Demand Side Management Programs

Chris Edge
July 20, 2007
What is Demand Side Management?

### DEMAND SIDE MANAGEMENT (DSM)

<table>
<thead>
<tr>
<th>Demand Response</th>
<th>Energy Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direct Load Management</strong></td>
<td><strong>Building Envelope</strong></td>
</tr>
<tr>
<td>Control of customer heating,</td>
<td>Programs, standards and incentives to reduce the</td>
</tr>
<tr>
<td>cooling and appliances.</td>
<td>energy needs of a commercial or residential building</td>
</tr>
<tr>
<td></td>
<td>structure.</td>
</tr>
<tr>
<td><strong>Contractual Load Reduction</strong></td>
<td><strong>Infrastructure/Equipment</strong></td>
</tr>
<tr>
<td>Agreements to reduce load upon</td>
<td>Programs, standards and incentives designed to promote</td>
</tr>
<tr>
<td>notification, normally applicable</td>
<td>the adoption of more efficient heating, cooling and</td>
</tr>
<tr>
<td>to large industrial companies</td>
<td>appliances.</td>
</tr>
<tr>
<td><strong>Voluntary Price Response</strong></td>
<td></td>
</tr>
<tr>
<td>Customer demand reduction in</td>
<td></td>
</tr>
<tr>
<td>response to fixed or dynamic</td>
<td></td>
</tr>
<tr>
<td>pricing signals.</td>
<td></td>
</tr>
<tr>
<td><strong>Education/Awareness</strong></td>
<td></td>
</tr>
<tr>
<td>Overall programs aimed at increasing</td>
<td></td>
</tr>
<tr>
<td>energy issues and changing customer</td>
<td></td>
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<tr>
<td>behaviors.</td>
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*Progress Energy*
Meeting Demand

- Baseload Generation
- Intermediate Generation
- Peaking Generation

Time of Day: a.m.  p.m.
Existing Programs

1,000 MW of Existing Generation Displacement

Price Response
- System and Load Management
- Energy Conservation Programs

Time of Use Rates
- Real-Time Pricing
- Thermal Energy Storage

Large Load Curtailment
- Voltage Reduction

Home Energy Check
- ENERGY STAR homes
- Energy efficiency financing
## Existing Demand Response Programs

<table>
<thead>
<tr>
<th>Price Response</th>
<th>System (Participants)</th>
<th>Western Region (Participants)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential TOU</td>
<td>28,952</td>
<td>1,539</td>
</tr>
<tr>
<td>C&amp;I TOU</td>
<td>24,944</td>
<td>2,077</td>
</tr>
<tr>
<td>Thermal Storage</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interruptible</th>
<th>System (Participants / MW)</th>
<th>Western Region (Participants / MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load Curtailment</td>
<td>58 / 319 MW</td>
<td>3 / 3.6 MW</td>
</tr>
</tbody>
</table>
# Existing Energy Conservation Programs

<table>
<thead>
<tr>
<th>Residential</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 5% energy discounts</td>
<td>- Energy Profiler online</td>
</tr>
<tr>
<td>- Home Energy Check</td>
<td>- CurrentLines</td>
</tr>
<tr>
<td>- Energy Star Homes</td>
<td>- Lunch-n-Learns</td>
</tr>
<tr>
<td>- High efficiency financing</td>
<td></td>
</tr>
<tr>
<td>- Builder training</td>
<td></td>
</tr>
<tr>
<td>- HVAC contractor training</td>
<td></td>
</tr>
<tr>
<td>- Education/outreach</td>
<td></td>
</tr>
<tr>
<td>- Community Energy Savings</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PGN Facilities &amp; Fleet</th>
<th>Western Region participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Facilities</td>
<td>Home Energy Checks – 2,700+</td>
</tr>
<tr>
<td>- Load curtailment</td>
<td>5% Discount – 19,528</td>
</tr>
<tr>
<td>- Alt. energy vehicles</td>
<td>Energy Star Homes – 189</td>
</tr>
</tbody>
</table>
PEC Facilities and Fleet

- Plug-in hybrid Prius
- Additional alternative fuel use and vehicles
- Company-wide computer change out
- Auditing all western NC Progress Energy buildings
Why Are We Here? When Demand > Supply

West Region Supply Resources

2007 Winter Peak Demand

2010 Winter Peak Demand

- Marshall & Walters - Hydro
- Rockport - Purchase
- Marshall & Walters - Hydro
- SEPA - Purchase
- Asheville 4 - Combustion Turbine
- Asheville 3 - Combustion Turbine
- Asheville 2 - Coal
- Asheville 1 - Coal

