



**CIGRE Colloquium on HVDC and Power Electronic Systems  
Including overhead line and insulated cable applications**

**Dates: Wednesday March 7 through Friday March 9, 2012**

**Location: Hotel Nikko, San Francisco, California, USA**

**Sponsored by:**

**US National Committee of CIGRE, Cigre Study Committees B1  
Insulated Cables , B2 Overhead Lines and B4 HVDC and Power  
Electronics**

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**March 7, 2012**

**Exposition Open to Registered Attendees**

**7 AM to 6 PM**

**Opening of Colloquium**

**Welcome**

**Speaker TBD**

**Session Chair: Dr. Bjarne Andersen, UK**

| <b>Papers</b> | <b>Title</b>                                                                                                    | <b>Authors</b>                                                                                                                                                                                                                                 |
|---------------|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| B4-1          | Simulation of Transients with HVDC and FACTS in Large AC Systems                                                | V. Hild, D. Retzmann, M. Schmidt, Siemens AG, Germany<br>M. Luthur, FAU University of Erlangen-Nuremburg, Germany<br>D. Povh, Senior Consultant, Germany                                                                                       |
| B4-2          | Modeling of Multi-level Multi-terminal HVDC VSC Systems in EMT Programs                                         | J. C. Garcia Alonso, F. Mosallat, R. Wachal, Manitoba Hydro International, Canada<br>P. Brunnegård, G. Pinares, STRI AB, Sweden<br>M. Meisingset, Ø. A. Rui, Statnett, Norway<br>M. Danielsson, Svenska Krafnet, Sweden                        |
| B4-3          | HVDC Links Using the Modular Multilevel Converter: Impact of Control Strategy Using Different Simulation Models | G. Bergna-Diaz, P. Egrot, E. Berne, J-C. Vannier, EDF R&D and Supélec, France                                                                                                                                                                  |
| B4-4          | Fault Analysis of a Multilevel Voltage Source Converter-based Multi-terminal HVDC System                        | G. Pinares, N. Ullah, M. Lindgren, P. Brunnegård, STRI AB, Sweden<br>J. C. Garcia Alonso, F. Mosallat, R. Wachal, Manitoba Hydro International, Canada<br>M. Meisingset, Ø. A. Rui, Statnett, Norway<br>M. Danielsson, Svenska Krafnet, Sweden |
| B4-5          | VSC HVDC System Suitable for Overhead Power Transmission                                                        | T. Kikuma, K. Takenaka, M. Takasaki, Central Research Institute of Electric Power Industry, Japan<br>T. Fukushima, T. Uchiumi, Hokkaido Electric Power Co. Inc., Japan                                                                         |
| B4-6          | 500 kV VSC Transmission System for Lines and Cables                                                             | B. Jacobson, B. Westman, ABB, Sweden<br>M. Bahrman, ABB, United States                                                                                                                                                                         |
| B4-7          | Standardized Approach to HVDC Connections with Isolated Wind Generation                                         | E. Larsen, G. Drobnjak, GE Energy, United States                                                                                                                                                                                               |

**Session Chair: Dr. Hamid Elahi, GE, USA**

| <b>Papers</b> | <b>Title</b>                                                                                          | <b>Authors</b>                                                                                                                                                                     |
|---------------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| B4-8          | Trans Bay Cable – A Breakthrough of VSC Multilevel Converters in HVDC Transmission                    | J. Dorn, H. Gambach, J. Strauss, T. Westerweller, Siemens AG, Germany                                                                                                              |
| B4-9          | A 3150 MW HVDC Transmission Scheme to Transport Renewable Energy to Remote Load Centres               | N. M. MacLeod, B. N. Kayibabu, Alstom Grid, United Kingdom<br>N. M. Kirby, Alstom Grid, United States                                                                              |
| B4-10         | Bipole Operation of an HVDC VSC Converter with an LCC Converter                                       | J. P. Kjaergaard, K. Sjøgaard, S. D. Mikkelsen, Energinet, Denmark<br>T. Pande-Rolfsen, A. Strandem, Statnett, Norway<br>B. Bergdahl, H-O Bjarne, ABB, Sweden                      |
| B4-11         | Fault Tolerant MVDC-HVAC Power Converter for Wind Farm Applications                                   | J. K. Reed, G. Venkataramanan, University of Wisconsin-Madison, United States                                                                                                      |
| B4-12         | Application of High Capacity Voltage Source Converter HVDC Technology at the Tres Amigas SuperStation | N. M. Kirby, Alstom Grid, United States<br>N. M. MacLeod, Alstom Grid, United Kingdom<br>D. Stidham, Tres Amigas LLC, United States<br>M. Reynolds, POWER Engineers, United States |
| B4-13         | Series Capacitor Applications including Thyristor-Controlled Series Compensation for AC Lines         | I. A. Erinmez, Powerforce APP, United Kingdom<br>S. Nilsson, Exponent, United States                                                                                               |
| B4-14         | Large Scale Wind in Texas – Utility Experience with Series Capacitors, SVCs, and Weak Systems         | D. Kidd, P. Belkin, B. Mehraban, American Electric Power, United States<br>G. Irwin, D. Woodford, A. Isaacs, Electranix, Canada                                                    |

