

SOUTH ASIAN ASSOCIATION FOR REGIONAL COOPERATION (SAARC)



**SAARC ENERGY CENTRE  
ISLAMABAD**

# THE REPORT

Program Activity: PRG-82/2015/POSIT



SAARC Perspective Workshop

## **"The Past, Present and Future of High Voltage DC (HVDC) Power Transmission"**

30 September - 01 October 2015

Lahore - Pakistan

Organized by

**SAARC Energy Centre, Islamabad**

in collaboration with

**National Transmission and Dispatch Company Limited, Pakistan**



**October 2015**

SAARC Energy Centre  
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SEC Program Activity (PRG-82/2015/POSIT)

Perspective Workshop

## **Past, Present and Future of High Voltage DC (HVDC)**

### **Power Transmission**

Lahore, Pakistan, 30 September - 01 October 2015



SAARC Perspective Workshop

### **“The Past, Present and Future of High Voltage DC (HVDC) Power Transmission”**

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## The Report

### Introduction

SAARC Energy Centre, Islamabad under its program for FY 2015 organized a two days perspective workshop **Past, Present and Future of High Voltage DC (HVDC) Power Transmission** in Lahore, Pakistan on 30 September - 01 October 2015. The event was arranged at Hotel Avari in collaboration with the National Transmission and Dispatch Company Limited, Pakistan as the Knowledge Partner. Copy of the Workshop Program is available at Annexure I.

2. SEC has especially envisaged this training workshop, aiming at strengthening the power transmission engineers and planners of the SAARC Member States with the following major objectives:

- Inform the professionals of transmission utilities of the new developments, trends and challenges with respect to the bulk power transmission
- Exchange the latest experience of the experts with the Member States in opting the HVDC or HVAC for their future power transmission projects particularly regional power inter-connections
- Creating opportunity for the power transmission professionals to enhance their knowledge through interactive sessions based on regional and international experiences

### **Participation**

3. A total of 72 delegates from i) Member States Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka; ii) Resource Persons from Canada, China, Netherlands, India, Pakistan and Sri Lanka; iii) The World Bank and USAID SARI/EI participated in the workshop. Participants list is available at **Annexure II**. The workshop attracted an overwhelming participation from the host Member State Pakistan; Pakistani delegates, dominated by SEC's Knowledge Partner for this Workshop i.e. National Transmission and Dispatch Company Limited, Pakistan along with National Electric Power Regulatory Authority eagerly participated in the workshop proceedings discussing the rationale for selection and operation of high voltage direct current or alternating current power transmission and interconnection.

### **Major Aspects Covered**

4. The Workshop focused on strengths, weaknesses, opportunities and threats for HVDC technological developments in comparison to the High Voltage Alternating Current (HVAC) Power Transmission and in view of the regional and international experiences. Using the perspectives that emphasize both positive and negative aspects of HVDC power transmission, technological options (Voltage-Sourced Converter (VSC-HVDC) and Line-Commutated Converter (LCC-HVDC) were highlighted and discussed at length during the workshop. HVDC applications were discussed with emphasis on HVDC modeling (Harmonics, System integration), HVDC network integration, Risk assessment, Security & reliability of HVDC grid, etc.

5. The workshop started with the Inaugural session chaired by Mr. Abid Sher Ali, Honorable State Minister for Water and Power, Government of Pakistan followed by six technical sessions. The event was closed with the Valedictory Session on second day of the event i.e. 1<sup>st</sup> October 2015, chaired by Ch. Muhammad Arshad, Managing Director, NTDC, Pakistan.

### **Inaugural Session**

6. Mr. Muhammad Naeem Malik, Director, SAARC Energy Centre welcomed the resource persons and all the delegates from SAARC Member States for attending the workshop and extending keen interest. He especially thanked Chief Guest, Mr. Abid Sher Ali, Honorable State Minister for Water and Power, Government of Pakistan for his gracious presence at this workshop and for encouraging the SAARC endeavor to achieve

performance excellence by the power transmission utilities.

