



WISP

Western Interconnection Synchrophasor Program

Vickie VanZandt
NASPI Work Group Meeting
October 12-13, 2011



Western Electricity Coordinating Council

Assuring reliability in the Western Interconnection

Key Activities

- WECC's "Western Interconnection Synchrophasor Program" is installing more than 300 phasor measurement units (PMUs) and 60 phasor data concentrators (PDCs) across the Western Interconnection.

Aims and Strategies

- Provide grid operators and reliability coordinators with more frequent and time-synchronized system information.
- Better system visibility will help system operators avoid large-scale regional outages, better utilize existing system capacity, and enable greater utilization of intermittent renewable generation resources.

Results and Benefits

- 19 organizations are participating in the project, providing 100% coverage for the Western Interconnection.
- Real-time information and automated controls being deployed will enable grid operators to allow an additional 100 MW of operational capacity on the California-Oregon Intertie (COI). Similar system benefits are possible in other parts of the system.

Transmission System Modernization



Phasor Measurement Unit

Facts & Figures

Total Project Budget:

\$107,780,000

Federal Share:

\$53,890,000

Project Area:

Western Interconnection,
1.8 million square miles

Project Team:

19 utility organizations

Program Participants

- **WECC – Program Awardee**
 - **Program Director:**
 - Linda Perez lperez@wecc.biz
 - **Program Manager:**
 - Vickie VanZandt vrvanzandt@gmail.com
 - **Technical Delivery Manager:**
 - Eric Whitley ericwhitley@wecc.biz
 - **Technical Architect:**
 - Dan Brancaccio dbrancaccio@wecc.biz
 - **Participant Liaison:**
 - Vic Howell vhowell@wecc.biz

Program Participants (cont.)

<u>Cost Share Participants</u>	<u>PMUs</u>	<u>PDCs</u>
○ Bonneville Power Administration	132	4
○ California ISO/CEC	0	2
○ Idaho Power Corporation	4	1
○ NV Energy	14	5
○ Pacific Gas & Electric	158	26
○ PacifiCorp	3	2
○ Salt River Project	21	2
○ Southern California Edison	32	gateways
○ WECC		6
TOTAL	364	48

