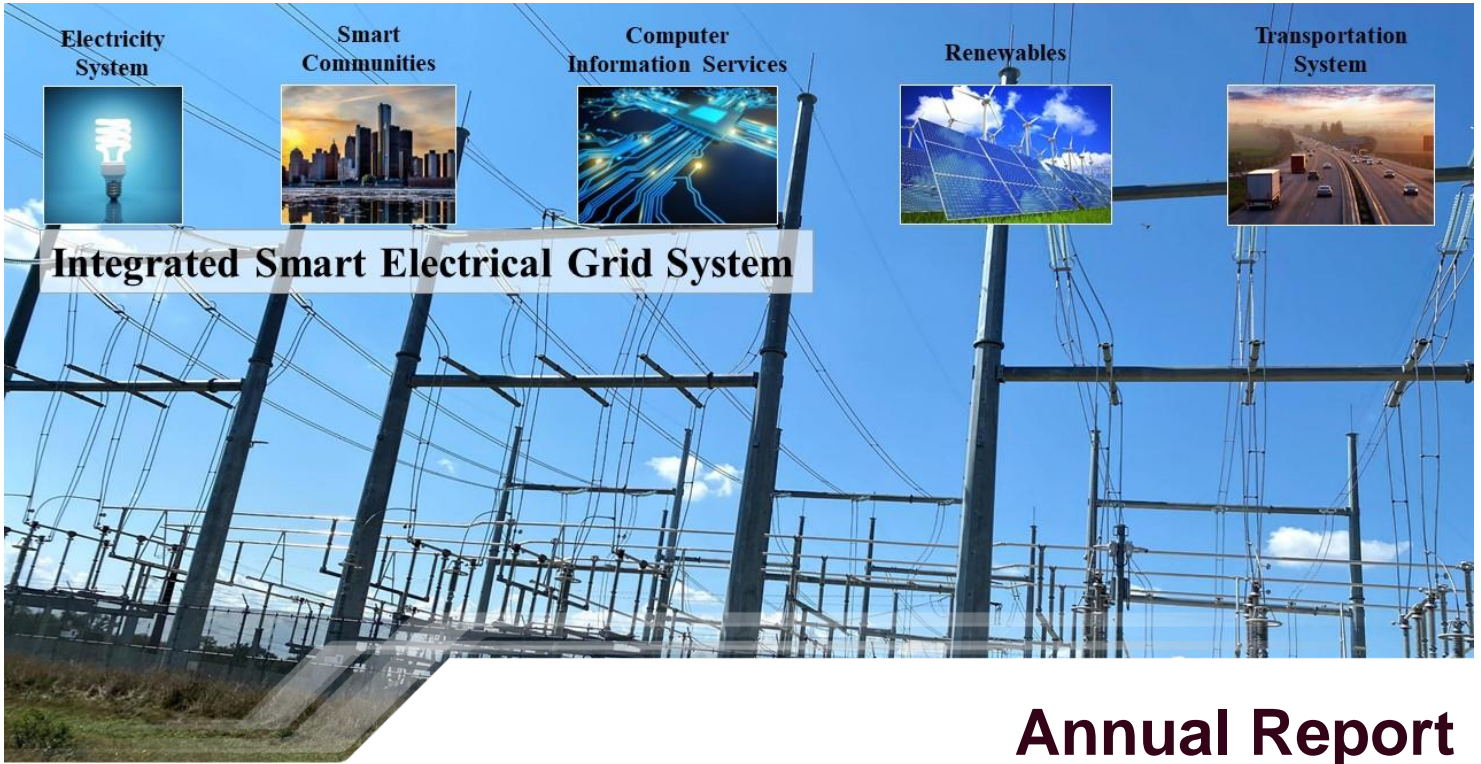




SMART GRID CENTER

TEXAS A&M ENGINEERING EXPERIMENT STATION



Annual Report

September 2021 - August 2022

The main goals of the TEES Smart Grid Center (SGC) were: 1) Developing strategic large-scale research projects; 2) Pursuing research projects funded by SGC partially based on its membership with companies; 3) Hosting SGC webinars; and 4) Co-hosting a Research Day.

Membership of Smart Grid Center

The following companies have currently SGC memberships:

- CenterPoint Energy, Full Member
- Dell Technologies, Inc., Full Member
- ERCOT, Full Member
- Lower Colorado River Authority (LCRA), Associate Member.

Research Projects Funded by the Center

- “Predictive Outage and Asset Management Decision-making Tool Assisting Distribution Operators”, PI: M. Kezunovic (ECE TAMU)
- “Application of Texas A&M Electric Grid Control Center testbed”, PI: T. Overbye,

Co-PIs: K. Davis and A. Birchfield (ECE TAMU)

- “Distributed Generation and Its Impact on Market and Protection”, PI: L. Xie, Co-PIs: D. Kalathil, M. Begovic (ECE TAMU)
- “Application of Deep Learning for Electric Grid Problems”, PI: B. Don Russell, Co-PIs: C. Benner, Thomas Overbye (ECE TAMU)
- “Impact of Customer Owned Battery Storage on the Grid”, PIs: Miroslav Begovic and Chanan Singh (ECE TAMU)

Strategic Project Focus Areas

Cyber-physical security with emphasis on interactions between different critical infrastructures; Future wholesale ancillary service products and retail market participation strategies; Synthetic grids; Microgrids; Testbeds; Impact of geomagnetic disturbances on power grid; Big data including weather impact analyses integrated into GIS framework;



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

Synchrophasors and synchronized sampling technology for transmission & distribution applications; Flexible loads including on-site energy storage and distributed generation at different scales; Renewable forecasting with focus on solar and wind generation; Data science and AI applications in power systems.

