Overview of DSM:
How DSM Works with New Technology; Recent Successes
Chris Ivanov, Leader of Load Forecasting and DSM at PSE

Chris has nearly a decade of electric utility experience both as a consultant and at a utility. He currently provides senior-level consulting and project management services on projects involving load forecasting, integrated resource planning, market and load research, survey creation, and development of spatial forecasts to support long range T&D plans. Prior to coming to PSE, Chris worked at Wisconsin Public Power Inc. (WPPI), a joint action agency serving the municipal systems in Wisconsin. Mr. Ivanov has a Masters in Applied Economics and a Masters in Business Administration.
About PSE

• Power System Engineering, Inc. (PSE) is a **full service consulting firm** for electric utilities.

• The professionals at PSE include engineers, IT and communications experts, utility strategy experts, economists, and financial analysts.

• Our team has extensive experience in all facets of the utility industry.

• Established in 1974 to serve the engineering and technology needs of electric cooperatives.

• Have served more than 250 clients including distribution cooperatives, G&Ts, municipal utilities, and IOUs.

• 100 % employee owned and managed.

• About 55 employees with offices in Wisconsin, Iowa, Ohio, Minnesota, South Dakota, and Indiana.

• PSE is independent:
  
  o PSE is a 100 % independent consulting firm with no sales ties or marketing affiliations with any vendors.
  
  o PSE is NOT a value-added reseller (VAR) of any software, hardware or services from any supplier.
  
  o Our entire business model is based on being an agent, advocate, resource, and technical advisor to our clients.
## PSE Services

### Utility Automation
- Technology Work Plans
- Integration, Testing, Training and Support
- Information Management
- Substation and Distribution Automation
- Strategic Planning
- Consulting and Procurement services on SCADA, AMI/AMR, OMS, GIS, CIS, and others

### Economics & Research
- Load Forecasting
- Statistical Performance Measurement (Benchmarking)
- Market & Load Research
- Energy Efficiency
- Demand Side Management (DSM)
- Value of Service
- Other Economic Studies

### Rates & Financial Planning
- Revenue Requirement Studies
- Class Cost of Service Studies
- Rate Design
- Key Account Services
- Rate Comparisons & Competitive Assess.
- Strategic & Financial Planning

### Communications
- Strategic Comm. Planning
- Technology Assessments: Private vs. Commercial
- Land Mobile Radio Design
- Radio Path & Propagation Studies
- Fiber WAN Design & Procurement
- GIS Mapping & Integration of Communication Assets
- Microwave & Fixed Data Design & Procurement

### Engineering & Design
- System Planning Studies
- Distributed Generation Strategies
- Transmission Studies
- Power Factor Correction Studies
- System Loss Evaluation
- Substation Design
- Line Design
# Agenda

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Definition of Demand Response

DOE and FERC: “Changes in electric usage by end-use customers from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at a time of high wholesale market prices or when system reliability is jeopardized”
3 Major Ways to Change Consumer Usage

1. Offer a **price signal incentive**
   - Dynamic Pricing (CPP, PTR, RTP)
2. Sign them up for **direct load control** (AC, WH,)
3. **Customer engagement** and education on in-home energy use conservation and cost savings.
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</table>
Why Should Cooperatives Promote Demand Side Management (DSM)?

- To reduce future power costs
- Members want it
- To provide most competitive electric technologies
- To reduce member costs for:
  - Heating and Cooling
  - Hot Water
  - Refrigeration
  - Lighting
  - Farm Operations
  - Motor Load
  - Other Significant Load
- To optimize new generation additions
- To reduce future emissions
- External mandates
What’s Holding Us Back?

- Lack of clear objectives
- Rate impact concerns from reduced sales
- Expensive, time-consuming programs with long paybacks
- Futility—we can’t eliminate all new generation by implementing EE/DR
- Flat load shapes create DR implementation times that are too long (control periods are too long)
Successful DSM Programs

Distribution costs may actually be higher, but:

⇒ Lower power supply costs
⇒ Lower Tx capacity costs
⇒ Lower Dx capacity costs
⇒ More engaged and satisfied customer base
Question: “What Programs Should We Do?”

A cost-benefit analysis is required to properly answer this.

