# Preparing Now for the Utility of the Future:
# Paths to a Smarter, Cleaner, Cheaper and More Flexible Grid

Presentation to NECPUC

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# Paths to a Smarter, Cleaner, Cheaper and More Flexible Grid

- Utility benefits from smart grid investments will continue to be realized.
- Delivering a fair share of the benefits to customers is a bigger challenge.
- Solution:  Unlock innovative technologies and energy services available to customers through:
    - **Real-time data access**
    - **Regulatory reform**
    - **Market access for demand resources**

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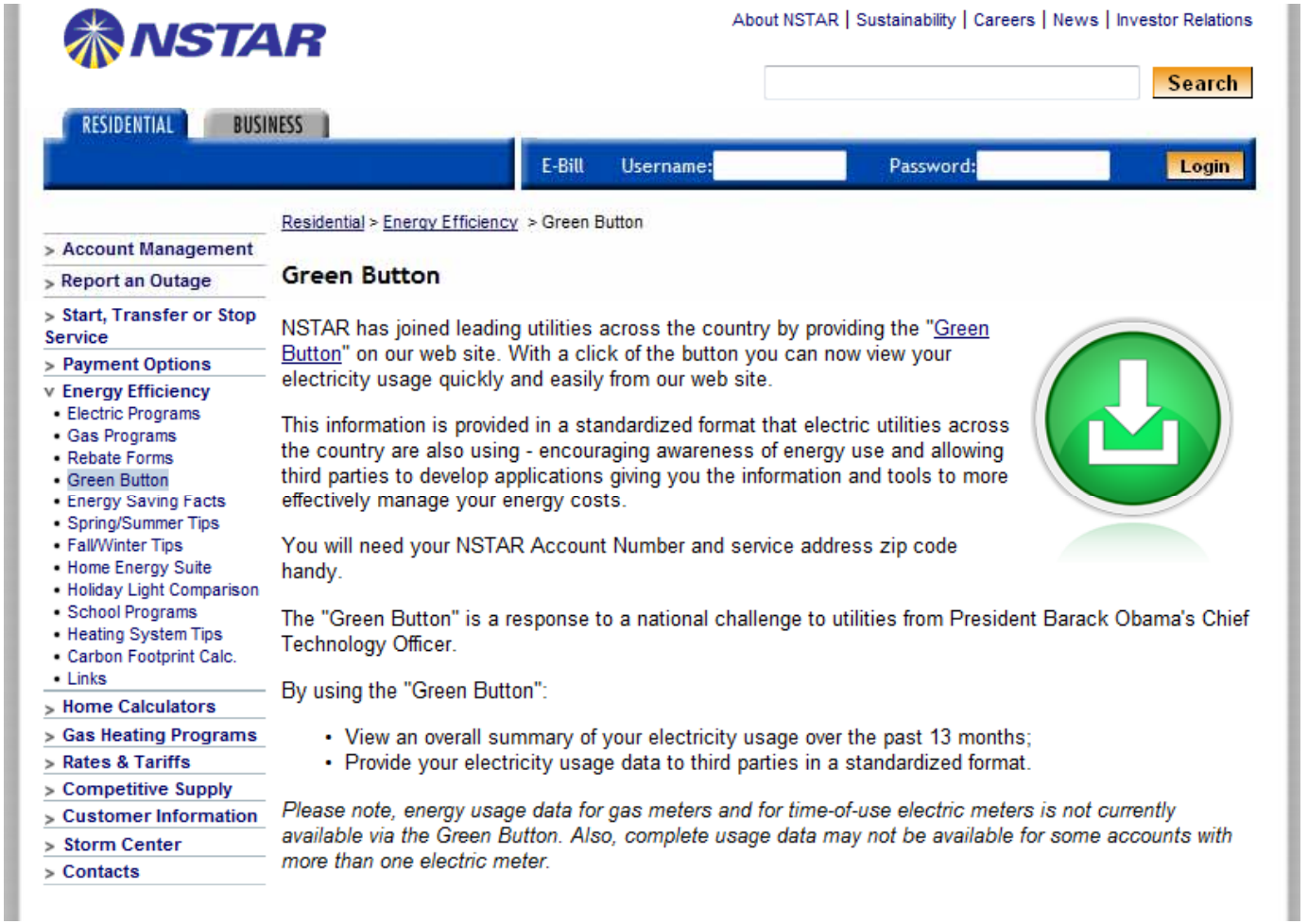
# Data Access

# Historic Lack of Visibility

# Green Button is a good first step…



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**Green Button**

NSTAR has joined leading utilities across the country by providing the "Green Button" on our web site. With a click of the button you can now view your electricity usage quickly and easily from our web site.

