Oregon Wave Energy Trust
Utility Market Initiative

Task 4.6: Telemetry

www.oregonwave.org

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The Utility Market Initiative was prepared by *Pacific Energy Ventures* on behalf of the Oregon Wave Energy Trust.

Task 4.6 was completed by Ecofys.

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For information about this project, please contact Justin Klure at Pacific Energy Ventures:

Phone: (503) 475-2999

Email: jklure@peventuresllc.com

About Oregon Wave Energy Trust

The Oregon Wave Energy Trust – (OWET) - with members from fishing and environmental groups, industry and government - is a nonprofit public-private partnership funded by the Oregon Innovation Council in 2007. Its mission is to serve as a connector for all stakeholders involved in wave energy project development - from research and development to early stage community engagement and final deployment and energy generation - positioning Oregon as the North America leader in this nascent industry and delivering its full economic and environmental potential for the state. OWET's goal is to have ocean wave energy producing 2 megawatts of power - enough to power about 800 homes - by 2010 and 500 megawatts of power by 2025.

Report for:
Oregon Wave Energy Trust – Utility Market Initiative
Telemetry: Current Developments
for Distributed Energy Resources in Oregon

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Authored by:
Diane Broad, P.E., Sr. Consultant
Ecofys US

Project Overview

Bonneville Power Administration (BPA) has provided funding through their Technology Innovation group to enable the development of a new, more cost-effective monitoring and communications system. The project is lead by the Oregon Department of Energy, and includes a team of subcontractors: Portland General Electric, Factory IQ, Community Renewable Energy Association, and Ecofys US. The telemetry project will develop a uniform monitoring and communications system to integrate the rapidly increasing number of distributed energy resources within the BPA balancing area or other balancing areas in the region. Developers of distributed energy projects are often required by the interconnecting electric utility to install highly complex and costly monitoring systems as part of the interconnection agreement (costs of $150,000 and higher are typical). The utilities believe that these systems, as currently specified, are the only acceptable method to transmit the required real-time operational data from the small generators to the system control center (SCC), in a way that is reliable and meets all regulatory requirements, specifically those of the North American Electric Reliability Corporation (NERC) and the Western Electricity Coordinating Council (WECC). The project will identify standards, requirements and protocols common to utilities in the Western Energy Coordinating Council (WECC), and establish prioritized data-structures and protocols for integrating distributed resources (DR).

The demonstration intent is to use conventional and existing hardware, software, systems languages, protocols and applications adaptable to this use and available in the market.

The software side of the project will build upon "GenOnSys," the PGE-developed Invensys(R) application currently utilized to monitor, control and provide dispatch capability for PGE's SCC. GenOnSys allows PGE's SCC to start 45 megawatts of distributed customer-owned generation via the utility's Dispatchable Standby Generation program. As part of these 45 megawatts, GenOnSys monitors renewable generation at solar and biogas sites for their owners.

Although a proven system for PGE's remote generator operations, GenOnSys has not tackled the key problem of communications system integration with the WECC, BPA system or with other system control centers in the region. This project will result in the demonstration of the

monitoring and communications necessary to integrate no fewer than three distributed generation, renewable resource projects, into one or more of the electric grid system control centers in Oregon.

Objectives

This system will

1. Define a standardized interface/protocol for linking to any independent system operator (ISO) or utility system control center (SCC),
2. Define a standardized naming convention and data structure simplifying the application for all forms of DR, and
3. Provide an affordable monitoring and communication equipment package for distributed generation projects.

Major objectives are:

- Detailed review of research recently completed with ISOs, several RTOs, and several SCC operators identifying issues, methods, data-structures, and protocols for integrating distributed resources into their working systems completed under a GridApp grant.

- Identify the common elements with these organizations and prioritized data-structures and protocols with BPA and PGE essential for integrating DR with BPA and PGE.

- Select a Control Center reporting method, hardware/software data-link structure and data-reporting structure that would be acceptable to WECC System Operators.

- Integrate this Control Center reporting method link into the GenOnSys kernel and complete a test link into BPA's System Control Center or another utility's Control Center besides PGE.

- Work with at least two DR project developers and their generator controller programmers to conform to this standard data structure in projects that are currently under development in the region.

- Complete a sample data-push of DR information to the BPA EnergyWeb and Oregon Department of Transportation website. (Note: Many DR advocates would like to see web-based information. The challenge is meeting FERC/NERC cybersecurity standards for generation needed for SCC linkages. These security requirements are currently at odds with the public information on the World Wide Web.)

The project is organized into four tasks.

Task 1 Control Center Representatives' Interest and Alignment
Task 2 Definition of system hardware and software requirements
Task 3 Standard method of procedure for data transmissions
Task 4 Implementation at Demonstration Sites and Control Center Demonstrations

One of the goals of this project is to identify an alternative hardware design that can provide real-time telemetry for the variety of small generators that are seeking interconnection to the electricity grid, whether the resource is wind, solar, hydro, biomass, wave or any other generating technology. The hardware will be easily adaptable to the wide range of generators in the market, low-cost, robust, reliable and adaptable to various communications methods.

