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:

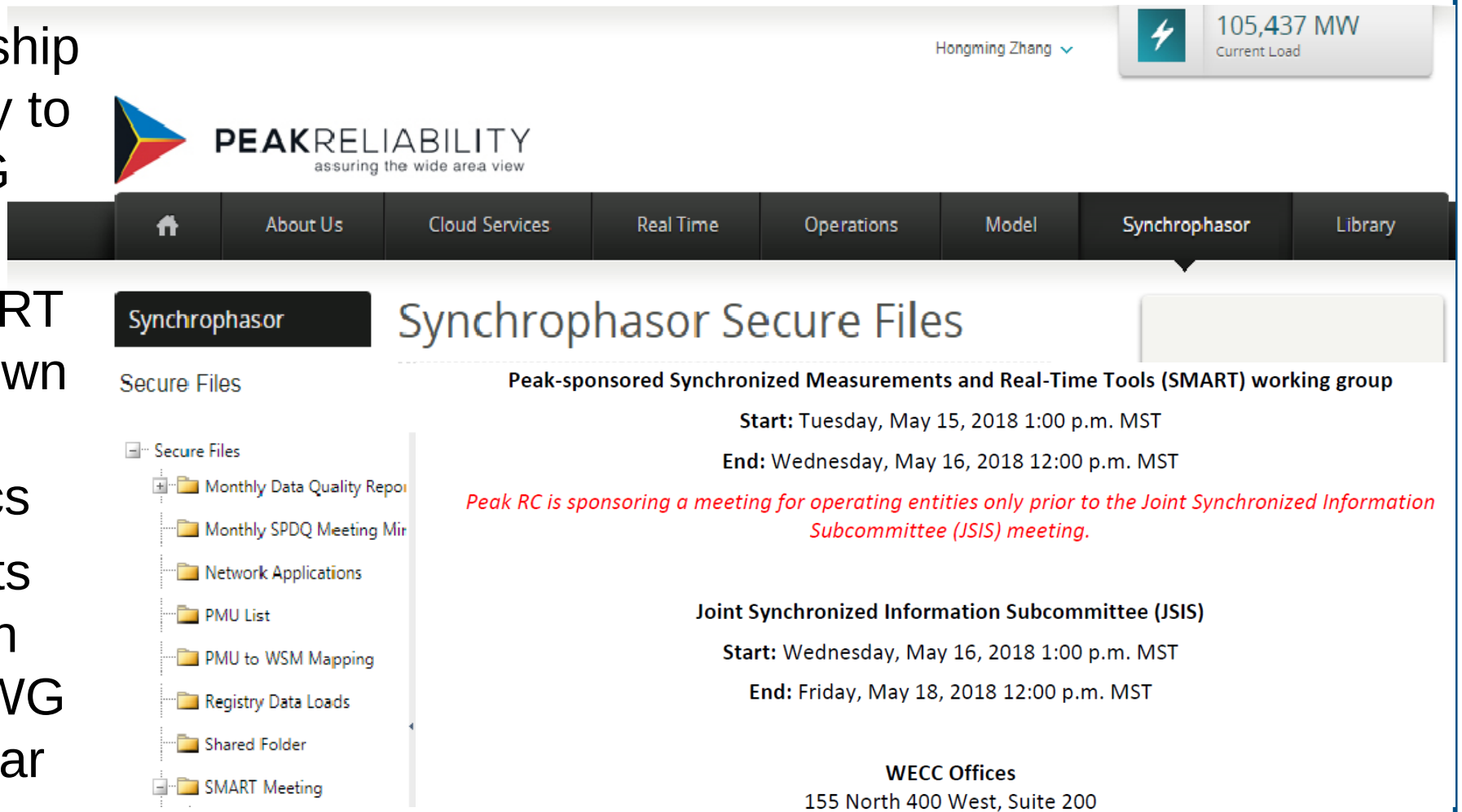
- Baselining/correlation analysis study, sensitive contingency identification, and low damping mitigation control development and validation

