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CIGRE ASSOCIATION | CIGRE SYMPOSIUM 2019 DENMARK | CIGRE SYMPOSIUM 2019 CHINA | CIGRE YOUNG MEMBERS | CIGRE WORLD BANK | CONDIS BY MAXWELL TECHNOLOGIES | ELECTRIC ART | GOALAND | HITACHI | HUAWAI | MEGGER | MOXA | NGK INSULATORS | OPAL-RT TECHNOLOGIES | PSI | SELTA | SIEMENS | SOFTTEAM |



# INTRODUCTION

## ABOUT THE CIGRE SESSION

The International leading event for Power System Industry offers during a whole week an extensive range of activities to more than 3 200 delegates and 6 600 exhibition visitors:

### Sunday 26 August

- › 16:00 - Opening Ceremony

### Monday 27 August

- › **Opening Panel:** the future sustainable power system: organic, disruptive and secure
- › **Workshop – Large Disturbances:** Market Performance & System Operation Perspectives
- › **Conference:** Consumer – producer interaction. Distributed energy resources impact on the bulk connected network – CIGRE working on the whole value chain **NEW**

### Monday 27 to Friday 31 August

- › **16 "Poster Sessions"** › Authors present their Papers\* *[see page 25]*
- › **16 Group Discussion Meetings** › an opportunity to contribute to discussions around the Session Papers\* *[Tuesday > Friday] [see page 14]*
- › **16 Tutorials** › learn more about the work of each Study Committee *[Monday > Thursday, see page 26]*
- › **Workshops** › the latest trends of the Power Industry are presented and discussed *[see page 21]*
- › **Forums** › Next Generation Network Forum *[on Wednesday, see page 12]*  
CIGRE Women in Engineering Forum *[on Thursday, see page 30]*
- › **Networking** › cocktail reception on Monday from 6 pm in the Exhibition Halls › **open to all**, coffee breaks & lunch bars,  
cocktail diner on Thursday *for Delegates & registered Companions*

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A **TECHNICAL EXHIBITION** runs in parallel in the same location on levels 1, 2, 3. More than 290 international companies, technology and services providers are exhibiting their latest innovations & offers.

**TO MAKE THE MOST OF CIGRE SESSION, download CIGRE 2018 APP**

For registered Delegates & Conference Attendees:

- › Follow the progress of the parallel discussions in the different Group Discussion Meeting Rooms.
- › Complete a satisfactory questionnaire in real time *[Conference Attendees only]*. **NEW**
- › Download the Session Papers *[Delegates only]*.

\*Special reports, Session papers are posted on [www.cigre.org](http://www.cigre.org)  
+ a daily summary of discussions *[for delegates only]*.

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## À PROPOS DE LA SESSION DU CIGRE

La Session du CIGRE est l'événement international leader des systèmes électriques, proposant, durant toute une semaine, une multitude d'activités pour plus de 3 200 délégués et 6 600 visiteurs de l'exposition :

### Dimanche 26 août

- › 16:00 - Cérémonie d'ouverture

### Lundi 27 août

- › **Table ronde** : système électrique durable du futur : évolutif, disruptif et sûr
- › **Atelier sur les grands incidents** : perspectives pour l'exploitation du système électrique et les règles de marché
- › **Conférence** : Interaction entre consommateurs et producteurs – Impact des ressources d'énergie distribuées sur le réseau général interconnecté – Présence du CIGRE sur l'ensemble de la chaîne de valeur **NOUVEAU**

### Lundi 27 > Vendredi 31 août

- › **16 «Poster Sessions»** › Les auteurs présentent leurs Papiers de Session\* (voir page 25)
- › **16 Groupes de Discussion** › une opportunité de contribuer aux discussions autour des Rapports de la Session\* (mardi > vendredi) (voir page 15)
- › **16 Tutoriels** › apprenez davantage sur le travail de chaque Comité d'Etude (lundi > jeudi, voir page 26)
- › **Workshops** › échanges et débats sur les dernières innovations de l'industrie (voir page 21)
- › **Forums** › Forum des jeunes membres du CIGRE (mercredi, voir page 12)  
Forum Femmes du CIGRE dans l'ingénierie (jeudi, voir page 30)
- › **Convivialités** › cocktail lundi à partir de 18:00 au niveau de l'exposition technique > **ouvert à tous**, pauses café & bar - déjeuner, cocktail dînatoire jeudi pour les Délégués & Accompagnants inscrits

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Une **EXPOSITION TECHNIQUE** se tient parallèlement et au même endroit (niveaux 1, 2 & 3). Plus de 290 sociétés internationales, fournisseurs de solutions techniques et de services exposeront leurs dernières innovations.

Pour profiter pleinement de la Session du CIGRE, téléchargez l'appli 2018

Pour les délégués et les participants aux conférences :

- › Suivez l'avancement des discussions dans les différentes salles de conférence.
- › Complétez un questionnaire de satisfaction en temps réel (uniquement pour ceux qui participent aux conférences). **NOUVEAU**
- › Téléchargez les Papiers de la Session (pour les Délégués uniquement).

\*Les rapports spéciaux, les Papiers de la Session sont mis en ligne sur le site [www.cigre.org](http://www.cigre.org) + un résumé journalier des discussions (pour les délégués uniquement).

