



2019 CIGRE CANADA CONFERENCE & EXPO

September 16-19, 2019 Le Westin Montréal Québec, Canada www.cigre.ca

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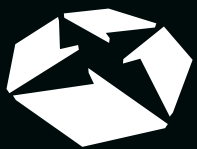
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WELCOME MESSAGE FROM GENERAL CHAIR

On behalf of the members of the CIGRE Canada committee and Hydro-Québec, I would like to officially welcome you to the 14th Annual CIGRE Canada Conference on Power Systems. Hydro-Québec is proud to host this important event, which will bring together many major players in the energy sector. From September 16 to 19, business leaders, manufacturers, engineers, regulators and academics will come to Montréal to discuss the latest technical and technological breakthroughs as well as major trends in the power industry.

In recent years, Montréal has garnered a reputation for being a high-tech centre of excellence and an innovation hub, becoming in the process a global leader in artificial intelligence. The theme of this year's conference could therefore not be more appropriate: Innovation at the heart of power grid transformation.

Innovation must be a top priority given that all aspects of tomorrow's power grid will incorporate digital technologies, enabling interactive features that promote customer participation. Regardless of your role in the industry, I am sure you share my conviction that the effects of this changing reality are already being felt. This shift pushes us to question our methods, review our current paradigms and rethink our strategies. However, in spite of the very real business challenges resulting from the transformation of our industry, I personally see a remarkable opportunity to draw on our expertise and demonstrate creativity through innovation.

Therefore, in the era of transportation electrification, digital transformation and home automation, it is the ideal time to meet and share our knowledge, know-how and innovative practices in order to ensure that the power grid evolves and adapts to the reality of tomorrow. The 2019 CIGRE Canada Conference will provide a unique forum for enriching discussions and new ideas, where you will have the opportunity to learn from your peers on topics of interest including efficient electrification, customer empowerment, asset management and the smart power grid.

I also sincerely hope that you will be able to discover all that Montréal has to offer or perhaps get reacquainted with our cosmopolitan city whose European charm and North American enthusiasm have made it world renowned. When you're not at the conference, I encourage you to discover our local culture by visiting the city's various neighbourhoods and their many shops, art galleries, museums and restaurants.

I'm looking forward to seeing you there!

Yours truly,



Marc Boucher
President, Hydro-Québec TransÉnergie

A DYNAMIC CONFERENCE PROGRAM

The 2019 edition of the CIGRE Canada conference is innovating to reach out and connect the various players in the industry and electric utilities in the context of the remarkable global evolution of power grids in recent years, which will continue in coming years with the gradual liberalization of electricity markets and the penetration of renewable energies into the electricity grid.

The conference will begin with our keynote speaker, Éric Martel, President and CEO of Hydro Quebec, and will follow with a technical panel composed of industry leaders, accompanied by Denis Tremblay, President and CEO of AIEQ, as moderator. AIEQ has joined CIGRE Canada for this year's conference.

Thanks to the volunteer efforts of a very dynamic core (Kasun Samarasekera, Aleks Modelewska and Farhad Yahyaie), we will be inaugurating a networking activity for the new generation of Cigreans (35 and under). Scientific papers by the Next Generation Network (NGN) and students will be evaluated and prizes will be awarded for both groups at the conference banquet.

During Tuesday's lunch break, Robyn Koropatnick will facilitate a Women in Engineering activity, bringing quality guests to the forefront and providing opportunities for women to share and learn from these inspiring leadership journeys. Women are often underrepresented in our sector of activity and this forum aims to recognize the excellence of their contributions and their know-how so as to promote the advancement of women in the electricity sector.

Five technical seminars will take place on Monday prior to the day's conference, along with three workshops on Thursday following the day's conference, all in addition to the various papers to be presented over the span of the conference. These activities are golden opportunities to gain further knowledge and insight in your areas of interest.

Two visits to the Varennes site of the Hydro-Québec research institute (IREQ) are also on the agenda. Hydro-Québec is the only utility in North America to have a research center as large as IREQ, spending an average of \$100 million a year on its innovation projects. The work at IREQ makes it possible to:

- Extend the useful life of equipment
- Increase equipment performance
- Optimize maintenance
- Support energy efficiency programs and improve customer service

We invite you to participate in this unique forum in large numbers and are eager to see you at the CIGRE Canada 2019 conference.



Pierre Van Dyke
Canadian Representative SC B2
Program Chair
Research Scientist
Institut de recherche
d'Hydro-Québec



Stéphane Talbot
CIGRE Canada Executive
Committee Member
Director Planning
Hydro-Québec TransÉnergie



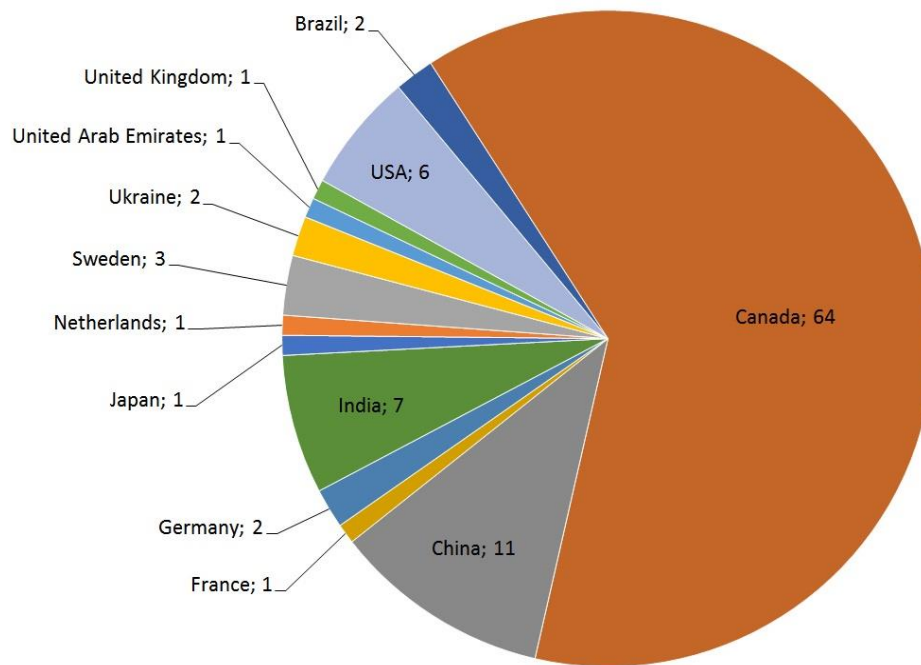
Jean-Pierre Tardif
Local Arrangement Chair
Communication Advisor
Institut de recherche
d'Hydro-Québec



Jean-François Allan
Technical Committee Chair
Research Scientist
Institut de recherche
d'Hydro-Québec

MESSAGE FROM TECHNICAL COMMITTEE CHAIR

On behalf of the Technical and Organizing Committees, I am pleased to welcome you in Montréal to the 14th Annual CIGRE Canada Conference on Power Systems. At the first stage of the selection process, 146 abstracts were received. Then, 102 papers from 13 countries made it to the conference final program inside 22 technical sessions. In the figure below is presented the distribution of the 102 papers by country, based on the country of the principal author of a paper.



I would like to express my sincere appreciation to the 38 technical committee members for the exposure given to the Call for Papers through the industry, research centres and universities. I am grateful for their time, efforts and expertise provided during the contribution evaluation process. Also, special thanks to the authors for their significant contributions that make the technical program highly relevant to participants.



Jean-François Allan
 Technical Committee Chair
 Research Scientist, Institut de recherche d'Hydro-Québec

COMMITTEES

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General Chair

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Canadian Representative SC B2
Program Chair

Jean-François Allan, Hydro-Québec (IREQ)

Technical Committee Chair

Jean-Pierre Tardif, Hydro-Québec (IREQ)

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Basile Agba, Hydro-Québec (IREQ), Canada

Behzad Kordi, University of Manitoba, Canada

Brent Maksymiw, SaskPower, Canada

Claude Rajotte, Hydro-Québec, Canada

Colin Clark, AltaLink, Canada

Daniel Wong, AltaLink, Canada

David Jacobson, Manitoba Hydro, Canada

David Olan, BC Hydro, Canada

Debashish Datta Ray, Bhabha Atomic Research Centre, India

Derek Oliver, University of Manitoba, Canada

Dipendra Rai, BC Hydro, Canada

Duc-Hai Nguyen, Hydro-Québec (IREQ), Canada

Francisc Zavoda, Hydro-Québec (IREQ), Canada

Jean-Bernard Dastous, Hydro-Québec (IREQ), Canada

Jean-François Allan, Hydro-Québec (IREQ), Canada

John Martin, Alberta Electric System Operator, Canada

Jorge Hollman, Powertech Labs, Canada

Julien Beaudry, Hydro-Québec (IREQ), Canada

Kankar Bhattacharya, University of Waterloo, Canada

Manuela Dobrescu, Hydro-Québec TransÉnergie, Canada

Mark Stemmler, Nexans High Voltage USA Inc., USA

Nicolas Pouliot, Hydro-Québec (IREQ), Canada

Normann Fischer, Schweitzer Engineering Laboratories, USA

Patrick Picher, Hydro-Québec (IREQ), Canada

Pierre Couture, Hydro-Québec (IREQ), Canada

Pierre Van Dyke, Hydro-Québec (IREQ), Canada

Rémi Tremblay, Hydro-Québec, Canada

Rick Spyker, AltaLink, Canada

Sébastien Poirier, Hydro-Québec (IREQ), Canada

Serge Montambault, Hydro-Québec (IREQ), Canada

Simon Prud'homme, Hydro-Québec, Canada

Steven Pai, BC Hydro, Canada

Sudhakar Cherukupalli, BC Hydro, Canada



Tarlochan Sidhu, University of Ontario Institute of Technology, Canada

Tatiana Guerrero, WSP, Canada

Xicai Zhao, NR Electric, China

Zibby Kieloch, Manitoba Hydro, Canada

WEEK-AT-A-GLANCE

Monday September 16, 2019	
7:00-17:30 Registration 3 rd floor	
<p>Technical visits to IREQ Departures and arrivals at the main entrance of the hotel Le Westin</p>  	<p style="text-align: center;">CIGRE Workshops 9th floor, room St-Antoine</p>
8:00 Departure 1 st technical visit	8:30-9:30 B2.48 Experience with the mechanical performance of non-conventional conductors, P. Van Dyke
9:00-12:00 First technical visit (capacity 48 people)	9:45-10:45 B2.44 Coatings for protecting overhead power network equipment in Winter conditions M. Farzaneh et H. Gauthier
13:00 Departure 2 nd technical visit	11:00-12:00 Asset management and its importance for electric power utilities, D. Komljenovic
14:00-17:00 Second technical visit (capacity 48 people)	13:30-14:30 C6 Impact of Distributed Energy Resources (DER) on transmission grid operations and control, M. de Montigny
	14:45-15:45 C5 Regulation and market design barriers preventing to capture all the value from fast and high locations freedom energy storage Kankar Bhattacharya (CA), Jarrad Wright (ZA) and Arnaud Banner (FR), supported by Anant Venkateswaran (US)
18:00-20:00 Welcome Reception 8 th floor, Grande Place	

