BONNEVILLE POWER ADMINISTRATION

BPA Events from NERC's Forced Oscillation Guideline

NASPI-NERC Technical Workshop

September 27th

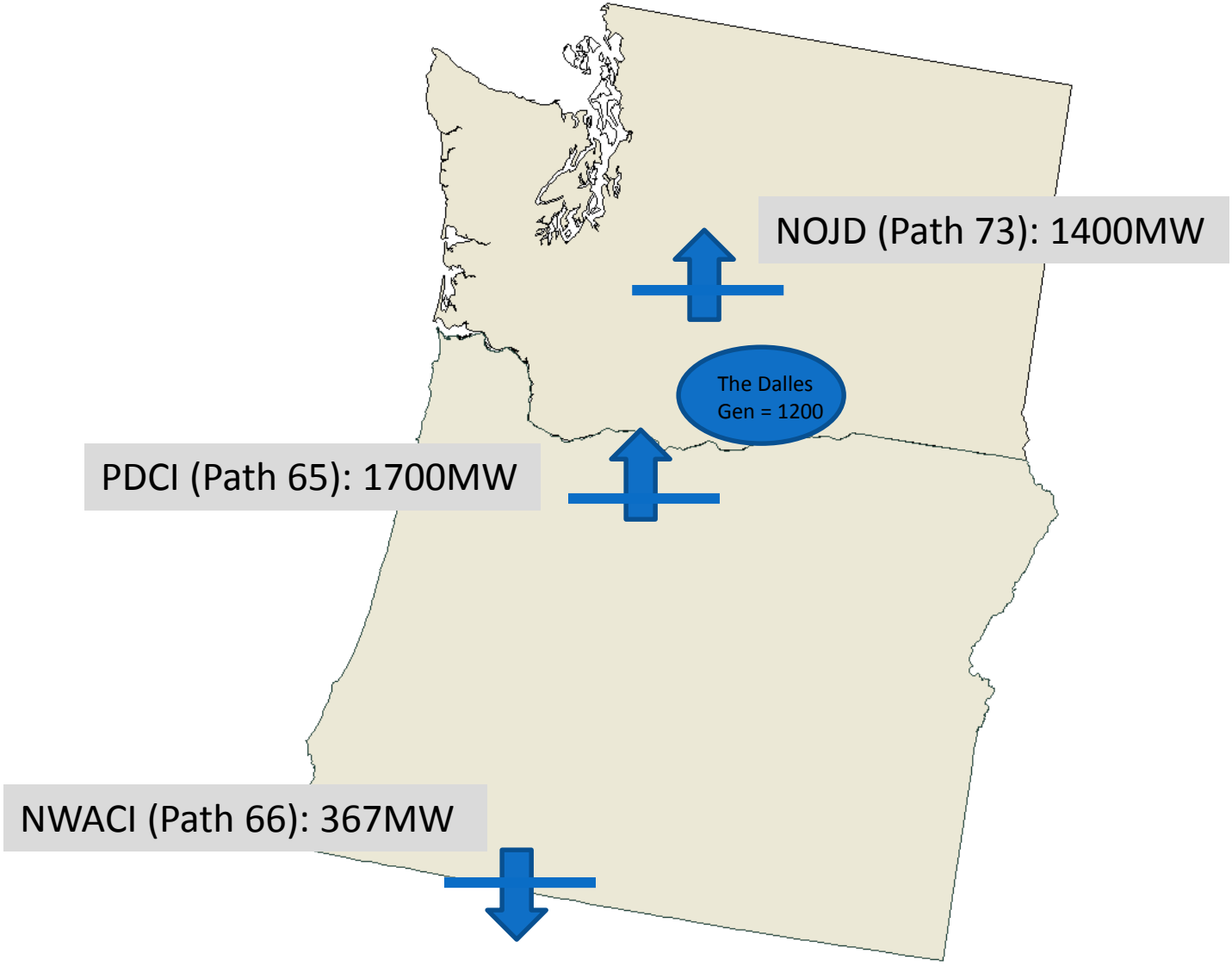
Timeline of BPA tools

- Before May 2013
  - SCADA
  - Research-grade PMU network
  - Engineer Responded
- May 2013 – June 2016
  - SCADA
  - Testing phase of Oscillation Detection Monitor (ODM)
  - Engineer Responded
- After June 2016
  - ODM went operational
  - System Operator Responds

