EXECUTIVE SUMMARY

1. INTRODUCTION

Power is a critical element of infrastructure for economic development and for improving the quality of life, therefore the reach of electricity should be to all the citizens of the country particularly to the poorest. Accelerated development of Renewable Energy sources such as sunlight, wind, water and biomass will have a vital role in the development of power infrastructure, for sustainable development.

Government of India has decided to provide 24 x 7 power to all the citizens of the country. The Government has a great mission of exploiting the Renewable Energy Sources in the country to an optimum level. In line with this mission it has multifaceted plans to tap the huge potential of unharnessed Renewable Energy Resources in an effort not only to supply 24 x 7 power to all but also to reduce the GHG emissions. These plans include about 100 GW of solar power, 60 MW of Wind power, 5 MW of power from small hydro plants and 10 MW from Biomass and Bagasse cogeneration plants by the year 2022.

2. RENEWABLE ENERGY SCENARIO IN INDIA (OVERVIEW)

Power generation from renewable sources is on the rise in India, with the share of renewable energy in the country's total energy mix rising from 7.8% in the year 2008 to 13% as on 31.12.2014. India has about 34 GW of grid connected installed renewable energy capacity as on 31 December, 2014. Wind accounts for about 66% of the capacity, with 22.5 GW of installed capacity, making India the world's fifth-largest wind energy producer. Small hydro power (4.0 GW), bio-energy (4.2 GW) and solar energy (3.0 GW) constitute the remaining capacity.

3. SMALL HYDRO POWER (UP TO 25 MW)

About 20,000 MW of potential has been assessed from small, mini and micro hydel schemes (i.e., schemes of capacity up to 25 MW). So far, 6474 potential sites with an aggregate capacity of 19750 MW have been identified. Small hydropower in natural streams, canal falls and dam toes mostly in Himalayan and other hilly regions where fast flowing and perennial streams, can easily be exploited for tapping this renewable source of energy

4. DEVELOPMENT OF SOLAR ENERGY IN INDIA

Sun is an inexhaustible source of Energy in the country. India is endowed with vast solar energy potential. About 5,000 trillion kWh per year energy is incident over India's Land area with most of the parts receiving between 4 and 7 kWh/sq. m. Solar energy can be used through thermal as well as photovoltaic routes. Both technology routes for conversion of solar radiation into heat and electricity, namely solar thermal and solar photovoltaics, can effectively be harnessed providing huge scalability for solar in India. Solar also provides the ability to generate power on a distributed basis and enables rapid capacity addition with short lead times. Off-grid decentralized and low-temperature applications will be advantageous from the rural electrification perspective. These applications will further meet other energy needs for power, heating, cooling etc. in both rural and urban areas. From an energy security perspective, solar is the most secure of all sources, since it is abundantly available. Theoretically, a small fraction of the total incident solar energy (if captured effectively) can meet the entire country's power requirements.

The geographical location of India enables it to have long and sunny days for major part of the year. Hence solar energy can be the practical solution to generate electricity for the mass of Indian population.

The Government of India has an ambitious mission to have 1,00,000 MW solar capacity by the year 2022, out of which, it is envisaged to set up of 25 solar parks in various States, each with a capacity of 500 to 1000 MW thereby targeting around 20,000 MW solar generation installed capacity.

5. POWER FROM BIOMASS

Biomass is one of the main energy sources for the mankind since civilisation. Biomass energy both in the off/ on grid mode is now a cost-effective route of power and, in most cases, combined heat and power generation (cogeneration). Every year millions of tons of Agriculture and Forest residues are generated and can provide a renewable source of energy. Biomass materials used for power generation include bagasse, rice husk, straw, cotton stalk, coconut shells, soya husk, de-oiled cakes, coffee waste, jute wastes, groundnut shells, saw dust etc.