Exhibitor Trade Show Opening Hours

8th floor, Grande Place

Monday	18:00-20:00
Tuesday	9:00-20:00
Wednesday	9:00-16:00

Time		Tuesday September 17, 2019		
06:30	19:00	Registration <i>11th floor, Foyer Montreal</i>		
06:45	08:00	Breakfast <i>11th floor, Foyer Montreal</i>		
07:00	16:00	Speaker ready room <i>11th floor, Foyer Montreal</i>		
08:00	08:10	Word of welcome <i>11th floor, Foyer Montreal</i>		
08:10	08:30	Keynote speech – Innovation at the heart of power grid transformation Éric Martel, President and CEO of Hydro-Québec <i>11th floor, Foyer Montreal</i>		
08:30	10:00	Business panel – Power grid transformation <i>Marc Boucher, President of Hydro-Québec TransÉnergie</i> <i>Gaétan Thomas, President and CEO NB Power</i> <i>Mark Lauby, Senior vice president and chief engineer, NERC</i> Moderator: Denis Tremblay, President and CEO AIEQ <i>11th floor, Foyer Montreal</i>		
10:00	10:30	Networking Break <i>8th floor, Grande Place</i>		
10:30	12:00	Session 1 (A2) <i>11th floor, Foyer Montreal</i>	Session 2 (B4) <i>9th floor, room Ville-Marie</i>	Session 3 (C6) <i>9th floor, room St-Antoine</i>
12:00	13:15	Breakfast <i>11th floor, Foyer Montreal</i>		Women in engineering <i>9th Floor room Ville-Marie</i>
13:15	14:30	Session 4 (B2) <i>11th floor, Foyer Montreal</i>	Session 5 (B5) <i>9th floor, room Ville-Marie</i>	Session 6 (C5) <i>9th floor, room St-Antoine</i>
14:30	15:00	Networking Break <i>8th floor, Grande Place</i>		
15:00	16:15	Session 7 (A3) <i>11th floor, Foyer Montreal</i>	Session 8 (B4) <i>9th floor, room Ville-Marie</i>	Session 9 (B5) <i>9th floor, room St-Antoine</i>
16:15	16:45	Networking Break <i>8th floor, Grande Place</i>		
16:45	17:45	Session 10 (B3) <i>11th floor, Foyer Montreal</i>	Session 11 (A2) <i>9th floor, room Ville-Marie</i>	Session 12 (C2) <i>9th floor, room St-Antoine</i>
17:45	19:00	Cocktail Reception <i>8th floor, Grande Place</i>		
19:00	22:30	Conference Banquet and presentation of the finalists Best Student Papers - Best NGN Papers <i>11th floor, Foyer Montreal</i>		

Time		Wednesday September 18, 2019		
06:30	13:00	Registration 11 th floor, Foyer Montreal		
06:45	08:00	Breakfast 11 th floor, Foyer Montreal		
07:00	13:00	Speaker ready room 11 th floor, Foyer Montreal		
08:00	08:15	AIEQ – Future direction Denis Tremblay, President and CEO AIEQ 11 th floor, Foyer Montreal		
08:15	09:15	Sponsor Panel – Towards the energy system of the future Faisal Kazi, President & CEO, Siemens Canada, Urban Strandberg, VP Sales & Marketing, ABB Grid & Power, Quality, NA John Camilleri, Manager Operation Technologies, PSC Consulting Randy Berry, VP, Utilities Business Unit, Open Systems International Moderator: Mike Bartel, VP Asset Management, AltaLink 11 th floor, Foyer Montreal		
09:15	09:45	Networking Break 8 th floor, Grande Place		
09:30	12:00	Canadian Study Committee Representatives meeting 8 th Floor room Viger		
09:45	10:45	Session 13 (A2) 11 th floor, Foyer Montreal	Session 14 (C2) 9 th floor, room Ville-Marie	Session 15 (B4) 9 th floor, room St-Antoine
10:45	11:15	Networking Break 8 th floor, Grande Place		
11:15	12:15	Session 16 (B4) 11 th floor, Foyer Montreal	Session 17 (C2) 9 th floor, room Ville-Marie	Session 18 (B3) 9 th floor, room St-Antoine
12:15	13:45	Breakfast 8 th floor, Foyer Montréal		Réseau de la nouvelle génération 8 th floor, room Ramezay
13:45	15:00	Session 19 (C1) 11 th floor, Foyer Montreal		Session 20 (B2) 9 th floor, room Ville-Marie
15:00	15:30	Networking Break 8 th floor, Grande Place		
15:30	16:30	Session 21 (B5) 11 th floor, Foyer Montreal	Session 22 (A2) 9 th floor, room Ville-Marie	
16:30	16:45	Networking Break 8 th floor, Grande Place		
16:30	17:15	Award Presentation of the Best Papers and Closing Session Award of the Best Student Paper – Award of the Best NGN Paper – Prize draws 11 th floor, Foyer Montreal		
19:00	21:30	Next Generation Network (NGN) Social – Networking and cocktails Air rooftop terrace, Renaissance hotel, 1250 Robert-Bourassa boul., Montreal, Qc H3B 3B8		
Time		Thursday September 19, 2019		
08:00	12:00	Tutorial ABB 8 th floor, room Ramezay		Tutorial Siemens 8 th floor, room Palais

DETAILED AGENDA

Social Events

Welcome Reception

Monday September 16, 2019 | 18:00 – 20:00, 11th floor, room Montreal

Le Westin Montréal, Casual dress

Get the conference off to a great start by networking with your colleagues over a glass of wine and collecting your registration materials.

Cocktail Reception

Tuesday September 17, 2019 | 17:45 – 19:00, 8th floor, Grande Place

Le Westin Montréal, Business casual

Enjoy a beverage while networking with the exhibitors and your colleagues before the banquet.

Banquet

Tuesday September 17, 2019 | 19:00 – 22:00, 11th floor, room Montreal

Le Westin Montréal, Business casual

The conference banquet is an evening of fine dining and stimulating conversation, providing an opportunity to salute the work accomplished during the conference. Network with participants and enjoy the entertainment.

The finalists for the Best Student Paper Award and the Best NGN Paper Award will be presented during the banquet.

This recognition consists of a personalized certificate for each finalist.

Awards Presentation

Wednesday September 18, 2019 | 16:45 – 17:15, 11th floor, room Montreal

Le Westin Montréal, Business casual

In recognition of their outstanding contributions for the 2019 CIGRE Canada Conference, a Best Student Paper Award and a Best NGN Paper Award will be presented to the author(s) of a student and an NGN paper, based on the quality of the full paper and the presentation.

2019 CIGRE Canada Conference Best Student Paper Award

This award consists of a personalized certificate and a cash award in the amount of \$1,000.

2019 CIGRE Canada Conference Best NGN Paper Award

This award consists of a personalized certificate and a cash award in the amount of \$1,000.

Sponsored by CIGRE Canada



WIE Luncheon

Tuesday September 17, 2019 | 12:00 – 13:15, 9th floor, room Ville-Marie

CIGRE Canada Women in Engineering is pleased to host a panel discussion during the WIE Luncheon:

Over the past 30 years there have been numerous initiatives attempting to increase the participation of women in engineering.

The concepts of inclusion and diversity, in addition to recognition of how engineering solutions can be improved when the design team better reflects society, are being discussed now more than ever by engineering students, professors, professionals, and the general public.

This session will consider where our influential panelists started their careers, where they are in their careers at present and what initiatives are being considered and, what their hopes are for the future including concepts that can be implemented to achieve gender parity within the engineering profession.

12:00	12:30	Lunch served to all in attendance at approximately 12:05	
12:30	12:38	Welcome from the moderator and introduction of panelists	Robyn Koropatnick, Vice President, Business Development, Teshmont Consultants LP
12:38	13:13	WIE Panel 'Past, Present and Future' Roundtable theme	Kathy Baig, President, Ordre des ingénieurs du Québec (OIQ) Nathalie Pilon, ABB Canada President Arielle Kadoch, Stantec Principal Sector Leader, Power T&D Canada East Moderator: Robyn Koropatnick, Vice President, Business Development, Teshmont Consultants LP
13:13	13:15	Closing remarks	Robyn Koropatnick, Vice President, Business Development, Teshmont Consultants LP

CIGRE Canada NGN

CIGRE Canada Luncheon

Wednesday September 18, 2019 | 12:00 – 13:15, 8th floor, room Ramezay

12:00	12:10	Welcome	Aleks Modelewska, Business Development, Digital Engineering
12:10	12:20	Note from CIGRE Canada President	Mike Bartel, Vice President, Asset Management, Altalink
12:20	12:30	Note from CIGRE President	Rob Stephen, GM Master Specialist Technology Group, ESKOM <i>(Via Letter read by Aleks Modelewska, Digital Engineering)</i>
12:30	12:40	Ice breaker intro	Farhad Yahyaie, Senior Engineer, Power System Studies, Powertech Labs Ani Chopra, Lifecycle Maintenance EIT, Altalink Brendan Kelly, Smartwires Kurtis Martin Sturmey, Utility Project Lead, METSCO
12:40	13:15	Ice breakers	

CIGRE Canada NGN Social

Networking and cocktails – Come out for a great time!

Wednesday September 18, 2019 | 18:00 – 20:30

Air rooftop terrace, Renaissance hotel, 1250 Robert-Bourassa boul., Montreal, Qc H3B 3B8

18:00	18:10	Welcome	Aleks Modelewska, Business Development, Digital Engineering Farhad Yahyaie, Senior Engineer, Power System Studies, Powertech Labs Ani Chopra, Lifecycle Maintenance EIT, Altalink Brendan Kelly, Smartwires Kurtis Martin Sturmey, Utility Project Lead, METSCO
18:10	20:00	Mingling	

Technical Tour

Hydro-Québec's Research Institute - IREQ

Monday September 16, 2019

First visit : 8:00 – 12:00

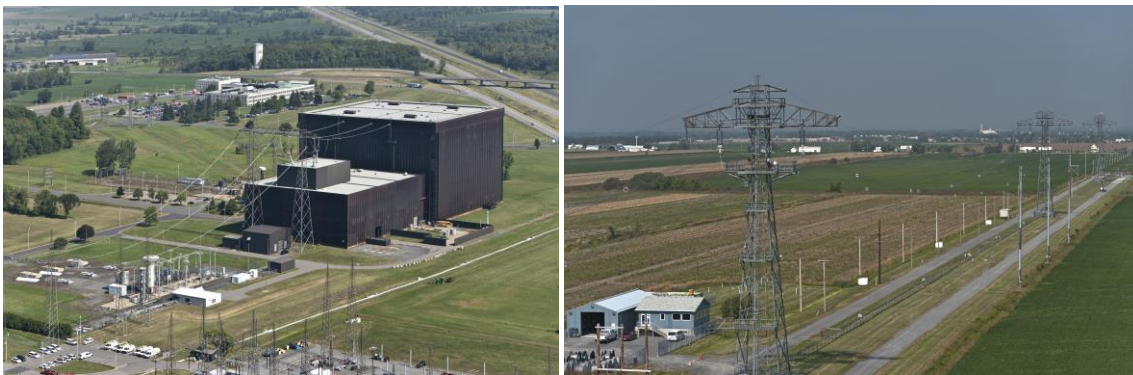
Second visit : 13:00 – 17:00

Departures and arrivals at the main entrance of the hotel Le Westin

Hydro-Québec's research institute, IREQ, is one of the largest integrated electrical research and testing centres in North America. Created in 1970, IREQ has developed large-scale expertise in electrical apparatus, network analysis and control, automation and measurement, materials, chemical and mechanical engineering, and applications of electricity. It has impressive facilities at its disposal: distribution tests lines, high-voltage laboratory, a power system study and simulation centre and an electrotechnology laboratory, as well as numerous specialized laboratories, notably in robotics, battery materials and mechanical engineering. It has also an extensive three-span mechanical test line to study vibration phenomena. Before you begin the tour of our facilities, a short presentation will give you an overview of Hydro-Québec's grid.

IREQ has facilities in Varennes, some 45 minutes from downtown Montréal.

Don't miss this great opportunity!



*For summary verification purposes, all visitors must provide at the moment of the registration to the visit the following information; those who fail to provide it will unfortunately not be able to attend the visit.

* Complete Name, Date of birth, Passport number, Country emitting the passport

CIGRE Workshops

B2.48 Experience with the mechanical performance of non-conventional conductors

Monday September 16, 2019 | 8:30 – 9:30, 9th floor, room St-Antoine

Presenter: Pierre Van Dyke, Hydro-Québec Research Institute (IREQ)

Bottlenecks in transmission and distribution grids are causing more and more precarious situations. Non-conventional conductor change may become an attractive option to increase the capacity. This can offer higher capacity without weight penalty and higher ampacity limits with limited or no structure changes. The use of high temperature conductors with high ampacity rating, small diameter (to stay below existing wind load limits), light weight and reduced sag characteristics can be attractive.

