



# PowerTech MILANO2019

LEADING INNOVATION  
FOR ENERGY TRANSITION



23-27 JUNE 2019





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## WELCOME FROM CONFERENCE CHAIRS



DARIO ZANINELLI | General Chair

POWERTECH 2019: we welcome all delegates and visitors to Milano, Italy! POWERTECH is the anchor conference of IEEE PES in Europe and provides a forum for engineers and scientists in electric power and energy systems to present their work and share information in this area of growing interest and importance in the Industry and Economy around the world.

I sincerely thank the International Steering Committee of the POWERTECH for the encouragement and support provided over the last few years to hold this conference in Italy for the second time and feel very honoured by the recognition they have demonstrated towards our activities.

My sincere gratitude is offered to the members of the Organizing Committee, who have worked tirelessly to prepare the Conference, for their efforts in the numerous tasks always required for such an event. I am sure that they will continue to do their best during your stay to render it a pleasant memory.

I sincerely thank my Institution, the Politecnico di Milano, and Fondazione Politecnico di Milano for the support provided in the administration, organization and logistics for the Conference.

I also wish to thank the International Advisory Committee, the Basil Papadias Award Committee and the paper reviewers for their precious work in order to guarantee the high quality of the Conference.

The sponsorships provided by ENGIE eps, RTDS Technologies, SCHNEIDER Electric, DIGSILENT, UNARETI, ETAP, RTE, OPAL RT Technologies, MONTE-LE, POWERSYS solutions, SCHALTBAU, SORGENIA, TERNA, ABB, KIEPE Electric, SAET Padova, BOMBARDIER are greatly appreciated.

Sincere thanks to all Authors that made this conference possible by means of their participation and papers.

This conference happens in the context of an energy transition which brings new challenges and opportunities for all involved in the development of sustainable electrical energy networks in which new technologies and models for research study, industry development and business plan are being proposed, developed and tested. Leading innovation in this frame is a serious attempt to provide the best system at a given period, and succeeds in producing new workable solutions to invest for the future, reflecting the opportunities of the technological knowledge.

I and the Organizing Committee, we hope you will find the conference stimulating and enjoyable, have a memorable time in Milano, Italy and have the opportunity to renew old friendships and make new ones.

Prof. Dario Zaninelli

A stylized, handwritten signature of Dario Zaninelli in black ink.




**FEDERICA FOIADELLI | Program Chair**


I am honored and delighted to welcome all of you, dear authors and participants, to Milan, my city, one of the most famous cities for arts, education, fashion and business. Our world is facing with a technological revolution and a wise response is expected. A revolution characterized by a fusion of technologies, disrupting almost every industry in every country. The gathering of all stakeholders, from the public and private sectors to academia and civil society is the only answer in front of such challenge. We worked hard to create a real "arena" where academies, research centers and enterprises will enhance their cooperation in order to guide future developments in our sector: "Leading innovation for energy transition".

A very ambitious program will include scientific, industrial and student track sessions and events, inspired by the aim of a cross-fertilization. A full day of tutorials will open the Conference. Then four intensive days will follow where several scientific sessions, both technical and poster, will show the most promising scientific results and special sessions and European project sessions will present actual and future solutions. Three prestigious plenaria sessions will introduce us into the most exciting challenges and opportunities coming from this technological revolution, disclosing how the breadth and depth of these changes herald the transformation of entire systems of production, management and governance and guiding us to new paths of research and scientific dissemination. Besides the program, other events such as laboratory tours, workshops and networking sessions will enrich the offer. I join the General Chair in thanking all the people who contributed to make this event possible.

I sincerely wish you to experience Powertech 2019 in Milan, breathing its air still full of the energy left by Leonardo da Vinci 500 years ago.

Prof. Federica Foiadelli

**SONIA LEVA | Publications Chair**


Dear Authors and Attendees at the 13th IEEE PowerTech 2019, I am honored to announce you that this year more than 900 papers from 65 countries around the globe have been submitted.

The reviewer process took a huge amount of work. It involved all the International Steering Committee, International Advisory Committee, and Basil Papadias Award Committee members, including also about 480 reviewers spread all over the world. I sincerely thank all Committees' members and the reviewers for their essential support of the 13th IEEE PowerTech 2019 Conference. None of this would have been possible without their passion, effort and voluntary assistance.

In the end of such process, experts from Universities, Research Centers and Industry selected more than 630 top-rated peer reviewed papers for their final presentation and debate participation during the conference. About 180 accepted papers are authored by PhD students and undergraduates.

The papers address key issues related to the hot-topics currently leading the innovation for energy transition, in different research fields like: system operation and control, data science and ICT in power technologies, innovative grids with energy hybrid systems integration, and power industry leading innovation trends.

Accepted and presented papers at the 13th IEEE PowerTech 2019 will be submitted to IEEEExplore, and will be also indexed by INSPEC®, EI's engineering information index, Scopus and Web of Science. It has been a great privilege for me to serve as Publications Chair of this conference. I am mighty grateful to you for your support to the 13th IEEE PowerTech 2019 and your attendance, and I wish you a pleasant and rewarding experience in Milan.

Prof. Sonia Leva



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## BASIL PAPADIAS AWARD COMMITTEE

The Basil Papadias Award Committee is formed by the following members, who are also members of the International Advisory Committee:

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**Antony Papavasiliou**, *Belgium*

**Robin Preece**, *United Kingdom*

**Thierry Van Cutsem**, *Belgium*



## VENUE

## ABOUT MILANO

With a population of about 1.3 million, Milan, the capital of Lombardy, is located in the Po Valley, not far from the Alps with the great lakes (Lake Como, Lake Maggiore, Lake Lugano) to the North.

Milan is considered the Italian economic and finance center, with the headquarters of the Stock Exchange and of many of the most important industrial and financial businesses of the Country.

The city hosted the Universal Exposition in 2015 under the theme “Feeding the planet, energy for life”.

It is also the Italian symbol of fashion and design: it hosts many of the main Italian fashion maisons and international design fairs, such as “Settimana della Moda” (Milan Fashion Week) and the “Salone Internazionale del Mobile” (Milan Furniture Fair); also, a Design School operates at Politecnico di Milano.

Milan hosts the “Teatro alla Scala,” considered the temple of lyrics all over the world, and several prose theatres such as the “Piccolo Teatro” founded by Giorgio Strehler.

In Milan are located the headquarters of the main daily newspapers (Il Corriere della Sera, Il Sole 24 Ore) and many of the main Italian publishers (Mondadori, Feltrinelli, Garzanti, Rizzoli).

The city offers to visitors the possibility to admire a wide range of monuments, museums and buildings reflecting the vestiges of history and culture left by many people who lived here.

The ancient Roman remains are preserved at the Colonne di San Lorenzo, whereas the Romanesque can be admired at Sant’Ambrogio, Sant’Eustorgio or San Simpliciano Basilicas.

The Duomo is one of the largest cathedrals in the world and the most important example of Gothic architecture in Italy. The Castello Sforzesco, built on the wishes of the Duke Francesco Sforza, nowadays hosts the Michelangelo’s “Pietà Rondanini” and several museums.

The church of Santa Maria delle Grazie hosts the famous masterpiece “The Last Supper” by Leonardo da Vinci – declared part of the World Heritage by UNESCO.

The city has always participated actively to the National History since its origins, contributing to the purposes and the aims that led to reunification of Italy in the 19th century.

Some distinguished people, who gave a significant contribution to Italian culture, lived in Milan, such as Leonardo da Vinci (who lived in Milan from 1482 to 1500), the poet and novelist Alessandro Manzoni, the musician Arturo Toscanini, the writer Carlo Emilio Gadda, the film director Luchino Visconti. Two Nobel prizes operated in Milan: Giulio Natta (1963, in chemistry) and Dario Fo (1997, in literature).





## ABOUT POLITECNICO DI MILANO



**POLITECNICO**  
MILANO 1863

Politecnico di Milano is a scientific-technological university which trains engineers, architects and industrial designers.

The University has always focused on the quality and innovation of its teaching and research, developing a fruitful relationship with business and productive world by means of experimental research and technological transfer.

Research has always been linked to didactics and it is a priority commitment which has allowed Politecnico Milano to achieve high quality results at an international level as to join the university to the business world.

Research constitutes a parallel path to that formed by cooperation and alliances with the industrial system.

Knowing the world in which you are going to work is a vital requirement for training students.

By referring back to the needs of the industrial world and public administration, research is facilitated in following new paths and dealing with the need for constant and rapid innovation.

The alliance with the industrial world, in many cases favored by Fondazione Politecnico and by consortiums to which Politecnico belong, allows the university to follow the vocation of the territories in which it operates and to be a stimulus for their development.

The challenge which is being met today projects this tradition which is strongly rooted in the territory beyond the borders of the country, in a relationship which is developing first of all at the European level with the objective of contributing to the creation of a single professional training market.

Politecnico takes part in several research, sites and training projects collaborating with the most qualified European universities.

Politecnico's contribution is increasingly being extended to other countries: from North America to Southeast Asia to Eastern Europe.

Today the drive to internationalization sees Politecnico Milano taking part into the European and world network of leading technical universities and it offers several courses beside many which are entirely taught in English.

[www.polimi.it](http://www.polimi.it)





The 13th IEEE PES PowerTech Conference will be held at the Bovisa Campus of Politecnico di Milano, Italy on 23-27 June 2019.

Welcome Reception will be in the historical Leonardo Campus in Piazza Leonardo da Vinci, Milano.

Gala Dinner will be in Villa Castelbarco, Vaprio D'Adda (Milano).

#### CONFERENCE LOCATION

##### **Politecnico di Milano, Campus Bovisa**

Via Lambruschini, 4  
20156 Milano (MI)

The Campus is located in the north side of Milano and can be easily reached by urban trains from the city center.

A new building equipped with a modern Conference Hall for more than 400 attendees has been recently delivered. In the same building and in the neighboring ones, several smaller conference rooms (200 attendees each) as well as spaces for posters presentation and exhibition are also available.

#### CONFERENCE REGISTRATION

Registration to the Conference will be available:

Sunday	8:30 - 15:00 Campus Bovisa (Conference Location) 18:00 - 20:00 Campus Leonardo (Welcome Location)
Monday Tuesday Wednesday	Full day
Thursday	8:00 - 12:00

#### WELCOME RECEPTION

**Sunday 23rd | 18:00 - 20:00**

##### **Politecnico di Milano, Campus Leonardo**

Piazza Leonardo da Vinci, 32  
20153 Milano (MI)

#### TRAVEL INFORMATION | 18.00

##### **GETTING TO MILANO**

As you're likely to land in Malpensa, in Linate or in Orio al Serio airport, you can plan how to reach Milano following these suggestions.

If you land at **Linate Airport**:

Air Bus to Centrale Railway Station: [www.atm-mi.it](http://www.atm-mi.it)

Bus no. 73 to Piazza San Babila: [www.atm-mi.it](http://www.atm-mi.it)

If you land at **Malpensa Airport**:

Malpensa Express Train to Cadorna Railway Station: [www.malpensaexpress.it](http://www.malpensaexpress.it)

Malpensa Shuttle to Centrale Railway Station: [www.malpensashuttle.it](http://www.malpensashuttle.it)

If you land at **Orio al Serio Airport**:

Terravision Bus to Centrale Railway Station: [www.terravision.eu/milan\\_bergamo.html](http://www.terravision.eu/milan_bergamo.html)

Orio shuttle to Centrale Railway Station: [www.orioshuttle.com](http://www.orioshuttle.com)

## GETTING TO THE BOVISA CAMPUS

From the city centre, get to one of the following subway stops: **Porta Venezia** (red line), **Repubblica** (yellow line) or **Garibaldi** (green line), take one of the railways named "Passante ferroviario" and get off at either Bovisa Politecnico or Villapizzzone stations.

Also, you can reach **Cadorna** subway stop (green and red line), go to its railway station, take any train that leaves from there (except Malpensa Express) and get off at **Bovisa Politecnico** stop.

Once you get out of Bovisa railway station, turn right to reach the Engineering Campus (Via Lambruschini 4).

## TIMINGS

From the city center (subway stops):

**Cadorna** (green&red line) | 6 min

**Garibaldi** (green line) | 11min

**Repubblica** (yellow line) | 14 min

**Porta Venezia** (red line) | 16 min

**Centrale** (green&yellow) | 16 min

From **Malpensa airport**: Direct connection with the airport every 30 min - 32 min

## FARES (ATM | Azienda Trasporti Milanese)

**Urban Ticket** – Price: € 1.50

Valid for 90 minutes after stamping, gives you unrestricted travels for all the Milan Municipality area. The ticket is valid for a single journey on the underground or rail network, including the urban rail lines of Trenord and the 'Passante Ferroviario' (Urban Railway Network).

**One Day Ticket** – Price: € 4.50

Valid for 24 hours after stamping, gives you unrestricted travels for all the Milan Municipality area. The ticket is valid even on the rail network, including the urban rail lines of Trenord and the 'Passante Ferroviario' (Urban Railway Network).

**Two Day Ticket** – Price: € 8.25

Valid for 48 hours after stamping, gives you unrestricted travels for all the Milan Municipality area. The ticket is valid even on the rail network, including the urban rail lines of Trenord and the 'Passante Ferroviario' (Urban Railway Network).

## TAXI

Taxi offer an easy way to get around the city. They can be found mainly at taxi stations, or can be called in advance.

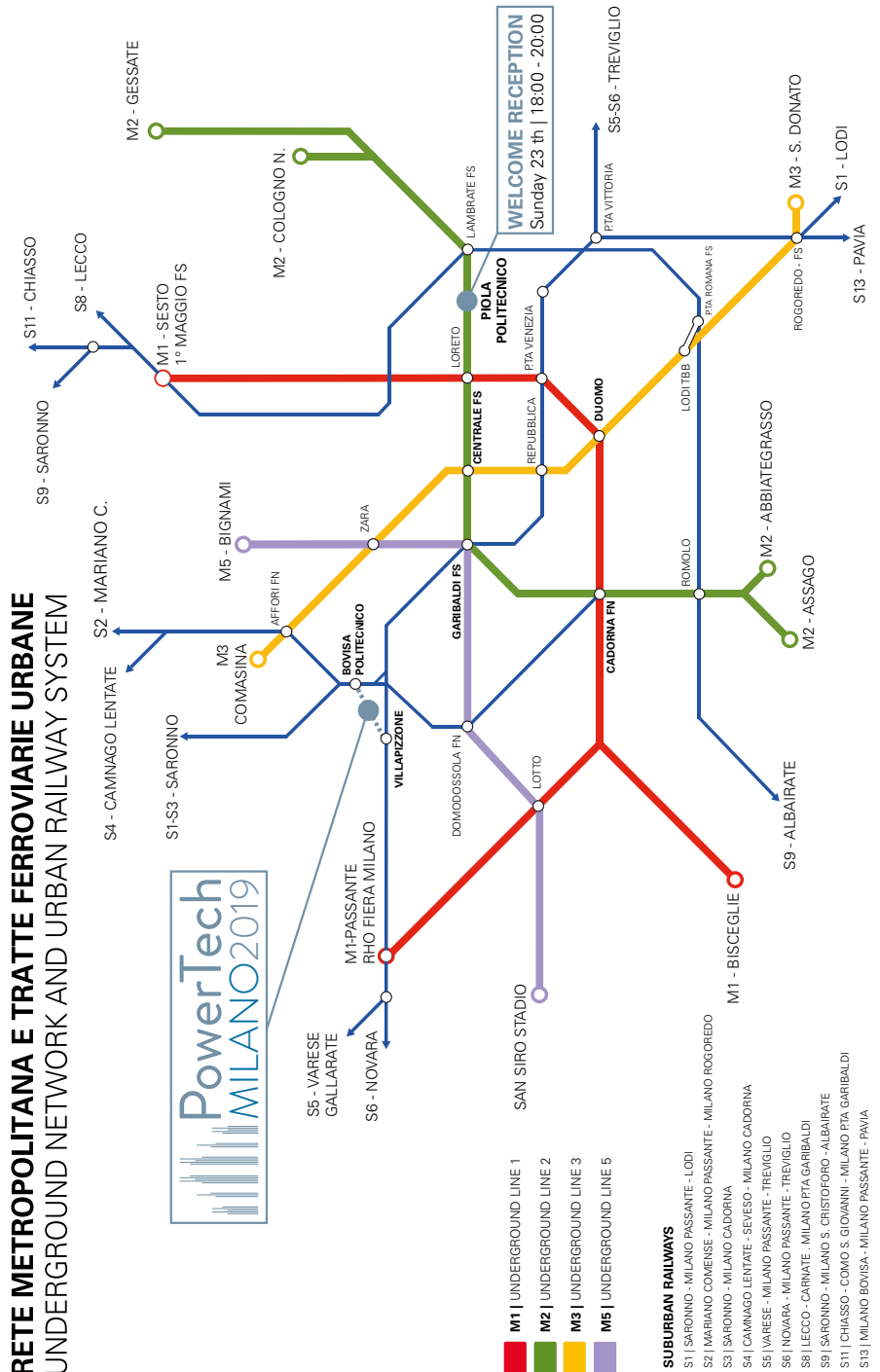
**Taxi 4040** Ph. +39 02 4040

**Taxi 8585** Ph. +39 02 8585

**Taxi 6969** Ph. +39 02 6969

**Taxi 7777** Ph. +39 02 7777

## RETE METROPOLITANA E TRATTE FERROVIARIE URBANE UNDERGROUND NETWORK AND URBAN RAILWAY SYSTEM





# MILAN

## MAP

### Conference venue

Politecnico di Milano,  
Campus Bovisa | via Lambruschini 4

### Welcome Reception

Politecnico di Milano,  
Campus Leonardo | piazza Leonardo  
da Vinci 32

### Cadorna railway station

Connection with subway lines 1 and  
2, train to Malpensa Airport T1 and T2

### Milano Centrale railway station

Connection with subway lines 2 and  
3, train to Malpensa Airport T1 and  
T2 and buses to Linate and Orio al  
Serio Airports

### Porta Garibaldi railway station

Connection with subway lines 2 and  
5, with Passante Ferroviario (Urban  
Railway Lines) and train to Malpensa  
Airport T1 and T2

### Villapizzone railway station

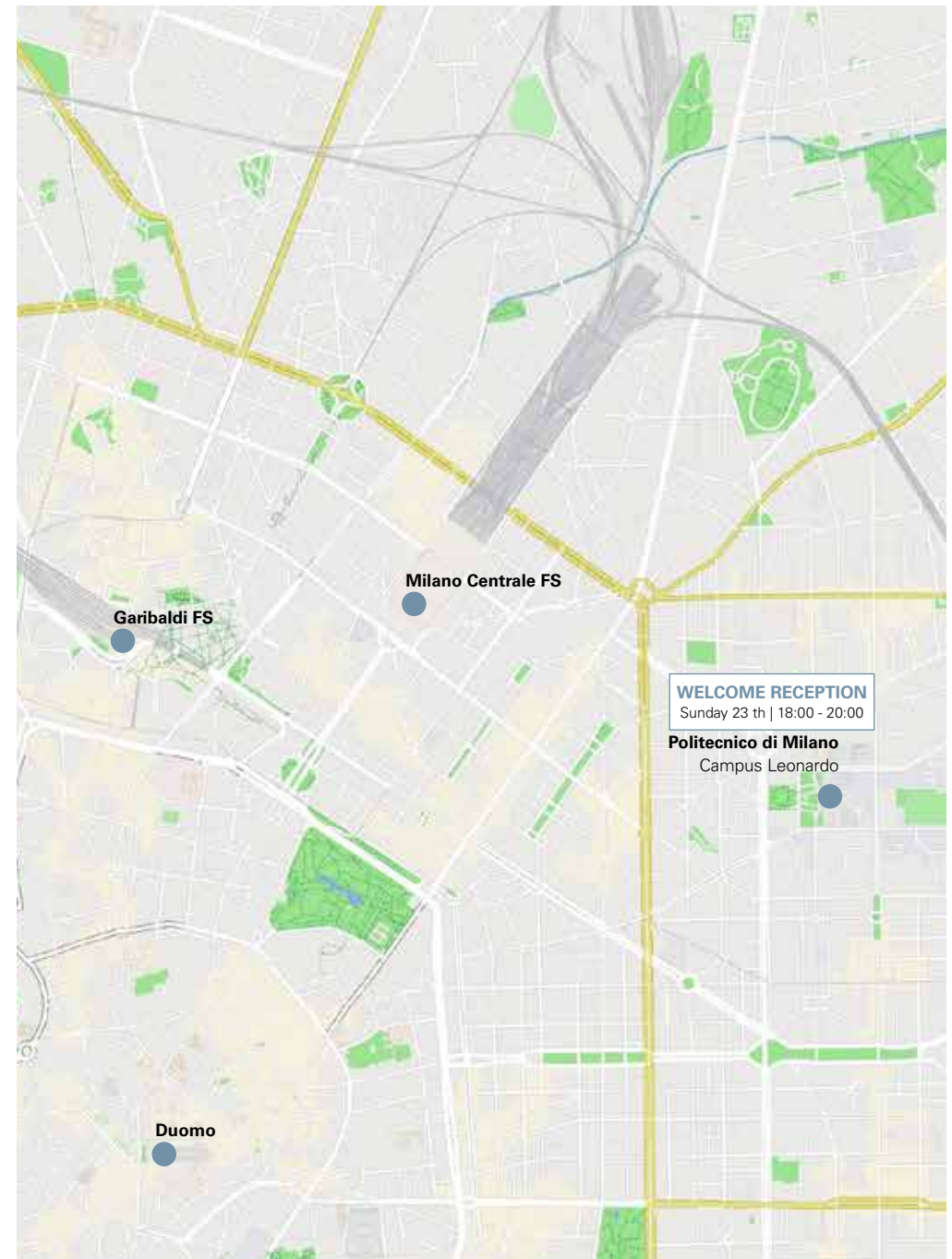
Connection with Passante Ferroviario  
(Urban Railway Lines)

### Bovisa railway station

Connection with Passante Ferroviario  
(Urban Railway Lines)

### Duomo di Milano

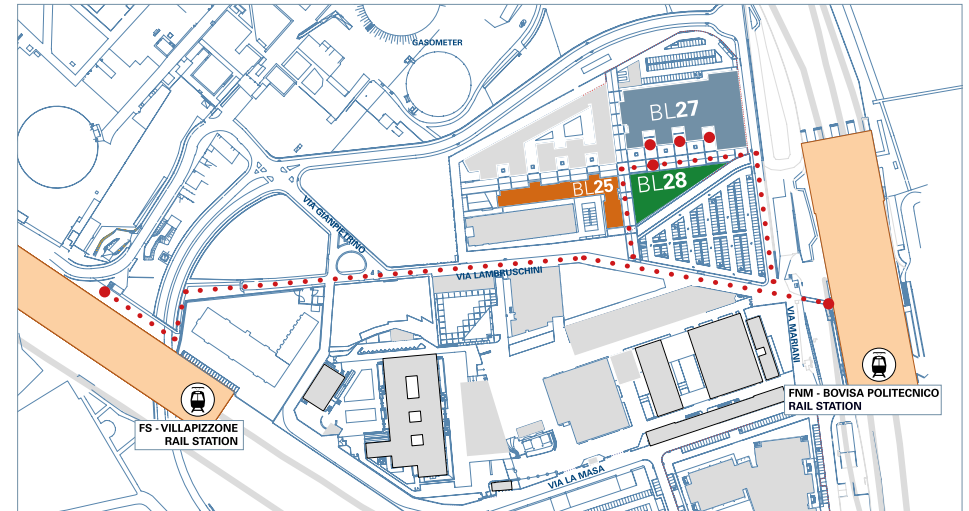
(Cathedral of Milan, downtown)  
Connection with subway lines 1 and 3





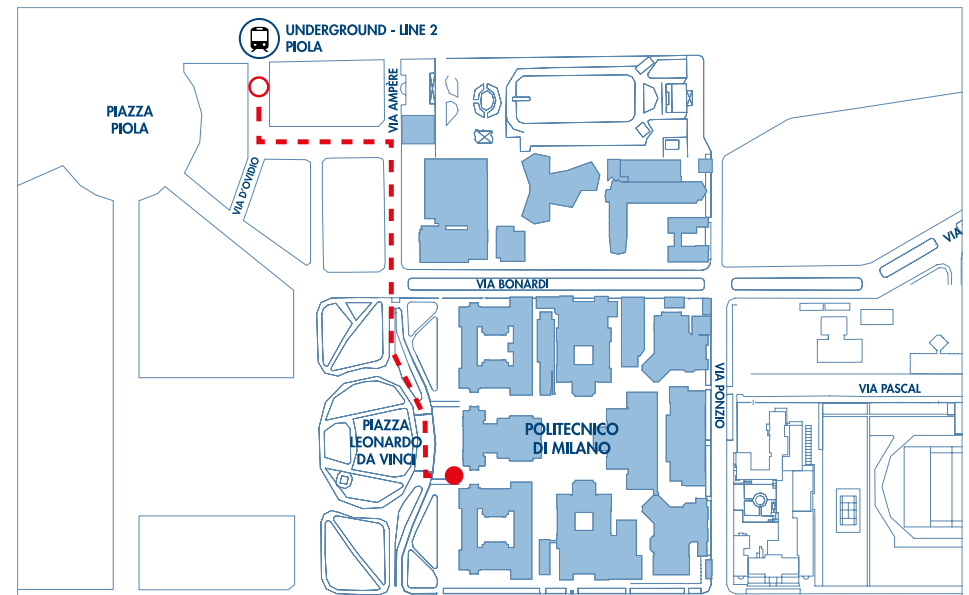
### CONFERENCE LOCATION

**Politecnico di Milano, Campus Bovisa** | Via Lambruschini, 4 | Milano



### WELCOME RECEPTION

**Politecnico di Milano, Campus Leonardo** | Piazza Leonardo da Vinci, 32 | Milano





## SOCIAL PROGRAM & COMPANIONS ACTIVITIES

### WELCOME RECEPTION IN CAMPUS LEONARDO

**Sunday 23rd June** at Leonardo Campus, Milano

Welcome Reception will be in the Leonardo Campus located in Piazza Leonardo da Vinci. Inaugurated in 1927, it is the oldest of Politecnico di Milano's campuses.

Over the course of the decades the campus has been expanded to encompass new campuses and given rise to a real and genuine university quarter commonly dubbed "Città Studi" (City of Studies).

The Milano Leonardo campus hosts the University's main management and administrative structures:

- The Rector's Office and the governing bodies (Senate and Board of Governors),
- The offices of the Central Administration,
- The Dean's Offices of the Schools of Engineering and Architecture,
- Most of the research Departments.

### GALA DINNER AT VILLA CASTELBARCO

**Wednesday 26th June** at Villa Castelbarco, Vaprio d'Adda

Gala Dinner will be organized in Vaprio d'Adda, in the hearth of Lombardy, province of Milan, on the bank of Adda river and Naviglio canal.

**Bus shuttle from Bovisa Campus to Gala dinner site will be available at the end of the afternoon sessions. Return shuttle to different areas in Milano (Cadorna, Centrale and Garibaldi railway stations). More details will be given on site.**

Villa Castelbarco is dipped into an amazing natural frame made of eighty thousand square meters of park where it is still possible to catch sight of free deer.

Villa Castelbarco is a private House able to combine the requirements of functionality of the present and an elegant architectural frame of the past. It is possible to date the beginning of the settlement around the 1100 AD.

In the same period, according to some scholars, a monastery was built by the Cistercians friars in that area, following the wrecking of what was considered the "centre" of the Cistercians, which dates back to the VII century AD and maybe stood where today the church of "San Colombano", in Vaprio d'Adda lies.

The original structure seems to be very simple, therefore attributable to monks, maybe to the austere tradition of the order of San Colombano (540-615), who followed the message of the Irish Saint.

In the architecture of the Villa it is still possible to identify the different parts built around the court near the church, typical of a monastery. This court is characterized by a double portico that could be the double cloister of the monastery.

Up to now it is still possible to feel the sense of unity around the place of worship: the chapter house, the dorms, the refectory are all constructed around the church.

The function of the House as a monastery continued perhaps also after the creation of the noble residency, as witnesses a pastoral visitation of Padre Leonetto Clavonio in 1570 and a historic map of XVIIth century AD that illustrated the presence of a Monastery in Concesa.

Read more about Villa Castelbarco <https://www.villacastelbarco.com/en/>

### COMPANION ACTIVITIES

Please note that you must be a registered companion to enjoy social events like the Welcome Reception and Gala Dinner.

#### City tours

A tour operator has been selected to offer symposium attendees and companions the opportunity to explore the many facets of Milano. Particular tours are scheduled on **25th and 26th June**, with required registration via the tour operator website.

[https://www.neiade.com/it/neiade\\_per\\_powertech\\_2019/](https://www.neiade.com/it/neiade_per_powertech_2019/)

Please take some time to review details carefully to make the best of your time in Milano

#### TOURS:

##### MUST-SEE ATTRACTIONS OF MILAN

This is an immediate and smart guided tour in Milan, discovering the most important and iconic places, the ones represented on every manifest of the city. A guided visit dedicated to tourists but also to people that live every day the city without knowing entirely its artistic and architectural value

##### THE FASHION DISTRICT OF MILAN

An original and exclusive tour in Brera, with art treasures of the most famous part of Milan, in the company of a tour guide to discover the most elegant boutiques in the area.

An original tour with art, design and fashion!



## EVENTS FOR ATTENDEE

## ENERGY START&amp;MEET UP

**Monday 24th June | 16:10 - 17:50 | Room BL.27.0.4**

*Deep Tech and R&D value: challenges to impact on strategic energy systems*

Power and Energy Systems will play a crucial role in the 21st century as major drivers of economic growth and sustainable development.

This SS will bring together different start-up experiences in the energy sector and will discuss about challenges, opportunities and barriers to entry from a business perspective.

In such epochal energy transition, governments will promote the electrification of end-uses with a direct impact in all sectors, namely buildings, RES, transportation, IT and related services for industry.

The start-ups will bring their point of view from different application perspectives, interacting with the audience and the help of moderators to stimulate confrontation on their future vision on business development.

This SS will logically follow the morning Plenary 1 panel.

## WIP NETWORKING COFFEE SECTION

**Tuesday 25th June | 8:00 | Room BL.28.0.1**



The Women in Power initiative has pulled together a Leadership Advisory Committee comprised of men and women from diverse backgrounds and cultures. Their stories and their positions in the industry help to demonstrate, first hand, the success that anyone can achieve with a lot of hard work. This leadership team is supported by mentors and role models who share their stories and share of themselves to help realize the potential of women in the power industry.

PES Women in Power's mission is to advance the world through the creativity and innovation of diverse leadership, and to foster the careers, connections, and talent of women in the Power Industry to achieve their full potential to become the leaders of the future.

PES Women in Power serves ambitious, professional women in the power and energy industry who are looking for leadership positions and career advancement.

The skills, networking and mentorship that are offered benefit women throughout the industry, whether they are engineers, attorneys, policy makers or accountants.

But this is not just for women. Anyone could benefit from the professional development offered and everyone is welcome to join.



## LABORATORIES GUIDED TOURS

Dear Students and Guests of the 13th IEEE PowerTech 2019,

you are more than welcome to visit our laboratories. Numerous activities are carried out in these laboratories at Bovisa Campus – Politecnico di Milano, from basic activities to complex ones, including targeted activities agreed with clients with specific needs.

The wide range of Laboratories, together with the expertise and skills of those carrying out the activities, ensures the Department of Energy is a major ally for research concerning the energy world.

The following are available for a guided tour:

**Laboratory of Electric Converters, Machines and Drives** | Head: Roberto Perini

**LFM Laboratory of Fluid Machines** | Head: Vincenzo Dossena

**LMGs Laboratory of MicroGrids** | Head: Sonia Leva, Giampaolo Manzolini

**MRT Fuel Cell Lab** | Head: Andrea Casalegno

**PhOS (Photovoltaic, Power Quality and Lighting System) Laboratory** | Head: Roberto Faranda

**STL SolarTechLab** | Head: Sonia Leva, Giampaolo Manzolini

Registration for the guided tour can be made at the registration desk during the conference.

### LABORATORY OF ELECTRIC CONVERTERS, MACHINES AND DRIVES



The Laboratory ECMD is focused on the research Group “Converters, electrical machines and drives” activities and studies design and modeling aspects of standard and novel electrical machines; besides, it is involved in analysis of power electronics converters, electrical drives and related control systems.

One kind of electrical machine the group has been analyzing in depth for several applications is the permanent magnet machine,

equipped with conventional or innovative windings (with tooth coils): wind power systems; special motors (with dual concentric rotors); high speed micromotors.

A second activity concerns the stability of isolated micro-grids, fed by power electronics converters non-interacting among them, and the problem of synthetic inertia.

Another research topic is the electromagnetic and dielectric analysis of reactors, transformers and magnetic devices in general.

A last but not least sector regards the sensorless control (without speed and position sensors) of doubly fed induction machines.

### LFM | LABORATORIO DI FLUIDODINAMICA DELLE MACCHINE

#### LABORATORY OF FLUID MACHINES



The research group working at the Lab. of Fluid Machines (LFM) is active in the field of experimental and numerical Fluid Dynamics, with particular emphasis on turbomachinery for compressible and incompressible fluids. The lab is equipped with a number of large-scale and advanced facilities for experimental research: two wind

tunnels for transonic and supersonic linear cascades, a high-speed closed-loop test rig for turbine and compressor stages (800 kW), a closed-loop rig for large scale (1m) turbine stages operated up to transonic conditions, a test-rig for studying the supersonic fluid dynamics of organic vapours, and a test rig for hydraulic turbines and pumps (100 kW).

The available measurement techniques range from classical Hot Wires and multi-hole directional pressure probes, to the own developed single and multi-hole Fast Response Aerodynamic Pressure Probes (FRAPP, up to 80 KHz) and optical systems (Schlieren, LDV and PIV). The numerical research group has developed several in-house codes for the performance and flow analysis and for the design and optimization of turbomachinery stages and components. The most common commercial codes, such as Ansys Fluent and CFX are also available at the LFM.

Many research contracts with major international companies operating in the turbomachinery market (GE Oil&Gas-NP, Ansaldo, Turboden, etc.) as well as the achieved competitive research funding (PRIN, FP7, etc) demonstrate the capabilities of the research group operating at LFM. Among the other facilities, two modern test sections for industrial R&D and product certification of safety valves operating in both air and water are also available.

### LABORATORY OF MICROGRIDS



The Laboratory of MicroGrids (LMGs) is an experimental Low Voltage rig operating in the Department of Energy of Politecnico di Milano since 2018 in collaboration with ENGIE EPS.

The LMGs includes programmable and non-programmable generation units (solar PV modules, natural gas fired combined heat and power engine), different types of storages (electrochemical batteries, bi-directional power-to-gas system and thermal storages) and various types of loads representative of the most future on- and off-grid applications for MultiGoods MicroGrids (electricity, heating and cooling, desalination, electric bikes and electric cars).

The LMGs has three power centers which serve as power hubs and local controllers.

They ensure the electrical and logical connection between all MG assets, reproduce the electrical effect of long distribution lines in between the PCs and connect/disconnect to the main electrical grid.

A Programmable Logic Controller oversees real-time MG management and monitoring based on the deployed EMS.

This experimental setup is an effective testbench for developing innovative Energy Management Systems, implementing Artificial Intelligent tools in the MG management and load/RES forecast, testing innovative components and integrating Electric Vehicles with bidirectional power flows (from grid to vehicle and vehicle to grid) in the MG management.

## MRT FUEL CELL LAB



The MRT Fuel Cell Lab contributes to the development of electrochemical technologies for energy conversion and storage.

The research activities are focused on both experimental and theoretical-modeling studies of transport phenomena, with the aim to:

- characterize the limiting physical phenomena
- develop innovative components
- optimize system operation and lifetime

The ongoing projects regard polymer electrolyte fuel cells, redox flow batteries and Lithium-ion batteries for automotive application and stationary energy storage.

The lab experimental facilities are:

- experimental stations for automated characterization of performance, degradation and transport phenomena in single cell
- systems for local characterization by means of segmented cells and reference electrodes
- instrument for in-situ electrochemical characterization (EIS, CV, LSV)
- instrument for the analysis of gas composition

## SOLAR TECH LAB



Established in 2011, Solar Tech Lab is located on the roof of the Department of Energy of Politecnico di Milano.

The main research objective of this laboratory is the development through experimental investigation of electrical and thermal power generation systems based on solar energy.

The following research lines are addressed at the SolarTech Lab:

- Performance assessment of PV module under real operating conditions on energy base for long period. Typical measurements aim at evaluating the impact of innovative PV module design/components (bi-facial PV modules, advanced glass and PV cells) or typical degradation phenomena (i.e. snail trails)
- Robust modeling for predicting and optimizing the system production is critical to increase the interaction of PV systems with smart electricity grids and to optimize energy use, delivery and storage.
- Integrating PVT modules for heat production in the so-called Solar Assisted Heat Pump configuration. Innovative SAHP have been manufactured and tested to assess the energy and economic advantages;
- Application of UAV for monitoring of PV plants to control and monitor performance over time. The purpose of this research line is also to propose in the near future a reliable, fast and cost effective method for PV plant planning and performance analysis, using unmanned systems even in other energy sectors.

Solar Tech Lab provides qualified scientific research, technical consulting and testing services in the field of photovoltaic, photovoltaic-thermal and concentration systems.

## PHOS (PHOTOVOLTAIC, POWER QUALITY AND LIGHTING SYSTEM) LABORATORY



Established in 2005, PhOS laboratory is located in the Department of Energy in Politecnico di Milano - Bovisa Campus, its activities are in Electric Power Systems field. Worldwide, in this area, the research is focused on the sustainability of generation and consumption.

Research group mainly works with Italian firms and the activities are mainly aimed at providing innovative solutions in real contexts to practical industrial problems. Therefore, generation from RES, Dispersed Generation, Smart Grids with storage (at different voltage levels both ac and dc), load management and power quality in LV network, are the main research topics considered.