This information is provided in a standardized format that electric utilities across the country are also using - encouraging awareness of energy use and allowing third parties to develop applications giving you the information and tools to more effectively manage your energy costs.

You will need your NSTAR Account Number and service address zip code handy.

The "Green Button" is a response to a national challenge to utilities from President Barack Obama's Chief Technology Officer.

By using the "Green Button":

- View an overall summary of your electricity usage over the past 13 months;
- Provide your electricity usage data to third parties in a standardized format.

*Please note, energy usage data for gas meters and for time-of-use electric meters is not currently available via the Green Button. Also, complete usage data may not be available for some accounts with more than one electric meter.*

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# …But real-time data is key to unlocking full value and innovation for customers

- Backhaul access to 24-hour lagged data through a utility server is not sufficient to unlock technology and business model innovation.
- 15-minute interval data is also not sufficient; needs to be more granular.
- Customers and their authorized agents should be given access to all data on a real-time basis that is capable of being communicated directly from the meter.
- Utility plays a critical role facilitating this data access and coordinating all appropriate privacy and security protocols.

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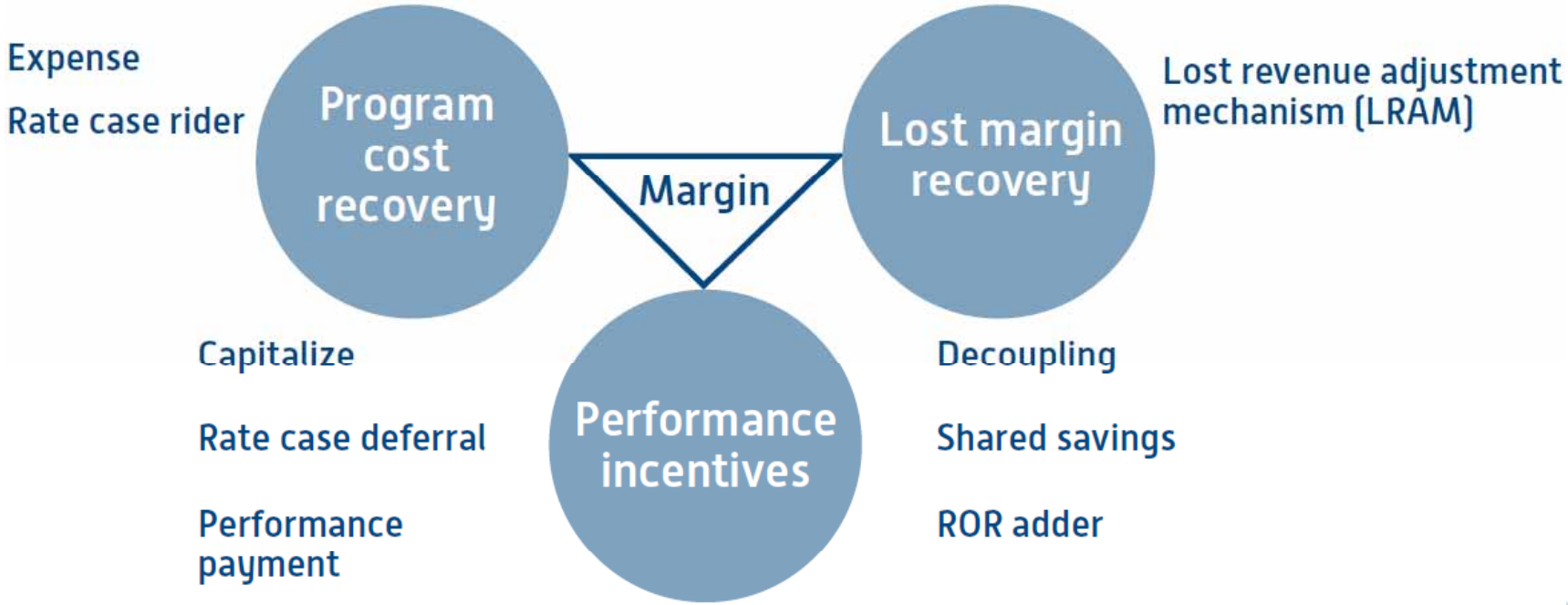
# Regulatory Reform