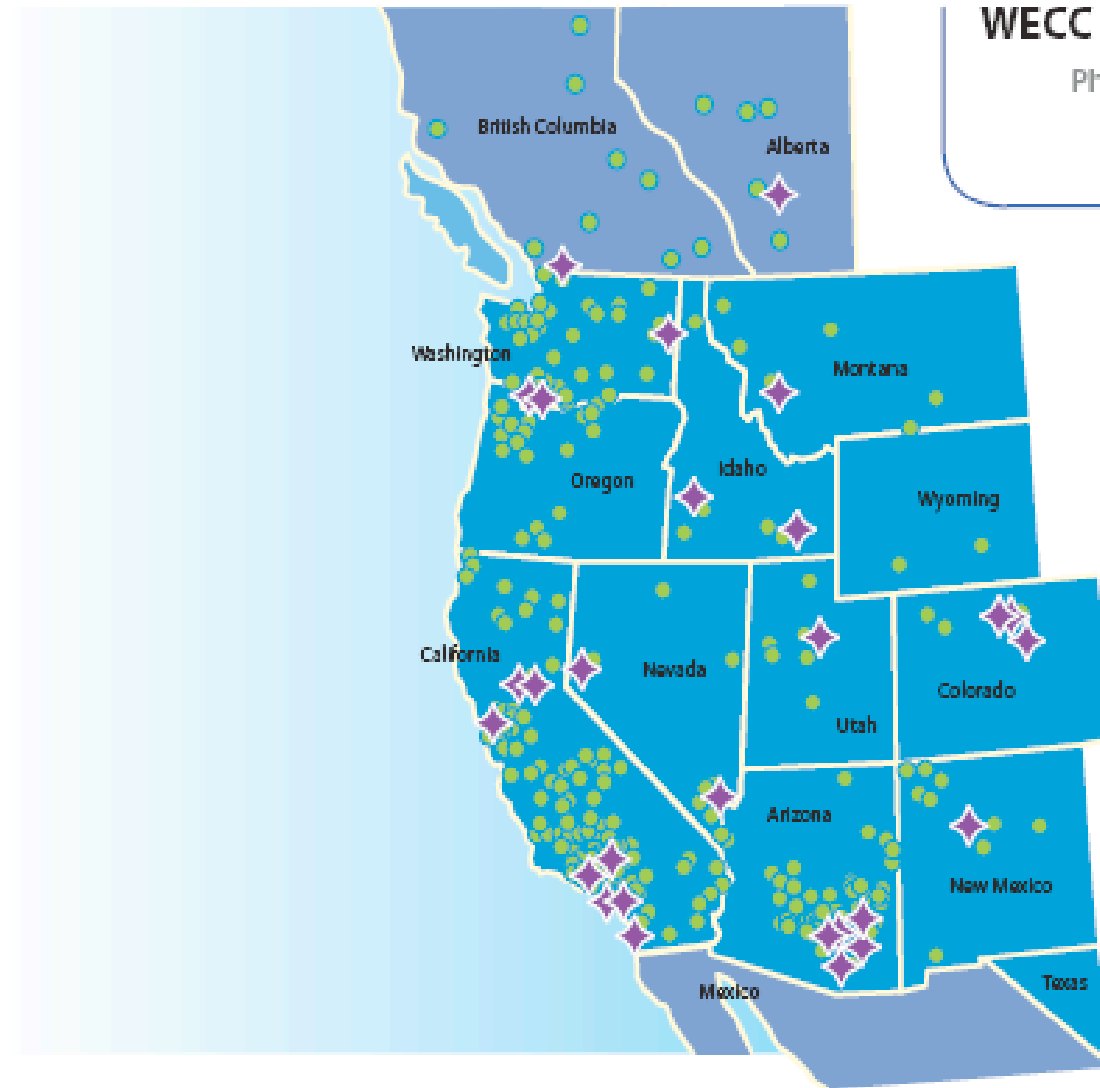


Program Participants (cont.)

<u>10 Additional Participants in WISP</u>	<u>PMUs</u>	<u>PDCs</u>
▪ Alberta Electric System Operator	6	1-2
▪ Arizona Public Service	21	1-2
▪ British Columbia Hydro	9	1-2
▪ Los Angeles Dept of Water & Power	6	1-2
▪ Northwestern Energy	4	1-2
▪ Public Service of New Mexico	4	1-2
▪ San Diego Gas and Electric	16	1-2
▪ Tri-State G&T	1	1-2
▪ Tucson Electric	2	1-2
▪ Western Area Power Admin	6	1-2
TOTAL	75	10-20

WECC Synchrophasor Infrastructure

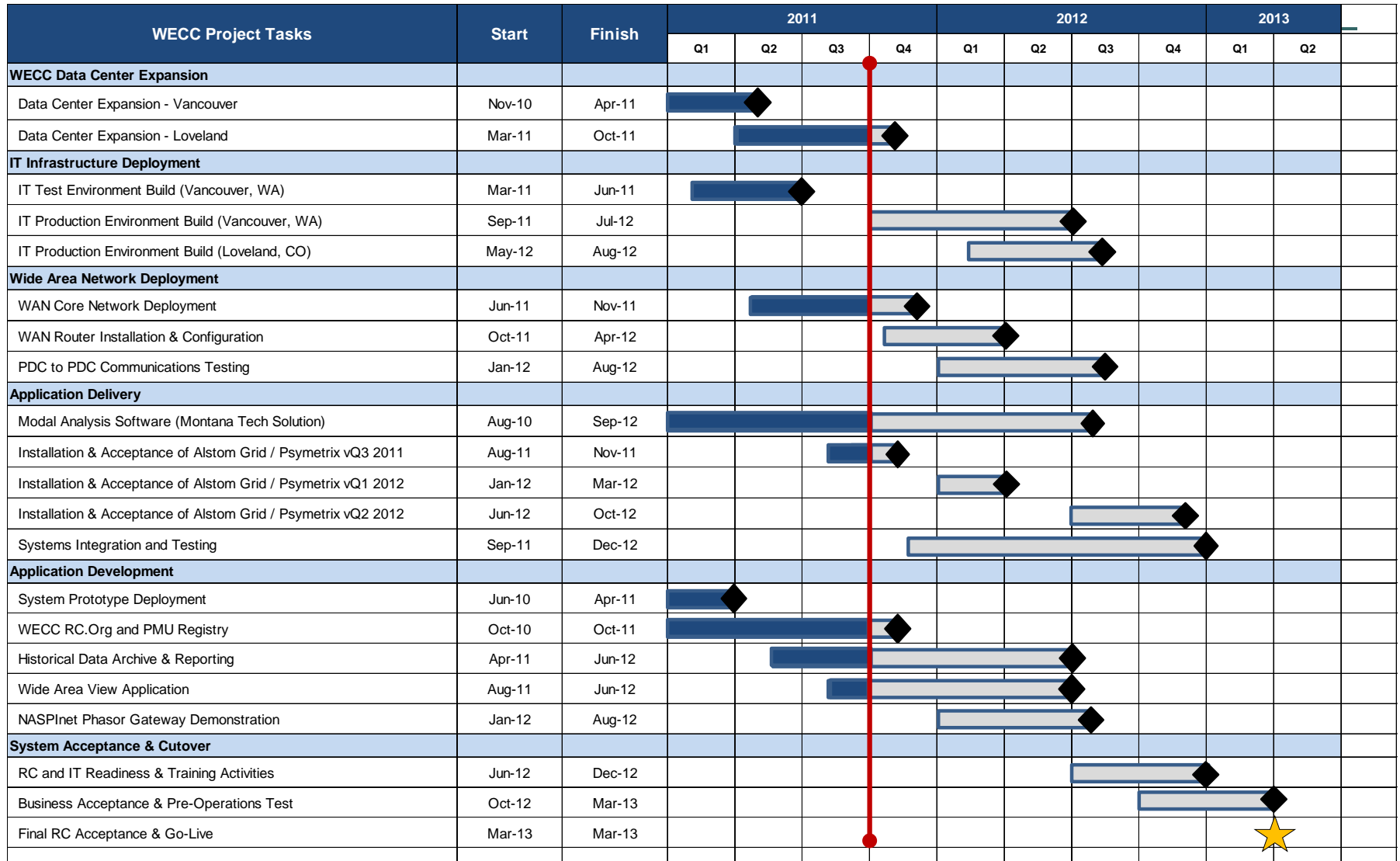
Phasor Measurement Units (PMUs) and
Phasor Data Concentrators (PDCs)
in the Western Interconnection



