

AEITHVDC

international conference 2019

Operational Experience and
Technological Development
for Application Worldwide

Florence • Italy • May 9-10 • 2019



Overview

High Voltage Direct Current (HVDC) transmission draws an ever increasing interest of TSO in Europe and all over the world.

Major developments in technology make HVDC in many cases more reliable, easy to apply and operate, economically affordable. Wider applications are now possible and many projects are under development, making HVDC an even more interesting business than before also for manufacturers and engineering companies.

The conference will serve as an International forum for the presentation and exchange of technological advances and research results in the broad fields of HVDC Power Systems applications.

The following issues are within the scope of the conference:

- HVDC operational experience;
- Outlook of HVDC projects planned and at design or construction stage;
- Latest (ongoing) and next coming developments in HVDC technology (converter stations, cables, overhead lines);
- Market perspective.

The conference will bring together leading utilities, universities, transmission system operators, consultants, equipment suppliers, and solution providers to help shape the future of power transmission industry.

P r o g r a m m e



with the technical cosponsorship of





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Costas Vournas • *National Technical Univ. of Athens, Greece*

Venue

University of Florence • *Complesso Sant'Apollonia*
Via San Gallo 25 • *Florence, Italy*

Registration Fees

FULL CONFERENCE REGISTRATION

AEIT Member	€ 500,00
CIGRE, IEEE Member	€ 500,00 +VAT
AEIT Young Member (< 32 years old)	€ 280,00
CIGRE, IEEE Student	€ 280,00 +VAT
Non Member	€ 550,00 +VAT
Non Member (< 32 years old/student)	€ 315,00 +VAT

Conference Dinner (May 9, 2019) € 50,00

(All papers have to be presented by one of the authors who has to proceed with a full registration to the conference)

AEIT Members' Fees with VAT non applicable due to artt. 1 e 4 (4 comma e 5 comma - lettera A) D.P.R. n. 633 26.10.1972.

On Site Secretariat

The Conference Secretariat will be open on site as follows

Thursday, May 9 2019	9.00 - 18.00
Friday, May 10 2019	8.30 - 18.30

Lunch

Lunch will be served at **Fuoco Matto**, Via Ventisette Aprile 16, Firenze

Conference Dinner

On the evening of May 9 a conference dinner is planned at **Konnubio**, Via dei Conti 8r, Florence. Participation in the dinner of the conference requires the purchase of the invitation.

Secretariat

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Via M. Macchi 32 • 20124 Milano, Italy
Phone: +39 02 87389965 • E-mail: hvdc2019@aeit.it
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Thursday 9 May

9,30/13,00

09.30 ▶ Registration

10.00 ▶ Welcome address

Debora Stefani • *AEIT General President*

Luigi Michi • *CIGRE Italian National Committee Chair*

Stefano Massucco • *IEEE-PES Italy Chapter Chair*

Bernardo Tellini • *IEEE Italy Section Chair*

10.30 ▶ Keynote opening address

HVDC Systems essential for the new Energy Transition to decarbonisation of electricity Generation

Massimo Rebolini • *CIGRE Fellow Honorary Member, Italy*

11.00 ▶ Coffee break

▶ TECHNICAL SESSION I ◀

▶ Converters Technology

Chair: Paolo Bordinon • RXHK, China

11.30 ▶ 1.1 • Power Quality Analysis of Modular multi-level inverter using nearest level modulation technique

Faheem Akhter Chachar, Jahangir Badar, Farah Shah, Sohail A. Soomro, Sadaqat Ali - *Sukkur IBA University, Pakistan*

11.45 ▶ 1.2 • Capacitor Voltage Ripple Minimization in Voltage Source Converter for HVDC Applications

Mario Marchesoni, Massimiliano Passalacqua, Luis Vaccaro - *University of Genova, Italy*, Mauro Carpita, Serge Gavin, Simon Kissling - *University of Applied Sciences of Western Switzerland, Switzerland*

12.00 ▶ 1.3 • Converter Technologies for HVDC

Marcelo Ferraz - *GE - Power Electronics HVDC, United Kingdom*

12.15 ▶ 1.4 • IFA2 - HVDC goes compact with Hybrid PASS420 modules and GIB connections

Alberto Persico, Mats Hyttinen - *ABB HVDC, Sweden*, Massimo Spiranelli - *ABB HVP, Italy*, David Barron - *National Grid, United Kingdom*

12.30 ▶ 1.5 • AC Transmission Emulation Control Strategy in VSC-HVDC systems: general criteria for optimal tuning of control system

Luigi Michi, Enrico Maria Carlini, Temistocle Baffa Scirocco, Gianluca Bruno, Roberto Gnudi, Gaetano Pecoraro, Cosimo Pisani - *Terna, Italy*

12.45 ▶ 1.6 • Realizing Bipolar Power Semiconductor for Highest reliable Applications

Jens Przybilla, Uwe Kellner-Werdehausen, Sebastian P. Sommer - *Infineon Technologies Bipolar, Germany*