B2.44 Coatings for protecting overhead power network equipment in Winter Conditions

Monday September 16, 2019 | 9:45 – 10:45, 9th floor, room St-Antoine

Presenters: M. Farzaneh, Consultant, H. Gauthier, Hydro-Québec Research Institute (IREQ)

The application of superhydrophobic and glaciophobic coatings could offer a number of opportunities to improve the performance of power network equipment subjected to icing. This tutorial is based on the work of CIGRE Working Group B2.44 as reported in CIGRE Technical Brochure 631 entitled Coatings for Protecting Overhead Power Network Equipment in winter conditions. The presentation deals with state-of-the-art activities related to techniques for protecting power network equipment including insulators, ground wires and conductors under icing conditions.

Asset management and its importance for electric power utilities

Monday September 16, 2019 | 11:00 – 12:00, 9th floor, room St-Antoine

Presenter: D. Komljenovic, Hydro-Québec Research Institute (IREQ)

The tutorial presents the basic concept and overview of asset management and asset management system such as defined in ISO 5500x. Asset management is described and discussed in a proper context of operational and business complexity including associated challenges to this context. The presentation highlights the difference between notions of “Asset management” and “Managing assets”. Current developments and trends in this field are presented in both electrical power industry and elsewhere including potential benefits from implementing a structured asset management system. Some practical experience from industry is also described. Factors of success and potential traps are stressed.

C6 Impact of Distributed Energy Resources (DER) on transmission grid operations and control

Monday September 16, 2019 | 13:30 – 14:30, 9th floor, room St-Antoine

Presenter: M. de Montigny, Hydro-Québec Research Institute (IREQ)

In the context of the energy transition, Hydro-Québec must carry out impact studies of distributed energy resources (DER) on grid operations and control. Those studies require a tool capable of representing the behaviour of the operators and grid control systems in the context of network planning. The work done in the SIRE project for the integration of wind power is presented and serves as a basis for the development for a new DER impact assessment tool on Hydro-Québec transmission network.

C5 Regulation and market design barriers preventing to capture all the value from fast and high locations freedom energy storage

Monday September 16, 2019 | 14:45 – 15:45, 9th floor, room St-Antoine

Presenters: Kankar Bhattacharya (CA), Jarrad Wright (ZA) and Arnaud Banner (FR), supported by Anant Venkateswaran (US)

In order to sustain the integration of a high share of renewable energy sources, there is an increased need for flexibility in power systems, creating value for new storage technologies. However, disruptive technology features are susceptible of revealing limitations of existing regulations and markets, simply because those were designed consistently with conventional generation, before these features even existed at industrial scale. This tutorial presents the results of the working group C5.25 which identifies regulation and market design barriers preventing to fully capture the value from “new” energy storage technologies, faster and with higher-location-freedom than conventional power generation assets. A theoretical analysis of potential value streams and barriers was performed together with a practical inventory for 14 countries, leading to four main recommendations.



08:10 – 08:30 Tuesday, September 17, 2019

Montreal Conference Room – 11th Floor

Innovation at the Heart of Power Grid Transformation

**Éric Martel , Président & CEO
Hydro-Quebec**

Business Panel

08:30 – 10:00 Tuesday, September 17, 2019

Montreal Conference Room – 11th Floor

Power grid transformation

Business Panel – Transformation of the electricity network

Marc Boucher, President of Hydro-Québec TransÉnergie

Gaétan Thomas, President and CEO NB Power

Mark Lauby, Senior vice president and chief reliability officer NERC

Moderator: Denis Tremblay, President and CEO AIEQ



Marc Boucher



Gaétan Thomas



Mark Lauby



Denis Tremblay

Presentation summary

Power Grid is one of the greatest modern achievement. It is impossible to deny the center role of Electricity in our modern world and for poor communities in the world to get access to a minimum quality of life. For long, the development of Grid System infrastructure has been the only way to make Electricity available to all. But things evolve, now the availability of Electricity in our live can be assured at a reasonable cost by other means than the usual heavy investments in the expansion of the Grid System.



Denis Tremblay

Keynote

8:00 – 08:15 Wednesday, September 18, 2019

Montreal Conference Room – 11th Floor

AIEQ – Future direction

Denis Tremblay, President and CEO, AIEQ

Sponsor Panel

08:15 – 09:15 September 18, 2019

Montreal Conference Room – 11th Floor

Towards the energy system of the future

Faisal Kazi, President & CEO, Siemens Canada

Urban Strandberg, VP Sales & Marketing, ABB Grid & Power Quality, NA

John Camilleri, Manager Operation Technologies, PSC Consulting

Randy Berry, VP, Utilities Business Unit, Open Systems International

Moderator: Mike Bartel, VP Asset Management, AltaLink

Presentation summary

The global energy transition is under way and the field of electrical energy is changing. The energy system of the future will evolve to be smart and optimize all operations, from production facilities to customers and back. Digital transformation brings opportunities such as digital twin technology to achieve a sustainable future.



Faisal Kazi



Urban Strandberg



John Camilleri



Randy Berry



Mike Bartel

ABB Technical Tutorial

Thursday September 19, 2019 | 08:00 – 12:00, 8th Floor, Ramezay Room

Innovations and best practices for implementing your digital transformation strategy

Summary

ABB’s latest technologies provide innovative solutions across the power value chain and help utilities to accelerate the digital transformation of power grids.

Traditional substations have always relied on copper cables to connect primary equipment like circuit breakers, conventional current and voltage transformers, and protection relays to control the electricity. Now, digital technologies with modern sensors, communications and standards are driving the evolution of something new—digital substations.

Digital substations are a key element of next-generation grids and recent innovations provide a vast list of benefits, including digital communications through fiber-optic cables replacing copper, which can maximize efficiency, reliability and safety, while reducing cost, risk and environmental impact.

Primary equipment’s as integrated digital solution such as a digitally enabled power transformers, enable remote monitoring and data analytics of its vital parameters in real time. Connected via the digital substation back to the enterprise level with an enterprise asset management and performance software opens the door for seamless end to end integration and gives the operational and planning folks a crystal clear view allowing them to drive operation and planning more efficient as decision making can be linked to broad and real-time data.

The global experience in going the digital path from different utilities is shared as well the motivation and experience of implementing a digital substation in Canada will be presented.

Attend this session to learn how utilities are leveraging digital substations to improve safety and reliability while providing a functional consolidation to lower costs and optimize resources.

Additionally get an overview and better understanding of today’s technology and innovations supporting the digital transformation.

Agenda

8:00 – 8:30 AM	Kal Allam Peter Rietmann	Introduction - Current challenges and how digital transformation helps (benefits) <ul style="list-style-type: none"> • Example of utilities challenges • Examples of applying digitalization • Brownfield vs Greenfield
8:30 - 10:00 AM	LucTousignant Peter Rietmann Jay Jayaraman Peter Rietmann	The digital building blocks (overview of current and future products) <ul style="list-style-type: none"> • Primary equipment / Digital Transformer • Protection and automation • Enterprise asset management solutions • Cybersecurity
10:00 - 10:30 AM		Coffee Break
10:30 - 11:00 AM	Varun Chhibbar	Digital Substation Experience - Implementation of Blackie Substation
11:00 – 12:00 PM	Robert Isbister Peter Rietmann Jay Jayarama	Panel discussion / ask the experts

Siemens Technical Tutorial

Thursday September 19, 2019 | 08:00 – 12:00, 8th Floor, Palais Room

The role of Distributed Energy Systems and Microgrids in the Energy Transition

Presenters: Alif Gilani, Head of Engineering, Digital Grid
 Bharat Solanki, Microgrid Protection Control Specialist

Summary

We are in the midst of an energy transition. A transition that is driven by the need to de-carbonize and increase sustainability, improve efficiency and enhance reliability and resilience.

Utilities and commercial and industrial (C&I) customers are turning to distributed energy systems (DES) as an answer for their power resource challenges. DES encompasses energy generation and storage close to the load, with both local and remote monitoring and control solution technologies. The maturity of distributed energy resources (DERs) and digitalization via automation and smart grid technology is at an intersecting point on their growth curve to trigger this transition.

Siemens has developed an interactive simulation allowing tutorial participants to take on various roles within the energy system. Stakeholders are required to plan and develop short-term and long-term strategies under real-life scenarios in order to meet sustainability, reliability, resiliency, and energy efficiency goals.

Distributed energy system solutions are quickly offering alternatives that can turn these challenges into opportunities to save costs, increase reliability, and reduce emissions. With a proven track record in business transformation and the industry’s most comprehensive portfolio from generation all the way to consumption, Siemens Canada is your trusted partner helping you navigate the energy transition.












By attending this session, you will gain an understanding of how DERs can help utilities and customers navigate the challenges faced by the energy transition and take part in an interactive simulation focused on DES.

Agenda





8:00 – 9:00 AM	Overview of DES and Microgrids in the Energy Transition <ul style="list-style-type: none"> • Challenges currently facing utilities • Benefits of Distributed Energy Resources and Microgrids • Use Case Examples
9:00 - 9:40 AM	DES Simulation <ul style="list-style-type: none"> • Review of the objectives and goals of the session • Opening round – assessment of stakeholder roles
9:40 - 10:10 AM	Simulation Round 1 <ul style="list-style-type: none"> • Asset Acquisition • Scenario One presentation • Assessment of impact on stakeholders
10:10 - 10:30 AM	Coffee Break
10:30 - 11:00 AM	Simulation Round 2 <ul style="list-style-type: none"> • Asset Acquisition • Scenario Two presentation • Assessment of impact on stakeholders
11:00 - 11:30 AM	Simulation Round 3 <ul style="list-style-type: none"> • Asset Acquisition • Scenario #1 presentation • Assessment of impact on stakeholders
11:30 – 12:00 PM	Recap & Open Discussion

TECHNICAL SESSIONS

Tuesday September 17, 2019

<p>Session 1 11th floor Room Montreal</p>	<p>Transformers (A2) Session chairs: Patrick Picher, Hydro-Québec - IREQ</p> <p>CIGRE-106  Generator Failure Forensic Simulations Study, Lessons Learned Hesamaldin (Sam) Maleki, Dan Kell, Iftikhar Khan, Myles Godfrey Hatch Ltd. (Canada)</p> <p>(10:30 – 10:45)</p> <p>CIGRE-133  [FR] Évaluation d'état diélectrique et Analyse des causes profondes des défaillances des transformateurs de courant HT et THT  [EN] HV and EHV Current Transformer dielectric condition assessment and root cause analysis Diego M. Robalino¹, Ismail Güner² ¹Megger (USA), ²Hydro-Québec</p> <p>(10:45 – 11:00)</p> <p>CIGRE-117  Analysis of Short Circuit Withstand Capability of Power Transformers I. LAZARIEV JSC Ukrainian research, design and technological transformer institute (JSC "VIT") (Ukraine)</p> <p>(11:00 – 11:15)</p> <p>CIGRE-198  [FR] Étude de cas d'analyse de la réponse en fréquence (FRA) pour l'évaluation de l'intégrité d'un transformateur usagé suite à une réparation  [EN] Case study for assessing the integrity of a service-aged transformer repair using Frequency Response Analysis (FRA) R. S. A. FERREIRA¹, H. SIMARD², P. PICHER³, V. BEHJAT¹, I. FOFANA¹, H. EZZAIDI¹ ¹Research Chair on Aging Power Network Infrastructure (ViAHT), Université du Québec à Chicoutimi (UQAC) (Canada), ²Énergie Électrique Rio Tinto, Saguenay-Lac-Saint-Jean, ³Institut de recherche d'Hydro-Québec (IREQ)</p> <p>(11:15 – 11:30)</p> <p>CIGRE-209  Web Applications for Transmission System Asset Health Monitoring Sunil Agarwal, P.K Srivastava, Sunil Kumar, Manoj Kumar, Abhishek Bhardwaj, Vikas Bishnoi Power Grid Corporation of India Limited (India)</p> <p>(11:30 – 11:45)</p> <p>CIGRE-160  [FR] Surveillance de l'état du système de refroidissement des transformateurs par l'utilisation de réseaux de neurones  [EN] Transformer cooling system monitoring using neural networks A. ZINFLOU, P. PICHER, L. VOULIGNY, A. MARCHAND Hydro-Québec (Canada)</p> <p>(11:45 – 12:00)</p>
<p>Session 2 9th floor Room Ville-Marie</p>	<p>HVDC and Power Electronics (B4) Session chairs: Antoine Manga, Claude Rajotte, Hydro-Québec</p> <p>CIGRE-180  Increasing Transient Stability Limit by Nonlinear Damping Design Jinpeng Guo, Haihao Jiang, Xiaozhe Wang, Boon-teck Ooi McGill University (Canada)</p> <p>(10:30 – 10:45)</p> <p>CIGRE-183  The Research on the Key Equipment for 750kV Fixed Series Compensation in 3000m a.s.l. CHEN Yuanjun, ZHOU Qiwen, WANG Dechang, Gao Jian, Chen Wei, Zhang Daoxiong NR Electric Co., Ltd. (China)</p> <p>(10:45 – 11:00)</p>

