Center for the Commercialization of Electric Technologies

Technology Solutions for Wind Integration in ERCOT

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Overview

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This end-to-end smart grid demonstration project will help us better understand how to integrate and commercialize the vast Texas wind energy resources into the grid.

Why Texas?
• Largest wind generation state in the U.S. • 9000 MW of wind generation capacity • Transmission expansion underway thru CREZ . • 32% of U.S. wind generation capacity. • Plans for an additional 10,000 MW by 2020. • Most aggressive Advanced Metering Implementation (AMI) in the U.S. • The Smart Meter Texas Portal gives access to usage data at a 15-minute level of granularity for all AMI customers. • ERCOT settles wholesale transactions with 15-minute data. • The Regional Demonstration results will be transferable to other U.S. regions as “best practices”.

Overview (cont.)

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The Project has three phases…

1. Synchrophasor Technology
2. Smart Meter Texas Portal
3. Smart Grid Community of the Future

1. Synchrophasor Technology

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1. Synchrophasor Technology –

Although we already know the many benefits of wind power, it is critical that we manage its effect on reliability of the grid before wind can become a viable energy source in the Texas electricity market.

Project Goals

- Providing real time dynamic information on large-scale wind resources
- Identifying changes in operating procedures to facilitate integration of renewable resources
- Improving grid reliability when employing large amounts of variable energy sources
- Transferring lessons learned for this wind dynamics monitoring and management to other parts of the U.S

1. Synchrophasor Technology (cont.)

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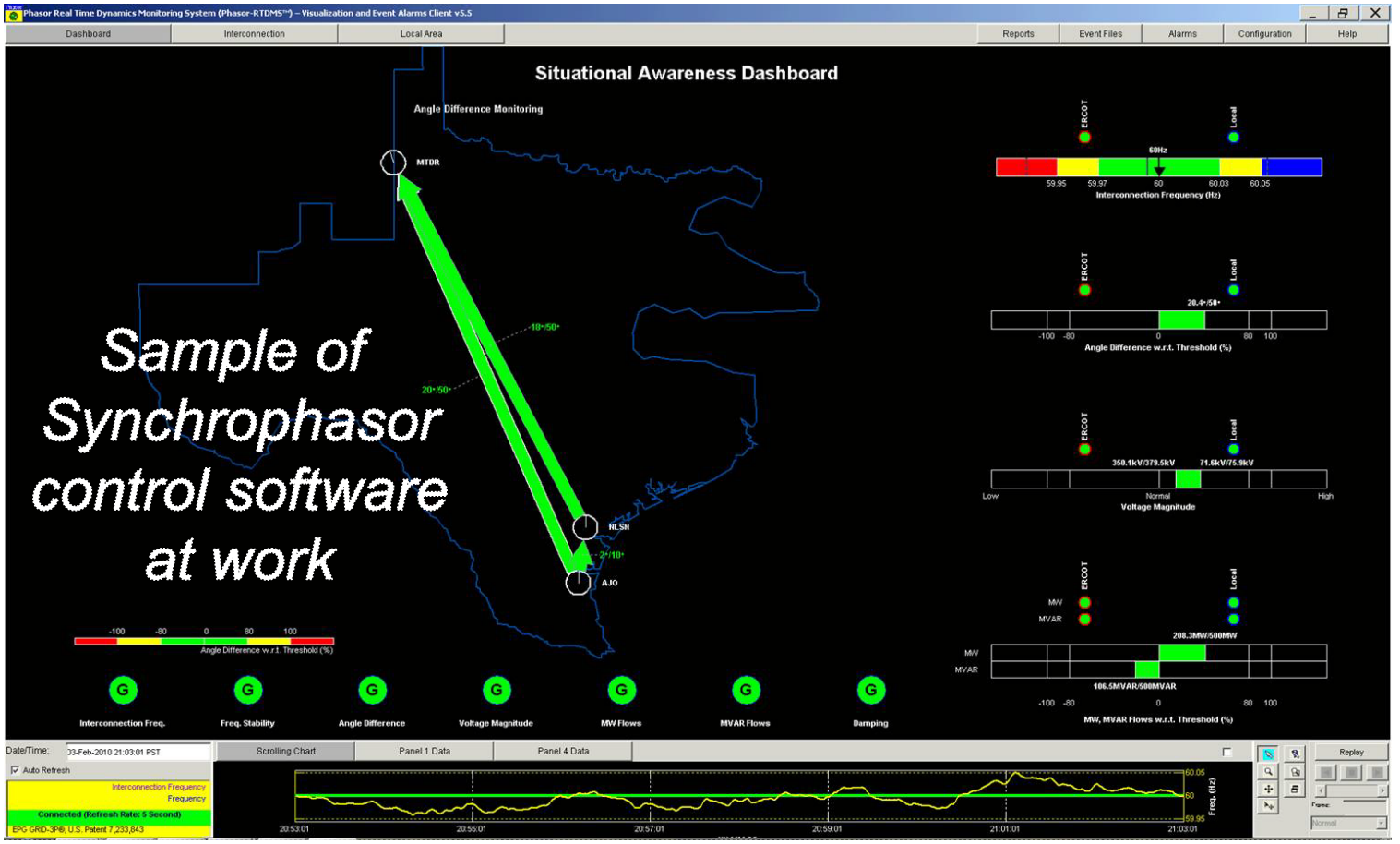
Synchrophasor technology measures variations across a transmission grid in absolute real-time. The measurement includes a time stamp that provides an easy method of correlating values from different locations that take different amounts of time to arrive at a common collection point. This gives us a tool to view the power system as a whole or to compare different points in real time.