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# PROGRAMME

			ROOM	LEVEL
<b>CIGRE OPENING CEREMONY (OPEN TO ALL)</b>				
Sunday 26 August	16:00	<b>OPENING CEREMONY</b> ■ CIGRE President Opening Speech ■ Keynote Speaker: Mrs. Audrey ZIBELMAN, Managing Director and Chief Executive Officer of the Australian Energy Market Operator <b>Future electricity markets and business models</b>	Grand Amphithéâtre	0
		■ Welcome drinks <i>(for Opening Ceremony attendees only)</i>	Hall Terres	1
<b>TECHNICAL MEETINGS SCHEDULE (OPEN TO DELEGATES ONLY)</b>				
Monday 27 August	8:45 12:00	<b>OPENING PANEL:</b> The future sustainable power system: organic, disruptive and secure	Grand Amphithéâtre	1
	14:30 18:00	<b>WORKSHOP - LARGE DISTURBANCES:</b> Market Performance & System Operation Perspectives	Bleu	2
	14:00 17:30	<b>CONFERENCE: NEW</b> ■ Consumer – producer interaction Distributed energy resources impact on the bulk connected network CIGRE working on the whole value chain	Grand Amphithéâtre	1
	14:30 18:00	Poster Sessions A1 & B4	Hall Terres	1
Tuesday 28 August	8:45 18:00	<b>A1:</b> Rotating electrical machines	Havane	3
		<b>B4:</b> DC systems and power electronics	Grand Amphithéâtre	1
		<b>C4:</b> Power system technical performance	Bordeaux	3
	9:00 12:30	<b>C6:</b> Active distribution systems and distributed energy resources	Bleu	2
9:00 12:30	Poster Sessions A3 & B5	Hall Terres	1	
14:30 18:00	Poster Sessions C5 & D1			
Wednesday 29 August	11:00 14:00	<b>Next Generation Network Forum</b>	353	3
	8:45 18:00	<b>A3:</b> Transmission & distribution equipment	Bordeaux	3
		<b>B5:</b> Protection and automation	Grand Amphithéâtre	1
		<b>C5:</b> Electricity markets and regulation	Havane	3
	14:00 15:30	<b>D1:</b> Materials and emerging test techniques	Bleu	2
	9:00 12:30	<b>B4 &amp; CENELEC Workshops:</b> System aspects of HVDC grids	352A	3
	9:00 12:30	Poster Sessions A2 & B3	Hall Terres	1
14:30 18:00	Poster Sessions C2 & D2			
Thursday 30 August	11:00 14:00	<b>CIGRE Women in Engineering Forum</b>	342AB	3
	8:45 18:00	<b>A2:</b> Power transformers and reactors	Bleu	2
		<b>B3:</b> Substations and electrical installations	Grand Amphithéâtre	1
		<b>C2:</b> Power system operation and control	Bordeaux	3
	15:30 17:00	<b>D2:</b> Information systems and telecommunications	Havane	3
	9:00 12:30	<b>A3 &amp; B4 Workshops:</b> HVDC circuit breakers, recent development and demonstration	242B	2
	9:00 12:30	Poster Sessions B1 & C1	Hall Terres	1
14:30 18:00	Poster Sessions B2 & C3			
Friday 31 August	9:00 12:00	<b>B3 Workshop:</b> Safe working in substations	241	2
	8:45 18:00	<b>B1:</b> Insulated cables	Bleu	2
		<b>B2:</b> Overhead lines <i>(morning)</i> / Joint B2 & C3 <i>(afternoon)</i>	Grand Amphithéâtre	1
		<b>C1:</b> Power system development and economics	Bordeaux	3
	9:00 12:30	<b>C3:</b> Power system environmental performance	Havane	3
9:00 12:30	Poster Sessions C4 & C6	Hall Terres	1	

■ GDM: Group Discussion Meetings are open to delegates only.  
■ Poster Sessions are open to delegates and SC / WG attendees.

		SALLE	NIVEAU	
<b>CÉRÉMONIE D'OUVERTURE</b> [OUVERTE À TOUS]				
Dimanche 26 août	16:00	<b>CÉRÉMONIE D'OUVERTURE</b> ■ Discours du Président du CIGRE ■ Orateur principal : Mme Audrey ZIBELMAN, PDG de l'Opérateur Australien du Marché de l'Energie <b>Les marchés de l'électricité et modèles économiques du futur</b>	Grand Amphithéâtre	0
		■ Cocktail de bienvenue <i>(pour les participants à la Cérémonie d'Ouverture uniquement)</i>	Hall Ternes	1
<b>PROGRAMME DES RÉUNIONS TECHNIQUES</b> [ACCÈS AUX DÉLÉGUÉS UNIQUEMENT]				
Lundi 27 août	8:45 12:00	<b>TABLE RONDE</b> : Système électrique durable du futur : évolutif, disruptif et sûr	Grand Amphithéâtre	1
	14:30 18:00	<b>ATELIER SUR LES GRANDS INCIDENTS</b> : Perspectives pour l'exploitation du système électrique et les règles de marché	Bleu	2
	14:00 17:30	<b>CONFÉRENCE: NOUVEAU</b> ■ Interaction entre consommateurs et producteurs Impact des ressources d'énergie distribuées sur le réseau général interconnecté Présence du CIGRE sur l'ensemble de la chaîne de valeur	Grand Amphithéâtre	1
	14:30 18:00	Sessions Posters A1 & B4	Hall Ternes	1
Mardi 28 août	8:45 18:00	<b>A1</b> : Machines électriques tournantes	Havane	3
		<b>B4</b> : Systèmes CC et électronique de puissance	Grand Amphithéâtre	1
		<b>C4</b> : Performances techniques des réseaux électriques	Bordeaux	3
		<b>C6</b> : Réseaux actifs de distribution et sources d'énergie distribuées	Bleu	2
9:00 12:30	Sessions Posters A3 & B5	Hall Ternes	1	
14:30 18:00	Sessions Posters C5 & D1			
Mercredi 29 août	11:00 14:00	<b>Forum des jeunes membres du CIGRE</b>	353	3
	8:45 18:00	<b>A3</b> : Équipements de transport et de distribution	Bordeaux	3
		<b>B5</b> : Protections et automatismes	Grand Amphithéâtre	1
		<b>C5</b> : Marchés de l'électricité et régulation	Havane	3
		<b>D1</b> : Matériaux et techniques de test émergentes	Bleu	2
	14:00 15:30	<b>Ateliers B4 &amp; CENELEC</b> : Aspects système des réseaux à courant continu	352A	3
	9:00 12:30	Sessions Posters A2 & B3	Hall Ternes	1
14:30 18:00	Sessions Posters C2 & D2			
Jeudi 30 août	11:00 14:00	<b>Forum Femmes du CIGRE dans l'ingénierie</b>	342AB	3
	8:45 18:00	<b>A2</b> : Transformateurs et réactances électriques	Bleu	2
		<b>B3</b> : Postes et installations électriques	Grand Amphithéâtre	1
		<b>C2</b> : Exploitation et conduite des réseaux électriques	Bordeaux	3
		<b>D2</b> : Systèmes d'information et télécommunications	Havane	3
	15:30 17:00	<b>Ateliers A3 &amp; B4</b> : Disjoncteurs à courant continu haute tension : derniers développements et démonstration	242B	2
	9:00 12:30	Sessions Posters B1 & C1	Hall Ternes	1
14:30 18:00	Sessions Posters B2 & C3			
Vendredi 31 août	9:00 12:00	<b>Atelier B3</b> : Travail en Sécurité dans les postes	241	2
	8:45 18:00	<b>B1</b> : Câbles isolés	Bleu	2
		<b>B2</b> : Lignes aériennes ( <i>matin</i> ) / B2 & C3 ( <i>après-midi</i> )	Grand Amphithéâtre	1
		<b>C1</b> : Développement et économie des réseaux électriques	Bordeaux	3
	9:00 12:30	<b>C3</b> : Réseaux et environnement électriques	Havane	3
		Sessions Posters C4 & C6	Hall Ternes	1

Les interventions sont en langue anglaise.

■ Les RGD : Réunions des Groupes de Discussion sont accessibles aux délégués uniquement.

■ Les Sessions Posters sont accessibles aux délégués et aux participants des réunions SC / WG.

