 2009
  - Workshop, “Application of Rock Mechanics – Tools and Techniques” 15-17 January 2010, Nagpur
  - One day workshop on Use of TBM/Road Header in Underground works – Issues & Challenges, 6 April 2010, New Delhi
  - Training Programme on Planning, Design & Construction of Earth & Rockfill, 18-20 May 2010, New Delhi
  - One day Workshop on Seismic Aspects of Dam Designs – Issues and Challenges, 2 July 2010, New Delhi

- Workshop on Safety in Tunnel and Underground Construction, 23-24 July 2010, New Delhi
- Training Programme on Design & Construction of Underground Works of Hydro Power Project, 17-19 August 2010, New Delhi
- Workshop on Shortcreting and Grouting, 22 September 2010, New Delhi
- Training Programme on Civil Quality Aspects in Hydropower Project Construction, 28-30 September 2010, New Delhi
- 7 Week Training Program on Hydro & Thermal Power Development, 18 October – 03 December 2010
- One Day Short Course on Carbon Sequestration in Sedimentary Basins, 23 October 2010, New Delhi
- Workshop on Rock Mechanics Methods and Tools for Mining Applications, 24 October 2010, New Delhi
- Workshop on Use of TBM/Road Header in Underground Works – Issues & Challenges, 23-24 October, 2010, New Delhi
- 7 Week Training Program on Hydro & Thermal Power Development, 06 December 2010 – 21 January 2011
- Workshop on Construction of Dams & Tunnels in Weak Rocks, 25-26 May 2011, JUIT, Wagnaghat (Solan), Himachal Pradesh
- Workshop on Drilling and Blasting for Surface and Underground Structures, 11-12 August 2011, New Delhi
- An Introductory Course on Geosynthetics, 22 September 2011, Chennai
- Workshop on Dam Safety Management, 29-30 September 2011, New Delhi
- 7 Week Training Program on Hydro & Thermal Power Development, 10 October – 25 November 2011
- Short Course on Scour of Rock, 19 October 2011, New Delhi
- 7 Week Training Program on Hydro & Thermal Power Development, 05 December 2011 – 20 January 2012
- Training Programme on “Health & Safety in Tunnel and Underground Construction”, 20-21 February 2012
- Workshop on Waterproofing for Tunnel and Underground Structure – 29-30 August 2012, New Delhi
- Workshop on Dam Safety Management, 25-26 September 2012, New Delhi
- Workshop on Use of Steel Fibers for Underground Space, 17 October 2012, New Delhi
- Workshop on “Geosynthetic Reinforced Soil Structures-Design & Construction”, 17-18 October 2012, New Delhi
- Workshop on Design, Construction and Risk Management in Underground Construction, 24-25 February 2013, New Delhi
- Workshop on “Design, Construction and Risk Management in Underground Construction”, 24-25 February 2013, New Delhi



# CHAPTER 9

## CONSULTANCY SERVICES

### 9.1 INTRODUCTION

The history of providing consultancy services by the Central Board of Irrigation & Power is as old as its inception since the year 1927. This could be ascertained from the fact that not only the projects, requiring under the rules, to be submitted to the Govt. of India (GOI) were to be referred to a subcommittee of the Board, but it was opened to any provincial govt. to ask for a subcommittee (of the Board) to advise on any difficult technical question connected with the irrigation project under preparation even though the project might not require, under the rules to be submitted to the Govt. of India.

The Central Board of Irrigation (now Central Board of Irrigation & Power) was created with the very objective of, not only, enabling the provincial governments to obtain a second opinion in regard to irrigation projects, but also to give the Govt. of India authoritative advise in regard to the settlement of disputes between provinces arising out of the claims to the same source of supply. The consulting engineer to the Govt. of India and all the Chief Engineers for irrigation in the provinces were members of the Board. The Board worked through subcommittees consisting of those engineers with recent experience of works akin to those to be discussed. These subcommittees would be convened by GOI at the instance of local govt. concerned when a new project was about to be sanctioned or when a province found itself in difficulty for any technical matter. The constitution of the Central Board of Irrigation resulted in the benefit of the experience gained in one province being placed at the disposal of other provinces.

Hence, the fore-goings give us clear indications of the extent to which the job of providing consultancy by the Board has been given importance and since inception, it has been very closely involved giving recommendations for all technical matters of various irrigation projects of the country.

