

Technology Considerations for Retail Electricity Markets At the Distribution Grid Level

Illinois NextGrid : Working Group 5



AMI

“Today”

- Advanced Metering Infrastructure (AMI)
 - AIC deployment complete 2019
 - 60 min data for Res. & Sm. Com. / 5 min data Large C&I
 - Moving to 15 min data for all customers
 - Meter data uploaded 4 times a day



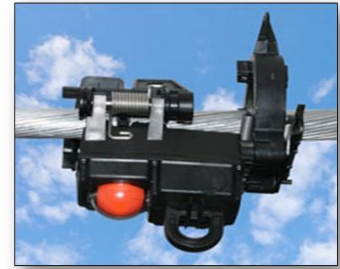
“Tomorrow”

- Will likely need to move towards more granular data and more "real time" in the future. How granular? How fast?

Communication Systems

Today

- Thousands of analog sensors & grid devices, million(s) of meters.
- Communication networks
 - AMI Mesh
 - Public Wireless & Wired
 - Utility Wireless
 - Utility Fiber



Tomorrow

- Tens of thousands of digital sensors & grid devices, millions of meters, & smart customer devices.
- Need for a much more robust system will be needed to accommodate volume and timeliness of data (high bandwidth & low latency).
- Communication Networks
 - AMI Mesh
 - Utility LTE / Point to Point
 - Utility Fiber

Software / Systems to Monitor and Control

Today

- Advanced Distribution Management System (ADMS) – includes functions such as Supervisory Control And Data Acquisition (SCADA), outage analysis, and switching.

Tomorrow

- “Smart” devices, distributed energy resources, etc. will need common standards, communication modules, etc.
- System to control these often referred to as a Distributed Energy Resources Management System (DERMS)
 - Broad set of capabilities – yet to all be identified and defined.
 - Linked to existing ADMS and SCADA to monitor & control DER, demand response, other devices.
 - Off the shelf product not available in market today.
- Computing capability / algorithms likely not available yet to “balance” millions of devices across the network in real time.



System Models

Today

- System model of distribution, sub-transmission, and transmission systems are in place, but not necessarily integrated.
- Physical changes may take days or weeks to get updated in model.
- Existing DER may not be fully modeled in systems.

Tomorrow

- Models of distribution, sub-transmission, and transmission systems need to be fully integrated.
- Every interconnection, re-configuration, addition, etc. must be assessed and reflected in the model in real time.
- Data must be extremely accurate.

Financial Engine & Rate Structure

Today

- Financial Engine (market platform) only exists at the RTO level.
- Some customers on real time rate structures, but most still on flat kWh rate structure.

Tomorrow

- Financial engine will need to operate at the distribution level – potentially millions of nodes with different prices for each time segment.
- Price discovery will need to be available in much more granular form than it is today at all appropriate locations on the system.
- Settlement calculations will be expanded to the millions.
- How much real time pricing vs. flat pricing is needed?
- Will pricing be 5 min or less for all customers? For certain customers?
- Will DR or other end uses be priced equally as traditional load?



Continued Role of Utility

- Customer service
- Safety
- Security (cyber & physical)
- Reliability
 - Voltage Quality
 - Start-up Power
- Affordability, efficiency
- Provide access to supply & other markets





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