# Regulatory reforms needed to unlock DSM

Reforms are needed to address supply-side bias in traditional rate regulation, and remove utility disincentives for demand side management




Source: National Action Plan for Energy Efficiency, EPA

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# Equalisation Incentive in the UK is the right idea

## Case Study: Electricity North West (UK)

Distribution Price Control Review 5 (DPCR5) launched the so –called “equalisation incentive” providing parity in treatment between CapEx and OpEx for Distribution Network Operators (DNOs) in the UK, leading to programs such as this.

**DR: Alternative to network investment**

**Focus**

- Specific substations in the Manchester area
- Avoids/defers the need for substation upgrades

**Availability Parameters**

- Dispatched by ENW directly; dual-participation with STOR (National Grid)
- Active during the weekday afternoon peak periods of Oct-March
- 30 Minute Response
- 1-6 hour event dispatch length

**Payments and Penalties**

- Capacity payments for nominated availability
- Energy payments for delivered reductions
- Load reductions are guaranteed and subject to non-performance penalties

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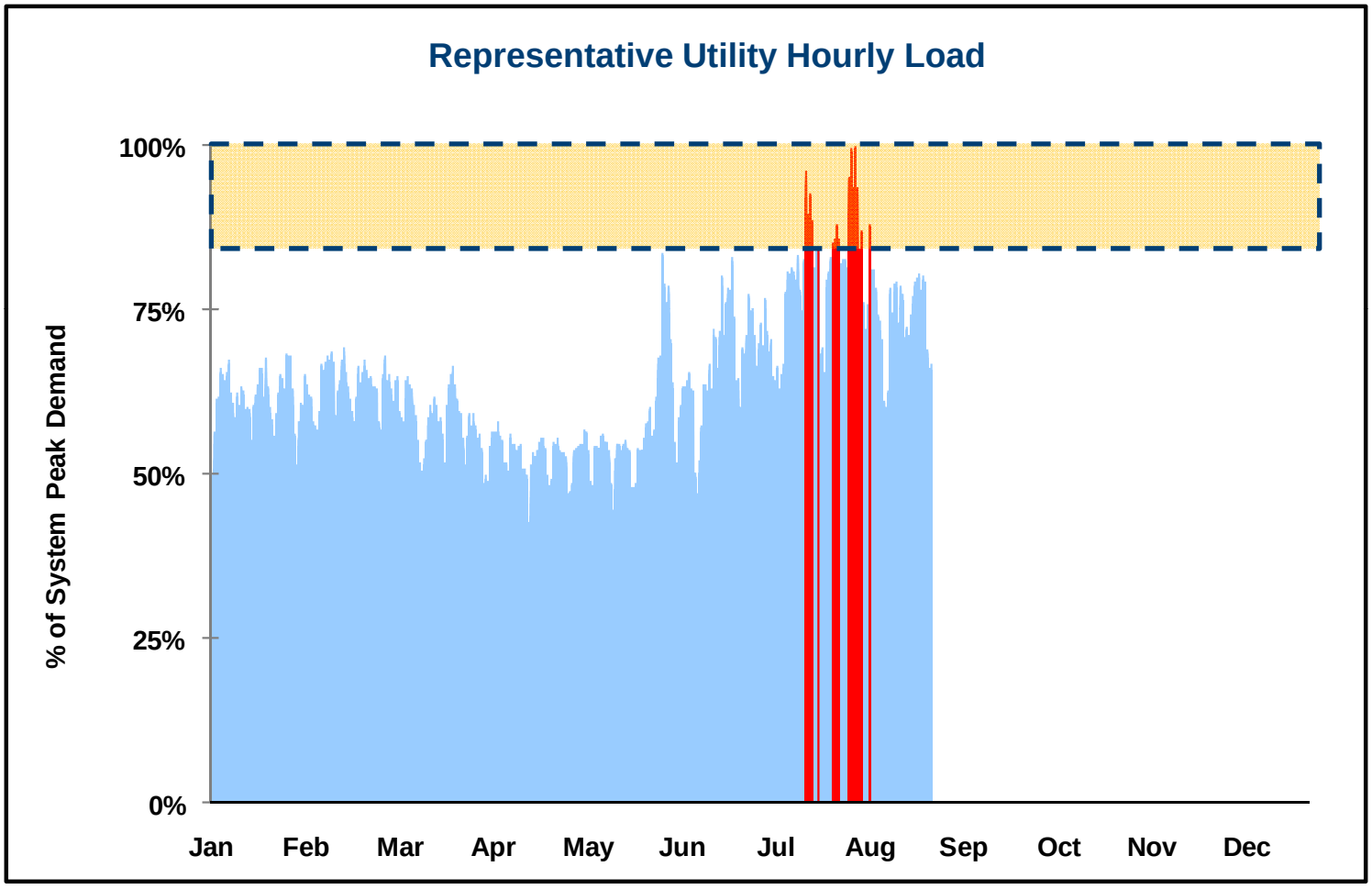
# Market Access

