



SMART GRID CENTER

TEXAS A&M ENGINEERING EXPERIMENT STATION



Annual Report September 2016 - August 2017

The implementation of the Experimental Open Source Ecosystem (EXPOSE) and related strategic projects were the focus points of the annual activities of the Smart Grid Center (SGC) endorsed by the Advisory Board.

Experimental Open Source Ecosystem (EXPOSE)

The novel concept of the EXPOSE platform has been developed to integrate large-scale testbeds at virtual and physical levels to mimic new grid control solutions at various spatial and temporal scales. It provides an agile development environment where the ideas and early product concepts are tested side by side with other mature products provided by several vendors donating hardware, software, and services in total over \$5 million, such as AE Techron, Colfax International, Electric Power Group, GE

Grid Solutions/Alstom, Mitsubishi, NI, OPAL-RT, OSIsoft, and PowerWorld.

Testbeds for synchrophasors, smart grids big data, weather-related power system data analytics, cybersecurity, and microgrids including distributed renewable power generation are currently being implemented and advanced.



The Center focuses on comprehensive large-scale testbeds, strategic projects, and smart grid training.

Strategic Project Focus Areas

Synchrophasors and synchronized sampling technology for T&D applications; Cyber-physical security with emphasis on interactions between different critical infrastructures; Big data including weather analyses integrated into GIS framework; Flexible loads, including on-site energy storage and distributed generation at different scales; Renewables forecasting with focus on solar and wind generation at different voltage levels; Future whole sale ancillary service products and retail market participation strategies.

Multidisciplinary proposals were submitted.

Smart Grid Center founded in August 2012

New Large-Scale Research Projects

- **“Scaleable Decision Model to Achieve Local and Regional Resilience of Interdependent Critical Infrastructure Systems and Communities”**, \$2.5M, over 4 years, NSF (CRISP Type 2) sponsored project, PI: W. G. Peacock (Landscape Architecture & Urban Planning; Hazard Reduction & Recovery Center), Co-PIs: N. Rosenheim (Hazard Reduction & Recovery Center; and Landscape Architecture & Urban Planning), D. Goldberg (Geog.; CSE);
- **“Timing Intrusion Management Ensuring Resiliency (TIMER)”**, \$4.4 million over 3 years, Department of Energy-DOE National Energy Technology Laboratory-NETL. PI: M. Kezunovic (ECE TAMU), Co-PIs: A. Sprintson (ECE TAMU), J.-C. S. Liu (CSE TAMU), Partners: Idaho Power Company-IPC, Electric Power Group - EPG, Pacific Northwest National Laboratory-PNNL;
- **“Smart Grids Big Data”**, \$1 million over 3 years, NSF- Big Data Spoke program. PI: M. Kezunovic (ECE TAMU), Co-PIs: D. Da Silva (CSE TAMU), P.R. Kumar (ECE TAMU), L. Xie (ECE TAMU), Z. Obradovic (Temple University), and S. Grijalva (Georgia Institute of Technology-GaTech);
- **“US-India Collaborative for Smart Distribution System with Storage (UI-ASSIST)”**, \$30 million over 5 years, PI: A. K. Srivastava (SG WSU). Co-PIs: M. Kezunovic (ECE TAMU), C. Singh (ECE TAMU), M. Begovic (ECE TAMU).

Announcement

Thomas Overbye, Ph.D. (ECE) is appointed Associate Director of the Center.

Advisory Board Meetings

The 7th and 8th meetings of the Board were held on December 5th, 2016, and April 17th, 2017. Members of the Board and the Center Director discussed current status of the strategic efforts and future plans of the Center. The Board includes the chair, J. Bermúdez (President and CEO of Byebrook Group), the vice chair, J. McDonald, P.E. (Director of Technical Strategy & Policy Development of GE Grid Solutions), and members: G. Arnold, Ph.D. (CEO, Tercio Solutions), M. Begovic, Ph.D. (Department Head, ECE Texas A&M), T. Doggett, P.E. (President, Benchmark Power Consulting), C. Eugster, Ph.D. (Chief Operating Officer, CPS Energy), K. Mercado, P.E. (Senior Vice President, CenterPoint Energy), M. O’Quinn (Vice President for Government Relations, Texas A&M), M. Scholtz, Ph.D. (Vice President for Research, Texas A&M), and P. Wood (Principal, Wood3 Resources).

New Advisory Board Members:

- William Abler, Vice President of Commercial Development & Innovation Entergy Corporation
- Bill Magness, President and Chief Executive Officer, Electric Reliability Council of Texas (ERCOT).
- Kevin Nowka, Ph.D. Director, IBM Research- Austin
- Gary Rackliffe, P.E. (Vice President, Smart Grids at ABB Group North America)
- Cameron Smallwood, CEO and General Manager, United Cooperative Services.



Publications

Research results were published in 13 peer-reviewed papers, 2 books and a book chapter, and 34 conference publications by faculty at SGC main campus.

SGC-Qatar faculty and staff published 9 peer-reviewed papers, 1 book chapter, and 26 conference publications.

Reference information may be viewed and some publications can be downloaded at the Center’s websites.

SGC Websites

Expertise of collaborating faculty members, information of industry partners, faculty activities, related publications, news and more can be viewed at <http://smartgridcenter.tamu.edu>.

For the SGC-Q, news and information on people, projects and publications are posted at <http://www.sgc-q.com>.

Fifth Smart Grid Workshop

“Smart Grids Big Data” workshop was held on April 18, 2017. The invited talk was given by Todd Horsman from CPS Energy. Four panels and six focus groups facilitated discussions. Graduate students presented their research results on posters.



The more than 130 attendees included 37 professors, 9 postdocs and research staff members, and 42 graduate students from the Texas A&M University System, 26 representatives from industries consisting of DOE, CenterPoint Energy, GE Grid Solutions, Esri, Knowledge Based Systems, NI, OSIsoft, NREL, Los Alamos National Laboratory, PNNL, and the Electric Power Research Institute. NSF Travel grant was awarded to 26 participants.

Trainings

- PowerWorld Training: 4 sessions were held by Dr. Thomas Overbye at Wisenbaker Engineering Building spread through February and March 2017.
- EPRI Open DSS Software Training: Instructed by Roger Dugan (EPRI) was held at Memorial Student Center on April 19-21, 2017.
- SGC-Qatar conducted 3 training events:
 - “Power Quality and Management in Modernized Power Systems”;
 - “Design, Fault Analysis and Protection of Industrial Power Distribution Systems”;
 - “Electrical Transformers and Switchgears; Faults, Inspection, Testing, Maintenance and Trouble Shooting”.

Expanding the SGC Portfolio

New collaborating faculty members joined:

- Kate Davis (Associate Professor, Electrical & Computer Engineering)
- Thomas Overbye (Professor, Electrical & Computer Engineering)

Future Plans

- Establishing the SGC Consortium;
- Using testbeds for industry training;
- Expanding the SGC Advisory Board;
- Organizing Hackathon for students – Utility LaunchPad for Vegetation Management collaborating with CNP and SAP, 2018;
- Organizing the 6th SG Workshop, 2018;
- Organizing the 1th Int.Conference on Smart Grid Synchronized Measurements & Analytics, 2019.