

Colloquium ATHENS 2018

***“Latest developments in HVDC
systems, battery storage and EMF
Challenges for integrating
connections in transmission
and distribution systems”***

***Organized by CIGRE
Greek National Committee***

Opening Session

- The Electricity Transmission & Distribution System of Greece
- What is CIGRE National Committee of Greece
- Why Colloquium ATHENS 2018

Markos CHAMPAKIS
Chairman

Opening Session

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Basic facts and figures

- Area: 131 957 km²
- Population: 10.75 million (2016)
- Number of electricity consumers: 7 486 000 (2017)
- Number of TSOs: 1
- Number of DSOs: 1
- Peak load: 10 610 MW (in 2007)

The Electricity Transmission & Distribution System of Greece

Global map of the grid and of its interconnections

Interconnectors with:

- Turkey
- Bulgaria
- F.Y.R.O.M.
- Albania
- Italy



Grid facts and characteristics

	Voltage Level	Total length (approx.)	Responsibility
Transmission Grid	400kV	3 000 km	TSO
High Voltage	150kV	8 600 km	TSO
High Voltage	150kV (Cables in Attica Region)	220 km	DSO
High Voltage	150kV (in non-interconnected islands)	770 km	DSO
Medium Voltage	20kV	112 000 km	DSO
Low Voltage	400V/230V	126 000 km	DSO

The Electricity Transmission & Distribution System of Greece

Map of the interconnected high voltage grid



Information on TSO

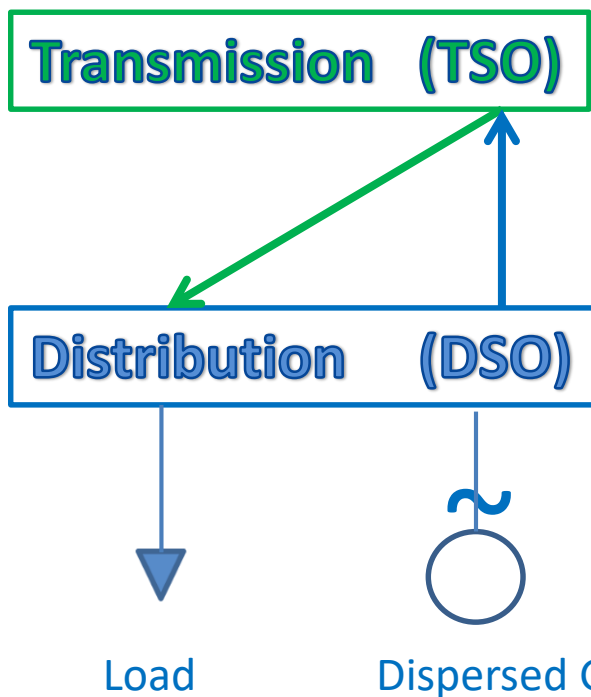
- Name: Independent Power Transmission Operator (IPTO or ADMIE)
- Network length ~11 600 (km)
- Served area ~115 000 (km²)
- Annual transmitted energy ~52 (TWh) (2017)
- website: <http://www.admie.gr>

Information on DSO₍₂₀₁₇₎

- Name: Hellenic Electricity Distribution Network Operator (HEDNO or DEDDIE)
- MV Network length: ~ 112 000 km
- LV Network length: ~ 126 000 km
- Submarine MV cables length: 1 100 km
- Total number of HV/MV Substations: 235
- Total number of MV/LV Substations: 162 614
- **DRES installed power: 3 760 MW**
- 11 500 MV customers, 7 474 500 LV customers
- website: <http://www.deddie.gr>

Cooperation of TSO and DSOs

Instructions to DSO in case that security is at risk mostly when curtailment is necessary



On-line and off-line info, long term forecasts to TSO for load and dispersed generation + measurements for market settlement