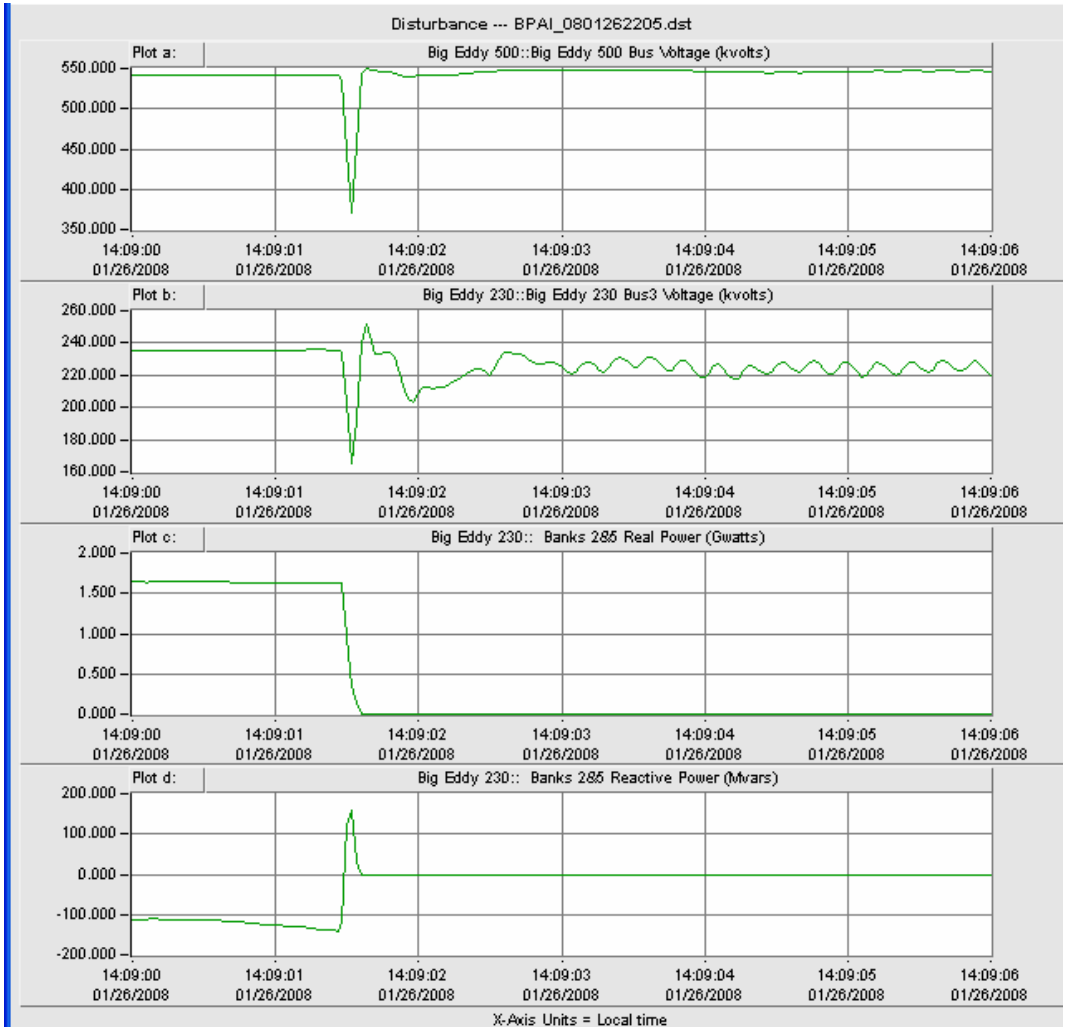
Forced Oscillation Guideline Event 1: Controller Oscillation at Pacific HVDC Intertie

