Real-Time PMU-Based Situational Awareness, Analysis, Monitoring and Control for Transmission and Distribution Systems

NASPI Work Group Meeting
**October 18 – 19, 2022**

Great to See Everybody in Person!

Please See Us during Vendor Show!

Preview of the Vendor Show

1. PMU-Based Power Network Analysis System at SDG&E

2. PMU-Based EMS System at TNB

3. Distribution Linear State Estimator for Increased Situational Awareness and Resilience at ComEd

4. Distribution Hybrid State Estimator as a Foundation for Grid Modernization Applications – FLISR; VVO, and DER dispatch

PMU-Based Power Network Analysis System at SDG&E
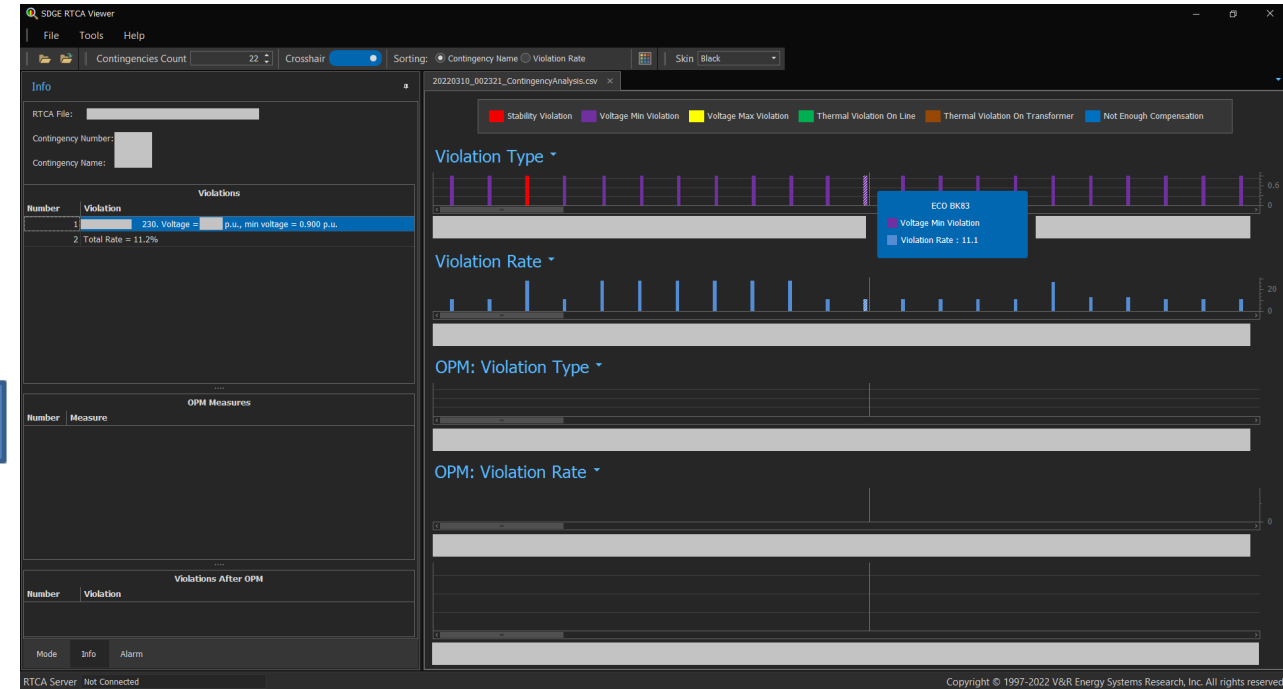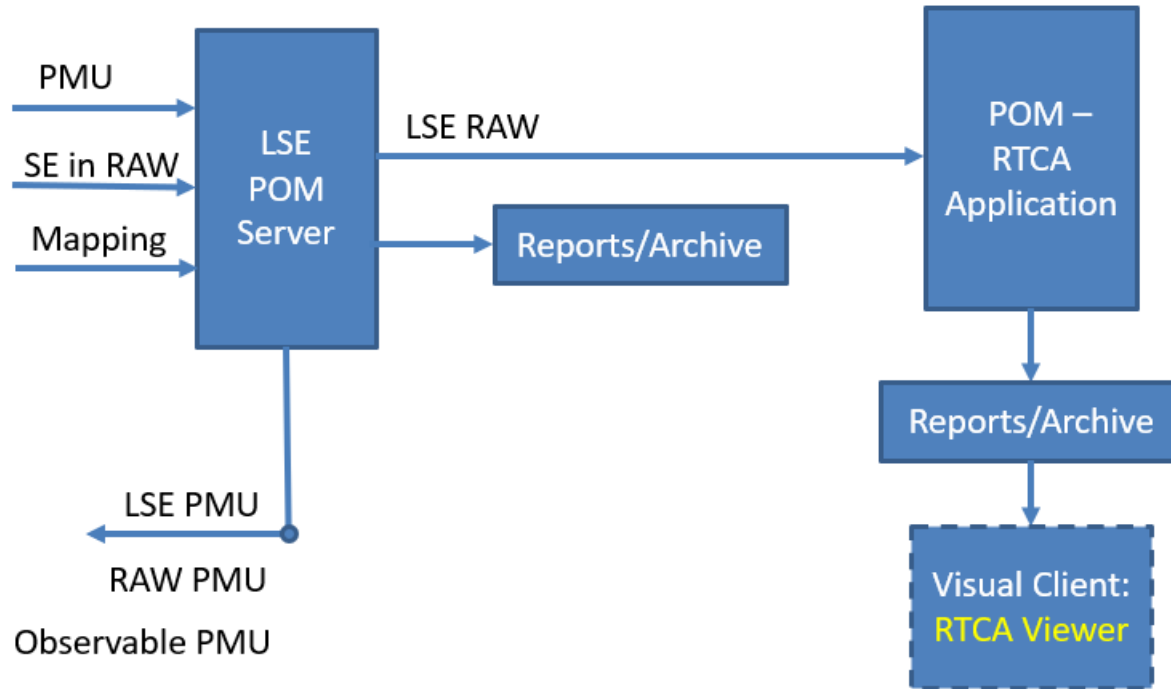
- The system consists of **LSE POM Server** application, **POM-RTCA** application, and **SDGE RTCA Viewer** Visual Client
 - Field deployment