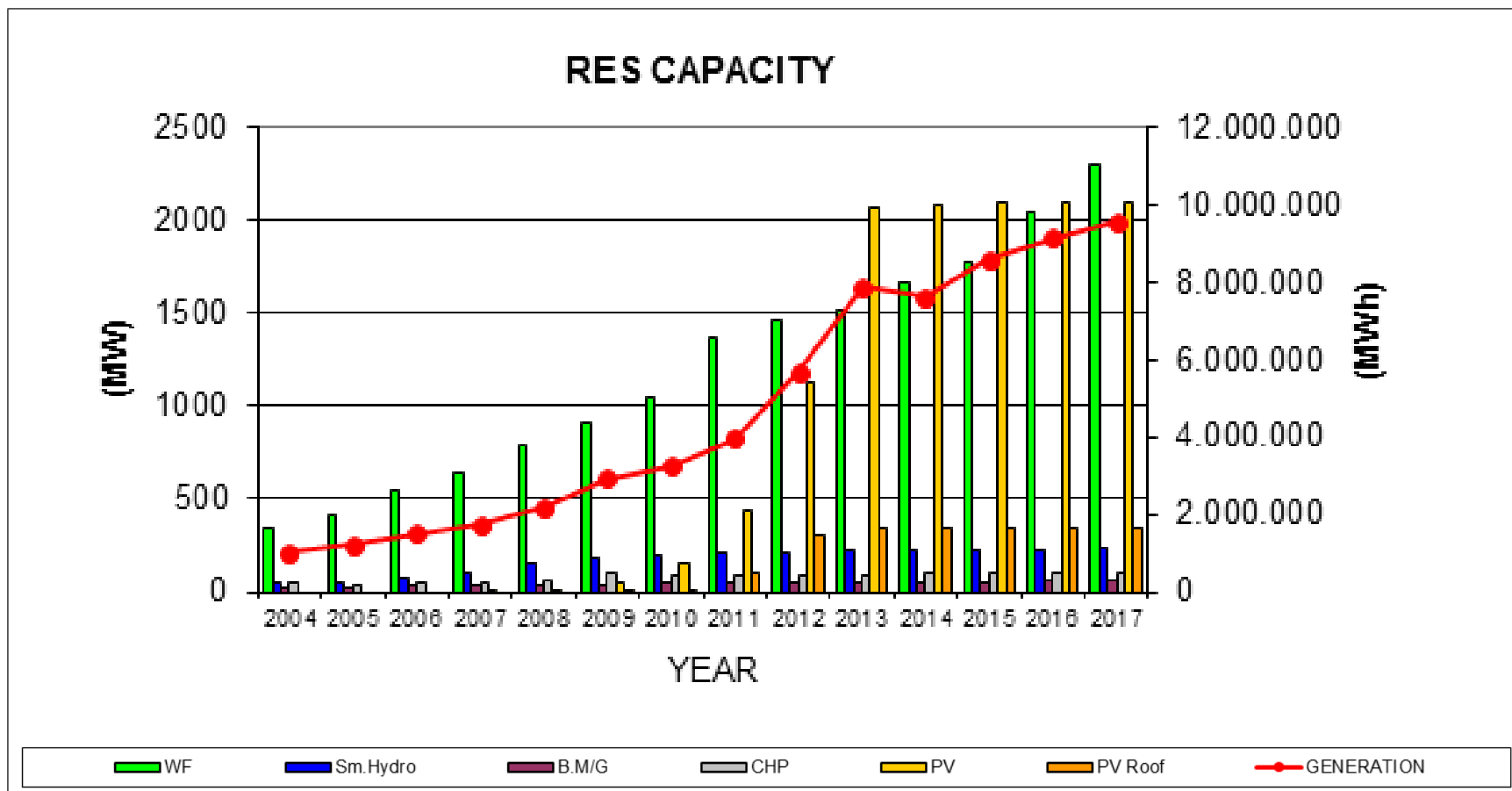
The Electricity Transmission & Distribution System of Greece