Example programs:
1. Peak-Time Rebate (PTR)
2. Water Heater Load Control
3. Smart Thermostat
4. Time-of-Use Rates
5. Energy Efficiency Rebates
6. Customer Engagement (conservation)
7. Distribution Automation
Questions to Be Answered

1. What program should we do?
   - YES: Cost-Benefit Analysis (best estimates)
   - No or Not Yet: Consider alternatives or wait for more information

2. How best to implement it?
   - Incentives? Timing? Recruitment?

3. What results are we actually getting?
   - M&V Analysis

4. How can we improve the program?
   - Concentrate recruitment? Expand it? Keep it as is? Shut it down?

Update Cost-Benefit Analysis

Re-examine program with updated impacts and inputs
Major Drivers of the Cost/Benefit Analysis

What are some of the key factors that significantly influence the outcome of the cost/benefit analysis?

1. Anticipated power supply situation.
2. Known risk of the market and transmission and distribution constraints.
3. Participant penetration and marketing costs.
4. Peak load shift.
5. Incentives impact. Price elasticity.

These assumptions fundamentally drive the conclusions.
Understand your Utility’s Energy Sales Profile

Sample Energy Profile

- Residential and Small C&I dominate energy sales.
- Irrigation has grown quickly – fuel switching due to oil and gas prices?
- Sales for Resale – Others reported first in 2008 (9,300 MWh).

2008 Energy Sales

- Residential: 42.3%
- Irrigation: 19.4%
- Small C&I: 31.4%
- Large C&I: 5.5%
- Public St & Hwy Lighting: 0.3%
- Sales for Resale - Others: 1.1%

SSVEC Energy Sales by Class (1995-2008)
Understanding the Utility's Peak Demand

Sample Non-Coincident Peak 1995 to 2008

Demand (kW)

- 250,000
- 200,000
- 150,000
- 100,000
- 50,000

Goal Setting

- Very important

Figure 3.2

Which of these might be best for your system?
Which of these might be best for your members?
Typical Cooperative Roles

G&Ts

Distribution Co-ops

Member Choices

- **How Many kWh to Use**
  - EE Tech Data
  - EE Education
  - Rates
  - Bills
  - Incentives
  - Member Services
  - Vendor Education

- **When to Use Those kWh**

- **Load forecasts**
- **Power supply plan**
- **Avoided costs**
- **Rate signals**
- **EE Technology**
- **Marketing**
- **Regulatory Interface**
- **Consulting**
Major Cost Categories

• Technology & equipment investments
• Annual maintenance and replacement of failed equipment
• Marketing & participant education costs (mailers, website upgrade, phone calls, materials to participants)
• Internal training
• Data gathering, storing, billing, etc… (who is in the program, survey data, opt-outs, interval data)
• Evaluation, measurement, and verification (EM&V)
• Incentives and rebates
Major Benefit Categories

• Power supply savings
• T&D capacity savings resulting from a lower load factor
• Lower system line losses
• Improved customer satisfaction?
• Better reliability?
Different Parties Affected Differently by DSM

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Total Resource</th>
<th>Power Supplier</th>
<th>Member</th>
<th>Participants</th>
<th>Non-Participant</th>
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<td>Avoided Capacity/ Increased Sales</td>
<td>Load Mgt Credits</td>
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<td>Reduced Wholesale Revenue</td>
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<td>Program Costs</td>
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<td></td>
<td>Installed Equipment Costs</td>
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Net Benefits | 1.5 | 0.0 | 0.0 | 1.0 | 0.5

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DR Stages

Feasibility
- Technology Readiness
- Technically Possible
- Economic Potential
- Cost/Benefit at Dx Level
- **End Goal: Decision on How to Proceed with Pilots**

Pilot
- Set Goals
- Pose Key Questions
- Design Program
- Evaluate Results
- **End Goal: Determine Optimal Deployment Strategy**

Deployment
- Develop Strategy
- Continue to Evaluate and Improve
- **End Goal: Maximize Program Value for a G&T and its Members**
Demand Response

Stimulate consumers to alter consumption habits
Rate Design Options

- Load Management Rates
- Dynamic Pricing
  - Real-Time Pricing (RTP)
  - Time of Use (TOU)
  - Peak Time Rebate (PTR)
  - Critical Peak Pricing (CPP)
  - Critical Peak Pricing w/Time of Use (CPP/TOU)
- Other alternatives
Dynamic Pricing

- Billing for electricity according to when it is used.
- Provides an incentive to reduce consumption during peak times, but relies on customers to take action.
- Requires integration of capable metering, billing, device automation, communications and data management systems, i.e. early stage smart grid.
- End goal is to better align the cost of producing and transmitting electricity with the retail price charged to customers.
Endless Possibilities with Dynamic Pricing

What programs should we pilot that may fit best with the utility’s circumstances?

