CMP’s Vision to become the Utility of the Future
Utility of the Future Technology Platform

- Utility of the Future Vision
- Platform Capability Mapping
- Foundational Technology
- Technology Platform Structure
- DSP Technology Roadmap
- Guiding Principles
- Next Steps
AVANGRID Background

our networks companies
• Berkshire Gas
• Central Maine Power
• CNG
• Maine Natural Gas
• NYSEG
• RG&E
• SCG
• UI
Utility of the Future Vision

Utility role is expanding to **smart integrator** owning and operating a diverse and intelligent platform

- **Monitor & Control** of 1000’s of Distributed Energy Resources (DER)
- **Real-Time** Grid Optimization (voltage/var, power flow, power quality)
- **Forecasting & planning** to accommodate DER
  - Leveraging **DER as solution** to network problems
- **Granular** **time based** consumption & pricing
- **New solutions** for customers
  - Information for market providers
Platform Capability Mapping

Foundational Platform Technology

DSP

Grid Operations

Integrated System Planning

Market Enablement

Grid Ops – Capability/Functionality/Timing

<table>
<thead>
<tr>
<th>Capability</th>
<th>Component</th>
<th>Function/Plan</th>
<th>Initial Design</th>
<th>New System Completion</th>
<th>DSP 1</th>
<th>DSP 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>DER Monitoring and Observability</td>
<td>DSP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DER Coordination and Control</td>
<td>DSP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real-Time Distribution System Optimization</td>
<td>DSP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T&amp;D Resource Coordination</td>
<td>DSP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integration of Grid and Market Operations</td>
<td>DSP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated System Planning with DER</td>
<td>DSP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beneficial Locations, Hosting Capacity, and Locational DER Value</td>
<td>DSP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand and Energy Forecasting with DER</td>
<td>DSP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Planning with DER</td>
<td>DSP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procurement of Non-Wires Alternatives</td>
<td>DSP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probabilistic Integrated System Planning</td>
<td>DSP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grid Ops – Functions to Technologies

- SCADA Monitoring and Observability
- DER Monitoring
- DER Coordination
- Real-Time Distribution System Optimization
- T&D Resource Coordination
- Integration of Grid and Market Operations
- Integrated System Planning with DER
- Beneficial Locations, Hosting Capacity, and Locational DER Value
- Demand and Energy Forecasting
- Capital Planning
- Procurement of Non-Wires Alternatives
- Probabilistic Integrated System Planning

Grid Ops – Technology to Projects

- Supervisory Control and Data Acquisition (SCADA) provides the link between grid automation devices and the control room. It delivers real-time information about the state of the network in terms of its co-operated connectivity (which breakers, switches, are opened or closed) and in terms of its operational health (overloads, under-voltage and over-voltage conditions). SCADA systems can also detect when a device fails to operate or is not operating correctly and provide information to allow timely maintenance activities.

Current Technology

- AVAIKON currently has SCADA capability via its Spectrum 4.15 SCADA/OMS. It extends to the limited set of substations that support remote SCADA monitoring and control.

Technology Gaps

- The gap in this case is not so much one of technology as one of penetration. Expanding deployment of the existing SCADA capability is needed to bring information about near-to-be automated substations and field devices into the control room.

Projects / Initiatives

- OPS-1: Level I Grid Automation (L1 & L2 Automation)
- OPS-2: Level II Grid Automation (L3, L4, L5 Capabilities, Regulators, MRA, etc.)
- OPS-3: Level III Grid Automation (— ph Relays)
- NPI: Increase system-wide efficiency
## Foundational Technology

<table>
<thead>
<tr>
<th>Technology</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AMI, AMI-OMS Integration, CIS Upgrade</strong></td>
<td>System-wide implementation of AMI to provide customer usage by time interval and system data, and upgraded billing / back-end systems</td>
</tr>
<tr>
<td><strong>Grid Automation</strong></td>
<td>Automate the substation feeder bays, line regulators, capacitors, sectionalizers, tie switches and single-phase reclosers to enable control over network facilities.</td>
</tr>
<tr>
<td><strong>GIS Model Enhancement</strong></td>
<td>Enhance the Geographic Information System (GIS) grid model to provide DER and impedance data for planning and operations to enable and enhance interconnections analysis, hosting capacity analysis, circuit optimization, voltage/var control, and other functions.</td>
</tr>
<tr>
<td><strong>Advanced Planning Tools</strong></td>
<td>Provide the capability to efficiently analyze and determine the DER hosting capacity, to accurately forecast load and DER generation, to incorporate distributed generation and energy storage into Integrated System Planning, and to communicate system data and accept interconnection requests.</td>
</tr>
<tr>
<td><strong>Advanced Distribution Management System</strong></td>
<td>Expand the energy control system to include distribution power flow; Volt/var optimization (VVO); demand response; DERMS; and Fault Location, Isolation, and Service Restoration (FLISR). The ADMS will enable DER visibility and control and support DER transactions.</td>
</tr>
<tr>
<td><strong>Enterprise Analytics Platform</strong></td>
<td>Develop a comprehensive Enterprise Analytics Platform to fully leverage the vast quantities of granular system and customer data that supports our vision for data management, business intelligence, and advanced analytics.</td>
</tr>
</tbody>
</table>
Technology Platform Structure

1 - Advanced Metering Infrastructure (AMI)

2 - Distribution Automation

3 - Telecommunications & IT

4 - Advanced Distribution Management System

5 - System Analysis and Planning Tools

ISO/RTO Markets

Third Party DERMS

Third Party DRMS

Source: EPRI with NYSEG & RG&E Analysis
### Guiding Principles

<table>
<thead>
<tr>
<th>Integrated solution</th>
<th>No islands of intelligence</th>
<th>No side systems</th>
<th>Leverage corporate systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Include DER in solutions</td>
<td>VVO</td>
<td>FLISR</td>
<td>Capital Planning Alternatives</td>
</tr>
<tr>
<td>Common Grid Model</td>
<td>in GIS</td>
<td>from corporate repositories</td>
<td>into Planning model</td>
</tr>
<tr>
<td>Data is Crucial</td>
<td>Quality</td>
<td>Governance</td>
<td>Processes</td>
</tr>
<tr>
<td>System Flexibility</td>
<td>Granularity</td>
<td>Market Design</td>
<td>Aggregation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CMP's Vision to become the Utility of the Future**
Next Steps

Control System
- Distribution model
- Distribution power flow
- FO, FLISR, VVO, DERMS, MMS
- Active Network Management

AMI
- VVO
- Automation
- Behind the meter

Automation
- Substation
- Line reclosers
- Strategic line switches
- Line regulators & capacitors

GIS
- Quality
- Governance
- Processes
- Roles & Rules

VVO
- VO Pilot project (EMT)
- VVO
- VVO with DER

CMP's Vision to become the Utility of the Future