RES Installed capacity and energy production 2017

	OWNER	Installed Capacity (MW)	Generated Energy (GWh)	Capacity factor (%)
Large Hydro	PPC	3018	3457	13,1
Small Cogeneration	IPPs	100	195	22,3
Wind	IPPs (mainly)	2302	4777	23,7
Small hydro	IPPs (mainly)	230	586	29,1
Biofuels - Biomass	IPPs (mainly)	61	278	52,0
PVs & PVs on buildings	IPPs (mainly)	2094 351	3243 475	17,7 15,4
Total Renewables (Grid & Network)		5138	9554	
TOTAL		8156	13011	

The Electricity Transmission & Distribution System of Greece

RES installed capacity and aggregated RES production since 2004



Power balance in 2017

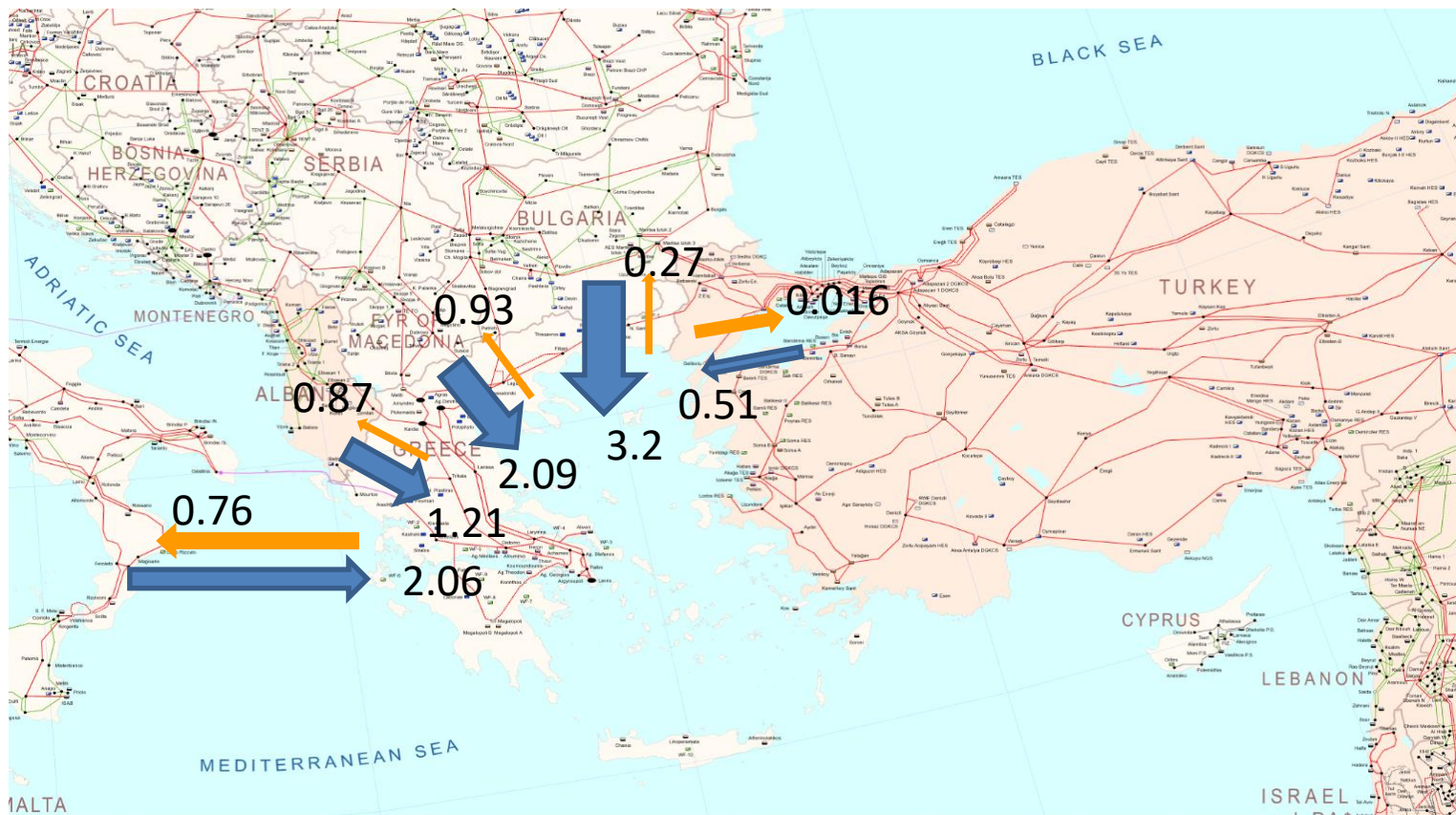
- Generation (TWh): 45.8
- Consumption (TWh): 52.0
- Imports (TWh): 8.7
- Exports (TWh): 2.5