Purpose of a pilot is to figure out what to deploy system-wide and how.
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### Why Cooperatives are Deploying AMI

**Answer:** To overcome the shortcomings of AMR and gain the added functionality and real time measurement benefits of AMI.

- Connect/disconnects
- Capacitor switching
- Load management (LM)
- Critical peak pricing (CPP)
- Demand response
- Outage detection
- Real time voltage readings
- Distribution automation (DA)

- Tamper/theft detection
- Rate and service limiting
- Pre-pay
- On demand reads
- Track phase changes
- New meters are more accurate than old mechanical meters
AMI: Beyond Meter Reading

We all know that AMI can read meters with no human intervention. But what else can it do to impact reliability and operational efficiency?
Creating the Communications Architecture

Tier 1: Blue
Tier 2: Green
Tier 3: Red
Observed Departmental Benefits of AMI

Why Deploy AMI?

Overall Integration: 7%

Meter Reading: 34%

Operations: 20%

Engineering Analysis: 29%

Customer Service: 10%
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Peak Time Rebate Overview

• Conducted with much lower technology costs – send out peak time rebate via text message, email, or voice mail from an IVR.

• With objectives to obtain a smaller amount of kW shift (i.e., 0.2 to 0.4 kW) but have a high number of participants.

• Pay rebate to consumers for actual load reduction (set rebate equal to or below power supply savings).

• Conduct a tolerable amount of peak periods per season.

• No one pays a penalty if they don’t shift their load
Peak Time Rebate Overview

• Designed to shift the cost or demand peak
• Conduct a tolerable amount of peak periods per season, such as < 20 per summer
• Conducted during hours when customers are home i.e., 3 p.m. to 8 p.m.
• Targeting loads that customers can shift to lower cost periods:
  – Air/heat
  – Dishwasher
  – Washer/Dryer
  – Other household load sources
Initial Thoughts on Peak Time Rebate (PTR)

- Pay rebate to consumers for actual load reduction (set rebate equal to or below power supply savings).
- Each customer’s own kW is “baselined” and compared to their peak days.
Sample Example: Peak Time Rebate Program Pilot

- **Objectives:** Conduct a pilot to determine the level of kW shift that will occur with a summer PTR pilot

- **Pilot Overview:**
  - Midwest Utility
  - PSE conducted a PTR impact evaluation for a pilot run during the summer of 2011.
  - Recruitment effort resulted in a 20% sign-up rate
  - Rebate amount of $1.00 per kW shifted during 4-hour period (determined by PSE regression Customer Base Line calculations)
  - Utility realized a 0.3 kW reduction per participant (~10% decrease)
Heartland PTR

- Kansas Cooperative with about 10,000 members

- [http://www.youtube.com/watch?v=CxOu3RN41UA&context=C4f08c1cADvjVQa1PpcFOvv7bk-ZTxHl9oHdo_GsmvBCsP7GSVgBw](http://www.youtube.com/watch?v=CxOu3RN41UA&context=C4f08c1cADvjVQa1PpcFOvv7bk-ZTxHl9oHdo_GsmvBCsP7GSVgBw)
Advantages and Disadvantages of PTR

Advantages:

– Consumers cannot be harmed by program.
  • Drastically increased participation rates possible.
  • Should help customer satisfaction.
– No change in rate design is necessary.
– Rebates can be set to financially benefit both participants and the utility (all members).

