

Peak's Synchronized Measurements and Advanced Real-time Tools (**SMART**) Working Group (initiated in Oct-2017)

- Focus on operationalizing Synchrophasor tools in Control room:
 - ❑ System Dynamic Limit Assessment & Frequency Responsive Measure Monitoring
 - Operationalize online Transient Stability Analysis Tools (TSAT) in control rooms:**
 - Validating the models and TSAT solutions against system events, implementing the new transient stability study criteria, and developing TSAT operating alarms/visualization and procedures
 - ❑ System Oscillation Monitoring, Forced Oscillation Detection and Source Location:
 - Monitor inter area oscillation modes, detect forced oscillations and identify source units:**
 - Baseline/correlation analysis study, sensitive contingency identification, and low damping mitigation control development and validation
 - ❑ Big Data Management and System Architecture- **Synchrophasor Handbook, PMU data mining analytics and system architecture for PMU data sharing and archiving/storage**
 - ❑ Model Validation- **Identify system and power plant modeling issues by event simulation and PMU data**



SMART WG Documents Shared with Peak Members via secured website of www.peakrc.org

- The SMART leadership team met bi-monthly to review and plan WG activities
- Typically each SMART taskforce holds its own monthly conference call on specific topics
- Peak SMART reports to WECC JSIS. Both have collaborative WG meetings twice a year

The screenshot shows the PEAKRELIABILITY website interface. At the top right, there is a user profile for 'Hongming Zhang' and a 'Current Load' indicator showing '105,437 MW'. The navigation menu includes 'Home', 'About Us', 'Cloud Services', 'Real Time', 'Operations', 'Model', 'Synchronphasor', and 'Library'. The 'Synchronphasor' section is active, displaying 'Synchronphasor Secure Files'. A sidebar on the left lists a file tree under 'Secure Files', including folders for 'Monthly Data Quality Report', 'Monthly SPDQ Meeting Mir', 'Network Applications', 'PMU List', 'PMU to WSM Mapping', 'Registry Data Loads', 'Shared Folder', and 'SMART Meeting'. The main content area features a title 'Synchronphasor Secure Files' and a sub-header 'Peak-sponsored Synchronized Measurements and Real-Time Tools (SMART) working group'. It lists two meetings: one starting on Tuesday, May 15, 2018, and another on Wednesday, May 16, 2018. A red notice states: 'Peak RC is sponsoring a meeting for operating entities only prior to the Joint Synchronized Information Subcommittee (JSIS) meeting.' Below this, the 'Joint Synchronized Information Subcommittee (JSIS)' meeting details are provided, including dates and times. At the bottom, the WECC Offices address is listed: '155 North 400 West, Suite 200, Salt Lake City, Utah 84103-1114'. The PEAKRELIABILITY logo is in the bottom right corner.

Progression in Oscillation Detection and Source Location

- Worked with WSU on forced oscillation detection software enhancement testing and the tool accuracy validating
- Improved oscillating unit locating toolset and deployed it to Prod (offline version) and Test environment (online and offline versions)
- Collaborated with BPA to complete a review of 2017 N-S Modes low damping events and identify the root causes
- Performed detailed study on BC Mode showing recurring low damping events and identified potential source units

