Intelligently Balancing Supply with Demand through Continuously Connected Customers

NCSL Task Force on Energy Supply

Keyvan Cohanim
Who is ENBALA?

- ENBALA Power Networks® is a Smart Grid technology company that enables utilities and electricity grid operators to **intelligently connect** to commercial and industrial customers and to provide **continuous value** back to the power system.

- ENBALA’s GoFlex™, **real-time demand-management** platform delivers **operational flexibility** to the electricity grid addressing an increasingly complex management challenge.
Electricity Industry is in Transformation

**Stressors**
- Aging Infrastructure
- Changing Generation Mix
- Intermittent Renewable Power Sources
- Retiring Coal
- Electric Vehicles

**Challenges**
- Generator Efficiency
- Increased Volatility
- Integrating Renewable Power Sources
- Cost Pressures
- Reliability
The Power System Needs Real-Time Flexibility

**Continuous delivery of electricity**

**Ability to meet peak requirement**

**Ability to continually match supply & demand (& manage intermittent generation)**

**ENERGY**

**CAPACITY**

**FLEXIBILITY**
Demand-side Electricity Management Initiatives

Increasing interaction with the Smart Grid

- Daily Energy Consumption
- Time of Use
- Peak Load Management
- Demand Response
- Synchronized Reserves

Increasing levels of granularity of controls

Increasing speed of telemetry

Source: Demand Response Research Center and Lawrence Berkley National Laboratory
Applications for the Power System

**Grid-Scale Applications**

**Supply/Demand Optimization**
Improve the overall efficiency of the generation fleet and reduce O&M costs.

**Wind Integration**
Provide the reliable integration of renewable generation, supporting a green grid.

**Frequency Regulation**
Engaging demand-side loads to provide frequency regulation.

**Distribution-Scale Applications**

**Dynamically Optimized DR**
Permission based demand response that allows load to participate on its terms.

**Load Shifting**
Using inherent process storage to intelligently shift energy consumption that allows load to specify level of impact.

**Customer Engagement**
Enhanced, bi-directional communication and information exchange that provides deeper understanding and relationship between the customer and their utility.
Inherent Process Storage in Existing Assets

1. Storage already exists in the power system
2. Storage in industrial systems and processes provides flexibility in consumption
3. We only have to connect and manage this storage
Customers Connecting to the Grid

The network supplies reliable storage to the power system and pays the facility for its flexibility.

Real-time optimization platform that understands process parameters.

Highly secure communication interface installed.

ENBALA engineers help “define” the facility’s flexibility and parameters.

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The individual responses from each asset in the network are aggregated to form the network response.
ENBALA Sample Clients

Water/Wastewater
- City of Cleveland
- American Water
- Region of Peel

Cold Storage
- Confederation Freezers
- Walmart
- Cargill

HVAC Applications
- National Institute of Standards and Technology (NIST)
- McMaster University
- Metropolitan Washington Airports Authority
- Sunnybrook Health Sciences Centre
Proven Technology in the Market Now

- Énergie NB Power: Wind Integration
- ieso: Grid Balance
- Oak Ridge National Laboratory: 26 GW Flexibility
- PJM: Frequency Regulation
- Integrated Utilities: Supply/Demand Optimization
Benefits of the ENBALA GOFlex™ Platform

- Provides additional benefits to customers
- Reduces costs of O&M in the system
- Reduces GHG emissions
- Helps to optimize generation
- Electricity consumer satisfaction rises through participation
Market Policy Experience

The role of the Demand Side is not typically considered when policy framework is written. The Demand Side needs a level playing field.
Deregulated Markets

<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
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<tbody>
<tr>
<td>Aggregation</td>
<td>Aggregation allows for much greater level of load participation. This allows the aggregator to be responsible for overall level of performance.</td>
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<tr>
<td>System vs. Local needs</td>
<td>Loads are distributed resources that can be coordinated to provide a fleet response. For system wide services/products, loads should not be confined to local geographic regions.</td>
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<td>Sub metering</td>
<td>Sub metering is crucial for more sophisticated demand-side management offerings. Flexibility services are able to use part of the load at a facility rather than having to manage the entire facility.</td>
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<td>Multiple CSPs</td>
<td>Allows multiple CSP’s to register the same customer with different products as the demand-side management world grows.</td>
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Regulated Markets

- Reduce complexity of defining specific products ... Provide broader directional support as long as demand management is delivering value.

- Demand-side resources can provide value in different ways over time, addressing evolving needs, creating an even bigger opportunity.

- Utilities are able to embrace some of these new technologies faster than deregulated markets.

- Continue to be more open to new creative approaches to encourage innovation.
There is nothing cheaper than IT enabling resources that are already a part of the electricity system.
Thank You

Keyvan Cohanim
Executive Vice President, Sales & Marketing
ENBALA Power Networks

Tel: 647.427.7007
Email: kcohanim@enbala.com

www.enbala.com
Demand-side Electricity Management Initiatives

Source: Benefits of Demand Response in Electricity Markets – US DOE
Wind Integration

1. Volatility – maintaining system balance
2. Ramp – losing wind at inconvenient times (during ramp)
3. Capacity – different form of generation

Volatility and ramp can be solved using demand-management technologies.
Challenge
To understand the opportunity that demand-side loads can play in the ancillary services market.

Benefits
• Confirmed that commercial & industrial demand-side loads have an excess of 26 GW of process flexibility
• Loads can play a valuable role in participating in ancillary services

Findings
Demand-side process storage already exists within loads and can support today’s complex power system.
Grid-Scale Applications

Go Flex™ Platform

- Supply/Demand Optimization
- Wind Integration
- Frequency Regulation
Generation Fleet Needs To Follow Ramp

Optimal Generation Set-Point

Actual Demand
Improving Supply/Demand Optimization

~3% efficiency savings and ~$80-100M in reduced costs

Optimal Generation Set-Point

Actual Demand
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Challenge
Meeting the province’s objective to reliably integrate wind generation, 6% (294 MW) of the generation mix into the power system.

Benefits
• Engagement of consumers to participate in the power system
• Reliable integration of wind generation
• Reduction of greenhouse gas emissions

Solution
Integration of wind power through intelligent load management.
Frequency Regulation

Second by second balancing of supply and load (Frequency Regulation), is currently accomplished by adjusting generation.
PJM

Challenge
PJM requires 700 to 1000 MW of Frequency Regulation daily, the need to balance supply and demand in real-time (every 2-4 seconds).

Benefits
• Flexible fleet response from loads
• Advanced grid optimization technology
• Cost-effective grid reliability

Solution
A fleet response from commercial and industrial loads who receive payment to participate in the Frequency Regulation market by providing real-time flexibility to the power system.