



# SMART GRID CENTER

TEXAS A&M ENGINEERING EXPERIMENT STATION



## Annual Report

### September 2018 - August 2019

In the last fiscal year (September 2018 – August 2019), the TEES Smart Grid Center (SGC) focused mostly on four goals endorsed by its Advisory Board: 1) Building the SGC Membership with companies; 2) Developing strategic large-scale research projects; 3) Developing short courses; and 4) Hosting the inaugural IEEE international conference on Smart Grid Synchronized Measurements and Analytics.

#### Membership Agreements of Smart Grid Center

While focusing on engaging utilities, vendors and non-profit organizations for improving the power grid, four companies signed SGC Membership Agreements. The Membership template was developed with assistance from the Advisory Board Members and TEES Intellectual Property Licensing Office and vetted by the legal teams of industry partners. It is available for interested companies upon request.

#### SGC Members

- CenterPoint Energy, at level of Full Member
- Entergy, at level of Associate Member
- ERCOT, at level of Full Member
- Texas Co-Op Power (United Cooperative Services, Bluebonnet EC, Farmer's EC, Grayson-Collin EC, Mid-South Synergy), at level of Full Member

#### Strategic Project Focus Areas

Cyber-physical security with emphasis on interactions between different critical infrastructures; Big data including weather impact analyses integrated into GIS framework; Synchrophasors and synchronized sampling technology for Transmission & Distribution applications; Flexible loads, including on-site energy storage and distributed generation at



Smart Grid Control Room Lab is located at the Center for Infrastructure (CIR) building at the RELIS campus of Texas A&M University System.

different scales; Renewables forecasting with focus on solar and wind generation at different voltage levels; Microgrids; Future whole sale ancillary service products and retail market participation strategies; Synthetic grids; Impact of geomagnetic disturbances on power grid.

Smart Grid Center founded in August 2012

The focus of the Center was on building its membership with companies, developing strategic projects and short courses, and hosting the IEEE international SGsMA conference.

### New Large-Scale Research Project

- “Deep Learning-Based Detection of Stealth False Data Injection Attacks (DEFENDA)”. PI: Katherine Davis (ECE, TAMU); Co-PIs: Erchin Serpedin (ECE, TAMU), Thomas Overbye (ECE, TAMU). NSF awarded \$360K for 3 years starting in September 2018.
- “Deep Cyber-Physical Situational Awareness for Energy Systems: A Secure Foundation for Next-Generation Energy Management”. PI: Katherine Davis (ECE, TAMU); Co-PIs: Thomas Overbye (ECE, TAMU), Daniel Ragsdale (CSE, TAMU), Ana Goulart (ET&ID, TAMU), Saman Zonouz (Security LLC), Eric Vurgin and Shamina Hossain-McKenzie (Sandia National Laboratories), Mark Rice (Pacific Northwest National Laboratories), and Edmond Rogers (UIUC). DOE awarded \$3M for 3 years starting in October 2018.
- “Big Data Synchrophasor Monitoring and Analytics for Resiliency Tracking (BDSMART)”. PI: Mladen Kezunovic (ECE, TAMU), Co-PIs: Zoran Obradovic (Temple University), Yi Hu (Quanta Technology), Rachna Handa (OSIsoft). DOE-NETL awarded \$1M for the 1.5-year project starting in July 2019.

### New Advisory Board Members

Two new members joined the Advisory Board of the Center this year:

- Mr. Richard Doying, Executive Vice President of Operations, Midcontinent Independent System Operator (MISO)
- Mr. Alen Nye Jr., J.D., CEO and Director, Oncor Electric Delivery

Information on all current Board Members can be viewed at <https://smartgridcenter.tamu.edu/index.php/advisory-board>

### Advisory Board Meetings

- The 12<sup>th</sup> AB meeting was held at TAMUS, in Austin, TX, on Oct. 1., 2018;
- The 13<sup>th</sup> AB meeting was held via teleconferencing in October-November 2018;

- The 14<sup>th</sup> AB meeting was held at CIR, Bryan, TX, on March 25, 2019.



From left to right: John McDonald, Richard Doying, Kenny Mercado, Bill Magness, Pat Wood, Jorge Bermúdez, Mladen Kezunovic, Mark Barteau, Narasimha Reddy, Thomas Overbye, Haitham Abu-Rub, Gary Rackliffe, Bill Abler, Nicholas Chremos, and Cameron Smallwood.

### IEEE International Conference on Smart Grid Synchronized Measurements and Analytics (SGsMA)

The inaugural SGsMA conference was held in College Station on May 21-23, 2019. This event chaired by Mladen Kezunovic jointly with Thomas Overbye from (ECE TAMU) attracted 180 attendees to the conference and the pre-conference events. Participants including 46 industry representatives, 6 governmental organizations, 10 TAMU faculty, and 53 students from the United States as well as from Canada, Switzerland, Germany, Ireland, the Netherlands, India, and Brazil. To offset travel expenses, 27 participants received NSF travel grants relevant to the Smart Grids Big Data Spoke project (PI: Mladen Kezunovic).



Smart Grid Synchronized Measurements & Analytics Conference held at Texas A&M Hotel & Conference Center in College Station, TX, on May 21-23, 2019.

The website of the conference is <http://sgsma.org>.

As pre-conference events, two tutorials and two workshops were held on May 20, 2019.

- Morning Tutorial titled “Synchrophasor Data Analytics”
- Afternoon Tutorial titled “Synchrophasor Standards”
- Morning Workshop titled “Use of Synchrophasors and Synchronized Sampling in Protection”
- Afternoon Workshop titled “Implementation of Synchrophasor Data Analytics”

### Webinar, Short Courses

- Webinar sponsored by the DOE UI-ASSIST project was presented by Dr. Chanan Singh (ECE TAMU): “Reliability Modeling and Improvement of Distribution System Systems with Distributed Energy Resources” on April 25, 2019.
- Short Courses at CIR:
  - “Fundamentals of Electrical Transmission Planning”, Director Thomas Overbye (ECE TAMU);
  - “Electric Grid Impact of Geomagnetic Disturbances”, Director Thomas Overbye (ECE TAMU)

### Publications

- Research results were published in 16 peer-reviewed papers, 2 books, and 22 conference publications by SGC faculty collaborators at SGC main campus.
- SGC-Qatar faculty and staff published 6 peer-reviewed papers, and 2 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>.

### Future Plans

- Recruiting new SGC Members;
- Extending current testbeds for research, education, and industry training;
- Expanding the SGC Advisory Board;
- Organizing short courses;
- Hosting a Research Day to showcase the SGC Membership projects;
- Continuing to host visits from industry and government organizations.