At present also consultancy is one of the thrust areas of CBIP and it undertakes consultancy jobs in various areas such as Power, Water Recourses and Renewable Energy. CBIP has a strong knowledge base including database of various case studies, a good collection of books in its Library, a strong base of its own updated technical manuals on various thrust areas along with a layer of very senior in-house officers and a strong base of more than 3000 members in the rank of Chief Engineers and above from reputed organizations (public & private) having rich and in-depth experience in various sub disciplines of these sectors i.e. Generation (hydro & thermal), Transmission, Distribution, Renewable, Irrigation, RCC dams Technology, Rock mechanics, Geosynthetics, Training, the man power planning etc.

It is quite capable of providing consultancy services to various utilities & organizations as per their requirements on various broad based and challenging issues. Some of the indicative areas where CBIP provides consultancy are indicated below:

Identification of hydro projects in states and clearance of PFR's & DPR's for Hydro Power and Thermal Power Projects

- Manpower planning, training need assessment and Development of Training Schedule for O&M personnel.
- Technical auditors of Hydro & Thermal Power Projects
- Preparation of operation and maintenance manuals.
- Recruitment of technical and non technical staff for power and water recourses projects on turnkey basis.
- Preparation of DPR/setting and establishment of training institute in any discipline of power sector.
- Consultancy for setting up Solar Power Plants.

CBIP being a think tank, with a back up support of experts in each narrow area of the three aforesaid sectors. CBIP also acts as guide to educational institutes, professionals for problem solving.

CBIP also provides free consultancy to the students.

In the recent past, CBIP has provided consultancy services to TATAs, KPCL, WPC Australia, APSEB, TNEB, IREDA, India Canada Environment Facility (ICEF), CPRI, US Hydro Power Council for International Development, PTC India Ltd., Indraprastha Power Generation Company Ltd. (IPGCL)/Pragati Power Company Ltd., Tenughat Vidyut Nigam Ltd. (TVNL), DTL etc.

## 9.2 CONSULTANCY PROJECTS UNDERTAKEN

The details of the some of the consultancy projects are as below:

- **Project Report for Sri Ramadevara Katte Mini Hydel Project (2x750 kW) – (1995)**  
A project for preparation of the Detailed Report for Sri Ramadevara Katte Mini Hydel Project (2x750 kW) was assigned to Central Board of Irrigation and Power by Karnataka Power Corporation Ltd. during the year 1995
- **Monitoring of Pilot project for energy conservation – installation of LT Switched capacitor banks in AP (Engineering Stall College of India, Hyderabad) – (1994 to 1999)**

This Project work awarded by REC to CBIP in 1994 was completed in 1999.

- **Rajasthan State Electricity Board requested CBIP for the consultancy assistance for arranging expeditious completion of their erection works of 33 kV Switchgear and other works at Parwan Lift Irrigation Scheme at Baran near Kota. – (1998)**

The Rajasthan State Electricity Board project's implementation had commenced quite a few years ago before it was referred to CBIP. There were delays for want of integration of various design and contractual obligations. The CBIP took up the project in hand and arranged for completion of balance work.

The project of Parwan Lift Irrigation Scheme, District Baran, Kota was inaugurated successfully on September 11, 1998 by the **Hon'ble Irrigation Minister, Rajasthan, Shri V.P. Singh Badnaur.**

- **SACFA Clearances for Tamil Nadu Electricity Board SCADA Project – (1999)**

This project was commenced in the year 1999 with an envisaged cost of Rs.15,90,000/- and completed in 2000.

- **Andhra Pradesh Energy Efficiency Project – Hyderabad Urban SCADA Project, SACFA Clearances – (2000)**

This project of SACFA clearances for the SCADA Project was commenced in the year 1999 with an envisaged cost of Rs. 16.00 lakhs and completed in 2000.

- **Project title; Study for Establishment of Model Distribution Management System in Nehru Place District of Delhi Vidyt Board: - (2001)**

This project is for studying the existing sub-transmission and distribution system in the Nehru Place District of Delhi Vidyt Board and consisted of the following main activities:

- Implementation of energy revenue monitoring system and customer interface
- Implementation of technical loss evaluation and proposals for revamping the system
- Remote monitoring on trial basis including communication
- Sample survey and analysis
- Data processing/simulation studies and analysis of results

This project was awarded by DVB to CBIP in June 2001 and scheduled to be completed within nine months period. The funding for the same was through Power Finance Corporation. The total cost of the project was Rs.87.00 lakh.