Ongoing research activities are focused on: the development of power electronic devices to enable DSO to increase power quality of the network and the minimization of END USER electric bill; load behavior under voltage variation (providing experimental investigation and analysis on different load types behavior including traditional lighting loads, more recent lighting type specially LED systems and some thermal loads) and RES system design and optimization, inverter control and MPPT control algorithms, management of storage system and optimal inverter sizing for PV system.

The main highlights of PhOS Laboratory mission includes but are not limited to:

- Power Quality (PQ) and Custom Power (CP)
- Power Electronics, application in LV distribution network
- Smart Grid and Microgrid Systems
- Load Management
- PV systems
- Storage systems
- Lighting Systems
- Electro Magnetic Application



## TUTORIALS

PowerTech 2019 tutorials are taking place on **Sunday 23rd June**

**T1** (full day)

*The Smart Transformer: Impact on the Electric Grid and Technology Challenges*

**T2** (full day)

*Probabilistic methods for power system management: state of the art, challenges and perspectives*

**T3** (full day)

*Computational Intelligence in Power System Applications*

**T4** (full day)

*Power System Optimization Modeling in GAMS*

**T5** (half day)

*Infrastructure planning under uncertainty: flexibility, resilience and multi-energy systems application*

**T6** (half day)

*Increasing the PV Hosting Capacity of Distribution Networks: The role of Smart Inverters and Storage*

Time	Room BL.28.1.2	Room BL.28.2.2	Room BL.25.0.09	Room BL.28.1.1	Room BL.28.2.1
08:30 - 09:00	Registration				
09:30 - 10:00	T1 - part 1	T2 - part 1	T3 - part 1	T4 - part 1	T5 - part 1
10:30 - 10:45	Coffee Break				
10:45 - 12:15	T1 - part 2	T2 - part 2	T3 - part 2	T4 - part 2	T5 - part 2
12:15 - 12:30	Q&A	Q&A	Q&A	Q&A	Q&A
12:30 - 13:30	Light Lunch (included in the tutorial registration fee)				
13:30 - 15:00	T1 - part 3	T2 - part 3	T3 - part 3	T4 - part 3	T6 - part 1
15:00 - 15:15	Coffee Break				
15:15 - 16:45	T1 - part 4	T2 - part 4	T3 - part 4	T4 - part 4	T6 - part 2
16:45 - 17:00	Q&A	Q&A	Q&A	Q&A	Q&A

**TUTORIAL T1** (Full day)

THE SMART TRANSFORMER:  
IMPACT ON THE ELECTRIC GRID AND TECHNOLOGY CHALLENGES

Organizers:

**Marco Liserre**, Chair of Power Electronics, Kiel University, [ml@tf.uni-kiel.de](mailto:ml@tf.uni-kiel.de)

**Giovanni De Carne**, Chair of Power Electronics, Kiel University, [gdc@tf.uni-kiel.de](mailto:gdc@tf.uni-kiel.de)

**Rongwu Zhu**, Chair of Power Electronics, Kiel University, [rzh@tf.uni-kiel.de](mailto:rzh@tf.uni-kiel.de)

**Ali Kazerooni**, WSP, [Ali.Kazerooni@wsp.com](mailto:Ali.Kazerooni@wsp.com)

**Michael Eves**, SP Energy Networks, [meves@spenergynetworks.co.uk](mailto:meves@spenergynetworks.co.uk)

Abstract:

The increasing connection of renewables and new loads is challenging the distribution grids. For overcoming actual and foreseen challenges, a new concept, with the capability to form intelligent grid nodes, is proposed: the “Smart Transformer”.

The Smart Transformer is a power electronics-based transformer, aiming not only to adapt the voltage level from MV to LV grids but also providing ancillary services to the grid. In order to exploit its capability, the ST requires combining power system aspects and power electronics constraints, resulting in new requirements and challenges.

This tutorial introduces the Smart Transformer concept and takes into account power system considerations as well as power electronics knowledge. ST architectures and topologies, basic controller designs and innovative concepts for increasing the availability are introduced. Hardware, control and grid connection requirements are described considering the matured industrial experience. The Project will summarize the results of EU ERC Consolidator Grant Project “HEART” of Kiel University and OFGEM-funded project “LV-ENGINE” of SP Energy Networks, leading to testing the Smart Transformer technology in the field.

Structure:

08:30-09:00	Registration
09:00-10:30	<b>From the Solid-State-Transformer (SST) to the Smart Transformer</b>   Marco Liserre
10:30-10:45	<i>Coffee break</i>
10:45-12:15	<b>The Smart Transformer in the distribution grid: LV-ENGINE project</b>   Ali Kazerooni, Michael Eves
12:15-12:30	Questions and Answers
12:30-13:30	<i>Light lunch</i>
13:30-15:00	<b>The Smart Transformer: a grid-tailored Solid-State-Transformer</b>   Marco Liserre, Giovanni De Carne
15:00-15:15	<i>Coffee break</i>
15:15-16:45	<b>ST virtuous loop: identify the LV-grid, control it, offer services to the MV-grid</b>   Giovanni De Carne
16:45-17:00	Questions and Answers

**TUTORIAL T2** (Full day)

PROBABILISTIC METHODS FOR POWER SYSTEM MANAGEMENT:  
STATE OF THE ART, CHALLENGES AND PERSPECTIVES

Organizers:

**Andrea Pitto**, Ricerca sul Sistema Energetico – RSE S.p.A., [andrea.pitto@rse-web.it](mailto:andrea.pitto@rse-web.it)

**Emanuele Ciapessoni**, Ricerca sul Sistema Energetico – RSE S.p.A., [emanuele.ciapessoni@rse-web.it](mailto:emanuele.ciapessoni@rse-web.it)

**Pierre Henneaux**, Université libre de Bruxelles, [Pierre.Henneaux@ulb.ac.be](mailto:Pierre.Henneaux@ulb.ac.be)

**Aydogan Ozdemir**, Istanbul Technical University, [ozdemiraydo@itu.edu.tr](mailto:ozdemiraydo@itu.edu.tr)

**Ricardo Jorge Bessa**, INESC TEC, [ricardo.j.bessa@inesctec.pt](mailto:ricardo.j.bessa@inesctec.pt)

**Louis Wehenkel**

**Efthymios Karangelos**

Abstract:

The increasing uncertainties in power systems due to the growing penetration of renewables and to market mechanisms as well as the increasing frequency of extreme weather events due to climate changes are major drivers for the application of probabilistic methods in a broad spectrum of activities aiming to assure the continuous operation of power systems: from long-term system development, through mid-term asset management towards short-term operational planning and real-time operation.

The tutorial presents an overview of state-of-art probabilistic methods for the planning and the operation of both transmission and distribution systems, taking into account the uncertainties due to growing penetration of renewables (which need accurate probabilistic modeling for decision-aid problems under risk) as well as the occurrence of extreme contingencies triggered by natural threats. The drawbacks and the limits of conventional methods are discussed and the results of case studies on real world systems are described. After demonstrating the need for probabilistic methods, the tutorial highlights the current barriers for uncertainty modeling in current decision-aid problems under risk and for a practical implementation of these probabilistic risk based approaches in control center environment.

Structure:

08:30-09:00	Registration
09:00-10:30	<b>Introduction</b>   Emanuele Ciapessoni <b>Probabilistic reliability analysis for transmission planning</b>   Pierre Henneaux <b>Reliability evaluation of active distribution systems</b>   Aydogan Ozdemir
10:30-10:45	<i>Coffee break</i>
10:45-12:15	<b>Probabilistic methods for risk-based power system operation</b>   Andrea Pitto
12:15-12:30	Questions and Answers   Emanuele Ciapessoni
12:30-13:30	<i>Light lunch</i>
13:30-15:00	<b>Probabilistic forecasting of renewable energy in decision aid problems under risk</b>   Ricardo Jorge Bessa
15:00-15:15	<i>Coffee break</i>
15:15-16:45	<b>Challenges for the practical implementation of probabilistic risk-aware reliability management</b>   Louis Wehenkel, Efthymios Karangelos
16:45-17:00	Questions and Answers   Emanuele Ciapessoni



**TUTORIAL T3** (Full day)

## COMPUTATIONAL INTELLIGENCE IN POWER SYSTEM APPLICATIONS

Organizers:

**Kalyanmoy Deb**, *Michigan State University*, [kdeb@egr.msu.edu](mailto:kdeb@egr.msu.edu)**Marco Mussetta**, *Politecnico di Milano*, [marco.mussetta@polimi.it](mailto:marco.mussetta@polimi.it)**Emanuele Ogliari**, *Politecnico di Milano*, [emanuelegiovanni.ogliari@polimi.it](mailto:emanuelegiovanni.ogliari@polimi.it)

Abstract:

- Module A: Machine Learning for power forecasting

The variability of renewable energy represents a huge challenge in the integrated electricity systems: power production forecasts can help reducing the amount of operating reserves needed for the system, finally reducing the balancing costs. While physical prediction methods strongly rely on the accuracy of the weather forecast, Artificial Neural Networks are based on the learning process of the underlying models and are commonly referred to as a “data-driven” or “black box” approaches.

In fact, they need historical data that, after being collected, are used to infer a general trend and behavior in order to predict future output of the power plant. Hybrid methods, consisting in any combination of the physical-based approach and Machine Learning can guarantee the highest level of accuracy when adopted to the power forecast of RES.

- Module B: Evolutionary Multi-Criterion Optimization with Case Studies on Power Dispatch Problem Solving

Evolutionary optimization methods, proposed in early sixties and used in practice since eighties, are population-based algorithms which are easily customizable to suit different problem-solving tasks. Evolutionary multi-criterion optimization (EMO) algorithms, proposed since early nineties, revolutionized the solution of problems having multiple conflicting objectives.

Starting with two and three-objective problems, EMO researchers have devised algorithms for solving up to 15-objective problems and applied to many engineering and practical problems. In this tutorial, we shall present a step by step account of the growth of EMO field by describing the principles of multi-criterion optimization, some key algorithms, and recent advances in the field. Case studies on power dispatch problem for single and multiple criteria aspects and its static and dynamic versions will be presented.

Structure:

08:30-09:00	Registration
09:00-10:30	<b>Module A: Machine Learning techniques for power forecasting</b>   Marco Mussetta
10:30-10:45	<i>Coffee break</i>
10:45-12:15	<b>Module A: Hybrid methods for power forecasting</b>   Emanuele Ogliari
12:15-12:30	Questions and Answers
12:30-13:30	<i>Light lunch</i>
13:30-15:00	<b>Module B: Evolutionary Multi-Criterion Optimization with Case Studies on Power Dispatch Problem Solving – part 1</b>   Kalyanmoy Deb
15:00-15:15	<i>Coffee break</i>
15:15-16:45	<b>Module B: Evolutionary Multi-Criterion Optimization with Case Studies on Power Dispatch Problem Solving – part 2</b>   Kalyanmoy Deb
16:45-17:00	Questions and Answers

**TUTORIAL T4** (Full day)

## POWER SYSTEM OPTIMIZATION MODELING IN GAMS

Organizer:

**eza Soroudi**, *Energy Institute UCD*, [Alireza.soroudi@ucd.ie](mailto:Alireza.soroudi@ucd.ie)

Abstract:

The optimal decision making is a key part of any engineering problem. The General Algebraic Modeling System (GAMS) can be used to solve various power system operation and planning optimization problems. This tutorial is to provide the audience with a comprehensive overview of the GAMS capabilities solving for basic/advanced power system optimization problems.

The theoretical background as well as the application examples and test case studies will be covered. It is suitable for dedicated and general audiences including power system professionals as well as researchers and developers from the energy sector and electrical power engineering community and will be helpful to undergraduate and graduate students.

Structure:

08:30-09:00	Registration
09:00-10:30	<b>Basic GAMS features Economic dispatch problem</b>
10:30-10:45	<i>Coffee break</i>
10:45-12:15	<b>Dynamic Economic Dispatch Energy Storage Dispatch</b>
12:15-12:30	Questions and Answers
12:30-13:30	<i>Light lunch</i>
13:30-15:00	<b>DC/AC - Optimal Power Flow in GAMS</b>
15:00-15:15	<i>Coffee break</i>
15:15-16:45	<b>PMU allocation problem Uncertainty modeling using GAMS</b>
16:45-17:00	Questions and Answers

**TUTORIAL T5** (Half day – morning)**INFRASTRUCTURE PLANNING UNDER UNCERTAINTY:  
FLEXIBILITY, RESILIENCE AND MULTI-ENERGY SYSTEMS APPLICATION**

Organizers:

**Mathaios Panteli**, *The University of Manchester*, [mathaios.panteli@manchester.ac.uk](mailto:mathaios.panteli@manchester.ac.uk)**Eduardo Alejandro Martínez Ceseña**, *The University of Manchester*,  
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Abstract:

Traditional investment planning practices are becoming less effective in the energy sector as uncertainties increase due to the integration of renewable energies and low carbon technologies (e.g., electric vehicles), and the increasing frequency and severity of extreme events due to climate change (e.g., droughts, earthquakes, etc.). To tackle these challenges, new tools that properly capture uncertainty and extreme events are required to develop more resilient and adaptive energy systems by capitalizing on emerging smart solutions based on active network management and different energy vectors (e.g., electricity, heat, gas and water). This tutorial provides an overview of recently developed state-of-the-art investment planning tools which explicitly address uncertainty (e.g., decision and real options theory) related to highly uncertain system evolution and low probability high impact events. Real world studies from international research projects are used to demonstrate the tools with distribution and transmission networks, community multi-energy systems, and integrated water-energy mega systems.

Structure:

08:30-09:00	Registration
09:00-10:30	<b>Infrastructure planning under uncertainty:</b> <ul style="list-style-type: none"> <li>– The different levels of uncertainty</li> <li>– Decision theory, robust and flexible decisions</li> <li>– New stochastic programming approaches</li> </ul> <b>Infrastructure planning considering uncertain extreme events:</b> <ul style="list-style-type: none"> <li>– Differences between reliability and resilience</li> <li>– Metrics: The resilience trapezoid</li> <li>– Tools: Probabilistic impact assessment and optimization via simulation</li> <li>– Novel probabilistic operational and planning methods</li> </ul>
10:30-10:45	Coffee break
10:45-12:15	<b>Future and already emerging energy systems</b> <b>Infrastructure planning for flexible and adaptive energy systems:</b> <ul style="list-style-type: none"> <li>– Smart distribution networks: Flexible active network management to accommodate emerging low carbon technologies</li> <li>– Building and community multi-energy systems: Use of multi-vector demand side flexibility to cope with uncertain demand growth, price variations and integration of low carbon technologies</li> </ul> <b>Infrastructure planning for resilient energy systems:</b> <ul style="list-style-type: none"> <li>– Resilient energy systems: development of optimal portfolios considering asset and non-asset solutions for stronger and smarter, more flexible transmission networks</li> <li>– Water-Energy-Environment Mega systems: Planning future integrated mega systems in developing countries in light of climate change threats</li> </ul>
12:15-12:30	Questions and Answers

**TUTORIAL T6** (Half day – afternoon)**INCREASING THE PV HOSTING CAPACITY OF DISTRIBUTION NETWORKS:  
THE ROLE OF SMART INVERTERS AND STORAGE**

Organizers:

**Luis (Nando) Ochoa**, *The University of Melbourne and The University of Manchester*,  
[luis.ochoa@unimelb.edu.au](mailto:luis.ochoa@unimelb.edu.au)**Andreas Procopiou**, *The University of Melbourne*, [andreas.procopiou@unimelb.edu.au](mailto:andreas.procopiou@unimelb.edu.au)

Abstract:

Distribution Network Operators (DNOs) in many countries are finding it challenging to allow residential customers to continue to install photovoltaic (PV) systems due to the potential technical impacts resulting from high penetrations. To remove these barriers, speed up connection times, and reduce costs, it is crucial for DNOs to increase the PV hosting capacity of their low and medium voltage networks. Adequately exploiting the capabilities of smart inverters and residential battery energy storage systems will be key.

This half-day tutorial will present and discuss different aspects required to assess the residential PV hosting capacity of distribution networks. Furthermore, it will explain and demonstrate the benefits but also the potential challenges from exploiting the capabilities of smart inverters (Volt-Watt, Volt-var, export limits) and residential storage systems to increase hosting capacity.

Real case studies from Australia will be used to demonstrate the quantification of PV hosting capacity considering potential strategies to make the most of smart inverters and storage.

Structure:

13:00-13:30	Registration
13:30-15:00	<b>Part 1. Distribution Networks and Solar PV</b>   Ochoa <ul style="list-style-type: none"> <li>– PV Hosting Capacity, Challenges, and Potential Solutions</li> <li>– Modelling of Distribution Networks</li> </ul> <b>Part 2a. PV Hosting Capacity and PV Inverters</b>   Procopiou <ul style="list-style-type: none"> <li>– Estimating Hosting Capacity with Stochastic Approaches</li> </ul>
15:00-15:15	Coffee break
15:15-16:45	<b>Part 2b. PV Hosting Capacity and PV Inverters</b>   Procopiou <ul style="list-style-type: none"> <li>– Increasing PV Hosting Capacity with Smart Inverter Functions and Active Control</li> <li>– Case Studies with French and Australian Networks</li> </ul> <b>Part 3. PV Hosting Capacity and Residential Battery Storage Systems</b>   Ochoa <ul style="list-style-type: none"> <li>– Limitations of Off-the-shelf Batteries and Solutions with Advanced Control</li> <li>– Case Studies with Australian Networks</li> </ul>
16:45-17:00	Questions and Answers



## EUROPEAN PROJECT SESSIONS

## EP1 | H2020 OSMOSE

**Monday 24th June | 14:20–16:00**

The Osmose project is an Horizon 2020 research and development project co-founded by the European Union (grant773406). The 33 partners of the consortium aims to address, through a holistic approach, the identification and development of the optimal mix of flexibilities to enable the integration of renewable energy sources. The purpose is to consider the power system as a whole, embracing the necessary flexibility sources and identifying the techno-economic potential of technologies, regardless of traditional silos, in order to capture synergies and make the energy transition as affordable as possible. Osmose is contributing to this purpose:

- by forecasting the economically optimal mix of flexibilities for the pan-European power system, taking into account these synergies, for the maximum social welfare;
- by proposing evolutions of market designs and regulatory frameworks to enable this targeted optimal mix;
- and by increasing the techno-economic maturity and scalability of flexibility solutions enabling “silo-breaking synergies” with the development of 4 demonstrators.

During this special session, we will present you an overview of the activities developed during the project with a special focus on some key topics and activities such as, for instance, the Osmose Italian demonstration.

## EP2 | CHALLENGES AND SOLUTIONS IN FUTURE TRANSMISSION NETWORKS

## WITH HIGH PENETRATION OF POWER ELECTRONICS

## RESULTS OF EU H2020 PROJECT MIGRATE

**Monday 24th June | 16:10–17:50**

The increasing integration of power electronic generators into the power system is not only changing the dynamic system behavior but is also changing the ways how power systems of the future need to be planned, analyzed, and operated. This panel will present the latest results from EU H2020 project MIGRATE considering the aspects related to system stability, control, protection and power quality.

## EP3 | H2020 SMARTNET

## HOW TO GET FLEXIBILITY FROM RESOURCES CONNECTED TO DISTRIBUTION GRIDS?

## THE RESULTS OF THE SMARTNET PROJECT

**Wednesday 26th June | 8:30-10:10**

The session presents the results of the Horizon2020 project SmartNet, aimed at investigating the possibility for flexible resources connected to distribution grids to provide system services. Scenario studies at 2030 for Italy, Denmark and Spain, three technological pilots and a hardware-in-the loop test complete each other to provide a comprehensive analysis. Finally, project results are put in relationship to the present regulatory trends in Europe and in the three mentioned Countries and regulatory guidelines are elaborated.



**EP4 | UNITED-GRID – INTEGRATED CYBER-PHYSICAL SOLUTIONS****FOR INTELLIGENT DISTRIBUTION GRIDS WITH HIGH PENETRATION OF RENEWABLES****Thursday 27th June | 08:30–10:10**

UNITED-GRID aims to secure and optimise operation of the future intelligent distribution networks by developing integrated cyber-physical solutions and efficiently exploiting the opportunities provided by the new actors and technologies.

The core deliverable is the UNITED-GRID tool-box that could be “plugged in” to the existing Distribution Management System (DMS) via a cross-platform for advanced energy management based on real-time system awareness and control, short term generation and load forecasting, advanced measurement-based protection schemes and new business models. This cross-platform allows interoperability from inverter-based distributed energy resources up to the distribution grid at the low and medium voltage levels, thus going beyond the state-of-the-art to optimise operation of the grid with real-time control solutions in a high level of automation and cyber-physical security. The solutions developed by the project will be demonstrated at three demo-sites provided by project partners.

**SPECIAL SESSIONS****SS1 | MICROGRID FOR ELECTRIFICATION IN DEVELOPING COUNTRIES****Tuesday 25th June | 8:30–10:10**

Off-grid small scale power systems are expected to represent one of the key solutions for rural electrification. Despite a centralized electrification could be more energy efficient and cost-effective in the long term, it is accepted that bottom-up off-grid power systems represent the most viable solution in the medium-short term. The proposed Special Session aims to open a technical discussion about the design, the monitoring, and the impact evaluation of electrification process.

*Supported by:***SS2 | EVOLUTION OF TECHNOLOGIES FOR THE INTEGRATION OF RENEWABLES****Tuesday 25th June | 14:20–16:00**

More and more distributed generation, based on renewable sources, is being connected to our distribution grids. New technologies are developing to support this trend, including protection systems, switching devices, control algorithms and more. At the same time, technologies need to work inside an operational framework given by standards and grid codes, in order to guarantee reliable and safe operation of the power grids.

The special session will focus on the evolution of technologies recently developed to ensure smooth integration of renewable energy sources, on the evolution of grid codes describing the rules of connection for such sources, and on how these two evolution paths influence each other.

*Supported by:***SS3 | OPTIMIZATION TECHNIQUES FOR RENEWABLE ENERGY SOURCES INTEGRATION WITH ENERGY STORAGE DEVICES****Tuesday 25th June | 16:10–17:50**

The Panel Session focuses on the challenges introduced by the optimal management of energy storage systems (ESSs) coupled with renewable energy sources (RESs) in accordance with the stochastic behaviour of RESs and taking into account the intrinsic characteristics (dynamic behavior, ageing, etc.) of ESSs.

*Supported by:*



#### SS4 | ENABLING TECHNOLOGIES AND METHODOLOGIES FOR WIDE AREA MONITORING PROTECTION AND CONTROL SYSTEMS

**Wednesday 26th June | 8:30-10:10**

Synchronized Measurement Technologies, such as Phasor Measurement Units (PMUs) have resulted in the design and application of various wide area monitoring, protection and control (WAMPAC) schemes. Most provide significant reliability and financial benefits in the planning, operation and maintenance of smarter power networks at both the distribution and transmission level. This Special Section analyzes the design, operation and maintenance of synchronized measurement technology in WAMPAC applications, discussing best practices, proof of concepts and the most promising enabling technologies.

#### SS5 | EDUCATION AND FORMATION OF FUTURE POWER ELECTRICAL ENGINEERS THE EXPERIENCE OF THE SCHOLARSHIP PLUS

**Wednesday 26th June | 14:20-16:00**

Considering the fundamental role of the power and energy sector in the sustainable growth of the economy, the function of the electrical engineer is becoming always more essential and therefore the challenge is in attracting students to the power sector. With a large number of other growing industries and manpower intensive sectors becoming the preferred choice for the best talent, the Power Sector needs to find innovative ways of attracting well qualified manpower and fresh talent.

The PES Scholarship Plus Initiative provides scholarships and real world experience to undergraduates who are interested in power and energy engineering careers. Power and energy engineers work with some of today's most exciting technologies, developing solutions to problems that affect our lives and lifestyles.

#### SS6 | NEW TRENDS IN EDUCATION AND TRAINING FOR THE ENERGY TRANSITION

**Wednesday 26th June | 16:10-17:50**

The transition to a low carbon society and in particular the crucial role of the energy sector in this transition dictate the development of new skills and expertise in different fields (e.g. electric power, ICT, economics, etc.).

The role of education and training is of utmost importance to address the current and emerging skill gaps and lead the way to a new generation of professionals and innovators. To this aim, recent technological advancements can revolutionize education by providing a plethora of new tools and possibilities.

At the same time, learner-centered and application-driven educational approaches are increasingly gaining interest. The presentations will address distributed generation and smart grids education focusing on, but not limited to the ongoing work of the ERIGrid project (H2020). The suggested topics include:

- New skills and educational needs for cyber-physical energy systems.
- New trends in laboratory education: Power Hardware in the Loop and Controller Hardware in the Loop simulation.
- Blended learning and applications of learner-centered educational methodologies.
- E-learning tools: interactive notebooks, virtual and remote laboratories etc.

#### SS7 | MICROGRID STABILITY DEFINITIONS, ANALYSIS, AND MODELING

**Thursday 27th June | 10:30-12:10**

The proposed microgrid stability definitions and classification will be first presented. The various models of the different microgrid components such as diesel generators, converters, RES, and associated controls, feeders, load models, and energy storage, will also be discussed, as well as the analysis techniques and tools used for stability studies. Finally, various examples of stability problems, controls, and modeling will be presented.

#### SS8 | UNDERSTANDING SYSTEM RESILIENCE IN CRITICAL INFRASTRUCTURES

**Thursday 27th June | 14:20-16:00**

Recent widespread outages and blackouts worldwide, often caused by extreme natural events, have brought to the fore the need for making the power system more resilient to extreme events. However, there is still lack of clarity about the concept of resilience itself, and as to what operational and planning tools may be required to enhance the resilience of power systems.

This special session will address a number of relevant issues, including what we actually mean by resilience and its relationship with security and reliability, its importance in future system planning, and practical transmission and distribution network applications to a number of events such as wildfires, windstorms, and earthquakes.

#### SS9 | VALIDATION AND DE-RISKING OF GRID MODERNIZATION TECHNOLOGIES WITH HARDWARE IN THE LOOP TESTING

**Thursday 27th June | 10:30-12:10**

This special session will explore hardware in the loop (HIL) testing as a tool for assessing novel power systems technologies and techniques prior to commercialization or deployment. Connecting protection, automation, and/or control schemes in a closed loop with a simulated network allows engineers to understand and mitigate the uncertainties of the modern power system – interoperability between devices of multiple vendors and communication types, vulnerability of low inertia systems, and AC-DC system interactions, for example. This session will provide an overview of real time simulation technology and examples of research done in this field.



Supported by:

#### SS10 | INTEGRATION OF PMU MEASUREMENTS INTO POWER SYSTEM STATE ESTIMATION

**Thursday 27th June | 16:10-17:50**

This special session addresses diverse aspects of synchronized phasor measurement technology contributions to power system situational awareness and state estimation. The presentations cover topics ranging from new hybrid algorithms for embedding phasor measurements into state estimation, to shared experiences on currently operating PMU-based estimators of distribution networks. Other applications of PMU measurements for power system modeling are also contemplated, such as parameter identification of renewable power plants and network model parameter estimation.

Finally, the session includes a contribution from PMU manufacturers concerning novel PMU applications to the secure operation of power systems.





MONDAY, June 24<sup>th</sup>

08:00	Registration full day					Dessert & Coffee
09:00 - 10:10	Opening Ceremony BL28   Room "Carassa Dadda" and streaming BL.270.1 and BL.270.2					
10:10 - 10:30	Coffee Break					
10:30 - 12:10	Plenary Session 1 - Bridging the gap: most promising technologies to invest in the future BL28   Room "Carassa Dadda" and streaming BL.270.1 and BL.270.2					
12:10 - 13:00	Lunch					
	BL27 First Floor   Poster Area					
13:00 - 14:20	PS 1A   Planning and Operation of Power Systems - Electricity Market and Pricing Mechanism  Session Chair: Marie-Cecilie Alvarez Herault	PS 1B   Power System Dynamics, Stability and Control – Voltage Regulation and Reactive Power Control  Session Chair: Eduardo Asada	PS 1C   Power System Dynamics, Stability and Control - Frequency Regulation and Active Power Flows  Session Chair: Federico Silvestro	PS 1D   Network Modeling, Protection and Security – Load Models and Power Flows  Session Chair: Luis Rouco	PS 1E   State Estimation and Situational Awareness - Power System State Estimation  Session Chair: Sarah Rönnberg	
	PS 1F   Modeling and Optimization of Hybrid and Multi-Energy System  Session Chair: Filippo Spertino	PS 1G   Microgrids, Market and Aggregators  Session Chair: Anna Pinnarelli	PS 1H   Forecasting, Modeling and Management of Load and RES 1  Session Chair: Vincente Debusschere	PS 1I   Forecasting, Modeling and Management of Load and RES 2  Session Chair: Luis Ochoa	PS 1J   Design and Economic Assessment of Electric Vehicle Technologies  Session Chair: Siddharth Suvanarayanan	

MONDAY, June 24<sup>th</sup>

	Room BL.270.1	Room BL.270.2	Room BL.270.3	Room BL.270.6	Room BL.270.7	Room BL.270.4
14:20 - 16:00	<b>EP 1</b>   H2020 OSMOSE  <b>Session Chairs:</b> Ilaria Losa, Stephanie Morello	<b>TS 1I</b>   Power Industry Leading Innovation - Advanced Methods for System Modeling and Simulation  <b>Session Chair:</b> Stefano Massucco	<b>TS 1J</b>   System Operation and Control - Advanced Methods for Power Systems Analysis  <b>Session Chair:</b> Patrick Panciatici	<b>TS 1K</b>   Innovative Grids in Energy Hybrid Systems Integration - Optimization of Energy Vectors  <b>Session Chair:</b> Shmuel Oren	<b>TS 1L</b>   System Operation and Control - DC Grids: Modeling and Operation  <b>Session Chair:</b> Martin Braun	
16:10 - 17:50	<b>EP 2</b>   H2020 MIGRATE - Challenges and Solutions in Future Transmission Networks with High Penetration of Power Electronics  <b>Session Chair:</b> Jako Kilter	<b>TS 1M</b>   System Operation and Control - Grid Operation with EVs and DERs  <b>Session Chair:</b> Mircea Eremia	<b>TS 1N</b>   System Operation and Control - Advance Methods for Security and Reliability Improvement  <b>Session Chair:</b> Math Bollen	<b>TS 1O</b>   Innovative Grids in Energy Hybrid Systems Integration - Technical and Regulatory Aspects  <b>Session Chair:</b> Neville Watson	<b>TS 1P</b>   System Operation and Control - Transmission Grid Expansion Planning  <b>Session Chair:</b> Maurizio Delfanti	<b>Start-up Meet UP event</b>  <b>Session Chair:</b> Jean-Luc Dormoy, Domenico Pannofino
17:50 - 18:10	<i>Happy Hour Time</i>					

TUESDAY, June 25<sup>th</sup>

08.00	WIP networking coffee session   BL.28.0.1				
	Registration full day				
	Room BL.270.1	Room BL.270.2	Room BL.270.3	Room BL.270.6	Room BL.270.7
8:30 - 10:10	<b>SS1</b>   Microgrid for Electrification in Developing Countries	<b>TS 2A</b>   Innovative Grids in Energy Hybrid Systems Integration - Forecasting and Mitigation of Variable Renewable Sources	<b>TS 2B</b>   System Operation and Control - Optimization Methods for Active and Reactive Power Flows	<b>TS 2C</b>   System Operation and Control - Power Quality Mitigation in Power Systems	<b>TS 2D</b>   System Operation and Control - Power System Stability with Large Renewable Sources
	<b>Organizers:</b> Marta Molinas, Marco Merlo	<b>Session Chair:</b> Anastasios Bakirtzis	<b>Session Chair:</b> Janusz Bialek	<b>Session Chair:</b> Alberto Borghetti	<b>Session Chair:</b> Luigi Maritano
10:10 - 10:30	Coffee Break				
10:30 - 12:10	<b>Plenary Session 2 - Multidisciplinary Research. Power System and Computational Intelligence</b> BL28   Room "Carassa Dadda" and streaming BL.270.1 and BL.270.2				
12:10 - 13:00	Lunch				

TUESDAY, June 25<sup>th</sup>

BL27 First Floor   Poster Area					
13:00 - 14:20	<b>PS 2A</b>   Planning and Operation of Power Systems under Market Condition - Distributed Generation, Renewables and Energy Storage Systems	<b>PS 2B</b>   Modelling, Analysis and Operation of HVDC and DC Distribution Systems	<b>PS 2C</b>   Power Quality Issues in Power Systems	<b>PS 2D</b>   Power System Dynamics, Stability and Control - Inverter-Connected Power Sources	<b>PS 2E</b>   Network Modelling, Protection and Security - Fault Detection and Protection Coordination
	<b>Session Chair:</b> Davide Poli	<b>Session Chair:</b> Morris Brenna	<b>Session Chair:</b> Cristian Lazaroiu	<b>Session Chair:</b> Roberto Perini	<b>Session Chair:</b> Héctor Chávez
14:20 - 16:00	<b>PS 2F</b>   Machine Learning and Computational Intelligence in Power Systems	<b>PS 2G</b>   Modeling and Optimization of Hybrid and Multi-Energy Systems	<b>PS 2H</b>   Microgrids and Aggregators - Modeling, Design and Control	<b>PS 2I</b>   Forecasting and Management of Renewable Energy Sources	<b>PS 2J</b>   Battery Energy Storage Systems
	<b>Session Chair:</b> Anna Mutule	<b>Session Chair:</b> Mathaios Panteli	<b>Session Chair:</b> Alessandro Massi Pavan	<b>Session Chair:</b> Reinaldo Tonkoski	<b>Session Chair:</b> Pavlos Georgiakis
	Room BL.270.1	Room BL.270.2	Room BL.270.3	Room BL.270.6	Room BL.270.7
16:10 - 17:50	<b>SS2</b>   Evolution of Technologies for the Integration of Renewables	<b>TS 2I</b>   Innovative Grids in Energy Hybrid Systems Integration - Optimization of Active Local Distribution Grids	<b>TS 2J</b>   Data Science and ICT in Power Technologies - Smart Metering for State Estimation and Analysis	<b>TS 2K</b>   System Operation and Control - Large Scale Wind Farm Integration in Power Systems	<b>TS 2L</b>   System Operation and Control - Distribution Grid Expansion Planning
	<b>Organizer:</b> Michela Longo	<b>Session Chair:</b> Joao Pecas Lopes	<b>Session Chair:</b> Alex Stankovic	<b>Session Chair:</b> Costas Vournas	<b>Session Chair:</b> Zita A. Vale
17:50 - 18:10	<b>SS3</b>   Optimization Techniques for Renewable Energy Sources Integration with Energy Storage Devices	<b>TS 2M</b>   Innovative Grids in Energy Hybrid Systems Integration - Management of Smart Distribution Grids	<b>TS 2N</b>   Data Science and ICT in Power Technologies - Advance Methods for Power System Analysis	<b>TS 2O</b>   System Operation and Control - HVDC: Operation and Protection	<b>TS 2P</b>   System Operation and Control - Medium and High Frequency Disturbances Issues
	<b>Organizers:</b> Gianfranco Chicco, Samuele Grillo	<b>Session Chair:</b> Mariacristina Roscia	<b>Session Chair:</b> Chanan Singh	<b>Session Chair:</b> Nikolai Voropai	<b>Session Chair:</b> Alfredo Testa
Happy Hour Time					
Dessert & Coffee					



WEDNESDAY, June 26<sup>th</sup>

Registration full day				
08:00	Room BL.270.1	Room BL.270.2	Room BL.270.3	Room BL.270.6
8:30 - 10:10	<b>SS4</b>   Enabling Technologies and Methodologies for Wide Area Monitoring Protection and Control Systems  <b>Organizers:</b> Alfredo Vaccaro Kwok Cheung	<b>TS 3A</b>   Innovative Grids in Energy Hybrid Systems Integration - Advanced Methods for Smart Grids Operation  <b>Session Chair:</b> Paolo Perani	<b>TS 3B</b>   System Operation and Control - Detecting Methods for Power System Reliability  <b>Session Chair:</b> Enrico Zio	<b>TS 3C</b>   System Operation and Control - Advanced Market Strategies  <b>Session Chair:</b> Christian Rehtanz
				<b>EP 3</b>   H2020 SmartNet - How to get flexibility from resources connected to distribution grids?  <b>Session Chair:</b> Gianluigi Migliaiavacca
10:10 - 10:30	Coffee Break			
10:30 - 12:10	Plenary Session 3 - Transfer of Knowledge: a guide to publish your research BL27   Room BL.270.4 and streaming BL.270.1, BL.270.2 and BL.270.3			
12:10 - 13:00	Lunch			
BL27 First Floor   Poster Area				
13:00 - 14:20	<b>PS 3A</b>   Planning and Operation of Power Systems under Market Condition - Distributed Generation, Renewables and Energy Storage Systems  <b>Session Chair:</b> Emilio Ghiani	<b>PS 3B</b>   Modeling and Monitoring Harmonics in Power Systems  <b>Session Chair:</b> Roberto Langella	<b>PS 3C</b>   Power System Dynamics, Stability and Control - Control and Stability of Generators  <b>Session Chair:</b> Giorgio Sulligoi	<b>PS 3D</b>   Power System Dynamics, Stability and Control - Power Systems Stability and Grid Automation  <b>Session Chair:</b> Valentina Cecchi
	<b>PS 3F</b>   Advanced Diagnostic and Power System Monitoring Techniques  <b>Session Chair:</b> Davide Falabretti	<b>PS 3G</b>   Machine Learning and Computational Intelligence in Power Systems  <b>Session Chair:</b> Robin Preece	<b>PS 3H</b>   Microgrids and Aggregators - Management and Optimization  <b>Session Chair:</b> Johanna Mathieu	<b>PS 3I</b>   Electric Vehicles Charging Infrastructure and V2G Technologies  <b>Session Chair:</b> Antonello Monti
				<b>PS 3E</b>   Network Modeling, Protection and Security - Security and Contingency Analysis  <b>Session Chair:</b> Gianbattista Grusso
				<b>PS 3J</b>   Battery Energy Storage Systems Optimization and Grid Integration  <b>Session Chair:</b> Giovanni Lutzemberger
Dessert & Coffee				

