Jon Wellinghoff, Commissioner
Federal Energy Regulatory Commission
May 24, 2007

2007 Second Annual IRC Board Conference
Gas Prices Near Historic High
Households Fill With “Connected” Electronic Equipment
Electric Demand Up 19% Over Next 10 Years, While Supply Increases Only 6%.
Electric Generation Prices Rise With Price of Natural Gas
Global Climate Change Threatens Coastal Cities
University Reducing Energy Use and Finding Hidden System Inefficiencies
Best Buy to Sell "Digital Home in a Box" to Control Energy Costs
Major Utility Proposes “Save-a-Watt” Program for All Customers
The World’s Most Complex Machine

953 GW Generation
351,000 Miles Transmission
21,688 Substations
Electricity Margins Projected Below Minimums

**Areas Needing Additional Resources**
- XXXX/YYYY – 1st year additional resources needed
- XXXX – beyond current projections
- YYYY – beyond uncommitted resources

**Regions**
- **WECC Canada** 2008/2009
- **MRO** 2009/2015+
- **Rocky Mtn** 2007/2015+
- **ERCOT** 2008/2013
- **New England** 2009/2011
- **ReliabilityFirst** 2008/2013
Current NOAA Forecast
Wide-spread Summer Heat

3-Month Outlook
Temperature Probability
1.5 month lead
Valid JJA 2007
Made 04/19/07

EC = Equal Chances for A, N, B
A = Above
N = Normal
B = Below
Summer 2007 Forward Prices
Now Higher Than Summer 2006 Prices

- **Southern California**: $93.35/MWh +29%
- **Northwest (Mid C)**: $75.00/MWh +23%
- **Massachusetts Hub**: $95.75/MWh +25%
- **New York City**: $134.00/MWh +20%
- **PJM Western Hub**: $102.50/MWh +19%
- **Midwest ISO**: $82.75/MWh +30%
- **Texas (ERCOT)**: $103.50/MWh +32%
- **Henry Hub (Gas)**: $8.11/MMBtu +21%

*Western prices are for 3rd quarter.
Sources: Platts for forward electricity prices for July and August 2007, NYMEX and ICE for gas. All prices effective 5/11.
Grid Efficiency - Physical & Regulatory Challenges

★ Limited Efficiency
- Carnot Cycle
- Thermal Resistance

★ Structural Costs
- T&D Investment
- Line & Transformer Losses
Electric Loading/Planning Order

★ Distributed Resources as “First Fuel”
  • Demand Response (Price Induced Change in Use of Energy that Reduces Load on Peak)
  • Energy Efficiency (From Generator to Load)
  • Distributed Generation (CHP)
  • Distributed Renewables (Geothermal, Wind, PV, Biomass, LFG, Small Hydro, In Stream Hydro, Wave Power)

★ Central Station Fossil Fuel Generation as “Second Fuel”
  • Natural Gas Combined Cycle
  • Coal w/Sequestration (Zero CO2)
Distributed Resources Make Sense as the “First Fuel”

- Economic Benefits (Lovins- Small is Profitable)
- Reliability Benefits
- Siting Benefits
Distributed Resources Make Sense for Reliability & Security

Worldwide Disasters 1900-2005
Distributed Resources Are Under Utilized

★ Economic Barriers
  • Ratebase Recovery (30 yr) vs. Market Recovery (Next Quarter)
  • Exclusion from Markets
  • Split Incentives in Lease Space

★ Institutional Barriers
  • Lack of Information
  • Lack of Industry Infrastructure
  • Regulatory & Industry Bias
Demand Response - 2005 EPAct

★ “Timed Based Pricing & Other Demand Response Shall Be Encouraged”
★ “Deployment of DR Technologies Shall Be Facilitated”
★ “Unnecessary Barriers to Demand Response Shall be Eliminated”
★ FERC- Section 1223 Directed to Promote Efficient Transmission Investments
  • List of 19 Items Includes DR/DG/Storage/ PV
Demand Response Should Be Allowed To Participate On a Comparable Basis- Order 890:

- Energy Markets- Real Time and Day Ahead
- Capacity Markets
- Provide Ancillary Services
  - Operating & Spinning Reserves
  - Regulation & Frequency Response
  - Reactive Supply & Voltage control

Be Included in Regional Transmission Planning
Utilized for Maintaining Grid Reliability- Order 493
## ISO Markets and Programs

<table>
<thead>
<tr>
<th>Market Element</th>
<th>NYISO</th>
<th>ISO-NE</th>
<th>PJM</th>
<th>CAISO</th>
<th>MISO</th>
<th>SPP</th>
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<td>Demand Response Market Participation:</td>
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H: History and in place
O: Open dockets and actions
I: Initiatives that are being discussed
Demand Response Critical in 2006