The current availability of biomass in India is estimated at about 500 millions metric tones per year. Studies sponsored by the MNRE have estimated surplus biomass availability at about 120 – 150 million metric tons per annum covering agricultural and forestry residues corresponding to a potential of about 18,000 MW. This apart, about 5000 MW additional power could be generated through bagasse based cogeneration in the country's 550 Sugar mills, if these sugar mills were to adopt technically and economically optimal levels of cogeneration for extracting power from the bagasse produced by them

6. WIND POWER

Wind energy has emerged as a viable, cost-effective and commercial option for grid-connected power generation. During the past quarter of the century, a significant thrust has been given to the development, trial and induction of wind energy technology for use in different sectors. Potential for setting up wind farms at 80 meter height is about 103,000 MW. India is one of the leading countries in generating power through wind energy. The private sector and industry *are* playing a major role in the production of renewable energy equipment as also in the development of renewable energy capacities. There has been a major scale-up in manufacturing capability, particularly in the wind energy sector.

7. WASTE TO ENERGY

Every year, about 55 million tonnes of municipal solid waste (MSW) and 38 billion litres of sewage are generated in the urban areas of India. In addition, large quantities of solid and liquid wastes are generated by industries. Waste generation in India is expected to increase rapidly in the future. As more people migrate to urban areas and as incomes increase, consumption levels are likely to rise, as are rates of waste generation. It is estimated that the amount of waste generated in India will increase at a per capita rate of approximately 1-1.33% annually.

8. INSTITUTIONAL FRAMEWORK

The Government of India have announced various policies i.e. the Electricity Act in 2003, Electricity Policy in 2005, Tariff Policy in 2006 and Hydro Policy in 2008 to create a conducive atmosphere for investments in the power sector including renewable energy (RE) sector. Govt. has also launched Jawaharlal Nehru National Solar Mission (JNNSM) in the year 2010 to promote use of solar energy in the country and released a Draft National Offshore Wind Energy Policy in 2013 to enable optimum exploitation of offshore wind energy in waters, in or adjacent to country, seaward distance of 12 nautical miles from baseline

Electricity is a concurrent subject. Ministry of Power, Government of India is primarily responsible for the development of electrical energy inthe country. Ministry of Power deals with among other works, the prospective planning, policy formulation, processing of projects for investment decisions and monitoring of implementation of the conventional power projects at the Government of India level. State Governments perform the above functions at the State level. The inter-state transmission of power generated in the country is carried out by power grid corporation of India which operates regional and national power grids to facilitate transfer of power within and across the regions. Power grid is operating regional load dispatch centers. The power within the state is transmitted/distributed by the State Electricity Board/ Transmission/Distribution utilities.Power Finance Corporation and Rural Electrification Corporation are prime development financial institutions for the growth and overall development of the power sector in the country.

Role of MNRE and State Governments

India is the only country which has an exclusive Ministry (MNRE) dealing with New and Renewable Energy Sources. MNRE is the nodal Ministry of the Government of India for all matters relating to new and renewable energy. The broad aim of the Ministry is to develop and deploy new and renewable energy for supplementing the energy requirements of the country. The role of new and renewable energy has been assuming increasing significance in recent times with the growing concern for the country's energy security.

Indian Renewable Energy Development Agency (IREDA)

IREDA is a public limited company under the administrative control of MNRE. The key objectives of IREDA are to operate a revolving fund for the promotion, development and commercialization of renewable energy sources. It is also responsible for renewable energy technology upgradation efforts. IREDA provides concessional loan financing to project developers, equipment manufacturers, financial intermediaries and end-users.

Solar Energy Corporation of India (SECI) has been established by MNRE for accelerating the Solar Power development and is playing a key role in this regard.

9. FORUM OF REGULATORS

The forum of regulators was constituted in 2005 with Chairperson of CERC as its Chairperson and comprising Chairpersons of the various SERCs with Secretary CERC as its member to consider the relevant provisions of National Electricity Policy, Tariff Policy in order to meet the objectives of smooth and coordinated development of the power system in the country and to evaluate and address policy issues including on Renewables.

10. LEGAL AND POLICY FRAMEWORK FOR RENEWABLE ENERGY

Till the enactment of Electricity Act, 2003, the renewable energy development was mainly governed by the policies framed by Central and State Governments. Enactment of Electricity Act, 2003 has brought out radical changes to legal and regulatory framework applicable to renewable sector in the country as it has specific provisions for matters related to promotion of renewable energy technologies. The responsibility of promoting co-generation and non-conventional energy sources has been entrusted to the Appropriate Commission In section 61 and in particular to the State Commissions under section 86(1)(e) of the Act.