**Summary: Marcio Szechtman, Brazil**

**Evening**

Dinner at Hotel Nikko

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**Thursday March 8, 2012**

**Exposition Open to Registered Attendees**

**7 AM to 5 PM**

**Cable Technologies**

**Session Chair: Gunnar Evenset, Nexans, Norway.**

| <b>Papers</b> | <b>Title</b>                                                                                                           | <b>Authors</b>                                                                                                                                                                                               |
|---------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| B1-1          | Recommendations for testing HVDC extruded cable systems for power transmission at a rated voltage up to 500 kV         | B. Sanden, Stattnet, Norway for Study Committee B1                                                                                                                                                           |
| B1-2          | Innovation and applications for extruded HVDC cable systems                                                            | M. Albertini, S. Franchi Bononi, M. Marelli, G. Miramonti, A. Orini, G. Perego, G. Pozzati, Prysmian, Italy<br>N. Kelley, Prysmian, United States                                                            |
| B1-3          | HVDC XLPE Cables and Accessories at a Rated Voltage up to 500kV                                                        | Yoshinao Murata, Masatoshi Sakamaki, Shoji Mashio, Osamu Matsunaga, Seiji Kashiya, Shoshi Katakai, J-Power Systems Corp., Japan                                                                              |
| B1-4          | Electromagnetic Fields of DC Cable Systems                                                                             | F. Lesur, F. DesChamps, RTE, France                                                                                                                                                                          |
| B1-5          | Basic Impulse Insulation Level Review of $\pm 80$ kV Nano-Composite DC XLPE Cable                                      | H. S. Park, C. K. Jung, J. W. Kang, D. H. Kim, J. W. Shim, B. S. Moon, KEPCO Research Institute, South Korea                                                                                                 |
| B1-6          | Development of XLPE Extruded Cable System for HVDC power Transmission                                                  | M. Mammeri, M. L. Paupardin, B. Poisson, I. Denizet, P. Argaut, Silec Cable, General Cable Co., France<br>J. Freestone, General Cable Corp., Spain<br>B. Vissouvanadin, Laboratoire Laplace Toulouse, France |
| B1-7          | Extruded HVDC Cables – A Solution for Different Customer Segments                                                      | K. Bergman, F. Mekic, ABB AB High Voltage Cables, United States<br>A. Gustafsson, MJP. Jeroense, ABB AB High Voltage Cables, Sweden                                                                          |
| B1-8          | Development, Prequalification, and Type test of HVDC Extruded Cable Systems – an Illustration of Cigre Recommendations | P. Mirebeau, M. Gardelein, L. Boyer, Nexans, France<br>B. Sonerud, Nexans, Norway<br>C. Frohne, Nexans, Germany                                                                                              |
| B1-9          | Advanced technology for reliable HVDC extruded cable system                                                            | H. Niinobe, N. Ishii, T. Nakajima, A. Watanabe, H. Tanaka, H. Kon, Viscas Corp., Japan                                                                                                                       |
| B1-10         | High Temperature Superconducting Power Cables for HVDC Applications                                                    | M. Stemmler, B. West, E. Marzahn, L. Lallouet, F. Schmidt, Nexans, Germany                                                                                                                                   |