7. Mr. Malik informed that HVDC intervention by SAARC aims to share the learning and experiences of the experts to help guiding the Member States in opting the HVDC or HVAC for their future power transmission projects particularly regional power inter-connections. He emphasized that, in view of the various interventions, interactions and discussions during the last five years or so, SAARC Energy Centre is totally convinced that domestic energy development and bilateral cooperation alone will not solve power and energy crisis of South Asia. Engagements have to be multi-lateral.

8. Director, SEC shared his strong belief that this Perspective Workshop will help the South Asian power professionals in moving ahead on the road to modern technology and regional energy connectivity through complementing efforts of professionals like you and many others who are not here today.

9. Mr. Abid Sher Ali, State Minister for Water and Power, Government of Pakistan chaired the Inaugural Session. In his inaugural address, the Chief Guest acknowledged the critical importance of the HVDC workshop in the background of sharp gap between power demand and supply in Pakistan and most of the SAARC Member States. He further added that during the last two decades or so, power system stability and security have become great challenges for the power planners throughout the globe. He also shared viable power generation options, covering hydro, coal, natural gas and renewable energy resources of Pakistan to cope with the demand supply gap. He opined that under this situation, it is in the best interest of all the SAARC Member States to start deploying the latest technologies, smart solutions aiming to reduce the losses while contributing towards the system security besides looking for the most optimum technical and financial solutions. He added that, in this perspective, investments in capacity building of the professionals and adoption of the latest technologies are worth pursuing.

10. In the end, the Minister stated that in order to catchup with the modern world, Pakistan and all the SAARC Member States are required to aggressively move towards the best industry practices including state of the art technologies like high voltage DC power transmission.

11. The Chief Guest thanked the SAARC Delegates and Resource Persons for their enthusiastic contribution in sharing invaluable knowledge in the dimension of high voltage power transmission in South Asia and wished all the success to the 2-day workshop. He hoped that this event will be result oriented and the knowledge shared during the process will help the SAARC Member States in resolving the power crisis currently prevailing in South Asia.

### **Technical Proceedings**

12. Brief information on the technical proceedings, designed in multiple sessions, is as follows (All the presentations delivered during the workshop are available at SEC's website [www.saarcenergy.org](http://www.saarcenergy.org)):

#### **A. Session 1**

- Country Scenario: Presentations by the participating Member States
  - a. Afghanistan

- b. Bangladesh
- c. Bhutan
- d. India
- e. Nepal
- f. Pakistan
- g. Sri Lanka

- **Technology Consideration for Cross Border Power Interconnections**

Mr. Hassan Jafar Zaidi, CEO, Power Planners International, Pakistan - UK

- **USAID SARI/EI: Key Activities Undertaken and the Way Forward**

Mr. V. K. Kharbanda, Project Director, Integrated Research and Action For Development (IRADe), USAID SARI/EI, India

- **An Introduction to the Project CASA-1000**

Mr. Muhammad Daud, Former General Manager, Planning (Power) NTDC

## B. Session 2

- **Flexible HVDC in China**

- Mr. Wang Bo, Deputy Project Manager, China Electric Power Equipment & Technology Co., Ltd., China

- **Inside the Technology: HVDC v/s HVAC**

- Mr. Tauqeer Ahmed, Project Engineering Manager (Eastern Alberta Transmission Link), Siemens, Canada

- **Pakistan Entering into the Era of HVDC Technologies**

- Mr. Abdur Razzaq Cheema, Consultant, NTDC, Pakistan

## C. Session 3

- **Regional Power Interconnections**

- Mr. Anjum Ahmad, Senior Energy Specialist, World Bank, Pakistan

- **High Voltage AC and DC Transmission for Power System Interconnection**

- Dr. P. N. Fernando, Former Manager, Energy Division, Infrastructure, Energy, Financial Sectors Dept (East), Asian Development Bank *Delivered by Mr. Hassan Jafar Zaidi*