- **Prototype Inspection and testing of double circuit 132 kV towers – (July to August 2002)**

Western Power Corporation (WPC), Australia requested Central Board of Irrigation & Power for the Consultancy assistance for Prototype inspection of tower/Leg Extensions and Testing of four different type of towers for 132 kV D/C Pinjar - Eneabba Transmission Line at Kalpataru Power Transmission Ltd., Gandhinagar.

The Project's implementation was taken up in July - August 2002. The works consisted of:

- (a) Study of Standards of the Country for tower testing, Purchaser's specifications in respect of Tower testing requirements, Structural drawings of the concerned tower submitted by the supplier in connection with prototype inspection, Loading diagrams, rigging diagrams etc.
- (b) Pre-test checking of the Prototype tower assembly, report of the material and bolts/nuts used in tower, rigging arrangement and location of load cells at the test bed and calibration of all the load cells used for the tower test.
- (c) Guiding and witnessing the tests on the Prototype tower and preparation of test report.

The Western Power Corporation, Australia requested Central Board of Irrigation and Power to act as witness during testing of tower. In doing so, it had extensively utilized the services of retired eminent experts from the relevant disciplines from the state of Uttar Pradesh.

- **Identification of Techno-economically Attractive Hydro Projects in Uttaranchal**

Central Board of Irrigation and Power was awarded the consultancy work by M/s. Tata power Company for identification of 7 or 8 techno-economically attractive Hydro Projects of Uttaranchal Pradesh and other good Hydro Schemes having an installed capacity of about 100-150 MW and above. This project was successfully completed within stipulated time of 3 months (March 2006 – June 2006) at a cost of Rs. 2.50 lakhs and the report of the project covering salient features of the identified project(s) such as type of scheme, location and approach, installed capacity, head and brief of water conductor system etc. including location map and photographs of the project components collected by the CBIP team who visited a few projects to firm up the project features, was handed over to Tata Power Company.

- **Creation of All India Computerized data base of Power Sector Specialists – (2006)**

Central Power Research Institute, Bangalore allotted a project titled, “Creation of All India Computerized data base of Power Sector Specialists” with an envisaged cost of Rs.4.00 lakh for a period 6 months from December 2006 onwards. The project involved creating a data bank of Power Sector Specialists, in the area of Planning/Designs/ Manufacturing/ Execution /Maintenance and R&M/R&D/ Contracts/ Operation/Non Conventional/Nuclear/ Hydro {Turbine/Generator} / Thermal {Turbine/Generator} /Transmission/ Distribution/ Material Science & Insulation.

- **Documentation of Results & Benefits of research carried out under MOP sponsored Research Schemes on Power (RSOP) from 1961 to 1998 by CBIP – (2012)**

Central Power Research Institute (CPRI), Bangalore assigned a research project to Central Board of Irrigation and Power for compilation of the Results & Benefits of the research carried out under Ministry of Power sponsored Research Schemes on Power (RSOP) from 1961 to 1998 by CBIP with a envisaged cost of Rs. 5.00 lakhs and duration of six months.

The objective of this project was to facilitate compilation of the research reports of CBIP in the country and abroad at one point for benefit of the professionals, organizations and other stake holders etc for accelerated development of power sector particularly in their respective fields. The following was the Scope of the project:

- Collection of old reports/data from CBIP.
- Scanning / Typing of reports available with CBIP (130 nos.)
- Development of software for easy access and search etc.
- Uploading on website.
- Promotion of sale/circulation of the data of research reports.

385 projects under RSOP on the subject areas such as hydro, thermal, transmission, distribution and Protection & General etc were coordinated and monitored by Central Board of Irrigation & Power during the period 1961-62 to 1998-99. Out of 385 projects, 130 reports relating to important projects have been published.

- **Creation of Data Bank of Power Sector Specialists in the country and Proper New Software Package for easy access & search – (2012)**

Availability of profile of experts in various fields of power sector at one place is of great help to share best practices in all areas of power sector, to provide broad based expertise

and provide a solid network for interaction with industry for technological development. It would facilitate rendering consultancy services in different areas of power sector using the proposed data base for utilizing the services of power sector specialists. It would also help in meeting the future power growth requirement. In view of this Central Power Research Institute, Bangalore assigned this project titled, 'Creation of Data Bank of Power Sector Specialists in the country and Proper New Software Package for easy access & search' to CBIP to create a data base of power sector specialists in various categories in a systematic and structured manner with an envisaged cost of Rs. 6.00 lakh in February 2012.