Losses of 1.1 TWh are included in the Consumption value.

The Electricity Transmission & Distribution System of Greece

Energy exchanges

- Commercial flows 2017 (TWh)



Electricity market in 2017 and in future

- Greek Electricity Market Model is a “**physical market**” based on a “**day-ahead mandatory pool**”
- RES are remunerated with **feed-in tariffs**, but from Mid 2018 **auctions** results will be taken into account
- Mid 2019 a new market structure will be implemented in order to comply with the European Target Model. In particular **forward market**, **day-ahead market** and **intraday market** will be operated by Hellenic Energy Exchange and **balancing market** will be operated by IPTO.

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What is CIGRE National Committee of Greece



Hellenic National Committee

- 1960 Liaison Office
- 1976 NC Establishment
- 1989 Legal Form

Almost 60 years of History



What is CIGRE National Committee of Greece

From 2018

- New Brand name according to CIGRE
- New Logo
- New website: **cigre.gr**
- Towards a mirror organization



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Friday 30 November 2018



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Key figures of the Committee

The Committee has:

- ✓ **100** Individual Members
- ✓ **25** Collective Members
- ✓ **One** Member in CIGRE Administrative Council
- ✓ **16** Members in Study Committees (one in each SC)
- ✓ **One** Honorary Member
- ✓ **18** “Distinguished” Members

For 2017 and 2018 more than **225 equivalent Members** leading to upgrade NC classification

Organization of Scientific / Technical Events

Sessions

The Committee has organized **29** Sessions, since 1978

- The most prestigious event on electricity in Greece
- Speakers and audience from TSO, DSO, Industry and Universities
- Attended by about 300 participants

Colloquia

The Committee has organized **14** Colloquia, since 1990

- Related to the conclusions of Paris Sessions
- Presentations by invited speakers
- Attracting a large audience

Sound participation in CIGRE activities

The Committee has uninterrupted participation in:

- ✓ CIGRE International Working Groups
- ✓ CIGRE Technical Brochures
- ✓ CIGRE Paris Sessions
 - Administrative Council
 - Papers & Delegation
- ✓ CIGRE/South East Europe Regional Committee
 - Management Board
 - Technical Advisory Committee
 - Papers & Delegation

Upcoming CIGRE major Events

The Committee has posed candidateship to host in Athens, Greece and organize:

- ❖ CIGRE ADMINISTRATIVE COUNCIL MEETING 2021
- ❖ CIGRE/SEERC CONFERENCE 2022

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List of islands of Greece

From Wikipedia, the free encyclopedia
(Redirected from [Greek Islands](#))

Greece has an extremely large number of [islands](#), with estimates ranging from somewhere around 1,200^[1] to 6,000,^[2] depending on the minimum size to take into account. The number of inhabited islands is variously cited as between 166^[3] and 227.^[2]