# PROGRAMME

ROOM / LEVEL

## TUTORIALS [OPEN TO DELEGATES WITH A DEDICATED REGISTRATION FOR TUTORIALS]

Monday 27 August	8:30 10:20	<b>B5:</b> Challenges and solutions for the maintenance of fully digital substation	ROOM MAILLOT	Level 2
	10:40 12:30	<b>B4:</b> HVDC planning, technology selection and specification		
	14:00 15:50	<b>A2:</b> Assessment of transformer paper ageing and post mortem investigation		
	16:10 18:00	<b>D2:</b> Framework for EPU operators to manage the response to a cyber-initiated threat		
Tuesday 28 August	8:30 10:20	<b>C1:</b> CIGRE feasibility study of a global electricity network		
	10:40 12:30	<b>D1:</b> Guidelines for altitude correction of pollution performance of insulators		
	14:00 15:50	<b>A3:</b> Transmission & Distribution Equipment		
	16:10 18:00	<b>C5:</b> Global overview of demand response markets and regulations		
Wednesday 29 August	8:30 10:20	<b>C4:</b> Recent advances in the application of synchrophasor technology		
	10:40 12:30	<b>C2:</b> System operation emphasising DSO/TSO interaction and co-ordination		
	14:00 15:50	<b>C6:</b> Application of battery storage systems in distribution systems		
	16:10 18:00	<b>B3:</b> Contemporary cost-effective substation design		
Thursday 30 August	8:30 10:20	<b>B2:</b> Experience with the mechanical performance of non-conventional conductors		
	10:40 12:30	<b>A1:</b> Revisiting the fundamentals of magnetic saturation in salient pole synchronous generators		
	14:00 15:50	<b>B1:</b> Fault location on land and submarine links (AD & DC)		
	16:10 18:00	<b>C3:</b> EMF - time to reassure		

## SOCIAL EVENTS

Sunday 26 August	17:00 18:30	Welcome drinks for opening ceremony <b>Welcome drinks for Open Ceremony attendees</b>	Hall Ternes	Level 1
Monday 27 August	18:00 20:00	Cocktail reception - Inside the technical exhibition ( <i>open to all</i> )	Levels 1, 2 & 3	
Monday to Friday	AM & PM	Coffee breaks will be held each mid-morning and mid-afternoon		
Thursday 30 August	19:30 23:00	Cocktail diner at <b>Cité de la Mode et du Design</b> For fully registered Delegates and Companions Invitations to be collected at the <i>Delegate's reception Desks</i>	34, quai d'Austerlitz 75013 Paris	

## TECHNICAL EXHIBITION

Monday	9:00 20:00	For more details on the technical exhibition: <b><a href="http://www.cigre-exhibition.com">www.cigre-exhibition.com</a></b>	Levels 1, 2 & 3
Tuesday to Thursday	9:00 18:00		
Friday	9:00 16:00		

## ASSOCIATION MEETING

Wednesday 29 August	12:15 13:15	Presentation of the results of the General Assembly of June 30, 2018	Room 242 AB	Level 2
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**TUTORIELS** (OUVERT UNIQUEMENT AUX DELEGUES AYANT CHOISI L'OPTION TUTORIELS)

Lundi 27 août	8:30 10:20	B5: Défis et solutions pour la maintenance des postes électriques tout numérique	SALLE MAILLOT Niveau 2
	10:40 12:30	B4: Planification du CCHT, choix de la technologie et spécifications	
	14:00 15:50	A2: Evaluation du vieillissement des isolants dans les transformateurs et expertises en fin de vie	
	16:10 18:00	D2: Cadre destiné aux exploitants de réseaux électriques pour gérer la menace d'une cyber-attaque	
Mardi 28 août	8:30 10:20	C1: Étude de faisabilité d'un réseau électrique mondial	
	10:40 12:30	D1: Guide pour la correction altimétrique de la tenue à la pollution des isolateurs	
	14:00 15:50	A3: Equipements de transport et de distribution	
	16:10 18:00	C5: Aperçu global des marchés et régulations en réponse à la demande	
Mercredi 29 août	8:30 10:20	C4: Les avancées récentes dans l'application de la technologie des synchrophaseurs	
	10:40 12:30	C2: Exploitation du système soulignant l'interaction et la coordination des GRD/GRT	
	14:00 15:50	C6: Utilisation de stockages par batteries dans les réseaux de distribution	
	16:10 18:00	B3: Solutions actuelles pour une conception économique des postes	
Jeudi 30 août	8:30 10:20	B2: Expérience acquise sur les performances mécaniques des conducteurs non-conventionnels	
	10:40 12:30	A1: Réexamen des fondamentaux de la saturation magnétique	
	14:00 15:50	B1: Localisation des défauts sur les liaisons terrestres et sous-marines	
	16:10 18:00	C3: CEM - Il est temps de rassurer	

**CONVIVALITÉS**

Dimanche 26 août	17:00 18:30	Cocktail de Bienvenue <i>(limité aux participants ayant assisté à la cérémonie d'ouverture)</i>	Hall Termes Niveau 1
Lundi 27 août	18:00 20:00	Un cocktail se tiendra au niveau de l'exposition technique <i>[ouvert à tous]</i>	Niveaux 1, 2 & 3
Du lundi au vendredi	MATIN & APRÈS-MIDI	Des pauses cafés sont prévues tous les jours, matin et après-midi	
Jeudi 30 août	19:30 23:00	Cocktail à <b>Cité de la Mode et du Design</b> Ouvert aux Délégués et Accompagnants Invitations à retirer aux comptoirs <i>Accueil des Délégués</i>	34, quai d'Austerlitz 75013 Paris

**EXPOSITION TECHNIQUE**

Lundi	9:00 20:00	Pour de plus amples détails sur l'exposition technique : <b><a href="http://www.cigre-exhibition.com">www.cigre-exhibition.com</a></b>	Niveaux 1, 2 & 3
Du mardi au jeudi	9:00 18:00		
Vendredi	9:00 16:00		

**RÉUNION DE L'ASSOCIATION**

Mercredi 29 août	12:15 13:15	Présentation des résultats de l'Assemblée Générale du 30 juin 2018	Salle 242 AB Niveau 2
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# CIGRE OPENING CEREMONY OPEN TO ALL

SUNDAY 26 AUGUST 16:00 GRAND AMPHITHÉÂTRE [ACCESS LEVEL 0]

## FUTURE ELECTRICITY MARKETS AND BUSINESS MODELS

CIGRE President Opening Speech

Keynote speaker :

**Mrs Audrey ZIBELMAN,**

Managing Director and Chief Executive Officer  
of the Australian Energy Market Operator

### SENDING THE WORLD A POSTCARD FROM THE FUTURE: MANAGING AUSTRALIA'S ENERGY TRANSITION

AUSTRALIA IS A POSTCARD FROM THE FUTURE. The issues we are grappling with are no different to those experienced in other developed nations. But the similarity ends there. While power systems and energy markets around the world are gearing up to face the challenges of the future, for AEMO and the broader energy industry in Australia, these challenges are in the here and now. Particularly in the National Electricity Market [NEM] that has covered Australia's eastern and south-eastern states since 1998, the energy transition is well underway and delivering tangible impacts. Australia's new world has a changing generation mix that includes a growing percentage of intermittent wind and solar power. Newer technologies such as battery storage are emerging and developing rapidly towards grid-scale viability. The ever increasing scope of communications will progressively allow customers more choice in how they source and use energy. In this new world, energy users are no longer passively accepting energy delivered to their homes and businesses. As a result we are seeing every day Australians taking control of their energy usage, engaging in distributed generation of energy and even neighborhood trading of energy to reduce energy costs and lower their carbon footprint. As the head of the market operator in Australia, it remains clear to me that regardless of the disruption, the end outcome of this energy transition must benefit energy consumer. And that requires the consideration of whether aspects of Australia's market and regulatory arrangements continue to be fit for purpose, and how we can best reflect the dynamic and evolving needs of energy customers.