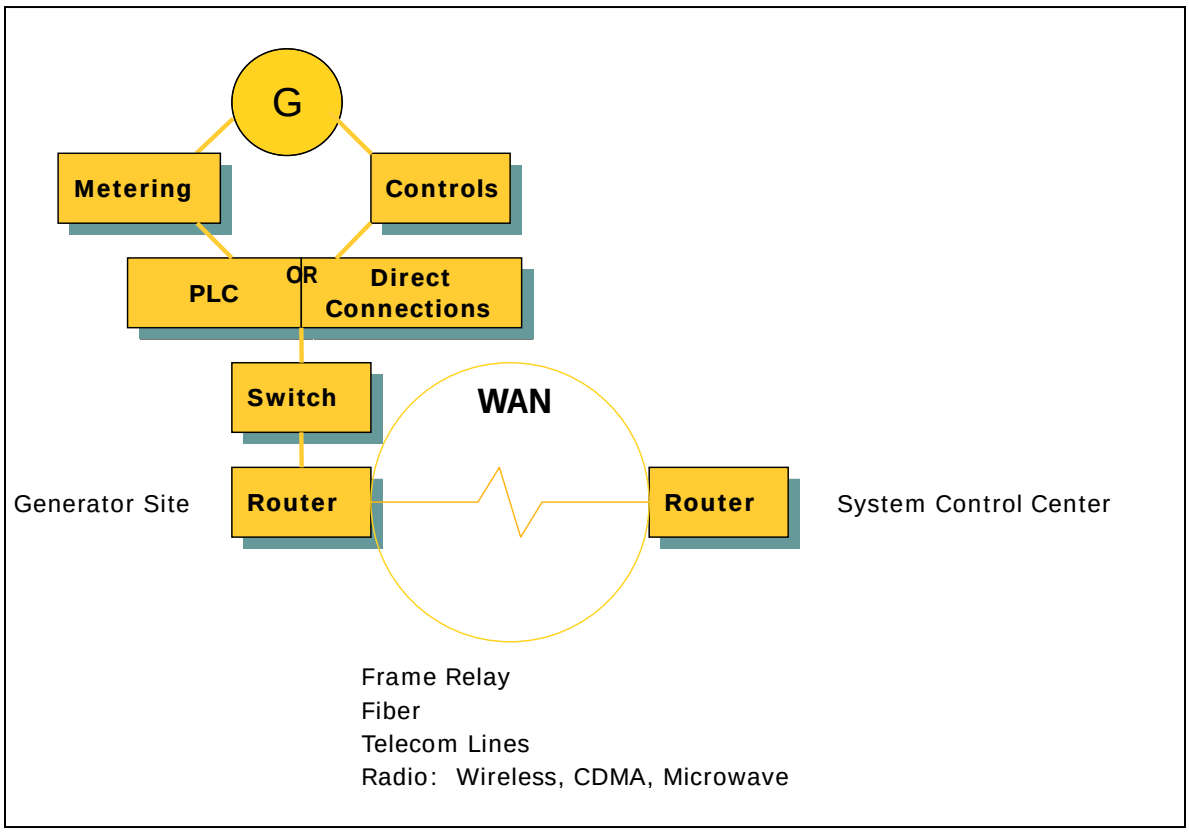

Figure 1. Overall Hardware Concept

It should be noted that the directives from the reliability councils have been for collection of a very small amount of data from each generator. Specifically, the following points are required at a minimum:

- Generator Status (ON/OFF)
- MW Output
- MVar Output
- System Heartbeat
- Generator Breaker Status (OPEN/CLOSED)

If a substation or switchyard is part of the generator interconnection, then the following points are also required:

- Circuit Breaker or Recloser Status (OPEN/CLOSED)
- Line-side Disconnect Switch Status (OPEN/CLOSED)

Project Progress

The project underwent a milestone review by BPA in October 2009. This review demonstrated the completion of Task 1 and Task 2. Task 3 is ongoing through December 2009. This includes system requirements, programming, database structuring, and website programming. Task 3 is on-schedule. Task 4 covers demonstration site selection, customer agreements, and site demonstration. Telemetry systems for three sites, consisting of a photovoltaic, a hydro, and a wind generation site, will be designed, installed, demonstrated, and data will be collected and analyzed. The telemetry systems have been designed and commissioned for the photovoltaic and hydro generation sites, with demonstrations scheduled for November and December, respectively.

Data collection and analysis will be ongoing through June 2010. The wind generation site has been selected. Design and setup will commence in early 2010. Task 4 is on schedule.

Summary

This project will develop an efficient, standardized, and low-cost telemetry procedure for distributed generation. The intent is to encourage distributed generation and support data acquisition for all involved parties. Three distributed sites, each using distinct technologies, were chosen for demonstration. This will support feasibility with photovoltaic, hydro, and wind generation.

For most projects, the data that is gathered by the telemetry system is collected at the point of interconnection with the utility. In the case of wave energy, this point is onshore and represents no particular challenge. If individual generators need to be monitored, this could present a unique challenge. As was mentioned in Task 4.4, Scheduling, the data source for the performance of individual generators is offshore, perhaps quite a long distance depending on the particular installation. Communications systems that can be deployed far from shore, in the challenging marine environment, without the benefit of a stable platform, and still reliably deliver minute-by-minute data need to be proven.

Although the current BPA development and demonstration project does not address wave energy projects in specific, there are no technical or operational reasons why this telemetry system will not be applicable to wave generation.