## D. Session 4

- **Management Roadmap: Introduction of HVDC Technology in Pakistan**

- Mr. Mohsin M. Syed, Member, Board of Directors, NTDC, Pakistan

- **Rationale for HVDC and HVAC**

- Mr. Tauqeer Ahmed, Project Engineering Manager (Eastern Alberta Transmission Link), Siemens, Canada

- **Protection Perspective of HVDC Technology**

- Mr. Muhammad Shafique, Chief Engineer, System Protection, NTDC, Pakistan

#### E. Session 5

- **SARI/EI study: Harmonization of Grid Codes, Standards and Operating Procedures for Transmission System Interconnection & for facilitating/Promoting CBET in South Asia**
- Mr. Rajiv Ratna Panda, Senior Project Manager, Integrated Research and Action For Development (IRADe), USAID SARI/EI, India
- **Critical Importance of Testing and Certification of Power System Equipment**
- Mr. Bas Verhoeven, Director Marketing & Sales, KEMA Laboratories, Netherlands
- **South Asian Power Sector: Investment Prospects, Challenges and Issues**
- Mr. V. K. Kharbanda, Project Director, Integrated Research and Action For Development (IRADe), USAID SARI/EI, India
- **HVDC Transmission System**
- Mr. Oomen Chandi, Executive Director (HVDC Engg.), PowerGrid, India;  
*Delivered by Mr. Ghanshyam Prasad and Mr. Y K Sehgal*

#### F. Session 6

- **HVDC – the Chinese Experience**
- Ms. Quan Bailu, Chief Engineer, HVDC Expert, China Electric Power Equipment & Technology Co. Limited, China
- **CASA 1000 – Up to date Progress**
- Mr. Rihan Akhtar, Chief Financial Officer, Central Power Purchasing Agency (Guaranteed)

#### Dinner Reception

13. SAARC Energy Centre hosted welcome dinner on Wednesday, 30<sup>th</sup> September 2015 for the workshop delegates providing an informal opportunity for close interaction and networking. A number of dignitaries from Government of Pakistan along with technocrats also joined on this occasion.

#### Valedictory Session

14. Engr. Salis Usman, Program Coordinator thanked the Chief Guest, Ch. Muhammad Arshad, Managing Director, NTDCL, Pakistan; Mr. Mohsin M. Syed, Member, Board of Directors, NTDCL; Ms. Sehrish Mubeen, Focal Person for this Workshop; Resource Persons from Canada, China, India, Netherland, Pakistan and Sri Lanka, delegates from the SAARC Member States and the guests for joining this invaluable event and acknowledged their proactive participation for maximizing the SAARC efforts with respect to achieving the performance excellence by the power sector of the SAARC Member States.

15. Engr. Usman reiterated SEC's commitment to continue working through such knowledge sharing activities and proposed closed liaison among the resource persons and delegates for sustained growth and development. He opined that this information dissemination event will facilitate the SAARC Member States in moving ahead on the road to technological advancement. He elaborated that the HVDC is considered to be the key

technology for bulk power transmission over long distances interconnecting regions and countries. Today's workshop by SAARC Energy Centre has been organized to cater the much needed knowledge and understanding on HVDC and HVAC options. As Program Coordinator, he shared his utmost satisfaction over the Workshop proceedings mainly due to the invaluable knowledge sharing by the regional and international experts pertaining to high voltage power transmission and the keen interest of the delegates from the SAARC Member States.

16. Mr. Usman concluded by wishing the whole South Asia to prosper, grow and glow through the coordinated vision and efforts of regional professionals and policy makers.

17. Ch. Muhammad Arshad, Managing Director, National Transmission and Dispatch Company Limited, Pakistan chaired the valedictory session. Through his address to the workshop delegates, he congratulated SAARC Energy Centre for organizing this invaluable opportunity for achieving and maximizing the knowledge sharing opportunities. He commented that SAARC Energy Centre is playing a vital role to enhance cooperation to address regional energy issues, to promote energy trade among the Member States and to enhance SAARC knowledge base in energy development and management.