*Programme dated June 18, 2018. Speakers and titles are subject to change at anytime.  
Programme au 18 juin 2018. Intervenants et titres peuvent changer.*

# OPENING PANEL

MONDAY 27 AUGUST 8:45 > 12:00 GRAND AMPHITHÉÂTRE (ACCESS LEVEL 1)  
FOR DELEGATES ONLY

## THE FUTURE SUSTAINABLE POWER SYSTEM: ORGANIC, DISRUPTIVE AND SECURE

8:45 9:00	<b>Welcome and introduction by Mark Waldron</b>
9:00 9:30	<b>Inside information/lessons learned from the Paris agreement</b> What is the impact of the Paris agreement on the electricity sector worldwide, what is there to learn, how to react, who is responsible to achieve the goals and how can technique help with that, what are the main focusses in the near future?
9:30 10:00	<b>Financing a more sustainable electricity sector in the future, by Mr. Kwawu Mensan Gaba, Lead Energy Specialist and Global Lead–Power Systems Solutions Group for the Energy and Extractive Industries Global Practice at the World Bank</b> To meet the new challenges for CIGRE regarding to sustainability, one of the new scopes of CIGRE (as stated in the new strategic plan and in the brochure network of the future) is energy for all. CIGRE started with the Africa initiative, a new working group about dissemination of information for Africa. Together with the World bank. In this presentation, we shall discuss the tasks, the approach, the finance of this project. A relation with the sustainability goals of CIGRE will be presented.
10:00 10:30	Coffee break
10:30 11:00	<b>Future North Sea Wind power Hub, enabling the change, by Mart van der Meijden</b> The Paris agreement challenges our imagination to find new solutions to massively develop RES and integrate them in our power system. The North Sea has great potential for large-scale development of offshore wind. A compelling view on a future North Sea Infrastructure will be presented based on the development of multi-national offshore interconnectors in combination with an island in shallow waters. The last can be constructed in stages, which will enhance optimal planning of the system rollout.
11:00 11:30	<b>Global Perspectives of Sustainability, Resilience and Distributed Generation</b> The world is transitioning from an electricity system based primarily upon large, central generation, traditional transmission and distribution (T&D) technologies, to one that also embraces emerging, distributed, digitally-enhanced, and low carbon technologies. Given the complexity of the current infrastructure, the global system is evolving towards an integrated and hybridized network that contains elements of traditional and emerging technologies, digital and physical, large and small, working synergistically. The impact of this transformation is giving rise to a proliferation of smart connected devices, big-data and analytics to enable better decision making as to operate a more reliable, safe and efficient grid.

Programme dated June 18, 2018. Speakers and titles are subject to change at anytime.  
Programme au 18 juin 2018. Intervenants et titres peuvent changer.

# CONFERENCE

## CONSUMER – PRODUCER INTERACTION

DISTRIBUTED ENERGY RESOURCES IMPACT ON THE BULK CONNECTED NETWORK  
CIGRE WORKING ON THE WHOLE VALUE CHAIN

**MONDAY 27 AUGUST 14:00 > 17:30** GRAND AMPHITHÉÂTRE (ACCESS LEVEL 1)  
FOR DELEGATES ONLY

Electric energy systems are in a transition phase all over the world. Fluctuating renewables are becoming the main sources for renewable energy in many power systems. High shares of these production facilities are connected to distribution networks. This generates new challenges for the whole power industry, thus Cigré is focusing on the whole value chain in the power system. We will see stronger cooperation between DSOs and TSOs to insure a stable a reliable electricity supply that fulfills the consumer's needs.

14:00	<b>WELCOME AND INTRODUCTION</b>	<b>MARK WALDRON</b> , TC Chairman
14:10	<b>MODERATION</b>	<b>CHRISTINE SCHWAEGERL</b> , Chair of SC C6: Active distribution systems and distributed energy resources
14:10 14:40	<b>FROM CENTRAL PRODUCTION TO ACTIVE DISTRIBUTED ENERGY RESOURCES</b> Historical power systems were based on large production plants connected to a transmission system and then energy where transported to the end user via distribution system. Now a large proportion of production capacity is connected to the distribution system providing opportunities, but also challenges to the system as will be demonstrated by the German showcase "Energiewende". New solutions and new methods are required for short term operational planning in a system where more than 50% of the production capacity is working autonomous and has a priority to produce due to political initiatives.	<b>JOACHIM VANZETTA</b> , Amprion GmbH, Germany
14:40 15:05	<b>DISTRIBUTION PLANNING AND OPERATIONS FOR THE ACTIVE DISTRIBUTION SYSTEM</b> What does the growing penetration of distributed energy resources (DER) mean for the Distribution System Operator (DSO)? The changes start with distribution planning – consideration of non-wires alternatives (NWA) to traditional investment is a way to recognize the value of distributed resources to the local grid. However, then we need new ways of the operating the grid to take advantage of these resources while also allowing them to participate in energy and service markets. This active distribution system requires widespread sensors, active management of the DER (including dynamic customer loads) and coordination with the transmission system operator. This has been called the Distribution System Platform (DSP) and requires the integration of Distributed Energy Resource Management Systems (DERMS) with Distribution Management Systems (DMS), including the interfaces to bulk energy markets, TSOs and local energy systems.	<b>MARK Mc GRANAGHAM</b> EPRI, USA
15:05 15:40	<b>HAS THE DISRUPTION JUST STARTED?</b> Some would say that the power system got disrupted when it went from central power plants to DER. Other would say it's just the start. Is off-grid for most consumers in the future or will local energy communities be the solution that changes the general power system concept. In Denmark already more than 50% of the generation is connected to the distribution system, with the target of 100% renewables in the power system by 2030, new solutions have to be found.	<b>JØRGEN CHRISTENSEN</b> , Danish Energy Association, Denmark
15:40 16:00	<b>COFFEE BREAK</b>	
16:00 16:25	<b>DISTRIBUTION SYSTEMS-THINK DC AND POWER ELECTRONICS</b> The debate about whether to use DC or AC in transmission and distribution is as old as our industry. On the distribution level, the issues are different and even more complex than the transmission, because it involves many consumers, their load patterns and habits plus their energy mix. The presentation provides both the DSO initiatives as well as the industry initiatives addressing the applications of DC and power electronics in distribution systems.	<b>MOHAMED RASHWAN</b> TGS Canada Chairman of SC B4 DC and Power Electronics
16:25 16:50	<b>LONG AND SHORT TERM PLANNING WITH DISTRIBUTED ENERGY RESOURCES</b> Distributed energy resources provide fluctuation challenges and flexibility solutions for the distribution and transmission system. The presentation summarizes recent results how system planning, asset management, markets and the future of reliability evolve with DER and energy cloud platforms.	<b>KONSTANTIN STASCHUS</b> , ENTSO-E Chairman of SC C1 System planning
16:50 17:15	<b>MANAGING A POWER SYSTEM WITH A HIGH SHARE OF DER PRODUCTION</b>	<b>CAMERON PARROTTE</b> , Executive General Manager, Western Australia Australian Energy Market Operator
17:15 17:25	<b>QUESTIONS</b>	
17:25 17:30	<b>CLOSING REMARKS</b>	<b>MARCIO SZECHTMAN</b>