The aim of the project was:

- To develop the category wise database of experts in the power sector in India.
- To develop new Software package for easy access and search of power sector experts with features like secure log in facility, secure log out facility, intelligent search etc.
- To regularly update the database of experts as per assignment of the job to CBIP from time to time.

• **Indraprastha Power Generation Co. Ltd. / Pragati Power Co. Ltd. – (2010)**

**Setting up of Solar Power plant(s) at various sites for Indraprastha Power Generation Co. Ltd. / Pragati Power Co. Ltd.**

CBIP has successfully completed the consultancy project of setting up of Solar Power plant(s) at various sites of IPGCL/PPCL, which include Preparation of PFR & DPR, tender documentation including technical specification; BOQ; cost estimate, project implementation; monitoring etc. for solar power generation system.

• **PTC Energy – (2011)**

Conducting due Diligence Study of 500 KW Hydro-Kinetic Energy Project on UBDC at Madhopur, Punjab on behalf of PTC Energy Ltd.

CBIP has successfully completed the consultancy project of conducting due Diligence Study on behalf of PTC Energy Ltd. with following scope of work

**Part A**

- Study of water availability round the year (in view of assumed PLF of 90%)
  - Reliable data for quantum of water (for adequate height proposed for suspension of machines)
  - Whether the water availability would be sufficient to achieve the claimed PLF of 90%
  - Velocity (Variations)
  - Authorization for use of canal water
  - Reliability of the past data available and collection of latest data
- To study the design details of the canal including slope, lining etc at the proposed site.
- Site visit to assess the field conditions.
- Confirmation about suitability of site.

- Details of permissions required for development of this project from different agencies like Punjab Irrigation Department etc.
- Whether this project would affect other irrigation and downstream power projects of the state.

#### **Part B**

- Technical Due Diligence of the proposed Hydrokinetic Power Plant including equipments to be used on technical parameters, efficiency, suitability, alternative option etc.
- Whether such technology requires patenting/license/certification & operational reliability of the proposed technology.

#### **Part C**

- Study of Capital Cost. Reasonability of the cost. If any such technology already exists in the market and its costing

#### **Part D**

- To assess the technical and commercial viability of establishing a factory for manufacturing the Hydro Kinetic Units.
- To assess whether PEL investing into the manufacturing facility would be a viable option.
- **Tenughat Vidyut Nigam Ltd. (TVNL) – (Oct. 2011 to May 2012)**

#### **Recruitment of Executives on Turnkey basis for Tenughat Vidyut Nigam Ltd conducted from October 2011 to May 2012.**

CBIP has completed the job of recruitment of executives for Tenughat Vidyut Nigam Ltd., a public sector undertaking of Jharkhand state Govt., in 11 disciplines on turnkey basis. The job involved releasing of advertisement in the newspaper, designing, testing & commissioning of customized software for inviting online applications, screening of the applications as per the various eligibility criteria, setting & printing of the questionnaires and OMR sheets, conducting of written test at various centers, issuing of online admit cards to the candidates, evaluation of the OMR sheets, preparation of result post wise/category wise merit of all the candidates, conducting of interviews and forwarding the final select list to the TVNL.

In total no. of 4141 online applications were received and the job has been completed by CBIP successfully within the time frame.

- **National Power Training Institute (NPTI) – (2011 to 2012)**

#### **Setting up of Questionnaire and Conduction of Post Graduate Diploma Course (CET) Exam on behalf on National Power Training Institute (NPTI) conducted during year 2011 and year 2012.**

CBIP has successfully completed the job of conducting Post Graduate Diploma Course (the most prestigious course of NPTI) Common Entrance Test (CET)-2011 Exam on behalf of NPTI which included designing of questionnaire and conducting of exam of more than 8000 graduate engineers of various disciplines at 14 centers.

CBIP has also completed the job of conducting the CET-2012 with same scope of work as above where more than 8000 graduate engineers of various disciplines had attended the written test at 14 centers.

- **Solar Energy Corporation of India (SECI) – (2013)**

**Conducting written test on behalf of Solar Energy Corporation of India (SECI) for the post of Sr. Engineer**

CBIP has already successfully completed the job of conducting written test on behalf of Solar Energy Corporation of India (SECI) for the post of Sr. Engineer which includes the screening of the applications, database management, designing of admit card and conducting of exam and evaluation of the OMR sheet. More than 3500 Engineers had applied for the test.