Tuesday September 17, 2019

- (11:00 – 11:15) **CIGRE-208**
 **Voltage Source Converter (VSC) Operation at DC Lines close to AC Lines**
 M. Weiland, E. Starschich, G. Ebner, R. Teixeira Pinto, M. Schmidt
 Siemens AG (Germany)
- (11:15 – 11:30) **CIGRE-261**
 **Influence of extreme low humidity on the dielectric strength of air insulation under critical design voltages**
 L. Arevalo¹, D. Wu¹, O. Diaz¹, M. Larsson², C. Tornkvist²
¹ABB Power Grids – HVDC (Sweden), ²ABB Corporate Research
- (11:30 – 11:45) **CIGRE-142**
 **Sizing Study for a Hybrid Power Flow Controller – Comparison with the Nanjing UPFC**
 J. Z. Bebic¹, Y. Dong², L. Pan², B. Wang³
¹Hybrid Power Flow Controller Ltd. (Canada), ²Research Institute of NR Electric Co., Ltd., ³NR Electric USA LLC
- (11:45 – 12:00) **CIGRE-144**
 **MULTI -FPGA SOLUTION FOR LARGE POWER SYSTEMS AND MICROGRIDS REAL TIME SIMULATION**
 TEJKIRAN RANGINEEDI, SYED QASEEM Ali, AMINE YAMANE, LUC-ANDRE GREGOIRE, JEAN-NICOLAS PAQUIN, JEAN BELANGER
 OPAL-RT Technologies (Canada)

Session 3 Distribution Systems and Dispersed Generation (C6)

9th floor

Session chairs: Pierre Couture, Annissa Heniche Oussedik, Hydro-Québec - IREQ

Room St-Antoine

- (10:30 – 10:45) **CIGRE-195**
 **A DER Management System for Distributing Power among Discretely and Continuously Controlled Devices within DER group**
 Chu Sun¹, Syed Qaseem Ali², Geza Joos¹, Francois Bouffard¹
¹McGill University (Canada), ²OPAL-RT Technologies
- (10:45 – 11:00) **CIGRE-202**
 **The Energy Twin – A Solution for Techno-Economic Business Case Analysis of Microgrids & Distributed Energy Systems (DES)**
 Bharatkumar Solanki, Alif Gilani
 Siemens Canada Limited (Canada)
- (11:00 – 11:15) **CIGRE-228**
 **Synchronous Generator Load Sharing Models for Diesel-Based Remote Systems**
 JASON A. ZRUM, MICHAEL ROSS
 Yukon Research Centre – Yukon College (Canada)
- (11:15 – 11:30) **CIGRE-230**
 **MiGen Project – Empowering the transformation at the grid edge**
 R. Abdullah¹, M. Lacroix²
¹Hydro Ottawa (Canada), ²eMcREY Solutions
- (11:30 – 11:45) **CIGRE-239**
 **Impact of Load Modelling Parameters on Motor Start simulation in The Alberta Electric System**
 Ping-Kwan Keung¹, Sabbir Ahmed¹, Hamid Zareipour², Ali Reza Seifi², Edmond Chih², Amir Saman Hoshyazadeh²
¹Alberta Electric System Operator (AESO) (Canada), ²University of Calgary
- (11:45 – 12:00) **CIGRE-161**
 **Determination of Hot Spots in Gas Generators Using Brillouin Based Fiber Optic Distributed Sensor**
 L. ZOU¹, O. SEZERMAN¹, C. SPENCER², G. DAILEY³
¹OZ Optics Limited (Canada), ²Calpine Corporation, ³QPS Photonics Inc

Tuesday September 17, 2019

Session 4 Overhead Lines (B2)

11th floor

Session chairs: Simon Prud'homme, Maryse Lavoie, Hydro-Québec

Room Montreal
(13:15 – 13:30)

CIGRE-187

Design optimization of a 138 kV transmission line with optical phase conductors
RICHARD MARANDA, GUILLAUME VACHON, BASSEM KAABIA
BBA Inc. (Canada)

(13:30 – 13:45)

CIGRE-194

[FR] Amélioration de la durée de vie en fatigue du conducteur en utilisant une pince de suspension avec des élastomères coniques
[EN] Improved conductor endurance limit by using a suspension clamp with conical elastomers
J. PARADIS, P. VAN DYKE
Institut de Recherche d'Hydro-Québec (Canada)

(13:45 – 14:00)

CIGRE-114

Management Insulator contamination problems, mitigation methods and innovative predictive maintenance of overhead lines.
JM GEORGE
Sediver (France)

(14:00 – 14:15)

CIGRE-199

Transmission Line Route Refinement with Simultaneous Geomorphological Assessment
Sébastien Paradis, Line Bariteau, Claude Roy
BBA Inc. (Canada)

(14:15 – 14:30)

CIGRE-232

[FR] Validation d'un conducteur AACSR avec fils trapézoïdaux pour une traversée de rivière
[EN] Validation of an AACSR conductor with trapezoidal wires for a river crossing
P. VAN DYKE¹, S. PRUD'HOMME², J. PARADIS¹
¹Institut de Recherche d'Hydro-Québec (Canada), ²Hydro-Québec

Session 5 Protection and Automation (B5)

9th floor

Session chairs: Annissa Heniche Oussedik, Patrick Picher, Hydro-Québec - IREQ

Room Ville-Marie
(13:15 – 13:30)

CIGRE-193

New Methodologies for Accurate Modelling and Simulation of Advanced Telecommunication-Based Protection Schemes in a Software Environment
Hadi Khani, Daniyal Qureshi, Saman Alaeddini, Ishwarjot Anand
Quanta Technology (Canada)

(13:30 – 13:45)

CIGRE-105

A Station Domain Islanding Detection Method Based on Topology Analysis
Hua Xiujuan, Jiang Miao, Xu Guangfu
NR Electric Co., Ltd. (China)

(13:45 – 14:00)

CIGRE-104

AI-Based Islanding Detection for Utilities and Industrials
K. BAVISSETTI¹, D. CRUDELE², J. FRANKLIN³, S. GILL¹, M. JENSEN⁴, K. VU¹
¹ABB (USA), ²NYSERDA, ³National Grid, ⁴PG&E

(14:00 – 14:15)

CIGRE-108

The Identification of Transmission Line Overload and Fault Based on Ucosφ
Wang xingguo¹, Zhou Zexin¹, Liu Huanzhang², Du dingxiang¹
¹China Electric Power Research Institute (China), ²Central China Grid Company Limited

(14:15 – 14:30)

CIGRE-244

The AURORA vulnerability: The sword of Damocles over the heads of rotating machines
Marc Potvin
BBA Inc. (Canada)

Tuesday September 17, 2019

<p>Session 6 9th floor Room St-Antoine (13:15 – 13:30)</p>	<p>Electricity Markets and Regulation (C5) Session chairs: Alex Cruickshank, chairman SC C5</p> <p>CIGRE-135 ⌚ The fundamental evaluation of the methodology of constrained connection for Distributed Generation for procuring flexibility in European countries –lessons for Japan- K. Furusawa Central Research Institute of Electric Power Industry (Japan)</p> <p>(13:30 – 13:45) CIGRE-140 ⌚ Generation Connection Process - North American vs Australian Experience M. HEIDARI, J. JIANG, J. TAILOR, T. ABDEL-GALIL SNC Lavalin Inc (Canada)</p> <p>(13:45 – 14:00) CIGRE-186 ⌚ Challenges Faced and Measures Adopted for RE Integration in Indian Power system P.K. Agarwal, S.K. Jain Power System Operation Corporation Ltd. (India)</p> <p>(14:00 – 14:15) CIGRE-217 ⌚ Energy Storage and Ancillary Services Markets in North America Hisham Alharbi, Kankar Bhattacharya University of Waterloo (Canada)</p> <p>(14:15 – 14:30) CIGRE-240 ⌚ Demand Response Services in Electricity Markets of US and Canada NITIN PADMANABHAN¹, MOHAMED AHMED², KANKAR BHATTACHARYA¹ ¹ECE Department, University of Waterloo (Canada), ²Independent Electricity System Operator</p>
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<p>Session 7 11th floor Room Montreal (15:00 – 15:15)</p>	<p>High Voltage Equipment (A3) Session chairs: Maryse Lavoie, Hydro-Québec, Masoud Farzaneh, Consultant</p> <p>CIGRE-112 ⌚ [FR] Réseau de transport électrique intelligent formé de lignes de transport intelligentes et d'un réseau indépendant et redondant de fibres optiques ⌚ [EN] Smart Transmission Grid Based on Smart Power Lines with Independent and Redundant Optical Fiber Network Pierre Couture Hydro-Québec (Canada)</p> <p>(15:15 – 15:30) CIGRE-175 ⌚ A Station Service Voltage Transformer Designed and Tested to Withstand a Severe Internal Arc Fault S. Brodeur¹, H. Dinh² ¹ABB Inc., Transformers (Canada), ²ABB Inc., High Voltage Products</p> <p>(15:30 – 15:45) CIGRE-201 ⌚ Mitigation of inrush and outrush currents in capacitor bank switching using dry type air core reactors M. Goulkhah D. Caverly, M. Sharp Trench Ltd (Canada)</p> <p>(15:45 – 16:00) CIGRE-231 ⌚ [FR] Fabrication de revêtements superhydrophobes durables pour les isolateurs en verre ⌚ [EN] Fabrication of a durable superhydrophobic coating for high voltage glass insulators A. Allahdini, G. Momen, R. Jafari Université du Québec à Chicoutimi (Canada)</p>
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Tuesday September 17, 2019

(16:00 – 16:15)

CIGRE-248

Connecting Controlled Switching Devices in Power Plants to Analytics Tools in Sorgenia's Operations Centre to Increase the Service Life of Apparatuses

V. BALVET¹, V. CHECOLA²

¹VIZIMAX Inc. (Canada), ²SORGENIA S.p.A.