The Act provides for policy formulation by the Government of India and mandates State Electricity Regulatory Commissions to take steps to promote renewable sources of energy within their area of jurisdiction. Section 3 of the Act, clearly mandates that formulation of National Electricity Policy, National Tariff Policy and Plan thereof for development of power systems shall be based on optimal utilization of all resources including renewable sources of energy. The Electricity Act 2003 provides that co-generation and generation of electricity from non-conventional sources would be promoted by the SERCs by providing suitable measures for connectivity with grid and sale of electricity to any person and also by specifying, for purchase of electricity in the area of a distribution licensee.

11. PROCUREMENT FROM RE SOURCES - RENEWABLE PURCHASE OBLIGATION (RPO)

"Pursuant to provisions of Section86 (1) (e) of EA 2003, Appropriate Commission shall fix minimum percentage for purchase of power from RE sources taking into account availability of such sources in the region and its impact on retail tariff." The Renewable Purchase Obligation (RPO) has been notified by different SERCs for respective states. The Renewable Purchase Obligation (RPO) is the obligation mandated by the State Electricity Regulatory Commission (SERC) under the Act, to purchase minimum level of renewable energy out of the total consumption in the area of a distribution licensee.

RE procurement obligation specifies in terms of purchase of energy and not in terms of installed RE capacity. Besides, the RPO is increased progressively as envisaged in the National Electricity Policy. The RPO is related to energy input in the system of distribution licensee, after adjustment of transmission losses, and not the energy (sales).

Wind, solar and small hydro are considered as 'non-firm' power sources and cannot be scheduled whereas the generation from biomass and bagasse is considered as firm power and can be scheduled.

12. INTRODUCING RE CERTIFICATE MECHANISM (REC)

Central Electricity Regulatory Commission (CERC) has notified regulations on 14 January, 2010 on development of market from non-conventional energy sources by issuance of transferable and saleable credit certificates. These regulations are applicable throughout India except Jammu & Kashmir who have issued separate Regulations. These regulations specify terms and conditions for recognition and issuance of Renewable Energy Certificate for Renewable Energy Generation. There will be two categories of certificates, viz. solar certificates issued to eligible entities for generation from solar energy sources and non-solar certificates for generation from renewable sources other than solar. Each certificate shall represent 1 MW hour of electricity generated from renewable energy sources and injected into the grid. The certificates shall be dealt only through the Power Exchange and not in any other manner. The price of the certificate shall be as discovered in the power exchange. The certificates shall remain valid for three hundred and sixty five days from the date of issuance of the certificates. CERC vide its notification dated 29th January 2010 has designated the National Load Despatch Centre (NLDC) as the Central Agency for recognition and issuance of renewable energy certificate for renewable energy generation.

13. SHARING CLEAN DEVELOPMENT MECHANISM (CDM) BENEFITS

India emits only 3% of world's total emission of CO_2 and per capita emissions are 23% of the Global average. Energy sector is the main emitter of CO_2 accounting for 87% of CO_2 emissions mainly sourced from coal, followed by oil and natural gas. GHG emission in India is increasing @ of 4.6% against the world average of 2%. Because of high potential of GHG reduction, India is in a position to avail the opportunity by capturing around 20-30% of CDM market resulting to revenue flow of US $ 30-300 million (Natural Strategy Study). MNRE has developed a study report on conceptual issues related to baselines and development of overall methodology for Renewable Energy Project under CDM.

Most of the Regulations provide that CDM benefits should be shared between developers and consumers on a gross basis, starting from 100% to developers in the first year after commissioning, and thereafter reducing by 10% every year till the sharing becomes equal (50:50) between the developers and the consumers, in the sixth year. Thereafter, the sharing of CDM benefits should remain equal till the time that benefits accrue.