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# WORKSHOP

## LARGE DISTURBANCES

MONDAY 27 AUGUST 14:30 > 18:00 AMPHI BLEU (LEVEL 2)  
FOR DELEGATES ONLY

## MARKET PERFORMANCE & SYSTEM OPERATION PERSPECTIVES

Introduction and opening:  
ANDREW OTT, CHAIR OF SC C5

First session chair:  
ALEX CRUICKSHANK

1	Virtual Transactions in the PJM Energy Market	USA	NATALIE TACKA and ADAM KEECH
2	Large Uncertainties in Long Term Forward Contracts for Distribution Utilities – required flexibilities	Brazil	J.C.O. MELLO, R. MENDES and E. NEVES
3	Managing Critical Grid Situations	France, Belgium, Italy	NICOLAS KITTEN FILIP CARTON ENRICO MARIA CARLINI

Second Session Chair:  
SUSANA DE GRAAFF, CHAIR OF SC C2

1	South Australian Blackout [26-09-2016]	Australia	BABAK BADRZADEH
2	National Energy Market – Market impacts of generation mix changes	Australia	RAINER KORTE
3	Hurricanes Irma & Harvey [2017]	USA	RENUKA CHATTERJEE
4	Brazilian Blackout on 21 <sup>st</sup> March 2018	Brazil	JAYME DARRIBA MACÉDO

Summary and session close: Susana de Graaff, Chair of SC C2.

# WORKSHOP

## B4 & CENELEC

WEDNESDAY 29 AUGUST 14:00 > 15:30 ROOM 352A (LEVEL 3)

OPEN TO ALL

### SYSTEM ASPECTS OF HVDC GRIDS

#### BACKGROUND OF THE PROPOSED WORKSHOP

CENELEC TC 8X/WG06 has published in 2018 the documents titled "HVDC Grid Systems and connected Converter Stations - Guideline and Parameter Lists for Functional Specifications" - "Part 1: Guidelines" [1] and "Part 2: Parameter Lists" [2].

The Guidelines and Parameter Lists to Functional Specifications are presented featuring planning, specification and execution of multi-vendor HVDC Grid Systems in Europe. Being elaborated by a team of experts from leading manufacturers of HVDC technology, Transmission System Operators (TSO's), Academia and Institutions in Europe, the present document provides a commonly agreed basis for an open market of compatible equipment and solutions for HVDC Grid Systems. Executing such systems and gaining operational experience is seen an important prerequisite for developing corresponding technical standards in the future.

#### PRELIMINARY CONTENTS THE WORKSHOP

Based on the present results of CENELEC TC 8X/WG 06, this workshop will provide a forum for discussing the development of standards for HVDC Grid Systems and strengthening the relationship between WG06 and CIGRE working groups active in the same field of technology.

Program / Titles	Affiliation / Company	Speaker
<b>Introduction to the WG06</b> Members, Team Goals, Activities, Liaisons Summary of existing Functional Specification documents	Siemens AG	Frank Schettler
<b>Functional Specification of AC/DC Converter Stations in HVDC Grid Systems</b>		
<b>Main Circuit Design</b>	ABB AB	Peter Lundberg
<b>Control</b>	50 Hertz Transmission GmbH	Anne-Katrin Marten
<b>Protection</b>		
<b>Testing</b>	RTE	Sebastien Dennetiere

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# WORKSHOP

## A3 & B4 PANEL IN COOPERATION WITH PROMOTiON PROJECT

THURSDAY 30 AUGUST 15:30 > 17:00 ROOM 242B [LEVEL 2]

OPEN TO ALL

# HVDC CIRCUIT BREAKERS, RECENT DEVELOPMENT AND DEMONSTRATION

### BACKGROUND OF THE PROPOSED TECHNICAL PANEL

CIGRE JWG A3/B4.34 published TB 683 "Technical requirements and specifications of state-of-the-art HVDC switching equipment" in 2017, which investigated various types of DC switching equipment potentially applicable to future multi-terminal HVDC grids along with the available technical specifications required for DC circuit breakers.

Several projects have been proceeding in order to implement future HVDC grids. A current one is the EU funded research project named PROMOTiON (Progress on Meshed Offshore HVDC Transmission Networks), in which 33 European stakeholders are participating.

One of the goals of the PROMOTiON is to demonstrate a practical HVDC protection with HVDC circuit breakers considering technical feasibility and economic aspects. The performance of HVDC circuit breakers with different technologies will be demonstrated in the project.

The proposed CIGRE-PROMOTiON technical panel will update and exchange the information on state-of-the-art HVDC circuit breakers applied in various international projects and discuss the necessity of further actions in CIGRE.

### PREFERENTIAL SUBJECTS OF TECHNICAL PANEL

1. Technical requirements of HVDC circuit breakers in future meshed DC grids.
2. State-of-the-art of HVDC circuit breaker development, testing and field demonstration

### CONTENTS OF THE PANEL SESSION :

In order to accommodate the growth of renewable energy sources into the market, HVDC with its ability to carry bulk power over long distances and its dynamic controllability is one of key technologies to enable the transition to a greener and smarter energy sector. The development of Voltage Source Converters (VSCs) and its ability to control both active and reactive power and "Black Start", allowing connection to offshore wind or weak networks. The change of power direction without voltage polarity reversal also allows converters to be connected in a grid easier. This facilitates the development of meshed DC networks, rather than a number of point-to-point links.

A major challenge when applying HVDC on a large scale in meshed grids is the DC protection. No natural zero crossings of DC current and the low impedance of DC networks makes the speed of fault detection and clearing more challenging.

