

International Tutorial (Online)

(Under the aegis of CIGRE NSC B4 on DC Systems & Power Electronics)

26 – 27 November 2020

Tutorial-1 (Day 1 session will be start at 17:00 – 19:00 hrs.)

Requirements for grid forming and grid following inverters in weak or isolated grids

Tutorial-2 (Day 2 session will be start at 15:00 – 16:30 hrs.)

AC side harmonics and appropriate harmonic limits for VSC HVDC

ORGANIZER

IN ASSOCIATION WITH

TUTORIAL CONDUCTED ON



CIGRE INTERNATIONAL SPEAKERS

DAY 1

DAY 2



Dr. Chandana Karawita
Canada



Dr. Hiranya Suriyaarachchi
Canada



Dr. Nigel Shore
Sweden

TAKEAWAYS

The capabilities of the inverters currently used in renewable energy sources and HVDC systems may not be adequate for the grids with a small percentage or no synchronous generators. For more than a century, synchronous generators have been successfully operated in power systems. This tutorial will first evaluate the contributions from the synchronous generators in terms of voltage, inertia and frequency support and define the requirements for the grid-forming and grid-following inverters. The current capabilities and future expectations will be evaluated using example simulation cases.

TAKEAWAYS

This tutorial presents the work of Working Group B4.68, which produced TB 754. This Technical Brochure examines the harmonic aspects of voltage source converters used for HVDC transmission. The harmonic profile of such converters differs greatly from that of the more established line commutated converters. The low magnitude of harmonic generation may imply that AC filters are not needed, or may be very small. The control system factors affecting both harmonic generation and the active internal impedance are examined. Possible deleterious effects of higher frequencies, inter-harmonics and even order harmonics are discussed, and recommendations given regarding statutory limitations. Mitigation of harmonics by means of either passive filtering or active filtering by converter control action is described. The Brochure explains various techniques for modelling the harmonic behaviour of VSC HVDC, and concludes with a review of harmonic stability issues and various techniques used to identify the risk of its occurrence and to indicate means of mitigation.

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ABOUT INTERNATIONAL SPEAKERS



Dr. Chandana Karawita is the vice president – studies of TransGrid Solutions, Winnipeg, Canada. He has more than 17 years of experience in power system studies and modelling related to HVDC, FACTS and inverter-based generation. He actively contributes to various CIGRE working groups and is the convener of working group C4/B4.52 “Guidelines for Sub-synchronous Oscillation Studies in Power Electronics Dominated Power Systems”. He is also involved in academic research activities as an adjunct professor at the University of Manitoba, Canada.



Dr. Hiranya Suriyaarachchi received the B.Sc. Engineering degree from University of Moratuwa, Sri Lanka in 2003 and M.Sc. and Ph.D. degrees from University of Manitoba, Canada in 2008 and 2014, respectively. Since 2010, he is with TransGrid Solutions where he was involved with a number of HVDC projects in North America, Europe and in Asia. Dr. Suriyaarachchi is the secretary of the CIGRE working group B4.87: Voltage Source Converter (VSC) HVDC responses to disturbances and faults in AC systems which have low synchronous generation.



Dr. Shore graduated from the University of Edinburgh in 1973, then completed a Ph.D. on "Minicomputer Control of HVDC Converters" at Imperial College, London, in 1976. After several years with UK consultants as a power system analyst, he moved to Brazil to work on the Itaipu HVDC project, first for Promon Engenharia then ASEA. His positions included main circuit design, control group manager, site commissioning manager and system test co-ordinator. From 1986-1989 he was a design engineer in ASEA/ABB Sweden, engaged on harmonic analysis and filter design. In 1989, he relocated to England to work remotely for ABB Ludvika. Since then he has been responsible for harmonic studies and filter design in very many of ABB's HVDC projects and tenders, along with developing software tools and design methodologies, and mentoring. He has been active in IEEE and IEC, and within CIGRE he has participated in eight Working Groups, four of which as Convenor. He received the Technical Committee Award in 2014 and Distinguished Member status in 2020. Dr. Shore is a Life Senior Member of IEEE and a Member of the IET.

FACILITATION CHARGES

The duration for online training will be of 1 hr. 30 min. will be for tech. session followed by 30 min. for question/ answer session.

Category	Charges in INR	
	Members (CBIP/CIGRE)	Non Members
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Up to 15 Login	26,000/-	30,000/-
Up to 25 Login	40,000/-	44,000/-
Students	750/- per login	
First 25 students will be given one year membership of CIGRE to have access to 10,000 Technical Report available on e-CIGRE library.		
Note: 18% GST extra for all categories.		

The program is limited to 200 participants, which will be on First cum First serve basis.

TO REGISTER

The perspective participants, desirous of attending the above training may register themselves by sending the following details to CIGRE-India along with necessary facilitation charges:

Title of Training ____; Name: ____; Designation: ____; Organization: ____; Mailing address: ____; Phone / Fax/E-mail: ____

Note: After registration, the participants will be provided the link 1 day prior to the session. Registered participants may please contact for link to join the program at:

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