● PMU locations

◆ PDC locations

WISP Milestone Schedule



PMUs

- 18 Transmission Owners will deploy over 400 PMUs (some outside the WISP grant)
 - Each entity will select its own vendor
- 100% coverage of Western Interconnection
 - Coverage depends on application
- Variety of Types
 - Stand alone
 - DFR
 - Relay-based

PMUs (cont.)

- 244 Substations with PMUs
- Sampling Rate 30-120 sps
- Installation Rate:
 - 2011 Q3 22
 - 2011 EOY 38
 - 2012 EOY 267
 - 2013 Q1 362

PDCs

- RC centers with PDCs 2
- BA/TO control centers with PDCs 21
- Field PDCs 25
- Archive/database
 - Storage duration and capacity:
 - All Data On-Line – 3 months – 20 TB
 - All Data Off-Line – 15 months – 100 TB
 - Disturbances – forever – TBD

Communications

- Dedicated, private Wide Area Network (WAN)
- Provided by Harris Corporation
 - WAN from RCs up to TOs/ISOs edge routers under contract to WECC
 - Centralized management
 - Core Network Deployment: Nov. 2011
 - PDC to PDC Communications Testing: Aug. 2012
- Enables peer-to-peer communication
- Will facilitate NASPInet phasor gateway pilot – Aug. 2012