This panel aims to present the HVDC circuit breaker technologies and their application, as one hurdle in the realization of HVDC grids. In particular, the panel aims to address the following crucial points:

1. Technical merits and expectations of HVDC circuit breakers compared with other protection schemes
2. HVDC circuit breaker requirements expected by TSOs
3. HVDC circuit breaker development and demonstration update

Program / Titles	Affiliation / Company	Speaker
Opening	CIGRE SC A3	Hiroki Ito
HVDC breaker experience in China	GEIRI (State Grid Corp. of China)	Ting An
	China Southern Power Grid	Shukai Xu
Considerations on HVDC breaker application in Europe	SHE Transmission, Scotland	Paul Neilson
Current injection HVDC circuit breakers	Mitsubishi Electric Corp., Japan	Hiroki Ito / Tadao Minagawa
Novel technology DC circuit breaker	SciBreak, Sweden	Lennart Ångquist
Testing of HVDC circuit breakers	KEMA Laboratories DNV GL, NL	René Smeets
Discussion		

#### References :

[1] H2020 "PROgress on Meshed HVDC Offshore Transmission Networks (PROMOTiON)",  
<https://www.promotion-offshore.net/>

[2] CIGRE Technical Brochure 492, "VSC HVDC for Power Transmission", WG B4.46 [2012]

[3] CIGRE Technical Brochure 533, "HVDC Grid Feasibility Study", WG B4.52 [2013]

[4] CIGRE Technical Brochure 683, "Technical requirements and specifications of state-of-the-art HVDC switching equipment", JWG A3/B4.34 [2017]

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# WORKSHOP B3

FRIDAY 31 AUGUST 9:00 > 12:00 ROOM 241 [LEVEL 2]

OPEN TO ALL

## SAFE WORKING IN SUBSTATIONS

PRESENTERS: **JOHN NIXON (GB), TAKASHI ABE (SG)**

We want our workers who build, operate, maintain, revamp and demolish T&D substations, to go home each day to their families in exactly the same condition as they arrived for work. It is the right of every employee and contractor. In recent years there has been much emphasis on the health and safety of workers but we are struggling to reduce injuries and fatalities even with such focus. More needs to be done, but how do we achieve a better safety culture?

The topic for working group B3.46 is "Guidelines for safe work methods in substations". The work considers the impact and influence everyone can have on the health and safety of others. A questionnaire has been created and 71 contributions have been received from a global spread of countries with 85% of respondents coming from generation, distribution and transmission operators. We therefore already have a large amount of data that we are examining and which will be utilised by the WG team.

The purpose of the workshop in Paris is to take full advantage of the gathering of knowledgeable engineers and tap into their experience in the field of building and working in substations, particularly in a live environment. We need your actual experience, discussion, information exchange and feedback.

### DURING THE WORKSHOP WE WOULD LIKE THREE SPECIFIC QUESTIONS ANSWERED:

- How would you define "Safety Culture"?
- How do we achieve a better safety culture?
- What are the key drivers that have changed your safety KPI's?

*We look forward to your active participation.*

# 16 POSTER SESSIONS

FROM MONDAY 27 AUGUST (PM) TO FRIDAY 31 AUGUST (AM) HALL TERNES (LEVEL 1)  
FOR DELEGATES AND SC/WG BADGE HOLDERS ONLY

Monday 27 August	14:30 18:00	A1: ROTATING ELECTRICAL MACHINES (Room 1) B4: DC SYSTEMS AND POWER ELECTRONICS (Room 2)
	9:00 12:30	A3: TRANSMISSION & DISTRIBUTION EQUIPMENT (Room 1) B5: PROTECTION AND AUTOMATION (Room 2)
Tuesday 28 August	14:30 18:00	C5: ELECTRICITY MARKETS AND REGULATION (Room 1) D1: MATERIALS AND EMERGING TEST TECHNIQUES (Room 2)
	9:00 12:30	A2: POWER TRANSFORMERS AND REACTORS (Room 1) B3: SUBSTATIONS AND ELECTRICAL INSTALLATIONS (Room 2)
Wednesday 29 August	14:30 18:00	C2: POWER SYSTEM OPERATION AND CONTROL (Room 1) D2: INFORMATION SYSTEMS AND TELECOMMUNICATIONS (Room 2)
	9:00 12:30	B1: INSULATED CABLES (Room 1) C1: POWER SYSTEM DEVELOPMENT AND ECONOMICS (Room 2)
Thursday 30 August	14:30 18:00	B2: OVERHEAD LINES (Room 1) C3: POWER SYSTEM ENVIRONMENTAL PERFORMANCE (Room 2)
	9:00 12:30	C4: POWER SYSTEM TECHNICAL PERFORMANCE (Room 1) C6: ACTIVE DISTRIBUTION SYSTEMS AND DISTRIBUTED ENERGY RESOURCES (Room 2)
Friday 31 August		

# TUTORIALS

## ROOM MAILLOT LEVEL 2

OPEN TO DELEGATES WITH A DEDICATED REGISTRATION FOR TUTORIALS (LIMITED SEATS AVAILABLE)

### MONDAY 27 AUGUST

#### **B5: CHALLENGES AND SOLUTIONS FOR THE MAINTENANCE OF FULLY DIGITAL SUBSTATION**

8:30  
10:20

This tutorial will cover challenges and solutions related to the quality assurance process, condition-based and time-based maintenance testing. The impact on IEC 61850 edition 2 related to testing is also covered. Testing during different phases, from FAT (Field Acceptance Test) to SAT (Site Acceptance Testing) and maintenance, in addition to testing of functional chains in a full process-bus SPACS (Substation Protection and Automation Control System) with NCIT (Non-Conventional Instrument Transformer) and SAMU (Stand-Alone Merging Unit) is discussed. The tutorial will conclude with some experience feedback and recommendations regarding test tools and specifications.

Presenters:  
**VOLKER LEITLOFF** [FR]  
and **ALEX APOSTOLOV** [US]

#### **B4: HVDC PLANNING, TECHNOLOGY SELECTION AND SPECIFICATION**

10:40  
12:30

The tutorial covers technical factors that would be considered when choosing VSC or LCC technology for a new HVDC system. It will cover technical considerations such as cost, footprint, losses, maximum rating, and fault recovery performance that may be decisive in the selection of one technology as well as other factors which may not be decisive but could still influence the decision in favour of one technology over the other. The tutorial will also cover selected topics related to specification of both LCC and VSC technology including ratings, performance requirements and testing.

Presenter:  
**BRUNO BISEWSKI** [CA]

#### **A2: ASSESSMENT OF TRANSFORMER PAPER AGEING AND POST MORTEM INVESTIGATION**

14:00  
15:50

When a transformer is permanently removed from service, the opportunity arises to perform a detailed and destructive examination thus direct observations and measurements can be made and material samples collected for later examination. Of special interest are paper insulation samples for investigation of ageing. Also of great interest is the ability to capture valuable information on design and construction as well. Furthermore, the analysis of material samples drives future research and development.