- **Midwest ISO**
  - Abt. 3,000 MW
  - 2.6% of Peak

- **CAISO**
  - 2,066 MW
  - 4.1% of Peak

- **SPP**
  - 70 MW
  - 0% of Peak

- **NYISO**
  - 1,139 MW
  - 2.8% of Peak

- **ISO-NE**
  - 520 MW
  - 1.9% of Peak

- **PJM**
  - 2,050 MW
  - 1.4% of Peak

Sources: RTOs and ISOs, companies, PUCs and NERC
Demand Response Benefits

- PJM Study Shows That a 3% Reduction in Demand of Top 20 Five-hour Blocks in 5 Mid-Atlantic States Could Save $280 Million per Year

- The Brattle Group Estimates That a 5% Reduction in Grid Peak Load (757 GW) Can Result in $3 Billion Savings Annually, for PV Over 20 Years of $35 Billion
Customer Barriers to DR Participation

★ Regulatory
- Wholesale Prices not Communicated to Retail Level
- Lack of Hardware (Meters)
- Lack of TOU Rate Structures
- Wholesale Tariffs That Are not Resource Neutral
- Bar Participation
- Provide Reduced (Unfair) Compensation
- Are Unavailable
- Retail Customers Barred by State from Participation at Wholesale Level

★ Non-Regulatory
- Lack of Information
- Financial / Operational Constraints
Economic Neutrality for Demand Response

★ Beyond- Energy, Capacity, and Ancillary Service Payments
- Payments for Increasing Capacity or Reducing Congestion
- Payments “As If” Demand Response Were a Transmission Investment
Grid Friendly Appliances sense grid frequency excursions & control region’s appliances to act as spinning reserve – No communications required!

Grid Friendly Appliances

Load and Reserves on a Typical U.S. Peak Day

- Industrial: 28%
- Residential (GFA*) : 18%
- Operating Reserves: 13%
- Commercial: 29%
- Resident. (non-GFA): 12%

GFA* potential exceeds US operating reserve requirements!

*GFA for: heat, AC, HW, refrig.
Advanced Demand Response

Zero to 60 in 4 Seconds
250 Miles on a Charge
Vehicle to Grid Capable Now
55 KWh Storage for Wind and/or Peak Reductions
Ancillary Services—Spinning Reserve and Regulation
Potential $2,000 to $4,000 in Payments
$10 Billion Market
The “Cash Back” in CashBack Hybrid

Payments to CBH Owners for Spinning Reserves and Regulation Services. As Much as $2,000 $4,000 per Year.

Cumulative Cost

$50,000

$40,000

$30,000

$20,000

Years After Purchase

$3.00/gal.

$0.094/kWh (2005 average, not off-peak)

LI-ION BATTERIES

Conventional Gasoline

Hybrid

Plug-In

Cash Back Hybrid

Maintenance costs not included, no discount rate applied
CashBack Hybrid Electric System

Benefits

★ Efficient Grid Management
- Ancillary Services (Spinning Reserve & Regulation)
- Dispatchable Reactive Power
- Peak Demand Services (Demand Response)
- Reduced Operating and Planning Reserves
- Distribution/Substation Level Support
- Reduced Line Losses
- Improved Power Plant Efficiency
- Improved Load Factor

★ Storage & Integration of Renewable Power
- Wind & Solar
- Load Following

★ Emergency Power Supply

★ Electric Transit Power Support
ISO/RTO Distributed Resources Optimization

★ Fully Integrate DR Into Markets
- DR Compete to Establish Market Clearing Price
- DR Compete to Provide Ancillary Services
- Comparable Payment for Comparable Service
- Establish Interoperability Criteria, Communication, M&V, and Settlement Protocols to Facilitate DR Participation

★ Fully Integrate DR Into Planning
- Actively Seek DR Proposals
- Request DR Estimates From Industry Providers
- Use “Comparable” Data Sources for Forecasts

★ Actively Involve DR Providers in Stakeholder
ISO/RTO DR Optimization Challenge

★ Examine Best Practices to Integrate DR Into Markets, Operations, and Planning
★ Fully Inventory Your Region’s Configuration of Existing and Potential DR
★ Establish Goal of Performance Comparable in Function and Value to Best Practices for Distributed Resources in All Markets and Operations for:
  - Market Access and Compensation
  - Communication and Interoperability
  - Interface with Retail Programs and State Policies
  - M&V
  - Incorporation into Planning Processes as Viable Compliments and/or Alternatives
  - Forecasting Impacts and Availability
  - Stakeholder Participation
  - Economic Comparability with Supply Side Resources
Questions?