

Real-time modeling and simulation of synchrophasor systems at the New York Power Authority: Use cases and applications

*IEEE Smart Grid Synchronized Measurements and Analytics (SGSMA) conference
May 25-27, 2021*

*Panel Session: Role and Use Cases of Real Time Simulators (RTS) Towards Advancing and Deploying Synchrophasor Based Wide Area Monitoring Protection and Control (WAMPAC) Systems
May 25, 2021*



**Advanced Grid Innovation
Laboratory for Energy**

A Program of the New York Power Authority

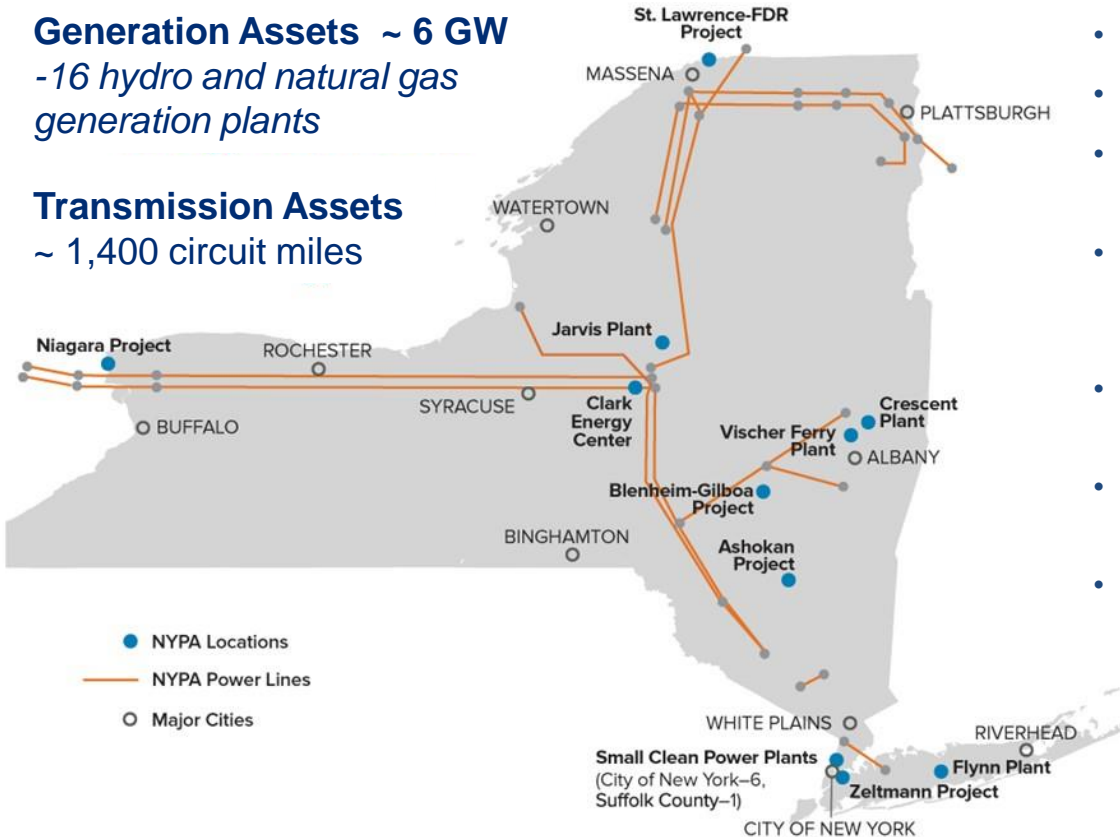
NYPA Overview – Generation/Transmission Assets

Generation Assets ~ 6 GW

-16 hydro and natural gas generation plants

Transmission Assets

~ 1,400 circuit miles



- Established by the NY State Legislature in 1931.
- Largest state public electric utility in the United States.
- Wholesale power supplier throughout New York State and neighboring states as required by law.
- Provides, with generation and power purchases, about 25% of New York State's electricity. No Distribution System
- 2019 Net Generation: 30.2 million MWh; 80% hydro; 20% gas/oil
- Transmission lines: 1,400+ circuit miles; 115kV, 230kV, 345kV & 765kV
- Non-profit energy corporation, does not use tax revenues or state credits, finances projects through bond sales and cash from operations