# Traditional demand response paradigm

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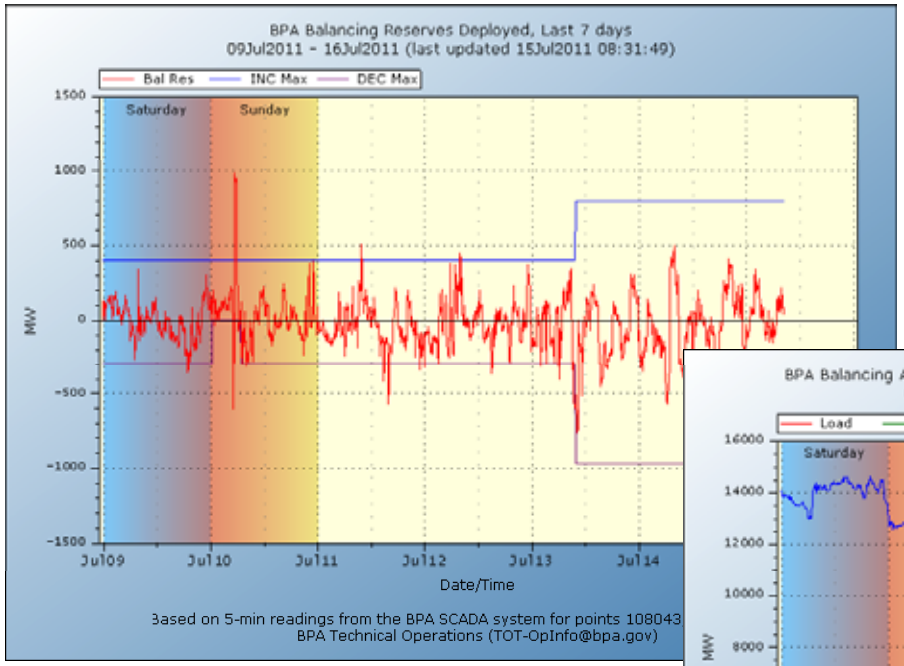
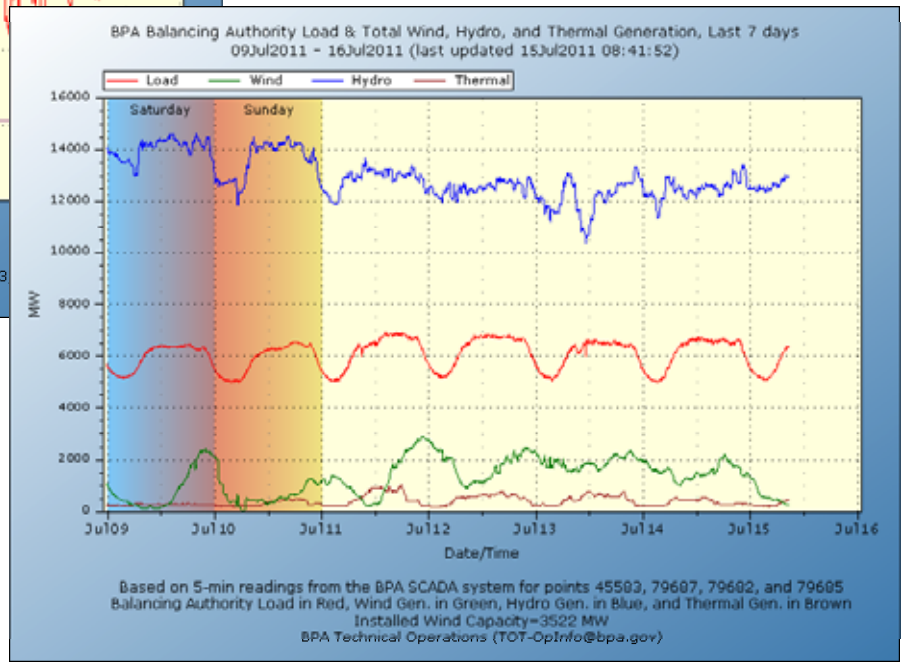
# Evolving Demand Response Paradigm