❑ 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



PEAKRELIABILITY

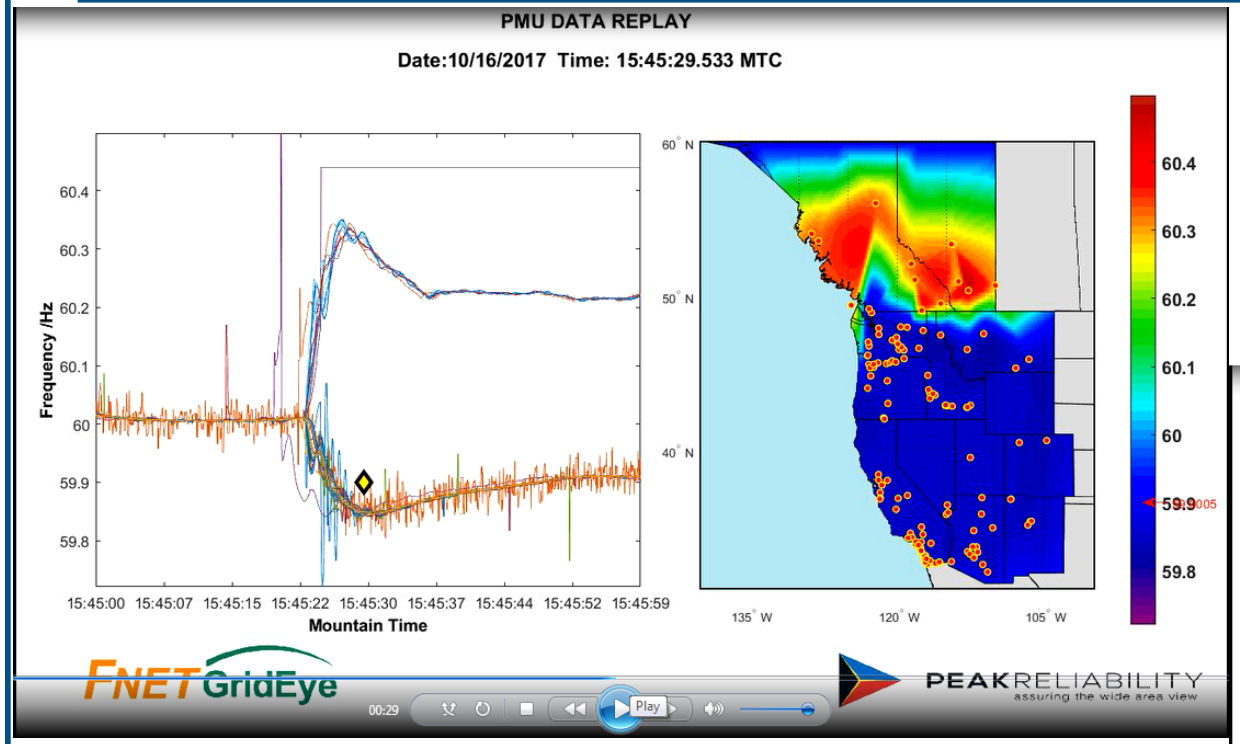
Progression in Oscillation Detection and Source Location

- 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

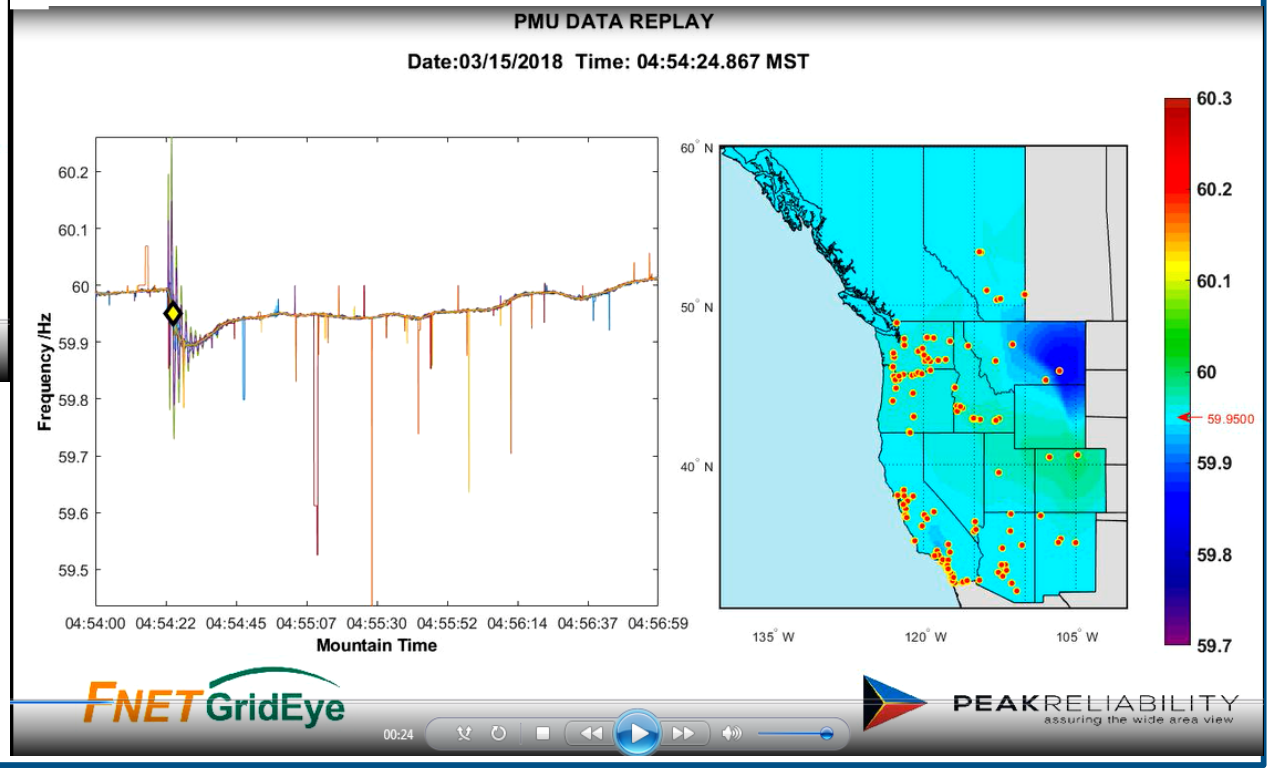
- Build initial oscillation event alarms (to notify NetApps team only for now) to monitor N-S Modes closely in Prod/Test
- Started to use UTK-FNET/GridEye visualization tool for post-disturbance analysis on frequency/islanding events
- Worked with EPG to test and validate MAS2.0 software that is integrated 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

