



SUMMER SCHOOL ON SMART GRID



Smart Grid Ancillary services: the effective utilization of integrated DERs, including ESRs, for their provision

Introduction

Power grids are undergoing rapid and numerous changes continually. A major disturbance that is highly impactful arises from the deeper penetrations of distributed energy resources (DERs), including energy storage resources (ESRs), integrated into the distribution networks. Such developments necessitate changes in the planning, operations, economics and analysis of distribution grids. A key focus is on the role of the distribution network operator (DNO) and the need for closer interactions and cooperation with the Independent Transmission System Operator (ISO or TSO). Indeed, the rapid implementation of microgrids, coupled with the broader deployment of DERs, provides motivation for the establishment of an Independent Distribution System Operator (IDSO) to manage the increasingly important activities of the implemented DERs and to harness the benefits of competitive forces. Such considerations are particularly critical in the role of the IDSO to enable the participation of distribution grid integrated DERs in the provision of various ancillary services procured through the electricity markets associated with transmission grids.

The increases in capacity of installed DERs – distributed renewable and conventional generation technology, curtailable loads, energy storage, electric vehicle aggregations and various other resources – together with the deepening penetrations of renewable energy resources integrated into transmission grids, lead to increased requirements for grid operational flexibility that ISO/TSOs must have to ensure around-the-clock supply–demand balance. In particular, the DERs constitute excellent, potential sources to provide the needed flexibility services. The effective DER utilization for the provision of frequency regulation, load following, voltage/reactive power support as well as various types of spinning and non-spinning reserves is fraught with various challenges that need to be addressed effectively to enable their provision in the electricity markets of the ISOs. Indeed, such resources can be deployed to improve the reliability, security and resilience of the grids.

The challenges are of a policy/regulatory, technical and economic nature. The formulation of appropriate policy directives and associated regulatory rule making are absolutely a pre-requisite to unlock the potential the DERs represent. So are the formulation of the needed rules of the road and the specification of other policy matters to promote the level of open access on distribution networks to reach the level established on transmission grids. On the technical front, the network-wide implementation of bilateral power flows with the appropriate protection schemes requires speeded-up implementation. There are numerous issues on the investment area as well as the issues related to transactive energy markets on a regional basis in the distribution systems represent major challenges.



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The School explains the nature and the scope of these various challenges and discusses some of the pioneering developments on the regulatory, technical and implementation fronts. The presentations discuss the progress to date in various parts of the world. The initial developments on the incorporation of DER participation in the California ISO markets are detailed. So are the efforts in the EU on the realignment of the individual network codes to allow the smoother coordination between TSOs and DSOs. In addition, there will be updates on the status of renewable resource integration, storage resources and the deployment of demand response in various regions. The major developments in the distribution grid in Italy will be discussed and the thrusts of the current plans will be presented.

The 2018 School builds on the strong foundation on smart grids, electricity markets, renewable resource integration into transmission grids and flexibility considerations established by the previous editions to focus on key aspects of integrated DER utilization in today's grids. The School provides an excellent forum for the interchange of ideas on the most effective ways to address the multiple challenges in the implementation of sustainable approaches to meet present and future energy needs.

The School has a cadre of leading, world-class experts and leading industry practitioners, who will present tutorials on some of the cutting-edge developments in the smart grid arena and discuss the progress to date on the many challenges remaining to be solved to transition towards more flexible power systems. These presentations will be accompanied by informative panel sessions to provide the participants with valuable insights into the way the barriers in today's grids can be overcome to harness the potential of DERs through effective deployment. The School encourages the active participation of each attendee in the sessions. Each module is accompanied by a multiple-choice exam to test the knowledge gained by the participants.

The School awards five ECTS to each participant who meets the requirements and a certificate of attendance plus a diploma to indicate that the attendee met all the School requirements.

Key Objectives and Scope

The School goals are to provide participants with an overview on problems, methodologies, techniques and economic assessment approaches related to the evaluation, planning and management of DERs to enable the deeper penetrations of integrated renewable resources at both the distribution and transmission levels. In addition, participants will be appraised of the current status of renewable and storage resource integration. The School aims to provide adequate background to the attendees to understand the technical and economic literature.

The course, characterized by a strong interdisciplinary perspective, combines fundamental operational, economic and technical aspects in the management of DER such as distributed generation, energy storage systems, controllable loads, and electric vehicles.

Specific tools based on innovative strategies for the developing of ancillary services in transmission and distribution systems will be illustrated, alongside presentation of the state-of-the-art research at the international level.



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Targeted Participants

The School is intended for researchers, postdocs, graduate and Ph.D. students whose centre of activities focuses on the power system engineering and economics areas, in general, and the development and implementation of sustainable smart grid aspects, in particular.

The Venue

The School will be held at the Department of Industrial Engineering of the University of Salerno, via Giovanni Paolo II, 132, 84084 Fisciano (SA), Italy.

Time Schedule

The School will be offered over the four days from July 2 to July 5, 2018. The program covers a total of 30 hours of presentations and discussion.