January 26, 2008

Event 1 System Conditions

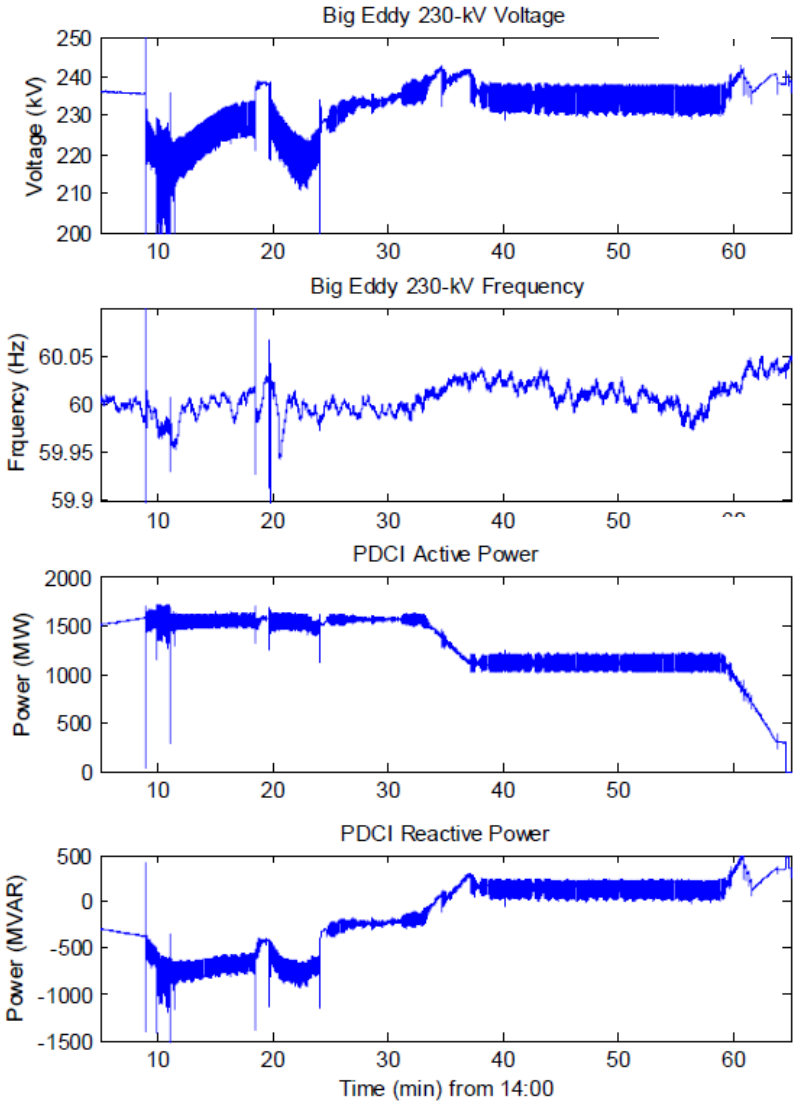


Event 1



- Cause:
  - Celilo converter station had low short circuit ratio conditions, causing issues on the PDCI controllers