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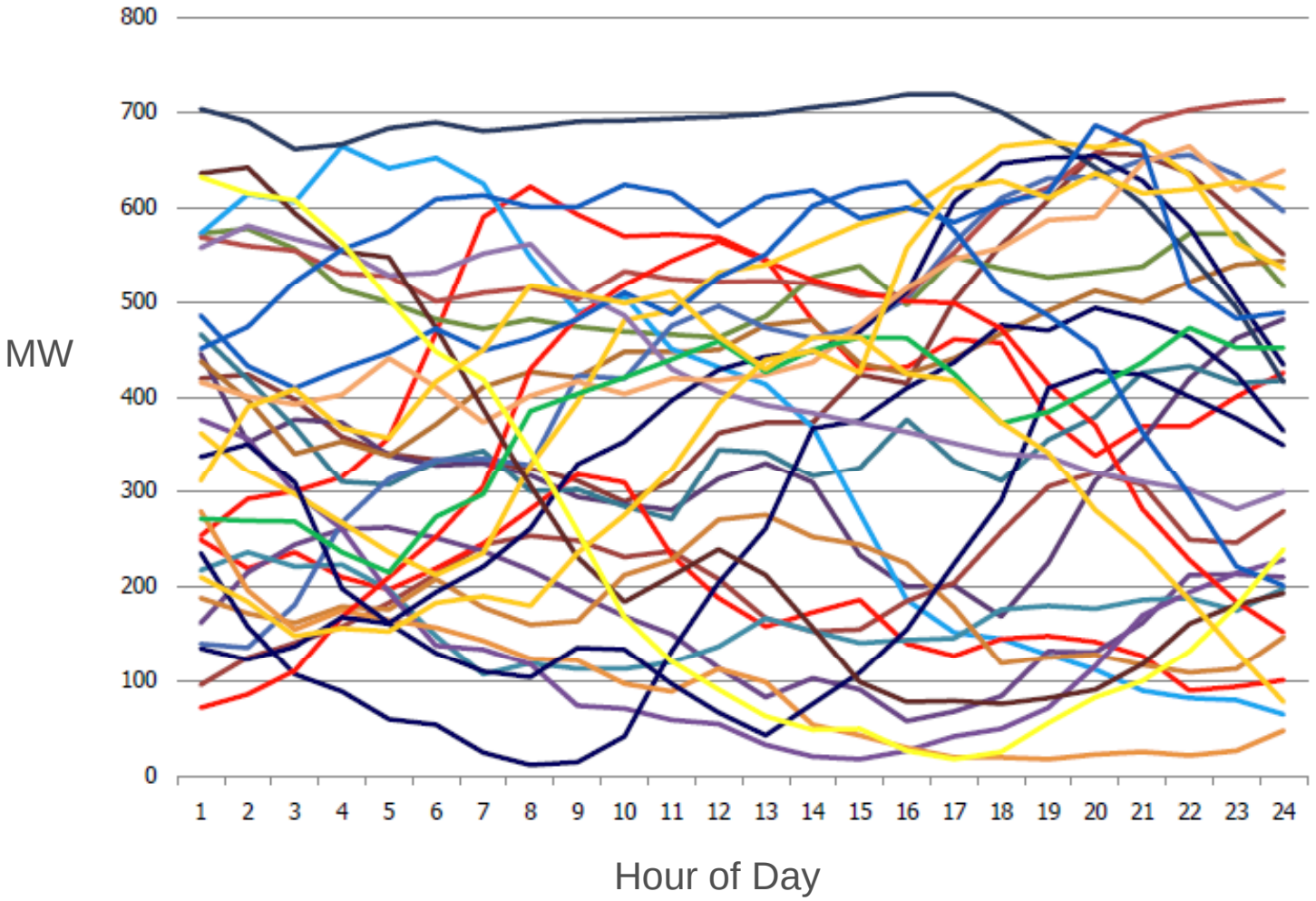
# Wind output isn't exactly predictable

