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Ameren Illinois 4th Quarter 2014 Smart Grid Test Bed Report

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Executive Summary

Ameren Illinois Company (Ameren Illinois) submits the following Smart Grid Test Bed Quarterly Report in accordance with the Energy Infrastructure Modernization Act (EIMA), 220 ILCS 5/16-108.5 et seq. This report provides updates on the steps Ameren Illinois has taken to implement its test bed plan during the fourth quarter of 2014. The report includes information on activities Ameren Illinois has undertaken to further develop its “primary” test bed location, discussions with potential test bed customers, and on the testing application process.

DOE Funding Opportunity Projects

Technology Applications Center (TAC) personnel continue their work on the following DOE funded projects. Work includes the identification of what TAC equipment is available to perform testing of the project solutions as well as assisting in the development of test plans to validate the project solutions.

- **(ARMORE) - Applied Resiliency for More Trustworthy Grid Operation**

Primary Investigator – Grid Protection Alliance

Partners – University of Illinois – Urbana/Champaign, Pacific Northwest National Laboratory

An open-source system that can perform inspection of network packets and alarms on communication that does not comply with the specified ARMORE policy. ARMORE will be able to be configured to take action to block network traffic based on deep inspection of common substation communications protocols, such as DNP3.

- **(CODEF) - Collaborative Defense of Transmission and Distribution Protection and Control Devices Against Cyber Attacks**

Primary Investigator – ABB

Partners – University of Illinois – Urbana/Champaign

This project will advance the state of the art for cyber defense methods for transmission and distribution grid protection and control devices by developing and demonstrating a distributed security domain layer that enables transmission and protection devices to collaboratively defend against cyber-attacks in an IEC 61850 environment.

- **(PBCONF) – Secure Policy-Based Configuration Framework**

Primary Investigator: Electric Power Research Institute (EPRI)

Partners – University of Illinois – Urbana/Champaign, Schweitzer Engineering Laboratories

An extensible, policy-based configuration framework to support the secure configuration and remote access of modern and legacy devices from a variety of vendors. The open-source framework will combine a policy engine with a translation engine to address the interoperability challenges of various remote access control methods and provide utilities with a single, organization-wide view of the security configuration for their power delivery devices.

- **(SDN) – Software-Defined Networking**

Primary Investigator: Schweitzer Engineering Laboratories

Partners – University of Illinois – Urbana/Champaign, Pacific Northwest National Laboratory

SDN allows a programmatic change control platform, which allows the entire network to be managed as a single asset, simplifies the understanding of the network, and enables continuous monitoring in more detail. Control system networks are often more static, while the corporate world is more dynamic.

Other Current Test Bed Projects

- Ameren Illinois continues to evaluate new LED lighting technology by measuring and collection of data via our AMI metering matrix. In the last quarter, Ameren Illinois continued to collect and compile usage data from lights with varying ages. The data being collected will be analyzed for energy consumption to determine if the roadway LED's are recommended for Ameren Illinois future offerings.
- Home Area Network (HAN) and AMI testing has been initiated to determine the functionality and operability of how end use devices interface with Ameren Illinois 's AMI meters. We are currently finalizing Ameren Illinois HAN Device Validation Program for distribution to HAN manufacturers and vendors to communicate how to submit products and devices to the TAC for review.
- Ameren Illinois is finalizing the evaluation of our internal testing of wireless communication systems with the Voltage Regulator controls and radios. Three communication platforms were evaluated for this proof-of-concepts; Satellite, WiFi-Mesh, and Ethernet transceivers, each technology has its advantages/disadvantages depending on application and location of installation, Ameren Illinois is still reviewing the cost benefits of each to determine which platform if any will be the most beneficial to our distribution system.

- Ameren Illinois met with EPRI to discuss possible field demonstrations of the ANSI/CEA-2045 Modular Communication Interface Standard. The concept embodied in the CEA-2045 standard is that of a low-cost modular socket interface that could be built into products upfront. This concept potentially applies to end-use equipment in mass markets - thermostats, electric water heaters, pool pumps, electric vehicle supply equipment, and other products that might be of interest for demand response programs.
- The TAC was part of an internal Ameren Cyber Security evaluation for the NERC/CIP Reliability Procedures by providing a connection from the relay network at the TAC to the Ameren Missouri relay lab. This proof-of-concept of software provided by a third party, is a centralized security suite that consolidates antivirus, patching, whitelisting, change & configuration management, vulnerability scans, backups, and security information & event management technologies into a single solution. Having the TAC available for this demo/evaluation was very successful and also demonstrated the flexibility of the TACs network and testing platform.

Test Bed Applications

- An application was received from an Energy Storage System Integrator for the installation of a battery storage system. Ameren Illinois is currently reviewing the application for the potential operational testing of the storage facility at the TAC for connection on the 12kV distribution system.
- As per our 3rd quarter report, Ameren Illinois continues to discuss the application received from a solar panel manufacturer desiring to test its new Concentrated Photovoltaic solar panel. Ameren Illinois has identified several testing locations within its Service Divisions for possible testing to define the scope of the requested testing services.

Industry Participation

- Ameren Illinois' presented at the EEI TDM (Transmission, Distribution and Metering) Fall Conference held in St. Louis, MO on October 7, 2014. EEI's TDM Conference is the premier conference that focuses on transmission, distribution and metering issues for the investor-owned electric utility community. It is the only conference developed specifically by utilities with a focus on the key areas EEI Member companies view as strategically important. (See www.eei.org for more details)
- On October 21, 2014, Ameren Illinois participated on the utilities perspective of Energy Storage panel session for the University of Illinois – Urbana/Champaign and the Joint Center for Energy Storage Research (JCESR). The symposium was held to bring together academic and industry perspectives on the challenges and opportunities for integrating battery storage onto the electrical grid.
- Ameren Illinois provided a WebEx presentation to a company called G2 Inc. which is assisting the National Institute of Standards and Technology (NIST). NIST is seeking to

enhance collaboration amongst the many parties that are currently seeking to harness the opportunities presented by Cyber Physical Systems G2 Inc. wants to ensure that the NIST testbed is a functional success, so they began looking across industry and academia to examine existing facilities to receive guidance on the best way forward. They do not want their testbed to be a stand-alone location that replicates capabilities already present in testbeds (i.e. TAC) and laboratories across the country. They envision a facility that acts as more of a center of collaboration.

- Ameren Illinois assisted the University of Illinois at the fall 2014 TCIPG Annual Industry Workshop November 11-13, 2014, by presenting an overview of the TAC facility and also hosting a tour at the conclusion of the workshop.
- TAC staff worked on development of communication/marketing materials that will be utilized in Ameren Illinois's booth at the 2015 Distributech conference.

Test Bed Tours

- On December 4, 2014, Ameren Illinois TAC staff provided a tour to an EPRI member that is responsible for EPRI's ANSI/CEA-2045 Modular Communication Interface Standard project. This tour provided the EPRI member an understanding of the TAC's testing capabilities and on-going discussions are planned to establish a possible field demonstration of end use appliances that utilize the ANSI/CEA-2045 Modular Communication Interface socket device.
- The TAC staff also provided tours for the JCESR and TCIPG groups as-noted in the above paragraph with 20-30 people attending on both occasions.

Smart Grid Test Bed Plan Success

Ameren Illinois' commitment to the successful implementation of its Smart Grid Test Bed plan is strong. However, as set forth above, Ameren Illinois reserves the right to modify, amend or alter this plan, as necessary and consistent with the law, to meet the requirements and objectives of the EIMA and other related provisions. Additionally, Ameren Illinois reserves its right to terminate this plan.