Disadvantages:

– Less incentive for consumers to reduce load relative to a Critical Peak Pricing (CPP) program (just the carrot, not the stick).
– Need to estimate customer baseline load.
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Critical Peak Pricing

- Rate structure that prices peak capacity or energy costs into “critical” peak hours.
  - Consumers notified ahead of peak.
  - Peak hours often are pre-determined, i.e. 4-hour window.
  - Typically 40-80 hours per year.
  - Retail per kWh price may be 4 up to 10 times higher than standard rate.
  - Can include or exclude Time-of-Use.
  - Increase success/efficiency if coordinated with power supplier.
  - Are typically offered as voluntary or pilot programs.
### Example of CPP Rate Design

<table>
<thead>
<tr>
<th>Rate Period</th>
<th>Present Rate (per kWh)</th>
<th>New Rate (per kWh)</th>
<th>% of Annual Time on Each New Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off Peak</td>
<td>$0.09</td>
<td>$0.065</td>
<td>85%</td>
</tr>
<tr>
<td>Peak</td>
<td>$0.09</td>
<td>$0.11</td>
<td>14%</td>
</tr>
<tr>
<td>Super Peak</td>
<td></td>
<td>$0.45</td>
<td>1%</td>
</tr>
</tbody>
</table>

Published in the January 2008 NRECA CRN Report, *AMI: Value Beyond Meter Reading*
• SVE won a ARRA DOE Investment Grant that partially funded a system-wide AMI deployment
• SVE wanted to use the investments to impact peak demands when wholesale power costs were the greatest
• PSE and SVE partnered to develop a CPP pilot
A process is needed for all types of projects - from small... to large.
Why a Pilot Program?

1. Internal Learning Process Prior to Full Deployment
2. Get specific data for your system:
   – Weather
   – Customer class make up
   – Avoided costs (Power Supply, Wholesale, T&D)
   – Customer reaction
   – Geographic differences
   – Appliance saturations
3. Provide “proof of concept” to stakeholders
Overview of Steps in a DR Pilot

Step 1: Define program goals and objectives based on circumstances

Step 2: Program selection using cost/benefit analysis and goals from step 1

Step 3: Equipment procurement and data reporting plan

Step 4: Design pilot program rules (e.g. test groups, incentive amounts)

Step 5: Determine statistically adequate sample size for test/control groups

Step 6: Sample selection (representative of your system adjusting for variance)

Step 7: Data review and baseline determination (control group)

Step 8: Recruitment effort (fill up your test groups, test different marketing strategies)

Step 9: Enrollment survey and survey control group

Step 10: Explain program to participants, provide them with information (refrigerator magnets?)

Step 11: Program execution

Step 12: Post-Pilot Survey

Step 13: M&V of the program results

Step 14: Program adjustment based on M&V results (test a new variable and/or optimally deploy based on results)
### CPP Rate Design

- Residential accounts broken into two rate classes
  1. Residential
  2. Farm and Rural Residential
- Pilot tested the reactions of 3 groups within each rate class (Opt-out, Opt-in, Information-only)

<table>
<thead>
<tr>
<th>Residential &amp; Rural Residential Consumers with Smart Meters</th>
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<tbody>
<tr>
<td><strong>Test Group I</strong></td>
</tr>
<tr>
<td>CPP Rate (non-voluntary)</td>
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<tr>
<td>Energy Usage Info</td>
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</table>
Critical peak events charged at 50 cents per kWh

<table>
<thead>
<tr>
<th>Farm and Rural Residential Rates</th>
<th>Default</th>
<th>CPP</th>
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<tbody>
<tr>
<td>Single Phase</td>
<td>$30.00</td>
<td>$30.00</td>
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<tr>
<td>Multi Phase</td>
<td>$60.00</td>
<td>$60.00</td>
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<tr>
<td>First 500 kWh</td>
<td>$0.1038</td>
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<td>Next 1,000 kWh</td>
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<table>
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</tr>
<tr>
<td>First 500 kWh</td>
<td>$0.0915</td>
<td>$0.0689</td>
</tr>
<tr>
<td>Excess kWh</td>
<td>$0.0746</td>
<td>$0.0562</td>
</tr>
<tr>
<td>Critical Peak kWh</td>
<td>N.A.</td>
<td>$0.5000</td>
</tr>
</tbody>
</table>
Sample Size of Test and Control Groups