The Advanced Grid Innovation Laboratory for Energy (AGILE)

Collaboratively enabling an affordable, reliable, low-carbon future

*Bringing together **industry stakeholders** to evaluate integrated grid solutions for a clean energy future and accelerate development and adoption of new technologies*



Advanced T&D Applications



Cybersecurity



Advanced Modeling and Simulation with Real-Time Hardware/Software-in-the-loop Capabilities



Power Electronic Controls



Grid Automation



Advanced Sensors



End-to-end grid modeling and real-time simulation



Hardware/software-in-the-loop equipment testing for digital substation automation and control

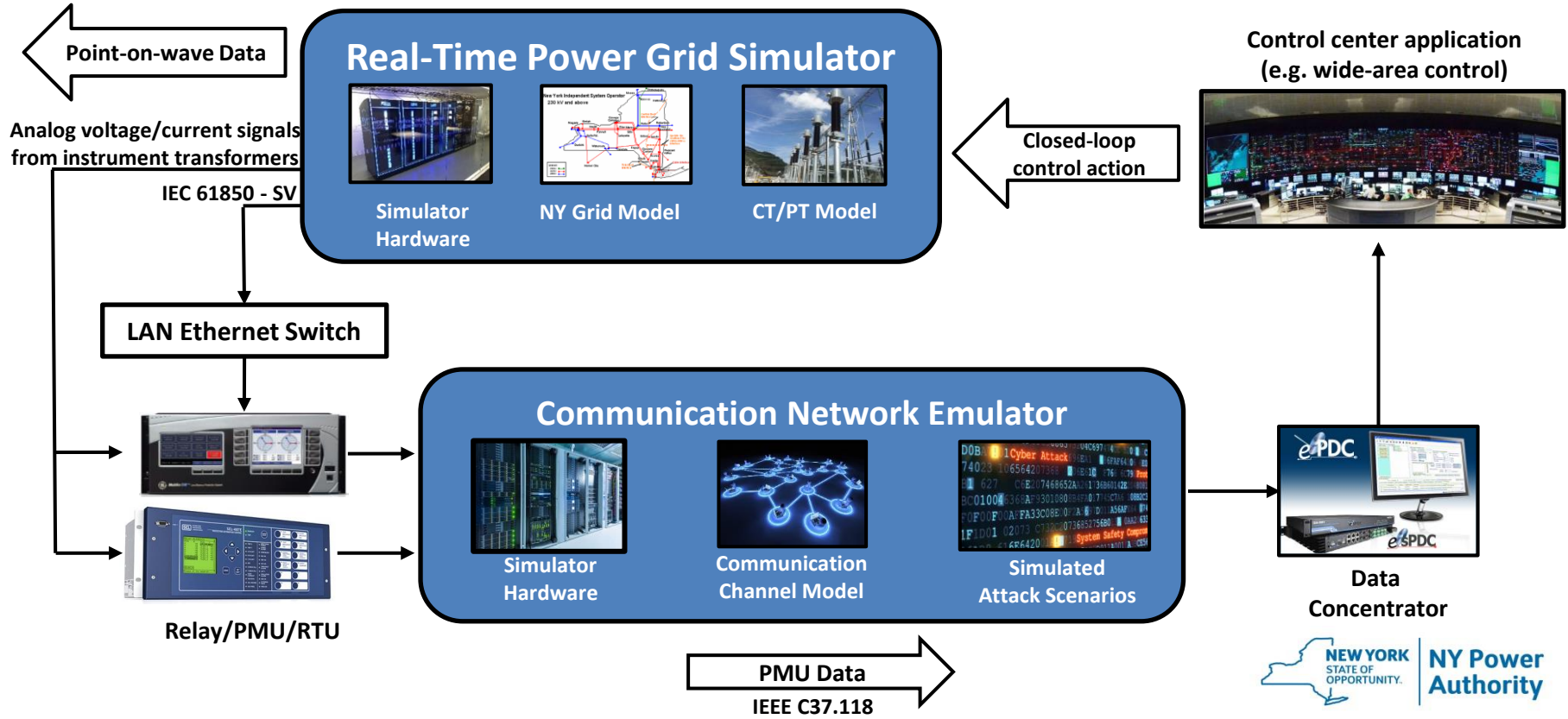


Simulation of communication systems and cyber security events

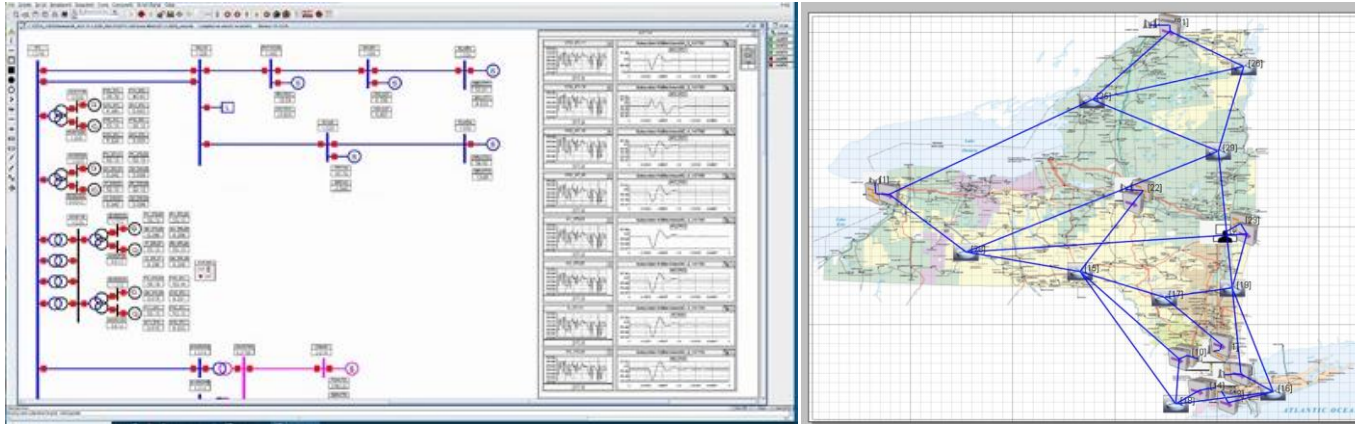


Economic analysis and evaluation of technical solutions

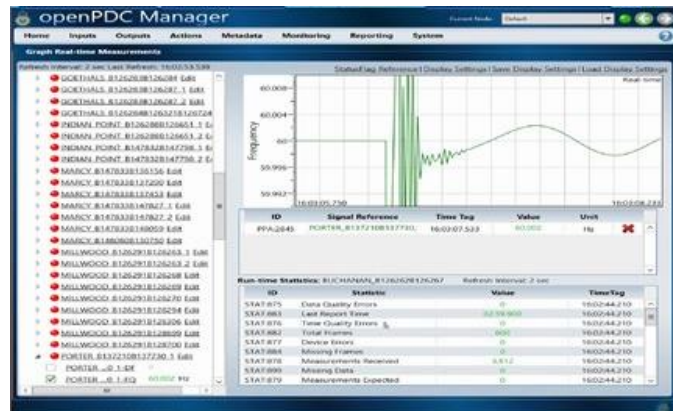
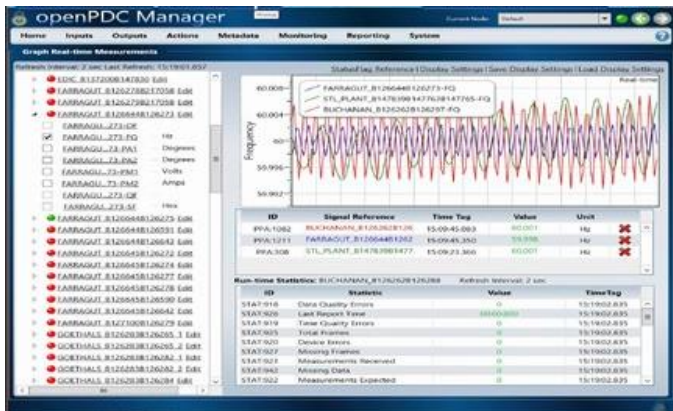
Development of a RTS-Based Testbed for Synchrophasor Applications



