NASPI WG Panel Session

PG&E Experience and Lessons Learned

NASPI Meeting

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PG&E

Initial Synchrophasor Deployment at PG&E

- Installed for WISP with DOE Cost Share (2009)
- PMUs in existing RAS relays
- 202 PMUs, 101 redundant measurement locations (line voltages and currents)
- 24 Substation PDCs, 12 redundant locations
- 4 control center PDCs, 2 redundant locations
- Architecture is NERC CIP compliant (Operational Data Network, PCAs vs BCAs)
- 61850 communications protocol between PMUs and substation PDCs, and between substation PDCs and control center PDCs (Field Gateways)
- 2 WISP Gateways delivering data to PeakRC

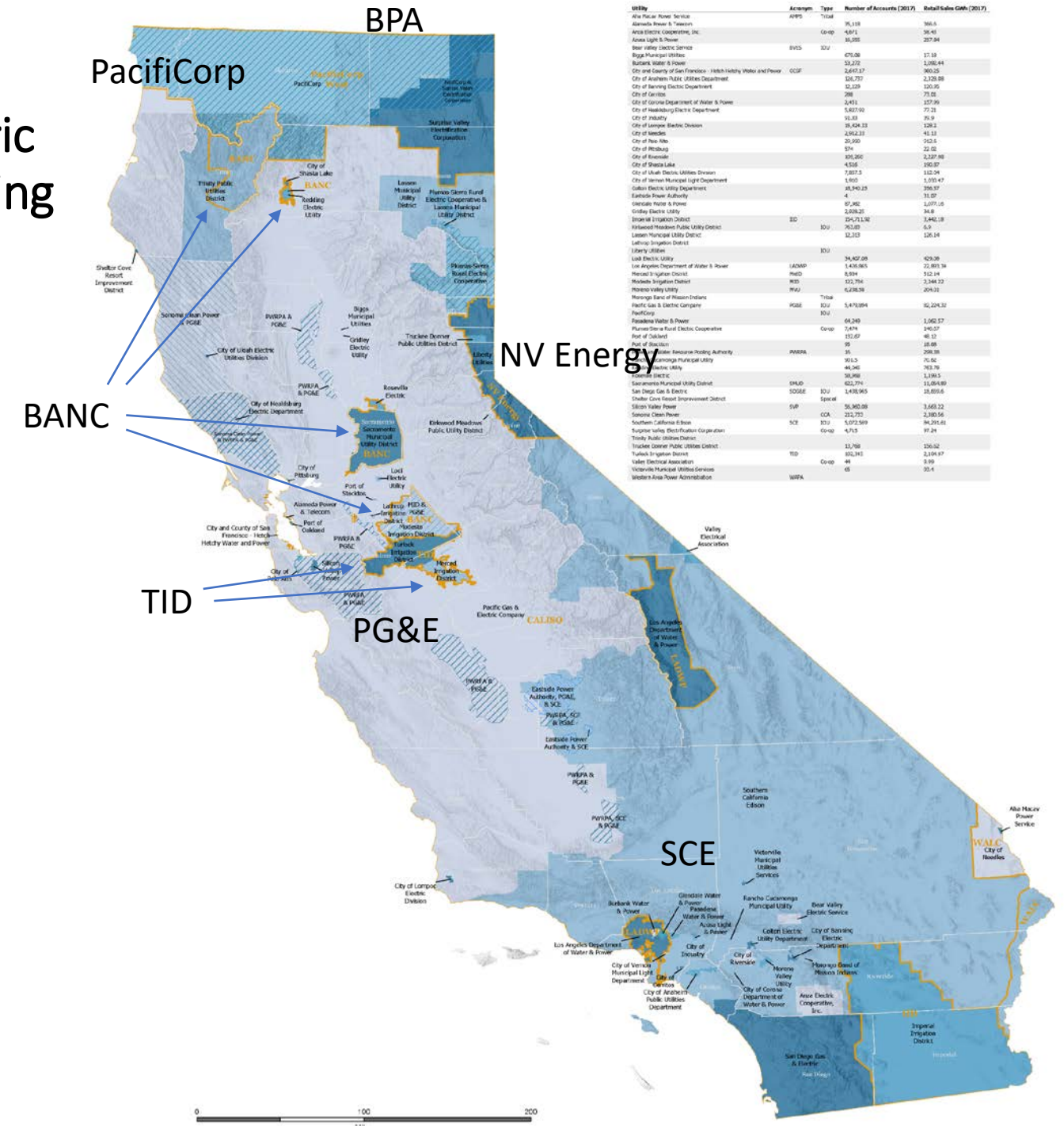
Enhancements

- Installed 3 PMUs on generator terminals at 2x1 combined cycle power plant (MOD-26 & MOD-27)
- Established Transmission Operations Synchrophasor Test Lab (TOSTL)
- Initial deployment had low availability and high latency, changed communications protocol from substation PDCs to control center PDCs to 37.118 resulting in greatly enhanced data availability
- Replaced all substation GPS clocks
- Added 6 PMUs monitoring 500 kV bus voltages and line currents
- Standardized on general purpose PMU/PDC appliance for future PMU/PDC installations monitoring bus voltages and line currents
- Established PMU/PDC lifecycle program
- 2 WISP Gateways sending data to CAISO RC West via managed ethernet 10Mbps

Future Enhancements

- All lifecycle PMU/PDCs will stream 37.118 to control center Field Gateways and measure bus voltages and line currents
- PMUs will be independent of substation relays
- Improve system-wide availability
- Improve access to archived data
- Establish OSISoft PI archive on corporate network
- Install PMUs on 500 kV tie-lines to two STATCOMs (Gates and Round Mountain)
- Install PMUs on 500 kV tie-lines to the 300 MW/1200 MWh Dallas Battery Energy Storage System at Moss Landing (world's largest battery energy storage project)
- Install PMUs on all tie-lines with other utilities (BAL-003)

Neighboring Electric Utilities and Balancing Authorities



Archives

- Original archives openHistorian and PhasorPoint distributed among multiple servers
- Future archives moving to a combination of openHistorian and OSISoft PI (150 TB, 3 years)
- OSISoft PI will be deployed on corporate network to make data available enterprise wide (PRC-002-2, MOD-033)

Lessons Learned

- Utilize 37.118 until there is a new standard
- Install on NERC CIP-compliant network even if applications will not be used by grid operators initially
- Install reliable GPS clocks
- Utilize PMU/PDCs independent of substation relays
- Establish support network including IT system administrators, network operations, communications technicians, protection engineers, automation engineers, and substation electrical technicians

Data Availability Dashboards