Megawatts

2007 Winter Peak Demand

2010 Winter Peak Demand

- Marshall & Walters - Hydro
- Rockport - Purchase
- Marshall & Walters - Hydro
- SEPA - Purchase
- Asheville 4 - Combustion Turbine
- Asheville 3 - Combustion Turbine
- Asheville 2 - Coal
- Asheville 1 - Coal

Progress Energy
Program Design Approach

Conduct Market Assessment
- Appliance Saturation Survey
- Personalized Energy Report
Appliance Information & Usage Study

- 13,200 8-page surveys mailed out July 13
- Minimum ending sample of 2,182
- Strata break down:
  - Geography
  - Energy Usage
  - Housing Type (single-family, multi-family, mobile home)
- Develop Residential Information Database
  - End-use devices
  - Customer usage habits
  - Attitudes about energy usages & potential changes
- Final Report & Data Available mid-September
Personalized Energy Report (PER)

- Survey to all Western Region customers with 2+ years of service (approx. 87,000)
- Collects information about energy use
- Sending to homes in Fall 2007
- Will be used to help design additional programs for Western Region
Program Design Approach

Pilot New Concepts & Technologies
- Energy Displays
- Energy Advisor On Loan
- Community Energy Savings
- HVAC Tune-Ups
- Duct Repair & Testing
- CIG Online Audit
- Smart Thermostats

Conduct Market Assessment
- Appliance Saturation Survey
- Personalized Energy Report
Energy Displays

- Offers customers access to information about energy use
- Portable, in-home display provides real-time information about electricity use and the costs of that use
- Program in Canada showed between 1% and 15% reduction
Smart Thermostats

- Deployed 500 Smart Thermostats
- Measure Load Impact over Summer Period
- Analyze Technology
- Evaluate Customer Acceptance
Program Design Approach

**Pilot New Concepts & Technologies**
- Energy Displays
- Energy Advisor On Loan
- Community Energy Savings

**Conduct Market Assessment**
- Appliance Saturation Survey
- Personalized Energy Report

**Solicit Stakeholder Input**
- CEAC
- Trade Allies, Vendors, Utilities

**Integrate Evaluation Methods**
- Impact Evaluation
- Market Transformation
- Process Evaluation

**Benchmark with Industry**
- Survey Landscape
- “Best in Class”
- PEF
Program Guidelines

- **Simple**
  - Ensure that customers can easily understand
  - Make participation easy
  - Evolve to more comprehensive programs

- **Cost-Effective**

- **Well-Managed**
  - Focus on programs that are modular and quick to deploy

- **Adequate service & delivery infrastructure**
  - Maximize benefit from the marketplace
Comprehensive Benchmarking Study

- 2006 comprehensive study to identify best practices across country with respect to program offerings
  - Online databases, publishings, & interviews
  - Identified factors unique to NC and SC

- Identified “best-in-class” programs
  - Potential kW and kWh impact
  - Broken down by Residential & Commercial
  - Additional consideration for “Widely Practiced” vs. “New/Innovative”
Residential Programs Under Development

Demand Response Programs
• Central AC Load Control
• Water Heater Load Control
• West Region Heating Load Control
• West Region WH Load Control
• Critical Peak Pricing Pilot

Energy Efficiency Programs
• HVAC Tune-Up
• Duct Testing & Repair
• High Efficiency HVAC rebates
• Insulation/Air Sealing Upgrades
• CFL’s

New Construction
• Energy Star Builder Rebates
• Energy Star Builder Training

Energy Information & Audits
• In-Home Energy Displays
• On-line Audits
• Walk-Through Audits
• Mail-in Audits
• Personalized Energy Reports
• Energy Education Expositions

Low-Income Initiatives
• Personalized Energy Reports
• Energy Saving Kits
• Low income specific program rebates
Commercial, Industrial, & Governmental Programs Under Development

Demand Response Programs
• Standby Generator Program
• Summer AC & WH Load Control
• Rates

Energy Efficiency Programs
• HVAC Tune-up
• Duct Testing & Repair
• High Efficiency HVAC rebates
• High Efficiency Lighting rebates
• Energy Efficient Motors
• Cool Roof
• Energy Innovation
• Retrofits

Audits, Education & Awareness
• Walk-Through Audits
• Online Audits
• Energy Manager On-Loan Pilot
• Schools Benchmarking Program
• Energy Newsletters
• Energy Profiler On-line

PEC Facilities Initiatives
• Walk –Through Energy Audits
• Generator Load Shed
• Summer AC & Water Heater Control
• Employee Awareness Program
Other Programs Under Development

Intelligent Grid – Phase 1

Alternative Energy Initiatives
• Renewable Education & Demonstration Initiatives
• Fuel Cells & PV
• Plug-In Hybrid vehicles