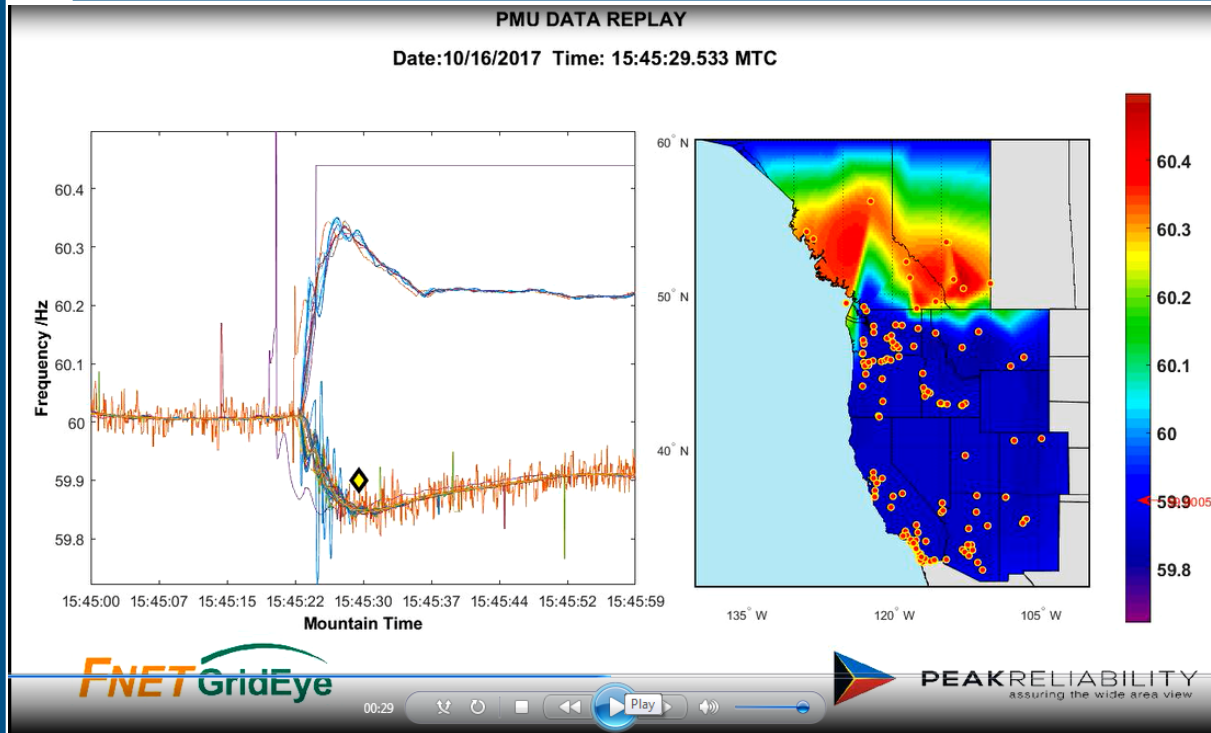


Progression in Oscillation Detection and Source Location

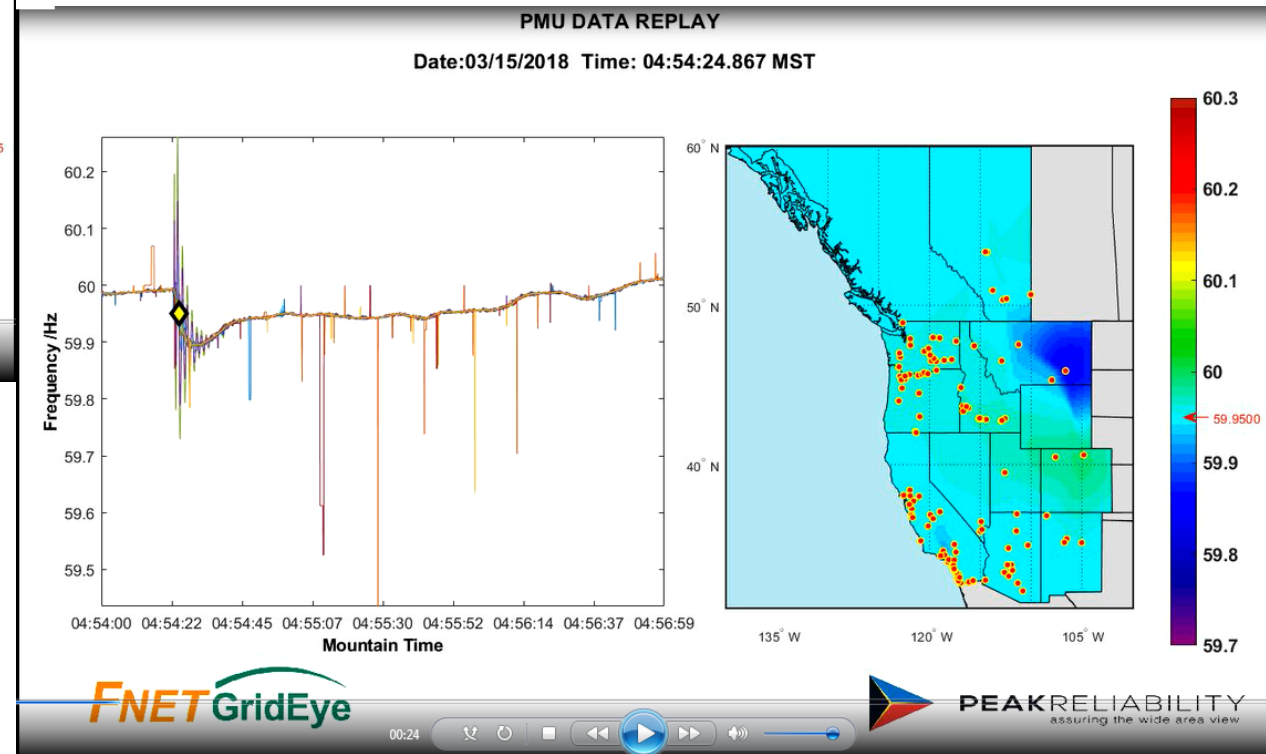
- Build initial oscillation event alarms (to notify NetApps team only for now) to monitor N-S Modes closely in Prod/Test
- Started to use UTK-FNET/GridEye visualization tool for post-disturbance analysis on frequency/islanding events
- Worked with EPG to test and validate MAS2.0 software that is integrated into RTDMS product
- Created multiple study reports on forced oscillation events and source location findings. We shared the reports with the entities for further review and discussion