WEDNESDAY, June 26<sup>th</sup>

	Room BL.270.1	Room BL.270.2	Room BL.270.3	Room BL.270.6	Room BL.270.7
14:20 - 16:00	<b>SS5</b>   Education and Formation of Future Power Electrical Engineers – the Experience of the Scholarship Plus  <b>Organizers:</b> Edvina Uzonovic, Carlo Alberto Nucci	<b>TS 3I</b>   Innovative Grids in Energy Hybrid Systems Integration - Grid-Connected and Stand Alone Microgrids Operating Strategies  <b>Session Chair:</b> Aydogan Ozdemir	<b>TS 3J</b>   System Operation and Control - Optimization Methods for Active and Reactive Power Flows  <b>Session Chair:</b> Federico Milano	<b>TS 3K</b>   System Operation and Control - Islanding  <b>Session Chair:</b> Akihiko Yokoyama	<b>TS 3L</b>   System Operation and Control  <b>Session Chair:</b> Madelaine Gibescu
	<b>SS6</b>   New Trends on Education and Training for the Energy Transition  <b>Organizers:</b> Nikos Hatziaargyriou, Panos Kotsampopoulos	<b>TS 3M</b>   Innovative Grids in Energy Hybrid Systems Integration - Energy Management in Migrogrids  <b>Session Chair:</b> Thierry Van Cutsem	<b>TS 3N</b>   System Operation and Control - Modeling and Testing for Grid Operation  <b>Session Chair:</b> Gianfranco Chicco	<b>TS 3O</b>   System Operation and Control - Optimal Operation of Primary and Secondary Distribution grids  <b>Session Chair:</b> Jin Zhong	<b>TS 3P</b>   Data Science and ICT in Power Technologies  <b>Session Chair:</b> Riccardo Zich

GALA DINNER

THURSDAY, June 27<sup>th</sup>

Registration						
	Room BL-270.1	Room BL-270.2	Room BL-270.3	Room BL-270.6	Room BL-270.7	Room BL-270.4
08:00 - 12:00	<b>EP4</b>   UNITED-GRID Integrated Cyber-Physical Solutions for Intelligent Distribution Grids with High Penetration of Renewables <b>Session Chair:</b> Tuan Le	<b>TS 4A</b>   Innovative Grids in Energy Hybrid Systems Integration - New Technology Solutions for Power Applications <b>Session Chair:</b> Mario Paolone	<b>TS 4B</b>   System Operation and Control - Transient Events Detection and Modeling <b>Session Chair:</b> Jean Mahseredjian	<b>TS 4C</b>   Innovative Grids in Energy Hybrid Systems Integration - Advanced Estimation Methods for Smart Energy Districts <b>Session Chair:</b> Gabriela Hug	<b>TS 4D</b>   System Operation and Control <b>Session Chair:</b> Alessandro Gandelli	
10:10 - 10:30	Coffee Break					
10:30 - 12:10	<b>SS7</b>   Microgrid Stability Definitions, Analysis and Modeling <b>Organizer:</b> Claudio Canizares	<b>TS 4E</b>   Innovative Grids in Energy Hybrid Systems Integration - Energy Storages for Power System Improvement <b>Session Chair:</b> Raphael Caire	<b>TS 4F</b>   System Operation and Control - Reliability Analysis for Electrical Power Components <b>Session Chair:</b> Arturo Bretas	<b>TS 4G</b>   Innovative Grids in Energy Hybrid Systems Integration - Large Multi-Energy Systems Management <b>Session Chair:</b> Joe Chow	<b>TS 4H</b>   Innovative Grids in Energy Hybrid Systems Integration <b>Session Chair:</b> Pablo Arboleya	<b>SS9</b>   Validation and De-Risking of Grid Modernization Technologies with Hardware in the Loop Testing <b>Organizer:</b> Kati Sidwall
	12:10 - 13:00	Lunch				
BL27 FIRST FLOOR   Poster Area						
13:00 - 14:20	<b>PS 4A</b>   Planning and Operation of Power Systems under Market Condition - Grid Planning, Dispatch and Unit Commitment <b>Session Chair:</b> Valentin Ilea	<b>PS 4B</b>   Power Systems Stability <b>Session Chair:</b> Stefano Bracco	<b>PS 4C</b>   Network Modeling, Protection and Security - Coordination Issues and System Reliability <b>Session Chair:</b> Phuong Nguyen	<b>PS 4D</b>   Advanced Monitoring for Equipment Reliability <b>Session Chair:</b> Irene Y.H. Gu	<b>PS 4E</b>   Big Data and Data Analysis in Power Systems <b>Session Chair:</b> Raul Igual	
	<b>PS 4F</b>   Computational Intelligence, Optimization Methods and Data Driven Approaches in Power Systems <b>Session Chair:</b> Marco Pasetti	<b>PS 4G</b>   Advanced Metering and Cyber Security <b>Session Chair:</b> Simone Franzò	<b>PS 4H</b>   Co-Simulation of Electric Energy Systems and ICT Systems <b>Session Chair:</b> Carmen Borges	<b>PS 4I</b>   Smart Controls and Advanced Software Tools <b>Session Chair:</b> Samuele Grillo		
	Dessert & Coffee					

THURSDAY, June 27<sup>th</sup>

	Room BL.270.1	Room BL.270.2	Room BL.270.3	Room BL.270.6	Room BL.270.7
14:20 - 16:00	<b>SS8</b>   Understanding System Resilience in Critical Infrastructures <b>Organizer:</b> Pierluigi Mancarella	<b>TS 4I</b>   Innovative Grids in Energy Hybrid Systems Integration - Advanced Methods for Power Systems Planning and Modeling <b>Session Chair:</b> João Paulo Tomé Saraiva	<b>TS 4J</b>   System Operation and Control - Power Quality Mitigation Techniques <b>Session Chair:</b> A.P Sakis Meliopoulos	<b>TS 4K</b>   System Operation and Control - Mitigation Techniques for Power System Stability <b>Session Chair:</b> Alberto Berizzi	<b>TS 4L</b>   System Operation and Control <b>Session Chair:</b> Rachid Cherkaoui
	<b>SS10</b>   Integration of PMU Measurements into Power System State Estimation <b>Organizer:</b> Antonio Simoes Costa	<b>TS 4M</b>   System Operation and Control - Advanced Solutions for Voltage and Frequency Stability <b>Session Chair:</b> Fabio Napolitano	<b>TS 4N</b>   System Operation and Control - Methodologies for Uncertainties Mitigation in Power Systems <b>Session Chair:</b> Giovanni Spagnuolo	<b>TS 4O</b>   System Operation and Control - Multiterminal HVDC for Stability Improvement <b>Session Chair:</b> Enrico Tironi	<b>TS 4P</b>   Innovative Grids in Energy Hybrid Systems Integration <b>Session Chair:</b> Ermanno Cardelli
17:50 - 18:10	Happy Hour Time				



DETAILED PROGRAM | MONDAY, June 24<sup>th</sup>

09:00 – 10:10 | BL.28 Room "CARASSA DADDA"

Streaming BL.270.1 and BL.270.2

**IEEE PowerTech Milano 2019 Opening Ceremony***Speakers:*

- Dario Zaninelli | *General Chair of the PowerTech Milano 2019*
- Costas Vournas | *Chair of the PowerTech International Steering Committee*
- Saifur Rahman | *President IEEE PES*
- Fabio Inzoli | *Head of Department of Energy – Politecnico di Milano*
- Sonia Leva | *Publication Chair of the PowerTech Milano 2019*
- Federica Foiadelli | *Program Chair of the PowerTech Milano 2019*

10:30 – 12:10 | PLENARY SESSION 1 | BL28 Room "CARASSA DADDA"

Streaming BL.270.1 and BL.270.2

**Bridging the gap: most promising technologies to invest in the future**Chair: Vincenzo Piuri | *IEEE Past Vice President for Technical Activities**Keynote Speakers:*

- Saifur Rahman | *President IEEE PES*
- Allan Tear | *RevUp Capital Founder*
- Carlalberto Guglielminotti | *CEO, Engie EPS*
- Adel El Gammal | *Secretary General, EERA – European Energy Research Alliance*
- Marco Gazzino | *Head of Innovation and Product Lab, Enel X*

13:00 - 14:20 | PS 1A | BL27 First Floor | Poster Area

**Planning and Operation of Power Systems Under Market Condition - Electricity Market and Pricing Mechanism**Chair: Marie-Cecile Alvarez Herault | *Univ. Grenoble Alpes, France*

- **ID 149** | *The Impacts of an Integrated European Dayahead and Intraday Electricity Market on Market Performance: The Iberian Region Case*  
Shagahyegh Zalzar, Ettore Bompard | *Politecnico di Torino, Italy*
- **ID 572** | *Pricing Mechanism Based on Losses Using Grid Topology*  
Victor Reijnders, Marco Gerards, Johann Hurink | *University of Twente, Netherlands*
- **ID 167** | *Pricing Mechanism for Demand Response based on Penalty Paradigm*  
Ashim Basnet, Jin Zhong | *The University of Hong Kong, Hong Kong*

- **ID 730** | *Integrated zonal-exchange and nodal-flow clearing model in multi-zonal spot electricity markets*  
Andreas Vlachos | *Regulatory Authority for Energy, Greece*  
Pandelis Biskas | *Aristotle University of Thessaloniki, Greece*
- **ID 160** | *Manipulability of Cost and Benefit Allocation in Cross-border Electrical Interconnection Projects*  
Andrey Churkin, David Pozo, Janusz Bialek | *Skolkovo Institute of Science and Technology (Skoltech), Russia*  
Nikolay Korgin | *Institute of Control Sciences of Russian Academy of Sciences, Russia*  
Enzo Sauma | *Pontificia Universidad Catolica de Chile, Chile*
- **ID 285** | *Optimal Adjustments on the Market Dispatch Solution to Supply System Losses*  
Rafael Zárate-Miñano, Miguel Carrión | *University of Castilla - La Mancha, Spain*
- **ID 582** | *Modelling of the Demand Curve of the Italian Capacity Market*  
Ahmed Hussein | *Othman Fouad, Egypt*  
Cristian Bovo | *Politecnico di Milano, Italy*
- **ID 398** | *Accommodating Bounded Rationality in Pricing Demand Response*  
Andrea Marin Radoszynski, Vladimir Dvorkin, Pierre Pinson | *Technical University of Denmark, Denmark*
- **ID 277** | *Value of Thermostatic Loads in Energy/Frequency Response Markets: a Mean Field Game Approach*  
Antonio De Paola | *University of Bath, United Kingdom*  
Vincenzo Trovato | *EDF Energy R&D, United Kingdom*  
David Angeli, Goran Strbac | *Imperial College London, United Kingdom*
- **ID 822** | *Consumer Hedging Against Price Volatility Under Uncertainty*  
Shantanu Chakraborty, Milos Cvetkovic, Remco Verzijlbergh, Zofia Lukszo | *Delft University of Technology, Netherlands*  
Kyri Baker | *University of Colorado at Boulder, United States*

**13:00 - 14:20 | PS 1B | BL27 First Floor | Poster Area**

### *Power System Dynamics, Stability and Control – Voltage Regulation and Stability, Reactive Power Control*

Chair: Eduardo Asada | *University of São Paulo, Brazil*

- **ID 797** | *Equivalent dynamic model of active distribution networks for large voltage disturbances*  
Nuno Fulgêncio, Leonel Carvalho | *INESC TEC, Portugal*  
Carlos Moreira, João Peças Lopes | *FEUP / INESC TEC, Portugal*
- **ID 384** | *Voltage Support Scheme for Low Voltage Distribution Grids Under Voltage Sags*  
Anastasis Charalambous, Lenos Hadjidemetriou, Elias Kyriakides | *KIOS Research and Innovation Center, University of Cyprus, Cyprus*
- **ID 740** | *Impact of Varying Shares of Distributed Energy Resources on Voltage Stability in Electric Power Systems*  
Sebastian Liemann, Lena Robitzky, Christian Rehtanz | *ie3 - TU Dortmund, Germany*

- **ID 439** | *Reactive Power Reserves Management by DGs for Voltage Stability Enhancement: A Case Study*  
Abdulaziz Alkuhayli | *King Saud University, Saudi Arabia*  
Iqbal Husain | *North Carolina State University, United States*  
Thamer Alquthami | *King Abdulaziz University, Saudi Arabia*
- **ID 443** | *Reactive Power Dispatching Among Generating Units Connected to Point of Common Coupling*  
Jasna Dragosavac, Zarko Janda, Jelena Pavlovic, Zoran Ćirić | *Electrical Engineering Institute Nikola Tesla, Serbia*
- **ID 751** | *Impact of Smart Inverter Functions on Dynamic Step Voltage Regulator Settings for Distribution Voltage Control*  
H. M. Mesbah Maruf, Badrul Chowdhury | *UNC Charlotte, United States*
- **ID 783** | *Applying Steinmetz Circuit Design to Mitigate Voltage Unbalance using Distributed Solar PV*  
Mengqi Yao, Ian A. Hiskens, Johanna L. Mathieu | *University of Michigan, United States*
- **ID 124** | *A Parallel Processing Approach to Stability Analysis Considering Transmission and Distribution Systems*  
Angie Daniela Vasquez, Thales Sousa | *Federal University of ABC, Brazil*
- **ID 669** | *Integration of Centralized and Local Voltage Control Scheme in Distribution Network to Reduce the Operation of Mechanically Switched Devices*  
Salish Maharjan, Ashwin M. Khambadkone, Jimmy C. H. Peng | *National University of Singapore, Singapore*

**13:00 - 14:20 | PS 1C | BL27 First Floor | Poster Area**

### *Power System Dynamics, Stability and Control - Frequency Regulation and Active Power Flows*

Chair: Federico Silvestro | *University of Genova, Italy*

- **ID 19** | *Impact of Realistic Bus Frequency Measurements on Wide-Area Power System Stabilizers*  
Georgios Tzounas, Muyang Liu, Mohammed Ahsan Adib Murad, Federico Milano | *University College Dublin, Ireland*
- **ID 43** | *Extending the Reach of Traditional Frequency Control for Fast Responses*  
Jean Ubertalli, Timothy Littler | *Queen's Belfast University, United Kingdom*
- **ID 352** | *On the Use of Thermostatically Controlled Loads for Frequency Control*  
Maksim Parshin, Maryam Majidi, Federico Ibanez, David Pozo | *Skolkovo Institute of Science and Technology, Russia*
- **ID 402** | *ADRC for Decentralized Load Frequency Control with Renewable Energy Generation*  
Sergio A. Dorado-Rojas | *Rensselaer Polytechnic Institute, United States*  
John Cortés-Romero, Sergio Rivera, Eduardo Mojica-Nava | *Universidad Nacional de Colombia, Colombia*



- **ID 289** | *Delay-Robust Distributed Secondary Frequency Control: A Case Study*  
Sultan Alghamdi, Nathan Smith, Petros Aristidou | *University of Leeds, United Kingdom*  
Johannes Schiffer Brandenburg | *University of Technology Cottbus-Senftenberg, Germany*
- **ID 712** | *Comparison of two schemes for closed-loop decentralized frequency control and overload alleviation*  
Oleg O. Khamisov, Tatiana Chernova, Janusz W. Bialek | *Skolkovo Institute of Science and Technology, Russia*
- **ID 578** | *Smart Transformers - Enabling power-frequency regulation services for hybrid AC/DC networks*  
Justino Rodrigues | *INESC TEC, Portugal*  
Carlos Moreira, Joao Pecas Lopes | *FEUP, University of Porto, Portugal*
- **ID 142** | *LFC model for frequency stability analysis of prospective power systems with high shares of inverter based generation*  
Arun Kannan, Maria Nuschke, Diana Strauß-Mincu | *Fraunhofer Institute for Energy Economics and Energy System Technology (IEE), Germany*

**13:00 - 14:20** | PS 1D | BL27 First Floor | Poster Area

*Network Modeling, Protection and Security – Load Models and Power Flows*

Chair: Luis Rouco | *Universidad Pontificia Comillas, Spain*

- **ID 177** | *Feature- and Structure-Preserving Network Reduction for Large-Scale Transmission Grids*  
Julia Sistermanns, Matthias Hotz, Dominic Hewes, Rolf Witzmann, Wolfgang Utschick | *Technische Universität München, Germany*
- **ID 326** | *Optimal Adaptive Power Flow Linearizations: Expected Error Minimization using Polynomial Chaos Expansion*  
Tillmann Mühlpfordt, Veit Hagenmeyer | *Karlsruhe Institute of Technology, Germany*  
Daniel Molzahn | *Argonne National Laboratory, United States*  
Sidhant Misra | *Los Alamos National Laboratory, United States*
- **ID 440** | *Retrospective Optimal Power Flow for Low Discriminating Active Power Curtailment*  
Friederike Meier, Christian Tobermann | *Fraunhofer IEE, Germany*  
Martin Braun | *University of Kassel, Germany*
- **ID 757** | *A Co-simulation Framework for Distribution Network Analysis: Case Study of Hosting Capacity Analysis*  
Xiao Xu, Jagadeesh Gunda, Sasa Djokic | *The University of Edinburgh, United Kingdom*
- **ID 44** | *Temperature-Dependent Radial Power Flow with Distributed Generation*  
Alessandra Freitas Picanco | *IFBA, Brazil*  
A.C. Zambroni de Souza | *UNIFEI, Brazil*
- **ID 836** | *Conductor Temperature Estimation under Uncertain External Conditions Using a Temperature-Dependent Power Flow*  
Valentina Cecchi, Mahbubur Rahman | *University of North Carolina at Charlotte, United States*

- **ID 616** | *A Novel Improved Hilbert-Huang Transform Technique for Implementation of Power System Local Oscillation Monitoring*  
Reza Zamani, Mohsen Parsa Moghaddm, Maryam Imani | *Tarbiat Modares University, Iran*  
Hassan Haes Alhelou | *Tishreen University, Syria*  
Mohammad Esmail Hamedani Golshan | *Isfahan University of Technology, Iran*  
Pierluigi Siano | *University of Salerno, Italy*
- **ID 106** | *Computation of subtransmission losses based on statistical optimization approach with network constraints*  
Delberis Lima, Sergio Cárdenas | *PUC-Rio (Pontifical Catholic University of Rio de Janeiro), Brazil*
- **ID 597** | *Performance Assessment of Kron Reduction in the Numerical Analysis of Polyphase Power Systems*  
Andreas Martin Kettner, Mario Paolone | *École Polytechnique Fédérale de Lausanne (EPFL), Switzerland*

**13:00 - 14:20** | PS 1E | BL27 First Floor | Poster Area

*State Estimation and Situational Awareness - Power System State Estimation*

Chair: Sarah Rönnerberg | *Luleå Technical University, Sweden*

- **ID 75** | *Equivalent Circuit Programming for Estimating the State of a Power System*  
Marko Jereminov, Martin Wagner, Larry Pileggi | *Carnegie Mellon University, United States*  
Aleksandar Jovicic, Gabriela Hug | *ETH Zurich, Switzerland*
- **ID 188** | *State estimation of low voltage distribution network with integrated customer-owned PV and storage unit*  
Motaz Ayiad | *UPorto/EFACEC, Portugal*  
Onyema Nduka, Bikash Pal | *Imperial College London, United Kingdom*  
Hugo Martins | *EFACEC, Portugal*
- **ID 268** | *Distribution Grid State Assessment for Control Reserve Provision Using Boundary Load Flow*  
Volker Scheffer, Hanks Ipach, Christian Becker | *Hamburg University of Technology, Germany*
- **ID 378** | *Robust State Estimation Using Node-Breaker Substation Models and Phasor Measurements*  
Ali Abur, Bilgehan Donmez, Gianna Scioletti | *Northeastern University, United States*
- **ID 455** | *Analysis of State Uncertainty for Distribution System State Estimation*  
Annika Brueggemann, Christian Rehtanz | *TU Dortmund University, Germany*  
Theresa Noll | *Westnetz GmbH, Germany*
- **ID 466** | *Assessing the Normalized Residuals Technique with AMB-SE for Non-Technical Loss Detection*  
Rodrigo Sau, Luis Ugarte, David Sarmiento, Madson Almeida | *Unicamp, Brazil*
- **ID 576** | *Inclusion of converter controller measurements into state estimation algorithm for hybrid ac-dc grid*  
Gaurav Kumar Roy, Marco Pau, Abhinav Sadu, Ferdinanda Ponci, Antonello Monti | *RWTH aachen University, Germany*

- **ID 705** | *PMUs and SCADA Measurements in Power System State Estimation through Bayesian Inference*  
Julio Augusto Druzina Massignan, João Bosco Augusto London Jr, Carlos Dias Maciel | *University of São Paulo, Brazil*  
Michel Bessani | *Federal University of Minas Gerais, Brazil*  
Vladimiro Miranda | *INESC TEC and University of Porto, Portugal*
- **ID 796** | *Statistical Criteria for Evaluation of Distribution System State Estimators*  
Thiago Ramos Fernandes, Leonardo Ramos Fernandes, Luis Fernando Ugarte Vega, Rafael Schincariol da Silva, Madson  
Cortes de Almeida | *University of Caminas, Brazil*
- **ID 600** | *An Improved UFLS Scheme based on Estimated Minimum Frequency and Power Deficit*  
Hassan Haes Alhelou, Mohammad Esmail Hamedani Golshan, Takawira Njenda | *Isfahan University of Technology, Syria*  
Reza Zamani, Mohsen Parsa Moghaddam | *Tarbiat Modares University, Iran*  
Pierluigi Siano | *University of Salerno, Italy*  
Mousa Marzband | *Northumbria University Newcastle, United Kingdom*

### 13:00 - 14:20 | PS 1F | BL27 First Floor | Poster Area

#### Modeling and Optimization of Hybrid and Multi-Energy Systems

Chair: Filippo Spertino | *Politecnico di Torino, Italy*

- **ID 586** | *Prosumer Markets: A Unified Formulation*  
Thomas Baroche | *ENS Rennes, France*  
Fabio Moret, Pierre Pinson | *Technical University of Denmark, Denmark*
- **ID 132** | *Modeling an Optimal Peer-to-Peer Energy Sharing Between Prosumers in a South African Context*  
Kanzumba Kusakana | *Central University of Technology, Free State South Africa*
- **ID 304** | *Stochastic Operation Scheduling Model for a Swedish Prosumer with PV and BESS in Nordic Day-Ahead Electricity Market*  
Christos Agathokleous, Anh Tuan Le, David Steen | *Chalmers University of Technology, Sweden*
- **ID 373** | *Improvement of Self-Sufficiency for an Innovative Nearly Zero Energy Building by Photovoltaic Generators*  
Filippo Spertino, Paolo Di Leo, Stefania Fichera, Gabriele Malgaroli, Alessandro Ratclif | *Politecnico di Torino, Italy*
- **ID 599** | *Implementation of SCADA Systems for a Real Microgrid Lab Testbed*  
Luigi Martirano, Mostafa Kermani, Francesco Manzo, Arsalan Bayatmakoo, Umberto Grasselli | *University of Rome, Italy*
- **ID 544** | *Impact of Grid Tariffs Design on the Zero Emission Neighborhoods Energy System Investments*  
Dimitri Pinel, Sigurd Bjarghov, Magnus Korpås | *NTNU, Norway*

- **ID 547** | *Using the Ecovat system to supply the heat demand of a neighbourhood*  
Gijs de Goeijen, Gerwin Hoogsteen, Johann Hurink, Gerard Smit | *University of Twente, Netherlands*
- **ID 802** | *Electricity and Gas Network Expansion Planning: an ADMM-based Decomposition Approach*  
Yinghui Nie, Meisam Farrokhifar, David Pozo | *Skolkovo Institute of Science and Technology, Russia*
- **ID 129** | *Operational Optimization of a Microgrid with Differential Algebraic Constraints*  
Ruben de Girardier, Anastasios Rousis, Ioannis Konstantelos, Goran Strbac | *Imperial College London, United Kingdom*
- **ID 651** | *Solar Power Resource Assessment Using Light Detection and Ranging Data and Open Source Geographic Information System*  
Ellen Jane G. Gulben, Jeeng-Min Ling | *Southern Taiwan University of Science and Technology, Taiwan*  
Daxter William L. Gulben | *Southern Taiwan University of Science and Technology, Philippines*  
Noel R. Estoperez | *Mindanao State University-Iligan Institute of Technology, Philippines*

### 13:00 - 14:20 | PS 1G | BL27 First Floor | Poster Area

#### Microgrids, Market and Aggregators

Chair: Anna Pinnarelli | *University of Calabria, Italy*

- **ID 21** | *Conditional Value of Lost Load based Unit Commitment in Microgrid Considering Uncertainty in Battery Swap Station*  
Ferinar Moaidi, Masoud Aliakbar Golkar | *K. N. Toosi University of Technology, Iran*
- **ID 60** | *Sensitivity Analysis of a Local Market Model for Community Microgrids*  
Laurine Duchesne, Bertrand Cornélusse | *University of Liege, Belgium*  
Iacopo Savelli | *Università di Siena, Italy*
- **ID 473** | *Iterative Algorithm For Local Electricity Trading*  
Amin Shokri Gazafroudi, Juan Manuel Corchado | *University of Salamanca, Spain*  
Miadreza Shafie-khah | *University of Vaasa, Finland*  
Mohamed Lotfi, João P.S. Catalão | *The University of Porto and INESC TEC, Portugal*
- **ID 486** | *Techno-economic Assessment of Reserve Service Provision from Microgrids for Resilience Enhancement*  
Asimina Frosinou, Mathaios Panteli | *The University of Manchester, United Kingdom*  
Yutian Zhou | *Ove Arup & Partners Ltd, United Kingdom*
- **ID 665** | *Optimal Operation Strategy for Community-based Prosumers through Cooperative P2P Trading*  
Wonpoong Lee, Daesoo Kim, Yunsun Jin, Minsu Park, Dongjun Won | *Inha-University, South Korea*
- **ID 853** | *Optimal Operation of Distribution Networks through Clearing Local Day-ahead Energy Market*  
Salah Bahramara, Pouria Sheikahmadi | *Islamic Azad University, Iran*  
Mohamed Lotfi, João P. S. Catalão | *FEUP and INESC TEC, Portugal*  
Sérgio F. Santos | *UBI, Portugal*  
Miadreza Shafie-khah | *University of Vaasa, Finland*

- **ID 718** | *Techno-economic Planning Framework of a Household MicroGrid with Hybrid Energy Storage System*  
Jeeng-Min Ling, Meng-Hui Lim, Ming-Tsung Tsai | *Southern Taiwan University of Science and Technology, Taiwan*
- **ID 553** | *Influence of Combining Real-time and Fixed Tariffs in the Demand Response Aggregation and Remuneration Schemes Definition*  
Cátia Silva, Pedro Faria, Zita Vale | *Polytechnic of Porto, Portugal*
- **ID 260** | *A Game Model Reflecting the Interaction between Supply and Demand of Power System and Its Q Learning Solution*  
Bin Wang, Shiming Li, Ruifeng Zhao, Wenxin Guo, Yueting Lin | *Electric Dispatch and Control Center, Guangdong Power Grid Co., Ltd, China*  
Kaiping Qu | *College of Electric Power, South China University of Technology, China*

### 13:00 - 14:20 | PS 1H | BL27 First Floor | Poster Area

#### Forecasting, Modeling and Management of Load and Renewable Energy Sources 1

Chair: Vincente Debusschere | *Univ. Grenoble Alpes, France*

- **ID 790** | *Deep Learning Based Forecasting of Individual Residential Loads Using Recurrence Plots*  
Roozbeh Rajabi | *Qom University of Technology, Iran*  
Abouzar Estebarsari | *Politecnico di Torino, Italy*
- **ID 901** | *Deep Learning Application to Non-Intrusive Load Monitoring*  
Pablo Arbolea, Viet Linh Nguyen | *University of Oviedo, Spain*
- **ID 427** | *Electricity consumption forecasting in office buildings: an artificial intelligence approach*  
Aria Jozi, Tiago Pinto, Goreti Marreiros | *GECAD/IPP, Portugal*  
Zita Vale | *Polytechnic of Porto, Portugal*
- **ID 623** | *Forecasting the Electricity Hourly Consumption of Residential Consumers with Smart Meters using Machine Learning Algorithms*  
Eduardo Martín Sobrino, Andrea Veiga Santiago, Alicia Mateo González | *Endesa Energía, Spain*
- **ID 899** | *Load modeling and scheduling optimization for energy sharing in prosumers network*  
Matteo Barsanti, Marco Mussetta | *Politecnico di Milano, Italy*
- **ID 520** | *Influence of Flexibility Modeling Parameters on Residential-Scale Demand Response Assessment*  
Karlis Baltutnis, Zane Broka, Antans Sauhats | *Riga Technical University, Latvia*
- **ID 921** | *RESs Integration and Transmission Expansion Planning Considering Load Shedding Costs*  
Catalina Alexandra Sima, Mihai Octavian Popescu, Claudia Laurenta Popescu, Gheorghe Lazaroiu | *University POLITEHNICA of Bucharest, Romania*

- **ID 556** | *Modeling of Consumer Preferences and Constraints for the Optimal Schedule of Consumption Shifting*  
Pedro Faria, João Spinola, Zita Vale | *Polytechnic of Porto, Portugal*
- **ID 631** | *The Effect of Inaccurate Load Composition on Power System Contingency Analysis and Planning*  
Elena Polykarpou, Markos Asprou, Elias Kyriakides | *KIOS Research and Innovation Center of Excellence, University of Cyprus, Cyprus*

### 13:00 - 14:20 | PS 1I | BL27 First Floor | Poster Area

#### Forecasting, Modeling and Management of Load and Renewable Energy Sources 2

Chair: Luis Ochoa | *University of Melbourne, Australia*

- **ID 12** | *A Comparative Study on Feature Selection based Improvement of Medium-Term Demand Forecast Accuracy*  
Engin Ilseven, Murat Gol | *Middle East Technical University, Turkey*
- **ID 162** | *Load Forecasting of Privacy-Aware Consumers*  
Jun-Xing Chin, Thierry Zufferey, Etta Shyti, Gabriela Hug | *ETH Zurich, Switzerland*
- **ID 498** | *A study of risk reduction for daily peak load demand forecasting*  
Kodai Ogihara, Shoichi Urano | *Meiji University, Japan*
- **ID 507** | *Short-Term Probabilistic Load Forecasting at Low Aggregation Levels using Convolutional Neural Networks*  
Alexander Elvers, Marcus Voß, Sahin Albayrak | *Technische Universität Berlin, Germany*
- **ID 621** | *Modelling and forecasting of electrical consumption for demand response applications*  
Iacob Crucianu, Otilia Bularca | *SIVECO Romania SA, Romania*  
Ana-Maria Dumitrescu | *Politehnica University of Bucharest, Romania*
- **ID 262** | *Ramp Analysis of the Portuguese Net Load under Different Decarbonization Scenario*  
Jorge Magalhães | *Faculdade de Engenharia da Universidade do Porto, Portugal*  
Jose Villar | *INESC TEC (Institute for Systems and Computer Engineering, Technology and Science), Portugal*
- **ID 397** | *Modelling long-term electricity load demand for rural electrification planning*  
Fabio Riva, Francesco Davide Sanvito, Francesco Tonini, Emanuela Colombo | *Politecnico di Milano, Italy*  
Fabrizio Colombelli | *CEFA Onlus, Italy*
- **ID 259** | *Comprehensive analysis of Conservation Voltage Reduction: A real case study*  
Igor Visconti | *Electric Energy Research Center/PUC-Rio (Pontifical Catholic University of Rio de Janeiro), Brazil*  
Delberis Lima | *Pontifical Catholic University of Rio de Janeiro, Brazil*  
Jovica Milanović | *University of Manchester, United Kingdom*



- **ID 654** | *Impact of Residential Load Models for Overvoltage Prevention Studies in PV-Rich LV Grids*  
Fernando Bereta dos Reis, Kapil Duwadi, Robert Fourney, Reinaldo Tonkoski, Timothy Hansen | *South Dakota State University, United States*  
Mohammad Asif Iqbal Khan, Sumit Paudyal | *Michigan Tech, United States*

**13:00 - 14:20** | PS 1J | BL27 First Floor | Poster Area

### *Design and Economic Assessment of Electric Vehicle Technologies*

Chair: Siddharth Suryanarayanan | *Colorado State University, United States*

- **ID 409** | *Proposal for Modeling Electric Vehicle Battery Using Experimental Data and Considering Temperature Effects*  
Juan D. Valladolid, Juan P. Ortiz | *Universidad Politécnica Salesiana, Ecuador*  
Diego Patiño | *Pontificia Universidad Javeriana, Colombia*  
Ismael Minchala | *Universidad de Cuenca, Ecuador*  
Giambattista Grusso | *Politecnico di Milano, Italy*
- **ID 646** | *A Review on Dynamic Wireless Charging Systems*  
Davide De Marco, Alberto Dolara, Michela Longo | *Politecnico di Milano, Italy*
- **ID 772** | *An Energy Saving Management Strategy for Battery-Aided Ship Propulsion Systems*  
Luisa Alfieri | *University of Naples Parthenope, Italy*  
Fabio Mottola, Mario Pagano | *University of Naples Federico II, Italy*
- **ID 166** | *Electric Vehicles Charging Optimization Considering EVs and Load Uncertainties*  
Leonardo Bitencourt, Bruno Dias | *UFJF - Federal University of Juiz de Fora, Brazil*  
Tiago Abud, Bruno Borba, Márcio Fortes | *UFF - Fluminense Federal University, Brazil*  
Renan Maciel | *Federal University of Technology – Paraná – UTFPR, Brazil*
- **ID 577** | *Online Load Control in Medium Voltage Grid by Means of Reactive Power Modification of Fast Charging Station*  
Xiang Gao, Giovanni De Carne, Marius Langwasser, Marco Liserre | *Kiel University, Germany*
- **ID 881** | *A Power Demand Estimator for Electric Vehicle Charging Infrastructure*  
Mahmoud Draz, Sahin Albayrak | *Technische Universität Berlin, Germany*
- **ID 372** | *Assessment of Real-Time Tariffs for Electric Vehicles in Denmark*  
Tiago Soares | *INESC TEC, Portugal*  
Carlos Fonseca, Hugo Morais, Sergio Ramos | *Polytechnic Institute of Porto (IPPI), Portugal*  
Tiago Sousa | *Technical University of Denmark (DTU), Denmark*
- **ID 725** | *Techno-Economic Assessment of EV Charging Infrastructure Development in Brazilian Universities*  
Wanessa Guedes, José Carlos Faria, Bruno Dias, Leonardo de Oliveira, Matheus de Souza, José Luiz Pereira | *UFJF - Federal University of Juiz de Fora, Brazil*  
Jairo Quirós-Tortós | *University of Costa Rica, Costa Rica*

- **ID 908** | *An Optimization Model for Airport Infrastructures in Support to Electric Aircraft*  
Francesco Salucci, Lorenzo Trainelli, Roberto Faranda, Michela Longo | *Politecnico di Milano, Italy*

**14:20 - 16:00** | EP 1 | Room BL.270.1

### *H2020 OSMOSE*

Organizers:

Ilaria Losa, Nathalie Grisey | *RTE*

Stephanie Morello | *DOWEL*

- OSMOSE: finding the optimal mix of flexibilities for European electricity  
Nathalie Grisey | *RTE*
- Overview the Italian pilot: increasing flexibility through enhanced coordination of grid devices, large demand-response and RES generation  
Luca Orrù | *Terna*
- CrossBorder exchange of flexibilities near realtime  
Miran Kavrečić | *HSE*

**14:20 - 16:00** | TS 1I | Room BL.270.2

### *Power Industry Leading Innovation – Advanced Methods for System Modeling and Simulation*

Chair: Stefano Massucco | *University of Genova, Italy*

- **ID 393** | *A Comparative Analysis of LU Decomposition Methods for Power System Simulations*  
Lukas Razik, Lennart Schumacher, Antonello Monti | *RWTH Aachen University, Germany*  
Adrien Guironnet, Gautier Bureau | *RTE Réseau de Transport d'Electricité, France*
- **ID 642** | *Distribution Network Planning Tool for Rural Areas*  
Thai Phuong Do | *CEA, France*  
Marie-Cecile Alvarez-Herault | *Univ. Grenoble Alpes, France*
- **ID 892** | *Seamless Grid: an off-chain model proposal for scalable P2P electricity markets and grids management*  
Fabrizio Bruno Armani, Francesco Grimaccia, Sonia Leva, Marco Mussetta | *Politecnico di Milano, Italy*
- **ID 69** | *Metaheuristic-based Design and Optimization of Offshore Wind Farms Collection Systems*  
Daniel Hermosilla Minguijón, Juan-Andrés Pérez-Rúa, Kaushik Das, Nicolaos A. Cutululis | *DTU, Denmark*
- **ID 895** | *Minute Ahead Wind Speed Forecasting Using a Gaussian Process and Fuzzy Assimilation*  
Miltiadis Alamaniotis | *University of Texas at San Antonio, United States*  
Georgios Karagiannis | *Durham University, United States*

- **ID 503** | *Incremental Deep-Learning for Continuous Load Prediction in Energy Management Systems*  
Gustavo Aragón, Harsh Puri, Alexander Grass, Sisay Chala | *Fraunhofer FIT, Germany*  
Christian Beecks | *University of Münster, Germany*

