



ComEd Transmission System PMU Deployment

David Schooley, Ph.D., P.E.
Transmission Strategy, Exelon Utilities



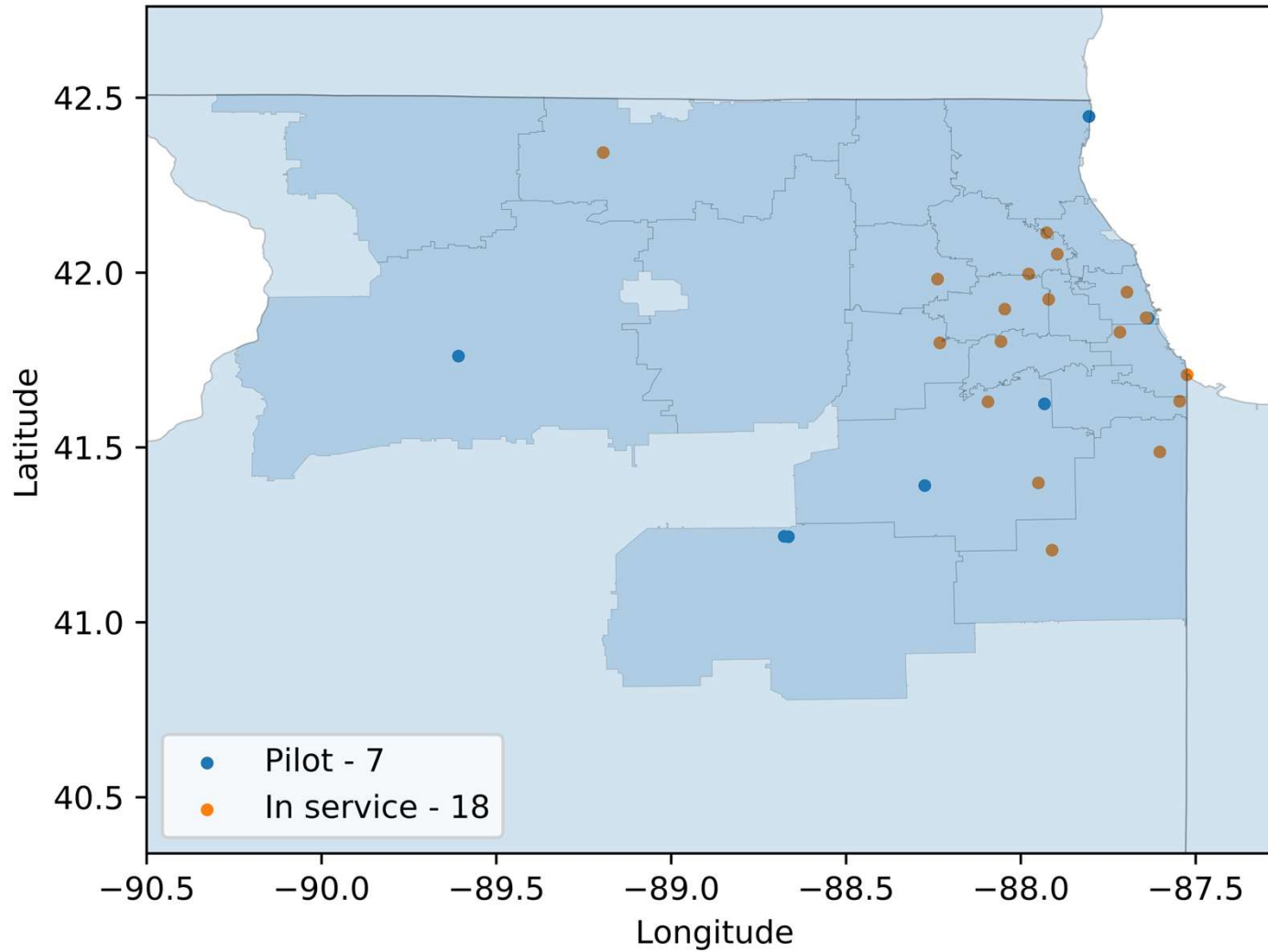
ComEd Status

- ComEd's initial PMU deployment was part of the DOE ARRA grant with PJM
- The use of PMUs in event analysis convinced executive leadership that more PMUs were a good idea
 - Plots of PMU data in event reports increased awareness of PMUs and the value of the data
- Quanta Technology was contracted to help develop a roadmap and system design
- Approval of the roadmap allowed us to start spending money
- Data Center
 - Redundant data centers
 - Servers with fail-over capability
 - Redundant storage – OSISoft PI Historian
 - Application suite from EPG: ePDC, DataNXT, RTDMS, PGDA, and a few other tools
 - Designed to support distribution-PMU pilot project