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# Hourly wind output in ERCOT

MW

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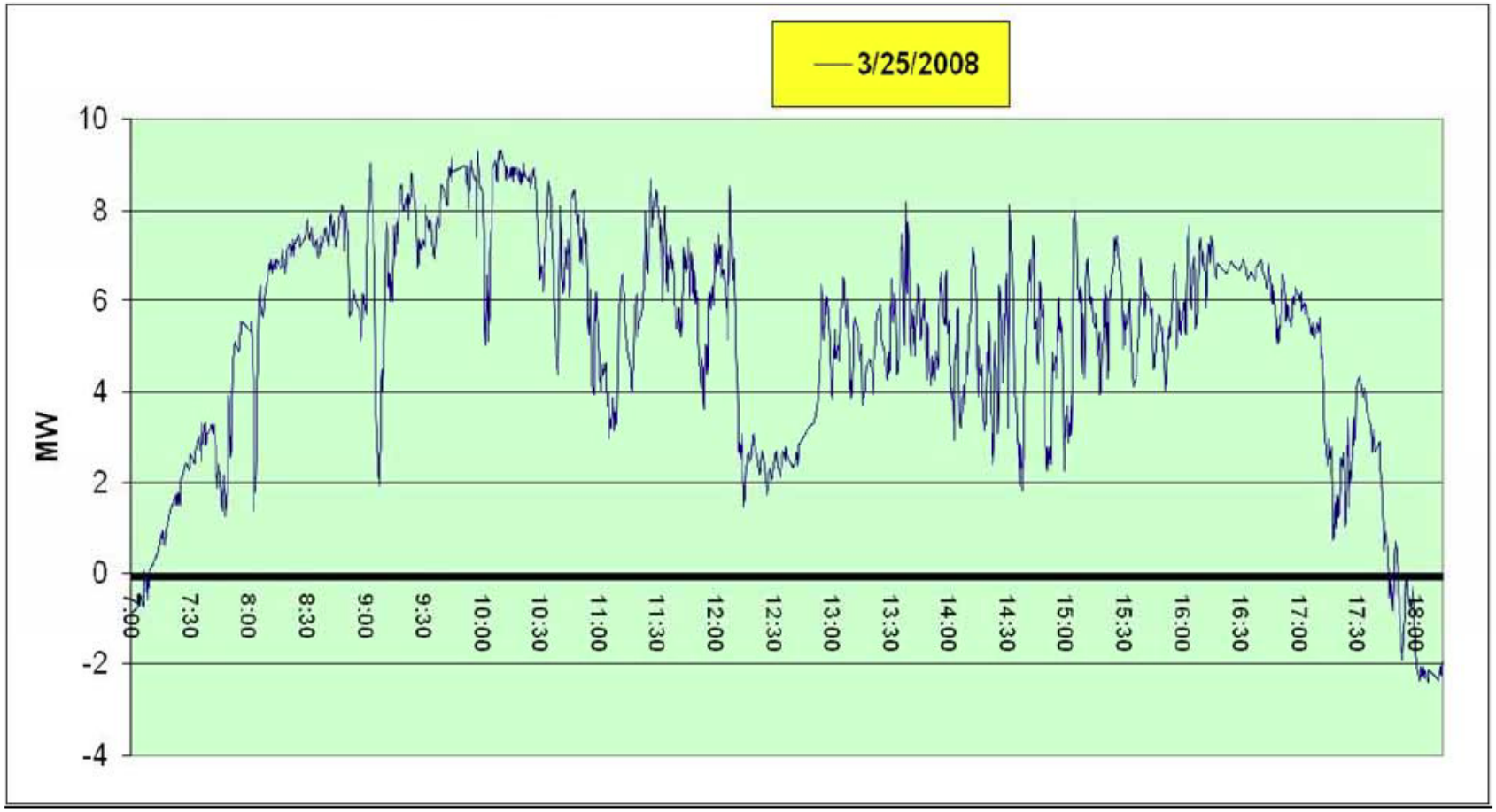
# Solar PV Output (Partly Cloudy Day)

