



# Western Interconnection Synchrophasor Program

## Summary

On Thursday August 6, 2009, the Western Electricity Coordinating Council (WECC) — in collaboration with public and private partners throughout the U.S. portion of the Western Interconnection — submitted an application in response to the U.S. Department of Energy's (DOE) Funding Opportunity Announcement (FOA) DE-FOA-0000058 to facilitate investment in "Smart Grid Technology." The application for Smart Grid Investment Grant Program (SGIG) funding to deploy a large-scale synchronized phasor measurement system with selected smart grid functions involves investment in synchrophasor infrastructure and software applications and will improve situational awareness, system-wide modeling, performance analysis, and wide-area monitoring and controls for the Western Interconnection. The program's estimated cost is \$107.8 million, which includes a matching funding request from the DOE for 50 percent of the total cost (\$53.9 million). On October 27, 2009 WECC was notified that it has been selected for award negotiations for \$53.9 million.

## FREQUENTLY ASKED QUESTIONS

### 1.0 BACKGROUND - TECHNICAL QUESTIONS

#### 1 *What is a synchrophasor?*

Synchrophasors are precise grid measurements now available from monitors called phasor measurement units (PMUs). PMU measurements are taken at high speed (typically 30 observations per second – compared to one every 4 seconds using conventional technology). Each measurement is time-stamped according to a common time reference. Time stamping allows synchrophasors from different utilities to be time-aligned (or "synchronized") and combined together providing a precise and comprehensive view of the entire interconnection. Synchrophasors enable a better indication of grid stress, and can be used to trigger corrective actions to maintain reliability. (source: [www.NASPI.org](http://www.NASPI.org))

#### 2 *What have synchrophasors got to do with the so called "smart grid"*

The smart grid will use distributed sensors and measurement techniques with digital communications and controls and distributed computing technology and analytics to optimize the efficiency, reliability and safety of electricity production, delivery and use. At the transmission and generation level, synchrophasor systems are the single most effective technology to realize and implement the smart grid, because synchrophasor systems collect, distribute, and analyze critical data and convert it in real time into information and insights that improve grid automation and operation. It is expected that using phasor data to manage grid operations could improve transmission efficiency and

utilization by increasing line throughput and reducing line losses. (*source: [www.NASPI.org](http://www.NASPI.org)*)

**3 What is a phasor measurement unit?**

Phasor Measurement Units (PMUs) are devices that measure grid conditions from 6 to 60 samples per second. Specialized, stand-alone PMUs have been manufactured for decades, but PMU functionality has been built into many electronic relays and digital fault recorders that are already installed on the grid. PMUs are most often installed within transmission substations and can be placed at generator busbars. Most PMUs can collect between 8 and 45 analog inputs; the minimum information collected for wide-area visibility includes location, time, frequency, current, voltage and phase angle relative to some known reference point on the grid. Most PMUs collect and relay data at no less than 30 times per second; in contrast, SCADA data are measured every 5 seconds. IEEE Synchrophasor Standard C37.118-2005 describes the functional requirements for PMUs and basic data measurement and verification requirements; work is under way to refine this standard for dynamic measurements and to verify compliance and interoperability among commercially available PMUs. (*source: [www.NASPI.org](http://www.NASPI.org)*)

**4 What is a phasor data concentrator?**

Concentrated data are relayed on a wideband, high-speed communications channel to a higher-capability phasor data concentrator (PDC) that feeds the consolidated data from all the PMUs into analytical applications such as a wide-area visualization tool, state estimator, and alarm processors. These applications feed the phasor data-based information (such as a real-time, grid condition dashboard) out to control room operators, system operations planners, and others. (*source: [www.NASPI.org](http://www.NASPI.org)*)

**5 What is a super phasor data concentrator?**

A super phasor data concentrator collects information from various phasor data concentrators to afford greater use of the total amount of phasor data collected over a wide area.

## **2.0 AWARD INFORMATION**

**1. Please explain how the funding works**

As part of the application to the DOE, the eight partner entities provided commitment letters that detail their participation in the program. These letters contained estimates of their organizations' spend on synchrophasor-related initiatives within their system. Their level of commitment is based on their business plans, budgets, and other business factors. In its application, WECC sought a matching sum from the Stimulus grant for WISP.

**2 When do you expect to hear if you have been awarded the grant?**

On October 27, 2009 WECC was notified by the DOE that it had been selected for award negotiations for the matching funds of \$53.9 million.