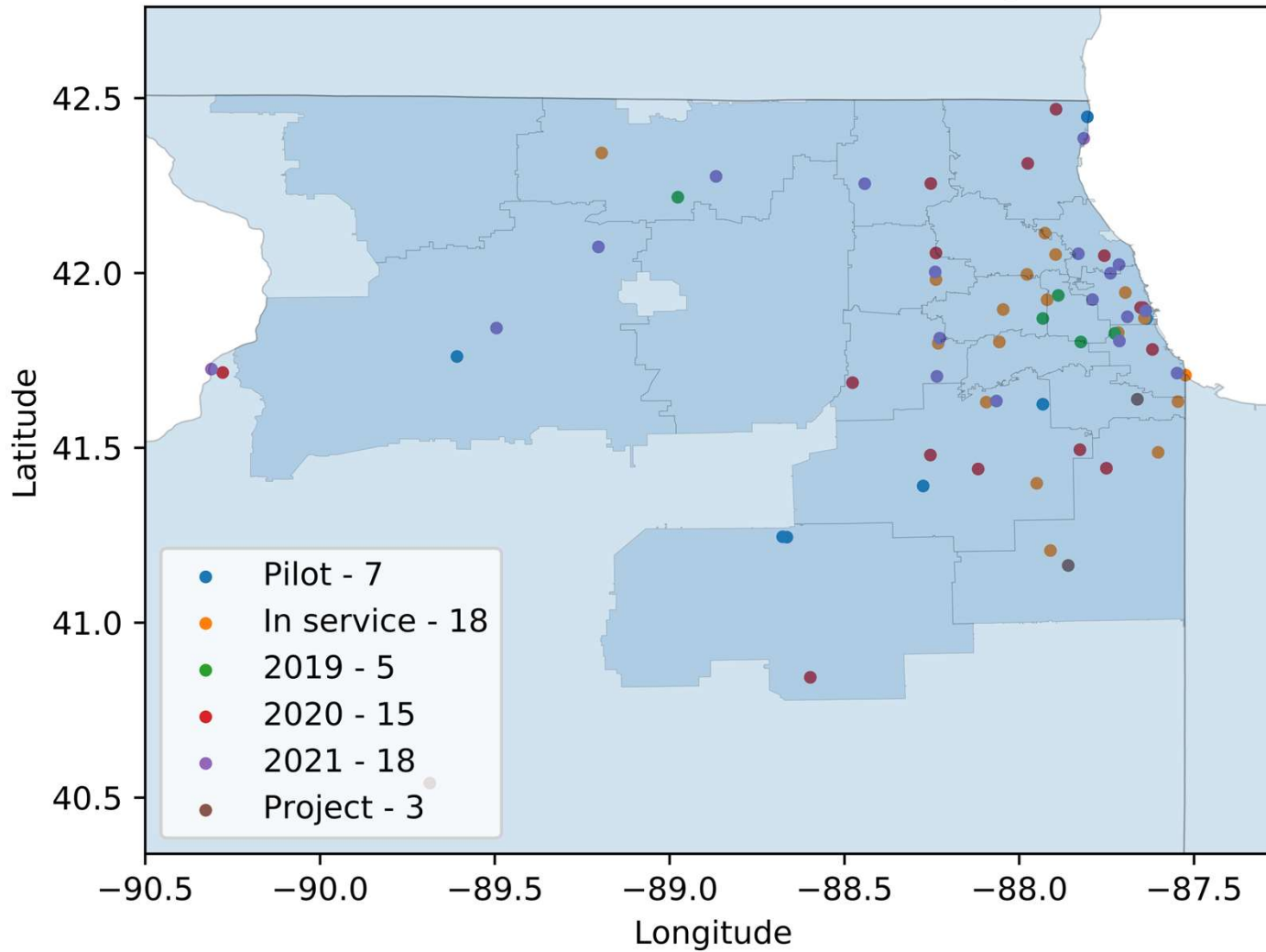
PMU Deployment

- Go Big or Go Home!
- Budgeted projects starting in 2017/2018 through 2022
 - By the end of this process:
 - We will have PMUs at almost all 345kV substations and many 138kV substations
- Additional substations and PMUs to be implemented during reinforcement projects
 - Already seeing benefits from this
- To date:
 - 52 transmission PMUs
 - This number will be out of date this week
 - 42 distribution PMUs

