



Annual Report September 2014 - August 2015

In the third year of the the Smart Grid Center (SGC) existence, the synergistic activities spreading across several strategic initiatives were continued. The three strategic initiatives endorsed by the Advisory Board are the following:

- Strategic research projects;
- Comprehensive large-scale testbeds;
- Focused smart grid training.

Strategic Projects

- Big data analyses integrated into framework of GIS and GPS;
- Synchrophasors and synchronized sampling technology for T&D applications;
- 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;
- Predictive control and protection based on real-time weather impact assessment;
- Cyber-physical security with emphasis on interactions between different critical infrastructures.

Eight projects were completed, 11 projects were on-going, and 5 new collaborative proposals and an extension were funded. Several multidisciplinary proposals were in the process of being submitted. The information about current and completed projects can be viewed at http://smartgridcenter.tamu.edu/sqc/web/?page_id=115



Director: Dr. Mladen Kezunovic

Comprehensive Large-Scale Testbeds

The Center has developed a novel concept of complex physical and cyber systems integrated at virtual and physical levels to mimic new grid control solutions at various spatial and temporal scales. To develop integrated large-scale testbeds, collaborations have been initiated and strengthened at the 3rd Smart Grid Workshop with several vendors, national labs, non-profit organizations, and universities abroad.

Smart Grid Center founded in August 2012

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

Focused Smart Grid Training

Tutorial “Multiple Uses of Substation IED Data for Future Grid Applications” was given by M. Kezunovic and T. Popovic at the Grid of the Future Symposium held by CIGRE (The Council on Large Electric Systems) in Houston, Texas, on October 19-21, 2014.

Advisory Board Extended

The new member of the Advisory Board is Kenny Mercado (Senior Vice President, CenterPoint Energy). Chair: Jorge Bermúdez (President and CEO of Byebrook Group); Vice-Chair: John McDonald (Director of Technical Strategy & Policy Development of GE); Members: Dr. George Arnold (Tercio Solutions), Dr. Miroslav Begovic (IEEE PES), Trip Doggett (ERCOT), Michael O’Quinn (Government Relations, TAMU), Dr. Martin Scholtz (VPR, TAMU) Dr. Le Tang (VP, ABB), Pat Wood (Wood3 Resources). Meetings were held in College Station on 11/25/ 2014 and in Doha, Qatar, on 3/24/2015.



SGC Advisory Board meeting on November 25, 2014. From left to right: M. Kezunovic, M. Begovic, K. Watson (Provost, Exe. VP-Acad. Affairs, TAMU), K. Banks (Dir. TEES, Dean CoE, TAMU), M. Scholtz, J. McDonald, J. Bermúdez, G. Laine (VP-Research, TAMU), A. Kishné (SGC Administrator), P. Wood, T. Doggett, and M. O’Quinn.

First Workshop on Smart Grid and Renewable Energy Doha, Qatar, March 22-23, 2015

Organizer: Smart Grid Center-Qatar in collaboration with the TEES SGC and TAMU-Qatar

<http://www.sgre2015.com>

Research Awards to the Center

New large research awards

- NSF PSERC, PI: M. Kezunovic (ECE TAMU), Partners: S. Meliopoulos (GaTech), T. Overbye (U. Illinois), D. Bakken (WSU), A. Srivastava (WSU), “Life-Cycle Management of Mission-Critical Systems through Certification, Commissioning, In-Service Maintenance, Remote Testing, and Risk-Management”, \$1.2M, 3 yr.
- NSF, PI: J. Silva-Martinez (ECE, TAMU), Co-PI: A. Karsilayan (ECE TAMU), “Design and Calibration Methodologies for Power-Efficient, High-Resolution Broadband Analog-to-Digital Converters”, \$475K, 3 yr.
- Sandia Nat’l Laboratories. PI: J. Silva-Martinez (ECE, TAMU), Co-PI: A. Karsilayan (ECE TAMU), “Single-Chip CMOS “BRAIN” GaN/GaAs Power Amplifiers”, \$475K, 3 yr.
- QNRF, PI: P. Balbuena, Co-PI: J. Seminario (CHEN TAMU), F. El-Mellouhi (QEERI, Qatar) “Analysis and Design of Materials for Lithium-Ion Batteries”, \$900K, 3 yr.
- QNRF, PI: M. Kezunovic (ECE, TAMU) Co-PI: H. Abu-Rub (TAMUQ), “Integration of Solar Generation and Electric Vehicles into the Smart Grid”, \$789K, 3 yr.

Technology Transfer

- An extensive Technology-to-Market effort is underway as a part of the RATC project funded by DOE ARPA-E.
- Provisional smart grid-related patent application titled “Encryption Key Distribution System and Method” was submitted by L.B. Kish (Professor, ECE) and E. Gonzalez (Ph.D. student, ECE).

Publications

In 34 peer-reviewed papers, 1 book and 3 book chapter, and 13 peer-reviewed conference publications, collaborators reported smart grid related results that may be viewed at the SGC website.

SGC Websites

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

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



Lance Spross, Oncor
Panel Chair, State of the Art: Modeling, Simulation, Testing & Calibration Facilities

The Third Smart Grid Workshop

On April 21, 2015, this Workshop was focused on challenges in evaluating smart grid solutions. Invited talks were given by Kenny Mercado (senior vice president, CenterPoint Energy, Electric Operations, and Robin Podmore (president & CEO, IncSys). Panels and focus groups facilitated discussions. More than 110 people attended including 22 faculty members, 53 students and 27 industry experts representing companies, such as ABB, Alstom, Austin Energy, CenterPointEnergy, Oncor, Opal-RT, OSIsoft, Siemens, and non-profit ERCOT and Southwest Research Institute. Attendees included visitors from Qatar, Brazil, Chile, and China.

Expanding the SGC Portfolio

- In Doha, Qatar, the Smart Grid Center – Qatar (SGC-Q) was established by the Board of Regents in November 2014. Dr. Haitham Abu-Rub, a long-time center collaborator, is the managing director of SGC-Q.
- New collaborating faculty members:
 - Rebekka Dudensing (Ag. Economics);
 - Oliver Frauenfeld (Geography);
 - Daniel Goldberg (Geography; Computer Science & Engineering);
 - Zenon Medina-Cetina (Civil Engineering);
 - Steven Quiring (Geography);
 - Anita Rapp (Atmospheric Sciences);
 - Yu Xiao (Landscape Architecture & Urban Planning).

Future Plans

- Implementing Control Center testbeds;
- Exploring new funding opportunities;
- Engaging existing and new partners;
- Developing a comprehensive plan for using testbeds for industry training;
- Expanding the SGC Advisory Board;
- Organizing the 4th SG Workshop and several mini-workshops.