13.00 ▶ Lunch

Program

Thursday 9 May

14,30/17,30

► TECHNICAL SESSION II ◀

► Systems components for HVDC

Chair: Marco Marelli - *Prysmian Group, Italy*

14.30 ► 2.1 • HVDC links at increased voltage, CESI experience on extruded cable systems up to 525kV
Uberto Vercellotti - *CESI, Italy*

14.45 ► 2.2 • On the choice of the right HVDC Electrode type

Paolo Molfino, Mario Nervi - *University of Genova, Italy*, Stefano Malgarotti - *CESI, Italy*

15.00 ► 2.3 • Transient Overvoltage Analysis in HVDC MMC Power Cables: Assessment of the Critical Points

Roberto Benato, Sebastian Dambone Sessa, Antonio Chiarelli - *University of Padova, Italy*

15.15 ► 2.4 • Space charges and life models for lifetime inference of HVDC cables under voltage polarity reversal

Massimo Marzinotto, Antonio Battaglia - *Terna, Italy*, Giovanni Mazzanti - *University of Bologna, Italy*

15.30 ► 2.5 • HVDC Cables - The technology boost

Giuseppe Lagrotteria, Davide Pietribiasi, Marco Marelli - *Prysmian Group, Italy*

15.45 ► Coffee break

► TECHNICAL SESSION III ◀

► Reliability and systems restoration

Chair: Alberto Persico - *ABB, Sweden*

16.15 ► 3.1 • On the Optimization of Damping Enhancement in a Power System with a Hybrid HVDC Link

Harold Chamorro - *KTH Royal Institute of Technology, Sweden*, Roozbeh Torkzadeh - *Loyola Universidad Andalucia, Spain*, Omar Kotb - *MathWorks AB, Sweden*, Kumars Rouzbehi - *Loyola Universidad Andalucia, Spain*, Francisco Gonzalez-Longatt - *Loughborough University, United Kingdom*, Oriol Gomis Bellmunt - *Universitat Politecnica de Catalunya, Spain*, Ivan Zelinka - *VSB-Technical University of Ostrava, Czech Republic*, Vijay K. Sood - *University of Ontario, Canada*

16.30 ► 3.2 • Functional validation of a real VSC HVDC control system in black start operation

Cosimo Pisani, Gianluca Bruno - *Terna, Italy*, Hani Saad, Pierre Rault, Bertrand Clerc - *RTE, France*

16.45 ► 3.3 • Use of VSC-HVDC links for power system restoration

Stefano Barsali, Massimo Ceraolo, Paolo Pelacchi, Davide Poli - *University of Pisa, Italy*

17.00 ► 3.4 • The restoration field tests in Sardinian network involving HVDC, synchronous condensers and hydraulic power plant

Luigi Michi, Enrico Maria Carlini, Temistocle Baffa Scirocco, Gianluca Bruno, Roberto Gnudi, Cosimo Pisani - *Terna, Italy*, Massimo Salvetti, Daniele Macalli - *CESI, Italy*

17.15 ► 3.5 • Key Features of Recent Projects for Highly Flexible LCC Schemes

Volker Hussennether - *Siemens, Germany*

20.00 ► Conference Dinner

a m m e

Friday 10 May

9,00/12,45

9.00 ▶ **PANEL** ◀

▶ **What's new on the HVDC planet**

Chair: Alessandro Clerici • *WEC Italy Honorary Chair, Italy*

Paolo Bordignon • *RXHK, China*

Marcelo Ferraz • *GE Power Electronics HVDC, United Kingdom*

Giorgio Giannuzzi • *Terna, Italy*

Volker Hussennether • *Siemens, Germany*

Mats Hyttinen • *ABB, Sweden*

Yuanliang Lan • *Global Energy Interconnection Research Institute Europe, Germany*

Marco Marelli • *Prismian Group, Italy*

10.30 ▶ **Coffee break**

▶ **TECHNICAL SESSION IV** ◀

▶ **Modelling, analysis and planning**

Chair: Angelo L'Abbate • *RSE, Italy*

11.00 ▶ **4.1 • Modelling of the 500 MW Back-to-Back Converter Station between Uruguay and Brazil in ATP**

Claudio Saldaña - *Ingeniería de Protecciones, UTE, Uruguay*, Graciela Rosa Calzolari - *Estudios y Proyectos de Trasmisión, UTE, Uruguay*

11.15 ▶ **4.2 • Modelling of VSC-HVDC with power synchronization method including frequency support**

Giulio Macchia, Michele Antonio Trovato, Maria Dicorato, Giuseppe Forte - *Politecnico di Bari, Italy*

11.30 ▶ **4.3 • HVDC for frequency stability under RES penetration: the Sardinia Island case**

Carmelo Mosca, Ettore Bompard - *Politecnico di Torino, Italy*, Chiara Vergine, Benedetto Aluisio, Michela Migliori - *Terna, Italy*, Paolo Cuccia - *Terna Rete Italia, Italy*

11.45 ▶ **4.4 • An overview of the HVDC transmission system models in planning tools: the Italian experience**

Pietro Capurso, Angelo Bugliari Caldarulo, Federico Falorni - *Terna, Italy*, Maurizio Quadrio, Daniele Canever, Luca Giorgi - *CESI, Italy*