Event 1

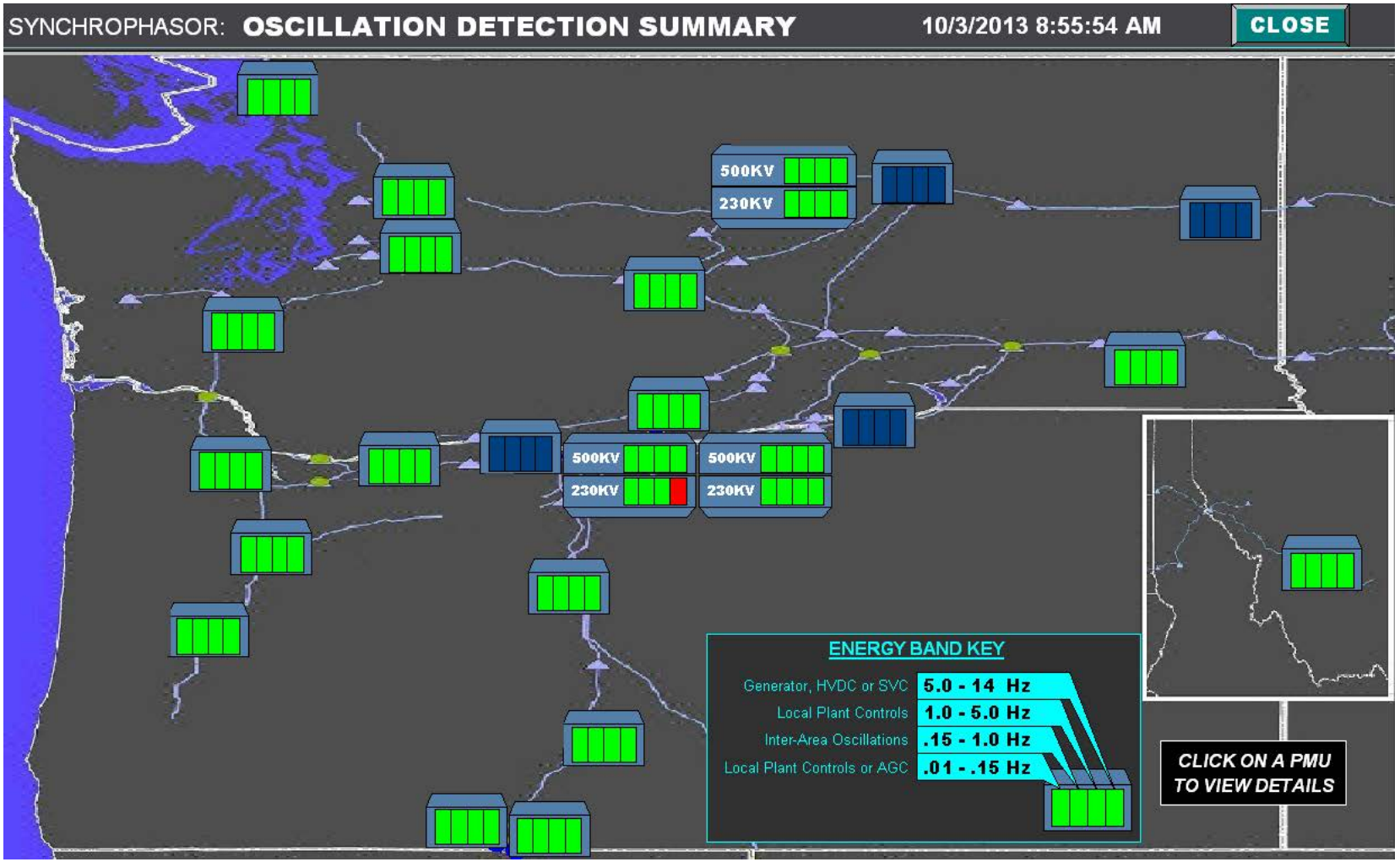


- Response:
  - SCE staff contacted BPA and communicated the erratic readings from the oscillation
- Solution:
  - PDCI power transfer was lowered.
  - Repair of Valve Group tap changer on Celilo converter
  - Big Eddy transformer CT ratio error was corrected

Forced Oscillation Guideline Event 3: Wind Power Plant High Frequency Oscillations

