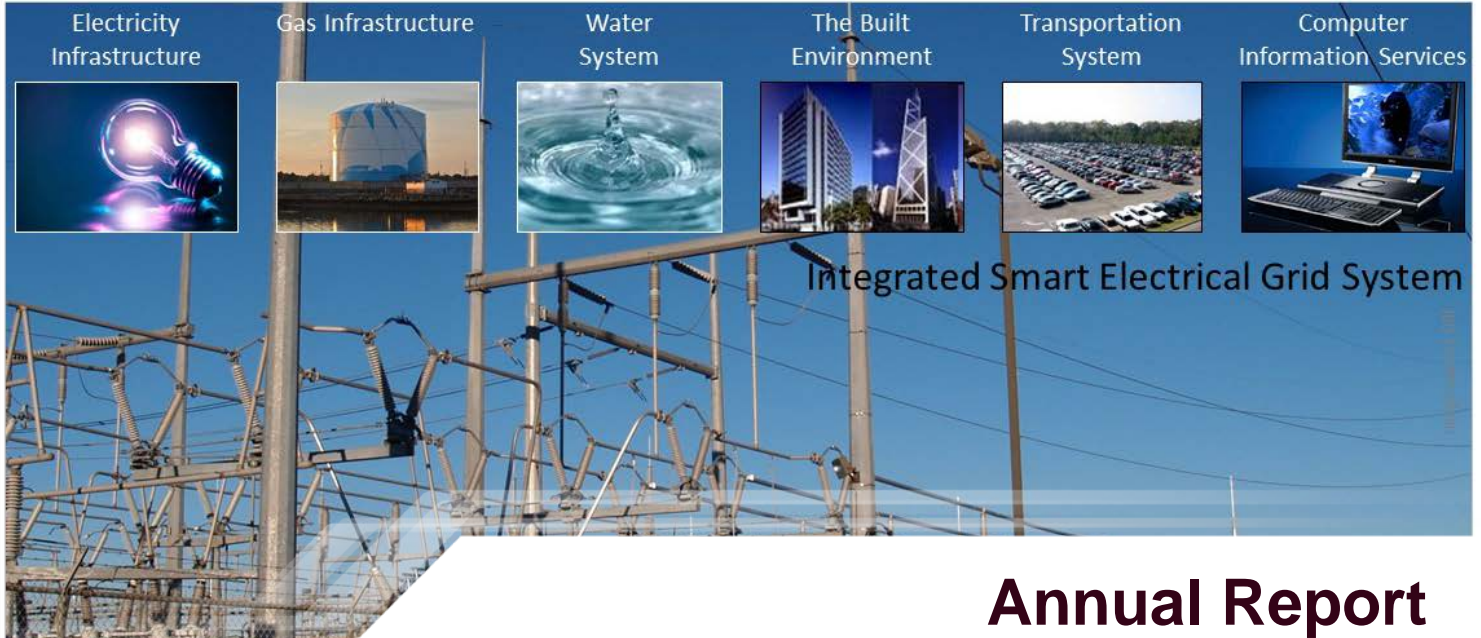




SMART GRID CENTER

TEXAS A&M ENGINEERING EXPERIMENT STATION



Annual Report

September 2013 - August 2014

Strategic Initiatives

This year, the synergistic activities of the Center spread across several strategic initiatives. To differentiate itself from other similar efforts in the Nation, the Smart Grid Center (SGC) has focused on three strategic initiatives endorsed by its Advisory Board:

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

Strategic Projects. The projects considered pivotal for developing and demonstrating the SGC expertise are:

- Big data, particularly integration 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 forecast 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 with real-time and operations planning coordination;
- Cyber-physical security with emphasis on interactions between different critical infrastructures.



Director: Dr. Mladen Kezunovic

Several new collaborative proposals worth over \$15 million were either submitted or are in the process of being submitted.

The current projects may be viewed at http://smartgridcenter.tamu.edu/sgc/web/?page_id=115

Comprehensive Large-Scale Test Beds. The Center has developed a novel concept that allows complex physical and cyber systems to be integrated at virtual and physical levels to mimic new solutions at broad spatial and temporal scales.

Smart Grid Center founded in August 2012

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

To jointly develop integrated large-scale test beds defined in a white paper titled “Experimental Open Source Ecosystem (EXPOSE) for Smart Grid Resiliency Research”, collaborations have been initiated and strengthened at the Smart Grid Workshop with several vendors (Alstom, ABB, OsiSoft, NI, ESRI, IBM, Honeywell) and national labs (LBNL, LLNL, ORNL, and NREL).