**14:20 - 16:00** | TS 1J | Room BL.270.3

### System Operation and Control – Advanced Methods for Power Systems Analysis

Chair: Patrick Panciatici | *Réseau de transport d'électricité, RTE (FR)*

- **ID 366** | *Dynamic equivalent of an active distribution network taking into account model uncertainties*  
Gilles Chaspierre, Thierry Van Cutsem | *University of Liège, Belgium*  
Guillaume Denis, Patrick Panciatici | *RTE, France*
- **ID 603** | *Critical Bus Voltage Mapping using ANFIS with regards to Max Reactive Power in PV buses*  
Fernando Fachini, Benedito Isaias Lima Fuly | *Federal University of Itajubá, Brazil*
- **ID 482** | *A Quasi-Dynamic Tool for Validation of Power System Restoration Strategies at Distribution Level*  
Davood Raoofsheibani, Philipp Hinkel, Wolfram Wellssow | *TU Kaiserslautern, Germany*
- **ID 74** | *Application of Filippov Theory to the IEEE Standard 421.5-2016 Anti-windup PI Controller*  
Mohammed Ahsan Adib Murad, Federico Milano | *University College Dublin, Ireland*  
Brendan Hayes | *Dublin City University, Ireland*
- **ID 543** | *Data-driven Control Design Schemes in Active Distribution Grids: Capabilities and Challenges*  
Stavros Karagiannopoulos, Gabriela Hug | *ETH Zurich, Switzerland*  
Roel Dobbe, Duncan Callaway | *UC Berkeley, USA*  
Petros Aristidou | *University of Leeds, UK*
- **ID 798** | *Fast Calculation of the Transfer Capability Margins*  
Mazhar Ali, Elena Gryazina | *Skolkovo Institute of Science and Technology, Russia*  
Konstantin Turitsyn | *Massachusetts Institute of Technology, United States*

**14:20 - 16:00** | TS 1K | Room BL.270.6

### Innovative Grids in Energy Hybrid Systems Integration – Optimization of Energy Vectors

Chair: Shmuel Oren | *University of California, Berkeley, United States*

- **ID 202** | *On the Solvability of Steady-State Load Flow Problems for Multi-Carrier Energy Systems*  
Anne Markensteijn, Kees Vuik | *Delft University of Technology, Netherlands*  
Johan Romate | *Shell Global Solutions International B.V. and Delft University of Technology, Netherlands*

- **ID 347** | *Energy hub modelling for multi-scale and multi-energy supply systems*  
Lahiru Jayasuriya, Modassar Chaudry, Meysam Qadrdan, Jianzhong Wu, Nick Jenkins | *School of Engineering, Cardiff University, United Kingdom*
- **ID 470** | *Coordination of Power and Natural Gas Systems: Convexification Approaches for Linepack Modeling*  
Anna Schewe, Christos Ordoudis, Jalal Kazempour, Pierre Pinson | *Technical University of Denmark, Denmark*
- **ID 433** | *A Modelling Framework for a Virtual Power Plant with Multiple Energy Vectors Providing Multiple Services*  
James Naughton, Pierluigi Mancarella, Michael Cantoni | *University of Melbourne, Australia*
- **ID 388** | *Implications of Power-to-Heat on Transmission Expansion Needs: A Real Life Case Study*  
Ankita Gaur, Desta Fititwi, John Curtis | *Economic and Social Research Institute- Dublin, Ireland*
- **ID 416** | *Multi-vector energy optimization tools for energy islands*  
Sanket Puranik, Heidi Tuiskula, Iliana Ilieva | *Smart Innovation Norway, Norway*  
Ferran Torrent, Joan Colomer, Joaquim Meléndez | *University of Girona, Spain*

**14:20 - 16:00** | TS 1L | Room BL.270.7

### System Operation and Control - DC Grids: Modeling and Operation

Chair: Martin Braun | *University of Kassel and Fraunhofer Institute for Energy Economics and Energy System Technology IEE, Germany*

- **ID 396** | *Efficient Isomorphism Based Simulation of Modular Multilevel Converters*  
Davide del Giudice, Federico Bizzarri, Daniele Linaro, Angelo Brambilla | *Politecnico di Milano, Italy*
- **ID 323** | *A Real-Time Hardware-In-The-Loop Test Bench for Modular Multilevel Converter with Energy Based Control*  
Haibo Zhang, Moez Belhaouane, Frédéric Colas, Riad Kadri, François Gruson, Xavier Guillaud | *Univ. Lille, Centrale Lille, Arts et Métiers Paris Tech, France*
- **ID 341** | *Dynamic Average Converter Model for MVDC Link Harmonic Analysis*  
Tibin Joseph, Jun Liang, Gen Li, Wenlong Ming | *Cardiff University, United Kingdom*  
Senthooan Balasubramaniam | *Swansea, United Kingdom*  
Andrew Moon, Kevin Smith, James Yu | *SP Energy Networks, United Kingdom*
- **ID 415** | *On Stored Energy Requirement in the Alternate Arm Converter*  
Pierre Vermeersch, Francois Gruson, Xavier Guillaud | *Univ. Lille, Centrale Lille, Arts et Métiers ParisTech, France*  
Philippe Egrot | *Electricité de France R&D - EDF R&D, France*  
Michaël M.C. Merlin | *School of Engineering, University of Edinburgh, United Kingdom*

- **ID 831** | *A Distributed Optimal Power Flow for Secondary Control of Hybrid AC/DC Networks*  
Niklas Wehring, Daniel Schema, Falko Wöhner, Albert Moser | *Institute of Power Systems and Power Economics (IAEW), Germany*
- **ID 91** | *Robust L1 Estimators for Interconnected AC/DC Power Systems*  
Ali Abur, Arthur Mouco | *Northeastern University, United States*

**16:10 - 17:50** | EP 2 | Room BL.270.1

### *H2020 MIGRATE - Challenges and Solutions in Future Transmission Networks with High Penetration of Power Electronics*

Organizer: Jako Kilter | *TalTech, Tallinn University of Technology, Estonia*

- Mitigation approaches for power system stability under high PE penetration – preliminary results  
Sven Rüberg | *TenneT*
- Wide-Area-Controls for improved system stability – results of pilot tests in Iceland  
Birkir Heimisson | *Landsnet*
- From grid-forming definition to experimental validation with a VSC  
Thibault Prevost | *RTE*
- Protection principles and challenges in future power systems  
Jose Chavez | *TU Delft*
- Probabilistic approach for assessment of harmonic propagation in power networks  
Jovica Milanovic | *The University of Manchester*

**16:10 - 17:50** | TS 1M | Room BL.270.2

### *System Operation and Control – Grid Operation with EVs and DERs*

Chair: Mircea Eremia | *University Politehnica of Bucharest, Romania*

- **ID 695** | *Optimal charging coordination of electric vehicles considering distributed energy resources*  
Adrian-Toni Radu, Mircea Eremia, Lucian Toma | *University Politehnica of Bucharest, Romania*
- **ID 276** | *Optimal Day-Ahead Energy and Reserve Bidding Strategy of a Risk-Averse Electric Vehicle Aggregator in the Nordic Market*  
Lars Herre, Jacob Dalton, Lennart Söder | *KTH Royal Institute of Technology, Sweden*
- **ID 420** | *A Hybrid Robust-Stochastic Approach for the Day-Ahead Scheduling of an EV Aggregator*  
Simone Minniti, Niyam Haque, Nikolaos Paterakis, Phuong Nguyen | *Eindhoven University of Technology, Netherlands*
- **ID 746** | *The Impact of Electric Vehicles Aggregator on the Stability Region of Micro-Grid System with Communication Time Delay*  
Hakan Gündüz, Şahin Sönmez, Saffet Ayasun | *Nigde Omer Halisdemir University, Turkey*

- **ID 679** | *Identification of Stability Delay Margin for Load Frequency Control System with Electric Vehicles Aggregator using Rekasius Substitution*  
Ausnain Naveed, Şahin Sönmez, Saffet Ayasun | *Nigde Omer Halisdemir University, Turkey*
- **ID 469** | *Medium- and Low-voltage Planning of Electric Power Distribution Systems with Distributed Generation, Energy Storage Sources, and Electric Vehicles*  
Diogo Rupolo, José Roberto Sanches Mantovani | *São Paulo State University, UNESP, Brazil*  
Benvindo Rodrigues Pereira Junior | *University of São Paulo, Brazil*

**16:10 - 17:50** | TS 1N | Room BL.270.3

### *System Operation and Control - Advance Methods for Security and Reliability Improvement*

Chair: Math Bollen | *Luleå Technical University, Sweden*

- **ID 50** | *Impact of the Periodicity of Feeder Re-Allocation on the Efficiency of Under-Frequency Load Shedding*  
Barnabé Potel, Florent Cadoux, Vincent Debusschere | *Univ. Grenoble Alpes, CNRS, France*  
Leticia de Alvaro Garcia | *Enedis, France*
- **ID 850** | *Dynamic Thermal Rating for Efficient Management of Post-Contingency Congestions*  
Duo Fang, Jagadeesh Gunda, Mingzhe Zou, Sasa Djokic, Gareth Harrison | *The University of Edinburgh, United Kingdom*  
Alfredo Vaccaro | *University of Sannio, Italy*
- **ID 107** | *An Extended Metric for the Analysis of Power-Network Vulnerability: The Electrical Line Centrality*  
Rafael Espejo, Sara Lumbreras, Andres Ramos | *Universidad Pontificia Comillas, Spain*  
Tao Huang, Ettore Bompard | *Politecnico di Torino, Italy*
- **ID 558** | *Cost-Reliability Optimization of Automation and Protection Configurations in Active Distribution Grids*  
Michiel Tavernier, Stavros Karagiannopoulos, Gabriela Hug | *ETH Zurich, Switzerland*  
Philipp Fortenbacher | *FEN - Research Center for Energy Networks, ETH Zurich, Switzerland*  
Evdokia Kaffe | *Elektrizitaetswerk der Stadt Zurich (ewz), Switzerland*
- **ID 348** | *Intrusion Detection in Smart Grid Measurement Infrastructures based on Principal Component Analysis*  
Elisabeth Drayer, Tirza Routtenberg | *Ben-Gurion University of the Negev, Israel*
- **ID 336** | *Approaches To Obtain Usable Solutions For Infeasible Security-Constrained Optimal Power Flow Problems Due To Conflicting Contingencies*  
Florin Capitanescu | *Luxembourg Institute of Science and Technology (LIST), Luxembourg*



**16:10 - 17:50 | TS 1O | Room BL.27.0.6***Innovative Grids in Energy Hybrid Systems Integration  
Technical and Regulatory Aspects*Chair: Neville Watson | *University of Canterbury, New Zealand*

- **ID 231** | *Three-Phase Current-Limiting Droop Controlled Inverters Operating in Parallel*  
Alexandros Paspatis, George Konstantopoulos | *The University of Sheffield, United Kingdom*
- **ID 209** | *Critical Model Parameters: A Security Vulnerability in Electricity Market Operation*  
Ali Abur | *Northeastern University, United States*  
Yuzhang Lin | *University of Massachusetts-Lowell, United States*  
Hanchen Xu | *University of Illinois-UC, United States*
- **ID 810** | *Coordination between an Aggregator and Distribution Operator to Achieve Network-Aware Load Control*  
Stephanie Ross, Necmiye Ozay, Johanna Mathieu | *University of Michigan, United States*
- **ID 844** | *IGDT Opportunity Method in the Trading Framework of Risk-Seeker Demand Response Aggregators*  
Morteza Vahid-Ghavidel, Miadreza Shafie-khah | *INESC TEC, Portugal*  
João P. S. Catalão | *FEUP and INESC TEC, Portugal*  
Sahar Seyyedeh Barhagh, Behnam Mohammadi-Ivatloo | *University of Tabriz, Iran*
- **ID 779** | *Analyses of electrification and battery ageing processes in a real offgrid hybrid microgrid*  
Olivia Rigovacca, Pietro Raboni | *Engie EPS, Italy*  
Simone Polimeni, Giampaolo Manzolini, Sonia Leva | *Politecnico di Milano, Italy*
- **ID 187** | *Joint investment and operation optimization of a distribution system in a market environment*  
Xuejiao Han, Gabriela Hug | *ETH Zurich, Switzerland*

**16:10 - 17:50 | TS 1P | Room BL.27.0.7***System Operation and Control – Transmission Grid Expansion Planning*Chair: Maurizio Delfanti | *RSE S.p.A.*

- **ID 84** | *Impact of Carbon Tax Flexibility on the Chilean Power System Expansion Planning*  
Andres Pereira, Enzo Sauma, Juan Montero | *Pontificia Universidad Católica de Chile, Chile*
- **ID 735** | *Robust Transmission Expansion Planning Associated with Wind Farms Integration*  
Seyed Mazyar Mirhosseini Moghaddam, Sanaz Mahmoudi, Behnam Alizadeh, Magnolia Khadir | *Lahijan Branch, Islamic Azad University (IAU), Iran*
- **ID 644** | *An Ambiguity Averse Approach for Transmission Expansion Planning*  
Alexandre Moreira da Silva, Goran Strbac | *Imperial College London, United Kingdom*  
Bruno Fanzeres | *Pontifical Catholic University of Rio de Janeiro, Brazil*

- **ID 334** | *Integrated Grid Planning Model with High Distributed Solar PV*  
Syahrul Nizam Md Saad, Adriaan Hendrik van der Weijde | *University of Edinburgh, United Kingdom*
- **ID 829** | *A three-stage multi-year transmission expansion planning using heuristic, metaheuristic and decomposition techniques*  
Luiz Eduardo de Oliveira, João Paulo Tomé Saraiva, Phillipe Vilaça Gomes | *INESC TEC and the Faculty of Engineering of the University of Porto, Portugal*  
Francisco Damasceno Freitas | *University of Brasília, Brazil*
- **ID 154** | *Governor Parameter Estimation Considering Upper/Lower Production Limits*  
Mahsa Sajjadi, Hossein Seifi | *Tarbiat Modares University, Iran*

**16:10 - 17:50 | EVENT | Room BL.27.0.4***ENERGY Start&Meet UP**Deep Tech and R&D value: challenges to impact on strategic energy systems*

Chairs:

Jean-Luc Dormoy | *Shaman*Domenico Pannofino | *PoliHub Incubator*Mauro Tosi | *LEDCom International*Janati Nakimera | *Solar Net Metering*Manuele Aufiero | *MilanoMultiphysics*Nicola Fergnani | *Hydro Smart*Jacopo Berlusconi | *USES4*Elisa Baronchelli | *Ecomet refining*

DETAILED PROGRAM | TUESDAY, June 25<sup>th</sup>

08:30 - 10:10 | SS 1 | Room BL.270.1

*Microgrid for Electrification in Developing Countries*

Organizers:

Marta Molinas | *NTNU*Marco Merlo | *Politecnico di Milano, Italy*

- Electrification pathways for sustainable development  
Claudia Pavarin | *World Energy Outlook, Energy Modeller, International Energy Agency*
- Energy for inclusive development in South Asia  
Reihana Mohideen | *University of Melbourne, Australia*
- **ID 390** | *Comparison among deterministic methods to design rural mini-grids: effect of operating strategies*  
Davide Fioriti, Davide Poli, Paolo Cherubini, Giovanni Lutzemberger | *University of Pisa, Italy*  
Andrea Micangeli | *University of Rome Sapienza, Italy*  
Pablo Duenas-Martinez | *Massachusetts Institute of Technology*
- **ID 726** | *Two-stage stochastic sizing of a rural micro-grid based on stochastic load generation*  
Nicolo' Stevanato, Francesco Lombardi, Emanuela Colombo | *Politecnico di Milano, Italy*  
Sergio Balderrama | *University of Liège, Belgium*  
Sylvain Quoilin | *KU Leuven, Belgium*
- **ID 419** | *Pre-feasibility techno-economic comparison of rural electrification options: exploitation of PV and wind*  
Fabio Scazzosi, Stefano Mandelli, Alessandro Bertani | *CESI S.p.A., Italy*  
Matteo Moncecchi, Marco Merlo | *Politecnico di Milano, Italy*
- Industrial experience in electrification projects: "Hybrid Microgrid, on grid, off grid"  
Antonio Zingales | *Sales Manager - SAET*
- Eritrea Mobility and Cultural Heritage: New Frontiers of the Horn of Africa  
Susanna Bortolotto | *Politecnico di Milano, Italy*

**08:30 - 10:10 | TS 2A | Room BL.270.2***Innovative Grids in Energy Hybrid Systems Integration – Forecasting and Mitigation of Variable Renewable Sources*Chair: Anastasios Bakirtzis | *Aristotle University of Thessaloniki, Greece*

- **ID 130** | *Risk-adjusted Cost Ratios for Quantifying Improvements in Wind Power Forecasting*  
Fathalla Eldali, Siddharth Suryanarayanan | *Colorado State University, United States*  
Mauricio Samper | *Institute of Electric Energy, CONICET-UNSJ, Argentina*
- **ID 144** | *Active Management of LV Residential Networks under High PV Penetration*  
Seyyed Mahdi Noori Rahim Abadi, Masoume Mahmoodi, Paul Scott, Lachlan Blackhall, Sylvie Thiebaux | *Australian National University, Australia*
- **ID 418** | *Dynamic Behavior of Conventional and Storage Power Plants in a Single Power System*  
Harald Weber, Nayeemuddin Ahmed, Martin Töpfer, Paul Gerdun, Vinaykumar Vernekar | *University of Rostock, Germany*
- **ID 453** | *Interval-Based Adaptive Inertia and Damping Control of a Virtual Synchronous Machine*  
Uros Markovic, Nicolas Früh, Gabriela Hug | *ETH Zurich, Switzerland*  
Petros Aristidou | *University of Leeds, United Kingdom*
- **ID 346** | *Static vs dynamic FRR sizing for power systems with increasing amounts of renewables*  
Marie-Liesse Cauwet, Efthymios Karangelos | *University of Liège, Belgium*  
Louis Wehenkel | *University of Liège, Belgium*  
Bruno Georis | *Engie, Belgium*
- **ID 502** | *Sizing Storage for Reliable Renewable Integration*  
Vivek Deulkar, Jayakrishnan Nair, Ankur Kulkarni | *IIT Bombay, India*

**08:30 - 10:10 | TS 2B | Room BL.270.3***System Operation and Control – Optimization Methods for Active and Reactive Power Flows*Chair: Janusz Bialek | *Skolkovo Institute of Science and Technology (Skoltech), Russia*

- **ID 125** | *A Stochastic Market-Clearing Model Using Semidefinite Relaxation*  
Erik Francisco Alvarez Quispe, Juan Camilo López Amezcuita, Pedro Pablo Vergara Barros, Jefferson Javier Chavez Arias, Marcos Julio Rider Flores | *University of Campinas, Brazil*
- **ID 425** | *Theoretical Potential of Dynamic Line Ratings for Congestion Management in Large-Scale Power Systems*  
Maximilian Schneider, André Hoffrichter, Ralf Puffer | *RWTH Aachen University, Germany*

- **ID 64** | *Evaluation of the Uncertainties used to Perform Flow Security Assessment: A Real Case Study*  
Maria Helena Vasconcelos | *INESC TEC and FEUP, Portugal*  
Carla Gonçalves | *INESC TEC and FCUP, Portugal*  
José Meirinhos | *INESC TEC, Portugal*  
Nicolas Omont | *Réseau de Transport d'Electricité (RTE), France*  
Andrea Pitto, Gaia Ceresa | *Ricerca sul Sistema Energetico (RSE S.p.A.), Italy*
- **ID 687** | *Performance Assessment of Linearized OPF-based Distributed Real-time Predictive Control*  
Rahul Kumar Gupta, Fabrizio Sossan, Mario Paolone | *EPFL, Switzerland*
- **ID 421** | *Reliability improvement of distribution system through distribution system planning: MILP vs. GA*  
Sanja Duvnjak Zarkovic, Stefan Stankovic, Ebrahim Shayesteh, Patrik Hilber | *KTH Royal Institute of Technology, Sweden*
- **ID 727** | *Reactive Power Provision with Distributed Energy Resources: Limitations, Potentials and Losses*  
Hartmudt Köppe, Merten Schuster | *Technische Universität Braunschweig, Germany*  
Robin Grab | *Fraunhofer Institute for Solar Energy Systems ISE, Germany*  
Bernd Engel | *Technische Universität Braunschweig, Germany*

**08:30 - 10:10 | TS 2C | Room BL.270.6***System Operation and Control – Power Quality Mitigation in Power Systems*Chair: Alberto Borghetti | *University of Bologna, Italy*

- **ID 598** | *Lightning-Originated Overvoltages in a Multi-Circuit HV-MV Line*  
Alberto Borghetti, Fabio Napolitano Carlo Alberto Nucci, Juan Diego Rios Penaloza, Fabio Tossani | *University of Bologna, Italy*  
Guilherme Martinez Ferraz | *High Voltage Equipment (HVEX) Itajubá, Brazil*  
Alexandre Piantini | *University of Sao Paulo, Brazil*
- **ID 488** | *Optimal tuning and placement of POD for SSCI mitigation in DFIG-based power system*  
Muhammad Taha Ali, Mehrdad Ghandhari, Lennart Harnefors | *KTH Royal Institute of Technology, Sweden*
- **ID 508** | *Modular White-Box Model of single-phase Photovoltaic Systems for Harmonic Studies*  
Elias Kaufhold | *TU Dresden, Germany*
- **ID 270** | *Comparison of a non-parametric and parametric method for interharmonic estimation in PV systems*  
Vineetha Ravindran, Tatiano Busatto, Sarah Rönnberg, Math Bollen | *Luleå Technical University, Sweden*
- **ID 462** | *Smart Transformer requirements for integration in distribution grids and power quality improvement*  
Giovanni De Carne, Xiang Gao, Zhixiang Zou, Marco Liserre | *Kiel University, Germany*  
Ali Kazerooni, Michael Eves | *SP Energy Networks, United Kingdom*



- **ID 627** | *Properties of Direct-Time and Reversed-Time Transfer Functions to Locate Disturbances along Power Transmission Lines*  
Zhe Chen, Zhaoyang Wang, Farhad Rachidi | *Electromagnetic Compatibility (EMC) Laboratory, Swiss Federal Institute of Technology (EPFL), Switzerland*  
Mario Paolone | *Distributed Energy System Laboratory (DESL), Swiss Federal Institute of Technology (EPFL), Switzerland*

**08:30 - 10:10** | TS 2D | Room BL.270.7

### System Operation and Control – Power System Stability with Large Renewable Sources

Chair: Luigi Martirano | *University of Rome*

- **ID 456** | *Improvement of the Consideration of Short-Circuit Current Contributions from Doubly-Fed Induction Generator Based Wind Turbines for Short-Circuit Current Calculation According to IEC 60909*  
Thomas Lager, Lutz Hofmann | *Institute of Electric Power Systems, Germany*
- **ID 688** | *Impact of Inertia Distribution on Power System Stability and Operation*  
Bahman Alinezhad Osbouei, Gareth Taylor | *Brunel University London, United Kingdom*  
Olivier Bronckart, Johan Maricq | *Elia Group, Belgium*  
Martin Bradley | *UK National Grid, United Kingdom*
- **ID 835** | *Measurement-based inertia estimation method considering system reduction strategies and dynamic equivalents*  
Guido Rossetto Moraes, Fabio Pozzi, Valentin Ilea, Alberto Berizzi | *Politecnico di Milano, Italy*  
Giorgio Giannuzzi, Roberto Zaottini, Enrico Maria Carlini | *Terna Rete Italia SpA, Italy*
- **ID 301** | *Assessing the Impact of Offshore Wind Farm Grid Configuration on Harmonic Stability*  
Matthias Quester, Viswaja Yelliseti, Fisnik Loku Ralf Puffer | *RWTH Aachen University, Germany*
- **ID 361** | *Centralized Wide Area Damping Controller for Power System Oscillation Problems*  
Jean Dobrowolski, Petr Korba, Felix Rafael Segundo Sevilla | *Zurich University of Applied Science (ZHAW), Switzerland*  
Walter Sattinger | *Swissgrid Switzerland*
- **ID 612** | *Harmonic Resonance Analysis for DFIG-based Offshore Wind Farm with VSC-HVDC Connection*  
Yonggang Zhang, Christian Klabunde, Martin Wolter | *Otto-von-Guericke-Universität Magdeburg, Germany*

**10:30 – 12:10** | PLENARY SESSION 2 | BL28 Room “CARASSA DADDA”

Streaming BL.270.1 and BL.270.2

### Multidisciplinary Research. Power System and Computational Intelligence

Chair: Antonio Volpin | *Senior Partner, McKinsey's Electric Power & Natural Gas Practice in the Asia-Pacific region*

Keynote Speakers:

- Ganesh Kumar Venayagamoorthy | *Distinguished Professor of Electrical and Computer Engineering, Clemson University, Clemson, SC*
- David Hill | *Chair of Electrical Engineering, The University of Hong Kong*
- Yilu Liu | *Governor's Chair Professor, The University of Tennessee, Knoxville*
- Chicco Testa | *Chairman, Sorgenia*

**13:00 - 14:20** | PS 2A | BL27 First Floor | Poster Area

### Planning and Operation of Power Systems under Market Condition - Distributed Generation, Renewables and Energy Storage Systems

Chair: Davide Poli | *Università di Pisa, Italy*

- **ID 136** | *Modelling the Growth of DG Market and the Impact of Incentives on its Deployment: Comparing Fixed Adoption and System Dynamics Methods in Brazil*  
Mario Domingos Pires Coelho | *University of Porto, Brazil*  
João Tome Saraiva | *University of Porto, Portugal*  
Gabriel Konzen, Maria Cecilia Araujo | *Energy Research Office, Brazil*  
Adelino Coelho Pereira | *Instituto Superior de Engenharia de Coimbra, Portugal*
- **ID 680** | *Receding horizon algorithm for dynamic transformer rating and its application for real-time economic dispatch*  
Ildar Daminov, Anton Prokhorov | *Tomsk Polytechnic University, Russia*  
Raphael Caire, Marie-Cecile Alvarez-Herault | *Univ. Grenoble Alpes, CNRS, France*
- **ID 312** | *The Role of Nuclear Power Plants in Electricity Systems with High RES Share*  
Timo Gerres, José Pablo Chaves Ávila, Francisco Martín Martínez, Michel Rivier Abbad, Tomás Gómez San Román | *Universidad Pontificia Comillas, ICAI, Spain*
- **ID 634** | *A Long-term Reactive Power Planning Framework for Transmission Grids with High Shares of Variable Renewable Generation*  
Nikolaos Savvopoulos | *National Technical University of Athens (NTUA), Greece*  
C. Yaman Evrenosoglu, Adamantios Marinakis, Alexandre Oudalov | *ABB Power Grids Division, Switzerland*  
Nikos Hatziargyriou | *National Technical University of Athens (NTUA), Greece*
- **ID 353** | *Allocation of Active Power Reserve from Active Distribution Networks Using a Cost-Benefit Approach: Application to Swissgrid Network*  
Mohsen Kalantar-Neyestanaki, Mokhtar Bozorg, Fabrizio Sossan, Rachid Cherkaoui | *EPFL, Switzerland*

- **ID 823** | *Mitigation analysis of MV distribution network constraints thanks to a self-consumption policy for photovoltaic distributed units*  
Valentin Pailloux, Bruno Francois | *L2EP - Centrale Lille, France*
- **ID 280** | *Conversion of Balancing Energy Offers from Generating, Demand Response and Energy Storage Resources*  
Ilias Marneris, Christos Roumkos, Pandelis Biskas, Anastasios Bakirtzis | *Aristotle University of Thessaloniki, Greece*
- **ID 87** | *Two-Stage General Variable Neighborhood Search Algorithm to Solve the Static Transmission Network Expansion Planning*  
Gustavo Rebello, Edimar José de Oliveira, Marina Borges | *Federal University of Juiz de Fora, Brazil*

13:00 - 14:20 | PS 2B | BL27 First Floor | Poster Area

### Modelling, Analysis and Operation of HVDC and DC Distribution Systems

Chair: Morris Brenna | *Politecnico di Milano, Italy*

- **ID 228** | *Benefit Analysis of a Hybrid HVAC/HVDC Transmission Line: a Swiss Case Study*  
Ognjen Stanojev, Jared Garrison, Turhan Demiray | *Research Center for Energy Networks, ETH Zurich, Switzerland*  
Sören Hedtko, Christian Franck | *High Voltage Laboratory, ETH Zurich, Switzerland*
- **ID 337** | *Approximation of Current Contribution by Converters with DC Fault Ride-Through Capability for Short Circuit Current Calculation of DC Distribution Grids*  
Raphael Bleilevens, Alexander Jaschek, Albert Moser | *RWTH Aachen University, Germany*
- **ID 383** | *New Synchronous Condenser – Flywheel Systems for a Decarbonized Sardinian Power System*  
Francesco Palone | *TERNA Rete Italia S.p.A., Italy*  
Fabio Massimo Gatta, Alberto Geri, Stefano Lauria, Marco Maccioni | *Sapienza" University of Rome, Italy*
- **ID 461** | *Zonal DC Distribution System based on Multiport Converters: Fault Analysis and Protection Design*  
Simone Negri, Enrico Tironi | *Politecnico di Milano, Italy*  
Giovanni Ubezio | *Energy Components & Consulting S.r.l., Italy*
- **ID 851** | *Study on TOV after Fault Recovery in VSC based HVDC systems*  
Hani Saad, Sebastien Dennetière | *RTE, France*
- **ID 691** | *Robust Research of Power Oscillations Damping Controller for HVDC Inserted in Meshed AC Grids*  
Yankai XING, Bogdan Marinescu | *Ecole Centrale de Nantes, France*  
Florent Xavier | *Réseau de transport d'électricité (RTE), France*

- **ID 755** | *Model Predictive Control of VSC-HVDC Embedded into AC Grid Subject to State and Control Constraints*  
Emile Thau, Elkhatab Kamal, Bogdan Marinescu | *Ecole Centrale de Nantes, France*  
Guillaume Denis | *RTE, France*
- **ID 833** | *Dynamic System Performance Analysis of a Novel Grid Connection Topology for Offshore Wind Farms using MMC-HVDC Transmission*  
Pedro Lozada, Jose Rueda | *TU Delft, Netherlands*  
C.G.A. Koreman | *TenneT TSO B.V, Netherlands*  
M.A.M.M. van der Meijden | *TU Delft, TenneT TSO B.V, Netherlands*
- **ID 370** | *Impact of VSC-HVDC Reactive Power Control Schemes on Voltage Stability*  
Josep Oriol Bernat, Robin Preece | *The University of Manchester, United Kingdom*

13:00 - 14:20 | PS 2C | BL27 First Floor | Poster Area

### Power Quality Issues in Power Systems

Chair: Cristian Lazaroiu | *University POLITEHNICA of Bucharest, University MARITIMA of Constanta, Romania*

- **ID 325** | *Impact of Load Unbalance on Low Voltage Network Losses*  
Nuno Fidalgo, Carlos Moreira | *INESC TEC, Portugal*  
Rafael Cavalheiro | *FEUP, Portugal*
- **ID 389** | *On the Methods of Resonance Identification in Power Systems*  
Amir Arasteh, Ömer Göksu, Jayachandra Naidu Sakamuri, Nicolaos Antonio Cutululis | *DTU Wind Energy (Technical University of Denmark), Denmark*
- **ID 527** | *Measurement Based Identification of Equivalent Circuit Models for Aggregated Harmonic Impedances of Public Low Voltage Grids*  
Max Domagk, Robert Stiegler, Jan Meyer | *Technische Universität Dresden, Germany*
- **ID 313** | *Frequency-Domain Modeling of Nonlinear Power System Devices: the Quasi-Sinusoidal Volterra Approach*  
Christian Laurano, Sergio Toscani, Michele Zanoni | *Politecnico di Milano, Italy*
- **ID 173** | *Simultaneous Optimal Placement and Sizing of DSTATCOM and Parallel Capacitors in Distribution Networks Using Multi-Objective PSO*  
Arash Zeinalzadeh | *North Khorasan Electric Distribution Company, Iran*  
Abouzar Estebarsari | *Politecnico di Torino, Italy*  
Alireza Bahmanyar | *Iran University of Science and Technology, Iran*
- **ID 478** | *The impact of voltage dips to low-voltage-ride-through capacity of doubly fed induction generator based wind turbine*  
Cheng Chen | *Royal Institute of Technology (KTH), Sweden*  
Azam Bagheri, Math Bollen | *Luleå University of Technology, Sweden*  
Massimo Bongiorno | *Chalmers University of Technology, Sweden*

- **ID 849** | *Review of Responsibilities Assignment Methods for Harmonic Emission*  
Camilo Garzón, Andrés Pavas | *Universidad Nacional de Colombia, Colombia*
- **ID 310** | *Secondary Harmonic Emission in Wind Power Plants*  
Daphne Schwanz, Math Bollen, Anders Larsson | *Luleå University of Technology, Sweden*
- **ID 852** | *Operational Performance and Instability of PV Inverters Under Different Control Methods*  
Nan Zhang, Sasa Djokic | *The University of Edinburgh, United Kingdom*  
Sergey Yanchenko | *Moscow Power Engineering Institute, Russia*  
Sarath Perera | *University of Wollongong, Australia*  
Igor Papic | *University of Ljubljana, Slovenia*
- **ID 864** | *Iteratively-Coupled Co-simulation Framework for Unbalanced Transmission-Distribution System*  
Gayathri Krishnamoorthy, Anamika Dubey | *Washington State University, United States*  
PK Sen | *Colorado School of Mines, United States*

**13:00 - 14:20** | PS 2D | BL27 First Floor | Poster Area

*Power System Dynamics, Stability and Control – Inverter-Connected Power Sources*

 Chair: Roberto Perini | *Politecnico di Milano, Italy*

- **ID 24** | *Adaptive Fast Frequency Response for Power Electronic Connected Energy Sources*  
John Fradley, Robin Preece, Mike Barnes | *The University of Manchester, United Kingdom*
- **ID 145** | *Design of Proportional-Resonant Controller with Zero Steady-State Error for a Single-Phase Grid-Connected Voltage Source Inverter with an LCL Output Filter*  
Ahmad Ali Nazeri, Peter Zacharias | *University of Kassel, Germany*  
Federico Martin Ibanez | *Skolkovo Institute of Science and Technology, Russia*  
Sakda Somkun | *Naresuan University, Thailand*
- **ID 710** | *Grid Supporting VSCs in Power Systems with Varying Inertia and Short-Circuit Capacity*  
Georgios Misyris, Jeanne Mermet-Guyennet, Spyros Chatzivasilieiadis, Tilman Weckesser | *Technical University of Denmark, Germany*
- **ID 253** | *Tuning of AC voltage-controlled VSC based Linear Quadratic Regulation*  
Taoufik Qoria, Chuanyue Li, Ko Oue, François Gruson, Frédéric Colas, Xavier Guillard, | *L2EP, France*  
Thibault Prévost | *Réseau de Transport d'Electricité, France*
- **ID 193** | *An Event-Based Wide Area Control System Using Inverters of Photovoltaic Generation for Improvement of Transient Stability in Power Systems*  
Kenichi Kawabe, Toshiya Nanahara | *Tokyo Institute of Technology, Japan*
- **ID 536** | *Holistic Time-Varying Small Signal Stability Assessment in PV-Rich Power Systems*  
William Nacmanson, Dillon Jaglal, Luis Ochoa | *University of Melbourne, Australia*

- **ID 537** | *Characterization of the Grid-forming function of a power source based on its external frequency smoothing capability*  
Marie-Sophie Debry, Guillaume Denis, Thibault Prévost | *Réseau de Transport d'Electricité, France*
- **ID 764** | *Critical Clearing Time Calculation using Energy Functions for VSC based Grid Connected PV Generators with PQ Control*  
Indla Rajitha Sai Priyamvada, Sarasij Das | *Indian Institute of Science, Bangalore, India*
- **ID 387** | *Robust Converter Control Design under Time-Delay Uncertainty*  
David Rodriguez Flores, Uros Markovic, Gabriela Hug | *ETH Zurich, Switzerland*  
Petros Aristidou | *University of Leeds, United Kingdom*

**13:00 - 14:20** | PS 2E | BL27 First Floor | Poster Area

*Network Modeling, Protection and Security – Fault Detection and Protection Coordination*

 Chair: Héctor Chávez | *University of Santiago, Chile*

- **ID 322** | *Protection Issues in DC Traction System with Regenerative Braking*  
Carola Leone, Morris Brenna, Federica Foiadelli, Michela Longo | *Politecnico di Milano, Italy*
- **ID 114** | *Performance Assessment of Distance Protection in Systems with High Penetration of PVs*  
Alexander Novikov | *R&D Center for Power Engineering Moscow, Russia*  
Jose de Jesus Chavez, Marjan Popov | *TUDELFT, Netherlands*
- **ID 484** | *System of the Traveling-Wave Fault Location in 6(10) kV Treelike Distribution Electric Grids*  
Rustem Khuzyashev, Igor Kuzmin, Vitaliy Vasilev, Samat Tukaev | *Kazan State Power Engineering University, Russia*
- **ID 613** | *Impact of Distributed PV Generation on Relay Coordination and Power Quality*  
Muhammad Akmal, Faris Al-Naemi | *Sheffield Hallam University, United Kingdom*  
Nusrat Iqbal, Anas Al-Tarabsheh | *Abu Dhabi University, United Arab Emirates*  
Lasantha Meegahapola | *RMIT University, Australia*
- **ID 126** | *Locating Faults on Transmission Lines using Unscented Kalman Filter*  
Sayari Das, Bijaya Ketan Panigrahi | *Indian Institute of Technology, Delhi, India*
- **ID 34** | *Issues and Challenges of Steady-State Fault Calculation Methods in Power Systems With a High Penetration of Non-Synchronous Generation*  
Rafat Aljarrah, Hesamoddin Marzooghi, Vladimir Terzija | *The University of Manchester, United Kingdom*  
James Yu | *SP Energy Networks, United Kingdom*
- **ID 295** | *A Novel Model Recognition -based Current Differential Protection in Time-Domain*  
Kaiqi Ma, Zhe Chen, Claus Leth Bak, Zhou Liu | *Aalborg University, Denmark*
- **ID 321** | *Comparative Study between Single-Objective and Multi-Objective Optimization Approaches for Directional Overcurrent Relays Coordination Considering Different Fault Locations*  
Mohamed Afifi, Hebatallah Sharaf, Mahmoud Sayed, Doaa Khalil Ibrahim | *Cairo University, Egypt*



