

1st Grid Transformation Professional Development Seminar on Microgrid Design and Battery Storage

15-16 April 2019



While renewable energy is redefining the power and energy mix, the technological developments and power electronics systems are also transforming the power grid to a greater scale. Therefore, to respond to the grid transformation, power utilities, numerous industrial sectors and governments are seeking to build innovation, research and training capabilities.

This two-day seminar will draw on the experiences of the contributors, S&C, LG Chem and the University of Adelaide, to provide in-depth knowledge on the design of microgrids, starting with the feasibility study and business case development through concept design, detailed engineering design, procurement, installation, testing, and commissioning. In addition, network-scaled battery storage technologies and their integration issues will be covered in detail together with the extensive power quality and environmental level real-life data.

This unique professional development seminar is a must for microgrid developers, design engineers, distribution network planning engineers, consultants, educators, and graduate students. The seminar is also intended for managers and decision makers who have interests to develop sound background knowledge in the area of microgrid applications and the future directions of the grid transformation.

The seminar will accommodate questions/answers modules, and a training certificate will be issued to each participant.

This 1st advanced seminar aims to provide the background knowledge for the future training opportunities, which will include grid modernization, energy economics, virtual power plants, electric vehicles in the grid, and renewable energy in mining.

Date: 15-16 April 2019

Venue: The University of Adelaide, Adelaide, South Australia

Registration Fees (Excl. GST):

Full : A\$2250
Early Bird : A\$1950 (until 31 January 2019)
Students: A\$600

The registration fee includes all seminar notes, two lunches and the networking dinner on the first day.

For the registration please contact:

A/Prof. Nesimi Ertugrul
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The following is a detailed list of the topics that will be covered during the professional development seminar.

DAY 1

1. Introduction:

Keynote address: State of Energy Storage and Microgrid Deployment in Australia

2. Microgrid Overview:

Definitions, benefits and challenges

Business cases: reliability, resiliency, sustainability, economic improvements, and cyber security

3. Component Analysis of Microgrids:

Equipment

Distributed generation, distributed energy resources (energy storage, renewables, rotating machines)

4. Battery Energy Storage Systems

Introduction to the history of the lithium battery industry

Battery packaging formats

Chemistries, strengths & weaknesses, NMC, LFP, flow batteries

How to specify a battery, key aspects

Battery life, cycle and calendar and battery modelling

The battery module and battery protection unit

Battery section controller

Volume and outlook for the ESS industry

How the market operates; EPC's, SI's, cell makers

How batteries are procured, EOI, RFQ, Contracts, T&C's

Battery operation in a microgrid

DAY 2

5. Designing Microgrids:

Power systems studies and analysis

Advanced microgrid protective relaying

New builds versus retrofits

Islanding and Re-synchronising

Automation and Integration

Communications

6. Microgrid Control Theory:

Role of microgrid controller

Sequence of operations

Use cases

Contingency handling

Benefits of central/decentralized control

7. Microgrid Modelling:

High/low inertia systems

Voltage regulation

Generation to load ratio analysis

Fault characteristics

8. Microgrid Testing/Monitoring:

Current/voltage injection

Synchrophasors

Outage management

Flexible microgrid testing system

9. Case Studies on Fully Completed, Commissioned Microgrids

Contributors and Speakers:

S&C Electric Company:

S&C specializes in the switching, protection, and control of electric power systems and applies innovative products and services to address the challenges facing today's power grid. S&C's award-winning microgrid systems are providing breakthroughs in how distributed generation resources, including energy storage, solar, and wind, are managed by customers and their network service providers.

www.sandc.com



Paul M. Pabst, P.E. is a Manager of Engineering Services in the Power Systems Solutions group of S&C Electric Company with 11 years of experience in the electric power industry. He has been the technical lead on multiple MW-scale microgrid systems with generation sources that include lithium ion battery energy storage, PV solar, wind, natural gas, diesel, and propane. These microgrid systems utilize advanced protective relaying and control schemes. Other responsibilities include technical lead for protection & control (P&C) systems, SCADA integration design, control enclosure design, field start-up and commissioning of green field and brown field substations, and design and full-scale testing of distribution automation systems.