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# The next wave of product development in markets and will be the A/S markets

*"According to NERC's 2008 Long-Term Reliability Assessment, over 145,000 MW of new variable resources are projected to be added to the North American bulk power system in the next decade . . . represent[ing] one of the largest new resource integration efforts in the history of the electric industry."*

NERC Special Report: "Accommodating High Levels of Variable Generation," April 2009

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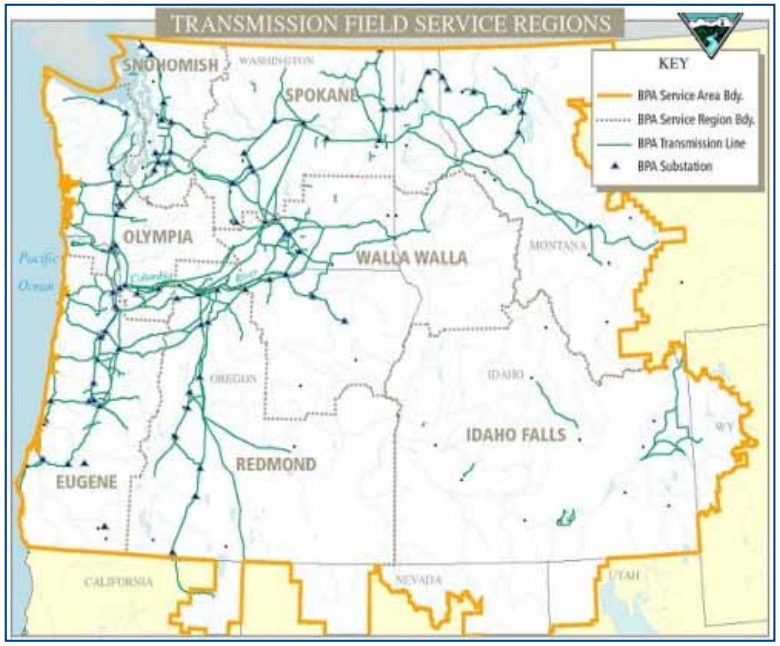
Demand Response
More of this

# Controlling Loads Both Up and Down

## Case Study: Bonneville Power Administration Pilots




Pace of wind power development in the Pacific Northwest is dramatically exceeding expectations, with 3,000 MW online today and another 6,000 MW 'in-process'.

### Demand Response to Balance Wind

**Technology Requirements**

- Automated remote load control
- Real-time interval metering

**Resource Details**

- Capability to provide both load decreases and load increases
- Sub 10-minute notice
- 24/7/365 resource availability

**Pilot Projects**

- Refrigerated Warehouses
- Residential Hot Water Heaters
- Municipal Water Pumps
- Industrial Processes
- Irrigation Pumps

# Increasing Transmission Capacity

## Case Study: DemandSMART™ Alberta - LSSi

### Load Shed Service for Imports (LSSI)

This program:

- Increases the transmission capacity of the Alberta-B.C. intertie
- Mitigates extreme electricity price fluctuations
- Potentially lowers cost of electricity
- Empowers participating businesses to manage their energy usage in real-time self-scheduling tool

**EnerNOC manages a portfolio capable of responding to grid signals within 0.2 seconds.**

**Technology Requirements**

- Under-frequency Relays (UFRs) at each site to detect if grid frequency drops below 59.50 Hz
- Real-time interval metering
- Self-scheduling platform using online DemandSMART™ application