- **ID 606** | *New Method Based on Wavelet Transform and ANN for Multiterminal HVDC System Protection*

Julio Torres, Ricardo Santos | *Federal University of ABC, Brazil*

**13:00 - 14:20** | PS 2F | BL27 First Floor | Poster Area

### *Machine Learning and Computational Intelligence in Power Systems*

Chair: Anna Mutule | *Institute of Physical Energetics, Latvia*

- **ID 283** | *An Application of Machine Learning for a Smart Grid Resource Allocation Problem*  
Yingying Zheng, Siddharth Suryanarayanan, Howard Jay Siegel, Anthony A. Maciejewski | *Colorado State University, United States*  
Berk Celik | *Université de Toulouse, France*  
Timothy M. Hansen | *South Dakota State University, United States*
- **ID 442** | *State of Health Prediction of Li-ion Batteries using Incremental Capacity Analysis and Support Vector Regression*  
Mohsen Vatani, Preben J.S. Vie | *Institute for Energy Technology (IFE), Norway*  
Mariusz Szerepko | *University of Oslo (UiO), Norway*
- **ID 897** | *Intra-day forecasting of building-integrated PV systems for power systems operation using ANN ensemble*  
Gabriel Mendonça de Paiva, Sergio Pires Pimentel, Enes Gonçalves Marra, Bernardo Pinheiro de Alvarenga | *Federal University of Goias, Brazil*  
Sonia Leva, Marco Mussetta | *Politecnico di Milano, Italy*
- **ID 549** | *Day-ahead electricity market price forecasting using artificial neural network with spearman data correlation*  
João Nascimento | *Energia Simples, Portugal*  
Tiago Pinto, Zita Vale | *Polytechnic of Porto, Portugal*
- **ID 335** | *Soft Computing Techniques for Designing of Adaptive Power System Stabilizer*  
Pimal Gandhi | *Sardar Vallabhbhai Patel Institute of Technology, India*  
Satish Joshi | *The M.S. University of Baroda, India*
- **ID 351** | *On-line Voltage Instability Prediction using an Artificial Neural Network*  
Hannes Hagmar, Le Anh Tuan, Ola Carlson | *Chalmers University of Technology, Sweden*  
Robert Eriksson | *Svenska Kraftnät, Sweden*
- **ID 759** | *Islanding Detection Based on Artificial Neural Network and S-transform for Distributed Generators*  
Thiago S. Menezes, Denis V. Coury | *São Carlos School of Engineering, University of São Paulo, Brazil*  
Ricardo A. S. Fernandes | *Federal University of São Carlos, Brazil*
- **ID 643** | *Data-driven learning from dynamic pricing data - Classification and forecasting*  
Morten Herget Christensen, Diego Caviedes Nozal, Ioannis Kavadas, Pierre Pinson | *Technical University of Denmark, Denmark*

- **ID 753** | *Exploration of Machine Learning Methods for Predicting the Operation Schedule of a Combined Heat and Power Plant*

Johannes Mast, Stefan Rädle, Joachim Gerlach | *Albstadt-Sigmaringen University, Germany*

Oliver Bringmann | *University of Tübingen, Germany*

- **ID 808** | *Exploration of Artificial Intelligence Approaches for the Integration of E-Mobility Energy Storage Systems into Virtual Power Plants*

Stefan Rädle, Johannes Mast, Joachim Gerlach | *Albstadt-Sigmaringen University, Germany*

Oliver Bringmann | *University of Tübingen, Germany*

**13:00 - 14:20** | PS 2G | BL27 First Floor | Poster Area

### *Modeling and Optimization of Hybrid and Multi-Energy Systems*

Chair: Mathaios Panteli | *The University of Manchester, Unites Kingdom*

- **ID 875** | *Learning for DC-OPF: Classifying active sets using neural nets*  
Deepjyoti Deka, Sidhant Misra | *Los Alamos National Laboratory, United States*
- **ID 350** | *Modelling and Simulation of Hybrid PV & BES Systems as Flexible Resources in Smartgrids – Sundom Smart Grid Case*  
Chethan Parthasarathy, Hossein Hafezi, Hannu Laaksonen, Kimmo Kauhaniemi | *University of Vaasa, Finland*
- **ID 437** | *Coordinated Power Smoothing Method of Wind Turbine Considering ESS Degradation Cost*  
Chunghun Kim, Hongjoon Kim, Se-Hee Lee, Sekyung Han | *Kyungpook National University, South Korea*
- **ID 590** | *XSG-based control scheme for a grid-connected hybrid generation system*  
Nadjwa Chettibi, Adel Mellit | *University of Jijel, Algeria*  
Alessandro Massi Pavan, Vanni Lughì | *University of Trieste, Italy*  
Sonia Leva | *Politecnico di Milano, Italy*
- **ID 738** | *Nanogrids with Renewable Sources, Electrical Storage and Vehicle-to-Home Systems in the Household Sector: Analysis for a Single-Family Dwelling*  
Stefano Bracco, Federico Delfino, Giorgio Piazza | *University of Genoa, Italy*  
Federica Foadelli, Michela Longo | *Politecnico di Milano, Italy*
- **ID 814** | *Modified Carbon Trading Based Low-carbon Economic Dispatch Strategy for Integrated Energy System with CCHP*  
Li Yajing, Tang Wenhua, Wu Qinghua | *South China University of Technology, China*
- **ID 239** | *Feasible Operation Regions of Electricity-gas Integrated Energy Distribution System*  
Liu Liu, Dan Wang, Zhengji Meng, Hongjie Jia | *Key Laboratory of Smart Grid of Ministry of Education, Tianjin University, China*  
Weiliang Wang | *State Grid Jiangsu Electric Power Company Maintenance Branch, China*  
Menghua Fan | *State Grid Energy Research Institute, China*

- **ID 887** | *Overview on Photovoltaic Inspections Procedure by means of Unmanned Aerial Vehicles*  
Alessandro Niccolai, Alessandro Gandelli, Francesco Grimaccia, Riccardo Enrico Zich, Sonia Leva | *Politecnico di Milano, Italy*
- **ID 856** | *Control of Interlinking Bidirectional Converter in AC/DC Hybrid Microgrid Operating in Stand-Alone Mode*  
Abdullah Sajid, Reza Sabzehgar | *San Diego State University, United States*  
Mohammad Rasouli | *Penn State Behrend, United States*  
Poria Fajri | *University of Nevada Reno, United States*

### 13:00 - 14:20 | PS 2H | BL27 First Floor | Poster Area

#### Microgrids and Aggregators – Modeling, Design and Control

Chair: Alessandro Massi Pavan | *University of Trieste, Italy*

- **ID 150** | *Introduction of current limiting impedance for a previously solid grounded medium voltage distribution network*  
Alex Castro | *Inproel, Ecuador*  
Dario Zaninelli | *Politecnico di Milano, Italy*
- **ID 886** | *Ground Fault Analysis in a Microgrid Scenario*  
Alberto Dolara, Emanuele Ogliari | *Politecnico di Milano, Italy*  
Pietro Raboni | *ENGIE EPS, Italy*
- **ID 711** | *Multi-Objective Optimization of Urban Microgrid Energy Supply According to Economic and Environmental Criteria*  
Nicoletta Cannata, Maurizio Cellura, Sonia Longo, Francesco Montana, Eleonora Riva Sanseverino | *University of Palermo, Italy*  
Quyen Le Luu, Ninh Quang Nguyen | *Vietnamese Academy of Science and Technology, Vietnam*
- **ID 273** | *Sizing and Operation of an Isolated Microgrid with Cold Storage*  
Selmane Dakir, Ioannis Boukas, Vincent Lemort, Bertrand Cornélusse | *University of Liège, Belgium*
- **ID 319** | *Consensus-Based Distributed Control for Overvoltage Mitigation in LV Microgrids*  
Tam Mai, Niyam Haque, Phuong Nguyen | *Eindhoven University of Technology - TU/e, The Netherlands, Netherlands*
- **ID 806** | *A Guideline for Modeling Voltage and Frequency Controls in AC Microgrids: The Influence of Line Impedance on Transient Time*  
Maryam Majidi, Ahmad Ali Nazari | *University of Kassel, Germany*  
Federico Ibanez, David Pozo | *Skolkovo Institute of Science and Technology, Russia*
- **ID 381** | *Modelling and Transient Stability Analysis of Interconnected Autonomous Hybrid Microgrids*  
Kishan Veerashekar, Stefan Eichner, Matthias Luther | *University of Erlangen-Nuremberg, Germany*

- **ID 201** | *Fault Detection and Localization in LV Smart Grids*  
Nikolaos Sapountzoglou, Bertrand Raison | *Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab, France*  
Nuno Silva | *Efacec, Portugal*
- **ID 803** | *Intentional Island and Dynamic Analysis of a Microgrid*  
Wandry Rodrigues Faria, Mario Oleskovicz, Denis Vinicius Coury, Benvindo Rodrigues Pereira Junior | *University of São Paulo, Brazil*  
Rodrigo Bueno Otto | *Itaipu Technological Park Foundation, Brazil*

### 13:00 - 14:20 | PS 2I | BL27 First Floor | Poster Area

#### Forecasting and Management of Renewable Energy Sources

Chair: Reinaldo Tonkoski | *South Dakota State University, United States*

- **ID 298** | *A Hybrid Approach for Short-Term PV Power Forecasting in Predictive Control Applications*  
Evangelos Vrettos, Christoph Gehbauer | *LBNL (Lawrence Berkeley National Laboratory), United States*
- **ID 573** | *Development of a forecast model for the prediction of photovoltaic power using neural networks and validating the model based on real measurement data of a local photovoltaic system*  
Michael Kelker, Katrin Schulte, Dirk Hansmeier, Felix Annen, Kersten Kröger, Paul Lohmann, Jens Haubrock | *University of Applied Science Bielefeld, Germany*
- **ID 605** | *Improving Forecast Accuracy Using a Synthetic Weather Station: An Incremental Approach and BFCOM2018 Lessons Learned*  
Daniel L. Donaldson, Zafar A. Khan, Dilan Jayaweera | *University of Birmingham, United Kingdom*
- **ID 677** | *Sequence to sequence deep learning models for solar irradiation forecasting*  
Bhaskar Mukhoty, Vikas Maurya, Sandeep Shukla | *Indian Institute of Technology Kanpur, India*
- **ID 840** | *Demand Response Program Implementation for Day-Ahead Power System Operation*  
Mohamed Lotfi, João Catalão | *INESC TEC and FEUP, Portugal*  
Mohammad Sadegh Javadi | *INESC TEC, Portugal*  
Ali Esmaeel Nezhad | *University of Bologna, Italy*  
Miadreza Shafie-khah | *University of Vaasa, Finland*
- **ID 900** | *PV power forecasting improvement by means of a selective ensemble approach*  
Sonia Leva, Marco Mussetta, Alfredo Nespoli, Emanuele Ogliari | *Politecnico di Milano, Italy*
- **ID 587** | *Renewable Energy Integration in India: Present State and Long-Term Perspective*  
Subrata Mukhopadhyay | *Netaji Subhas University of Technology (NSUT), India*  
Sushil Soonee, Samir Saxena, Baba KVS, Narasimhan SR, Pawan Kumar KVN | *POSOCO, India*  
Pankaj Batra | *CEA, India*  
Praveen Agarwal | *POSOCO, India*

- **ID 676** | *Distribution Voltage Regulation Using Combined Local and Central Control Based on Real-Time Data*  
Min-seung Ko, Sae-hwan Lim, Jae-kyeong Kim, Kyeon Hur | *Yonsei University, South Korea*
- **ID 876** | *Assessing Impact of PV Systems on Centralised Generation*  
Michela Longo, Alessandro Corradi, Federica Foadelli, Morris Brenna | *Politecnico di Milano, Italy*
- **ID 524** | *Capacity Value of Variable-Speed Wind Turbines*  
Hamed Farhadi Gharibeh | *Sahand University of Technology, Iran*  
Leyla Mokhtari Khiavi | *University of Tabriz, Iran*  
Meisam Farrokhiyar, Arman Alahyari, David Pozo | *Skolkovo Institute of Science and Technology, Russia*

**13:00 - 14:20** | PS 2J | BL27 First Floor | Poster Area

### Battery Energy Storage Systems

Chair: Pavlos Georgilakis | *National Technical University of Athens (NTUA), Greece*

- **ID 98** | *Battery Energy Storage Degradation Impact on Network Reliability and Wind Energy Curtailments*  
Mohamed Abogaleela, Konstantinos Kopsidas | *University of Manchester, United Kingdom*
- **ID 358** | *Operation Mode Transitions in the Kinetic Battery Model*  
Paul Dicke, Reinhard German | *Friedrich-Alexander University Erlangen-Nürnberg (FAU), Germany*  
Frank Steinbacher, Barbara Schriker | *Siemens AG, Germany*
- **ID 781** | *Estimating the Value of Second Life Batteries for Residential Prosumers*  
Carmen Bas Doménech, Miguel Heleno | *Lawrence Berkeley National Laboratory, United States*
- **ID 611** | *Impacts of Feeder Failure Statistics on EV-Supported Distribution System Reliability Improvement*  
Sitki Guner, Aydogan Ozdemir | *Istanbul Technical University, Turkey*
- **ID 655** | *Frequency Stability Provision From Battery Energy Storage System Considering Cascading Failures, with Applications to Separation Events in Australia*  
Ahvand Jalali, Mehdi Ghazavi Dozein, Pierluigi Mancarella | *The University of Melbourne, Australia*
- **ID 561** | *Impact Index for Allocating Transportable Energy Storage Systems in Power Distribution Networks*  
Sérgio Augusto Morais, Felipe Markson, José Carlos Vieira, Eduardo Asada | *University of São Paulo, Brazil*  
Mauricio Biczkowski | *COPEL Distribuição S.A., Brazil*
- **ID 529** | *Grid-forming inverters replacing Diesel generators in small-scale islanded power systems*  
Pedro Beires | *INESC TEC, Portugal*  
Carlos Moreira, João Peças Lopes | *University of Porto - Faculty of Engineering, INESC TEC, Portugal*

- **ID 791** | *Impact of Operational Decisions and Size of Battery Energy Storage Systems on Demand Charge Reduction*  
Roozbeh Karandeh, Tumininu Lawanson, Valentina Cecchi | *University of North Carolina Charlotte, United States*
- **ID 824** | *Massive Integration of Wind Power at Distribution Level Supported by Battery Energy Storage Systems*  
Juan. M. Lujano-Rojas, José A. Domínguez-Navarro, José M. Yusta | *Univ. Zaragoza, Spain*  
Gerardo J. Osório | *C-MAST/UBI, Portugal*  
Mohamed Lotfi, João Catalão | *INESC TEC and FEUP, Portugal*
- **ID 474** | *Evaluation of Customer-oriented Power Supply Risk with Distributed PV-Storage Energy Systems*  
Mike Brian Ndawula, Antonio De Paola | *University of Bath, United Kingdom*  
Ignacio Hernando-Gil | *University of Bordeaux, France*

**14:20 - 16:00** | SS 2 | Room BL.270.1

### Evolution of Technologies for the Integration of Renewables

Organizer: Michela Longo | *Politecnico di Milano, Italy*

- BESS and automation for renewables grid integration  
Pietro Serra | *ABB*
- Safety related components for the integration of RES  
Ghulam Dar | *SPII – Schaltbau*
- Grid code definition to support high level of penetration of renewables  
Antonello Monti | *RWTH Aachen*
- RES integration into energy vectors. The case of P2X: from Mirroring to Coupling  
Guido Bortoni | *President ARERA*
- Battery Energy Storages for Offgrid Microgrids and novel Behind the Meter Installations  
Pietro Raboni | *Engie-EPS*

**14:20 - 16:00** | TS 2I | Room BL.270.2

### Innovative Grids in Energy Hybrid Systems Integration – Optimization of Active Local Distribution Grids

Chair: Joao Pecos Lopes | *FEUP / INESC TEC, Portugal*

- **ID 279** | *Optimising Load Flexibility for the Day Ahead in Distribution Networks with Photovoltaics*  
Jose Angel Velasco, Hortensia Amaris | *Universidad Carlos III de Madrid, Spain*  
Valentin Rigoni, Alireza Soroudi, Andrew Keane | *University College Dublin, Ireland*



- **ID 105** | *Improving the Scalability of a Prosumer Cooperative Game with K-Means Clustering*  
Liyang Han, Thomas Morstyn, Constance Crozier, Malcolm McCulloch | *University of Oxford, United Kingdom*
- **ID 591** | *Numerical and experimental testing of predictive EMS algorithms for PV-BESS residential microgrid*  
Simone Polimeni, Luca Moretti, Giampaolo Manzolini, Sonia Leva | *Politecnico di Milano, Italy*  
Lorenzo Meraldi, Pietro Raboni | *Engie Eps, Italy*
- **ID 494** | *Energy Management of Buildings with Phase Change Materials Based on Dynamic Programming*  
Zahra Rahimpour, Gregor Verbic, Archie Chapman | *University of Sydney, Australia*
- **ID 760** | *Energy Storage in Madeira, Portugal: Co-Optimizing for Arbitrage, Self-Sufficiency, Peak Shaving and Energy Backup*  
Md Umar Hashmi, Ana Busic | *INRIA and Ecole Normale Supérieure, France*  
Lucas Pereira | *Madeira-ITI/ LARSyS and prsma.com, Portugal*
- **ID 80** | *Verification of Linear Flexibility Range Assessment in Distribution Grids*  
Daniel Contreras, Krzysztof Rudion | *University of Stuttgart, Germany*

**14:20 - 16:00** | TS 2J | Room BL.270.3

#### *Data Science and ICT in Power Technologies – Smart Metering for State Estimation and Analysis*

Chair: Alex Stankovic | *Tufts University, United States*

- **ID 15** | *A Mixed Integer SDP Method for Optimal Meter Placement in Power Transmission Systems*  
Themistoklis Xygkis, George Korres, Nikolaos Manousakis | *University of West Attica (UNIWA), Greece*
- **ID 147** | *Pseudo-Value Generation for Low Voltage State Estimation with Poor Input Data from Smart Meter using Gradient Descent Method*  
Marco Weisenstein, Wolfram Wellssow | *Technical University of Kaiserslautern, Germany*  
Robert Brandalik | *Amprion GmbH, Germany*
- **ID 222** | *Load Identification and Classification of Activities of Daily Living using Residential Smart Meter Data*  
Michael Devlin | *National University of Ireland Galway, Ireland*  
Barry Hayes | *University College Cork, Ireland*
- **ID 707** | *Load Forecasting Benchmark for Smart Meter Data*  
João Viana, Ricardo Bessa | *INESC TEC, Portugal*  
João Sousa | *INESC Coimbra and Polytechnic Institute of Leiria, Portugal*
- **ID 333** | *Efficient management of demand in a power distribution system with smart meter data*  
Zafar A. Khan, Dilan Jayaweera | *University of Birmingham, United Kingdom*
- **ID 371** | *Smart Meter Privacy Control Strategy Including Energy Storage Degradation*  
Ramana Reddy Avula, Tobias Oechtering | *KTH Royal Institute of Technology, Sweden*  
Jun-Xing Chin, Gabriela Hug | *ETH Zurich, Switzerland*

**14:20 - 16:00** | TS 2K | Room BL.270.6

#### *System Operation and Control – Large Scale Wind Farm Integration in Power Systems*

Chair: Costas Vournas | *National Technical University of Athens, Greece*

- **ID 170** | *Economic Analysis on Multi-Terminal VSC HVDC Systems with Wind Farms based on Hierarchical Optimal Power Flow with Stability Constraint*  
Sangwon Kim, Akihiko Yokoyama | *The University of Tokyo, Japan*  
Yusuke Takaguchi, Tomihiro Takano, Kazuyuki Mori, Yoshio Izui | *Mitsubishi Electric Corporation, Japan*
- **ID 434** | *Primary Frequency Support from Offshore Wind Power Plants Connected to HVDC Grid*  
Ali Bidadfar, Oscar Saborio-Romano, Jayachandra Naidu Sakamuri, Müfit Altin, Nicolaos Antonio Cutululis, Poul Ejnar Sørensen | *Technical University of Denmark, Denmark*
- **ID 660** | *Techno-Economic Analysis of HVAC, HVDC and OFAC Offshore Wind Power Connections*  
Stephen Hardy, Kristof Van Brusselen, Stijn Hendrix | *CG Holdings Belgium NV, Belgium*  
Dirk Van Hertem, Hakan Ergun | *KU Leuven, Belgium*
- **ID 211** | *Primary Frequency Response from Offshore Wind Farms Connected to HVdc via Diode Rectifiers*  
Oscar Saborio-Romano, Ali Bidadfar, Jayachandra Naidu Sakamuri, Ömer Göksu, Nicolaos Antonio Cutululis | *Technical University of Denmark, Denmark*
- **ID 468** | *Effects of Wind Power Technology Development on Large-scale VRE Generation Variability*  
Matti Koivisto, Petr Maule, Nicolaos Cutululis, Poul Sørensen | *DTU Wind Energy, Denmark*
- **ID 299** | *Detailed vs. Aggregate Wind Farm representation for Transmission System Voltage Stability Support*  
Theodoros Souxes, Aristeidis Parasidis, Costas Vournas | *National Technical University of Athens, Greece*

**14:20 - 16:00** | TS 2L | Room BL.270.7

#### *System Operation and Control – Distribution Grid Expansion Planning*

Chair: Zita A. Vale | *Polytechnic of Porto, Portugal*

- **ID 459** | *A Literature Review of Intraday Electricity Markets and Prices*  
Priyanka Shinde, Mikael Amelin | *KTH Royal Institute of Technology, Sweden*
- **ID 819** | *Role of Flexible Demand in Supporting Market-Based Integration of Renewable Generation*  
Gerasimos Takis-Defteraios, Dimitrios Papadaskalopoulos, Yujian Ye, Rodrigo Moreno | *Imperial College London, United Kingdom*

- **ID 465** | *Considering local photovoltaic production in planning studies for low voltage distribution grids*  
Ahmed Hadsaid, Vincent Debusschere, Marie-Cécile Alvarez-Herault, Raphaël Caire | *Univ. Grenoble Alpes, CNRS, France*
- **ID 789** | *Quantifying the Flexibility by Energy Storage Systems in Distribution Networks with Large-Scale Variable Renewable Energy Sources*  
Marco R. M. Cruz, Sérgio F. Santos | *UBI, Portugal*  
Desta Z. Fitiwi | *ESRI, Ireland*  
João P. S. Catalão | *INESC TEC and FEUP, Portugal*
- **ID 359** | *Transmission Expansion Planning Considering Detailed Modeling of Expansion Costs*  
Marco Franken, Hans Barrios, Alexander B. Schrief, Ralf Puffer | *RWTH Aachen University, Germany*

### 16:10 – 17:50 | SS 3 | Room BL.27.0.1

#### *Optimization Techniques for Renewable Energy Sources Integration with Energy Storage Devices*

Organizers:

Gianfranco Chicco | *Politecnico di Torino, Italy*  
Samuele Grillo | *Politecnico di Milano, Italy*

- Optimization Applications for Microgrid Operation and Planning  
Claudio Cañizares | *University of Waterloo, Canada*
- Techniques for the optimal planning of distributed energy storage systems  
Mario Paolone | *École Polytechnique Fédérale De Lausanne, Swiss*
- Challenges and solutions to maintaining security in future sustainable power systems  
Florin Capitanescu | *Luxembourg Institute of Science and Technology (LU)*
- **ID 487** | *Optimal DER Regulation and Storage Allocation in Distribution Networks: Volt/Var Optimization and Congestion Relief*  
Federico Silvestro, Paola Pongiglione, Fabio D'Agostino, Matteo Saviozzi, Stefano Massucco | *University of Genova, Italy*
- Congestion management using electrical batteries for an efficient utilization of the existing grid assets  
Patrick Panciatici | *Réseau de transport d'électricité, RTE (FR)*

### 16:10 – 17:50 | TS 2M | Room BL.27.0.2

#### *Innovative Grids in Energy Hybrid Systems Integration – Management of Smart Distribution Grids*

Chair: Mariacristina Roscia | *University of Bergamo, Italy*

- **ID 88** | *Transactive Energy Trading of Residential Prosumers Using Battery Energy Storage Systems*  
Mohammad Sohrab Hasan Nizami, Md. Jahangir Hossain, B M Ruhul Amin, Muhammad Kashif, Edstan Fernandez | *Macquarie University, Australia*  
Khizir Mahmud | *University of New South Wales, Australia*
- **ID 93** | *Decentralized Charging Control of Battery Energy Storage Systems for Distribution System Asset Management*  
Riku Okubo, Shinya Yoshizawa, Yasuhiro Hayashi | *Waseda University, Japan*  
Shunsuke Kawano, Tomihiro Takano, Nobuhiko Itaya | *Mitsubishi Electric Corporation, Japan*
- **ID 269** | *Comparison of MPC Formulations for Building Control under Commercial Time-of-Use Tariffs*  
Olivier Van Cutsem, Maher Kayal | *EPFL, Switzerland*  
David Blum, Marco Pritoni | *LBNL, United States*
- **ID 380** | *Multiobjective Home Appliances Scheduling Considering Customer Thermal Discomfort: A Multistep Look-ahead ADP-Based Approach*  
Babak Jeddi, Yateendra Mishra, Gerard Ledwich | *Queensland University of Technology, Australia*
- **ID 324** | *Shapley value analysis of distribution network cost-causality pricing*  
Donald Azuatalam, Archie Chapman, Gregor Verbic | *The University of Sydney, Australia*
- **ID 830** | *EV smart charging in collective residential buildings: the BienVEnu project*  
Marc Petit, Martin Hennebel | *GeePs, France*

### 16:10 – 17:50 | TS 2N | Room BL.27.0.3

#### *Data Science and ICT in Power Technologies – Advance Methods for Power System Analysis*

Chair: Chanan Singh | *Texas A&M University, United States*

- **ID 191** | *Data Classification and Parameter Identification in Power Systems by Manifold Learning*  
Andrija Saric | *University of Novi Sad, Serbia*  
Mark Transtrum | *Brigham Young University, United States*  
Alex Stankovic | *Tufts University, United States*
- **ID 771** | *Deep Learning for Power System Security Assessment*  
Jose-Maria Hidalgo Arteaga, Florian Thams, Spyros Chatzivasileiadis | *Technical University of Denmark, Denmark*  
Fiodar Hancharou | *Skolkovo Institute of Science and Technology, Russia*

- **ID 838** | *Predicting transmission line congestion in energy systems with a high share of renewables*  
Philipp Staudt, Benjamin Rausch, Johannes Gärtner, Christof Weinhardt | *Karlsruher Institute of Technology, Germany*
- **ID 885** | *Analytical Solutions for Power Flow Equations Based on the Multivariate Quotient-Difference Method*  
Chengxi Liu, Claus Leth Bak | *Aalborg University, Denmark*  
Yongli Zhu | *GEIRI North America, United States*  
Kai Sun | *The University of Tennessee, United States*
- **ID 593** | *A Method for Sizing Centralised Energy Storage Systems Using Standard Patterns*  
Shahab Karrari, Nicole Ludwig, Veit Hagenmeyer, Mathias Noe | *Karlsruhe Institute of Technology (KIT), Germany*
- **ID 90** | *Interharmonic Modeling and Simulation via the Flexible Extended Harmonic Domain*  
Uriel Vargas, Abner Ramirez | *CINVESTAV-Guadalajara, Mexico*  
George Cristian Lazaroiu | *University POLITEHNICA of Bucharest, University MARITIMA of Constanta, Romania*  
Mariacristina Roscia | *Universita di Bergamo, Italy*

**16:10 - 17:50** | TS 2O | Room BL.270.6

*System Operation and Control – HVDC: Operation and Protection*

 Chair: Nikolai Voropai | *Irkutsk National Research Technical, Russia*

- **ID 363** | *A framework for dynamic security assessment of combined multi-terminal HVDC and AC grids*  
Lampros Papangelis, Mevludin Glavic, Thierry Van Cutsem | *University of Liege, Belgium*
- **ID 477** | *Frequency support provision by parallel, hybrid HVDC-HVAC system with Voltage-based Load Control*  
Marius Langwasser, Giovanni De Carne, Marco Liserre | *Kiel University, Germany*  
Matthias Biskoping | *ABB AG, Germany*
- **ID 26** | *Pole Voltage Balancing in HVDC Systems: Analysis and Technology Options*  
Mian Wang, Jef Beerten, Dirk Van Hertem | *KU Leuven, Belgium*
- **ID 251** | *Fault Location Dependency of Short-Circuit Currents in MMC based Meshed HVDC Cable Systems*  
Anna Pfendler, Andreas Saciak, Jutta Hanson, Gerd Balzer | *TU Darmstadt, Germany*
- **ID 559** | *Impact of harmonic pollution in junctions between DC cables with different insulating technologies: electrical and thermal analyses*  
Andrea Colavitto, Alfredo Contin, Andrea Vicenzutti, Giorgio Sulligoi | *University of Trieste, Italy*  
Megan McCandless | *Massachusetts Institute of Technology, United States*

- **ID 584** | *Pole-to-ground fault protection strategy for HVDC grids under symmetrical monopolar configuration*  
Alberto Bertinato, Pascal Torwelle, Guilherme Dantas de Freitas, Manuel Colmenero | *SuperGrid Institute, France*  
Bertrand Raison | *Univ. Grenoble Alpes, France*

**16:10 - 17:50** | TS 2P | Room BL.270.7

*System Operation and Control – Medium and High Frequency Disturbances Issues*

 Chair: Alfredo Testa | *University of Campania “Luigi Vanvitelli,” Italy*

- **ID 33** | *Expression for Conductor Resistance in the Frequency Range 2-150 kHz*  
Ángela Espín-Delgado, Sarah Rönnerberg, Math Bollen | *Luleå Tekniska Universitet, Sweden*
- **ID 112** | *Thermal Interactions in Modern Lighting Equipment due to Disturbances in the Frequency Range 2-150 kHz*  
Victor Khokhlov, Jan Meyer, Peter Schegner | *Technische Universität Dresden, Germany*
- **ID 672** | *Influence of measurement setup on the emission of devices in the frequency range 2-150 kHz*  
Daniel Agudelo-Martínez, Andrés Pavas | *Universidad Nacional de Colombia, Colombia*  
Ana María Blanco, Robert Stiegler, Jan Meyer | *Technische Universität Dresden, Germany*
- **ID 674** | *Harmonic Modeling of LED lamps by Means of Admittance Frequency Coupling Matrices*  
Roberto Langella, Adam Collin, Alfredo Testa | *University of Campania “Luigi Vanvitelli,” Italy*  
Jiri Drapela | *Brno University of Technology, Czech Republic*  
Sasa Djokic | *The University of Edinburgh, United Kingdom*  
Neville Watson | *University of Canterbury, New Zealand*
- **ID 118** | *Evaluation of the Impact of LED and Compact Fluorescent Lamps on the PLC Transmission with X-10 Technology*  
Marcio Fortes, Allan Delfino, Roberto Brandão, Henrique Henriques, Vitor Ferreira, Thiago Bumpus | *Fluminense Federal University, Brazil*
- **ID 510** | *Challenges and Pitfalls of Implementing Realistic Simulations to Study Harmonic Levels in Public Low Voltage Networks*  
Sascha Müller, Jan Meyer | *TU Dresden, Germany*



DETAILED PROGRAM | WEDNESDAY, June 26<sup>th</sup>

08:30 – 10:10 | SS 4 | Room BL.270.1

*Enabling Technologies and Methodologies for Wide Area Monitoring Protection and Control Systems*

Organizers:

Alfredo Vaccaro | *SMIEEE, University of Sannio, Italy*Kwok Cheung | *FIEEE, Director of Global Market Management Solutions, General Electric Grid Solutions, Redmond, Washington*

- Benefits of Synchrophasor Data and High-Bandwidth Communications in Monitoring, Protection and Control of Interconnected Power Systems  
Dan Gabel | *Senior Manager, Interconnection and System Studies, Commonwealth Edison Company (ComEd)*
- Consideration of Communication Time Delays in Wide-Area Control  
Anjan Bose | *Washington State University*
- Real-Time Power System Inter-Area Oscillation Detection Using Modal Analysis  
Armando Guzmán | *SMIEEE, Fellow Engineer, Schweitzer Engineering Laboratories*
- On advance wide area control of future low inertia power systems  
Vladimir Terzija | *FIEEE, University of Manchester*
- WAMPAC seduces SCADA in a control room  
Srdjan Skok | *University North, Varazdin, Croatia*  
Igor Ivankovic | *Croatian Transmission System Operator, Croatia*

08:30 – 10:10 | TS 3A | Room BL.270.2

*Innovative Grids in Energy Hybrid Systems Integration – Advanced Methods for Smart Grids Operation*Chair: Paolo Perani | *ABB S.p.A.*

- **ID 120** | *A New Approach of Conti-Varlet Method Applied to a PV System to Size a Battery Energy Storage*  
Paulo Vieira, Edson Bortoni | *Itajubá Federal University, Brazil*  
Arturo Bretas | *University of Florida, Brazil*
- **ID 610** | *Simplified Voltage Sensitivity Based curtailment Arrangement for Active Network Management*  
Thiago Mendonca | *Imperial College London, United Kingdom*  
Nathaniel Bottrell | *Ricardo Energy and Environment, United Kingdom*  
Timothy Green | *Imperial College London, United Kingdom*

- **ID 258** | *Demand Side Flexibility Prospects in Modern LV Networks: A Probabilistic Assessment*  
Iasonas Avramidis, Vasileios Evangelopoulos, Pavlos Georgilakis | *National Technical University of Athens (NTUA), Greece*
- **ID 734** | *A Markov Process Approach to Ensemble Control of Smart Buildings*  
Roman Pop | *Skolkovo Institute of Science and Technology, Russia*  
Ali Hassan, Yury Dvorkin | *New York University, United States*  
Kenneth Brunninx | *KU Leuven, Belgium*  
Michael Chertkov | *Los Alamos National Laboratory, United States*
- **ID 152** | *A Smart Voltage Optimization Approach for Industrial Load Demand Response*  
Adarsh Madhavan | *PG&E, United States*  
Brian Le | *IESO, Canada*  
Claudio Canizares, Kankar Bharttacharya | *University of Waterloo, Canada*
- **ID 925** | *Net Zero Energy settlements for costs reduction*  
Paolo Perani | *ABB S.p.A., Italy*

08:30 – 10:10 | TS 3B | Room BL.270.3

*System Operation and Control – Detecting Methods for Power System Reliability*Chair: Enrico Zio | *Politecnico di Milano, Italy*

- **ID 403** | *Tracking Transmission Line Parameters in Power Grids Observed by PMUs*  
Ali Abur, Pengxiang Ren, Hanoch Lev-Ari | *Northeastern University, United States*
- **ID 178** | *Assessing the Effect of Preventive Islanding on Power Grid Resilience*  
Matthias Noebels, Mathaios Panteli | *The University of Manchester, United Kingdom*
- **ID 364** | *Noncommunication Accelerated Sequential Tripping for Remote-End Faults on Transmission Lines*  
Sadeq Azizi, Mingyu Sun | *United Kingdom*  
Marjan Popov | *Delft University of Technology, Netherlands*  
Vladimir Terzija | *The University of Manchester, United Kingdom*
- **ID 743** | *Comparison of multi-megawatt LVRT testing setups for the certification of wind turbines*  
Jonas Bielemeier, Anica Frehn, Antonello Monti | *RWTH Aachen University, Germany*  
Richard Frühmann, Fritz Santjer | *UL International GmbH, Germany*
- **ID 604** | *Reliability Evaluation of ICT Used on Dynamic Line Rating for Power System Flexibility*  
Carlos Cruzat, Konstantinos Kopsidas | *The University of Manchester, United Kingdom*
- **ID 733** | *Advanced Local Voltage Control through Polynomial P-Var Functions*  
Carsten Heinrich, Charalampos Ziras, Henrik W. Bindner | *Danish Technical University, Denmark*

08:30 – 10:10 | TS 3C | Room BL.270.6

*System Operation and Control – Advanced Market Strategies*Chair: Christian Rehtanz | *TU Dortmund University, Germany*

- **ID 339** | *A DSO-Level Contract Market for Conditional Demand Response*  
Corey Kok, Jalal Kazempour, Pierre Pinson | *Technical University of Denmark, Denmark*
- **ID 267** | *An Optimal Virtual Power Plant Planning Strategy from a Composite System Cost/Worth Perspective*  
Arijit Bagchi | *Queens University Belfast, United Kingdom*  
Lalit Goel, Peng Wang | *Nanyang Technological University, Singapore*
- **ID 374** | *Stochastic Energy and Reserve Market in a Microgrid Environment*  
Diogo Castro, Tiago Soares | *INESC TEC, Portugal*  
Manuel Matos | *INESC TEC and FEUP, Portugal*
- **ID 131** | *Coordination of Local and Central Electricity Markets for Providing Balancing Services*  
Yaser Tohidi, Madeleine Gibescu | *Copernicus Institute of Sustainable Development, Netherlands*
- **ID 776** | *Market Power in the Presence of Carbon Taxes in Electricity Markets*  
Ahmad Milyani, Daniel Kirschen | *University of Washington, United States*
- **ID 571** | *Impact of a Minimum Remaining Available Margin Adjustment in Flow-Based Market Coupling*  
Björn Matthes, Christopher Spieker, Dennis Klein, Christian Rehtanz | *TU Dortmund University, Germany*

08:30 – 10:10 | EP 3 | Room BL.270.7

*H2020 SmartNet - How to Get Flexibility from Resources Connected to Distribution Grids?*Organizer: Gianluigi Migliavacca | *RSE*