**Session 8
9th floor**

Room Ville-Marie

(15:00 – 15:15)

HVDC and Power Electronics (B4)

Session chairs: Patrick Picher, Alain Côté, Hydro-Québec - IREQ

CIGRE-213

Active Filtering of harmonic voltages or currents utilizing a MMC STATCOM-Design Aspects and Performance Experience

T. Schlegl, Dr. G. Pilz

Siemens AG (Germany)

(15:15 – 15:30)

CIGRE-223

HVDC O&M Strategy

D. KAVANAGH¹, C. MADSEN², D. KELL³

¹Nalcor Energy (Canada), ²ATCO Electricity Global Business Unit, ³Hatch

(15:30 – 15:45)

CIGRE-225

Research on Key Technical Parameters of Main Equipments for UHV Converter Station in High Altitude Area

Zhang He, Wu Fangjie, Shen Xiaolin, Yue Bo, Yang yiming, Wang yaoxuan

State Grid Economic and Technological Research Institute Co., Ltd. (China)

(15:45 – 16:00)

CIGRE-227

A COORDINATION CONTROL BETWEEN SVC AND BUS/SHUNT REACTORS

LOKESH CHUNDAWAT, ALOK SHARMA

Power Grid Corporation of India Ltd (India)

(16:00 – 16:15)

CIGRE-189

Method for Suppressing Current Spike in Wide Input Flyback converter

XIAO Yuwei¹, LIU Xuandong¹, SUN Wei², WU Bin¹

¹School of Electrical Engineering, Xi'an Jiaotong University (China), ²Wuyi University

**Session 9
9th floor**

Room St-Antoine

(15:00 – 15:15)

Protection and Automation (B5)

Session chairs: Antoine Manga, Claude Rajotte, Hydro-Québec

CIGRE-101

Study of Distributed Grounding Line Selection Application Based on GOOSE

Jiang Miao, Shi Yong, Dong Kaida, Hou Wei, Li Yuqi

NR Electric Co., Ltd. (China)

(15:15 – 15:30)

CIGRE-181

Real-Time Dynamic Protection Zone Determination for Interconnected Power Systems using Network Theory Principles

A.C. ADEWOLE¹, A.D. RAJAPAKSE¹, D. OUELLETTE², P. FORSYTH²

¹University of Manitoba (Canada), ²RTDS Technologies Inc.

(15:30 – 15:45)

CIGRE-129

Shunt Reactor with Auxiliary Winding System Inter-turn Protection Based on Zero Sequence Differential Current

GUO Yarong¹, WANG Xingguo¹, LIU Huanzhang², LIU Dan³

¹State Key Laboratory of Power Grid Safety and Energy Conservation (China Electric Power Research Institute) (China)

²Central China Grid Company, ³China National Electric Power Dispatch and Control Center

(15:45 – 16:00)


CIGRE-197

Con Edison Transmission System Reliability Model

R. Hasan¹, M. Viele¹, D. J. Allen²







¹Con Edison (USA), ²The Risk Research Group

Tuesday September 17, 2019

- (16:00 – 16:15) **CIGRE-242**
 **Comprehensive Motor Condition Monitoring Integrated in Advanced Protection Relays – A real case study**
 Umar Khan¹, Mital Kanabar¹, Mathieu Harvey², Carlos Oliveira³
¹GE Renewable Energy (Canada), ²Arcelor Mittal Mines, ³Trelec Inc.




Session 10
11th floor
Room Montreal
(16:45 – 17:00)

Substations (B3)
Session chairs: Dragan Komljenovic, Jean-François Boudreau, Hydro-Québec – IREQ

- (16:45 – 17:00) **CIGRE-138**
 [FR] **Prise de décisions en gestion des actifs des utilités électriques en tenant compte des risques**
 [EN] **Risk-Informed Decision-Making in Asset Management of Electrical Utilities**
 Dragan Komljenovic¹, Darragi Messaoudi², Pierre Larivière², Steve Caron², Ramzi Chahine²
¹IREQ (Canada), ²Hydro-Québec TransÉnergie
- (17:00 – 17:15) **CIGRE-185**
 **Recognition of the benefits by the use of Transformers and Reactors immersed in insulating fluid with high fire point (K Class): the case of Fire Department of Sao Paulo state in Brazil**
 ROBERTO IGNACIO DA SILVA, ALEXANDRE COELHO
 Cargill (Brazil)
- (17:15 – 17:30) **CIGRE-190**
 [FR] **Évolution numérique des systèmes de commande et de protection d'un poste électrique conformément à la norme 61850 ; Retour d'expérience d'un projet pilote ayant été pré-validé sur réplique avant un son installation**
 [EN] **DIGITAL TRANSFORMATION OF SUBSTATION THROUGH IEC61850 STANDARD: EXPERIENCE DEPLOYING DIGITAL SUBSTATION PILOT THROUGH DIGITAL SUBSTATION REPLICA**
 Saurabh Talwar¹, Eric Loiselle², David Lambert², William Boutin², Michel Lavallee², Felipe Sarubbi¹
¹Siemens Canada Limited (Canada), ²Hydro-Québec
- (17:30 – 17:45) **CIGRE-158**
 **Early Fault Detection on Energized Substation Equipment**
 C. JEAN, R. WEISER
 Positron Inc. (Canada)

Session 11
9th floor
Room Ville-Marie
(16:45 – 17:00)

Transformers (A2)
Session chairs: Mariela Rodriguez, Hydro-Québec – IREQ

- (16:45 – 17:00) **CIGRE-157**
 **Bypassing GSU transformers in case of emergencies or maintenance**
 E. GOMEZ HENNIG¹, K. KAINEDER², R. MAYER², E. SCHWEIGER³
¹Siemens Canada Ltd. (Canada), ²Siemens AG (Austria), ³Siemens AG (Germany)
- (17:00 – 17:15) **CIGRE-219**
 **Use of GIS Tools and Space Technologies for Optimal Transmission Line Routing and Asset Mapping**
 B. N. De. Bhowmick, V. K. Bhaskar, S. B. R. Rao, Pradeep Patil, Pradeep Singh Chauhan, Shalini Raj
 Power Grid Corporation of India Limited (India)
- (17:15 – 17:30) **CIGRE-166**
 **Improved Jiles-Atherton Hysteresis Model for Converter Transformer Controlled Switching Assessment in Nelson River Bipole III HVDC System**
 C. Fang¹, A. D. Rajapakse², R. Jayasinghe³
¹Manitoba Hydro (Canada), ²University of Manitoba, ³Manitoba Hydro International
- (17:30 – 17:45) **CIGRE-167**
 **Development of transmission voltage class, reconnectable 230 x 115 kV mobile transformers for improved reliability of power delivery**
 T. KALICKI¹, W. ZIOMEK², K. VIJAYAN²
¹Hydro One Inc. (Canada), ²PTI Transformers LP




Tuesday September 17, 2019

<p>Session 12 9th floor Room St-Antoine (16:45 – 17:00)</p>	<p>System Operation and Control (C2) Session chairs: Pierre Couture, Atieh Delavari, Hydro-Québec – IREQ</p>
<p>(17:00 – 17:15)</p>	<p>CIGRE-111 ⌚ Power System Stabilizer Tuning with Presence of Torsional Oscillations A. MOSHREF¹, H. TAGOURTI¹, N. WOOSTER¹, R. HARRISON², T. RICIOPPO² ¹BBA Engineering Ltd. (Canada), ²ATCO</p>
<p>(17:15 – 17:30)</p>	<p>CIGRE-118 ⌚ Simulation and Analysis of Resilient Power Systems in PJM N. TACKA, A. GIACOMONI, S. BENNER, R. HILDERBRAND PJM Interconnection (USA)</p>
<p>(17:30 – 17:45)</p>	<p>CIGRE-146 ⌚ Normalised Voltage Instability Sensitivity Index: A New Concept for Monitoring Voltage Stability in the Control Centre V.N. SEWDIEN¹, R. PREECE², J.L. RUEDA TORRES³ ¹TenneT TSO B.V. (Netherlands), ²The University of Manchester, ³TU Delft</p>
<p>(17:30 – 17:45)</p>	<p>CIGRE-249 ⌚ PV Solar Farm Control as STATCOM (PV-STATCOM) for Alleviating Subsynchronous Oscillations R. Salehi, R. K. Varma The University of Western Ontario (Canada)</p>

Wednesday September 18, 2019

<p>Session 13 11th floor Room Montreal (9:45 – 10:00)</p>	<p>Transformers (A2) Session chairs: Claude Rajotte, Hydro-Québec, Champlain Landry, Hydro-Québec – IREQ</p>
	<p>CIGRE-148 🕒 The Value of Performing Power Factor Sweep Measurements on Bushings BRANDON DUPUIS, LOGAN MERRILL OMICRON electronics Corp. (USA)</p>
(10:00 – 10:15)	<p>CIGRE-120 🕒 Torsion of Transformer Windings Under Short Circuit I. LAZARIEV JSC Ukrainian research, design and technological transformer institute (JSC “VIT”) (Ukraine)</p>
(10:15 – 10:30)	<p>CIGRE-134 🕒 [FR] Méthodologie d'évaluation d'état des transformateurs de puissance 🕒 [EN] Condition Assessment Methodology for Power Transformers Brian Sparling¹, Ismail Güner² ¹Dynamic Ratings (Canada), ²Hydro-Québec</p>
(10:30 – 10:45)	<p>CIGRE-229 🕒 [FR] Étude préliminaire de fluide à base d'ester pour application dans des transformateurs exploités en région climatique froide 🕒 [EN] Preliminary Study of Ester-based Fluid for Application in Transformers Serving in Cold Climatic Regions U. Mohan Rao¹, I. Fofana¹, T. Jaya¹, E. M. Rodriguez Celis², J. Jalbert², B. Noirhomme², P. Picher² ¹Research Chair on the Aging of Power Network Infrastructure (ViAHT), Université du Québec à Chicoutimi (Canada) ²Institut de recherche d'Hydro-Québec (IREQ)</p>
<p>Session 14 9th floor Room Ville-Marie (9:45 – 10:00)</p>	<p>System Operation and Control (C2) Session chairs: Martin de Montigny, Kelly Lazo de la Vega, Hydro-Québec - IREQ</p>
	<p>CIGRE-192 🕒 Investigating the Choice of Load Model and its Parameters for Different Voltage Response Scenarios in Large Power Systems A. S. Hoshyarzadeh¹, H. Zareipour¹, P. Keung², S. A. Ahmed² ¹University of Calgary (Canada), ²Alberta Electric System Operator</p>
(10:00 – 10:15)	<p>CIGRE-200 🕒 Active Power Priority Vs. Reactive Power Priority Operating Modes in Solar Plants M. DARYABAK, M. RAHMATIAN, K. KABIRI, K. CHILUKURI PSC Consulting (Canada)</p>
(10:15 – 10:30)	<p>CIGRE-246 🕒 Dynamic Interactions between a large PV plant and a STATCOM Sibin Mohan, Rajiv K. Varma The University of Western Ontario (Canada)</p>
(10:30 – 10:45)	<p>CIGRE-188 🕒 Challenges Faced and Lessons Learnt in Development of Indian Electricity Markets and Regulations S.K. Jain, P.K. Agarwal Power System Operation Corporation Ltd. (India)</p>

Wednesday September 18, 2019

<p>Session 15 9th floor Room St-Antoine (9:45 – 10:00)</p>	<p>HVDC and Power Electronics (B4) Session chairs: Sébastien Poirier, Hydro-Québec – IREQ, Antoine Manga, Hydro-Québec</p> <p>CIGRE-163  Operational Experience of Essex STATCOM after Refurbishment J. BURROUGHS¹, J. Hu², B. Bisewski², Chris Root¹ ¹Vermont Electric Power Co. Inc (USA), ²RBJ Engineering</p> <p>(10:00 – 10:15) CIGRE-165  Design Validation and Field-Testing Experience of Linear Shore Line Grounding Electrodes for Reliable Operation of HVDC Links A. DARIANI SNC LAVALIN (Canada)</p> <p>(10:15 – 10:30) CIGRE-179  A Complete Average Value Model of Modular Multilevel Converter Jinling Qi¹, Haihao Jiang², Weixing Li¹, Boon-Teck Ooi² ¹Harbin Institute of Technology (China), ²McGill University</p> <p>(10:30 – 10:45) CIGRE-260  Lifecycle Management for HVDC Systems ERIK JANSSON, URBAN ELGQVIST ABB (Sweden)</p>
<p>Session 16 11th floor Room Montreal (11:15 – 11:30)</p>	<p>HVDC and Power Electronics (B4) Session chairs: Atieh Delavari, Hydro-Québec – IREQ, Claude Rajotte, Hydro-Québec</p> <p>CIGRE-102  System-Based Technique to Evaluate the Risk of Self-Excitation of Synchronous Machines Sameh K. Kodsi, Thiromi Rajapakse, Jun Tan Teshmont Consultants LP (Canada)</p> <p>(11:30 – 11:45) CIGRE-116  The Design of Control and Protection System of 150 MVAR SVC in Nuevo Vallarta Substation in Mexico Xin Huang, DaoXiong Zhang, Chihan Chen, Haiying Li, Qiwen Zhou, Gang Du NR Electric Co., Ltd. (China)</p> <p>(11:45 – 12:00) CIGRE-137  [FR] Améliorations aux protections des filtres c.a. des convertisseurs CCHT en utilisant un calcul d'impédance  [EN] Upgrade to HVDC AC Filters Protections – Using Impedance Calculation P.-A. Chiasson, S. Tremblay Hydro-Québec (Canada)</p> <p>(12:00 – 12:15) CIGRE-122  A Simplified Practical Relation of Tap-Changer Control Mode Upon HVDC Valve Power Loss and its Engineering Application Zhongyuan Zhao, Bin Wang NR Electric Company Ltd. (China)</p>

