AMI and HAN Systems

Integrated Resource Plan Stakeholder Meeting
Megan Pomeroy, The United Illuminating Company
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History

- Majority of today’s power systems are largely based upon technology from the 1950s and installed over the last 40-50 years.
- Utility companies have had to send workers out to gather much of the data needed to provide electricity.
- Most of the devices utilities use to deliver electricity have yet to be automated and computerized.
Smart Grid Applications
“Evolutionary, not Revolutionary”

Distributed Generation and Alternate Energy Sources

Self-Healing Wide-Area Protection and Islanding

Asset Management and On-Line Equipment Monitoring

Demand Response and Dynamic Pricing

Real-time Simulation and Contingency Analysis

Participation in Energy Markets

Shared Information – Continuously Optimizing – Intelligent Responses!
The Electric Power Research Institute (EPRI) released a broad assessment of the costs and benefits to modernize the U.S. electricity system and deploy what has become known as “the smart grid.”

Factoring a wide range of new technologies, applications and consumer benefits the investment needed to implement a fully functional smart grid ranges from $338 billion to $476 billion and can result in benefits between $1.3 trillion and $2 trillion. (April 7, 2011)
Smart System... supports the entire electricity supply chain

- conventional power generation: increased flexibility
- renewable energy integration
- increasing grid capacity: asset utilization, power flow control
- consumer gateway, home automation
- decision support for operations
- energy storage integration
- grid operation with distributed generation
- plug-in vehicles for grid
- local balancing of distributed resources
- increasing grid reliability: fault management
- load management/demand response
- grid operation with distributed generation
- efficient long distance transmission
- energy storage integration
- consumer gateway, home automation
Mesh Network – AMI Systems

Host System

Take Out Point

Two-way Mesh Network

Nth Take Out Point

Other Applications

• Distribution Automation
  • Home Automation
  • Load Management

Transmit-Only
• Gas
• Water

• Water/Wastewater Applications
  • Reservoir Management

• Reclosers
  • Switches
  • Sectionalizers
  • Capacitor Bank

Residential Products:
• Smart Thermostat
• Load Management

High-Rise Solution
Tracking AMI

~ 160 Million Electric Meters
90% Residential
~10% AMI Deployed (electric)
~35% In Play
Accelerated by $4.3B in Federal Funding
An Evolution, No End-State

Energy Management – HAN Systems
HAN Systems – Suppliers’ Devices

Tendril

EnergyHub
HAN Systems – Suppliers’ Portals
Demand and Price Response

- Potential residential load response programs and dynamic pricing
- Communicate with Customer through HAN systems what’s going on and why
- Network-agnostic
- Measurement & Verification
## Benefits of AMI and HAN Systems

<table>
<thead>
<tr>
<th>Smart Grid Benefit</th>
<th>Nature of Benefit</th>
<th>Primary Beneficiary</th>
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<tbody>
<tr>
<td></td>
<td>Service</td>
<td>Cost</td>
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<tr>
<td><strong>Customer Participation</strong></td>
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<tr>
<td>Smart meters &amp; home automation</td>
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<td>Accomodation of plug-in hybrid electric vehicles</td>
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<tr>
<td>Facilitation of demand response</td>
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<tr>
<td><strong>System Reliability &amp; Efficiency</strong></td>
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<tr>
<td>Improved customer service</td>
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<td>✔️</td>
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<tr>
<td>Enhanced grid reliability</td>
<td>✔️</td>
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<tr>
<td>Optimization of network performance</td>
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<td>✔️</td>
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<tr>
<td>Reduce system losses, operating expense</td>
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<tr>
<td><strong>Asset Utilization</strong></td>
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<tr>
<td>Equipment monitoring &amp; reduced risk of failure</td>
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<tr>
<td>Optimization of asset utilization</td>
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<td>✔️</td>
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<tr>
<td>Prioritization of system enhancements, repairs</td>
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<tr>
<td><strong>Environmental Benefits, Renewable Energy, Energy Storage</strong></td>
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<td>Reduced carbon footprint</td>
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<td>Wind, solar, biomass integration</td>
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<tr>
<td>Facilitate distributed generation</td>
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<tr>
<td>Enabling micro-grids</td>
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Demand Side Integration And Load Management

Solar Sites

Electric Vehicles

Distributed Generation Sites

Water Heater
Load Control Devices
Drawbacks of AMI and HAN Systems

- Customer recruitment, engagement, installation
- High HAN install costs – Cost Benefit Analysis
- Negative connotation of smart meters
  - Meter Accuracy
  - RF Health Effects
  - Privacy
- Energy Industry Communication Standards not keeping up with Technology Advancements
- Bandwidth availability of AMI versus Internet
  - Internet Market (~77% nation wide by 2012)
- Thermostat compatibility
  - 37% of customers in UI service territory have central AC
Drawbacks of AMI and HAN Systems

Hype Cycle – Gartner Group
By March 2013 ConnSMART will:
- Deploy approximately 45,000 smart meters (100% deployment across five municipal service territories, all rate classes);
- Deploy 3 AMI communications networks and 3 MDM systems; and
- Upgrade substations and implement new distribution control systems.

By March 2015 ConnSMART will pilot:
- Residential and Commercial cost and use website presentment (target availability: 24,000 customers);
- Residential and Commercial time-of-use rates (target volunteer enrollment of ~100 customers); and
- Residential direct load control program (target volunteer enrollment of ~300 customers).
UI’s Efforts of AMI and HAN Systems

- Mesh Network – RF, Fiber, Concentrators, Collectors
- 81,000 two way or Advanced Meters deployed by 2012
- Meter Data Management (MDM) – store data and interface with SAP
- Helo Pilot – 1,000 households
- HAN Devices deployed (In-home display, programmable t-stats, controllable plugs, load control devices)
- Explore potential programs (Residential Demand Response, Dynamic Pricing, and Behavioral Component)
Summary

- AMI deployment level still low nationally
- Flexibility required in integrating customer devices
- AMI performance is trending upward to support ancillary functions
- Value of historical AMI data is immediate, real-time data use is emerging, direct sharing of the AMI network is uncertain
- Level of customer engagement in price responsiveness and demand response will determine AMI and HAN potential to decrease peak load.