- Introduction to SmartNet  
Gianluigi Migliavacca | *RSE*
- Results of the simulations at 2030 for Italy, Denmark and Spain  
Marco Rossi | *RSE*
- Results for the three project pilots  
Carlos Madina | *TECNALIA*
- Results for the hardware-in-the-loop activities  
Filip Pröstl-Andren | *AIT*
- Regulatory Guidelines  
Ivana Kockar | *University of Strathclyde*
- Project exploitation and impact  
Gianluigi Migliavacca | *RSE*

**10:30 - 12:10** | PLENARY SESSION 3 | Room BL.270.4

Streaming BL.270.1, BL.270.2 and BL.270.3

### ***Transfer of Knowledge: a guide to publish your research***

Chairs:

Mohammad Shahidehpour | *Founding EiC, IEEE Transactions on Smart Grid*

Adam Fraser | *Senior Publisher, Elsevier*

Keynote Speakers:

- Badrul Chowdhury | *EiC, IEEE Transactions on Sustainable Energy*
- Nikos Hatziargyriou | *EiC, IEEE Transaction on PWRS*
- Carlo Alberto Nucci | *EiC, Elsevier EPSR*
- Vladimir Terzija | *EiC, Elsevier JEPES*

**13:00 - 14:20** | PS 3A | BL27 First Floor | Poster Area

### ***Planning and Operation of Power Systems under Market Condition – Distributed Generation, Renewables and Energy Storage Systems***

Chair: Emilio Ghiani | *University of Cagliari, Italy*

- **ID 94** | *Market Operations using Swing Contracts for Demand Response and Energy Storage*  
Ashim Basnet, Jin Zhong | *The University of Hong Kong, Hong Kong*
- **ID 845** | *Impact of Energy Storage on Market-Based Generation Investment Planning*  
Temitayo Oderinwale, Yujian Ye, Dimitrios Papadaskalopoulos, Goran Strbac | *Imperial College London, United Kingdom*
- **ID 445** | *Annual Electricity Cost Minimization for South Australian Dwellings through Optimal Battery Sizing*  
Vanika Sharma, Mohammed H. Haque, Syed Mahfuzul Aziz | *University of South Australia, Australia*
- **ID 317** | *Estimating the Option Value of Grid-Scale Battery Systems to Distribution Network Service Providers*  
Yiju Ma, Gregor Verbic, Archie Chapman | *The University of Sydney, Australia*
- **ID 595** | *Coordinated Dispatch Performance of AC Grid-Connected Energy Storage Systems*  
Rebecca Todd, Alessandro Massi Pavan, Tom Feehally, Andrew Forsyth | *The University of Manchester, United Kingdom*  
Shahab Nejad, Daniel Gladwin, David Stone, Martin Foster | *The University of Sheffield, United Kingdom*
- **ID 784** | *Contribution of Energy Storage to System Adequacy and its Value in the Capacity Market*  
Stefan Boroza, Michael Evans, Goran Strbac | *Imperial College London, United Kingdom*  
Tiago Rodrigues | *National Grid PLC, United Kingdom*

- **ID 225** | *Value of Injection from Residential PV with Storage for the Bulk Power System*  
Sebastián Martín, Juan Pérez-Ruiz, Pablo López-Pérez | *Universidad de Málaga, Spain*
- **ID 491** | *Evaluation of Impact of Regulation Signal on Energy Storage Operation in PJM Regulation Market*  
Yanzhu YE, Bo Yang, Panitarn Chongfuangprinya, Sumito Tobe, Yasushi Tomita | *Hitachi America, Ltd. R&D, United States*

**13:00 - 14:20** | PS 3B | BL27 First Floor | Poster Area

### ***Modeling and Monitoring of Harmonics in Power Systems***

Chair: Roberto Langella | *University of Campania "Luigi Vanvitelli", Italy*

- **ID 423** | *Modeling of harmonic propagation of fast DC EV charging station in a Low Voltage network*  
Stefano Cassano, Federico Silvestro | *University of Genova, Italy*  
Emmanuel De Jaeger, Caroline Leroi | *Universite Catholique de Louvain, Belgium*
- **ID 661** | *Minimization of Radio Interference Levels in a Hybrid Transmission Line*  
Carlos Tejada-Martinez, Fermin P. Espino-Cortes | *Instituto Politécnico Nacional (IPN), Mexico*  
Aydogan Ozdemir, Suat Ilhan | *Istanbul Technical University, Turkey*
- **ID 467** | *Detection and Monitoring of Supraharmonic Anomalies of an Electric Vehicle Charging Station*  
Tim Streubel, Christoph Kattmann, Adrian Eisenmann, Krzysztof Rudion | *Universität Stuttgart, Germany*
- **ID 614** | *Performance Improvement of Railway Power Conditioner with Model Predictive Control Approach*  
Hamed Jafari Kaleybar, Seyed Saeed Fazel, Arefeh Rasi Vayghan | *Iran University of Science and Technology, Iran*  
Morris Brenna, Federica Foiadelli | *Politecnico di Milano, Italy*
- **ID 615** | *Power Quality Indicators in Electric Railway Systems: A Comprehensive Classification*  
Morris Brenna, Federica Foiadelli | *Politecnico di Milano, Italy*  
Hamed Jafari Kaleybar, Seyed Saeed Fazel | *Iran University of Science and Technology, Iran*
- **ID 622** | *Power Quality problems in hospital: a case study*  
Alberto Prudenzi, Andrea Fioravanti, Luigi Petriconi | *University of L'Aquila, Italy*  
V. Caracciolo | *S. Giovanni-Addolorata General Hospital, Italy*
- **ID 567** | *Corona Inception and Breakdown Voltages of Rod-Plane Electrode for Severe Ambient Conditions*  
Shayan Shahi Gharaaghaji, Hamza Fadil, Suat Ilhan, Aydogan Ozdemir | *Istanbul Technical University, Turkey*  
Hasbi Ismailoglu | *Kocaeli University, Turkey*  
Fermin Espino Cortes | *Instituto Politécnico Nacional, Mexico*



**13:00 - 14:20 | PS 3C | BL27 First Floor | Poster Area***Power System Dynamics, Stability and Control – Control and Stability of Generators*Chair: Giorgio Sulligoi | *University of Trieste, Italy*

- **ID 563** | *Provision of Ancillary Services by different Decentralized Energy Resources*  
Christoph Strunck, Marvin Albrecht, Christian Rehtanz | *TU Dortmund, Germany*
- **ID 123** | *Decision Making on Generator for Wind Turbines using the AHP Methodology*  
Davi Paiva, Natan Santos, Edson Bortoni, Roberto Yamachita | *Itajubá Federal University, Brazil*
- **ID 306** | *Analysis of the Integration of Type C Wind Turbines in Distribution Networks*  
Fernando Arduini, André Pessoa, Eduardo Asada, Mário Oleskovicz | *University of Sao Paulo, Brazil*
- **ID 243** | *Stability Analysis of a 100MW Wind Power Plant with Type 3 Wind Turbines - A Field Test Verification of Generic Dynamic Models*  
Maysam Esmaily-Radvar, Savio Yeung | *Ready Technologies Inc., United States*  
Seyed Ali Arefifar | *Oakland University, United States*
- **ID 566** | *New control approach for blackstart capability of full converter wind turbines with direct voltage control*  
Abdul Korai, Jens Denecke | *University of Duisburg-Essen, Germany*  
José Luis Rueda Torres, Elyas Rakhshani | *Delft University of Technology, Netherlands*
- **ID 518** | *Inertial response of isolated power networks with wind power plants*  
Massimo Bongiorno | *Chalmers University of Technology, Sweden*  
Salvatore Favuzza, Mariano Giuseppe Ippolito, Rossano Musca, Gaetano Zizzo | *University of Palermo, Italy*
- **ID 263** | *The Role of Energy Storage Systems in Reducing Effect of Load Models on Frequency Dynamics and Large Disturbance Rotor Angle Stability*  
Atia Adrees, Yue Xing, Jovica Milanovic | *The University of Manchester, United Kingdom*
- **ID 83** | *LPV Modeling of Clusters in Dynamic Power System Models*  
Johnny Leung, Michel Kinnaert, Jean-Claude Maun | *Université libre de Bruxelles, Belgium*  
Fortunato Villella | *Elia Grid International, Belgium*
- **ID 580** | *Stability of power networks with grid-forming converters*  
Jeremy Watson, Yemi Ojo, Ioannis Lestas | *University of Cambridge, United Kingdom*  
Chrysosvalantis Spanias | *Electricity Authority of Cyprus (EAC), Cyprus*
- **ID 180** | *Passivity-Based Control for a PV/Battery/Fuel Cell/Electrolyser Hybrid Power System*  
Suyao KONG, Mickaël HILAIRET, Robin ROCHE | *FEMTO-ST, CNRS, Univ. Bourgogne Franche-Comte, UTBM, France*

**13:00 - 14:20 | PS 3D | BL27 First Floor | Poster Area***Power System Dynamics, Stability and Control – Power System Stability and Grid Automation*Chair: Valentina Cecchi | *University of North Carolina at Charlotte, United States*

- **ID 400** | *Finding Unstable Operating Points via One-Dimensional Manifolds*  
Jonattan E. Sarmiento, Antonio C. Zambroni de Souza, Benedito I. de Lima Lopes, Paulo F. Ribeiro, Cristian A. Alvez, Bruno de Nadai Nascimento, João Alvez da Silva Neto | *Universidade Federal de Itajubá, Brazil*
- **ID 200** | *A Model-Independent Delay Compensation Method for Power Systems*  
Muyang Liu, Georgios Tzounas, Federico Milano | *University College Dublin, Ireland*
- **ID 16** | *Tuning of robust controllers for damping oscillations using particle swarm*  
Felipe Fernandes da Silva, Alexandre César de Castro | *Universidade Federal da Paraíba, Brazil*
- **ID 541** | *Spectral properties of dynamical power systems*  
Felix Koeth, Nicolas Retiere | *G2Elab Grenoble, France*
- **ID 861** | *Damping Electromechanical Oscillations in a Load Frequency System Using Tabu Search*  
CAMILA SANTOS, Alexandre Castro | *UFPB, Brazil*
- **ID 839** | *Exploratory Study Towards Dynamic Equivalent Modelling of Hybrid Renewable Energy Source Plant Based on Historical Production Data*  
Ana Radovanović, Jovica Milanović | *The University of Manchester, United Kingdom*
- **ID 532** | *Flexible and Reconfigurable Automation Architecture for Electrical Power Systems*  
Jorge Velasquez, Rajkumar Palaniappan, Bjoern Bauernschmitt, Dominik Hilbrich, Christian Rehtanz | *TU Dortmund University, Germany*  
Carsten Krueger, Davood Babazadeh, Sebastian Lehnhoff | *OFFIS, Germany*
- **ID 557** | *Congestion Management in distribution grid networks through active power control of flexible distributed energy resources*  
Roberto Ciavarella, Marialaura Di Somma, Giorgio Graditi, Maria Valenti | *ENEA - Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Italy*
- **ID 499** | *Review of Asynchronous Interconnection Technology in China Southern Power Grid*  
Bo Li, Jianing Liu, Zhu Chao | *Guangdong Power Grid Power Dispatch Control Center, Guangzhou, China*  
Zuo Wang, Dongrui Zhang, Qi Wang, Yufeng Guo | *School of Electrical Engineering & Automation, Harbin Institute of Technology, Harbin, China*  
Jin Zhong | *The University of Hong Kong, Hong Kong, China*
- **ID 196** | *Harnessing the flexibility of energy management systems: a retailer perspective*  
Sébastien Mathieu, Miguel Manuel de Villena, Damien Ernst | *University of Liege, Belgium*  
Eric Vermeulen | *Haulogy, Belgium*

**13:00 - 14:20** | PS 3E | BL27 First Floor | Poster Area*Network Modeling, Protection and Security – Security and Contingency Analysis*Chair: Giambattista Gruosso | *Politecnico di Milano, Italy*

- **ID 868** | *Two-Stage Stochastic Mixed Integer Programming Approach for Optimal SCUC by Economic DR Model*  
Mohsen Kia | *Islamic Azad University, Iran*  
Reza Etemad | *Shahid Beheshti University, Iran*  
Alireza Heidari | *University of New South Wales, Australia*  
Mohamed Lotfi, João P. S. Catalão | *FEUP and INESC TEC, Portugal*  
Miadreza Shafie-khah | *University of Vaasa, Finland*  
Gerardo Osório | *C-MAST/UBI, Portugal*
- **ID 288** | *Cascading Outage Assessment using Thévenin Equivalent Static Contingency Assessment*  
Pauli Friðheim Petersen, Christian Oxholm, Jakob Glarbo Møller, Hjörtur Jóhannsson | *Technical University of Denmark, Denmark*
- **ID 290** | *Improved multi-objective evolutionary algorithm in subpopulation tables with features from NSGA-II for the service restoration problem*  
Leandro Tolomeu Marques, Jose Paulo R. Fernandes, Joao Bosco A. London Jr. | *University of Sao Paulo, Brazil*
- **ID 883** | *Probabilistic Voltage Security Region based on Monte Carlo Reliability Evaluation*  
Carmen Borges | *Federal University of Rio de Janeiro, Brazil*  
Nicolas Netto | *CEPEL, Brazil*
- **ID 377** | *Operating Power Grids during Natural Disasters*  
Ali Abur, Ahmet Oner | *Northeastern University, United States*
- **ID 216** | *Effect of interconnection lines on the vulnerability of power systems*  
Jesus Beyza, Jose A Dominguez-Navaro, Jose M Yusta | *University of Zaragoza, Spain*
- **ID 525** | *A risk-based resilience assessment tool to anticipate critical system conditions in case of natural threats*  
Emanuele Ciapessoni, Diego Cirio, Andrea Pitto | *RSE, Italy*  
Marino Sforna | *TERNA Rete Italia S.p.A., Italy*
- **ID 658** | *Towards Supervisory Protection Using Energy Functions for Relay Misoperations in a Stressed Power System During Blackout*  
Abhishek Banerjee, Rajesh Kavasseri | *North Dakota State University, United States*  
Munim Bin Gani | *New Mexico State University, United States*  
Sukumar Brahma | *Clemson University, United States*

- **ID 618** | *Qualifying Transmission Line Significance on Cascading Failures using Cut-sets*  
Claudia Caro-Ruiz | *Universidad Nacional de Colombia, Universidad Manuela Beltrán, Colombia*  
Andrés Pavas, Eduardo Mojica-Nava | *Universidad Nacional de Colombia, Colombia*  
Jin Ma | *The University of Sydney, Australia*  
David J. Hill | *The University of Hong Kong, Hong Kong*
- **ID 159** | *Sensitivity Analysis of the Interaction between Power System Dynamics and Unit Commitment*  
Taulant Kerci, Federico Milano | *University College Dublin, Ireland*

**13:00 - 14:20** | PS 3F | BL27 First Floor | Poster Area*Advanced Diagnostic and Power System Monitoring Techniques*

Chair: Davide Falabretti

- **ID 32** | *Power Quality Monitoring using Synchronized Phasor Measurements: An approach based on hardware-in-the-loop simulations*  
Igor Melo, José Luiz Pereira, Carlos Duque, Matheus Pereira, Leandro Manso Silva, Matheus de Souza | *Federal University of Juiz de Fora, Brazil*
- **ID 857** | *Voltage Sag State Estimation using Compressive Sensing in Power Systems*  
Jairo Blanco-Solano, Johann F. Petit-Suárez, Gabriel Ordóñez-Plata | *Universidad Industrial de Santander, Colombia*  
Nelson Kagan, Carlos FM Almeida | *Universidade de São Paulo, Brazil*
- **ID 281** | *Identifying the Class of Disturbance Events Using Recurrence Quantification Analysis*  
Mahmoodreza Arefi, Badrul Chowdhury | *UNC Charlotte, United States*
- **ID 602** | *Performance Investigation of a Monitoring Scheme for Low Voltage Grids with a Single Grounded Neutral*  
Andreas Kotsonias, Lenos Hadjidemetriou, Markos Asprou, Elias Kyriakides | *University of Cyprus, Cyprus*
- **ID 512** | *Voltage Unbalance Quantification and Mitigation Using a PMU-based Combined Transmission and Distribution System Linear State Estimator*  
Papiya Dutta, Aditya Nadkarni, Gopal Gajjar, Shreevardhan A. Soman | *IIT Bombay, India*
- **ID 264** | *Efficient Monitor Placement and Voltage Sag Estimation Using System Impedance Matrix*  
Araceli Hernandez | *Universidad Politécnica de Madrid, Spain*  
Jovica V. Milanovic | *University of Manchester, United Kingdom*
- **ID 314** | *Data Driven Event Assessment in Power Systems using Gaussian Mixture Models*  
Sirin Dutta Chowdhury, Nilanjan Senroy, Swades De | *Indian Institute of Technology Delhi, India*
- **ID 179** | *Adaptive Local-learning Models for Synchrophasor-based Dynamic Thermal Rating*  
Antonio Pepiciello, Guido Coletta, Alfredo Vaccaro | *University of Sannio, Italy*

- **ID 745** | *An MILP Approach for Distribution Grid Topology Identification using Inverter Probing*  
Sina Taheri, Vassilis Kekatos, Guido Cavraro | *Virginia Tech, United States*

**13:00 - 14:20** | PS 3G | BL27 First Floor | Poster Area

*Machine Learning and Computational Intelligence in Power Systems*

Chair: Robin Preece | *The University of Manchester, United Kingdom*

- **ID 138** | *Line Selection and Algorithm Selection for Transmission Switching by Machine Learning Methods*  
Zhu Yang, Shmuel Oren | *University of California, Berkeley, United States*
- **ID 535** | *Using Causal Inference to Measure Residential Consumers Demand Response Elasticity*  
Kamalanathan Ganesan | *University of Porto (FEUP), Portugal*  
Ricardo J Bessa | *INESC Technology and Science (INESC TEC), Portugal*  
João Tomé Saraiva | *University of Porto (FEUP) and INESC Technology and Science (INESC TEC), Portugal*
- **ID 670** | *Subgradient Methods for Averaging Household Load Profiles under Local Permutations*  
Marcus Voß, Brijnesh Jain, Sahin Albayrak | *Technische Universität Berlin, Germany*
- **ID 777** | *PQ classification by way of parallel computing - A sensitivity analysis for a real-time LSTM approach using waveform and RMS data*  
Adrian Eisenmann, Tim Streubel, Krzysztof Rudion | *University of Stuttgart, Germany*
- **ID 245** | *Adaptive GMM Based Technique for Online Health Monitoring of the PMU Instrumentation Chain*  
Tabia Ahmad, Nilanjan Senroy | *IIT Delhi, India*
- **ID 66** | *Algorithm for driving a dual-axis solar tracker*  
Gerardo Garcia-Gil, Juan M Ramirez | *CINVESTAV del IPN, Mexico*
- **ID 78** | *Maximum Power Point Tracking of Photovoltaic System Using Taguchi-based Fuzzy Logic Control*  
Ying-Yi Hong, Peter Mark P. Buay | *Chung Yuan Christian University, Taiwan*  
Angelo A. Beltran Jr. | *Adamson University, Philippines*
- **ID 234** | *Low Voltage Grid Data Visualisation with a Frame Representation and Cognitive Architecture*  
Mário Pereira, Ricardo Bessa, Clara Gouveia | *INESC TEC, Portugal*

**13:00 - 14:20** | PS 3H | BL27 First Floor | Poster Area

*Microgrids and Aggregators – Management and Optimization*

Chair: Johanna Mathieu | *University of Michigan, United States*

- **ID 867** | *Multi-Objective Optimisation of an Active Distribution System using Normalised Normal Constraint Method*  
M. Saffari, V. Vahidinasab | *Shahid Beheshti University, Iran*  
M. Saeed Misaghian, D. Flynn | *University College Dublin, Ireland*  
M. Kia | *Islamic Azad University, Iran*  
Mohamed Lotfi, João P. S. Catalão | *FEUP and INESC TEC, Portugal*  
Miadreza Shafie-khah | *University of Vaasa, Portugal*
- **ID 436** | *A Power-to-Gas Integrated Microgrid Optimal Operation Strategy Based on Rolling Horizon*  
Tongming Liu, Wang Zhang, Ke Meng, Zhao Yang Dong | *The University of New South Wales, Australia*
- **ID 632** | *Battery Energy Storage System and Improved Communication Topology for Enhancing Power Quality of Microgrid*  
Vishal Undre, Alberto Dolara, Sonia Leva | *Politecnico di Milano, Italy*
- **ID 716** | *A Transmission System Friendly Micro-grid: Optimising Active Power Losses*  
Thomas Krechel, Francisco Sanchez, Francisco Gonzalez-Longatt | *Loughborough University, United Kingdom*  
Harold Chamorro | *KTH, Sweden*  
Jose Luis Rueda | *TU Delft, Netherlands*
- **ID 429** | *An ADMM Approach for Day-Ahead Scheduling of a Local Energy Community*  
Camilo Orozco, Stefano Lilla, Alberto Borghetti, Fabio Napolitano, Fabio Tossani | *University of Bologna, Italy*
- **ID 505** | *Distributed Consensus Control with Event-Triggered Communication for Multi-Microgrid Cluster*  
Yaran Li, Ke Meng, Zhao Yang Dong | *The University of New South Wales, Australia*
- **ID 278** | *Distributed energy storage aggregation, quantitative evaluation of replicability and scalability*  
Andrea Michiorri | *Mines Paristech, France*
- **ID 38** | *Sustainable Islanding System Based on Dual Power Inverters with Cooperative Generator*  
Sewan Heo, Jinsoo Han, Wan-Ki Park | *Electronics and Telecommunications Research Institute, South Korea*



**13:00 - 14:20** | PS 3I | BL27 First Floor | Poster Area*Electric Vehicles Charging Infrastructure and V2G Technologies*Chair: Antonello Monti | *RWTH Aachen University, Germany*

- **ID 168** | *A V2G Strategy for Cost-Competitive Primary Frequency Regulation Considering EV Battery Degradation*  
Shigeru Tamura | *Meiji University, Japan*
- **ID 315** | *Impact Analysis of V2G Services on EV Battery Degradation - A Review*  
Jingli Guo, Jin Yang, Zhengyu Lin, Clara Serrano, Ana Maria Cortes | *Aston University, United Kingdom*
- **ID 513** | *Economics of Vehicle-to-Grid application for providing ancillary services in Italy*  
Luca Latini | *Siemens S.p.A., Italy*  
Sonia Leva, Fabrizio Bruno Armani | *Politecnico di Milano, Italy*  
Fabio Di Ninno | *Terna S.p.A., Italy*  
Giovanni Ravina | *Engie EPS, Italy*
- **ID 22** | *Demand Response Application of Battery Swap Station Using A Stochastic Model*  
Ferinar Moaidi, Masoud Aliakbar Golkar | *K. N. Toosi University of Technology, Iran*
- **ID 489** | *Infrastructuring of Canadian transport using hydrogen from RES: comparison between BEV and FCV*  
Morris Brenna, Federica Foiadelli, Michela Longo | *Politecnico di Milano, Italy*  
Wahiba Yaici | *CanmetENERGY Research Centre Natural Resources Canada, Canada*
- **ID 843** | *Evaluating Strategies for Decarbonising the Transport Sector in Great Britain*  
Peng Fu, Danny Pudjianto, Xi Zhang, Goran Strbac | *Imperial College London, United Kingdom*
- **ID 163** | *Probabilistic Sizing of PV Generation on Commercial Parking Lot with PEVs to Avoid Transformer Aging*  
Carolina Affonso | *Federal University of Para, United States*  
Mladen Kezunovic | *Texas A&M University, United States*
- **ID 382** | *Behaviour Analysis of Electrical Vehicle Flexibility Based on Large-Scale Charging Data*  
Poria Hasanpor Divshali, Corentin Evens | *VTT Technical research center of Finland, Finland*
- **ID 924** | *An improved Cell Transmission Model of Traffic Considering Electric Vehicles and Charging Stations*  
Enrico Zio | *Politecnico di Milano, Italy*  
Hongping Wang, Yi-ping Fang | *CentraleSupélec, Université Paris-Saclay, France*

**13:00 - 14:20** | PS 3J | BL27 First Floor | Poster Area*Battery Energy Storage Systems Optimization and Grid Integration*Chair: Giovanni Lutzemberger | *University of Pisa, Italy*

- **ID 52** | *Optimal Operation of Battery Energy Storage System in Smart Grid for Reducing Tap Changer Operation under Photovoltaic Fluctuation Using Cuckoo Search*  
Keerachat Tantrapon, Peerapol Jirapong, Panida Thararak | *Chiang Mai University, Thailand*  
Kannathat Mansuwan | *Provincial Electricity Authority, Bangkok, Thailand, Thailand*
- **ID 102** | *Application of Utility-Connected Battery Energy Storage System for Integrated Dynamic Services*  
Mehdi Ghazavi Dozein, Pierluigi Mancarella | *The University of Melbourne, Australia*
- **ID 233** | *Placement of Virtual Synchronous Generator Controlled Electric Storage combined with Renewable Generation*  
Junru Chen, Muyang Liu, Federico Milano, Terence O'Donnell | *University College Dublin, Ireland*
- **ID 356** | *Quantification and Verification of Residential Battery Response for Frequency Regulation in PV-Rich Power Systems*  
Dillon Jaglal, William Nacmanson, Luis Ochoa | *University of Melbourne, Australia*
- **ID 723** | *Optimization of Frequency Controller Parameters of a BESS by considering Rate of Change Constraints*  
Francisco Sanchez, Francisco Gonzalez-Longatt | *Loughborough University, United Kingdom*
- **ID 774** | *Optimal Planning and Operation Scheduling of Battery Storage Units in Distribution Systems*  
Hamidreza Mirtaheri, Alessandro Bortoletto, Maurizio Fantino | *LINKS Foundation, Italy*  
Andrea Mazza | *Politecnico di Torino, Italy*  
Mousa Marzband | *Northumbria University, United Kingdom*
- **ID 820** | *Optimal BESS Scheduling Strategy in Microgrids Based on Genetic Algorithms*  
Dorian-Octavian Sidea, Lucian Toma, Mihai Sanduleac, Irina Picioroaga, Valentin-Adrian Boicea | *University Politehnica of Bucharest, Romania*
- **ID 521** | *Frequency Regulation Services by a BESS-Generator System using Predictive Control*  
Stefano Massucco, Federico Silvestro, Francesco Conte, Giacomo-Piero Schiapparelli | *University of Genova, Italy*
- **ID 664** | *Optimal Operation of Aggregated Industrial Loads Coupled with Energy Storage System*  
Minsu Park, Yunsun Jin, Wonpoong Lee, Dongjun Won | *Inha University, South Korea*
- **ID 628** | *Total Cost of Ownership of electric vehicles using energy from a renewable-based microgrid*  
Alessandro Massi Pavan, Mariangela Scorrano, Vanni Lughì | *University of Trieste, Italy*

**14:20 – 16:00 | SS 5 | Room BL.270.1***Education and Formation of Future Power Electrical Engineers – the experience of the Scholarship Plus*

Organizers:

Edvina Uzunovic | *PES VP Education*Carlo Alberto Nucci | *Chair of the Region 8 Scholarship Plus Committee*

- “Power Education worldwide and the experience of Scholarship Plus in the USA”  
Edvina Uzunovic | *PES VP Education*
- “Region 8 Scholarship Plus experience”  
Federica Foadelli | *Politecnico di Milano, Italy*
- Testimonials from industries and students participating in the project: results and future expectations
- “Future of the Project”  
Carlo Alberto Nucci | *University of Bologna, Italy*

**14:20 – 16:00 | TS 3I | Room BL.270.2***Innovative Grids in Energy Hybrid Systems Integration – Grid-Connected and Stand-Alone Microgrids Operating Strategies*Chair: Aydogan Ozdemir | *Istanbul Technical University, Turkey*

- **ID 320** | *Protection of Distribution System Islands Fed by Inverter-Interfaced Sources*  
Sukumar Brahma | *Clemson University, United States*
- **ID 155** | *Power Flow Analysis of Islanded AC Microgrids*  
Eleftherios Kontis, Georgios Kryonidis, Angelos Nousedis, Kyriaki-Nefeli Malamaki, Grigoris Papagiannis | *Aristotle University of Thessaloniki, Greece*
- **ID 249** | *Flexibility options identification within Net Zero Energy Factories*  
Pio Lombardi, Przemyslaw Komarnicki | *Fraunhofer Institute for Factory Operation and Automation IFF, Germany*  
Rongwu Zhu, Marco Liserre | *Christian-Albrechts-Universität zu Kiel, Germany*
- **ID 821** | *Reducing the Unfairness of Coordinated Inverter Dispatch in PV-Rich Distribution Networks*  
Peter Lusi, Lachlan Andrew, Ariel Liebman, Guido Tack | *Monash University, Australia*  
Shantanu Chakraborty | *Delft University of Technology, Netherlands*
- **ID 837** | *A community microgrid control strategy to deliver balancing services*  
Anna Pinnarelli, Daniele Menniti, Nicola Sorrentino, Giuseppe Barone, Pasquale Vizza | *University of Calabria, Italy*
- **ID 515** | *Using Electric Vehicles and Demand Side Response to Unlock Distribution Network Flexibility*  
Hasan Berkem Sonder, Liana Cipicgan, Carlos Ugalde-Loo | *Cardiff University, United Kingdom*

**14:20 – 16:00 | TS 3J | Room BL.270.3***System Operation and Control - Optimization Methods for Active and Reactive Power Flows*Chair: Federico Milano | *University College Dublin, Ireland*

- **ID 492** | *Phase Balancing in Power Distribution Systems: A heuristic approach based on group-theory*  
Miguel Angel Rios, Juan Camilo Castaño, Alejandro Garces, Alexander Molina | *Universidad Tecnológica de Pereira, Colombia*
- **ID 265** | *Reactive Power Loop Flows in Transmission Grids*  
Markus Knittel, Nils Namockel, Maximilian Schneider, Ralf Puffer | *RWTH Aachen University, Germany*
- **ID 172** | *Intra-Area Mode: Measurement-Based and Model-Based Assessment in Indian Power System*  
Chandan Kumar, Akhil Gupta, Pushpa Seshadri, Rahul Shukla, Pradeep Kumar Sanodiya | *POSOCO, India*
- **ID 441** | *Validating Coordination Schemes between Transmission and Distribution System Operators using a Laboratory-Based Approach*  
Filip Pröbstl Andrén, Thomas I. Strasser, Julien Le Baut | *AIT Austrian Institute of Technology, Austria*  
Marco Rossi, Giacomo Vigano | *Ricerca sul Sistema Energetico (RSE), Italy*  
Giacomo Della Croce | *SELTA S.p.A., Italy*  
Seppo Horsmanheimo | *VTT Technical Research Centre of Finland, Finland*  
Armin Ghasem Azar | *Technical University of Denmark (DTU), Denmark*  
Adrian Ibanez | *Our New Energy, Spain*
- **ID 246** | *Oscillation Damping Controller Design Using Ring-down Measurements for the Italian Power Grid*  
Lin Zhu, Yi Zhao, Yilu Liu | *The University of Tennessee, Knoxville, United States*  
Evangelos Farantatos, Mahendra Patel, Papiya Dattaray, Deepak Ramasubramanian | *Electric Power Research Institute (EPRI), United States*  
Luigi Michi, Enrico Carlini, Giorgio Giannuzzi, Roberto Zaottini | *TERNA, Italy*

**14:20 – 16:00 | TS 3K | Room BL.270.6***System Operation and Control - Islanding*Chair: Akihiko Yokoyama | *The University of Tokyo, Japan*

- **ID 300** | *Modeling of Distributed Energy Resources for Simulating Fault-Initiated Islanding of Microgrids*  
Martijn Roos, Phuong Nguyen | *Eindhoven University of Technology, Netherlands*  
Johan Morren, Han Sloopweg | *Eindhoven University of Technology & Enexis Netbeheer, Netherlands*
- **ID 663** | *A Combinatorial Algorithm for Large-Scale Power System Islanding*  
Georgios Patsakis, Shmuel Oren | *University of California Berkeley, United States*

- **ID 250** | *Experimental Analysis of Grid-Forming Frequency Control Strategies for Load Sharing in Low Voltage Islanded Microgrids*  
Dominik Willenberg, Niklas Mierau, Sandor Simon, Reinhold Bertram | *Institute for High Voltage Technology - RWTH Aachen University, Germany*
- **ID 475** | *Impact of ROCOF-based Islanding Detection on the Stand-Alone Operation of a Distributed Synchronous Generator*  
Artur Piardi, Rodrigo Otto | *Itaipu Technological Park Foundation, Brazil*  
Liciane Otremba, Daniel Motter | *Western Parana State University, Brazil*  
Ahda Pavani | *Federal University of ABC, Brazil*  
Rodrigo Ramos | *University of Sao Paulo, Brazil*
- **ID 476** | *Islanded Microgrid Voltage Control Structure Small-Signal Stability Analysis*  
Guy Wanlongo Ndiwulu, Emmanuel De Jaeger | *Université catholique de Louvain (UCLouvain), Belgium*  
Angelo Kuti Lusala | *Université Kongo (UK), Congo (DRC)*
- **ID 500** | *Intentional Controlled Islanding of Power Systems Equipped With Battery Energy Storage Systems*  
Panayiotis Demetriou, Alexis Kyriacou, Elias Kyriakides, Christos Panayiotou | *KIOS Research and Innovation Center of Excellence, University of Cyprus, Cyprus*

**14:20 – 16:00** | TS 3L | Room BL.270.7

### System Operation and Control

Chair: Madeline Gibescu | *Copernicus Institute of Sustainable Development, Netherlands*

- **ID 920** | *A New Method for Dimensioning and Designing the Zero-Sequence Electromagnetic Filter Considering System Displacement Power Factor*  
Ricardo Fonseca Buzo, Luis Carlos Origa de Oliveira, Fabio Bertequini Leão | *Sao Paulo State University, Brazil*
- **ID 905** | *A Model-Free Approach for Emergency Damping Control Using Wide Area Measurements*  
Vedanta Pradhan | *ABB GISPL, Corporate Research Center in India, India*  
Anil M Kulkarni, Shrikrishna A Khaparde | *Indian Institute of Technology Bombay, India*
- **ID 906** | *Efficient Database Generation for Data-driven Security Assessment of Power Systems*  
Florian Thams, Andreas Venzke, Spyros Chatzivasileiadis | *Technical University of Denmark (DTU), Denmark*  
Robert Eriksson | *Svenska kraftnet, Sweden*
- **ID 42** | *Dispatching Stochastic Heterogeneous Resources Accounting for Grid and Battery Losses*  
Eleni Stai, Lorenzo Reyes-Chamorro, Fabrizio Sossan, Jean-Yves Le Boudec, Mario Paolone | *École Polytechnique Fédérale de Lausanne, Switzerland*
- **ID 67** | *PMU-Based Event Localization Technique for Wide-Area Power System*  
Do-In Kim, Yong-June Shin | *Yonsei University, South Korea*  
Austin White | *Oklahoma Gas & Electric, United States*

- **ID 79** | *Centralized Identification of Imbalances in Power Networks With Synchrophasor Data*  
Tirza Routtenberg | *Ben Gurion University of the Negev, Israel*  
Yonina C. Eldar | *Technion-Israel Institute of Technology, Israel*

**16:10 – 17:50** | SS 6 | Room BL.270.1

### New Trends in Education and Training for the Energy Transition

Organizers:

Nikos Hatziaargyriou, Panos Kotsampopoulos | *National Technical University of Athens, Greece*

- Power systems education: a new mix of disciplines, student engagements and laboratory capability  
Graeme Burt | *University of Strathclyde, Scotland*
- Evolution of electrical power systems education offer in the last decade  
Carlo Alberto Nucci | *University of Bologna, Italy*
- New trends in laboratory education: HIL simulation and remote labs  
Panos Kotsampopoulos | *National Technical University of Athens, Greece*
- Blended-learning for power systems: the experience at RWTH Aachen University  
Antonello Monti | *RWTH Aachen University, Germany*
- Research-driven power and energy systems education and training  
Filip Prössl Andrén, Thomas Strasser | *Austrian Institute of Technology, Austria*

**16:10 – 17:50** | TS 3M | Room BL.270.2

### Innovative Grids in Energy Hybrid Systems Integration - Energy Management in Microgrids

Chair: Thierry Van Cutsem | *University of Liège, Belgium*

- **ID 54** | *Economic Impact of the Active Power Droop Gain in Droop-Based Islanded Microgrids*  
Pedro P. Vergara, Juan C. López, Luiz Carlos Pereira da Silva, Marcos J. Rider | *University of Campinas, Brazil*
- **ID 140** | *Impacts of Price-led Operation of Residential Storage on Distribution Networks: An Australian Case Study*  
Kyriacos Petrou, Andreas T. Procopiou, Luis (Nando) Ochoa | *The University of Melbourne, Australia*  
Tom Langstaff, John Theunissen | *AusNet Services, Australia*
- **ID 210** | *On Feasibility and Flexibility Operating Regions of Virtual Power Plants and TSO/DSO interfaces*  
Shariq Riaz, Pierluigi Mancarella | *The University of Melbourne, Australia*



- **ID 77** | *A Performance Metric for Co-Optimization of Day-Ahead Dispatch and Reserves in Electric Microgrids*  
Mayank Panwar, Rob Hovsapien | *Idaho National Laboratory, United States*  
Siddharth Suryanarayanan | *Colorado State University, United States*  
Robin Roche | *Universite Bourgogne Franche-Comte, United States*
- **ID 164** | *An Efficient Decision-Making Approach for Optimal Energy Management of Microgrids*  
Najmeh Bazmohammadi | *Ferdowsi University of Mashhad (FUM), Denmark*  
Ali Karimpour | *Ferdowsi University of Mashhad (FUM), Iran*  
Somayyeh Bazmohammadi | *Khorasan Regional Electricity Company (KREC), Iran*  
Amjad Anvari-Moghaddam, Jozep M. Guerrero | *Aalborg University, Denmark*
- **ID 869** | *Reliable and Environmental Economic Dispatch in a Microgrid with Renewable Energy Sources*  
Mehrdad Tarafdar Hagh, Saeed Pouyafar, Farnaz Sohrabi, Ayda Shaker | *University of Tabriz, Iran*  
Morteza Vahid-Ghavidel | *INESC TEC, Portugal*  
João P. S. Catalão | *FEUP and INESC TEC, Portugal*  
Miadrea Shafie-khah | *University of Vaasa, Finland*