Smart Grid Center founded in August 2012

This year the focus was on developing strategic projects, extending testbeds, continuing Center-funded projects partially based on its membership with companies, hosting a Research Day, and webinars.

New Large Research Projects

In total, more than \$1,800,000 was received for new research projects.

“Enhanced Electromagnetic Disturbance Modeling”, PI: T. Overbye, Co-PIs: A. Birchfield, K. Davis (ECE, TAMU). Pacific Northwest National Laboratory, \$750,000, 3 years started in Apr. 2022.

“ERCOT Research Agreement, Phase II”, PI: L. Xie (ECE TAMU) \$635,105 awarded by Electric Reliability Council of Texas, Inc. to the project for 3 years started in Oct. 2021.

“Impact Assessment of EV Charging Stations and Regulation Policies for Upcoming Active Distribution Network of Qatar Utility Grid”, PI: I. Khan (TAMU-Galveston & ECE TAMU), Qatar University, \$102,259, started in Aug. 2021.

“Sustainable Transportation Electrification for an Equitable and Resilient Society (STEERS)”, NSF SRS RN: Planning grant, PI: T. Overbye, Co-PIs: A. Birchfield, K. Davis (ECE, TAMU), \$150,000, 1 year, started in Jan. 2022.

Advisory Board Meetings

- The 19th Board meeting was held via zoom on Oct. 11, 2021.
- The 20th Board meeting was held in person at CIR on RELLIS campus on Apr. 4, 2022.



From left to right: Valentine Emesh (CNP), Le Xie (ECE TAMU, Assistant Center Director for Research), Bill Magness (DNV Energy Systems), Khalil Shalabi (LCRA), Woody Rickerson (ERCOT), Thomas Overbye (ECE TAMU, Center Director), Cameron Smallwood (UCS, Vice Chair of SGC Advisory Board), Richard Medina (CPS Energy), Gary Rackliffe (Hitachi Energy), Jorge Bermúdez (Byebrook Group, Chair of Board SGC Advisory) Miroslav Begovic (ECE TAMU, Associate Center Director),

New Advisory Board Members

The following Board members started their 3-year terms on Jan. 1, 2022.

- Mr. Woody Rickerson, Vice President for System Planning & Weatherization at Electric Reliability Council of Texas (ERCOT)
- Mr. Richard Medina, Executive Vice President for Energy Delivery Services, CPS Energy.

The list of all current Board Members can be found [here](#).

Testbeds

- Large-Scale Electric System Research Center (PI: T. Overbye)
- Resilient Energy Systems Lab (RESLab), PI: K. Davis

Technology Transfer

“Shape memory alloy actuated switch”, R. Balog (ECE TAMU), I. Kamaran (MS&E, TAMU), M. Raslan (MS&E, TAMU), [US11515101B2 Patent](#)

Short Courses

The short courses were held via zoom. All short courses count toward the Texas A&M Certificate in Electrical Power Engineering.

- “Power System Analysis for Planning and Operations” for Southwest Power Pool (SPP) employees, Oct. 1.-Nov. 12, 2021; Course Dir.: T. Overbye (ECE TAMU). Attendees: 20
- “Data Science and Machine Learning for Modern Power Systems” for ISO New England (ISO-NE) employees, Oct. 25-27, 2021; Course Director: L. Xie (ECE TAMU). Attendees: 15
- “Power System Analysis for Planning and Operations” for Southwest Power Pool (SPP) employees, Mar. 4.-Apr. 15, 2022; Course Dir.: T. Overbye (ECE TAMU). Attendees: 20
- “Data Science and Machine Learning for Modern Power Systems” self-paced; Course Director: L. Xie (ECE TAMU). Attendees: 7

Conference

The “3rd International Conference on Smart Grid and Renewable Energy (SGRE)” hybrid face-to-face and virtual event in Doha, Qatar, Mar. 20-22, 2022. Technical sponsor IEEE; Conference Chair: H. Abu-Rub (ECE TAMU-Qatar). Attendees: 120



Research Day

This event highlighted projects conducted at the Center and the Energy & Power Group (ECE TAMU) and was held at the Center for Infrastructure Renewal (RELLIS campus) on Apr. 22, 2022. Event Chair: T. Overbye (ECE TAMU). Attendees: 85



Webinars

Ten webinars were held via zoom. The presenters were faculty from the Electrical & Computer Engineering and the Computer Science & Engineering (TAMU). The list of all webinars can be viewed [here](#).

Publications

- Research results were published in 37 peer-reviewed papers, 2 textbooks, 1 patent, and 26 conference publications by SGC faculty collaborators SGC.
- SGC-Qatar faculty, staff, and students published (as first authors) 12 peer-reviewed papers, and 10 conference publications.

Selected publications can be downloaded from the Center’s websites.

SGC Websites

Expertise of collaborating faculty members, news on relevant activities, selected publications, 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 companies to become SGC Members and retaining the membership of current SGC companies.
- Maintaining the representation of SGC members on Advisory Board.
- Developing large, multi-disciplinary research proposals involving member companies to attract federally sponsored funding.
- Extending current testbeds for research, education, and industry training.
- Organizing a Research Day, two workshops, short courses, and webinars.