Future Programs (Under Consideration)
• Water Heater Timer Pilot
• Solar Thermal Water Heating Pilot
• Appliance Recycling program
• Comprehensive Retrofitting Programs
• Premier Power
• Department of Defense Action Plans
  • Summer AC & Water Heater Control for military base housing
Water Heater Control

- Remotely control residential water heaters during times of peak load
- Significant load impact opportunity
  - 0.7 KW – 1.0 KW for Winter Peak Impact
  - 101,400 eligible customers

<table>
<thead>
<tr>
<th>Eligible Customers</th>
<th>If Participation Is…</th>
<th>Impact Would Be…</th>
<th>Technical Potential</th>
<th>Technical Potential Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>101,400</td>
<td>30%</td>
<td>21 MW</td>
<td>100%</td>
<td>71 MW</td>
</tr>
</tbody>
</table>

Progress Energy
### Keys to Success

- **Customer Participation and Commitment**
- **Aggressive Marketing**

<table>
<thead>
<tr>
<th>Utility</th>
<th>Program Details</th>
<th># Participants</th>
<th>Total Residential Customers</th>
<th>Participation Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excel Energy (Minnesota)</td>
<td>A/C Switch</td>
<td>285,000</td>
<td>1,194,000</td>
<td>24</td>
</tr>
<tr>
<td>Excel Energy (Colorado)</td>
<td>A/C Switch</td>
<td>70,000</td>
<td>1,102,000</td>
<td>6</td>
</tr>
<tr>
<td>Madison Gas &amp; Electric</td>
<td>A/C Switch</td>
<td>16,500</td>
<td>116,000</td>
<td>14</td>
</tr>
<tr>
<td>Austin Energy</td>
<td>A/C Stat</td>
<td>53,000</td>
<td>322,000</td>
<td>16</td>
</tr>
<tr>
<td>Otter Tail Power Co.</td>
<td>KW Controller</td>
<td>7,000</td>
<td>101,000</td>
<td>7</td>
</tr>
<tr>
<td>Southern California Edison</td>
<td>A/C Switch</td>
<td>187,000</td>
<td>4,058,000</td>
<td>5</td>
</tr>
<tr>
<td>Louisville Gas &amp; Electric</td>
<td>A/C Switch</td>
<td>80,000</td>
<td>342,000</td>
<td>23</td>
</tr>
</tbody>
</table>

* Source: E Source
** % Based on Total # Res Customers, not eligible customers
## Electric Strip Heat Control

- Remotely control residential heating systems during peak-load periods
  - Cycle strip heat on electric heating systems
- Must balance customer comfort with PEC’s need to control load
  - Avoid participant churn & negative rebound impacts

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<tbody>
<tr>
<td>31,200</td>
<td>30%</td>
<td>14 MW</td>
<td>100%</td>
<td>47 MW</td>
</tr>
</tbody>
</table>
HVAC Tune-Up and Duct Repair

- Prescriptive incentives to make improvements in performance of heating systems
  - Seal leaks in duct systems (permanent)
  - Improve efficiency of electric heating systems by performing maintenance (ongoing)
- Educating consumers and contractors

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</thead>
<tbody>
<tr>
<td>40,300 (Duct Repair)</td>
<td>5%</td>
<td>2 MW</td>
<td>100%</td>
<td>40 MW</td>
</tr>
<tr>
<td>31,200 (Tune-Ups)</td>
<td>5%</td>
<td>0.6 MW</td>
<td>100%</td>
<td>13 MW</td>
</tr>
</tbody>
</table>
CFLs

- Education
  - Savings benefits, longevity, and proper application
- Promotion
  - Community, Retail Partnerships, etc.
- Market Transformation
  - Buy-down programs, coupons, etc.

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<th>Technical Potential</th>
<th>Technical Potential Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>130,000</td>
<td>20%</td>
<td>2.6 MW</td>
<td>100%</td>
<td>13 MW</td>
</tr>
</tbody>
</table>

* Participation Defined as 10 bulbs/household
Western Region
Making It Happen - First Steps

- Education and Outreach
  - Personalized Energy Report
  - Western Region Energy Expo
  - On-line Audit Campaign
- Existing service industry infrastructure
  - Trade ally training & deployment
- Demonstrated programs that address winter-peaking contributors
  - Electric Heating and Water-Heating Control
  - Poorly operating HVAC
  - High leakage and poorly insulated components
  - Inefficient lighting and other appliances
Our Goal

ACHIEVE MAXIMUM CUSTOMER PARTICIPATION AND SAVINGS FROM A SET OF COST-EFFECTIVE DSM PROGRAMS
Save the Watts

Cari Boyce
July 20, 2007