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<p>Session 17 9th floor Room Ville-Marie (11:15 – 11:30)</p>	<p>System Operation and Control (C2) Session chairs: Kelly Lazo de la Vega, Martin de Montigny, Hydro-Québec - IREQ</p> <p>CIGRE-207  Paradigm Shift in Operational Philosophy of POWERGRID SUNIL AGRAWAL, P.K. SRIVASTAVA, SUNIL KUMAR, MANOJ KUMAR, VIKAS BISHNOI, ABHISHEK BHARDWAJ Power Grid Corporation of India Limited (India)</p> <p>(11:30 – 11:45) CIGRE-218  Reduction of CLPU Overload through Active Load Management S. DZELETOVIC, F. BOUFFARD, G. JOOS McGill University (Canada)</p> <p>(11:45 – 12:00) CIGRE-233  Application of Small Signal Analyses in Model Validation Studies F. YAHYAIE, P. ZADKHAJ Powertech Labs Inc. (Canada)</p> <p>(12:00 – 12:15) CIGRE-247  A Novel Combined Reactive Power-based Frequency and Power Oscillation Damping Control by PV-STATCOMs M. Akbari, R. K. Varma The University of Western Ontario (Canada)</p>
<p>Session 18 9th floor Room St-Antoine (11:15 – 11:30)</p>	<p>Substations (B3) Session chairs: Jean-Bernard Dastous, Sébastien Poirier, Hydro-Québec - IREQ</p> <p>CIGRE-196  Multi-Feeder Protection Methodology and New Product Design for Distribution Substations Kamyar Moghadam¹, Joshua Kuchison², Rainer Goblirsch³ ¹Siemens Canada Limited (Canada), ²EPCOR Transmission, ³Siemens AG</p> <p>(11:30 – 11:45) CIGRE-152  Reliability and Cost-Effectiveness Analysis of Various HV Substation Configurations A Borčić, D Bhatt, P Westerlund KTH Royal Institute of Technology (Sweden)</p> <p>(11:45 – 12:00) CIGRE-153  Harmonic Resonance phenomena in lightly loaded MV network Mohammed Bin Jarsh¹, Surendra S. Chhajta², Jayaraj Peter Prasad² ¹Department of Energy (United Arab Emirates), ²Abu Dhabi Transmission and Despatch Company (TRANSCO)</p> <p>(12:00 – 12:15) CIGRE-226  Substation Anomaly Detection System – A Substation & Distribution Network Cybersecurity Early Warning System Eric Hawthorne¹, Moein Manbachi¹, Alif Gilani² ¹British Columbia Institute of Technology (BCIT) (Canada), ²Siemens Canada Limited</p>

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Session 19 System Development and Economics (C1)

11th floor

Session chairs: Claude Rajotte, Hydro-Québec, Martin de Montigny, Hydro-Québec - IREQ

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(13:45 – 14:00)

CIGRE-151

Reactive Power Planning Strategy for the BC Hydro Transmission System

YANSONG LENG, PAUL HORAN, MING ZOU, WAH SHUM
BC Hydro (Canada)

(14:00 – 14:15)

CIGRE-176

[FR] Élaboration d'un système d'aide à la décision pour la gestion des actifs à TransÉnergie

[EN] Development of a decision support system for asset management at TransÉnergie
A. Côté, D. Messaoudi, D. Komljenovic, S. Alarie, O. Blancke, J.-F. Boudreau, M. Gaha, E. Truchon, S. Pelletier
Hydro-Québec (Canada)

(14:15 – 14:30)

CIGRE-238

Effects of Future Uncertainty on Present-day Asset Management

K. MARTIN-STURMEY, A. ALFALAH, A. BAKULEV
METSCO Energy Solutions (Canada)

(14:30 – 14:45)

CIGRE-168

Implementation Experience of URTDSM Project in Indian Power System

P.K. Agarwal, Rajkumar Anumasula, Chandan Kumar
Power System Operation Corporation Limited (India)

(14:45 – 15:00)

CIGRE-236

Optimal Energy Management and Storage Sizing for Electric Vehicles

A. DESHPANDE, J. TAYLOR
University of Toronto (Canada)

Session 20 Overhead Lines (B2)

9th floor

Session chairs: Josée Paradis, Maryse Lavoie, Hydro-Québec - IREQ

Room Ville-Marie
(13:45 – 14:00)

CIGRE-220

Transformation of a Large Diameter Monopole to a Pinned Support Guyed Tower

Pierre-Luc Massé, Richard Maranda, Alireza Aboutalebi
BBA Inc. (Canada)

(14:00 – 14:15)

CIGRE-113

Condition Assessment and Reliability Analysis of Porcelain and Toughened Glass Cap and Pin Insulators

C. BONILLA, H. LI
Powertech Labs. Inc. (Canada)

(14:15 – 14:30)

CIGRE-214

Steel foundations design optimization of a 138 kV transmission line

MAXIME SANSFAÇON¹, RICHARD MARANDA², GUILLAUME VACHON²
¹EMS Ingénierie (Canada), ²BBA Inc.

(14:30 – 14:45)

CIGRE-235

Line Rating Optimisation with Numerical Weather Models: the ALiRA Project

R. SUNDERLAND, G. LILJEBAKK, J. PARR, D.J. CANNON, F.G. BRAGLIA
Digital Engineering Ltd (United Kingdom)

(14:45 – 15:00)

CIGRE-203

Field Validation of Various Line Rating Methods on a 138 kV Transmission Line in British Columbia

M. L. Lu, C. Singh, R. Barone, K. Zhang, M. Guite, D. Chakrabarti
BC Hydro Power & Authority (Canada)

Wednesday September 18, 2019

Session 21 Protection and Automation (B5)

11th floor

Session chairs: Annissa Heniche Oussedik, Martin de Montigny, Hydro-Québec - IREQ

Room Montreal

(15:30 – 15:45)

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[FR] Unité Mobile : une nouvelle approche de remplacement d'un système de commande et protection dans une installation existante

[EN] Mobile unit: A new approach to modernize the protection and control systems in an existing substation

J-S LABBÉE

Hydro-Québec (Canada)

(15:45 – 16:00)

CIGRE-159

Implementation and Testing of a Flicker Meter Using IEC 61850-9-2 Sampled Values

J. WIJEKOON¹, A.D. RAJAPAKSE¹, N. PERERA², C. ADEWOLE¹

¹University of Manitoba (Canada), ²ERLPhase Power Technologies Ltd

(16:00 – 16:15)

CIGRE-178

Secured Substation Protection & Automation IED Firmware Management

ANCA CIORACA, MITAL KANABAR

GE Grid Solutions (Canada)

(16:15 – 16:30)

CIGRE-128

Research and Application of Protection Principle of 300Mvar Class New Synchronous Condenser

Yaoyao Ji, Huimin Wang, Guang Wang, Zigang Guo, Kai Wang, Jun Chen

NR Electric Co., Ltd. (China)

Session 22 Transformers (A2)

9th floor

Session chairs: Marie-Claude Lessard, Champlain Landry, Hydro-Québec - IREQ

Room Ville-Marie

(15:30 – 15:45)

CIGRE-177

Assessing Water Content and Vibration from Dynamic Measurement in Transformer

S. Akre¹, V. Behjat¹, P. Kung², I. Fofana¹

¹Research Chair on the Aging of Power Network Infrastructure (VIAHT), UQAC (Canada), ²QPS Photonics

(15:45 – 16:00)

CIGRE-184

Ten Years of Experience with Natural Ester Dielectric Fluid in 245 kV: Shunt Reactor of Vilhena Substation - Eletronorte

ROBERTO IGNACIO DA SILVA¹, IRAN PRADO ARANTES², ITO CAPINOS³, LUCAS DE OLIVEIRA¹, MAURÍCIO A. DE LIMA², GERALDO L. NICOLA⁴

¹Cargill (Brazil), ²Eletronorte, ³GE, ⁴Consultant

(16:00 – 16:15)

CIGRE-191

Converter Transformer Cold Starts: Specification Nuances and Operational Impacts

C. MADSEN¹, B. KORBUTIAK¹, L. BENOIT¹, L. NEUMANN¹, M. MIELKE¹, T. THOMPSON², K. WALKER³

¹ATCO Electricity Global Business Unit (Canada), ²Nalcor Energy, ³Hatch

(16:15 – 16:30)

CIGRE-221

Magnetic and Thermal Impact of GIC on Power Transformers: A Case Study

TR. Girgis¹, M. Saad², E. teNyenhuis², C. Clark³


¹ABB Inc. (USA), ²ABB Inc. (Canada), ³Altalink (Canada)

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Jiang Miao, Shi Yong, Dong Kaida, Hou Wei, Li Yuqi
NR Electric Co., Ltd. (China)


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 **System-Based Technique to Evaluate the Risk of Self-Excitation of Synchronous Machines**
Sameh K. Kodsji, Thiromi Rajapakse, Jun Tan
Teshmont Consultants LP (Canada)


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 **AI-Based Islanding Detection for Utilities and Industrials**
K. BAVISETTI¹, D. CRUDELE², J. FRANKLIN³, S. GILL¹,
M. JENSEN⁴, K. VU¹
¹ABB (USA)
²NYSERDA
³National Grid
⁴PG&E


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 **A Station Domain Islanding Detection Method Based on Topology Analysis**
Hua Xiujuan, Jiang Miao, Xu Guangfu
NR Electric Co., Ltd. (China)


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 **Generator Failure Forensic Simulations Study, Lessons Learned**
Hesamaldin (Sam) Maleki, Dan Kell, Iftikhar Khan, Myles Godfrey
Hatch Ltd. (Canada)



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 **The Identification of Transmission Line Overload and Fault Based on $U_{cos\phi}$**
Wang xinguo¹, Zhou Zexin¹, Liu Huanzhang², Du dingxiang¹
¹China Electric Power Research Institute (China)
²Central China Grid Company Limited

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 **Power System Stabilizer Tuning with Presence of Torsional Oscillations**
A. MOSHREF¹, H. TAGOURTI¹, N. WOOSTER¹, R. HARRISON²,
T. RICIOPPO²
¹BBA Engineering Ltd. (Canada)
²ATCO


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 **[FR] Réseau de transport électrique intelligent formé de lignes de transport intelligentes et d'un réseau indépendant et redondant de fibres optiques**
 **[EN] Smart Transmission Grid Based on Smart Power Lines with Independent and Redundant Optical Fiber Network**
Pierre Couture
Hydro-Québec (Canada)

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 **Condition Assessment and Reliability Analysis of Porcelain and Toughened Glass Cap and Pin Insulators**
C. BONILLA, H. LI
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I. LAZARIEV
JSC Ukrainian research, design and technological transformer institute (JSC "VIT") (Ukraine)


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N. TACKA, A. GIACOMONI, S. BENNER, R. HILDERBRAND
PJM Interconnection (USA)


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 **Torsion of Transformer Windings Under Short Circuit**
I. LAZARIEV
JSC Ukrainian research, design and technological transformer institute (JSC "VIT") (Ukraine)