**16:10 – 17:50** | TS 3N | Room BL.270.3

#### *System Operation and Control – Modeling and Testing for Grid Operation*

Chair: Gianfranco Chicco | *Politecnico di Torino, Italy*

- **ID 480** | *Modelling of Integrated Transmission and Distribution Grids based on Synthetic Distribution Grid Models*  
Marcel Sarstedt, Steffen Garske, Christoph Blaufuß, Lutz Hofmann | *Leibniz Universität Hannover, Germany*
- **ID 704** | *Structural Analysis and Improved Reactive Power Alignment for Secondary Voltage Control*  
Allal El Moubarek Bouzid, Bogdan Marinescu | *Ecole Centrale Nantes, France*  
Guillaume Denis | *RTE, France*
- **ID 656** | *Determination of Feasible Power Variability Ranges in Active Distribution Networks with Uncertain Generation and Demand*  
Giancarlo Noto, Veit Hagenmeyer, Riccardo Remo Appino | *Karlsruhe Institute of Technology, Germany*  
Gianfranco Chicco | *Politecnico di Torino, Italy*
- **ID 158** | *Power Hardware-in-the-Loop Setup for Developing, Analyzing and Testing Mode Identification Techniques and Dynamic Equivalent Models*  
Eleftherios Kontis, Angelos Noutsilias, Grigoris Papagiannis | *Aristotle University of Thessaloniki, Greece*  
Theofilos Papadopoulos | *Democritus University of Thrace, Greece*  
Mazheruddin Syed, Efren Guillo-Sansano, Graeme Burt | *Institute for Energy and Environment, University of Strathclyde, United Kingdom*

- **ID 801** | *Hardware in the Loop testing of Battery-less Hybrid Systems for Off-grid Power Supply*  
Nikolaos Ntavarinos, Panos Kotsampopoulos, Dimitris T. Lagos, Nikos Hatziaargyriou | *National Technical University of Athens, Greece*

**16:10 – 17:50** | TS 3O | Room BL.270.6

#### *System Operation and Control – Optimal Operation of Primary and Secondary Distribution Grids*

Chair: Jin Zhong | *The University of Hong Kong, Hong Kong*

- **ID 463** | *Studying the impact of storage systems on the planning studies of low voltage distribution grids*  
Ahmed Hadsaid, Vincent Debusschere, Marie-Cécile Alvarez-Herault, Raphaël Caire | *Univ. Grenoble Alpes, CNRS, France*
- **ID 309** | *Simulation Approach to Integrated Energy Systems Study Based on Energy Hub Concept*  
Nikolai Voropai, Ekaterina Ukolova, Dmitry Gerasimov, Konstantin Suslov | *Irkutsk National Research Technical, Russia*  
Pio Lombardi | *Fraunhofer Institute IFF Magdeburg, Germany*  
Przemyslaw Komarnicki | *University of Applied Science Magdeburg-Stendal, Germany*
- **ID 141** | *A Robust Optimization Framework for the Day-Ahead Scheduling of Active Distribution Networks including Energy Storage Systems*  
Mostafa Nick, Rachid Cherkaoui, Mario Paolone | *Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland*  
Mokhtar Bozorg | *University of Applied Sciences Western Switzerland, Switzerland*
- **ID 224** | *ADMM for Transactive Control of Microgrids*  
Oscar I. Parra, Joan Cruz, Eduardo Mojica-Nava | *Universidad Nacional de Colombia, Colombia*
- **ID 495** | *Planning Model of Microgrids for the Supply of Ancillary Services to the Utility Grid*  
Andrés Felipe Peñaranda Bayona, Pablo Elver Mosquera Duarte, Camilo Andrés Cortes Guerrero | *National university of Colombia, Colombia*  
Sergio Felipe Contreras Paredes, Johanna Myrzik | *University of Bremen, Germany*
- **ID 82** | *Optimal Energy Management of Unbalanced Three-Phase Grid-Connected Microgrids*  
Juan Sebastian Giraldo, Jhon Alexander Castrillon, Carlos Alberto Castro | *University of Campinas, Brazil*  
Federico Milano | *University College Dublin, Ireland*

**16:10 – 17:50** | TS 3P | Room BL.270.7*Data Science and ICT in Power Technologies*

Chair: Riccardo Zich | Politecnico di Milano, Italy

- **ID 307** | *A Hybrid Monte Carlo Simulation and Multi Label Classification Method for Composite System Reliability Evaluation*  
Dogan Urgan, Chanan Singh | *Texas A&M University, United States*
- **ID 355** | *Data Mining-Based Method to Reduce Multiple Estimation for Fault Location in Radial Distribution Systems*  
Denis Vinicius Coury, Evandro Agostinho Reche, Jeovane Vicente Sousa | *University of São Paulo, Brazil*  
Ricardo Augusto Souza Fernandes | *Federal University of São Carlos, Brazil*
- **ID 108** | *In-Field Validation of a Real-Time Monitoring Tool for Distribution Feeders*  
Julio Augusto Druzina Massignan, João Bosco Augusto London Jr, Michel Bessani, Carlos Dias Maciel, Alexandre Claudio Botazzo Delbem, Marcos Henrique Marçal Camillo | *University of São Paulo, Brazil*  
Telma Woerle de Lima Soares | *Federal University of Goiás, Brazil*
- **ID 230** | *Branch-and-Bound Guided Search for Critical Elements in State Estimation*  
Andre Abel Augusto, Milton Brown Do Coutto Filho, Julio Cesar Stacchini de Souza, Marcio Andre Ribeiro Guimaraens | *Fluminense Federal University, Brazil*
- **ID 4** | *Optimal scheduling of home appliances in home energy management systems using grey wolf optimisation (GWO) algorithm*  
Ahmad Rezaee Jordehi | *Lashtenesha-Zibakenar Branch, Islamic Azad University, Iran*

**DETAILED PROGRAM** | THURSDAY, June 27<sup>th</sup>**08:30 – 10:10** | EP 4 | Room BL.270.1*United Grid - Integrated Cyber-Physical Solutions for Intelligent Distribution Grids with High Penetration of Renewables*Organizer: Tuan Le | *Chalmers University of Technology, Sweden*

- General presentation of UNITED-GRID project  
Tuan Le | *Chalmers University of Technology, Sweden*
- Scenarios, pathways and business innovation plan for future intelligent distribution grids  
Joni Rossi | *Research Institute of Sweden AB (RISE)*
- Secure and scalable ICT infrastructure for future intelligent distribution grids  
Tuan Tran | *Commissariat à l'Énergie Atomique – Institut National de l'énergie solaire (CEA-INES), France*
- Advanced forecasting and market-based congestion management  
David Steen | *Chalmers University of Technology, Sweden*
- Safe and secure real-time monitoring, control and protection  
Phuong Nguyen | *Eindhoven University of Technology, The Netherlands*
- Tool-box and cross-platform integration, demonstrators operations and assessment  
Lucile Lemius | *Atos Worldgrid, France and Mouloud Guemri - Commissariat à l'Énergie Atomique - Institut National de l'énergie solaire (CEA-INES), France*

**08:30 – 10:10** | TS 4A | Room BL.270..2*Innovative Grids in Energy Hybrid Systems Integration – New Technology Solutions for Power Applications*Chair: Mario Paolone | *EPFL, Lausanne, Switzerland*

- **ID 410** | *Modelling of the PEM Fuel Cell and Design of a Closed Loop Control Based DC-DC Boost Converter For Locomotive Application*  
Upasana Sarma, Sanjib Ganguly | *Indian Institute of Technology Guwahati, India*
- **ID 96** | *Design and Control of A Switched-Diode Multilevel Inverter for Photovoltaic Application*  
Kaibalya Prasad Panda, Prabhat Ranjan Bana, Gayadhar Panda | *National Institute of Technology Meghalaya, India*
- **ID 185** | *Mitigation of Ignition Current Spike Causing from Forward Bias Drift for Laser Diode Driver*  
Kai-Jun Pai | *Ming Chi, University of Technology, Taiwan*

- **ID 702** | *Fuel-Cell Based Propulsion Systems for Hybrid Railcars*  
Michela Longo, Morris Brenna, Dario Zaninelli | *Politecnico di Milano, Italy*  
Massimo Ceraolo, Giovanni Lutzemberger, Davide Poli | *Università di Pisa, Italy*
- **ID 719** | *Hardware-in-the-Loop Simulation of a Battery Energy Storage System and External Storage Controller to provide Primary Control*  
Marvin Albrecht, Christoph Strunck, Christian Rehtanz | *TU Dortmund, Germany*
- **ID 256** | *Identifying washing machine consumption in supervised global electric consumption*  
Gilles Jacobs, Jean-Claude Maun | *Université Libre de Bruxelles, Belgium*

**08:30 – 10:10** | TS 4B | Room BL.270.3

### *System Operation and Control – Transient Events Detection and Modeling*

Chair: Jean Mahseredjian | *Polytechnique Montreal, Canada*

- **ID 198** | *A Piece-wise Linearized Transformer Winding Model for the Analysis of Internal Voltage Propagation*  
Andreas Theocharis | *Karlstad University, KAU, Sweden*  
Marjan Popov | *Technical University of Delft, TUDelft, Netherlands*
- **ID 629** | *Measurement and FEM analysis of DC/GIC effects on transformer magnetization parameters*  
Hilary Chisepo, Trevor Gaunt | *University of Cape Town, South Africa*  
Leslie Borrill | *Eskom Holdings SOC, South Africa*
- **ID 793** | *Two Variable Time-Step Algorithms for Simulation of Transients*  
Willy Nzale, Jean Mahseredjian, Ilhan Kocar | *Polytechnique Montreal, Canada*  
Xiaopeng Fu | *Tianjin University, China*  
Christian Dufour | *Opal-RT, Canada*
- **ID 302** | *Operation of Automatic Transfer Switches in the Networks with Distributed Generation*  
Pavel Ilyushin | *Petersburg Power Engineering Institute of Professional Development, Russia*  
Konstantin Suslov | *Irkutsk National Research Technical University, Russia*
- **ID 379** | *Evaluating Internal Resonances in Power Transformers by Using Instrumental Variable Vector Fitting*  
Lucas Rodrigues, Ricardo Schumacher, Gustavo Oliveira | *Federal University of Paraná, Brazil*  
Angélica Rocha | *ATG Engenharia, Brazil*  
Diogo Santo | *ESBR- Energia Sustentável do Brasil, Brazil*
- **ID 76** | *A Proposal to Mitigate Over-Voltage Issue within Period of 2017-2020 and A Vision to 2025 in Central Vietnam*  
Hong Lam Le | *The University of Da Nang - University of Science and Technology, Vietnam*  
Van Duong Ngo | *The University of Da Nang, Vietnam*

**08:30 – 10:10** | TS 4C | Room BL.270.6

### *Innovative Grids in Energy Hybrid Systems Integration – Advanced Estimation Methods for Smart Energy Districts*

Chair: Gabriela Hug | *ETH Zurich, Switzerland*

- **ID 291** | *Optimal energy management of all-electric residential energy systems in the Netherlands*  
Tom Terlouw, Tarek AISkaif, Wilfried van Sark | *Utrecht University, Netherlands*
- **ID 546** | *Inadequacy of Standard Algorithms and Metrics for Short-Term Load Forecasts in Low-Voltage Grids*  
Thierry Zufferey, Alice Lepouze, Gabriela Hug | *ETH Zurich, Switzerland*
- **ID 625** | *Photovoltaic Power Production Estimation Based on Numerical Weather Predictions*  
Frank Eduardo Atencio Espejo, Samuele Grillo, Lorenzo Luini | *Politecnico di Milano, Italy*
- **ID 729** | *A Close-to-Real-time Energy Management System for Smart Residential Buildings*  
Mohammad Ali Fotouhi Ghazvini, David Steen, Anh Tuan Le | *Chalmers University of Technology, Sweden*
- **ID 812** | *Spatial-Temporal Estimation of the PV Market Potential in Subareas*  
Joel Villavicencio Gastelu, Antonio Padilha Feltrin | *UNESP - São Paulo State University, Brazil*  
Joel Melo Trujillo | *Federal University of ABC, UFABC, Brazil*
- **ID 41** | *How Can Smart Buildings Be Price-Responsive?*  
Ricardo Fernández-Blanco, Juan Miguel Morales, Salvador Pineda | *University of Malaga, Spain*

**08:30 – 10:10** | TS 4D | Room BL.270.7

### *System Operation and Control*

Chair: Alessandro Gandelli | *Politecnico di Milano, Italy*

- **ID 5** | *Incorporating a Nodal Reactive Power Pricing Scheme into the DisCo's Short-Term Operation*  
Marcel Chuma Cerbantes | *China Three Gorges Corp, Brazil*  
Ricardo Fernández-Blanco | *University of Malaga, Spain*  
Miguel A. Ortega-Vazquez | *Electric Power Research Institute (EPRI), United States*  
José Roberto Sanches Mantovani | *Universidade Estadual Paulista (UNESP), Brazil*
- **ID 161** | *Reliable Renewable Generation and Transmission Expansion Planning: Co-Optimizing System's Resources for Meeting Renewable Targets*  
Alexander Moreira | *Imperial College London, United Kingdom*  
David Pozo | *Skolkovo Institute of Science and Technology, Russia*  
Alexandre Street | *Pontifical Catholic University of Rio de Janeiro, Brazil*  
Enzo Sauma | *Pontificia Universidad Catolica de Chile, Chile*



- **ID 240** | *Service Restoration With Prioritization of Customers and Switches and Determination of Switching Sequence*  
Leandro Tolomeu Marques, Alexandre C. B. Delbem, Joao Bosco A London Jr. | *University of Sao Paulo, Brazil*
- **ID 7** | *Unit Commitment With Inertia-Dependent and Multispeed Allocation of Frequency Response Services*  
Vincenzo Trovato, Agnes Bialecki, Anes Dallagi | *EDF Energy R&D UK Centre, United Kingdom*
- **ID 826** | *Provision of Frequency Support by Wind Power Plants: Assessment of Compliance with Grid Codes*  
Ayman B. Attia | *University of Huddersfield, United Kingdom*

**10:30 – 12:10** | SS 7 | Room BL.270.1*Microgrid Stability Definitions, Analysis, and Modeling*Organizer: Claudio Canizares | *University of Waterloo, Canada*

- Stability definitions and classification  
Mostafa Farrokhbabadi | *BluWave-ai, Ottawa, Canada*
- Models and tools for stability studies  
Reinaldo Tonkoski | *South Dakota State, SD*
- Converter PLL impact on microgrid stability  
Mario Paolone | *EPFL, Lausanne, Switzerland, and Marco Liserre - Kiel Univ., Kiel, Germany*
- Alaska Power System Integration Laboratory examples  
Richard Wies | *Univ. Alaska, Fairbanks, AK, US*
- Hardware in the Loop (HIL) examples  
Nikos Hatziaargyriou | *NTUA, Athens, Greece*

**10:30 – 12:10** | TS 4E | Room BL.270.2*Innovative Grids in Energy Hybrid Systems Integration – Energy Storages for Power System Improvement*Chair: Raphael Caire | *University Grenoble Alpes, CNRS, France*

- **ID 143** | *The effects of residential battery storage on grid impact indicators*  
Vladimir Gjorgievski, Snezana Cundeva | *University Ss. Cyril and Methodius, Macedonia*
- **ID 235** | *Congestion management within a multi-service scheduling coordination scheme for large battery storage systems*  
Clementine Straub, Jean Maeght, Camille Pache, Patrick Panciatichi | *RTE (Réseau de Transport d'Electricité), France*  
Ram Rajagopal | *Stanford, Civil and Environmental Engineering, United States*

- **ID 411** | *Energy Storage Sizing and Reliability Assessment for Power Systems with Variable Generation*  
Abdullah Alamri, Maad AlOwafeer, A.P Sakis Meliopoulos, George J. Cokkinides | *Georgia Institute of Technology, United States*
- **ID 589** | *Rapid Evaluation of Battery System Rating For Frequency Response Operation*  
Vasileios Tsormpatzoudis, Rebecca Todd, Andrew Forsyth | *The University of Manchester, United Kingdom*
- **ID 645** | *Intelligent management of battery system for energy arbitrage*  
Jonas Souza, Antonio Momesso, Felipe Monteiro, Eduardo Asada | *Sao Carlos School of Engineering - University of Sao Paulo, Brazil*  
Rodrigo Otto | *Itaipu Technological Park Foundation, Brazil*
- **ID 274** | *How and why the batteries in the sectors of photovoltaics and electric vehicles could have impact on the society*  
Suvad Halilčević | *University of Tuzla, Bosnia and Herzegovina*  
Pavlos Georgilakis | *National Technical University of Athens, Greece*

**10:30 – 12:10** | TS 4F | Room BL.270.3*System Operation and Control – Reliability Analysis for Electrical Power Components*Chair: Edson Bortoni | *Itajubá Federal University, Brazil*

- **ID 171** | *Optimal Sensor Placement Methodology based on FDTD for Partial Discharge Detection in GIS*  
Kwang-Seok Kim, Ju-Ik Oh, Jong-Won Yu | *School of Electrical Engineering Korea Advanced Institute (KAIST), South Korea*  
Jin-Ho Lee, Chang-Hwan Jin, Min-Gyu Kim | *LS Industrial System (LSIS) Co Ltd., South Korea*
- **ID 681** | *A Bayesian Network Framework for Operations of Circuit Breakers*  
Alberto Carboni, Khaled ElShawarby, Enrico Ragaini, Francesco Amigoni | *Politecnico di Milano, Italy*  
Gabriele Perrone | *ABB S.p.A., Italy*
- **ID 682** | *Electric Stress in Power Electronics Applications*  
Khaled ElShawarby, Alberto Carboni, Giovanni Maria Foglia, Roberto Perini, Antonino Di Gerlando | *Politecnico di Milano, Italy*  
Enrico Ragaini | *ABB S.p.A., Italy*
- **ID 391** | *EMD and MCSA Improved via Hilbert Transform Analysis on Asynchronous Machines for Broken Bar Detection Using Vibration Analysis*  
Aline Tremblé, Rogério Flauzino | *University of Sao Paulo, Brazil*  
Geraldo Brito Júnior | *Western Paraná State University, Brazil*
- **ID 128** | *Field measurements and model comparison for a very long submarine HV AC three-core cable*  
Francesco Palone | *TERNA Rete Italia S.p.A., Italy*  
Fabio Massimo Gatta, Alberto Geri, Stefano Lauria, Marco Maccioni | *"Sapienza" University of Rome, Italy*  
Bruno Ceresoli | *CESI S.p.A, Italy*

**10:30 – 12:10 | TS 4G | Room BL.270.6***Innovative Grids in Energy Hybrid Systems Integration – Large Multi-Energy Systems Management*Chair: Joe Chow | *Rensselaer Polytechnic Institute, United States*

- **ID 157** | *Archetypes of Country Energy Systems*  
Martin Küppers, Michael Metzger, Matthias Huber, Simon Paulus | *Siemens AG, Corporate Technology, Germany*
- **ID 59** | *On the Limitations of Volt-var Control in PV-Rich Residential LV Networks: A UK Case Study*  
Andreas T. Procopiou, Luis F. Ochoa | *The University of Melbourne, Australia*
- **ID 485** | *Improving Electricity and Natural Gas Systems Coordination Using Swing Option Contracts*  
Conor O Malley, Stefanos Delikaraoglou, Gabriela Hug | *ETH Zurich, Switzerland*
- **ID 414** | *Mixed integer quadratic programming receding horizon microgrid supervisor*  
Martin Legry, Frederic Colas, Christophe Saudemont, Jean Yves Dieulot | *Univ. Lille, Centrale Lille, Arts et Métiers Paris Tech, - L2EP - Laboratoire d'Electrotechnique et d'Electronique de Puissance, France*  
Olivier Ducarme | *Engie Lab Laborelec, France*
- **ID 575** | *Unlocking the Flexibility of CHP in District Heating Systems to Provide Frequency Response*  
Xiaodong Xu, Yue Zhou, Meysam Qadrdan, Jianzhong Wu | *Cardiff University, United Kingdom*
- **ID 252** | *The impact of energy dispatch strategy on design optimization of hybrid renewable energy systems*  
Kun Lee, Dongsuk Kum | *Korea Advanced Institute of Science and Technology (KAIST), South Korea*

**10:30 – 12:10 | TS 4H | Room BL.270.7***Innovative Grids in Energy Hybrid Systems Integration*Chair: Pablo Arbolea | *University of Oviedo, Spain*

- **ID 36** | *Control of Battery Storage Systems for the Simultaneous Provision of Multiple Services*  
Emil Namor, Fabrizio Sossan, Rachid Cherkaoui, Mario Paolone | *EPFL, Switzerland*
- **ID 219** | *A Comprehensive Assessment of the Short-Term Uncertainty of Grid-Connected PV Systems*  
Enrica Scolari, Lorenzo Reyes-Chamorro, Fabrizio Sossan, Mario Paolone | *EPFL, Switzerland*
- **ID 296** | *Defining Customer Export Limits in PV-Rich Low Voltage Networks*  
Tiago Ricciardi | *University of Campinas, Brazil*  
Kyriacos Petrou, Luis (Nando) Ochoa | *The University of Melbourne, Australia*  
John F. Franco | *Sao Paulo State University, Brazil*

- **ID 922** | *Planning and operation models for an EV sharing community in spot and balancing market*  
Meng Song, Mikael Amelin | *Royal Institute of Technology, Sweden*  
Xue Wang | *ABB, Sweden*  
Ashad Saleem | *Power2U, Sweden*
- **ID 854** | *User-Comfort Oriented Bidding Strategy for Electric Vehicle Parking Lots*  
Ibrahim Şengör, Alper Çiçek, Ayşe Kübra Erenoğlu, Ozan Erdiñç | *YTU, Turkey*  
Akin Taşçikaraoğlu | *Mugla Sıtkı Kocman University, Turkey*  
João P. S. Catalão | *FEUP and INESC TEC, Portugal*

**10:30 – 12:10 | SS 9 | Room BL.270.4***Validation and De-Risking of Grid Modernization Technologies with Hardware in the Loop Testing*Organizer: Kati Sidwall | *RTDS***13:00 - 14:20 | PS 4A | BL27 First Floor | Poster Area***Planning and Operation of Power Systems under Market Condition – Grid Planning, Dispatch and Unit Commitment*Chair: Valentin Ilea | *Politecnico di Milano, Italy*

- **ID 2** | *New Planning for the 500kV Vietnamese Grid with High Penetration of Renewable Energy Sources*  
Minh Quan Duong, Huu Hieu Nguyen, Tuan Le | *University of Danang, Vietnam*  
Marco Mussetta | *Politecnico di Milano, Italy*
- **ID 533** | *Uprating studies for a 230 kV-50 Hz overhead line*  
Luigi Michi, Enrico Maria Carlini, Michela Migliori, Francesco Palone | *TERNA, Italy*  
Stefano Lauria | *Sapienza University of Rome, Italy*
- **ID 46** | *Impact of Wind Speed Distortions on Chilean Power System Expansion Planning* Enzo Sauma, Catalina Rosende | *Pontificia Universidad Católica de Chile, Chile*
- **ID 818** | *Combined Planning of Medium and Low Voltage Grids*  
Roman Bolgaryn, Alexander Scheidler | *Fraunhofer Institute for Energy Economics and Energy System Technology IEE, Germany*  
Martin Braun | *University of Kassel and Fraunhofer Institute for Energy Economics and Energy System Technology IEE, Germany*
- **ID 601** | *Impact of Gas Third Party Access in the Unit Commitment Optimal Solution*  
Pedro Otaola-Arca, Javier García-González | *Universidad Pontificia Comillas, Spain*  
Fernando Mariño, Ignacio Rivera | *Endesa, Spain*

- **ID 272** | *Unit Commitment with ACOPF Constraints: Practical Experience with Solution Techniques*  
Diego A. Tejada-Arango, Sonja Wogrin, Andrés Ramos Galán, Pedro Sánchez Martín | *Universidad Pontificia Comillas, Spain*
- **ID 490** | *A Quadratic Convex Approximation for the Short-Term Hydro-Thermal Dispatch*  
Juan Camilo Castaño, Alejandro Garces | *Universidad Tecnológica de Pereira, Colombia*  
Olav B Fosso | *Norwegian University of Science and Technology, Norway*
- **ID 756** | *Load Dispatch Optimization using Dynamic Rating and Optimal Lifetime Utilization of Transformers*  
Nicola Viafora, Joachim Holboll | *Technical University of Denmark, Denmark*  
Syed Hamza H. Kazmi, Thomas H. Olesen, Troels S. Sørensen | *Ørsted Offshore Wind A/S, Denmark*
- **ID 706** | *Solving the stochastic transmission capacity expansion planning problem based on generalized partial transmission distribution factors*  
Victor Hinojosa, Joaquin Sepulveda | *Universidad Tecnica Federico Santa Maria, Chile*
- **ID 451** | *A Mixed Integer Second Order Cone Program for Transmission-Distribution System Co-Optimization*  
Ilyes Mezghani, Anthony Papavasiliou | *Center for Operations Research and Econometrics, Belgium*

**13:00 - 14:20** | PS 4B | BL27 First Floor | Poster Area

### Power System Stability

Chair: Stefano Bracco | *University of Genoa, Italy*

- **ID 109** | *Analysis of Angular Threshold Criteria for Transient Instability Identification in Uncertain Power Systems*  
Juan Dante Morales Alvarado, Jovica Milanovic | *The University of Manchester, United Kingdom*  
Panagiotis Papadopoulos | *University of Strathclyde, United Kingdom*
- **ID 115** | *Model Order Reduction of Active Distribution Networks with TSO-DSO Interconnection Power Flow Control*  
Holm Hinner, Johanna Myrzik | *University of Bremen, Germany*  
Daniel Mayorga Gonzalez | *TU Dortmund, Germany*
- **ID 340** | *Initial Study of the Power System Stability Boundary Estimated from Nonlinear Modal Decoupling*  
Xin Xu, Bin Wang, Kai Sun | *University of Tennessee, Knoxville, United States*
- **ID 405** | *Estimating Transient Stability Margin Regarding a Dominant Oscillation Mode*  
Wenjun Ju, Bin Wang, Kai Sun | *University of Tennessee, Knoxville, United States*
- **ID 653** | *A Sparse Grid Scheme for Fast Transient Stability Simulation with Reduced Redundancy*  
Yang Liu, Kai Sun, Bin Wang, Rui Yao | *University of Tennessee, Knoxville, United States*  
Wei Kang | *Naval Postgraduate School, United States*

- **ID 369** | *Synchronous Machine Representations for Stability Studies of Power Systems with Inverters*  
Guilherme Santos Pereira | *EDF / Centrale Lille, France*  
Valentin Costan | *EDF, France*  
Antoine Bruyère, Xavier Guillaud | *Centrale Lille, France*
- **ID 190** | *Influence of Power System Stabilizers on HVDC Control Systems in an Asynchronous Interconnection Power Grid*  
Chunxiao Liu, Wei Liu, Qiang Zhang | *China Southern Grid, China*
- **ID 552** | *PSS modification to stabilize synchronous machines during events with high Rate of Change of Frequency*  
Armin Kerperin | *Power Grid Services, Germany*  
Alf Assenkamp | *TÜV Rheinland Industry Service GmbH, Germany*  
Christian Kreischer | *Helmut Schmidt University/ Uni BWL, Germany*
- **ID 523** | *Design of power system stabilizers to damp low frequency inter-area oscillations with limited information*  
Javier Renedo, Lukas Sigrist, Luis Rouco | *Universidad Pontificia Comillas, Spain*
- **ID 203** | *System value for wind farms providing frequency services under different control frameworks*  
Vincenzo Trovato | *EDF Energy R&D UK Centre & Imperial College London, United Kingdom*  
Maria Dicorato, Giuseppe Forte | *Politecnico di Bari, Italy*  
Michele Trovato | *DEI - Politecnico di Bari, Italy*

**13:00 - 14:20** | PS 4C | BL27 First Floor | Poster Area

### Network Modeling, Protection and Security – Coordination Issues and System Reliability

Chair: Phuong Nguyen | *Eindhoven University of Technology, Netherlands*

- **ID 526** | *Fault Current Limiting Investigation for a Single-Phase Dynamic Voltage Conditioner*  
Roberto Faranda, Ali Bahrami | *Politecnico di Milano, Italy*  
Hossein Hafezi | *University of Vaasa, Finland*
- **ID 732** | *Effect of Extensive Cabling on Efficiency of Resonant Earthing Applied in Medium-Voltage Distribution Networks: a Hungarian Case Study*  
Bálint Hartmann, István Vokony, István Tácsi, József Kiss | *Budapest University of Technology and Economics, Hungary*
- **ID 662** | *Loss of Coordination in a Protection Scheme due to DG assessed by means of Reliability Analysis*  
Julián Valbuena G., Andrés Pavas | *Universidad Nacional de Colombia, Colombia*
- **ID 540** | *Impact on Reliability of Transformers on Account of Phase Unbalances in EHV Network*  
Abhishek Gautam, Aman Gautam, Rahul Shukla, Ashok Kumar, N. Nallarasana, S.R Narasimhan | *Power System Operation Corporation Limited, India*



- **ID 56** | *Transmission line unavailability due to correlated threat exposure*  
Erlend Sandø Kiel | NTNU - Norwegian University of Science and Technology, Norway  
Gerd Hovin Kjølle | SINTEF Energy Research/NTNU, Norway
- **ID 647** | *Towards On-line PMU-based Model Calibration for Look-ahead Frequency Analysis*  
Juan Quiroz, Hector Chavez | University of Santiago, Chile
- **ID 438** | *Open Phase Condition Scenarios for Nuclear Power Plant Electrical Network Studies*  
Anna Kulmala, Antti Alahäivälä | VTT, Finland
- **ID 135** | *Investment Model for Cost-effective Integration of Solar PV Capacity under Uncertainty using a Portfolio of Energy Storage and Soft Open Points*  
Spyros Giannelos, Ioannis Konstantelos, Goran Strbac | Imperial College London, United Kingdom

### 13:00 - 14:20 | PS 4D | BL27 First Floor | Poster Area

#### Advanced Monitoring for Equipment Reliability

Chair: Irene Y.H. Gu | Chalmers University of Technology, Sweden

- **ID 890** | *Analysis of Vibration Signals of HUV Shunt Reactor Based on CRP and RQA*  
Xuan Chen, Zhenyao Liu | State Grid Jiangsu Electric Power Co., Ltd. Maintenance Branch Company, China  
XinCheng Pan, Hongzhong Ma | College of Energy and Electrical Engineering, Hohai University, China
- **ID 891** | *Application of Empirical Wavelet Transform in Vibration Signal Analysis of UHV Shunt Reactor*  
Ning Jiang, Baoxing Hao | State Grid Jiangsu Electric Power Company's Maintenance Branch Company, China  
Ruoyu Zhao, Hongzhong Ma | College of Energy and Electrical Engineering, Hohai University, China  
Lei Xu, Li Li | Nanrui Jibao Electric Company, China
- **ID 362** | *Dynamic Resistance Measurements and Result Interpretation for Various On-Load Tap Changers*  
Aleksandar Boricic, Danilo Laban, Bruno Moedim, Almudena Conde Lopez, Ben Molinari, Zain Riaz | KTH Royal Institute of Technology, Sweden  
Roya Nikjoo | Megger Sweden AB, Sweden
- **ID 257** | *A Malfunction Detection Method For PV Systems*  
Tuna Yildiz, Murat Gol | Middle East Technical University, Turkey
- **ID 511** | *Identification and Diagnosis of a Photovoltaic Module based on Outdoor Measurements*  
Giovanni Spagnuolo | University of Salerno, Italy  
Kari Lappalainen, Seppo Valkealahti | Tampere University, Finland  
Patrizio Manganiello | IMEC, Belgium
- **ID 635** | *Relation of Winding Resistance Measurement and Dissolved Gas Analysis for Power Transformers*  
Roya Nikjoo | Megger, Sweden  
Nami Mahmoudi | PENCO, Iran

- **ID 241** | *Dynamic analysis of thermal degradation of basin-type insulator*  
Hu Jin, Ruihai Li | Electric Power Research Institute, China Southern Power Grid, China  
Peng Ren, Peng Peng, Wei Zhang, Yi Xiao, Haoxi Cong, Fucheng Wang | School of Electrical and Electronic Engineering, North China Electric Power University, China
- **ID 697** | *Electric field and Temperature Distribution along the Polymer Rod Type Suspension Insulator in Polluted Environment*  
Mirza Batalović, Halid Matoruga | Faculty of Electrical Engineering, Bosnia and Herzegovina  
Mirza Matoruga | Elektroprenos - Elektroprijenos BiH Sector for Power Lines, Bosnia and Herzegovina  
Sead Berberović | Faculty of Electrical Engineering and Computing, Croatia

### 13:00 - 14:20 | PS 4E | BL27 First Floor | Poster Area

#### Big Data and Data Analysis in Power Systems

Chair: Raul Igual | Universidad de Zaragoza, Spain

- **ID 117** | *Statistical Methods for Condition Assessment of Low-Failure Assets*  
Maikel Klerx, Johan Morren, Han Slootweg | Eindhoven University of Technology, Netherlands
- **ID 294** | *Explanatory and Causal Analysis of the MIBEL Electricity Market Spot Price*  
Carla Gonçalves, Miguel Ribero, João Viana, Renato Fernandes, José Villar, Ricardo Bessa | INESC TEC (Institute for Systems and Computer Engineering, Technology and Science), Portugal  
Gonçalo Correia, José Sousa, Virgílio Mendes, Ana Cristina Nunes | EDP Produção, Portugal
- **ID 367** | *Data-driven Feature Description of Heat Wave Effect on Distribution System*  
Yang Zhang, Andrea Mazza, Ettore Bompard | Politecnico di Torino, Italy  
Emiliano Roggero, Giuliana Galofaro | IRETI SpA, Italy
- **ID 417** | *An Advanced Tool for Data Analysis of Energy Management System Calculations*  
Domagoj Peharda | Koncar - Power Plant and Electric Traction Engineering Inc., Croatia  
Renata Rubeša, Igor Ivanković, Ana Kekelj | HOPS, Croatia
- **ID 464** | *Transmission Line Exclusion Algorithm to Solve the Expansion Planning Problem*  
Paula Pengo, Gustavo Rebello, Edimar José de Oliveira, Ivo da Silva | Federal University of Juiz de Fora, Brazil
- **ID 619** | *Learning from power system data stream*  
Mauro Escobar, Daniel Bienstock | Columbia University, United States  
Michael Chertkov | Los Alamos National Laboratory, United States
- **ID 657** | *Predictive Modeling of Electricity Trading Prices and the Impact of Increasing Solar Energy Penetration*  
Soumyo Chakraborty | Virginia Tech, United States  
Sandeep Shukla | Indian Institute of Technology – Kanpur, India

- **ID 666** | *Toward Data-Driven Identification of Essential Factors Causing Seasonal Change in Daily Electricity Demand Curves*  
Nanae Kaneko, Yu Fujimoto, Yasuhiro Hayashi | Waseda University, Japan
- **ID 747** | *Clustering Household Electrical Load Profiles Using Elastic Shape Analysis*  
Sutanoy Dasgupta, Jose Cordova, Anuj Srivastava | Florida State University, United States  
Reza Arghandeh | Western Norway University of Applied Sciences, Norway

**13:00 - 14:20** | PS 4F | BL27 First Floor | Poster Area

*Computational Intelligence, Optimization Methods and Data Driven Approaches in Power Systems*

Chair: Marco Pasetti | University of Brescia, Italy

- **ID 182** | *State duration based event detection for domestic power disaggregation*  
Liya Ma, Peter Schegner | TU dresden, Germany
- **ID 516** | *Online Demand Response for End-User Loads*  
Arman Alahyari, David Pozo | Skolkovo Institute of Science and Technology, Russia
- **ID 636** | *Detection and Characterization of Domestic Heat Pumps*  
Guillaume Le Ray, Morten Herget Christensen, Pierre Pinson | DTU, Denmark
- **ID 275** | *Clustering-based Discrimination of multiple Partial Discharge Sources: A Case Study*  
Mauro Palo, Benjamin Schubert, Jianguo Wei, Weilin Liu | Global Energy Interconnection Reserch Institute (GEIRI) Europe GmbH, Germany
- **ID 422** | *Smart Maintenance Model for Operational Planning of Static Synchronous Compensators*  
Manuel Alvarez-Alvarado, Dilan Jayaweera | University of Birmingham, United Kingdom
- **ID 748** | *A Data-driven Approach to Grid Impedance Identification for Impedance-based Stability Analysis under Different Frequency Ranges*  
Chendan Li, Marta Molinas, Olav Bjarte Fosso | NTNU, Norway  
Nan Qin | Energinet.dk, Denmark  
Lin Zhu | UTK, United States
- **ID 923** | *Implementation of PM Step Skew Technique to Optimum Design of a Transverse Flux PM Generator for Small Scale Wind Turbine*  
Reza Nasiri-Zarandi, Akbar Mohammadi Ajamloo | Niroo Research Institute (NRI), Iran
- **ID 139** | *Topology Control in Power System Using Visualization*  
Rao Fu, Hyungseon Oh | University at Buffalo, United States  
Ilya Grinberg | SUNY Buffalo State, United States