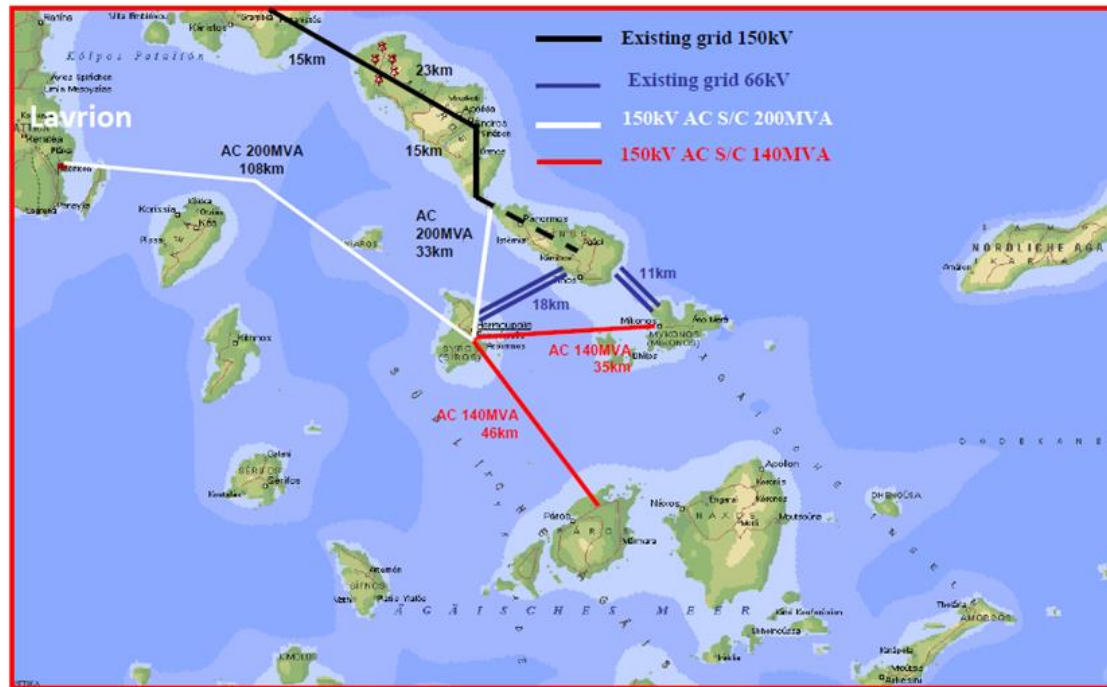
The largest Greek island by area is [Crete](#), located at the southern edge of the [Aegean Sea](#). The second largest island is [Euboea](#), which is separated from the mainland by the 60m-wide [Euripus Strait](#), and is administered as part of the [Central Greece](#) region. After the third and fourth largest Greek Islands, [Lesbos](#) and [Rhodes](#), the rest of the islands are two-thirds of the area of Rhodes, or smaller.

The Greek islands are traditionally grouped into the following clusters: The [Argo-Saronic Islands](#) in the Saronic gulf near [Athens](#), the [Cyclades](#), a large but dense collection occupying the central part of the Aegean Sea, the [North Aegean islands](#), a loose grouping off the west coast of Turkey, the [Dodecanese](#), another loose collection in the southeast between Crete and Turkey, the [Sporades](#), a small tight group off the coast of Euboea, and the [Ionian Islands](#), located to the west of the mainland in the [Ionian Sea](#) (one of these islands, [Kythira](#), is off the southern tip of the [Peloponnese](#) Peninsula and part of the [Attica region](#), but still considered part of the Ionian Islands, mainly because of historical reasons). There are also many islands, islets and rocks that surround the coast of Crete.