- You want a sample size large enough to econometrically test and produce statistically significant results (Power Factor Analysis).
- You want to have groups that reflect your entire system.
  - The pilot needs to be scalable to a system-wide deployment.
Sample Allocations and Sizes

Stratified random sampling (with adequate sample size) will enable test groups to be reflective of entire system

- Important for future business cases and in understanding pilot results
- Stratified random sampling reduces sampling error by as much as 300%

<table>
<thead>
<tr>
<th>Annual kWh Range</th>
<th># of Participants</th>
<th>% Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 – 12,000</td>
<td>47</td>
<td>31.9%</td>
</tr>
<tr>
<td>12,001 – 18,000</td>
<td>23</td>
<td>15.5%</td>
</tr>
<tr>
<td>18,001 – 28,000</td>
<td>42</td>
<td>28.4%</td>
</tr>
<tr>
<td>28,001 – 125,000</td>
<td>36</td>
<td>24.2%</td>
</tr>
</tbody>
</table>
Important Step is Enrollment Survey

• Important to test how different market segments react to program
  – Who likes it? Who responds to it through higher demand reductions?
  – Those with AC/Electric heat, those with “green” attitudes, etc…

• This will be key to an optimal deployment in the future
## Enrollment Survey Data

- Good survey response from SVE participants

<table>
<thead>
<tr>
<th>Sample</th>
<th>Test Group</th>
<th>Surveys Sent</th>
<th>Surveys Returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>CPIIRS</td>
<td>110</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>CPVRS</td>
<td>110</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Tech Only</td>
<td>110</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Farm and Rural Residential</td>
<td>CPIRFR</td>
<td>175</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>CPVFR</td>
<td>175</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Tech Only</td>
<td>175</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>855</td>
<td>313</td>
</tr>
</tbody>
</table>
Regression Evaluation Methods

• Compare hourly expected demand to actual demand
• Expected demand is a function of climate changes, event, participant characteristics, etc…
Evaluation of Program Impacts

• Developed two types of models to test the 13 critical peak events during the 2011 summer

  1. Fixed effects model: Most trustworthy specification for getting “average” impacts across heterogeneous accounts, but cannot include time invariant information (i.e. survey data)

  2. Random effects model: Enables the survey data to be incorporated into the analysis, allowing the impacts of variables such as “green” or “air conditioner present” to be included in the estimates

• All models included variables for weather, hours of the day, peak events
Fixed Effects Estimates

- Voluntary (opt-in) groups had largest reactions, followed by involuntary (opt-out), followed by the information-only

- All groups reduced usage at a statistically significant level during peak events

<table>
<thead>
<tr>
<th>Test Group</th>
<th>Baseline kW</th>
<th>kW Impact</th>
<th>% impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Farm Rural</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involuntary</td>
<td>5.71</td>
<td>-0.17</td>
<td>-3%</td>
</tr>
<tr>
<td>Voluntary</td>
<td>6.82</td>
<td>-1.28</td>
<td>-19%</td>
</tr>
<tr>
<td>Tech-only</td>
<td>5.20</td>
<td>-0.13</td>
<td>-2%</td>
</tr>
<tr>
<td><strong>Residential</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involuntary</td>
<td>3.07</td>
<td>-0.41</td>
<td>-13%</td>
</tr>
<tr>
<td>Voluntary</td>
<td>3.51</td>
<td>-0.85</td>
<td>-24%</td>
</tr>
<tr>
<td>Tech-only</td>
<td>3.33</td>
<td>-0.21</td>
<td>-6%</td>
</tr>
</tbody>
</table>

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Impacts by Hour for Residential Rate Class

- Events began at hour 16 and ended at hour 19
Impact of “green” attitudes is a significant driver in the involuntary test group and in the information-only group.

<table>
<thead>
<tr>
<th>Model Type</th>
<th>Farm Rural</th>
<th>Residential</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Involuntary</td>
<td>Voluntary</td>
</tr>
<tr>
<td>FE Model</td>
<td>-0.17</td>
<td>-1.28</td>
</tr>
<tr>
<td>Average Green with AC</td>
<td>-0.08</td>
<td>-1.06</td>
</tr>
<tr>
<td>Minimum Green with AC</td>
<td>0.47</td>
<td>-0.98</td>
</tr>
<tr>
<td>Maximum Green with AC</td>
<td>-0.32</td>
<td>-1.13</td>
</tr>
<tr>
<td>Difference in Max to Min Green</td>
<td>-0.79</td>
<td>-0.15</td>
</tr>
</tbody>
</table>
Advantages and Disadvantages of CPP

Advantages:

– Largest incentive to change behavior.
  • Depends on ratio and enabling technology.
– Will gain consumer attention.
– Can result in cost savings if optimizing rate plan.