Contact Person


Dr. Vito Calderaro, email: vcalderaro@unisa.it, ph: +39 089 964295, fax +39 089 962334, c/o DIIn - Department of Industrial Engineering – University of Salerno, via Giovanni Paolo II, 132, 84084 Fisciano (SA), Italy can provide any additional information on the School.

For organization:
Ing. Antonella Finamore
Dott. Andrea Fretta
Dott. ssa Simona Perrella



SUMMER SCHOOL ON SMART GRID

Time Schedule

	Monday 02	Tuesday 03	Wednesday 04	Thursday 05
Morning lecture (9:00 - 13:30)	<p><i>Prof. Aurelio Tommasetti</i> Rector, University of Salerno</p> <p>Welcome Address</p>	<p><i>Prof. George Gross</i> University of Illinois</p> <p>Large-Scale ESS Integration in Grids with Renewable Energy Resources</p>	<p>Technical visit to TERNA Dispatching Centre of South of Italy</p>	<p><i>Prof. Pierluigi Mancarella</i></p> <p>Flexibility in multi-energy communities with electrical and thermal storage</p>
	<p><i>Ing. Carlo Spigarolo</i> e-distribuzione</p> <p>The Changing Role of the DNO</p>			
	<p><i>Prof. George Gross</i> University of Illinois</p> <p>Current Status of Renewable Resource Integration (1 h)</p>			
	Lunch 	Lunch 	Lunch 	Lunch 
Afternoon lecture (14:30 - 18:00)	<p><i>Prof. George Gross</i></p> <p>Ancillary Services: Scope and Nature, Providers, Role of Markets and Status* (1h)</p>	<p><i>Prof. Gianfranco Chicco</i></p> <p>Uncertainty Impacts of DER Integration in Distribution Networks</p>	<p><i>Prof. Gianfranco Chicco</i></p> <p>Provision of Distribution Network services by DERs</p>	<p>ENEL's future distribution grid</p>
	<p><i>Prof. Pierluigi Mancarella</i></p> <p>Flexibility and Reliability in Smart Grids</p>	<p>Panel Discussion/Q&A</p>	<p>The Industrial perspective</p>	<p>Panel Discussion /Q&A</p>

Faculty

- Prof. **Gianfranco Chicco** – Professor of of Electrical Energy Systems, Politecnico di Torino (I)
- Prof. **George Gross** – Professor of Electrical and Computer Engineering and Professor, Institute of Government and Public Affairs, University of Illinois at Urbana Champaign (USA)
- Prof. **Pierluigi Mancarella** – Chair of Electrical Power Systems, University of Melbourne, Australia and Professor of Smart Energy Systems, University of Manchester, UK
- Dr. **Carlo Spigarolo** – E-Distribuzione
- Eng. **Antonio Pascucci** – TERNA (Head of the Center - South Area Regional Dispatching)



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School Fees

The School is free of charge. Each participant who is not enrolled at the University of Salerno and wishes to use the university canteen during the entire duration of the School is charged € 50 for the four days.

Transportation to the University of Salerno Campus in Fisciano

Directions for surface vehicles

- GPS coordinates: 40°46'27.7"N 14°47'17.0"E
- North direction from Naples (nord) via highway A3 (Naples – Salerno – Reggio Calabria): go towards Salerno and turn onto the highway connection Salerno – Avellino; follow until Fisciano – Mercato San Severino exit; turn right at the first road junction and enter the campus gate.
- from Naples (nord): using the highway A16 (Naples – Bari); from Napoli Est turn into A30 (Caserta – Salerno) and go towards Salerno. Turn off onto highway connection for Avellino up to Mercato San Severino. Turn right at the first road junction.
- from Bari (east): using the highway A16 (Bari – Naples); take the exit Avellino Est and turn off onto the highway connection Salerno – Avellino up to Fisciano - Mercato San Severino. Turn right at the first road junction.
- from Reggio Calabria (south): using the highway A3 (Naples – Salerno – Reggio Calabria); go towards Salerno and turn off onto the highway connection Salerno – Avellino (following the direction A1 or A16) up to Fisciano – Mercato San Severino. Turn right at the first road junction.

Via public transportation

- by train (not direct connection): Train to Salerno Centrale station and bus to Fisciano - Università.
- by bus: take a bus to Fisciano – Università
 - from Salerno (bus stops located in Piazza Vittorio Veneto - Stazione Centrale): can get to the university using the number 7, 17 and 27 buses.
 - from Napoli (bus stops located in via Galileo Ferraris – near the Railway Central Station)



Scientific Supervisor

prof. Vincenzo Galdi
DIIn - Dipartimento di Ingegneria Industriale
Università degli Studi di Salerno
Via Giovanni Paolo II, 132
84084 Fisciano (SA)
Italy
e-mail: vgaldi@unisa.it
phone: +39 089 964284
fax: +39 089 962334
mobile: +39 328 8926127

Technical Coordinator

ing. Vito Calderaro
DIIn - Università degli Studi di Salerno
Università degli Studi di Salerno
Via Giovanni Paolo II, 132
84084 Fisciano (SA)
Italy
e-mail: vcalderaro@unisa.it
phone: +39 089 964295
fax: +39 089 962334