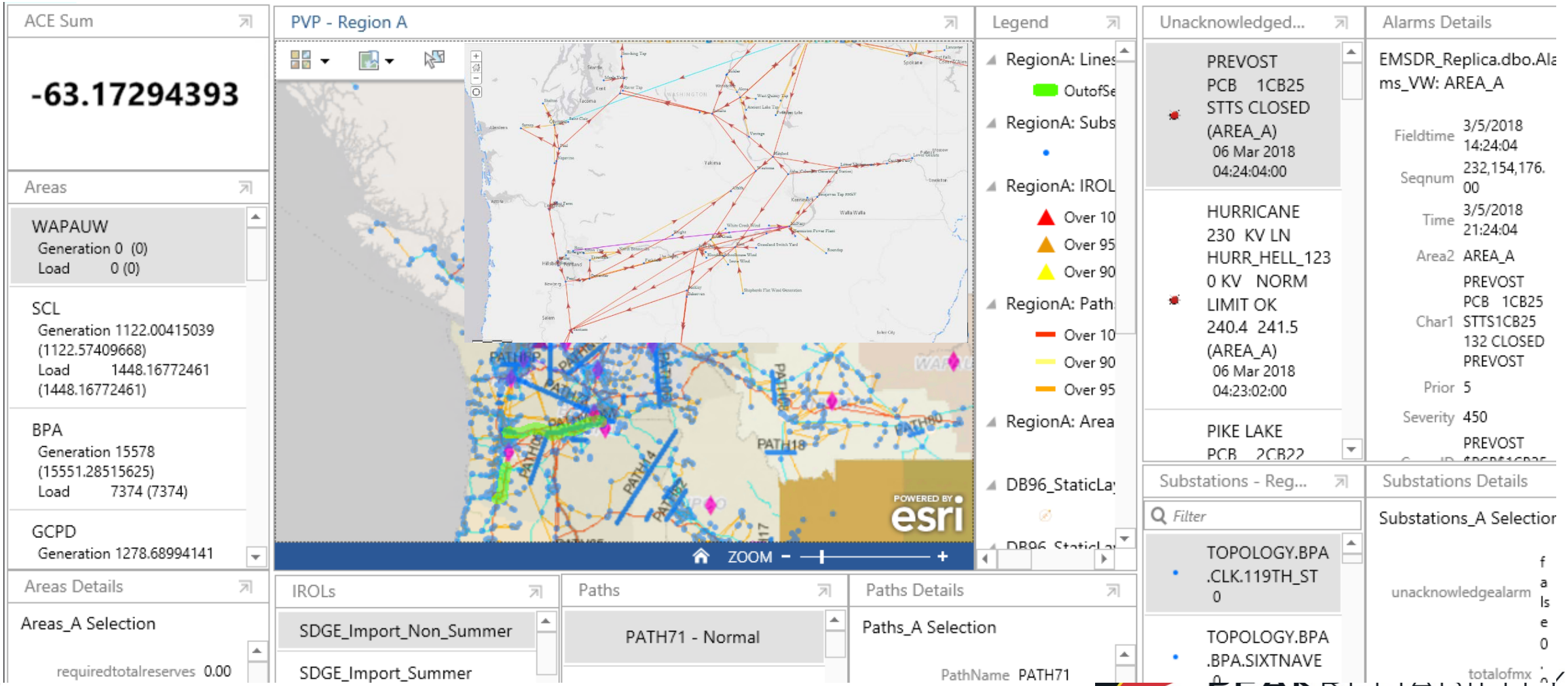
2-Unit Tripping Event



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



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