### 3.0 PROGRAM BENEFITS

**1 \$107.8 million is a significant sum of money - how will WISP help reliability?**

The requested grant will be invested in synchrophasor infrastructure and software applications; it will improve situational awareness, system-wide modeling, performance analysis, and wide-area monitoring and controls for the Western Interconnection. Synchrophasor data and supporting technologies will enable operators in the Western Interconnection to analyze stress on the bulk electric system through earlier indication of system vulnerabilities and evolving disturbances, allowing them to take timely actions to avoid wide-spread system blackouts.

**2 What are you hoping to achieve/what are the goals and benefits of WISP?**

- a) Large Scale Outage Avoidance
- b) Increased Transmission Utilization
- c) Increased Utilization of Intermittent Renewable Generation
- d) Reduced Capacity Firming Costs for Intermittent Generation
- e) Critical Infrastructure Protection (CIP) and Cyber Security

**3 What are the projected economic impacts of WISP?**

Energy and Environmental Economics Inc. quantified the program benefits in the Western Interconnection. Their forecasts indicate the program has the potential to provide numerous economic benefits by improving reliability, operating efficiency, asset utilization, system planning, and environmental impact. **Minimum** forecast economic benefits associated with the program (present value over 40 years using \$2008) include:

Benefit	Minimum Value
<i>Large-Scale Outage Avoidance</i>	\$1,220,540,494
<i>Increased Transmission Utilization on a Major Transmission Path</i>	\$34,748,816
<i>Increased Utilization of Intermittent Renewable Generation</i>	\$323,755,442
<i>Reduced Capacity Costs for Intermittent Generation</i>	\$307,735,069

### 4.0 INFORMATION

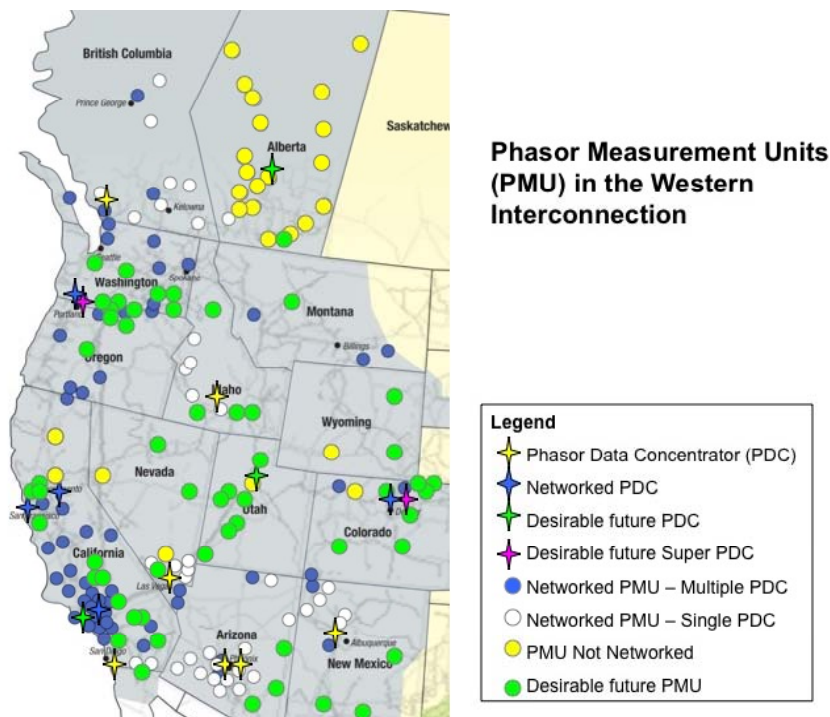
**1. Describe WISP:**

**a. How many PMUs are currently located in the Western Interconnection?**

There are 137 existing PMUs in the Western Interconnection.

**b. Where are they located and why?**

Phasor measurement units exist throughout the Western Interconnection and were placed there over the last three decades based on the individual decisions of utilities, system operators, and balancing authorities. The map below shows both existing and planned PMUs.



**2. Will existing PMUs need to be replaced with more modern PMUs?**

The status of existing PMUs will be decided on a case-by-case basis. It is likely many will be replaced by more technologically advanced models; however, it may be possible to upgrade some PMUs to meet the needs of the program.