Disadvantages:

– Consumers can be harmed by this rate if they don’t shift their peak.
– Need new rate design to assure revenue stability.
Critical Peak Pricing vs. Peak Time Rebates

• Peak Time Rebate Advantages:
  – Easier to understand than critical peak pricing.
  – Risk-free to consumers, hence less risk of negative press, set rebate amounts to have a “win-win” for participants and the utility (non-participants).
    • More customers are likely to participate, leading to higher possible system-wide load reduction.
  – No need to change basic rate design.

• Peak Time Rebate Disadvantages:
  – Requires “baseline” calculations which can be somewhat complex to explain (although not too expensive to calculate once it is set up).
<table>
<thead>
<tr>
<th>#</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>What is Demand Side Management (DSM)?</td>
</tr>
<tr>
<td>2)</td>
<td>Why and How to Do DSM</td>
</tr>
<tr>
<td>3)</td>
<td>Demand Response Focus</td>
</tr>
<tr>
<td>4)</td>
<td>Enabling Technology AMI</td>
</tr>
<tr>
<td>4a)</td>
<td>Peak Time Rebate Case Study: Heartland REC</td>
</tr>
<tr>
<td>4b)</td>
<td>Critical Peak Price Case Study: Sioux Valley REC</td>
</tr>
<tr>
<td>4c)</td>
<td>Direct Load Control: Overview of Changes with AMI</td>
</tr>
<tr>
<td>5)</td>
<td>Conclusions: When and Where</td>
</tr>
</tbody>
</table>
Direct Load Control

• As you know, these are not new programs. Many cooperatives have had these programs since the 1980s.

• Control appliances typically could be:
  – Water heaters
  – AC units
  – Space heat
  – Irrigation

• What is new with direct load control?

Historically, load management has been provided over One-Way PLC, VHF Radio, and Commercial Paging Technology.
Typical Direct Load Control Impacts

• AC and WH impacts depend on climate
• Program potential also depends on appliance saturation rates

• AC impacts typically between 0.4 - 0.7 kW (assumes 33%-50% cycling)
• WH impacts typically between 0.4 - 0.7 kW
Load Control & Demand Response Direct via PLC

LCS = Load Control Switch

Beat the Peak device plugs in a wall outlet and does not require professional installation.

LCS requires professional installation.
Load Control & Demand Response with Wireless AMI

LCS = Load Control Switch

Utility

AMI Server

Smart Thermostat

LCS

Web Portal

Meter AMI Gateway to ZigBee HAN

Wireless AMI Network

Internet

AMI Network

ZigBee HAN

Internet
Advantages and Disadvantages of Load Control

Advantages:

– More “reliable” or hard peak reduction.
– Consumers have nothing to do except sign-up.
– Ability to offer incentives up-front.
– Total demand impact more consistent than programs depending on customer decision to participate for each period of control.

Disadvantages:

– Loss of control by consumers (“Big Brother” concerns).
– Consumers could be inconvenienced and upset by control.
– Secondary peaks (when turning loads back on) must be monitored.
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In order to determine when and where: Management will want to know...

1. How much DR is technically and economically feasible?
2. How much is reasonably achievable in 3 years?
3. How best to proceed to pilot stage?
4. Are there any geographic advantages?

End goal: Benefit the service territory as much as possible.
Summary

With limited time and financial resources, what should we do? And... how best to do it?

Cost-benefit analysis is a great tool!

- Helps answer this for various stakeholder perspectives
- Helps evaluate the design/incentives
- Helps identify potential
- Helps determine what and how to pilot
PSE Suggestions

• Do A few programs well
• Establish realistic goals tied to potential
• Monitor results against goals and assumptions
• Adapt goals and incentives as you learn
• Establish clear baselines when developing savings estimates
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