14. STRATEGY

The Ministry of New and Renewable Energy (MNRE) has been implementing comprehensive programmes for the development and utilisation of various renewable energy sources in the country. As a result of efforts made during the past quarter century, a number of technologies and devices have been developed and have become commercially viable.

All the State Governments in the country have notified their respective policies on Renewable Energy Sector and all the State Regulatory Commissions have announced specific Regulatory and Tariff orders for renewable energy projects taking into account availability of various renewable resources. With the increasing importance of Renewable Energy, these provide as the basic enabling framework and guidance in the respective territory / locations. IREDA had brought out a Compendium of Regulatory and Tariff orders issued by CERC and State Regulatory Commissions on Renewable Energy Sector in India in the year 2010, which was complied by the expert team of Central Board of Irrigation & Power. Since then, a lot of new Regulations and Tariff orders as well amendments to the existing regulations and tariff orders have been issued by CERC and SERCs in respect of renewable energy sources and more in particular for solar after the Government of India launched Jawaharlal Nehru National Solar Mission (JNNSM). Even a few of states have for the first time brought out their Regulations on RE generation. The need for a comprehensive and authenticated compilation of the relevant information was observed by MNRE and IREDA. CBIP offered its services for preparation of a Compendium of Regulatory and Tariff orders issued by CERC and State Regulatory Commissions on Renewable Energy

Sector in India on Renewable Energy to act as an aid to Investment Promotion in the area of Renewable Energy Sector.

The compendium has been prepared by CBIP experts having rich experience in the field. The experts worked out the following strategy for Compendium:

- ***Collection of Information/ Data***

The data/information in respect of Regulatory and Tariff orders issued by CERC and State Regulatory Commissions on various Renewable Energy sub-sectors, e.g. Solar Energy, Wind Power, SHP, Bagasse Cogeneration, Bio-mass Power, Waste to power etc for their respective jurisdiction was collected by visiting the websites, by personal contact, phone calls, multiple emails, follow-ups, personal visits etc., to have authenticated information.

- ***Compilation***

The collected Information/ data were available in different forms and formats. It was re-typed and edited for corrections and completeness to make these suitable for inclusion in the Compendium. Copy of all the original Regulatory and tariff orders issued by CERC and the state Regulatory Commissions has been compiled for detailed reference at any stage which form part of the compendium. More than 4000 pages of these orders were involved.

- ***Summary of Individual Regulation and Tariff Orders / Combined Summary of Regulations and Tariff Orders for each Sub-sector***

Summary of each individual order in 3-4 pages has been prepared in a standard format for easy understanding.

Further a combined comparative summary for each type of technology, e.g., Solar, Wind, Small Hydro, Biomass/ Co-generation etc. has been prepared mostly containing data for easy understanding and comparison. This combined summary will enable to make fast assessment of the various Regulatory & Tariff Orders.

- ***Updation***

Central Board of Irrigation and Power (CBIP) had brought this compendium in the year 2010 on behalf of IREDA. The present compendium is the 1st Revision of this compendium. As the process of declaration of Regulatory and Tariff orders by CERC and SERCs is an on-going process, this Compendium will require to be updated on a regular basis..

15. USEFULNESS OF THE COMPENDIUM

The compendium intends to provide basic knowledge to a developer about the various aspects to be kept in view while formulating a project report for generation from renewable energy sources. The eligibility criteria and qualifying criteria as laid down by regulations and tariff orders issued by CERC and SERCs in regard to renewable purchase obligation (RPO), tariff structure prevailing in various states, the framework for grid connectivity, power evacuation facilities, wheeling and banking charges, incentives for different RE technologies, financial aspects etc. and all those features which a developer should know have all been brought out in this compendium.

For compilation of this compendium, all out efforts have been made to collect all the Regulatory/Tariff orders, making summary of individual order and then preparing a combined summary for Solar, Wind, Small Hydro, Biomass / Co-generation etc. It was a challenge to make summary of these techno-legal documents in 10% space. Although every care has been less than taken by CBIP experts but there may still be some short comings due to complex and challenging task. In case of any doubt original orders may be referred to. Suggestions and feed back is welcome for further improvement of this document. It is expected that all the stakeholders shall find this document to be useful and handy.