Why Colloquium ATHENS 2018

Recent Evolution: 13 islands connected to the Mainland on 2018

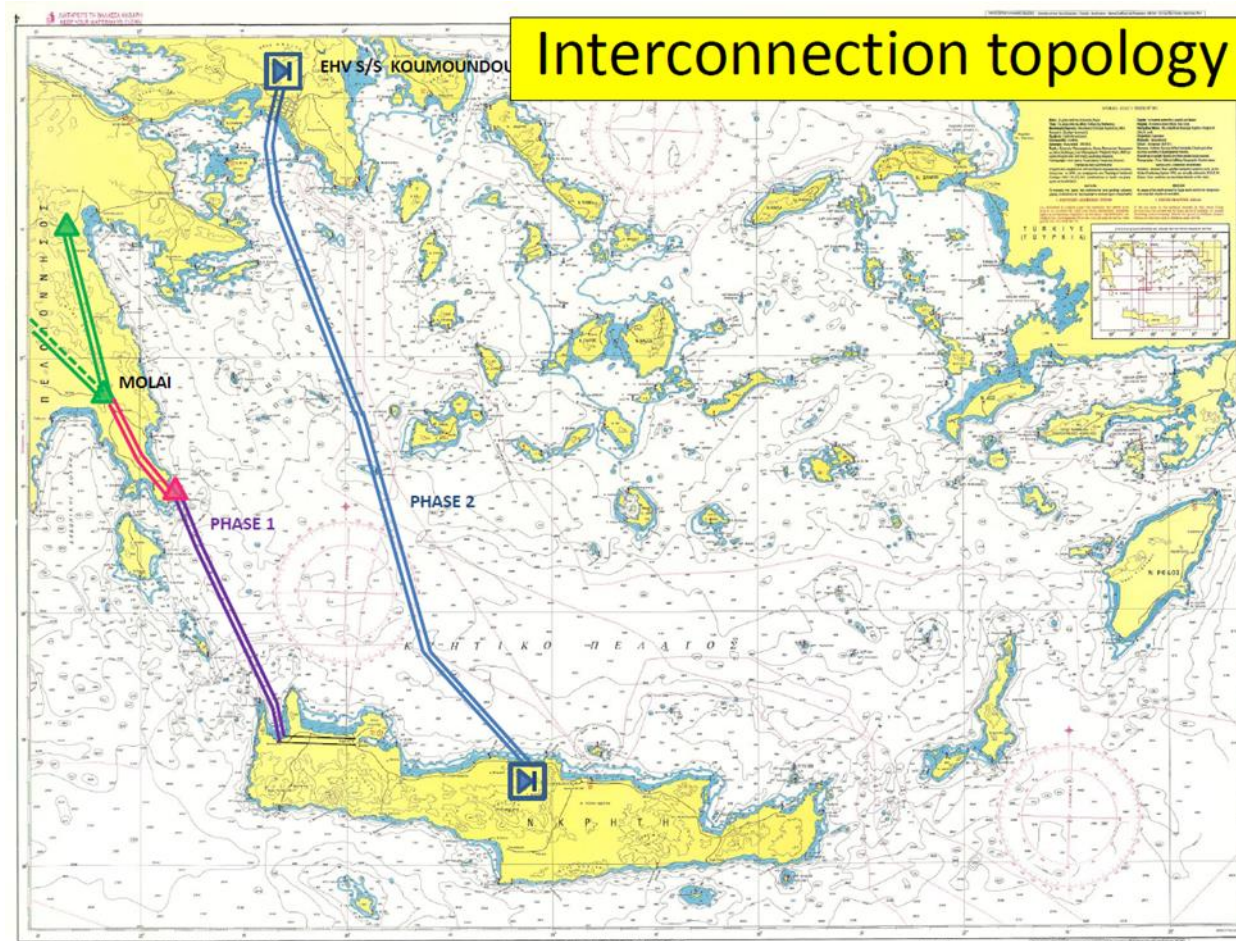


- Total budget: ~250 M€
- Total cable length: 220km
- Commissioning: March-May 2018

Estimated annual O&M savings: ~50 M€

Significant improvement of reliability of supply and power quality

Crete interconnection to the mainland projects





DISCUSSION MEETING

SUMMARY

Study Committee B4

HVDC and Power Electronics

28 August 2018

Chairman: Mohamed Rashwan

TUTORIAL C6 - APPLICATION OF BATTERY STORAGE SYSTEMS IN DISTRIBUTION SYSTEMS



C6: Application of battery storage systems in distribution systems

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.

Speaker(s) .

Nikos Hatziaargyriou (GR) • Geza Joos (CA)



Wednesday August 29, 2018

14:00 To 15:50



Room MAILLOT

TUTORIAL C3 - EMF - TIME TO REASSURE



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.

Speaker(s) :

Michel Plante (CA), Alexandre Legros (CA)



Thursday August 30, 2018

16:10 To 18:00



Room MAILLOT

Thank you for your attention