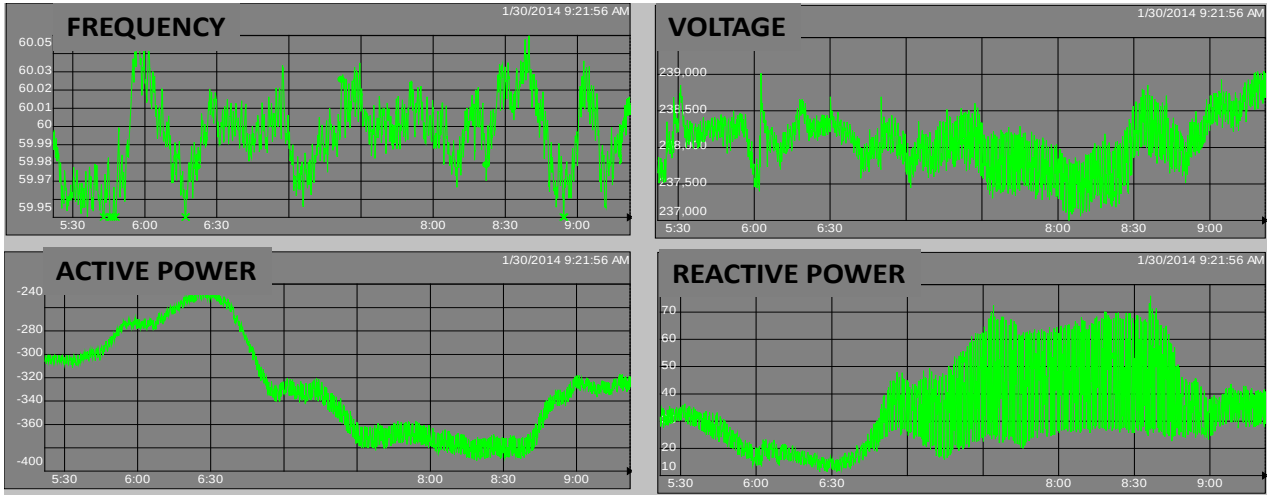
May 2011 – April 2014

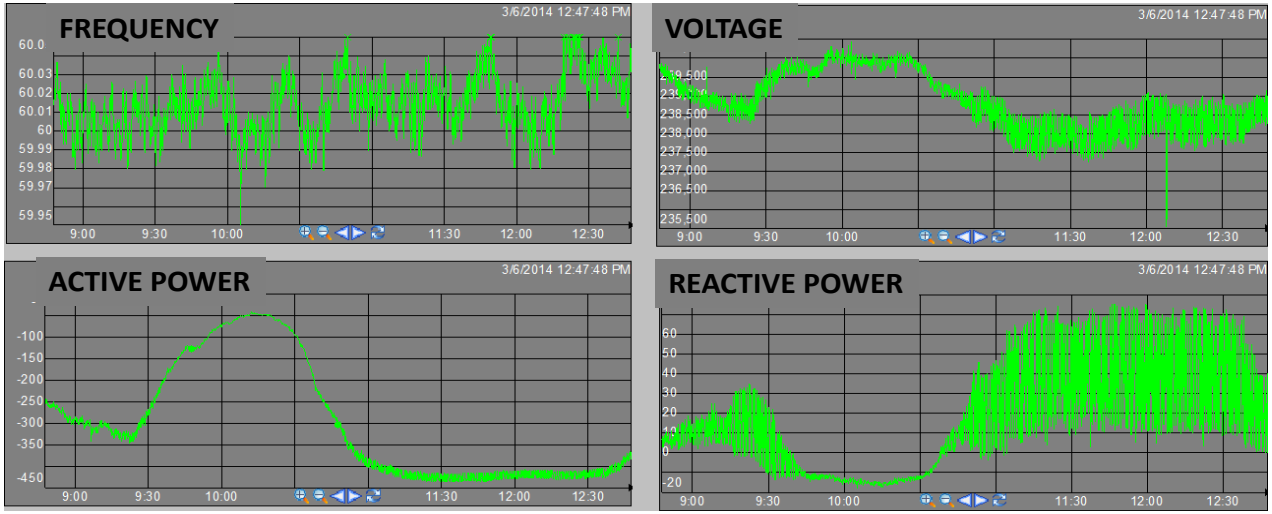
Event 3


SYNCHROPHASOR: OSCILLATION DETECTION SUMMARY
10/3/2013 8:55:54 AM
CLOSE
500KV
230KV
500KV
230KV
500KV
230KV
ENERGY BAND KEY
Generator, HVDC or SVC 5.0 - 14 Hz
Local Plant Controls 1.0 - 5.0 Hz
Inter-Area Oscillations .15 - 1.0 Hz
Local Plant Controls or AGC .01 - .15 Hz
CLICK ON A PMU TO VIEW DETAILS