**13:00 - 14:20** | PS 4G | BL27 First Floor | Poster Area

*Advanced Metering and Cyber Security*

Chair: Simone Franzò | Politecnico di Milano, Italy

- **ID 349** | *Reliable Data Communications Device Configuration Using IEC61850*  
John O'Raw | Letterkenny Institute of Technology, Ireland  
David Laverty, John Morrow | Queens University Belfast, United Kingdom
- **ID 311** | *Dynamic Synchrophasor Estimation Algorithm for P-class Phasor Measurement Units*  
Lei Chen, Wei Zhao, Fuping Wang, Yiqing Yu, Songling Huang | Tsinghua University, China
- **ID 448** | *Location of High Impedance Faults using Smart Meters in Distribution Systems with DGs, Power Electronic Loads and Electric Arc Furnaces*  
Asha Radhakrishnan, Sarasij Das | Indian Institute of Science, India
- **ID 454** | *Real-time monitoring and control system for Trieste University Campus electrical distribution grid*  
Massimiliano Chianzone, Marco Dalle Feste, Giorgio Sulligoi | University of Trieste, Italy
- **ID 630** | *Design of Interoperable Communication Architecture for TSO-DSO Data Exchange*  
Nermin Suljanovic, Andrej Souvent | Electric Power Research Institute Milan Vidmar, Slovenia  
Gareth Taylor, Mohammed Radi | Brunel University, United Kingdom  
Jérôme Cantenot, Eric Lambert, Hugo Morais | EDF Lab Paris-Saclay, France
- **ID 780** | *Detection and localization of non-technical losses in distribution systems with future smart meters*  
Mattias Persson, Anders Lindskog | Research Institutes of Sweden (RISE), Sweden
- **ID 48** | *An Increase in Information Security of Electric Power System with Wind Power Penetration under Low Redundancy of Measurements*  
Anna Glazunova, Elena Aksaeva | Melentiev Energy Systems Institute of Siberian Branch of the Russian Academy of Sciences, Russia
- **ID 248** | *Challenges and opportunities for phasor data based event detection in transmission control centers under cyber security constraints*  
Andre Kummerow, Dennis Rösch, Cristian Monsalve, Steffen Nicolai, Peter Bretschneider | Fraunhofer IOSB-AST, Germany  
Christoph Brosinsky, Dirk Westermann | Technische Universität Ilmenau, Germany
- **ID 375** | *Reinforcement Learning for Cyber-Physical Security Assessment of Power Systems*  
Xiaorui Liu, Charalambos Konstantinou | FAMU-FSU College of Engineering, Center for Advanced Power Systems, Florida State University, United States
- **ID 62** | *Efficient Convex Optimization for Optimal PMU Placement in Large Distribution Grids*  
Miguel Picallo | ETH Zurich, Switzerland  
Adolfo Anta | Austrian Institute of Technology, Austria  
Bart De Schutter | Delft University of Technology, Netherlands

**13:00 - 14:20** | PS 4H | BL27 First Floor | Poster Area*Co-Simulation of Electric Energy Systems and ICT Systems*Chair: Carmen Borges | *Federal University of Rio de Janeiro, Brazil*

- **ID 51** | *Implementation overview of a novel approach to Smart Microgrid Real Time Simulation*  
Harshavardhan Palahalli Mallikarjun, Giambattista Grusso, Yujia Huo | *Politecnico Di Milano, Italy*
- **ID 137** | *A Co-Simulation Framework for Power Systems and Communication Networks*  
Weilin Zhong, Muyang Liu, Federico Milano | *University College Dublin, Ireland*
- **ID 329** | *A Framework for the Integration of ICT-relevant Data in Power System Applications*  
Michael Brand, Shoaib Ansari, Felipe Castro, Ranim Chakra, Batoul Hage Hassan, Carsten Krüger, Davood Babazadeh, Sebastian Lehnhoff | *OFFIS - Institute of Information Technology, Germany*
- **ID 395** | *A REST based co-simulation interface for distributed simulations*  
Mike Vogt, Frank Marten, Juan Montoya, Christian Töbermann, Martin Braun | *Fraunhofer IEE, Germany*
- **ID 570** | *Suboptimality of Decentralized Methods for OPF*  
Ilgiz Murzakhonov, Alexander Malakhov, Elena Gryazina | *Skolkovo Institute of Science and Technology, Russia*
- **ID 585** | *A cyber-physical platform for simulating energy transactions in local energy markets*  
Marco Galici, Emilio Ghiani, Matteo Troncia, Giuditta Pisano, Fabrizio Pilo | *University of Cagliari, Italy*
- **ID 596** | *Mitigation of Communication Costs in Peer-to-peer Electricity Markets*  
Roman Le Goff Latimier, Thomas Baroche, Hamid Ben Ahmed | *SATIE Laboratory, France*
- **ID 815** | *A Survey on Simulation of Power Systems Resilience Under Extreme Weather Events*  
Izgh Hadachi, Sahin Albayrak | *TU Berlin, Germany*
- **ID 426** | *Energy Flexibility Analysis using FMUWorld*  
Digvijay Gusain, Milos Cvetkovic, Peter Palensky | *TU Delft, Netherlands*

**13:00 - 14:20** | PS 4I | BL27 First Floor | Poster Area*Smart Controls and Advanced Software Tools*Chair: Samuele Grillo | *Politecnico di Milano, Italy*

- **ID 100** | *Bidirectional back-to-back link based on the virtual synchronous machine approach*  
Juan M Ramirez, Emmanuel Torres-Montalvo, César Ibarra-Nuño | *CINVESTAV del IPN, Mexico*  
Julio C. Rosas Caro, Antonio Valderrabano-Gonzalez | *Universidad Panamericana Guadalajara, Mexico*
- **ID 165** | *Adaptive Asset Congestion Management in PV-Rich LV Networks*  
Andreas T. Procopiou, Luis F. Ochoa | *The University of Melbourne, Australia*
- **ID 406** | *Energy Management Modelling Under Real-time Approach*  
Anna Mutule, Ervin Grebesh, Ivars Zikmanis | *Institute of Physical Energetics, Latvia*  
Irina Oleinikova | *Norwegian University of Science and Technology, Norway*

- **ID 472** | *Estimation of Expected Cost Curve on Operation Parameter Space for Planning Residential PEFC-CGS*  
Yuta Tsuchiya, Yu Fujimoto, Akira Yoshida, Yoshiharu Amano, Yasuhiro Hayashi | *Waseda University, Japan*
- **ID 89** | *Python based scenario design and parallel simulation method for transient rotor angle stability assessment in PowerFactory*  
Sohail Khan | *Austrian Institute of Technology, Austria*  
Aadil Latif | *National Renewable Energy Laboratory, United States*
- **ID 236** | *A Julia Module for Polynomial Optimization with Complex Variables applied to Optimal Power Flow*  
Julie Sliwak | *RTE, Polytechnique Montréal & LIPN, Université, France*  
Manuel Ruiz | *RTE, France*  
Miguel F. Anjos | *School of Mathematics, University of Edinburgh, United Kingdom*  
Lucas Létocart, Emiliano Traversi | *LIPN, Université Paris 13, France*
- **ID 911** | *A Metamodel for Multi-utilities Asset Management*  
Alessandro Bosisio | *Politecnico di Milano, Italy*  
Davide Della Giustina, Stefano Fratti, Alessio Dedè, Stefano Gozzi | *UNARETI S.p.a., Italy*
- **ID 119** | *Real-Time Hardware-in-the-Loop Platform for Hybrid AC/DC Power System Studies*  
Tibin Joseph, Khadijat Jose, Carlos E. Ugalde-Loo, Gen Li, Jun Liang | *Cardiff University, United Kingdom*

**14:20 – 16:00** | SS 8 | Room BL.27.0.1*Understanding System Resilience in Critical Infrastructures*Organizer: Pierluigi Mancarella | *University of Melbourne, Australia*

- Session Introduction: Planning for Resilience  
Rodrigo Moreno | *University of Chile*  
Pierluigi Mancarella | *The University of Melbourne, Australia*
- Definition of Power System Resilience: a Property-Oriented View  
Emanuele Ciapessoni | *RSE, Italy*
- Distribution system resilience enhancement under wildfire threat  
Nikos Hatziaargyriou | *NTUA, Greece*
- Fundamental review of distribution network design standards: security versus resiliency  
Goran Strbac | *Imperial College London, UK*
- Power Systems Resilience: A Buzzword or a Matter of Survival?  
Mathaios Panteli | *The University of Manchester, UK*

**14:20 – 16:00 | TS 4I | Room BL.270.2***Innovative Grids in Energy Hybrid Systems Integration – Advanced Methods for Power Systems Planning and Modeling*

Chair: João Paulo Tomé Saraiva | *University of Porto (FEUP) and INESC Technology and Science (INESC TEC), Portugal*

- **ID 703** | *Mathematical Description of a Fundamental Transient Electric Load Model of Households*  
Franz Chirstange, Andreas Stadler, Thomas Hamacher | *Technical University of Munich, Germany*
- **ID 564** | *Taylor-Fourier PMU on a Real-Time Simulator: Design, Implementation and Characterization*  
Guglielmo Frigo, Asja Derviskadic, Yihui Zuo, Mario Paolone | *Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland*  
Alexandre Bach | *Ecole Normale Supérieure de Cachan, France*
- **ID 181** | *Stochastic optimization framework for online scheduling of an EV charging station in a residential place with photovoltaics and energy storage system*  
Gustavo Aragón, Otilia Werner-Kytölä | *Fraunhofer FIT, Germany*  
Erdem Gümrükcü | *RWTH Aachen University, Germany*
- **ID 447** | *Integrated Energy-Water Model for Interdependent Storage, Run-of-River and Pump Hydropower*  
Eduardo Alejandro Martínez Ceseña, Mathaios Panteli, Joseph Mutale, Pierluigi Mancarella, James Tomlinson, Julien Harou | *The University of Manchester, United Kingdom*
- **ID 799** | *A Novel Planning Method for Multi-Scale Integrated Energy System*  
Jingjie Yang, Wei Sun, Gareth Harrison, James Robertson | *The University of Edinburgh, United Kingdom*
- **ID 859** | *Optimal Operation of a Smart Multi-Energy Neighborhood*  
Mustafa Ata, Ayşe Kübra Erenoğlu, İbrahim Şengör, Ozan Erdiç | *YTU, Turkey*  
Akın Taşcıkaraoğlu | *Mugla Sıtkı Kocman University, Turkey*  
João P. S. Catalão | *FEUP and INESC TEC, Portugal*

**14:20 – 16:00 | TS 4J | Room BL.270.3***System Operation and Control – Power Quality Mitigation Techniques*

Chair: A.P. Sakis Meliopoulos | *Georgia Institute of Technology, United States*

- **ID 176** | *Wideband Harmonic Voltage Distortion Mitigation in Distribution Networks using Virtual Synchronous Machines*  
Jawwad Zafar, Agustí Egea-Álvarez | *University of Strathclyde, United Kingdom*  
Alan Collinson | *SP Energy Networks, United Kingdom*
- **ID 842** | *Assessment of best practices for mitigation of rapid voltage change due to transformer inrush*  
Gaurav Singh, Carl Miller, William Howe | *Electric Power Research Institute, United States*

- **ID 189** | *Flicker Mitigation by Optimization of Voltage Control*  
Reinhold Bertram | *RWTH Aachen University, Germany*
- **ID 392** | *Evaluation of automatic power quality classification in microgrids operating in islanded mode*  
Raul Igual, Carlos Medrano | *Universidad de Zaragoza, Spain*  
Franz Schubert | *HAW Hamburg (Hochschule für Angewandte Wissenschaften Hamburg), Germany*
- **ID 221** | *Generative Adversarial Model-Guided Deep Active Learning for Voltage Dip Labelling*  
Azam Bagheri, Math. H. J. Bollen | *Lulea University of Technology, Sweden*  
Irene Y.H. Gu | *Chalmers University of Technology, Sweden*
- **ID 386** | *The Novel Method for Voltage Transient Detection and Characterization*  
Azam Bagheri, Math H.J. Bollen | *Luleå University of Technology, Sweden*

**14:20 – 16:00 | TS 4K | Room BL.270.6***System Operation and Control – Mitigation Techniques for Power System Stability*

Chair: Alberto Berizzi | *Politecnico di Milano, Italy*

- **ID 104** | *Autonomous Soft Open Point Control for Active Distribution Network Voltage Level Management*  
Hossein Hafezi, Hannu Laaksonen | *University of Vaasa, Finland*
- **ID 357** | *Centralized and Distributed Battery Energy Storage System for Peak Load Demand Support of Radial Distribution Networks*  
Shubh Lakshmi, Sanjib Ganguly | *Indian Institute of Technology Guwahati, India*
- **ID 292** | *Enhancement of Transient Stability in Power Systems with High Penetration Level of Wind Power Plants*  
Da Wang, Jose Luis Torres, Mart van der Meijden, Peter Palensky, Arcadio Perilla Guerra, Elyas Rakhshani | *Delft University of Technology, Netherlands*
- **ID 184** | *Determination of Maximum Wind Power Penetration Considering Wind Turbine Fast Frequency Response*  
Elyas Rakhshani, Jose Rueda Torres, Mart van der Meijden, Peter Palensky | *Delft University of Technology (TUD), Netherlands*
- **ID 778** | *A Congestion Forecast Framework for Distribution Systems with High Penetration of PVs and PEVs*  
Ankur Srivastava, David Steen, Le Anh Tuan, Ola Carlson | *Chalmers University of Technology, Sweden*
- **ID 862** | *Flexible Co-operation of TCSC and Corrective Topology Control under Wind Uncertainty: An Interval-based Robust Approach*  
Ahmad Nikoobakht | *Higher Education Center of Eghlid, Iran*  
Jamshid Aghaei | *Shiraz University of Technology, Iran*  
Mohamed Lotfi, João P. S. Catalão | *FEUP and INESC TEC, Portugal*  
Gerardo J. Osório | *C-MAST, Portugal*  
Miadrezha Shafie-khah | *University of Vaasa, Finland*



**14:20 – 16:00** | TS 4L | Room BL.270.7*System Operation and Control*Chair: Rachid Cherkaoui | *EPFL, Switzerland*

- **ID 37** | *Controlling the Electrical State via Uncertain Power Injections in Three-Phase Distribution Networks*  
Cong Wang, Jean-Yves Le Boudec, Mario Paolone | *Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland*
- **ID 95** | *Analytical Estimation of Reactive Power Capability of a Radial Distribution System*  
Stefan Stanković, Lennart Söder | *KTH Royal Institute of Technology, Sweden*
- **ID 55** | *Towards Distributed OPF using ALADIN*  
Alexander Engelmann, Tillmann Mühlfordt, Timm Faulwasser | *Karlsruhe Institute of Technology (KIT), Germany*  
Yuning Jiang, Boris Houska | *ShanghaiTech University, China*
- **ID 39** | *On the Properties of the Compound Nodal Admittance Matrix of Polyphase Power Systems*  
Andreas Martin Kettner, Mario Paolone | *École Polytechnique Fédérale de Lausanne (EPFL), Switzerland*
- **ID 237** | *The Setting Map Methodology for Adjusting the DG Anti-Islanding Protection Considering Multiple Events*  
Daniel Motter | *Center of Engineering and Exact Sciences, Western Parana State University, Brazil*  
Jose Carlos de Melo Vieira | *São Carlos School of Engineering - University of São Paulo, Brazil*
- **ID 360** | *Analytical Approach for Active Distribution Network Restoration Including Optimal Voltage Regulation*  
Hossein Sekhvatmanesh, Rachid Cherkaoui | *EPFL, Switzerland*

**16:10 – 17:50** | SS 10 | Room BL.270.1*Integration of PMU Measurements into Power System State Estimation*Organizer: Antonio Simoes Costa | *University of Santa Catarina, Brazil*

- The impact of PMUs on network model parameter estimation and error detection  
Ali Abur | *Northeastern University, Boston, USA*
- Experimental Validation of the PMU-based Linear State Estimation of Lausanne Power Distribution Network  
Mario Paolone | *EPFL, Lausanne, Switzerland*
- PMU-Based Estimation of Renewable Power Plants Parameters  
Miguel A. Gonzalez-Cagigal, Antonio Gomez-Exposito, Jose A. Rosendo-Macias | *University of Seville, Spain*
- **ID 649** | *Correntropy-Based Fusion Strategy for Incorporating PMU Measurements into Power System State Estimation*  
Larah Brüning Ascari, Antonio Simões Costa | *Federal University of Santa Catarina (UFSC), Brazil*  
Vladimiro Miranda | *University of Porto and INESC TEC, Portugal*

- Synchrophasors Redefining SCADA Systems  
Ricardo Abboud | *Schweitzer Engineering Laboratories, Inc. (Pullman, WA, USA)*

**16:10 – 17:50** | TS 4M | Room BL.270.2*System Operation and Control – Advanced Solutions for Voltage and Frequency Stability*Chair: Fabio Napolitano | *University of Bologna, Italy*

- **ID 101** | *Optimum Communication Network Design for Distributed Secondary Voltage Control in Microgrids*  
Farideh Doost Mohammadi, Hessam Keshtkar Vanashi | *Christopher Newport University, United States*  
Ali Feliachi | *West Virginia University, United States*
- **ID 153** | *RoCoF-based Improvement of Conventional Under-Frequency Load Shedding*  
Urban Rudez, Rafael Mihalic | *University of Ljubljana, Faculty of Electrical Engineering, Slovenia*
- **ID 284** | *Performance Evaluation of STATCOM Equipment using Ambient and Disturbance Data*  
Christoph Lackner, Joe Chow | *Rensselaer Polytechnic Institute, United States*  
Felipe Wilches-Bernal | *Sandia National Laboratories, United States*
- **ID 766** | *Power Oscillation Monitoring using Statistical Learning Methods*  
Hallvar Haugdal, Kjetil Uhlen | *Norwegian University of Science and Technology (NTNU), Norway*
- **ID 919** | *A Hybrid Analysis Approach for Transient Stability Assessment in Power Systems*  
Michael Kyesswa, Hüseyin K. Çakmak, Lutz Gröll, Uwe Kühnappel, Veit Hagenmeyer | *Karlsruhe Institute of Technology (KIT), Germany*
- **ID 678** | *Simplified Models for Frequency Studies in Electrical Power Systems*  
Francisco Casado-Machado, José Luis Martínez-Ramos, Alejandro Marano-Marcolini | *Universidad de Sevilla, Spain*

**16:10 – 17:50** | TS 4N | Room BL.270.3*System Operation and Control – Methodologies for Uncertainties Mitigation in Power Systems*Chair: Giovanni Spagnuolo | *University of Salerno, Italy*

- **ID 877** | *Optimal Scheduling of Generators and BESS using Forecasting in Power System with Extremely large Photovoltaic Generation*  
Rajitha Udawapola | *University of Ruhuna, Sri Lanka*  
Taisuke Masuta | *Meijo University, Japan*  
Hideaki Ohtake | *National Institute of Advanced Industrial Science and Technology, Japan*  
Joao Gari da Silva Fonseca Junior | *The University of Tokyo, Japan*

- **ID 242** | *Pumped-Storage Hydropower Operation Scheduling Method for Net Load Ramp Leveling*  
Ryuya Tanabe | *Central Research Institute of Electric Power Industry, Japan*  
Akihiko Yokoyama | *The University of Tokyo, Japan*
- **ID 208** | *Comparison of stochastic and deterministic security constrained optimal power flow under varying outage probabilities*  
Elis Nycander, Lennart Söder | *KTH Royal Institute of Technology, Sweden*
- **ID 496** | *A Mixed-Integer Distributionally Robust Chance-Constrained Model for Optimal Topology Control in Power Grids with Uncertain Renewables*  
Mostafa Nazemi, Payman Dehghanian, Miguel Lejeune | *George Washington University, United States*
- **ID 809** | *Cloud-AC-OPF: Model Reduction Technique for Multi-Scenario Optimal Power Flow via Chance-Constrained Optimization*  
Vladimir Frolov | *Skolkovo Institute of Science and Technology, Russia*  
Line Roald | *University of Wisconsin, United States*  
Michael Chertkov | *Center for Nonlinear Studies and Theoretical Division, United States*
- **ID 58** | *Continuation Power Flow Analysis of Distribution Systems under Uncertainty using Modified Affine Arithmetic*  
Bala Surendra Adusumilli, Kalyan Kumar Boddeti | *Indian Institute of Technology Madras, India*

#### 16:10 – 17:50 | TS 4O | Room BL.270.6

##### *System Operation and Control – Multiterminal HVDC for Stability Improvement*

Chair: Enrico Tironi | *Politecnico di Milano, Italy*

- **ID 690** | *HVDC developments for the all-island Cyprus system in a pan-European long-term perspective*  
Angelo L'Abbate, Roberto Calisti | *RSE SpA, Italy*
- **ID 519** | *Mutual Interactions and Stability Analysis of MMC-Based VSC-HVDC Link*  
Saman Dadjo Tavakoli, Eduardo Prieto-Araujo, Enric Sánchez-Sánchez, Oriol Gomis-Bellmunt | *Universitat Politècnica de Catalunya, Spain*
- **ID 858** | *Impact on Power System Frequency Dynamics from an HVDC Transmission System With Converter Stations Controlled as Virtual Synchronous Machines*  
Francesco Palombi, Luigi Piegari | *Politecnico di Milano, Italy*  
Atsede Endegnanew, Jon Are Suul, Salvatore D'Arco | *SINTEF Energy Research, Norway*
- **ID 562** | *Dynamic simulation of simultaneous HVDC contingencies relevant for vulnerability assessment of the Nordic power system*  
Espen Hafstad Solvang, Iver Bakken Sperstad | *SINTEF Energy Research, Norway*  
Sigurd Hofsmo Jakobsen | *SINTEF Energy Research / NTNU - Norwegian University of Science and Technology, Norway*  
Kjetil Uhlen | *NTNU - Norwegian University of Science and Technology, Norway*

- **ID 204** | *Energy Droop Control for MMC based Multiterminal HVDC Systems*  
Sven Baumann, Christoph Hahn, Johannis Porst, Matthias Luther | *Friedrich-Alexander University Erlangen-Nürnberg (FAU), Germany*
- **ID 261** | *Utilization of HVDC-Systems in the International Grid Control Cooperation*  
Arne Pawellek, Lutz Hofmann | *Leibniz Universität Hannover, Germany*

#### 16:10 – 17:50 | TS 4P | Room BL.270.7

##### *Innovative Grids in Energy Hybrid Systems Integration*

Chair: Ermanno Cardelli | *Università degli Studi di Perugia, Italy*

- **ID 29** | *Energy Systems Integration in Smart Districts: Robust Optimisation of Multi-Energy Flows in Integrated Electricity, Heat and Gas Networks*  
Eduardo Alejandro Martínez Ceseña, Pierluigi Mancarella | *The University of Manchester, United Kingdom*
- **ID 394** | *A Multiobjective Optimization Technique to Develop Protection Systems of Distribution Networks With Distributed Generation*  
Katiani Pereira | *Center for Engineering and Exact Sciences at the State University of West Paraná – UNIOESTE, Brazil*  
Benvindo R. Pereira Junior | *São Paulo University, São Carlos, Brazil*  
Javier Contreras | *the E. T. S. of Industrial Engineering, University of Castilla - La Mancha, Spain*  
José R. S. Mantovani | *Paulista State University, Ilha Solteira, Brazil*
- **ID 116** | *Reliable Dispatch of Renewable Generation via Charging of Time-varying PEV Population*  
Riccardo Remo Appino, Miguel Muñoz-Ortiz, Jorge Ángel González Ordiano, Ralf Mikut, Veit Hagenmeyer, Timm Faulwasser | *Karlsruhe Institute of Technology, Germany*
- **ID 446** | *Trading Small Prosumers Flexibility in the Energy and Tertiary Reserve Markets*  
José Iria, Filipe Soares | *INESC TEC, Portugal*  
Manuel Matos | *FEUP, Portugal*
- **ID 297** | *Local Energy Markets in LV Networks: Community based and Decentralized P2P Approaches*  
Jaysson Guerrero, Archie C. Chapman, Gregor Verbic | *The University of Sydney, Australia*

INFORMATION FOR PRESENTERS

TECHNICAL SESSION (TS) PRESENTERS

Accepted papers will be presented on each day of the conference (24-27 June) in parallel sessions grouped by subject topics. Authors of accepted papers should be aware that they, or a delegate notified and approved by the conference organizers, are expected to present the paper in person at the conference, in order for their paper to be included in the conference proceedings and uploaded to IEEE Xplore.

Technical Session presentations are scheduled in the mornings (except on 24th) and in the afternoons, in time slots of 1 hour and 40 minutes, as detailed in the conference programme. Five parallel themed Special Sessions or European Projects Sessions or Technical Sessions or Transaction Sessions will be hosted in each of the time slots, with 6 papers presented in each session.

Each presenter will have **12 minutes for the presentation** followed by 3 minutes for clarifying questions from the audience. Timings will be strictly enforced.

No template is provided and presenters are encouraged to optimize their presentations for a 4:3 aspect ratio.

Only Microsoft Power Point (ppt/pptx) or PDF files will be accepted. Mac users should be advised that the display computers will be Windows and are strongly encouraged to check compatibility (including font and slide layout) before presentation.

Prior the Session

Presenters are asked to determine their scheduled slot for presentation in the conference programme. Presentation must be uploaded to the conference computer during the coffee break before the starting of the scheduled session. In particular:

- session
- 08:30–10:10 Presenters must upload the presentation 15 minutes prior to the start of the session
- 10:30–12:10 Presenters must upload the presentation during the morning coffee break (10:10–10:30)
- 14:20–16:00 Presenters must upload the presentation during dessert&coffee break (14:00–14:20)
- 16:10–17:50 Presenters must upload the presentation during dessert&coffee break (14:00–14:20)

To ensure the smooth running of sessions with minimal delays, all presentations must be uploaded. It will not be possible to present from your own laptop.

Presenters are asked to contact their Session Chair before the session if they have any questions. Session chairs will be detailed in the programme once finalized.

During the Session

Each accepted paper must be presented in the scheduled session. Absence of the presenter will be taken as NO-SHOW by the Session Chair and the paper manuscript will be excluded from IEEE Xplore upload.

Please keep strictly to the time limit given (12 minutes per presentation), this will be strictly enforced.

POSTER SESSION (PS) PRESENTERS

The poster sessions form a key part of the conference programme and are scheduled without other presentations in parallel to ensure maximum delegate participation. Posters will be presented on each day of the conference (24-27 June) from 13:00 to 14:20 in the same area of the desserts and coffee after lunch. Small themed Poster Sessions (up to 10 papers) are organized in order to let oral presentations to the Chairs and delegates by the Authors.

The allowed formats to plot the poster are: A0 portrait: width 84.1 cm x length 118.9 cm (33.1 inch x 46.8 inch), and A1: 59.4 cm x 84.1 (23.4 inch x 33.1 inch). The poster boards will not be able to accommodate posters wider than this (so do not bring A0 landscape). Other formats will not be accepted. No template is provided.

A full poster is required. Printouts of presentation slides will not be displayed and will not be counted as presented. The corresponding paper manuscript will be excluded from the IEEE Xplore upload.

The absence of a presenter during the scheduled session will be taken as NO-SHOW by the Session Chair and the corresponding paper manuscript will be excluded from the IEEE Xplore upload.

Presenters are asked to contact their Session Chair before the session if they have any questions. Session chairs will be detailed in the programme once finalized.

Prior the Session

Presenters should display their posters starting from 10:10 of the day of their poster session. Suitable materials and volunteers will be on hand to help you.

Each poster board will be labelled with the number of the corresponding poster session and paper ID. Presenters are asked to look for their number in the conference programme.

During the Session

Presenters must attend their scheduled session 5 minutes prior to the start of the session. Presenters are required to be in the session room at their poster location during the entire poster session.

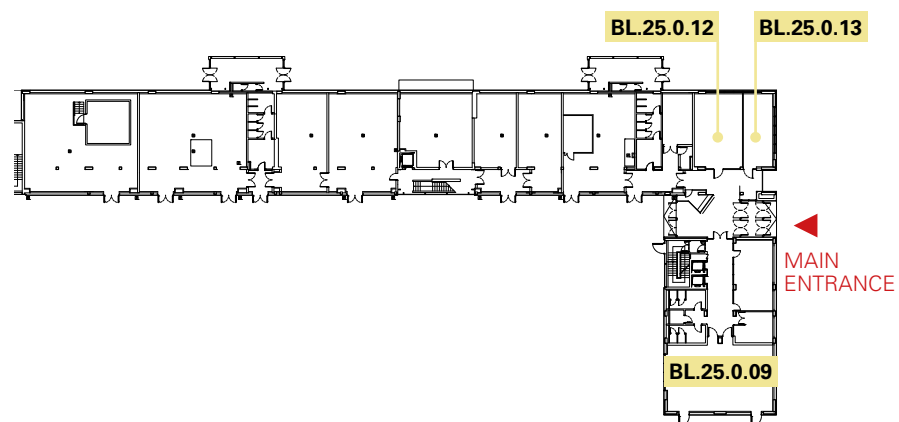
Poster sessions will be led by dedicated Chairs who will introduce the presenters who have up to 5 minutes to present their work. Timings will be strictly enforced. This will be followed by a brief Q&A.

After the Session

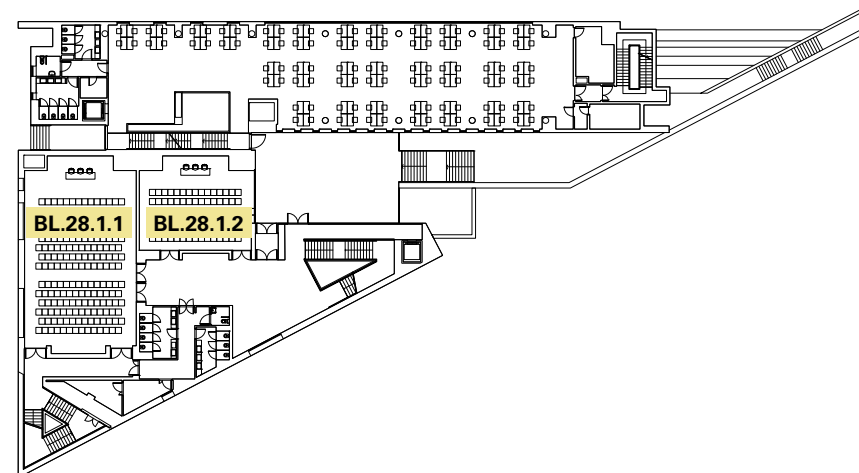
Presenters are required to remove their posters after the session has ended.

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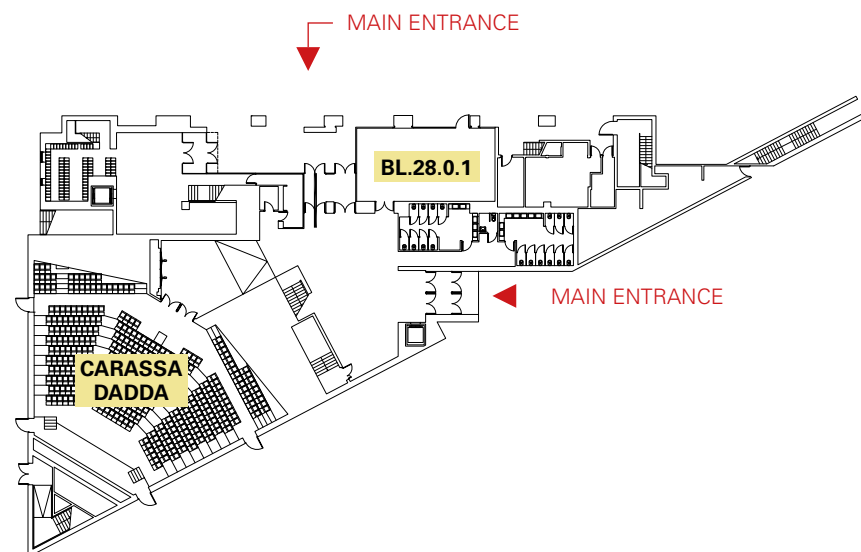
BL25 | Ground Floor



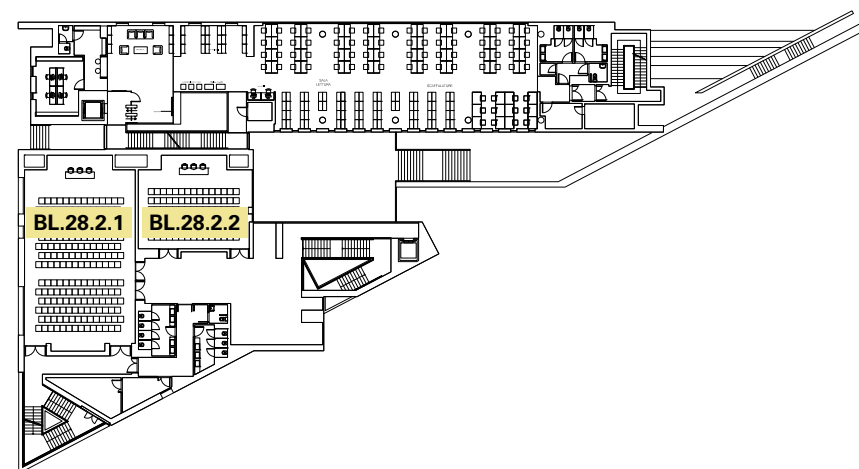
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BL28 | Ground Floor

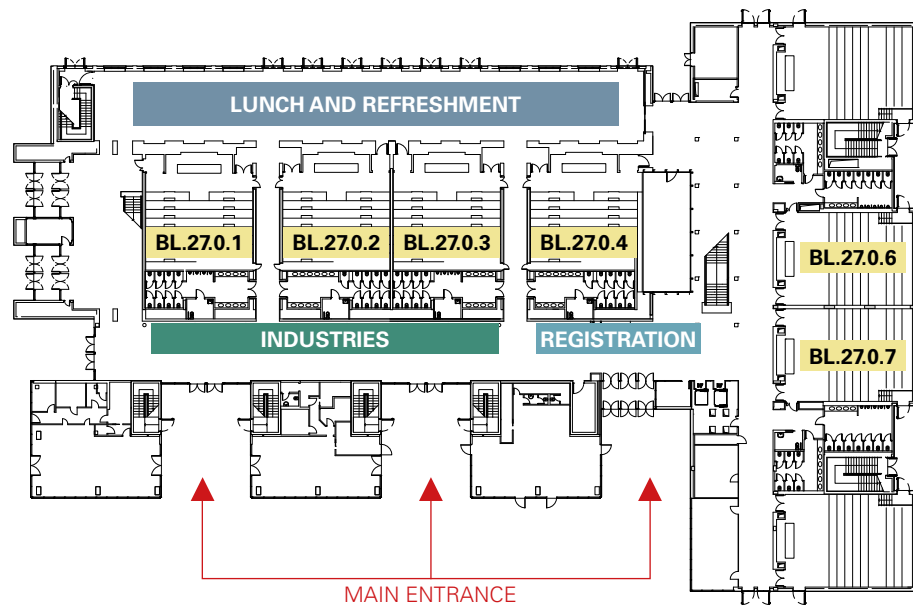


BL28 | Second Floor

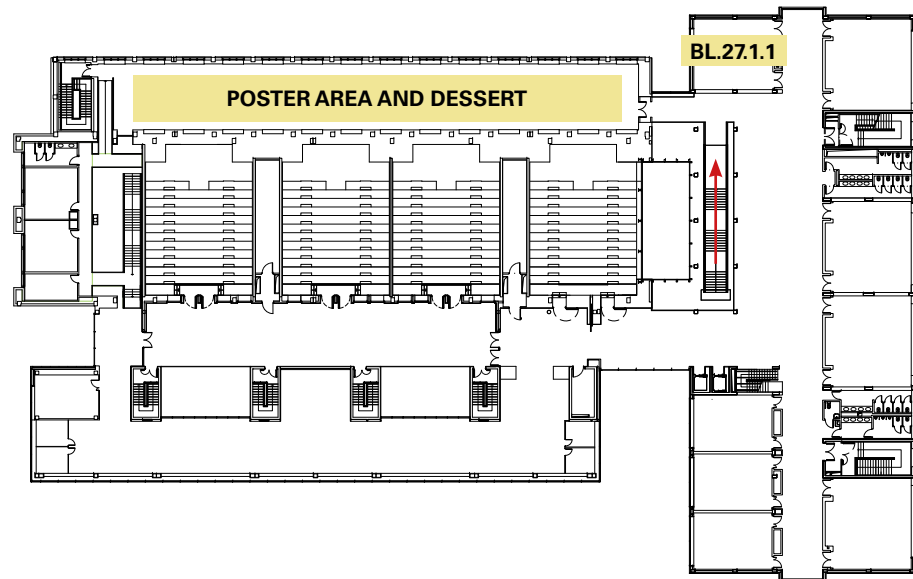




BL27 | Ground Floor



BL27 | First Floor



## NOTES

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Editing and Photos (except cover) by Gregorio Chiarenza

Photos:

Cover | Cathedral Square, *Milan*

Page 2 | Skycrapers in Gae Aulenti Square, *Milan*

Page 4 | Interior Rector's main building, Politecnico di Milano, *Milan*

Page 6 | Campus Leonardo Court, Politecnico di Milano, *Milan*

Page 8 | SCHOOL OF ARCHITECTURE, Politecnico di Milano, *Milan*

Page 12 | Cathedral of Milan (detail), *Milan*

Page 14 | Rector's main building, Politecnico di Milano, *Milan*

Page 16 | Campus Leonardo, Politecnico di Milano, *Milan*

Page 22 | Building BL28 Campus Bovisa, Politecnico di Milano, *Milan*

Page 25 | Milan in bronze, sculpture in Corso Vittorio Emanuele with inscriptions in Braille, *Milan*

Page 26 | Skycraper "Bosco Verticale", *Milan*

Page 32 | Building BL28 Campus Bovisa, Politecnico di Milano, *Milan*

Page 40 | Central Station, *Milan*

Page 46 | Interior Rector's main building, Politecnico di Milano, *Milan*

Page 56 | "Albero della vita", Area EXPO, *Milan-Rho*

Page 74 | Porta Nuova district, *Milan*

Page 96 | Areal view of Milan

Page 143 | Building BL27 Campus Bovisa, Politecnico di Milano, *Milan*

Page 147 | Città di Lombardia Square, *Milan*



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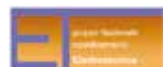


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