Presenter:  
**MARIE-CLAUDE LESSARD** [CA]

#### **D2: FRAMEWORK FOR EPU OPERATORS TO MANAGE THE RESPONSE TO A CYBER-INITIATED THREAT**

16:10  
18:00

This tutorial describes a framework for a tool set that electric public utility (EPU) operators can use to automate their response to cyber-initiated threats. Within this framework, a priority is placed on the capability for EPU personnel and supporting expert contractors (consultants, vendors, etc.) to create, model, simulate, and control the response to a cyber-initiated threat. Three pillars of model-based system engineering (MBSE) are tailored for EPU applications to establish a coherent framework.

Presenter:  
**DENNIS HOLSTEIN** [US]

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## TUESDAY 28 AUGUST

<p>8:30 10:20</p>	<p><b>C1: CIGRE FEASIBILITY STUDY OF A GLOBAL ELECTRICITY NETWORK</b></p> <p>With global climate protection and development of renewable energy, a global electricity network could take advantage of diversity from time zones, seasons, load patterns and variable generation, supported by developments in UHV transmission. Since 2016, CIGRE WG C1.35 studies the feasibility of a global electricity network. The tutorial presents advanced results based on modelling for a 2050 horizon, plus challenges, benefits, uneven distribution of energy resources such as wind and solar. In the discussion at the end, participants may comment on interfaces between continents.</p>	<p>Presenters: J. YU [CN], G. SANCHIS [FR], M. LEDU [FR], A. ILICETO [IT], D. RADU [BE] and S. CHATZIVASILEIADIS [DK].</p>
<p>10:40 12:30</p>	<p><b>D1: GUIDELINES FOR ALTITUDE CORRECTION OF POLLUTION PERFORMANCE OF INSULATORS (WG D1.44)</b></p> <p>The tutorial is focused on analysis and harmonization of the correction factors for altitude while dimensioning AC and DC insulators operating in polluted environments. Most of the present data in CIGRE/IEC documents is based on findings from the 1970s and 1980s. At that time the research was mostly limited to altitudes of up to 2000 m and very few results were known for altitudes up to 3000 m. The lack of data was the main driving force for the present investigation performed by WG D1.44 established at the direct request of CIGRE/IEC. Another driving force was that different approaches and different formulae exist in the present IEC and CIGRE recommendations on how to consider altitude correction.</p>	<p>Presenter: IGOR GUTMAN [SE]</p>
<p>14:00 15:50</p>	<p><b>A3: TRANSMISSION &amp; DISTRIBUTION EQUIPMENT</b></p> <p>This tutorial explains various switching equipment used in power systems in collaboration with CIGRE SC A3 Green book publication. The new Green book on switching equipment covers various equipment in power systems, current interrupting phenomena with different technologies, fault current limiters, surge arrestors, controlled switching and DC circuit breakers. The tutorial highlights the historical design transition of circuit breakers [oil, air-blast, SF6 and vacuum], fundamental switching phenomena, switchgear applied at distribution levels, and future interruption technologies.</p>	<p>Presenters: HIROKI ITO [JP], HARLEY WILSON [US], RENE SMEETS [NL] and NENAD UZELAC [US]</p>
<p>16:10 18:00</p>	<p><b>C5: GLOBAL OVERVIEW OF DEMAND RESPONSE MARKETS AND REGULATIONS</b></p> <p>This course explores the regulatory, markets, technology and the customer aspects of demand response programs in the context of electricity markets. While providing a detailed review of the similarities and differences among the implicit and explicit DR offerings in the different markets in which demand resources can participate, it also reviews enablers, barriers; support schemes and structures, DR products and certification and market design in the context of the current and future roles for electricity consumers, aggregators, energy retailers, utilities, and market operators etc., and evaluation, measurement and verification etc. This course will also explore and connect the current and emerging trends including role of storage, distributed energy resources etc., in the context of DR and share practical examples of how to leverage wholesale energy market models to design demand response programs. Several case studies will be examined.</p>	<p>Presenters: ANANT VENKATESWARAN [US] and ALEX CRUIKSHANK [AU]</p>

# TUTORIALS

## ROOM MAILLOT LEVEL 2

OPEN TO DELEGATES WITH A DEDICATED REGISTRATION FOR TUTORIALS  
(LIMITED SEATS AVAILABLE)

### WEDNESDAY 29 AUGUST

8:30 10:20	<b>C4: RECENT ADVANCES IN THE APPLICATION OF SYNCHROPHASOR TECHNOLOGY</b> <p>In recent years, significant advances have occurred through the IEEE Standards to ensure that the accuracy of phasor measurement units (PMUs) is appropriate for power system applications. The first section of the tutorial will review the changes and discuss their relevance to industry. This will be followed by a review of relevant communication standards and recommendations. Other issues to be discussed will include communication performance and cybersecurity requirements that arise from today's PMU applications and how PMU communication is currently implemented in practice. Some selected industry applications will be presented in this tutorial. There are numerous applications that have progressed beyond the 'research and development phase', while others are currently in a conceptual stage with an ongoing need for research and field trials. Samples of these applications will also be discussed during the tutorial.</p>	Presenters: <b>UDAYA ANNAKAGE</b> [CA], <b>ATHULA RAJAPAKSE</b> [CA], <b>EMIL HILLBERG</b> [SE], <b>KOJI YAMASHITA</b> [JP] and <b>VAJIRA PATHIRANA</b> [CA]
10:40 12:30	<b>C2: SYSTEM OPERATION EMPHASISING DSO/TSO INTERACTION AND CO-ORDINATION (JWG C2/C6.36)</b> <p>The paradigm shift in the configuration of the power system with a high penetration of distributed generation connected at the distribution level, creates the need for a new level of interaction and coordination among transmission system operators (TSOs) and distribution system operators (DSOs). This tutorial focuses on the following key aspects of this evolving relationship: TSO-DSO Cooperation for Frequency Management and Active Power Balancing with Distributed Resources, TSO-DSO Cooperation for Reactive Power management, Restoration with Distributed Resources, Operational Planning with Distributed Resources and Data Exchange.</p>	Presenters: <b>EAMONN LANNHOVE</b> [IE], <b>TONY HEARNE</b> [IE], <b>CARSTEN ROGGATZ</b> [DE] and <b>ELLEN DISKIN</b> [IE]
14:00 15:50	<b>C6: APPLICATION OF BATTERY STORAGE SYSTEMS IN DISTRIBUTION SYSTEMS</b> <p>Battery Electric Energy Storage Systems (BESS) are increasingly entering electric distribution networks. Distribution system operators, suppliers, vendors and policy makers lack a common framework in terms of guidelines and recommended practices on the way BESS should be integrated into the distribution networks. The tutorial is based on the results of WG C6.30 entitled "The Impact of Battery Energy Storage Systems on Distribution Networks" and focuses on planning and design as well as operational considerations, use-cases and business cases, standards and grid codes as well as practical international experiences with BESS in distribution systems.</p>	Presenters: <b>NIKOS TZIARGIYRIOU</b> [GE] and <b>GAZA JOOS</b> [CA]
16:10 18:00	<b>B3: CONTEMPORARY COST-EFFECTIVE SUBSTATION DESIGN</b> <p>This tutorial provides a guide on the substation design process aimed at lowering the cost of substations for developing countries. The tutorial has been segregated into three distinct themes. The first theme explores the substation design philosophy and process – philosophy of design, contemporary asset management applied to substation design and discussion of the design process. The second theme identifies engineering considerations for substation design – equipment selection, siting, access and constructability; operability and maintainability and safety and the environment. The third theme reflects on project management and commercial approaches intended to lower exposure to lifecycle cost – project management considerations, costing, procurement of infrastructure and training of design practitioners.</p>	Presenters: <b>PEREGRINE TONKING</b> [AU], <b>ROBERT SLEBODNIK</b> [US] and <b>PHILIP KONIG</b> [ZA]