## Overhead Line Technologies

**Session Chair: John Chan, EPRI, USA**

| Papers                                                                                      | Title                                                                                                                                                    | Authors                                                                                                                                                 |
|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| B2-1                                                                                        | A Study for Environmental Characteristics of AC/DC Hybrid Overhead Transmission Line Using Reduced-scale Model                                           | K. Y. Shin, Y. H. Kim, D. I. Lee, Korea Electric Power Research Institute, South Korea<br>D. H. Kim, B. S. Mun, Korea Electric Power Corp., South Korea |
| B2-2                                                                                        | Novel Design for Parallel VSC HVDC Links on Common Overhead Line Towers                                                                                  | J. Lundquist, STRI, Sweden<br>J. Lilliecrona, Svenska Kraftnät, Sweden                                                                                  |
| B2-3                                                                                        | Corona and Related Effects of Transmission Lines Converted from AC to DC Operation: Eskom's Perspective and Considerations for Cigré Working Group B2.41 | A. A. Beutel, A. Singh, N. Mahatho, A. C. Britten, N. Parus, P. Moodley, Eskom, South Africa                                                            |
| B2-4                                                                                        | Assurance of Adequate Electrical Clearance for AC or DC Overhead Lines at Maximum Power Flow                                                             | I. S. Grant, Tennessee Valley Authority, United States<br>D. A. Douglas, Power Delivery Consultants Inc., United States                                 |
| B2-5                                                                                        | System Benefits of Strategic Conversion of EHV AC Transmission Line to HVDC Operation                                                                    | T. J. McDermott, AECOM, United States<br>B. Shperling, New York Power Authority, United States<br>R. S. Burton, Teshmont, Canada                        |
| B2-6                                                                                        | Performance of DC Transmission Line Insulator Strings                                                                                                    | J. Bishop, G. Johnson, S. Nilsson, Exponent, United States<br>J. McNichol, Manitoba Hydro, Canada                                                       |
| B2-7                                                                                        | Electrical Environment: Conversion of an AC to a DC Transmission Line                                                                                    | G. B. Johnson, W. H. Bailey, Exponent, United States                                                                                                    |
| <p><b>Summary:</b><br/> <b>B1 - Marco Marelli, Prysmian, Italy</b><br/> <b>B2 - TBD</b></p> |                                                                                                                                                          |                                                                                                                                                         |

**Friday March 9, 2012**

**Technical Visit**

**Technical Visit arranged by Siemens to the San Francisco converter station terminal of the Trans Bay  
Cable Project**

## Tutorials

|                                 |                 |
|---------------------------------|-----------------|
| <b>Tutorial on HVDC Grid</b>    |                 |
| <b>Tuesday March 6, 2012</b>    |                 |
| <b>Full Day</b>                 |                 |
|                                 |                 |
| <b>Introduction</b>             | Gunnar Asplund  |
| <b>Available Technologies</b>   | Muhamed Rashwan |
| <b>HVDC Grid Configuration</b>  | Norman McLeod   |
| <b>Fault performance</b>        | Gunnar Asplund  |
| <b>Protection Requirements</b>  | Kerstin Linden  |
| <b>Power Flow Control</b>       | Kerstin Linden  |
| <b>Security and Reliability</b> | Norman McLeod   |
| <b>Grid Code</b>                | Gunnar Asplund  |
| <b>New components needed</b>    | Bjarne Andersen |
| <b>Conclusion</b>               | Gunnar Asplund  |

|                                                                                                                             |                   |
|-----------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>Tutorial on Testing of XLPE AC submarine and<br/>DC cable systems up to 500 kV</b>                                       |                   |
| <b>Tuesday March 6, 2012</b>                                                                                                |                   |
| <b>Half Day - morning</b>                                                                                                   |                   |
|                                                                                                                             |                   |
| <b>Introduction</b>                                                                                                         | Pierre Argaut     |
| <b>Test recommendations on XLPE AC submarine<br/>cables from 170 kV to 500 kV</b>                                           | Anders Gustafsson |
| <b>Recommendations for testing DC extruded cable<br/>systems for power transmission at a rated voltage up<br/>to 500 kV</b> | Bjorn Sanden      |