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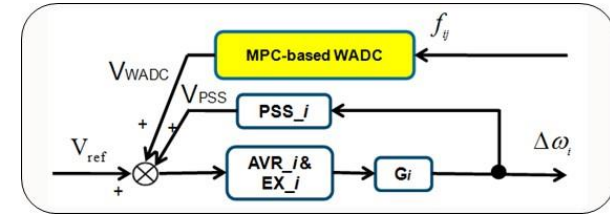
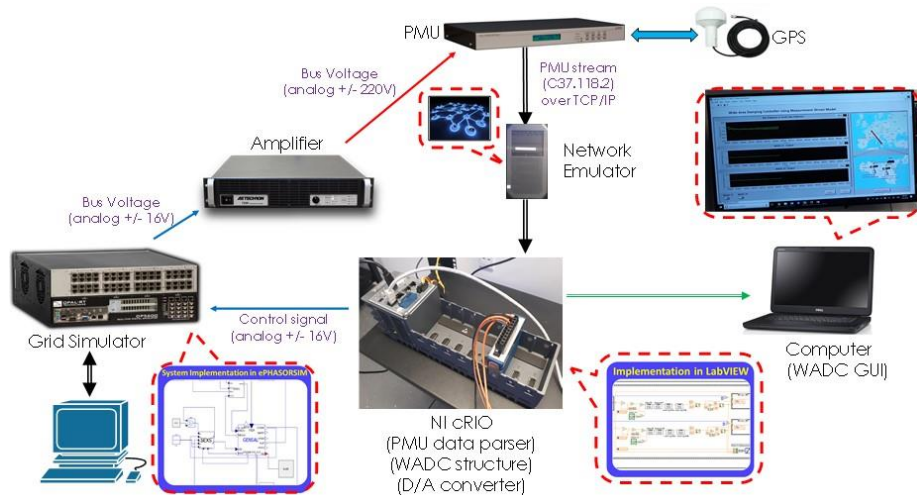
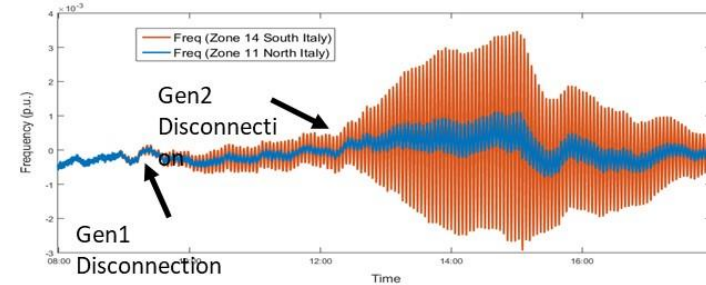


- Capability for detailed modeling of NYPA and NYS grid to simulate a large variety of phenomena
- Ability to model and co-simulate communication systems and cyber-security events evaluating their impact on grid applications
- Capability testing equipment and schemes in close-to-field conditions prior to field deployment
- De-risking synchrophasor-based wide-area monitoring, protection, and control systems



Use Case: Implementation and Testing of Wide Area Oscillation Damping Controller

- **Collaborators**
 - EPRI, NYPA, TERNA, UTK
- **Issue under study**
 - Design and implement an adaptive, wide-area oscillations damping controller utilizing phasor measurement unit data and is capable of damping interarea low-frequency oscillations observed after disturbance events.
 - Performance demonstration both in the New York state and the Italian transmission grids.



Discussion



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