Ex. PMU Visualization of System Events



← 1-Islanding Event



→ 2-Unit Tripping Event

Progression in Linear State Estimator Implementation

- Launched a Production project to implement EPG-eLSE tool. The tool is solving 30 sps with over 300 PMU in Dev/Test for LSE solution validation and software enhancement testing:
 - Includes both breaker and switch status measurements for topology process
 - Enables transformer tap changer modeling with tap measurements in eLSE
- Calculated Line/Path Flows and Phasor Angle Differences from raw PMU signals and downsampled them into EMS (viewable in SCADA or Grid Stability Assessment displays)
- Develop LSE solution visualization in PI-ESRI platform



Add LSE Overlays in PI-ESRI to Backup EMS/SE

ACE Sum

-63.17294393

Areas

WAPAUW
Generation 0 (0)
Load 0 (0)

SCL
Generation 1122.00415039
(1122.57409668)
Load 1448.16772461
(1448.16772461)

BPA
Generation 15578
(15551.28515625)
Load 7374 (7374)

GCPD
Generation 1278.68994141

Areas Details

Areas_A Selection

requiredtotalreserves 0.00

PVP - Region A

Legend

- Region A: Lines
 - OutofSe
- Region A: Subs
- Region A: IROL
 - Over 10
 - Over 95
 - Over 90
- Region A: Path
 - Over 10
 - Over 90
 - Over 95
- Region A: Area
- DB96_StaticLa

POWERED BY esri

ZOOM - +

Unacknowledged...

PREVOST
PCB 1CB25
STTS CLOSED
(AREA_A)
06 Mar 2018
04:24:04:00

HURRICANE
230 KV LN
HURR_HELL_123
0 KV NORM
LIMIT OK
240.4 241.5
(AREA_A)
06 Mar 2018
04:23:02:00

PIKE LAKE
PCB 2CB22

Substations - Reg...

Filter

TOPOLOGY.BPA
.CLK.119TH_ST
0

TOPOLOGY.BPA
.BPA.SIXTNAVE

Alarms Details

EMSDR_Replica.dbo.Alms_VW: AREA_A

Fieldtime 3/5/2018
14:24:04

Seqnum 232,154,176.
00

Time 3/5/2018
21:24:04

Area2 AREA_A

Char1 PREVOST
PCB 1CB25
STTS1CB25
132 CLOSED
PREVOST

Prior 5

Severity 450

PREVOST

Substations Details

Substations_A Selector

unacknowledgealarm

totalofmx

IROLs

SDGE_Import_Non_Summer

SDGE_Import_Summer

Paths

PATH71 - Normal

Paths Details

Paths_A Selection

PathName PATH71

PEARL RELIABILITY



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