18. The Chair highlighted that NTDC is entering into the era of HVDC technology; therefore, this seminar is a wonderful opportunity for NTDC professionals to get benefit from the practical experiences, issues and future prospects of this technology. He assured maximum support by the Government of Pakistan. He also thanked the delegates for coming to Pakistan and joining the SAARC perspective workshop with great interest and vigor. At the end, he hoped that SAARC will continue organizing such learning initiatives for the mutual benefit of the regional professionals and assured that NTDC will continue its collaboration as knowledge partner of the SAARC Energy Centre for development of power sector in the region.

19. Mrs. G.P. Senanayaka, Electrical Engineer, Ceylon Electricity Board from Member State Sri Lanka offered vote of thanks on behalf of all the delegates to the Chief Guest, Resource Persons, National Transmission and Dispatch Company Limited, Pakistan, National Electric Power Regulatory Authority, Pakistan, SAARC Energy Centre and hotel staff for successful organizing of the workshop and managing high enthusiasm and involvement on the part of delegates throughout the process.

Annexure I

**SAARC Perspective Workshop on the Past, Present and  
Future of High Voltage DC (HVDC) Power Transmission**  
30 September - 01 October 2015, Avari Hotel, Lahore, Pakistan  
Lahore, Pakistan | 30 September – 01 October 2015  
SAARC Perspective Workshop Program

Tuesday, 29 September 2015	
Arrival of Delegates: Lahore, Pakistan	
Wednesday, 30 September 2015	
Inaugural Session at Hotel Avari, Lahore	
Time	Description
0900 – 0930	Registration
0930 – 0940	Tilawat Quran-e-Majeed
0940 – 0950	Welcome address: Mr. Muhammad Naeem Malik, Director, SAARC Energy Centre (SEC)
0950 – 1000	Keynote Address: Mr. Wajahat Saeed Rana, General Manager, Grid System Construction, National Transmission and Dispatch Company Limited (NTDCL), Pakistan
1000 – 1015	Chief Guest, Mr. Abid Sher Ali, Honorable State Minister for Water and Power, Government of Pakistan
1015 – 1045	Group Photo and Refreshments
Session 1	
Chair: Mr. Muhammad Naeem Malik, Director, SAARC Energy Centre	
1045 – 1200	Country Scenario: Presentations by the participating Member States
1200 – 1230	<b>Technology Consideration for Cross Border Power Interconnections</b> Mr. Hassan Jafar Zaidi, CEO, Power Planners International, Pakistan - UK
1230 – 1245	<b>USAID SARI/EI: Key Activities Undertaken and the Way Forward</b> Mr. V. K. Kharbanda, Project Director, Integrated Research and Action For Development (IRADe), USAID SARI/EI, India
1245 – 1300	<b>An Introduction to the Project CASA-1000</b> Mr. Muhammad Daud, Former General Manager, Planning (Power) NTDCL, Pakistan
1300 – 1400	Luncheon