PMU-Based EMS System at TNB

- LSE facts:
  - LSE is performed 25 times/s
  - 1218 PMUs / 7 PDCs are used
- LSE (dark green line) successfully suppresses the error and estimates voltage with a difference of less than 0.01% compared to the true value

- Cascading results:
  - 1877 N-1 initiating events are analyzed in one run
  - 41 critical cascading events were identified and ranked based on severity measured using the Performance Index
  - Optimal mitigation measures are identified to alleviate this stability violation
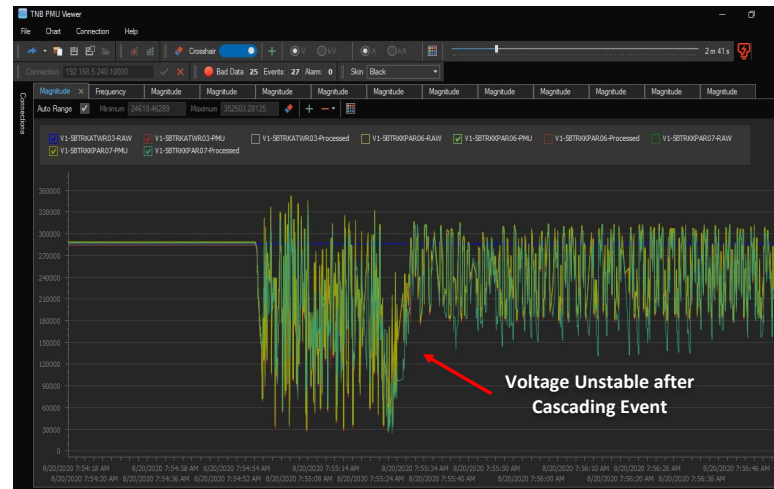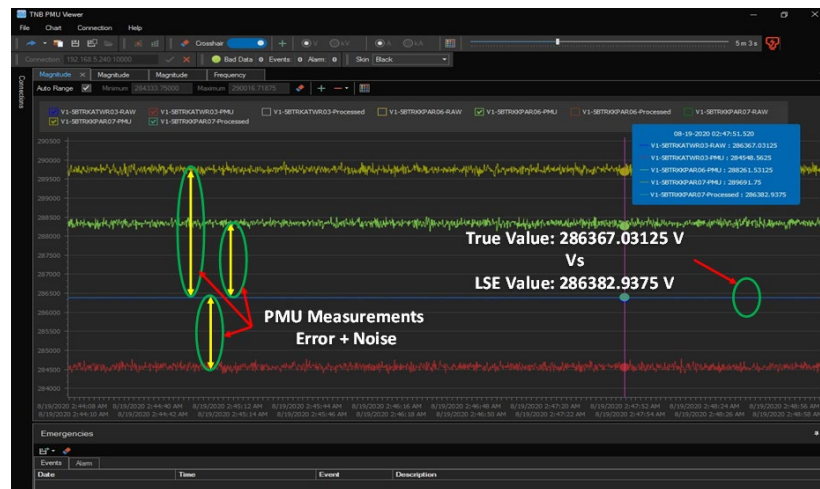
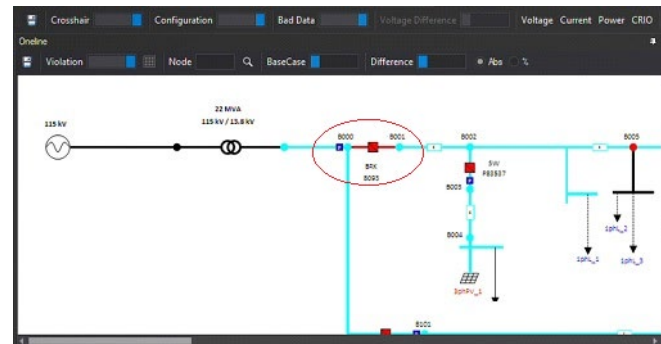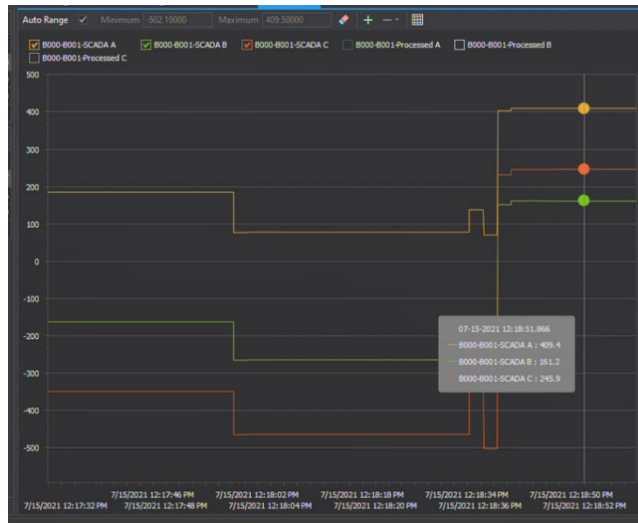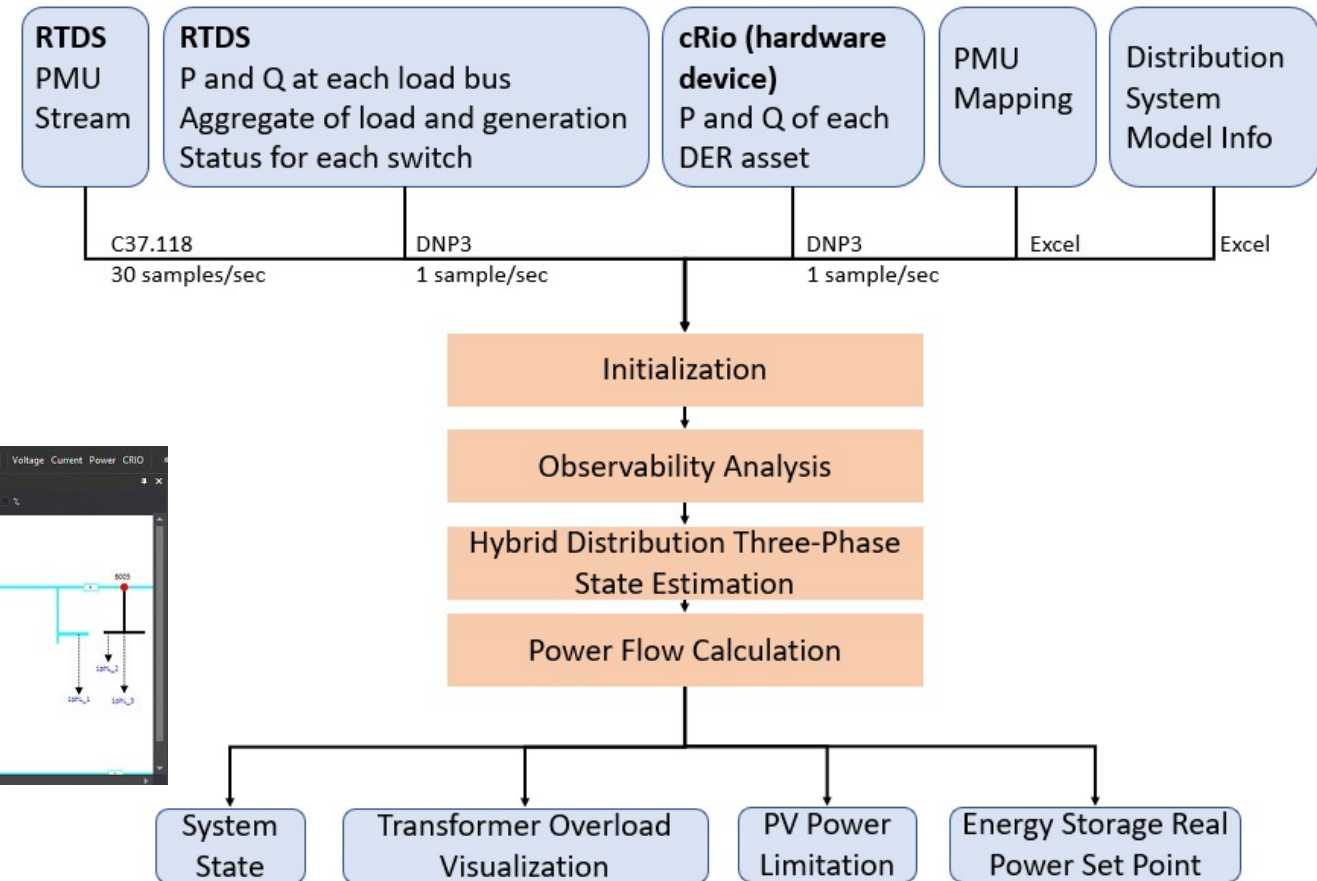- Initially - Lab deployment; moving to field