12.00 ▶ **4.5 • New HVDC technology in Pan-European power system planning**

Chiara Vergine, Chiara Giordano, Francesca Scavo, Ennio Giovanni Luciano, Benedetto Aluisio - *Terna, Italy*, Massimo Pompili, Stefano Lauria, Luigi Calcara - *Sapienza Università di Roma, Italy*, Angelo L'Abbate - *RSE, Italy*

12.15 ▶ **4.6 • Availability Assessment Methods for HVDC Systems: a Review**

Sebastian Dambone Sessa, Antonio Chiarelli - *University of Padova, Italy*, Angelo L'Abbate - *RSE, Italy*, Roberto Benato - *University of Padova, Italy*

12.30 ▶ **4.7 • Solar Power and Benefits of HVDC - Mediterranean Context**

Dipti Khare - *ABB HVDC, Sweden*, Alberto Persico - *ABB HVDC, Italy*

12.45 ▶ **Lunch**

P R O G R A M

Friday 10 May

14,30/18,15

► TECHNICAL SESSION V ◀

► HVDC Operation experience and projects implementation/refurbishment

Chair: Paolo Pelacchi • *University of Pisa, Italy*

14.30 ► 5.1 • Impact of SA.CO.I. refurbishment: flexibility analysis of the Sardinian system

Adriano Iaria, Roberto Calisti, Angelo L'Abbate, Marco Raffaele Rapizza - *RSE, Italy*

14.45 ► 5.2 • Placement of HVDC links for reduction of network congestions

Marco Giuntoli, Susanne Schmitt, Veronica Biagini, Milos Subasic, Georg Gutermuth, Athanasios Krontiris - *ABB AG, Germany*

15.00 ► 5.3 • SGCC: technical development from UHVDC to MTDC grids

Yuanliang Lan - *Global Energy Interconnection Research Institute Europe, Germany*

15.15 ► 5.4 • Possible technical solutions for the new Sardinia-Corsica-Italy link

Fabio Massimo Gatta, Alberto Geri, Stefano Lauria, Marco Maccioni - *University of Rome Sapienza, Italy*, Luca Buono, Massimo Marzinotto, Francesco Palone, Massimo Rebolini - *Terna Rete Italia, Italy*

15.30 ► 5.5 • Analysis of the plant and operational requirements for the design of a flexible and new generation LCC HVDC system: the Sa.Co.I 3 technology case

Antonio Battaglia, Luca Buono, Riccardo De Zan, Evaristo Di Bartolomeo, Massimo Marzinotto, Francesco Palone, Mattia Pazienza, Francesca Pede, Luigi Michi, Enrico Maria Carlini, Temistocle Baffa Scirocco, Gianluca Bruno, Roberto Gnudi, Gaetano Pecoraro, Cosimo Pisani - *Terna Rete Italia, Italy*

15.45 ► 5.6 • Maritime Link - The First Bipolar VSC HVDC with Overhead Line

Ole Vestergaard, Peter Lundberg - *ABB HVDC, Sweden*

16.00 ► 5.7 • Renewable sources integration using HVDC in parallel to AC traditional system: the Adriatic project

Michela Migliori, Stefano Lauria - *Sapienza University of Rome, Italy*, Benedetto Aluisio, Chiara Vergine - *Terna, Italy*

16.15 ► 5.8 • INELFE: main description and operational experience over three years in service

L. Coronado, R. Rivas, Silvia Sanz, J. Bola, G. Pérez, Carmen Longás, Paula Junco - *Red Eléctrica de España, Spain*

16.30 ► 5.9 • System dynamic behavior challenges: operating experience and future trends

Luigi Michi, Enrico Maria Carlini, Giacomo Donnini, Giorgio Giannuzzi, Matteo Renieri, Roberto Zaottini, Cosimo Pisani, Benedetto Aluisio, Andrea Urbanelli - *Terna, Italy*

16.45 ► Coffee break

► TECHNICAL SESSION VI ◀

► Protection

Chair: Willem Leterme • *KU Leuven, Belgium*

17.15 ► 6.1 • A comparison of non-unit and unit protection algorithms for HVDC grids

María José Pérez Molina, Dunix Marene Larruskain, Pablo Eguia Lopez, Oihane Abarrategi - *University of the Basque Country, Spain*, Maider Santos-Mugica - *Tecnalia Research & Innovation, Spain*

17.30 ► 6.2 • Protection and Local control of HVDC-Grids

Andrea Pitto - *Ricerca sul Sistema Energetico RSE, Italy*, Dirk Van Hertem - *KU Leuven, Belgium*

17.45 ► 6.3 • Selective protection of VSC HVDC grids: post-fault voltage recovery

Willem Leterme - *KU Leuven, Belgium*

18.00 ► 6.4 • MON.ITA HVDC Link - AC & DC Protection System

Luigi Michi, Enrico Maria Carlini, Temistocle Baffa Scirocco, Gianluca Bruno, Leandro Caciolli, Marco Cortese, Gianluca Ramundo - *Terna, Italy*, Mi Okuda, Takeru Murao - *Toshiba, Japan*

18.15 ► Closing Session



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