GT Clean Energy Series
The Agile Utility: Aligning Distributed Generation with Consumer Demand

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Aligning Distributed Generation with Consumer Demand

Aligning Consumer Demand with Generation
Outline

- Comverge background
- Evolving drivers for Demand Response
- Playing field
- Technology discussion
Provider of Demand Management Solutions

<table>
<thead>
<tr>
<th>Solutions</th>
<th>Comverge by the Numbers</th>
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<tbody>
<tr>
<td>➢ Solutions</td>
<td>➢ 6,000,000+ energy management devices deployed</td>
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<tr>
<td>▪ Demand Response</td>
<td>➢ 1,600,000+ residential participants enrolled into DR</td>
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<td>▪ Energy Efficiency</td>
<td>programs</td>
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<td>▪ Customer Engagement</td>
<td>➢ 500+ Utility Customers</td>
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<td>➢ Products</td>
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<td>▪ IntelliSOURCE software</td>
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<td>▪ IntelliTEMP thermostats</td>
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<td>▪ IntelliPEAK load control</td>
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<td>▪ switches</td>
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<td>➢ Services</td>
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<td>▪ Program Design and</td>
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<td>▪ Maintenance &amp; Support</td>
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<td>▪ Measurement and</td>
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<td>▪ Verification</td>
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Utility Clients

- Southern Company
- SDGE
- Duke Energy
- PECO
- SMECO
- PNM
- Dominion
- Pepco

4
Peak Price – Traditional Driver for DR

Cost of Electricity

Cumulative Hours of Operation

Hourly Wholesale Cost to Utility

$ / MWh

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

$0 $50 $100 $150 $200 $250 $300
Evolution of DR Requirements

Former Model: Controlled Supply

New Model: Variable Supply

Variable Demand

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Ramping – Emerging Driver for DR

Ca “Duck Curve” caused by variation in solar over the course of a day
US Markets

- California ISO
- Midcontinent ISO
- New England ISO
- New York ISO
- Southwest Power Pool
- Electric Reliability Council of Texas
- PJM Interconnection
Recent Regulatory Developments

- **FERC 745 overturned DR for energy**
  - Push to extend the ban to Capacity
  - PJM published paper pushing shift to allow DR only through load serving entities
  - DR saved $9.3B in capacity market

- **Disposition could force states to re-enable DR as a market force in the state**

- **NY State proposes Reforming the Energy Vision (REV)**
  - Enable customers to better manage their energy costs
  - System efficiency, bills, carbon, innovations, resiliency and competitive markets

2. [http://www3.dps.ny.gov/W/PSCWeb.nsf/a8333dcc1f8dfec0852579bf005600b1/26be8a93967e604785257cc40066b91a/$FILE/REV%20factsheet%208%2020%2014%20(2).pdf](http://www3.dps.ny.gov/W/PSCWeb.nsf/a8333dcc1f8dfec0852579bf005600b1/26be8a93967e604785257cc40066b91a/$FILE/REV%20factsheet%208%2020%2014%20(2).pdf)
Technology Enablers

- **Advance Metering Infrastructure (AMI)**
  - Allows pay-for performance DR
  - Enables price-responsive rates

- **Two-way solutions enable analytic insights**

- **Third Party Connected Devices**
  - WiFi connected thermostats
  - Potentially a customer-supplied DR resource
  - Tool for behavioral-based Energy Efficiency
Pay for Performance DR

Three Characteristics Drive the Value of a DR Asset

- Predictability – must know what quantity is available at any time
- Reliability – if scheduled, resource must deliver
- Timeliness - rapid start, long persistence
IntelliSOURCE – Bring Your Own Device

- Assign fair value to load drop
- Dynamically dispatch assets to achieve desired outcomes
- Mix and match device constraints for desired load shape
Analytics from T-Stat data

A Tale of Two Houses
House 1 - Better Insulation, Undersized AC

Uses for Data:
Remote Energy Audit
Candidates for other programs
EE and DR optimization

- Heat Slope: 1.5°/hr
- Cool Slope: 0.4°/hr
House 2- Poor Insulation, Oversized AC

Heat Slope
1.7⁰/hr

Cool Slope
2.1⁰/hr
House 2- Poor Insulation, Oversized AC

Heat Slope 1.7°C/hr
Cool Slope 2.1°C/hr

Custom Tip:
When away, set temp. up 3°C, return temp. an hour before arriving home.
IntelliSOURCE - DR Optimization

*Data to Inform Control Events*

- AMI Data
- Real Events
- Test Events
- Device Status
- Parcel Data
- Demographic Data
- SCADA
- Weather
- Device Telemetry
- Energy Price

- Real Time Data Stream Analysis
- Continuous Machine Learning

- More Accurate Predictions
- Cost Optimized Dispatch (including 3rd party devices)
- Precision Load Shape
- Reduce Free Riders
Demand Response Optimization

Utility Distribution Mgmt. System

Demand Response Optimization

Dispatch | Monitor | Register | Report | Settle

Head End Device—Specific APIs etc.

Comverge IntellISOURCE® | RDP | RDP | RDP | RDP

RDP: Retail Device Provider (Google)

RDP

Distributed Energy Resources

Comverge Direct Install

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Summary

- Changing supply, regulatory and technology landscape requires new requirements for demand response resources

- Bring Your Own Device (BYOD) programs change cost structure of DR programs but add increased complexity for program management

- Utilities must develop strategy to manage complexity while ensuring program optimization