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## THURSDAY 30 AUGUST

<p>8:30 10:20</p>	<p><b>B2: EXPERIENCE WITH THE MECHANICAL PERFORMANCE OF NON-CONVENTIONAL CONDUCTORS</b></p> <p>Bottlenecks in transmission and distribution grids are causing more and more precarious situations. Non-conventional conductor change becomes 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. Local line design standards and conditions will need to be taken into account as these will have a significant impact on the type of the high temperature conductor chosen.</p>	<p>Presenter: <b>PIERRE VAN DYKE [CA]</b></p>
<p>10:40 12:30</p>	<p><b>A1: REVISITING THE FUNDAMENTALS OF MAGNETIC SATURATION IN SALIENT POLE SYNCHRONOUS GENERATORS</b></p> <p>The tutorial focus on the basic flux elements that contribute to the total flux density of the magnetic core of hydro generators, with specific focus on the air gap magnetic flux density, stator core saturation, pole saturation, rotor rim saturation and total excitation current at now load. During the refurbishment of hydrogenerators in power houses, there is sometimes an opportunity to increase the generator power output by replacing stator and rotor windings but maintaining the original magnetic core. Higher power output means that higher flux densities of up to two Tesla is produced in many sections of the core and poles. To determine the effects of such abnormal high flux densities, a proper understanding of the magnetic behaviour of a stator core is necessary.</p>	<p>Presenter: <b>JOHNNY ROCHA [BR]</b></p>
<p>14:00 15:50</p>	<p><b>B1: FAULT LOCATION ON LAND AND SUBMARINE LINKS (AD &amp; DC)</b></p> <p>The increasing number of land and submarine cable assets globally has created a focus on cable fault location capabilities. The tutorial presents the contents of the Technical Brochure dedicated to this subject, covering fault location methods in a large variety of cable installation, such as direct buried cable systems, ducted land cable systems, cables between GIS bays, cables installed in horizontal directional drills and tunnels, cables at large burial depths, cable systems with different bonding types, very long cables. The presented brochure also includes a part dedicated to "Innovation and Future Developments" that describes cutting edge methods that are emerging in the field of fault location.</p>	<p>Presenter: <b>ROBERT DONAGHY [IE]</b></p>
<p>16:10 18:00</p>	<p><b>C3: EMF - TIME TO REASSURE</b></p> <p>The tutorial will review the effects of static and power-frequency electric and magnetic fields on the human health. It will include the potential effects of air ions produced by DC transmission lines as well. The tutorial will explain the interaction between the fields and the human body, the particular effects for which a protection is applied and the threshold at which these effects occur. Exposure limits from international bodies will be presented and discussed. Recent research on the effects of high magnetic field on humans will be presented in the context of international exposure recommendations.</p>	<p>Presenters: <b>MICHEL PLANTE [CA]</b> and <b>ALEXANDRE LEGROS [CA]</b></p>

CIGRE SESSION 2018

# Women in Engineering Forum 2018

11:00-14:00, August 30 - Room 342AB

Paris - Palais des Congrès

# 47

## Topics:

Engineering  
Needs Diversity

Empowering  
Women in Engineering

New Future for  
Women Engineers

**CIGRE WIE** is to promote the career paths of women engineers, by inspiration, experience sharing and professional links exploring, through setting-up network and organizing activities.

**CIGRE WIE 2018** will focus on the current and future career challenges & opportunities for women engineers in power and energy industry.

## Program

11:00-11:20	<p>Welcoming Address:</p> <ul style="list-style-type: none"> <li>☐ Moderator: Ruomei LI</li> <li>☐ Speakers:           <ul style="list-style-type: none"> <li>● Rob STEPHEN, CIGRE President</li> <li>● UNESCO Officer</li> <li>● Mark WALDRON, CIGRE Vice President</li> </ul> </li> </ul>
11:20-12:05	<p>Keynote Speech:</p> <ul style="list-style-type: none"> <li>☐ Moderator: Khayakazi DIOKA, South Africa</li> <li>☐ Speakers:           <ul style="list-style-type: none"> <li>● Philippe ADAM, CIGRE Secretary General, "Women members in CIGRE, Status, Challenges and Prospects"</li> <li>● Claire LAJOIE-MAZENC, France, "To encouraging women engineers in France"</li> <li>● Carla DAMASCENO</li> <li>● Speaker from GCC</li> </ul> </li> </ul>
12:05-12:20	Group Photos (A) & Drink Break
12:20-12:50	<p>WIE Dialogue:</p> <p><u>Topic:</u> How to promote Women's function in CIGRE</p> <p>Moderator: Marie HAYDEN, past Chair, Ireland NC</p> <p>Panelist:</p> <ul style="list-style-type: none"> <li>● Britta BUCHHOLZ, former SC C6 chair</li> <li>● Klaus KLEINEKORTE, past Chair, Germany NC;</li> <li>● Michel AUGONNET, CIGRE Vice president Finance;</li> <li>● Rannveig LOKEN, Norway, SC B5 chair</li> </ul>
12:50-13:10	Drink & Lunch Break
13:10-13:40	<p>Interactive Session:</p> <ul style="list-style-type: none"> <li>☐ Moderator: Biljana STOJKOVSKA, National Grid, UK</li> </ul> <p><u>Topics:</u></p> <ul style="list-style-type: none"> <li>➢ Be the best of you</li> <li>➢ Advancement and Empowerment of women engineers</li> <li>➢ Unity and Diversity</li> <li>➢ Challenges &amp; Opportunities for Women in new future</li> </ul> <p>☐ 8-10 Speakers:</p>
13:40-13:50	<p>Summary</p> <p>Chair: Ruomei LI</p>
13:50-14:00	Group Photos (B) & Close