Event 3

- Cause:
  - Nature of oscillation suggested voltage controller issues

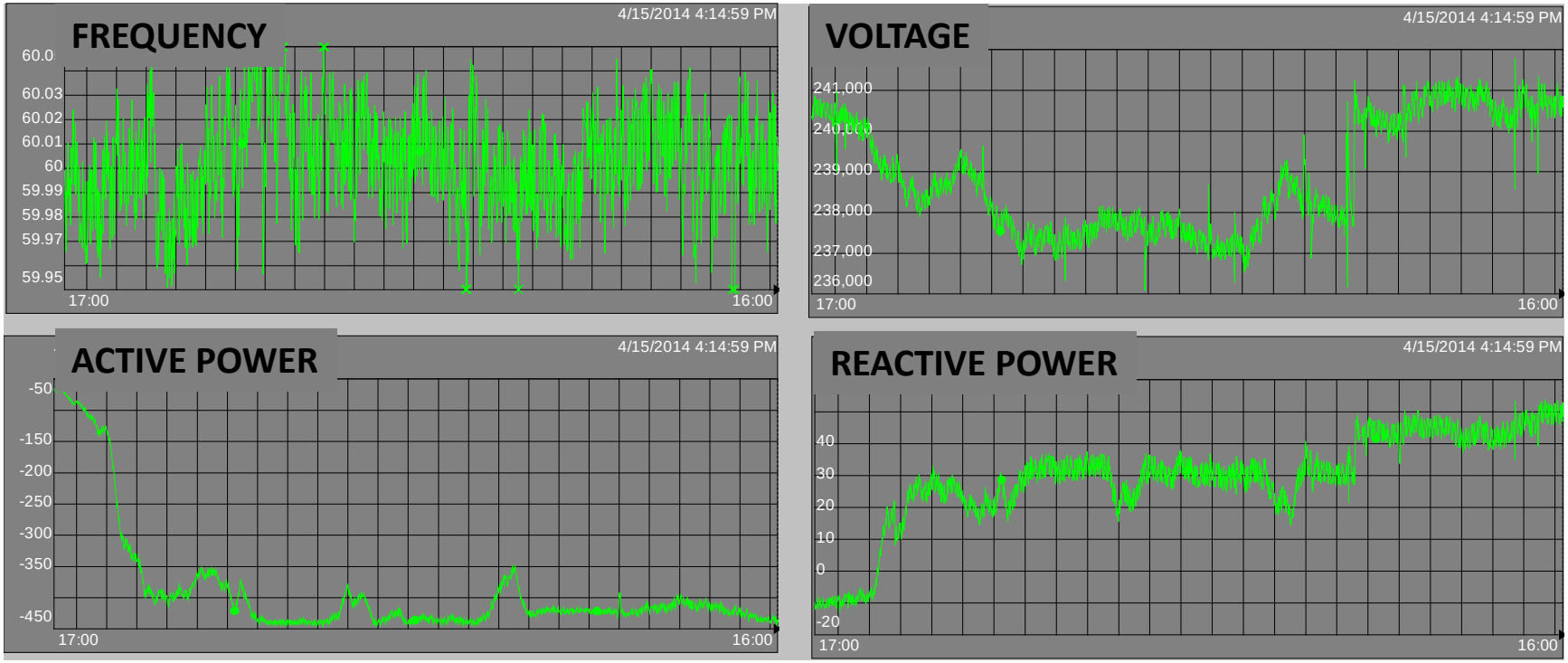




- Response:
  - BPA Engineer contacted Plant Owner

Event 3

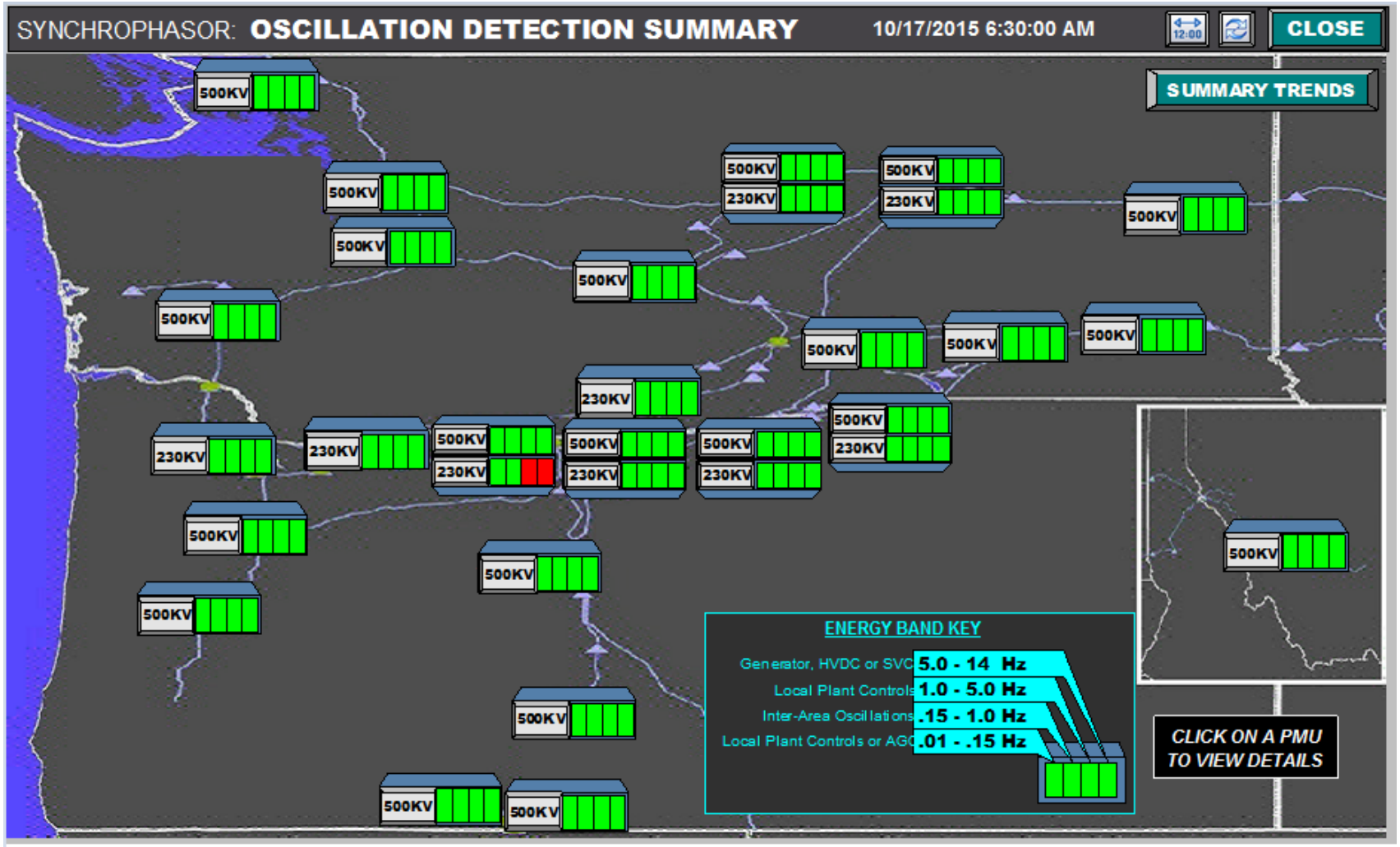
- Solution:
  - In April 2014, manufacturer upgraded the controls to fix the oscillation problem