2. Smart Meter Texas Portal Extension–

ERCOT and the largest electricity companies in Texas are in the process of launching the most aggressive Advanced Metering System (AMS) deployment in the U.S. The *Smart Meter Texas Portal* initiative is a several-year collaboration to properly integrate these meters into the ERCOT market. The grant Project will plan the expansion of the Portal capabilities.

This Project and all of its stakeholders will remain "advisors" to the launch of the Smart Meter Texas Portal and, moreover, use the resulting control systems and operational data. Examples of these are:

- Enhancements to the data capture of real-time electricity consumption,
- Direct Load Control (DLC) enabled by the newly-deployed AMS,
- Back office enhancements, with lower levels of granularity, so as that financial settlements are not out-paced by enhanced technology,

3. Smart Grid Community of the Future

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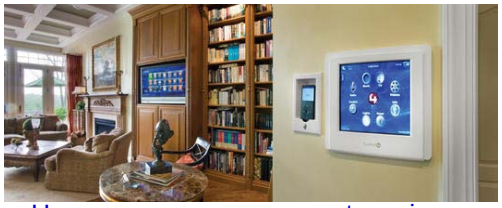
Formal testing of new types of Load Control and DR…

Providing a homeowner solution is the 3rd step and will involve creating a **"Smart Grid Residential Community of the Future"** in Spring, TX. Spring is a growing suburb 25 miles north of Houston and an excellent test bed for this kind of demonstration. This Community will feature homeowner services such as:

High efficiency HVAC systems with central Indoor Air Quality (IAQ) systems

Electronic Vehicle (EV) charging

Rooftop solar for serving as Distributed Generation (DG) for each home



Home energy management services including an in-home display & software applications to help homeowners manage their electricity more efficiently

2-way metering capabilities to support DG and new-generation demand response programs

Solar farm to supply common areas such as a water treatment plant, community center and swimming pool

Extraordinary high building envelope efficiencies

Smart appliances

Home Battery storage

3. Smart Grid Community of the Future (cont.)

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Four Customer tranches will be used for the benefit of collecting quality, accurate data.

	Control Group	EE1 Group	EE2 Group	EE3 Group
Development	Legends Ranch	Legends Ranch	Discovery at Spring Trials	Discovery at Spring Trials
Number of Homes	TBA	TBA	TBA	TBA
Electric Vehicle (EV) charging stations	—	—	—	Yes
High-efficiency HVAC systems	—	—	High	Higher
HERS weatherization measures	Audit only	Audit with light measures	Audit with heavy measures	Full weatherization
Home display	—	—	Information only	HEM capabilities
Net metering	Standard	1-way	2-way, no net metering	2-way, full net metering
Photovoltaic (PV) roof panels	—	—	DG only, no grid participation	DG with grid participation
Smart appliances	—	—	Information only	HEM capabilities
Load control	—	1-way DR	2-way, light DR	2-way, full DR
Whole-home battery backup	—	—	—	Yes
Whole-home Indoor Air Quality system	—	—	High	Higher

Project Team

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This diverse group of stakeholders arms this project with a deep understanding of all three phases of this Project.

AEP American Electric Power

EcoEdge

GE imagination at work

Sharyland Utilities

CenterPoint Energy

Electric Power Group

GridPoint

Department of Energy, United States of America

EnergyXtreme — Conservation Through Innovation

Southwest Research Institute

Land Tejas Companies

Direct Energy

ERCOT

TXU Energy

Drummond group

Frontier Associates

Oncor

Valence Energy — Smart Microgrid Solutions

Project Team (cont.)

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Shared Goals

A $13.5 million grant from the U.S. Department of Energy comprises half of the $27 million needed to achieve our goals for this project.

In return for their investment, the Department of Energy will receive a demonstrated, validated set of best practices and proven smart grid technologies for reliable commercialization of wind generation.

This will hopefully lay the groundwork for wind generation expansion across the U.S. and help meet the Obama Administrations' goal of 25% renewable energy by 2025; *an extremely aggressive goal at more than 5x the current amount!*

It will also define the roles of market participants and business processes that, when implemented, can expand the use of demand-side actions for reliability management purposes.

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Questions?

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