Distribution Linear State Estimator for Increased Situational Awareness and Resilience at ComEd

- The software solves 3 phase unbalanced DLSE

- Bad data detection, correction, alarming and reporting

- Observability analysis

- Detection of switching events (only based on PMU data)

- Real-time system monitoring (voltage and thermal)
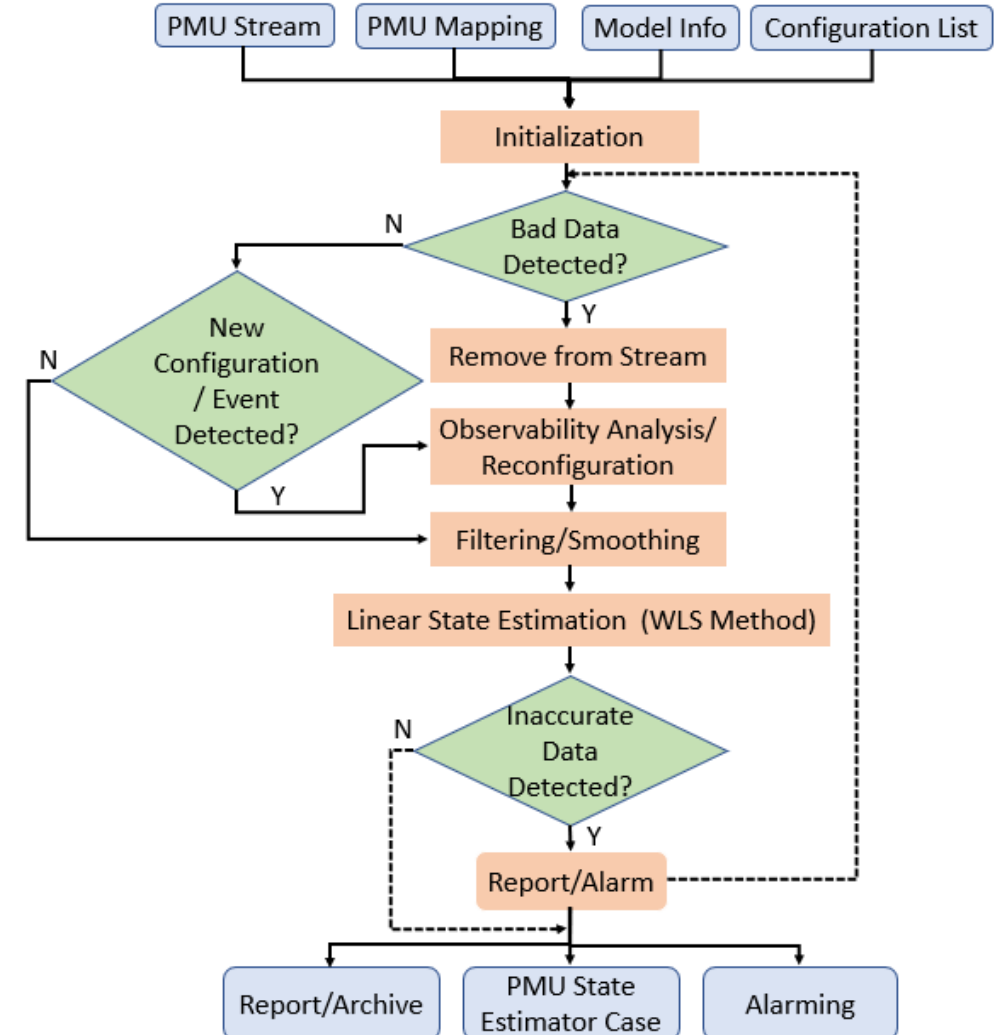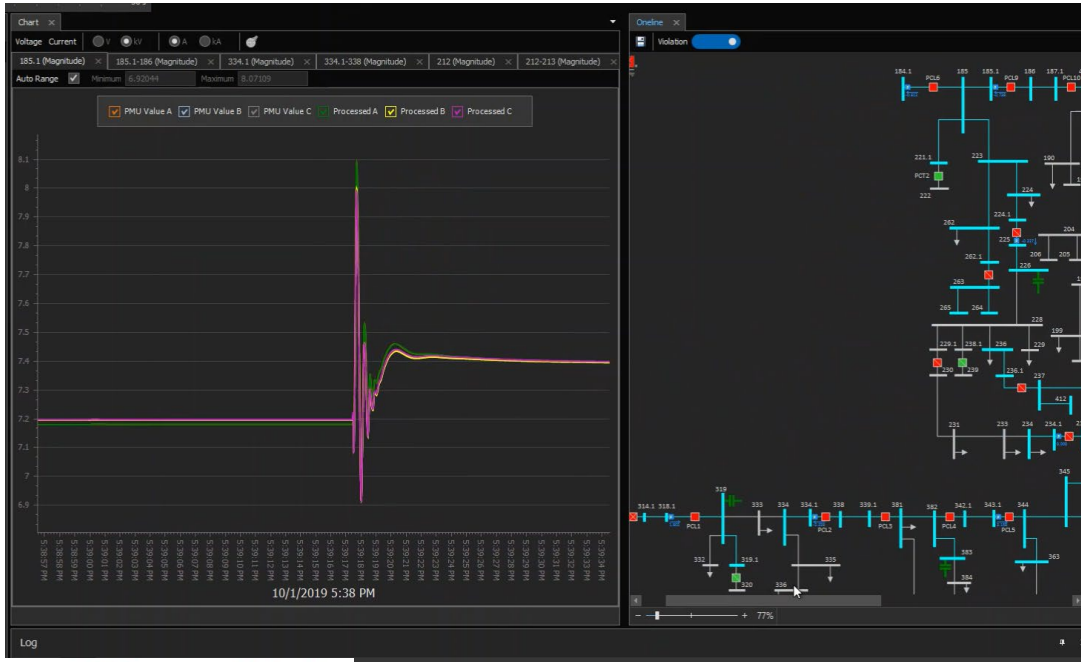
- Initially - Lab validation; currently – field deployment

Distribution Hybrid State Estimator as a Foundation for Grid Modernization Applications

- Enables integration of small DER through DER gateway and their monitoring using hybrid DSE

- Three use cases: fault location, isolation, and service restoration (FLISR); Volt - Var optimization (VVO), and DER dispatch

- NYSERDA demo project with Central Hudson and Quanta Technology

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