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 **A Simplified Practical Relation of Tap-Changer Control Mode Upon HVDC Valve Power Loss and its Engineering Application**
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 **Research and Application of Protection Principle of 300Mvar Class New Synchronous Condenser**
Yaoyao Ji, Huimin Wang, Guang Wang, Zigang Guo, Kai Wang, Jun Chen
NR Electric Co., Ltd. (China)

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Shunt Reactor with Auxiliary Winding System Inter-turn Protection Based on Zero Sequence Differential Current
GUO Yarong¹, WANG Xingguo¹, LIU Huanzhang², LIU Dan³
¹State Key Laboratory of Power Grid Safety and Energy Conservation (China Electric Power Research Institute) (China)
²Central China Grid Company
³China National Electric Power Dispatch and Control Center

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[FR] Évaluation d'état diélectrique et Analyse des causes profondes des défaillances des transformateurs de courant HT et THT
[EN] HV and EHV Current Transformer dielectric condition assessment and root cause analysis
Diego M. Robalino¹, Ismail Güner²
¹Megger (USA)
²Hydro-Québec

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[FR] Méthodologie d'évaluation d'état des transformateurs de puissance
[EN] Condition Assessment Methodology for Power Transformers
Brian Sparling¹, Ismail Güner²
¹Dynamic Ratings (Canada)
²Hydro-Québec

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K. Furusawa
Central Research Institute of Electric Power Industry (Japan)

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[EN] Upgrade to HVDC AC Filters Protections – Using Impedance Calculation
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[EN] Risk-Informed Decision-Making in Asset Management of Electrical Utilities
Dragan Komljenovic¹, Darragi Messaoudi², Pierre Larivière², Steve Caron², Ramzi Chahine²
¹IREQ (Canada)
²Hydro-Québec TransÉnergie

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[EN] Mobile unit: A new approach to modernize the protection and control systems in an existing substation
J-S LABBÉE
Hydro-Québec (Canada)

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SNC Lavalin Inc (Canada)

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J. Z. Bebic¹, Y. Dong², L. Pan², B. Wang³
¹Hybrid Power Flow Controller Ltd. (Canada)
²Research Institute of NR Electric Co., Ltd.
³NR Electric USA LLC

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OPAL-RT Technologies (Canada)

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V.N. SEWDIEN¹, R. PREECE², J.L. RUEDA TORRES³
¹TenneT TSO B.V. (Netherlands)
²The University of Manchester
³TU Delft

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BRANDON DUPUIS, LOGAN MERRILL
OMICRON electronics Corp. (USA)

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YANSONG LENG, PAUL HORAN, MING ZOU, WAH SHUM
BC Hydro (Canada)

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Reliability and Cost-Effectiveness Analysis of Various HV Substation Configurations
A Borčić, D Bhatt, P Westerlund
KTH Royal Institute of Technology (Sweden)

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Harmonic Resonance phenomena in lightly loaded MV network
Mohammed Bin Jarsh¹, Surendra S. Chhajta², Jayaraj Peter Prasad²
¹Department of Energy (United Arab Emirates)
²Abu Dhabi Transmission and Despatch Company (TRANSCO)

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Bypassing GSU transformers in case of emergencies or maintenance

E. GOMEZ HENNIG¹, K. KAINEDER², R. MAYER²,
E. SCHWEIGER³

¹Siemens Canada Ltd. (Canada)

²Siemens AG (Austria)

³Siemens AG (Germany)

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Early Fault Detection on Energized Substation Equipment

C. JEAN, R. WEISER

Positron Inc. (Canada)

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Implementation and Testing of a Flicker Meter Using IEC 61850-9-2 Sampled Values

J. WIJEKON¹, A.D. RAJAPAKSE¹, N. PERERA², C. ADEWOLE¹

¹University of Manitoba (Canada)

²ERLPhase Power Technologies Ltd

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[FR] Surveillance de l'état du système de refroidissement des transformateurs par l'utilisation de réseaux de neurones

[EN] Transformer cooling system monitoring using neural networks

A. ZINFLOU, P. PICHER, L. VOULIGNY, A. MARCHAND

Hydro-Québec (Canada)

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Determination of Hot Spots in Gas Generators Using Brillouin Based Fiber Optic Distributed Sensor

L. ZOU¹, O. SEZERMAN¹, C. SPENCER², G. DAILEY³

¹OZ Optics Limited (Canada)

²Calpine Corporation

³QPS Photonics Inc

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Operational Experience of Essex STATCOM after Refurbishment

J. BURROUGHS¹, J. Hu², B. Bisewski², Chris Root¹

¹Vermont Electric Power Co. Inc (USA)

²RBJ Engineering

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Design Validation and Field-Testing Experience of Linear Shore Line Grounding Electrodes for Reliable Operation of HVDC Links

A. DARIANI

SNC LAVALIN (Canada)

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Improved Jiles-Atherton Hysteresis Model for Converter Transformer Controlled Switching Assessment in Nelson River Bipole III HVDC System

C. Fang¹, A. D. Rajapakse², R. Jayasinghe³

¹Manitoba Hydro (Canada)

²University of Manitoba

³Manitoba Hydro International

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Development of transmission voltage class, reconnectable 230 x 115 kV mobile transformers for improved reliability of power delivery

T. KALICKI¹, W. ZIOMEK², K. VIJAYAN²

¹Hydro One Inc. (Canada)

²PTI Transformers LP

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Implementation Experience of URTDSM Project in Indian Power System

P.K. Agarwal, Rajkumar Anumasula, Chandan Kumar

Power System Operation Corporation Limited (India)

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A Station Service Voltage Transformer Designed and Tested to Withstand a Severe Internal Arc Fault

S. Brodeur¹, H. Dinh²

¹ABB Inc., Transformers (Canada)

²ABB Inc., High Voltage Products

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[FR] Élaboration d'un système d'aide à la décision pour la gestion des actifs à TransÉnergie

[EN] Development of a decision support system for asset management at TransÉnergie

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J.-F. Boudreau, M. Gaha, E. Truchon, S. Pelletier

Hydro-Québec (Canada)

CIGRE-177

Assessing Water Content and Vibration from Dynamic Measurement in Transformer

S. Akre¹, V. Behjat¹, P. Kung², I. Fofana¹

¹Research Chair on the Aging of Power Network

Infrastructure (ViaHT), UQAC (Canada)

²QPS Photonics

CIGRE-178

Secured Substation Protection & Automation IED Firmware Management

ANCA CIORACA, MITAL KANABAR

GE Grid Solutions (Canada)

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A Complete Average Value Model of Modular Multilevel Converter

Jinling Qi¹, Haihao Jiang², Weixing Li¹, Boon-Teck Ooi²

¹Harbin Institute of Technology (China)

²McGill University

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Increasing Transient Stability Limit by Nonlinear Damping Design

Jinpeng Guo, Haihao Jiang, Xiaozhe Wang, Boon-teck Ooi

McGill University (Canada)

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Real-Time Dynamic Protection Zone Determination for Interconnected Power Systems using Network Theory Principles

A.C. ADEWOLE¹, A.D. RAJAPAKSE¹, D. OUELLETTE², P. FORSYTH²

¹University of Manitoba (Canada)

²RTDS Technologies Inc.

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The Research on the Key Equipment for 750kV Fixed Series Compensation in 3000m a.s.l.

CHEN Yuanjun, ZHOU Qiwen, WANG Dechang, Gao Jian, Chen Wei, Zhang Daoxiong
NR Electric Co., Ltd. (China)

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Ten Years of Experience with Natural Ester Dielectric Fluid in 245 kV: Shunt Reactor of Vilhena Substation - Eletronorte

ROBERTO IGNACIO DA SILVA¹, IRAN PRADO ARANTES², ITO CAPINOS³, LUCAS DE OLIVEIRA¹, MAURÍCIO A. DE LIMA², GERALDO L. NICOLA⁴

¹Cargill (Brazil)

²Eletronorte

³GE

⁴Consultant

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ROBERTO IGNACIO DA SILVA, ALEXANDRE COELHO
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Challenges Faced and Measures Adopted for RE Integration in Indian Power system

P.K. Agarwal, S.K. Jain

Power System Operation Corporation Ltd. (India)

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Design optimization of a 138 kV transmission line with optical phase conductors

RICHARD MARANDA, GUILLAUME VACHON, BASSEM KAABIA
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Challenges Faced and Lessons Learnt in Development of Indian Electricity Markets and Regulations

S.K. Jain, P.K. Agarwal

Power System Operation Corporation Ltd. (India)

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Method for Suppressing Current Spike in Wide Input Flyback converter

XIAO Yuwei¹, LIU Xuandong¹, SUN Wei², WU Bin¹

¹School of Electrical Engineering, Xi'an Jiaotong University (China)

²Wuyi University

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[FR] Évolution numérique des systèmes de commande et de protection d'un poste électrique conformément à la norme 61850 ; Retour d'expérience d'un projet pilote ayant été pré-validé sur réplique avant un son installation

[EN] DIGITAL TRANSFORMATION OF SUBSTATION THROUGH IEC61850 STANDARD: EXPERIENCE DEPLOYING DIGITAL SUBSTATION PILOT THROUGH DIGITAL SUBSTATION REPLICA

Saurabh Talwar¹, Eric Loiselle², David Lambert², William Boutin², Michel Lavallee², Felipe Sarubbi¹

¹Siemens Canada Limited (Canada)

²Hydro-Québec

CIGRE-191

Converter Transformer Cold Starts: Specification Nuances and Operational Impacts

C. MADSEN¹, B. KORBUTIAK¹, L. BENOIT¹, L. NEUMANN¹, M. MIELKE¹, T. THOMPSON², K. WALKER³

¹ATCO Electricity Global Business Unit (Canada)

²Nalcor Energy

³Hatch

CIGRE-192

Investigating the Choice of Load Model and its Parameters for Different Voltage Response Scenarios in Large Power Systems

A. S. Hoshyarzadeh¹, H. Zareipour¹, P. Keung², S. A. Ahmed²

¹University of Calgary (Canada)

²Alberta Electric System Operator

CIGRE-193

New Methodologies for Accurate Modelling and Simulation of Advanced Telecommunication-Based Protection Schemes in a Software Environment

Hadi Khani, Daniyal Qureshi, Saman Alaeddini, Ishwarjot Anand

Quanta Technology (Canada)

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[FR] Amélioration de la durée de vie en fatigue du conducteur en utilisant une pince de suspension avec des élastomères coniques

[EN] Improved conductor endurance limit by using a suspension clamp with conical elastomers

J. PARADIS, P. VAN DYKE

Institut de Recherche d'Hydro-Québec (Canada)

CIGRE-195

A DER Management System for Distributing Power among Discretely and Continuously Controlled Devices within DER group

Chu Sun¹, Syed Qaseem Ali², Geza Joos¹, Francois Bouffard¹

¹McGill University (Canada)

²OPAL-RT Technologies

CIGRE-196

Multi-Feeder Protection Methodology and New Product Design for Distribution Substations

Kamyar Moghadam¹, Joshua Kuchison², Rainer Goblirsch³

¹Siemens Canada Limited (Canada)

²EPCOR Transmission

³Siemens AG

CIGRE-197

Con Edison Transmission System Reliability Model

R. Hasan¹, M. Viele¹, D. J. Allen²

¹Con Edison (USA)

²The Risk Research Group

CIGRE-198

[FR] Étude de cas d'analyse de la réponse en fréquence (FRA) pour l'évaluation de l'intégrité d'un transformateur usagé suite à une réparation

[EN] Case study for assessing the integrity of a service-aged transformer repair using Frequency Response Analysis (FRA)

R. S. A. FERREIRA¹, H. SIMARD², P. PICHER³, V. BEHJAT¹, I. FOFANA¹, H. EZZAIDI¹

¹Research Chair on Aging Power Network Infrastructure (ViAHT), Université du Québec à Chicoutimi (UQAC) (Canada)

²Énergie Électrique Rio Tinto, Saguenay-Lac-Saint-Jean

³Institut de recherche d'Hydro-Québec (IREQ)