- **National Hydro Power Corporation (NHPC) – (2013)**

**Conducting departmental examination for National Hydro Power Corporation (NHPC) Supervisor's**

Recently CBIP has successfully completed the job of conducting departmental examination for National Hydro Power Corporation (NHPC) Supervisors which includes designing, printing & evaluation of OMR Sheet, designing of questionnaire and conducting of exam.

- **Power System Operation Corporation Limited (POSOCO) – (2013)**

**Disbursement of Scholarships to SC/ST/OBC Students (Boys & Girls) under POSOCO Scholarship Programme**

Recently CBIP has successfully completed the job of disbursement of scholarship to SC/ST/OBC students (Boys & Girls) who have passed the class X during 2012 on behalf of POSOCO.

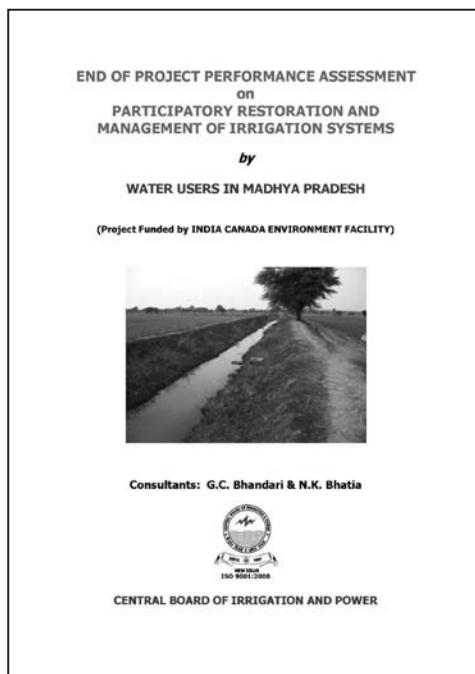
- **Bihar State Hydro Electric Corporation (BSHEC), Patna – (in Progress)**

**Main Power Planning/ Finalization of Manual personal and Finance Manual for Bihar State Hydro Electric Corporation, Patna - currently in progress.**

CBIP has been awarded the job of finalization of manpower planning, personal Manual, accounting Manual along with the delegations of power for Bihar State Hydro Electric Corporation, Patna. These projects are currently in progress.

- **Performance Assessment on Participatory Restoration and Management of Irrigation systems in Madhya Pradesh (2007)**

India-Canadian environment facility New Delhi entrusted CBIP the job of carrying out Performance Assessment on Participatory Restoration and Management of Irrigation Systems in Madhya Pradesh. The performance assessment was to be carried out for one major,



two medium and three minor irrigation projects of the state, which has been successfully completed.

### 9.3 OTHER CONSULTANCY WORKS

- The Indian Renewable Energy Development Agency (IREDA), US Hydropower council for International development and International Association for Small Hydro had sponsored the preparation of a “Manual on Development of Small Hydro-Electric Project” which was brought out in 2009.
- The special issues of “Water & Energy International” were bought out in respect of the following projects with the financial supports of the authorities of these projects
  - (i) Tehri Project
  - (ii) Indirasagar Project
  - (iii) Nathpajhakri Project
  - (iv) Omkareshwar Project
- CBIP was assigned the task of preparing a publication “Water Resources Development in India” and a map “Water Resources Map of India” by Indian National Committee on Irrigation & Drainage (INCID) on the occasion of the 60<sup>th</sup> International Executive Council meeting of ICID and 50<sup>th</sup> Asian Regional in Conference which were released at the time of its inauguration in December 2009, by the **Hon’ble Prime Minister of India, Dr. Manmohan Singh**.
- On the occasion of Indian Water Week 2012, CBIP was asked by the organizers to prepare two publications viz “Water Resources Development Scenario in India” and “History of Irrigation Development and Management in India”. These publication were released by Hon. Minister for Water Resources **Shri Pawan Kumar Bansal and Deputy Chairman Planning Commission, Shri Montek Singh Ahluwalia**.
- The Board has also been organizing workshops/training programs on Dam Safety and Canal Automation, exclusively for Kerala, Maharashtra, Orissa, Rajasthan, Tamil Nadu and West Bengal besides Indian Navy.