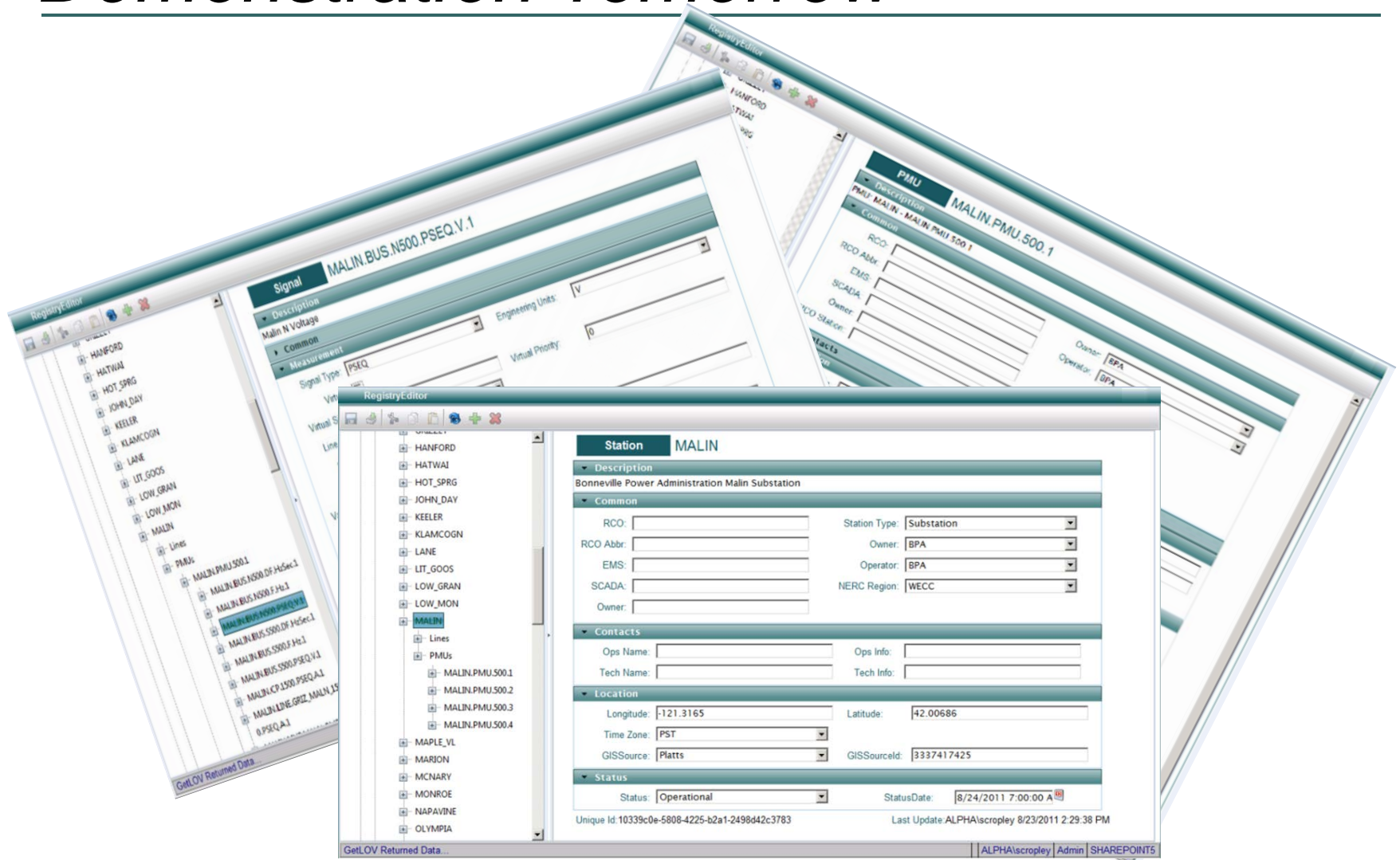
PMU/PDC/Signal Registry & Wide Area View (WAV)

- WECC In-house development: Oct. 2011
- Release 1 complete (Agile development, 8 Sprints).
 - Includes initial release of WECCRC.org.
 - PMU Registry – general application layout and styling completed.
 - PMU Registry device element structure and attributes complete.
 - Network security model complete.

PMU/PDC/Signal Registry & Wide Area View (WAV) – (cont.)

- Release 2 complete (Sprint 9).
 - Includes initial release of WAV, PMU Registry map and tree view.
 - Completed WAV high-level requirements.
 - Technology selection for the WAV user interface is complete.

PMU Registry Demonstration Tomorrow



Major Operational Applications

- Number of TOs/ISOs sharing phasor data: 18
- Wide-Area Situational Awareness: Jun./Oct. 2012
 - Alstom/Psymetrix – General visualization, monitoring, alarming and archiving.
 - Montana Tech/University of Wyoming/PNNL, Psymetrix, Washington State University – Oscillation Monitoring.
 - Vendor selection underway – Voltage Stability.

Major Operational Applications

- Wide Area View: June 2012
 - WECC in-house development – Telerik mapping, Silverlight display.
- Automated Report Generation: June 2012
 - System performance following events.
 - For baselining, model validation, trending.
- Response-Based Controls: BPA – March 2015
 - Fast reactive switching.
 - Primary and total reactive requirements for wind power plants.

Challenges and lessons learned

- Biggest Technical Challenge
 - Data mining tools for information retrieval.
- Biggest Programmatic/Execution Challenges
 - Took much longer than originally expected:
 - Execute agreements among participants.
 - Finalize contracts for infrastructure and applications.
 - Begin infrastructure construction.
 - Need an additional Data Sharing Agreement
 - To protect source data other than synchrophasors for WAV.

Acknowledgement and Disclaimer

- Acknowledgment: This material is based upon work supported by the Department of Energy under Award Number DE-OE0000364.
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