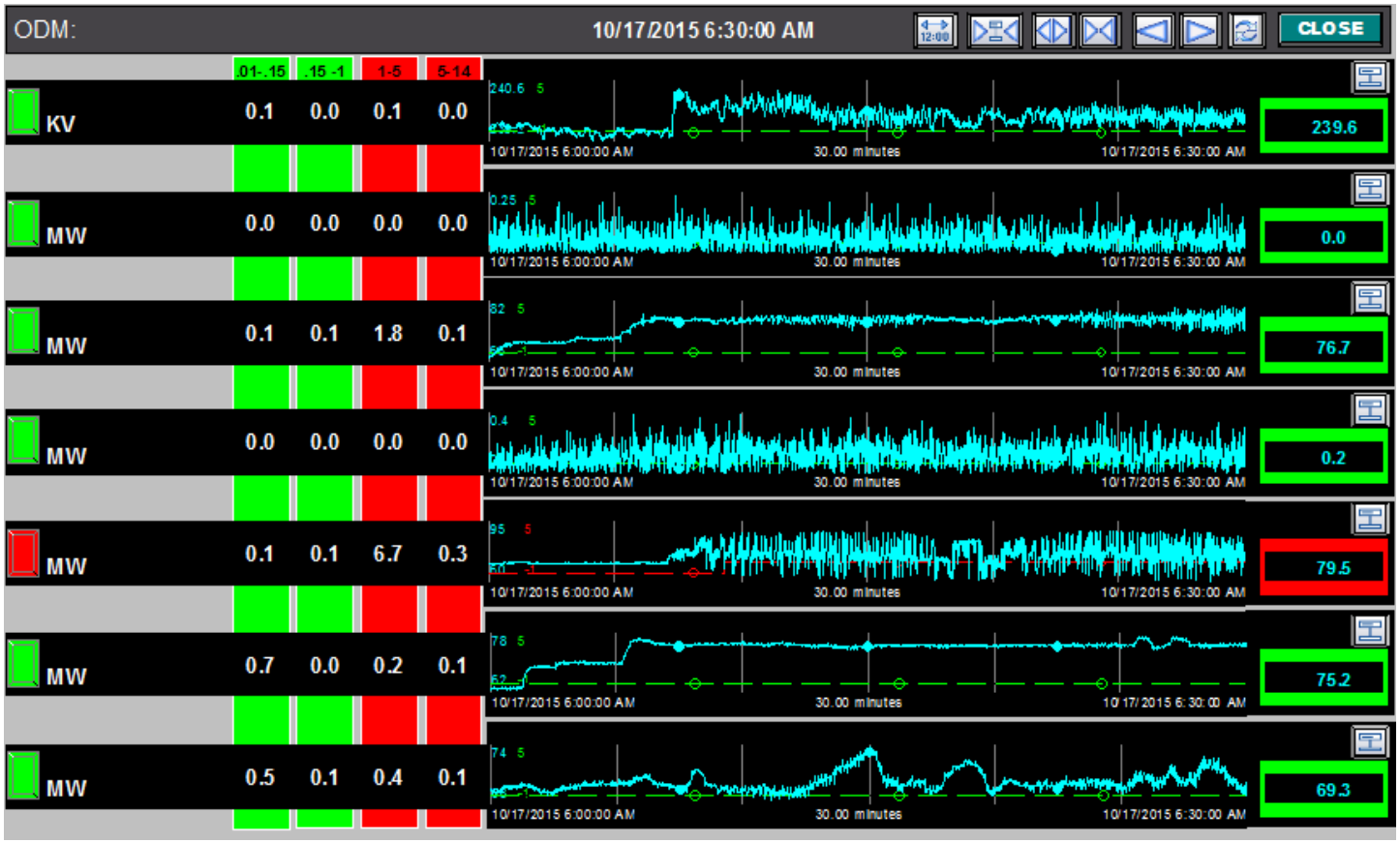
Forced Oscillation Guideline Event 5: Control Interactions between UEL and PSS