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Transmission Line Route Refinement with Simultaneous Geomorphological Assessment

Sébastien Paradis, Line Bariteau, Claude Roy

BBA Inc. (Canada)

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Field Validation of Various Line Rating Methods on a 138 kV Transmission Line in British Columbia

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Sunil Agarwal, P.K. Srivastava, Sunil Kumar, Manoj Kumar,

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Pierre-Luc Massé, Richard Maranda, Alireza Aboutaleb

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Eric Hawthorne¹, Moein Manbachi¹, Alif Gilani²
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U. Mohan Rao¹, I. Fofana¹, T. Jaya¹, E. M. Rodriguez Celis², J. Jalbert², B. Noirhomme², P. Picher²
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R. Abdullah¹, M. Lacroix²
¹Hydro Ottawa (Canada)
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P. VAN DYKE¹, S. PRUD'HOMME², J. PARADIS¹
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²Hydro-Québec

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Sibin Mohan, Rajiv K. Varma
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M. Akbari, R. K. Varma
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Connecting Controlled Switching Devices in Power Plants to Analytics Tools in Sorgenia's Operations Centre to Increase the Service Life of Apparatuses

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ERIK JANSSON, URBAN ELGQVIST
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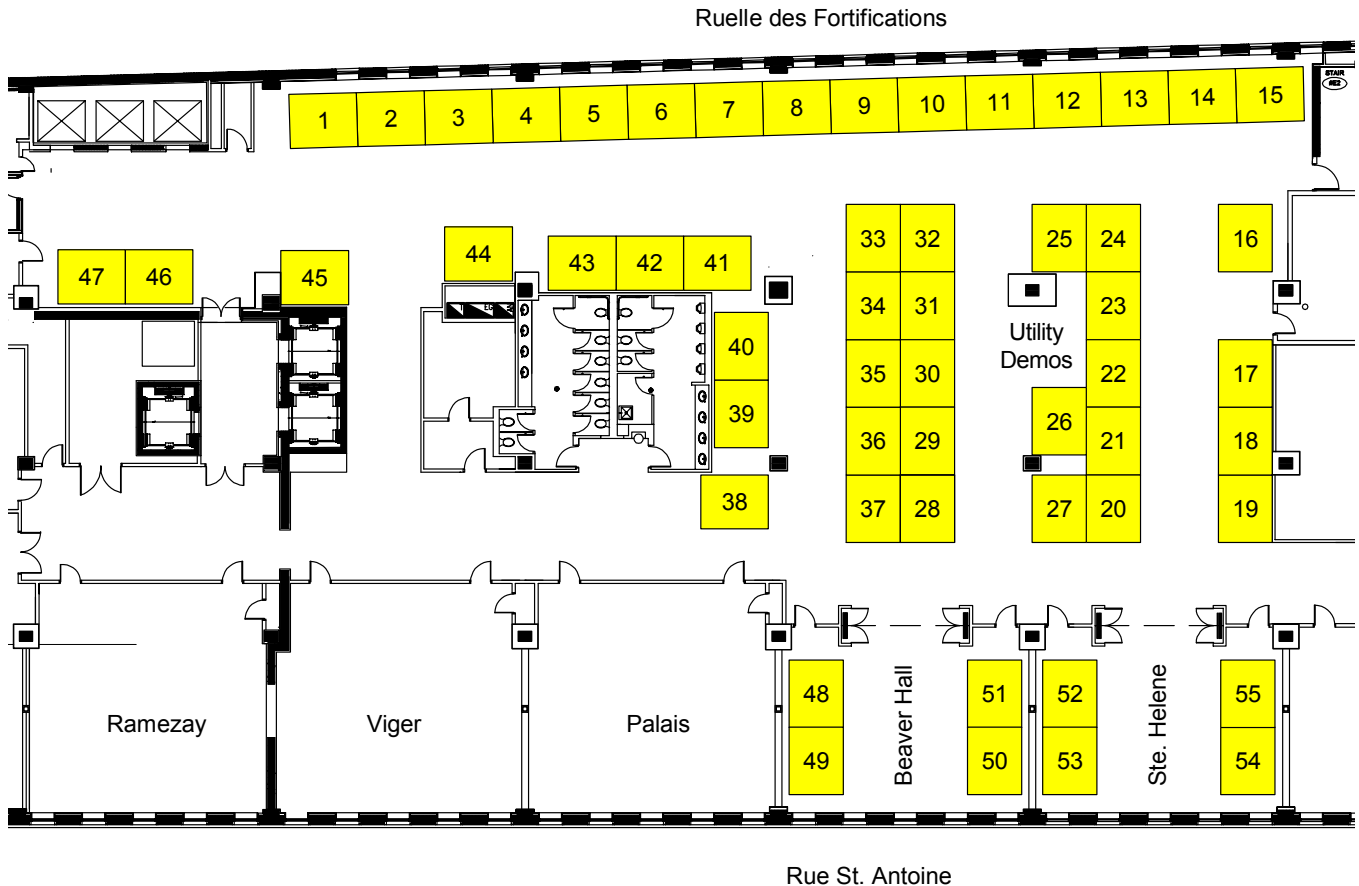
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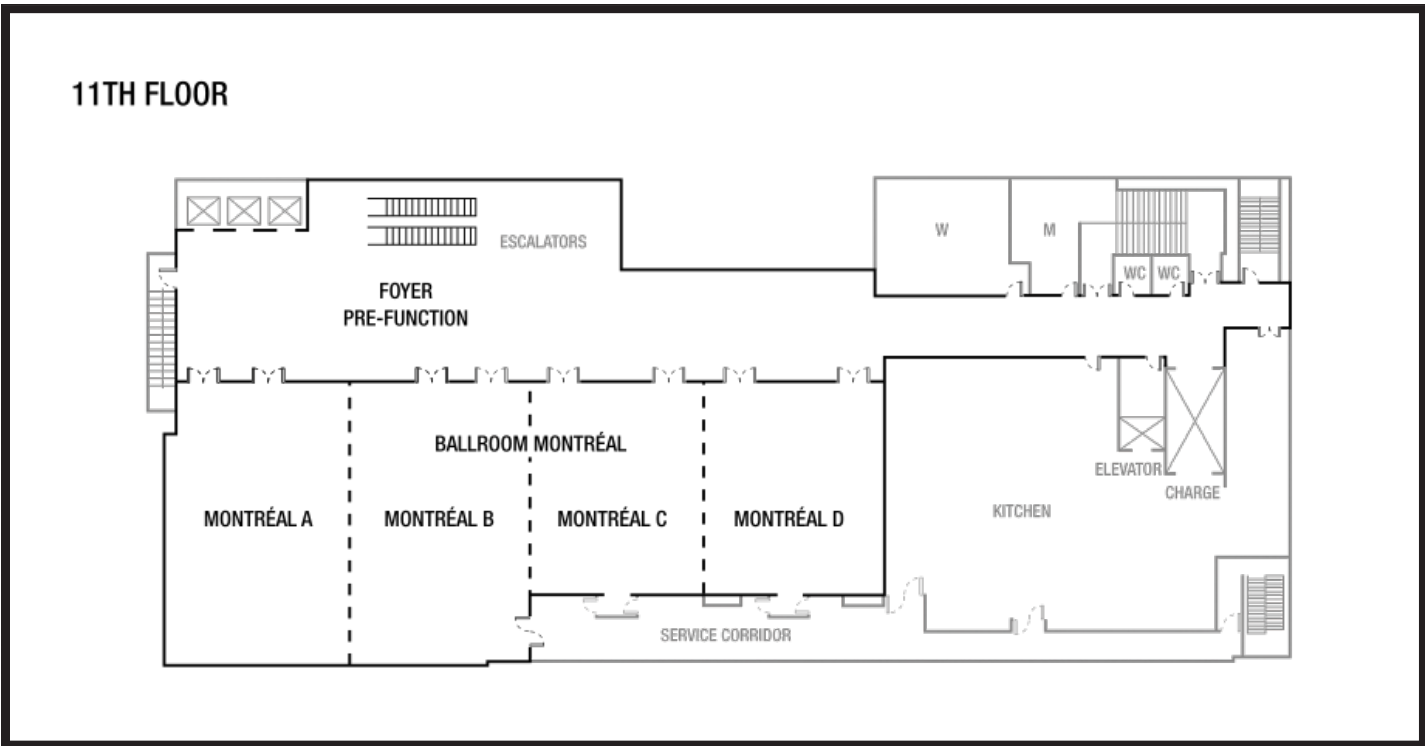
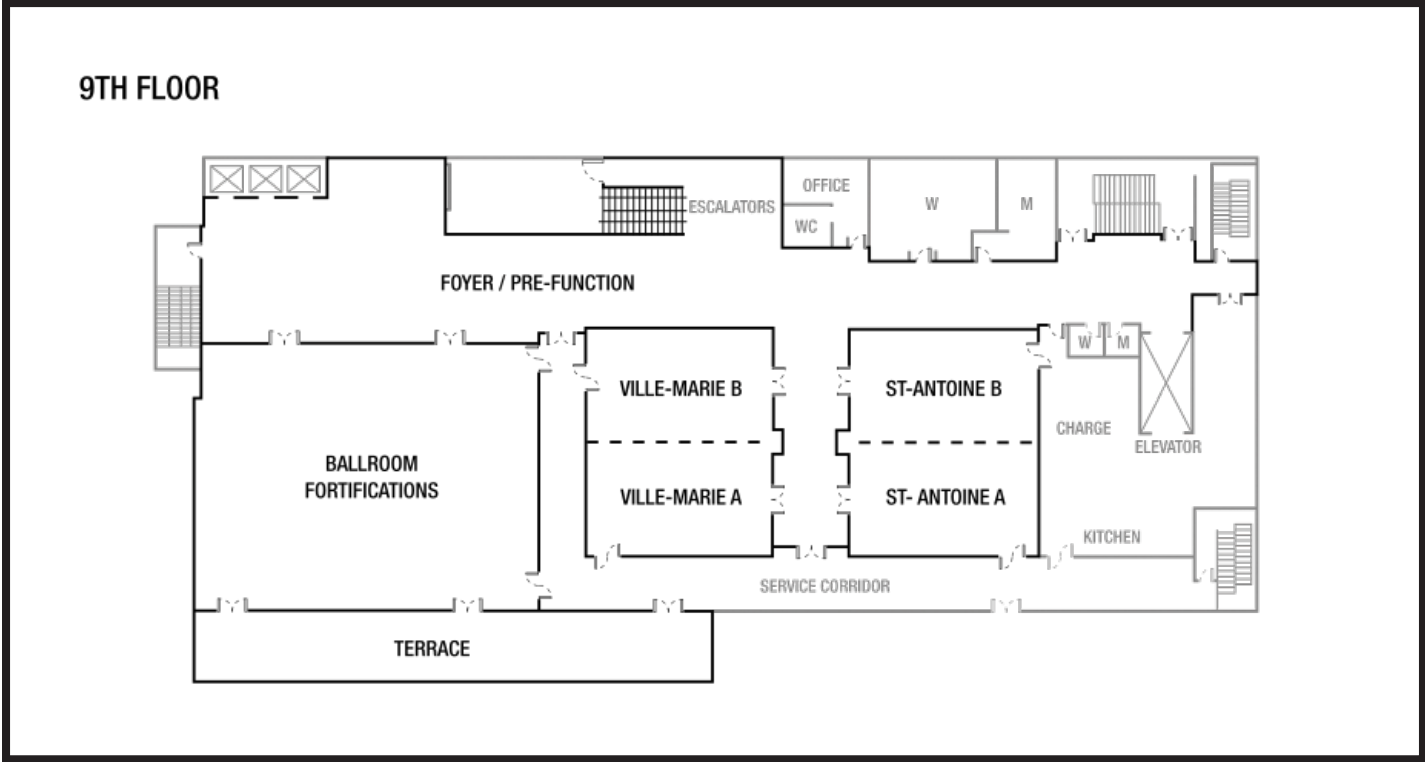


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