**3. What is the “life of the program”?**

The program will run from 2009–2012 and falls into six distinct phases:

- Phase 1: Initiation — Complete**
- Phase 2: Planning — Underway**
- Phase 3: Design — March 2010**
- Phase 4: Procurement and Construction — July 2010**
- Phase 5: Test — April 2011**
- Phase 6: Implementation — May 2012–September 2012**

**5.0 PROGRAM STRUCTURE AND MANAGEMENT**

**1. Please name the other organizations involved in WISP.**

The partner entities involved are: Bonneville Power Administration, CAISO/ California Energy Committee/EPG, Idaho Power, NV Energy, PacifiCorp, PG&E, Southern California Edison, and the Salt River Project

**2. Is WECC responsible for managing \$107.8 million?**

WECC will be responsible for \$53.9 million of funds received from DOE. Of that a portion will be spent on WECC projects (\$31.9 million) and \$22 million will go to PG&E as a sub-awardee. In addition, although the \$53.9 million committed by the partner entities will remain in their control to be allocated as dictated by their business plans and needs, WECC will be responsible for monitoring that the partner entities spend those monies committed from their own budget on synchrophasor-related initiatives, and will be responsible for reporting on total program progress to DOE.

**3. Who owns any infrastructure purchased as part of WISP? Will it belong to WECC?**

Any infrastructure purchased as part of an entity's existing synchrophasor initiative will belong to the entity. Any infrastructure purchased with the matching funds will be owned and managed by WECC on behalf of its members except for the \$22 million portion going to PG&E.

**4. How much has each organization committed?**

	<b>Entity Est. Non-Federal Spend</b>	<b>Stimulus match to WECC</b>	<b>Stimulus match to PG&amp;E</b>	<b>Total Estimated Spend</b>
Bonneville Power Administration (BPA)	\$20,000,000	\$20,000,000		<b>\$107,776,000</b>
California ISO (CAISO) /California Energy Commission (CEC) /Electric Power Group (EPG)	\$2,700,000	\$2,700,000		
Idaho Power Corporation (IPC)	\$200,000	\$200,000		
NV Energy	\$100,000	\$100,000		
PacifiCorp (PPW)	\$800,000	\$800,000		
Pacific Gas & Electric (PG&E)	\$25,000,000	\$3,000,000	\$22,000,000	
Southern California Edison (SCE)	\$4,400,000	\$4,400,000		
Salt River Project (SRP)	\$300,000	\$300,000		
WECC	\$388,000	\$388,000		
<b>TOTAL OVER THREE YEARS</b>	<b>\$53,888,000</b>	<b>\$31,888,000<sup>1</sup></b>	<b>\$22,000,000<sup>2</sup></b>	

**5. Some have committed more than others – how does that work?**

Levels of commitment were based on the various entities' own business plans, budgets, and other business factors. WECC is appreciative of any and all participation in funding the program.

<sup>1</sup> The WECC portion of the overall project is focused on core, common interconnection requirements: inter-utility network infrastructure, gathering data from entity PDCs into super PDCs, historical archiving, and application deployment for situational awareness, model validation, and control.

<sup>2</sup> \$22,000,000 of the DOE matching funds would go back to PG&E as a sub-awardee to complete the PMU, PDC, intra-utility network infrastructure, and application deployment within its own system. The \$3,000,000 of the Stimulus match going to WECC is for core, common interconnection requirements that absent the coordinated interconnection-wide project would have been performed as part of the PG&E project.

**6. *PG&E has committed \$25 million but only \$3 million of the matching funds will go to the core or common parts of this program –why is that?***

PG&E has committed \$25 million, and requires \$22 million in matching funds from DOE to complete the substantial investment in its system to install synchrophasor technology to meet its needs as a transmission owner and operator. The remaining \$3 million of matching funds from DOE are to be used by WECC to complete the core infrastructure and applications needed by the Western Interconnection as a whole.

PG&E has filed with the Federal Energy Regulatory Commission (FERC) a request for expedited approval of PG&E's portion of the program under the FERC's recently adopted Smart Grid Policy Statement, issued July 16, 2009 in FERC Docket No. PL09-4-000. PG&E expects that FERC will act on its request prior to the DOE's decision on grant awards under the SGIG program.

**7. *Is WECC leading this program?***

Yes, WECC is the program lead.

**8. *How is the full \$107.8 million apportioned and who has oversight to ensure it is spent appropriately?***

A robust management structure is being put into place that fully involves the WECC's Board of Directors and representatives of the funding partners. The required DOE process for tracking and reporting program expenditures has yet to be defined but will be adhered to.

**9. *How long is the \$107.8 million to last?***

The program will run from 2009–2012.