Focused Smart Grid Training. The unique approach taken by the Center is to offer continuing education and training in some highly specialized areas that span across fundamental and practical concepts of smart grid (SG) integration not covered comprehensively by short courses offered by vendors and other academic institutions.

Advisory Board was Established

The Advisory Board of the Center held its inaugural meeting on December 19, 2013 and its second meeting on April 8, 2014. Chair: Jorge Bermúdez (President and CEO of Byebrook Group); Vice-Chair: John McDonald (Director of Technical Strategy & Policy Development of GE), respectively. 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), and Pat Wood (Wood3 Resources).



SGC Advisory Board at the inaugural meeting on December 19, 2013. On the left: P. Wood, M. O’Quinn, L. Tang, J. Bermudez. On the right: M. Kezunovic, J. McDonald, G. Arnold, and M. Scholtz.

Research Awards to the Center

New research awards

- NSF, PI: M. Kezunovic (ECE TAMU), Travel Grant, Workshop on Energy Cyber-Physical Systems, \$40K.
- NSF PSERC, PI: C. Singh (ECE, TAMU), Co-PIs: V. Aravinthan (Wichita State Univ.), A. Sprintson (ECE TAMU), “Reliability Assessment and Modeling for Cyber-Enabled Power Systems with Renewable Sources and Energy Storage”, \$110K, 2 yr.
- NSF PSERC, PI: A Sun (Georgia Tech), Co-PIs: L. Xie (ECE TAMU), S. Meliopoulos (Georgia tech), “New Operation Tools for Improving Flexibility and Reliability of Systems with Variable Resources and Storage Devices”, \$70K, 2 yr.
- TAMU-CAPES, PI: M. Kezunovic (ECE TAMU), Co-PI: G. Taranto (COPPE / UFRJ, Brazil), “Development of Advanced Open-Source PMU/PDC Lab and Applications with Synchronized Data Obtained from Simulation and Actual Power Network”, \$50K, 2 yr.
- TAMU-TEES, PI: M. Kezunovic (ECE TAMU), Co-PI: C. Singh (ECE), P.R. Kumar (ECE), E. Moreno-Centeno (ISE), A. Sprintson (ECE), R. Stoleru (CSE), L. Xie (ECE), “Energy Cyberphysical Systems: Experimental Open Source Ecosystem (EXPOSE) for Synchronphasor Research”, \$100K, 2 yr.

Pending decisions on research awards

Five large-scale research proposals have been submitted recently to the NSF, Keck Foundation, and Carnegie Corporation, and decisions are anticipated in the next few months.

Technology Transfer

- Two patents were developed by D. Russel and C. Benner at Power System Automation Laboratory (ECE).
- An extensive Technology-to-Market (T2M) 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).

The SGC Website

Collaborating faculty members, industry partner information, faculty activities, and resulted publications can be viewed at <http://www.smartgridcenter.tamu.edu/sgc>

Second Smart Grid Workshop held around “Partnership” with industry and national labs on April 8, 2014



Smart Grid Workshop

The annual event was organized together with Alstom, GE, Honeywell, IBM Research, NI and LBNL to facilitate scientific exchange leading to collaborative proposal teams and improved teaching, as well as research and development activities across disciplines in electric transmission, distribution and renewable interfacing, grid monitoring, Big Data analytics optimization, energy management of buildings, cyber-physical security, sensors and communications, flexible load, demand-side management, and test beds. A total of 177 attendees including 40 faculty and staff members, 103 students and 21 representatives of industry and government agencies participated. Attendees included visitors from Qatar, Brazil, and Mexico.

Extending the SGC Portfolio

- Establishing the Smart Grid Center – Qatar (SGC-Q) located at the TEES Division TAMUQ in Doha, Qatar. Managing Director: H. Abu-Rub.
- Adding new collaborating faculty members: Pierce Cantrell (ECE, Assoc. Provost, Information Technology), Charles Culp (Architecture, Director, Energy System Lab), Dan Goldberg (Geography, CSE, Lead of Texas A&M GeoServices), Robin Murphy (CSE, Director, Center for Robot-Assisted Search & Rescue), Walter Peacock (Landscape Architecture & Urban Development) and Director of Hazard Reduction and Recovery Center, Johannes Strobel (ETID, Director, Educational Outreach Programs, TEES), and Xi Zhang (ECE).

Future Plans

- Targeting new funding opportunities;
- Engaging existing and new partners;
- Expanding the SGC Advisory Board;
- Organizing the 3rd SG Workshop.