October 2015

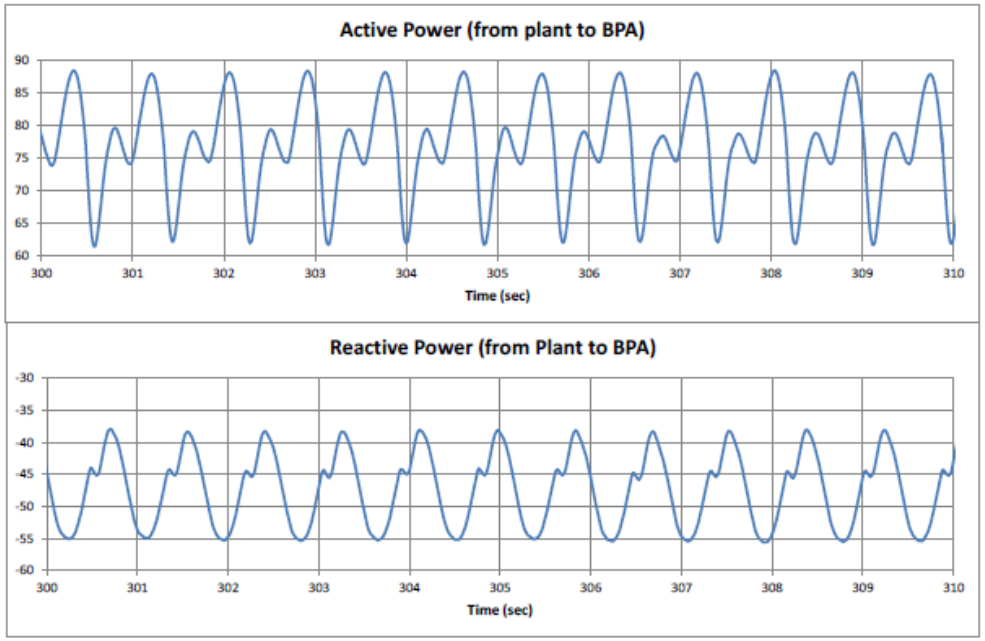
Event 5


SYNCHROPHASOR: OSCILLATION DETECTION SUMMARY
10/17/2015 6:30:00 AM
CLOSE
SUMMARY TRENDS
500KV
230KV
ENERGY BAND KEY
Generator, HVDC or SVC 5.0 - 14 Hz
Local Plant Controls 1.0 - 5.0 Hz
Inter-Area Oscillations .15 - 1.0 Hz
Local Plant Controls or AGC .01 - .15 Hz
CLICK ON A PMU TO VIEW DETAILS

Event 5


ODM:
10/17/2015 6:30:00 AM
CLOSE
.01-.15
.15 -1
1-5
5-14
KV
0.1
0.0
0.1
0.0
239.6
MW
0.0
0.0
0.0
0.0
0.0
MW
0.1
0.1
1.8
0.1
76.7
MW
0.0
0.0
0.0
0.0
0.2
MW
0.1
0.1
6.7
0.3
79.5
MW
0.7
0.0
0.2
0.1
75.2
MW
0.5
0.1
0.4
0.1
69.3
10/17/2015 6:00:00 AM
30.00 minutes
10/17/2015 6:30:00 AM

Event 5



- Cause:
  - Under-Excitation Limiter (UEL) and PSS started interacting

- Solution:
  - Move the units out of the UEL area.
- Response:
  - Plant engineer re-tuned UEL gains and retested.

Questions

Special thanks to Jim Burns, Dan Goodrich, Dmitry Kosterev, Jeff Anderson, Kliff Hopson, and Nick Leitschuh