**Resource Details**

- Capability to manage within an hourly average load band of 95% to 120% of an offered volume
- Sub-second notice
- 24/7/365 resource availability

**Pilot Projects**

- Energy and Mining Facilities
- Manufacturing and Mills
- Industrial Processes and Supply

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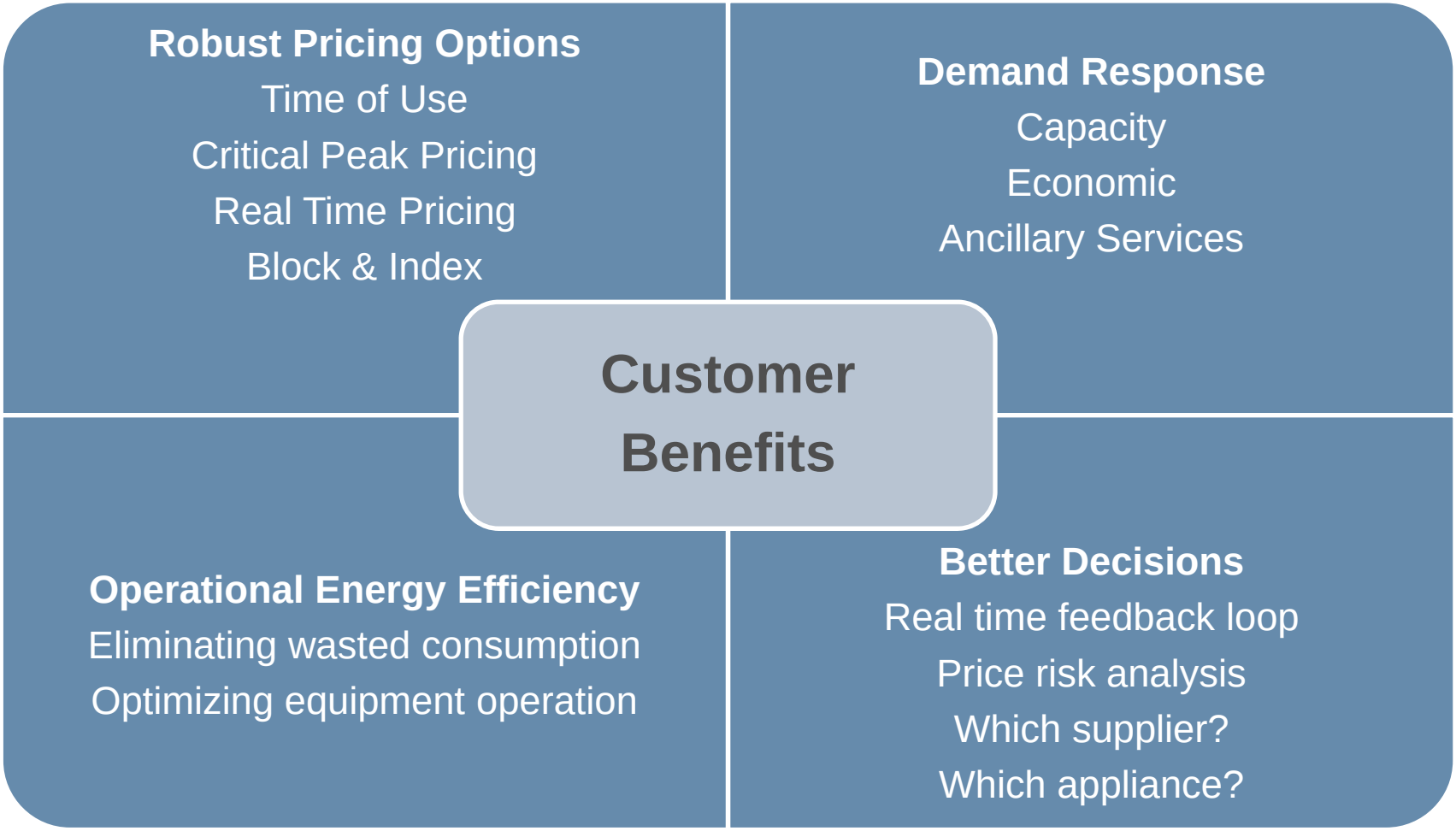
# Regulatory focus should be on getting benefits to customers

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