ComEd Substations with PMUs - Today

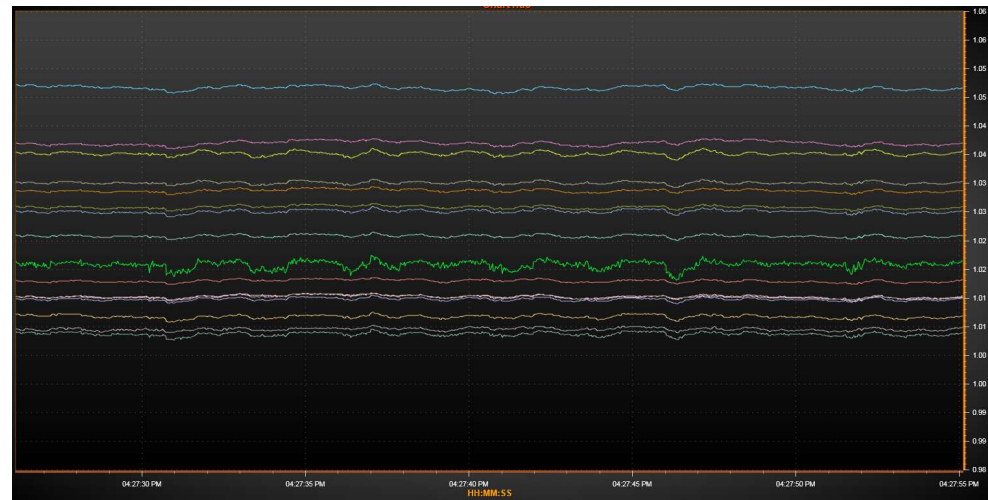
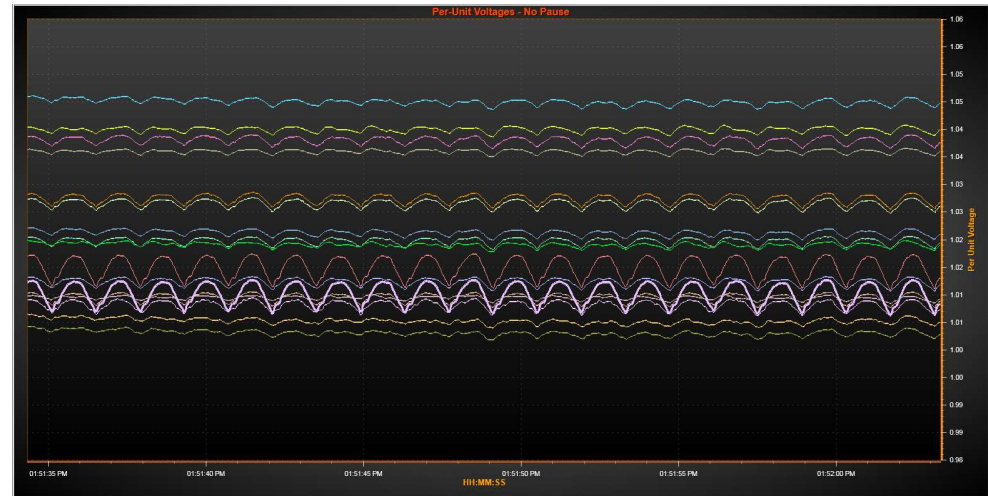


ComEd Substations with PMUs - Through 2021



Uses

- Event Analysis
 - Event analysis is the wind beneath our wings – we won't be giving it up
- Oscillation Identification
 - 0.72 Hz Eastern Interconnection Oscillation
 - “We have met the enemy and he is us.”
– The source resides within ComEd
- STATCOM Monitoring
 - ComEd is installing a STATCOM to mitigate power quality issues caused by a steel mill
 - PMUs will be used to monitor the success or failure of the project
- Long Term
 - LSE and use of PMUs for situational awareness during loss of SCADA
 - Control-room use
 - Implement ComEd system in remaining Exelon utilities



- **Big Data Number Crunching Archiving Platform**
 - Archiving is great – we know how to do that
 - Analytical tools with pre-defined capabilities – we have them
 - Analysis using Python or whatever – we know how to do that too
 - ComEd will soon have multiple years of data for a large number of PMUs
 - Other utilities and ISOs are ahead of us on this
 - How do we combine the archiving with the ability to run new applications without moving large amounts of data over the network?
 - Moving data over the network is bandwidth-intensive
 - Moving a large data set from the archive to somewhere where you can do something is time intensive and probably a waste of time
 - I don't know how to do this right now