Session 2	
Chair: Mr. Hassan Jafar Zaidi, CEO, Power Planners International	
1400 – 1430	<b>Flexible HVDC in China</b> Mr. Wang Bo, Deputy Project Manager, China Electric Power Equipment & Technology Co., Ltd., China
1430 – 1510	<b>Inside the Technology: HVDC v/s HVAC</b> Mr. Tauqeer Ahmed, Project Engineering Manager (Eastern Alberta Transmission Link), Siemens, Canada
1510 – 1530	<b>Pakistan Entering into the Era of HVDC Technologies</b> Mr. Abdur Razzaq Cheema, Consultant, NTDCL, Pakistan
1530 – 1545	Coffee/Tea Break
Session 3	
Chair: Mr. V. K. Kharbanda, Project Director, Integrated Research and Action For Development (IRADe), USAID SARI/EI, India	
1545 – 1600	<b>Regional Power Interconnections</b> Mr. Anjum Ahmad, Senior Energy Specialist, World Bank, Pakistan
1600 – 1700	<b>High Voltage AC and DC Transmission for Power System Interconnection</b> Dr. P. N. Fernando, Former Manager, Energy Division, Infrastructure, Energy, Financial Sectors Dept (East), Asian Development Bank <i>Delivered by Mr. Hassan Jafar Zaidi</i>
Welcome Dinner	
1930 – 2130	Welcome Dinner hosted by Director, SAARC Energy Centre at Salt & Pepper Village, Lahore
Thursday, 1 <sup>st</sup> October 2015	
Session 4	
Chair: Mr. Rihan Akhtar, CFO, Central Power Purchasing Agency (Guaranteed), Pakistan	
0930 – 1000	<b>Management Roadmap: Introduction of HVDC Technology in Pakistan</b> Mr. Mohsin M. Syed, Member, Board of Directors, NTDCL, Pakistan
1000 – 1040	<b>Rationale for HVDC and HVAC</b> Mr. Tauqeer Ahmed, Project Engineering Manager (Eastern Alberta Transmission Link), Siemens, Canada
1040 – 1100	<b>Protection Perspective of HVDC Technology</b> Mr. Muhammad Shafique, Chief Engineer, System Protection, NTDCL, Pakistan
1100 – 1120	Coffee/Tea Break

Session 5	
Chair: Mr. Mohsin M. Syed, Member, Board of Directors, NTDCL, Pakistan	
1120 – 1140	<b>SARI/EI study: Harmonization of Grid Codes, Standards and Operating Procedures for Transmission System Interconnection &amp; for facilitating/Promoting CBET in South Asia</b> Mr. Rajiv Ratna Panda, Senior Project Manager, Integrated Research and Action For Development (IRADe), USAID SARI/EI, India
1140 – 1210	<b>Critical Importance of Testing and Certification of Power System Equipment</b> Mr. Bas Verhoeven, Director Marketing & Sales, KEMA Laboratories, Netherlands
1210 – 1240	<b>South Asian Power Sector: Investment Prospects, Challenges and Issues</b> Mr. V. K. Kharbanda, Project Director, Integrated Research and Action For Development (IRADe), USAID SARI/EI, India
1240 – 1300	<b>HVDC Transmission System</b> Mr. Oomen Chandi, Executive Director (HVDC Engg.), PowerGrid, India; <i>Delivered by Mr. Ghanshyam Prasad and Mr. Y K Sehgal</i>
1300 – 1400	Luncheon
Session 6	
Chair: Mr. Anjum Ahmad, Senior Energy Specialist, The World Bank	
1400 – 1450	<b>HVDC – the Chinese Experience</b> Ms. Quan Bailu, Chief Engineer, HVDC Expert, China Electric Power Equipment & Technology Co. Limited, China
1450 – 1515	<b>CASA 1000 – Up to date Progress</b> Mr. Rihan Akhtar, Chief Financial Officer, Central Power Purchasing Agency (Guaranteed)
Valedictory Session	
Chair: Ch. Muhammad Arshad, Managing Director, NTDCL-Pakistan	
1515 – 1530	Group Photo
1530 – 1540	Summing-up the SAARC HVDC Intervention by Mr. Salis Usman, Program Coordinator, SEC
1540 – 1550	Address by the Chief Guest, Ch. Muhammad Arshad, Managing Director, NTDCL-Pakistan
1550 – 1605	Distribution of Certificates
1605 – 1620	Vote of Thanks by Mrs. G.P. Senanayaka, Ceylon Electricity Board, Sri Lanka
1620 – 1645	Refreshments
Friday, 2 October 2015	
Delegates Depart from Lahore, Pakistan	

## Annexure II

## SAARC Perspective Workshop on the Past, Present and Future of High Voltage DC (HVDC) Power Transmission

Lahore, Pakistan | 30 September – 01 October 2015

### List of Resource Persons, Delegates & SEC Team Members

#	Delegate's Name and Organization	Contact Information
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### Brief Pictorial View of the Workshop