He is active in the IEEE/PES Power & Energy Society, acting as the current Region 4 representative and is a IEEE Senior Member. He is a co-author of a IEEE white paper on microgrid design and has 3 utility patents pending based upon these technical achievements. He has been a technical presenter at 20+ conferences on topics including microgrid design, advanced protective relaying, and SCADA engineering.



Michael J. Higginson, P.E. is a Senior Engineer in the Power Systems Solutions group of S&C Electric Company with over 6 years of experience in the electric power industry. Michael's primary responsibilities include leading power system consulting and analysis for distribution systems and microgrid development. He has focused on

distributed resource integration, power system protection, and automation. Michael has lead power system analysis and relaying efforts for several distribution-integrated microgrid systems and renewable generation projects. Two of these microgrids have won awards recognizing their performance. These projects included designing, testing, and implementing sophisticated protection and control schemes as well as short-circuit, protection coordination, transient and dynamic stability, arc flash hazard analysis, and power quality studies.

Michael is active in the IEEE Power & Energy Society and CIGRÉ organizations. He is particularly involved in the IEEE Power System Relaying and Control Committee, where he has won the 2017 Young Professional Award. He chairs the working group on Microgrid Protection, is Vice Chair of the working group revising C37.110, and contributes to other working groups. He has authored 3 papers on microgrid design, operation, and smart inverter system impacts on power systems. Michael has submitted 3 provisional patents to the U.S. patent and trademark office based on innovative solutions applied in microgrid projects. He has delivered over 15 technical presentations at industry events, including tutorials and webinars, on topics including microgrid design, microgrid protection, and wind farm arc flash incident energy analysis. He teaches a course on Distribution Overcurrent Protection and Coordination.



Brad Luyster is Director of Business Development at IPERC ((Intelligent Power & Energy Research Company). IPERC is a leading innovator in advanced microgrid control solutions and cybersecurity for industrial control systems. Brad has spent the majority of his 30 years in the power and energy industry in various roles from selling electrical products to managing large business units in Fortune 1000 companies. His background gives him a unique view of Smart Grid and Microgrid technologies.

LG Chem:

LG Chem is part of the world leading LG Group of companies – a group which operates across many diverse business areas globally. With 22 years of experience in successfully delivering products and solutions to customers in the global energy sector, LG Chem is recognized as the industry leader in Lithium-ion battery manufacturing.

<http://www.lgchem.com/global/product>



Warrick Stapleton is General Manager for Grid, Commercial and Industrial battery systems for LG Chem Australia. Warrick holds a Bachelor's degree in Chemical Engineering and a Masters degree in Automotive Engineering. During his career he has worked for global leaders such as Mars, Mahle, Toyota (Manufacturing and R&D), CitiPower/Powercor and now LG Chem.

Warrick's journey with batteries began with Toyota where he was senior project control engineer for Hybrid Camry; involving stakeholder management across factory employees, suppliers and management. Upon joining an electrical distribution business, Warrick transferred his knowledge to lead the selection, procurement and installation of what was in 2015 Australia's biggest battery (2 MW/1 MWh) as well as a 20 home VPP using 4 different battery suppliers. Warrick now works with renewable farm developers, system integrators, investors and others in the industry to scope large-scale energy storage systems.

The University of Adelaide

The University of Adelaide is a member of a Group of Eight, a coalition of world-leading research intensive universities, established in 1874, the third-oldest university in Australia. The university's main campus is located in the Adelaide city centre, and has been associated with many notable achievements and discoveries. The university is composed of research institutes, and five faculties with each containing constituent schools, and it has a strong supporter of academic and industry partnership.

www.adelaide.edu.au ; www.aeskb.com.au



A/Prof. Nesimi Ertugrul has the B.Sc., M.Sc. and PhD degrees in electrical and electronic engineering. Since 1994, he has led a number of research projects primarily involving industrial partners, and has also contributed to the academic life in the form of books, book chapters, technical papers, patents and technical reports. He has been highly instrumental about the developments of

unique initiatives, including the development of first computer aided electrical machines teaching laboratory, and the establishment of Autonomous Vehicles Research Laboratory. Since 2010, his primary research focus has been the establishment of Australian Energy Storage Knowledge Bank and is leading the South Australia node of the Future Battery Industries Cooperative Research Centre.

Dr. Ertugrul is a keen supporter of electric energy for all, and low-cost energy for disadvantaged communities and for future industries.

