Welcome

Conservation Applied Research & Development (CARD) Webinar

December 5, 2018

The Electrified Frontier: Sharing Results from Stakeholder Interviews
The Electrified Frontier: 
Sharing Results from Stakeholder Interviews

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Webinar Basics

- Attendees in listen-only mode
- Type your questions into Q&A box
- Questions addressed at end
- Webinar recorded & archived

Chat box contains URLs for handouts

Enter Questions in Q&A box
Send Question to All Panelists

Click “?” Icon to get the Q&A box to popup below
• Purpose - to help Minnesota utilities achieve 1.5% energy savings goal by:
  • Identifying new technologies or strategies to maximize energy savings;
  • Improving effectiveness of energy conservation programs;
  • Documenting CO₂ reductions from energy conservation programs.

  Minnesota Statutes §216B.241, Subd. 1e

• Utility may reach its energy savings goal
  • Directly through its Conservation Improvement Program (CIP);
  • Indirectly through energy codes, appliance standards, behavior, and other market transformation programs.
CARD RFP Spending by Sector thru June 2018 (FY2018)

- 9 funding cycles
- Over 420 proposals
- 107 projects funded
- Almost $24.5 million in research

- Multi-sector (26), 24.6%
- Commercial (41), 36.6%
- Agricultural (6), 3.4%
- Residential 1 - 4 unit (18), 20.4%
- Industrial (11), 7.8%
- Multifamily 5+ unit (5), 7.2%
• Department order issued in 2005 prohibits inclusion of targeted fuel-switching projects in CIP.

• Department guidance issued in 2012 provided exception:
  • Electric utilities may provide direct space heating and domestic hot water energy savings measures to low-income delivered fuel customers and low-income small gas utility customers offered in conjunction with the Weatherization Assistance Program.
Department of Commerce Initiatives

1. Electrification White Paper
2. Fuel Switching Stakeholder Process
3. US DOE Funded Electrification Action Plan
THE ELECTRIFIED FRONTIER

STAKEHOLDER VIEWS ON THE INTERSECTION OF ELECTRIFICATION, EFFICIENCY, AND DE-CARBONIZATION
Michaels Energy

Who We Are

- Headquarters in La Crosse, Wisconsin
- Engineering and energy efficiency consulting
- Program implementation and program evaluation

On-going Commissioning for Outpatient Medical Facilities | Michaels Energy
Overview of White Paper

- Explore the topics of electrification and fuel switching – in the context of Minnesota and CIP
- MN Policy Context
- Literature Review
- Technology Review
- Policy Review
- Stakeholder Interviews
Project Goal

- Provide Minnesota-centric analysis
- Be a primer to inform CIP stakeholders
- Frame-up key questions
Background
Minnesota is behind on reaching its State GHG Reduction Goal.
Electrification is Beneficial When…

Core premise

Saves consumers money over the long run

Reduces environmental impacts

Enables better grid management

*Must achieve at least one of the three, without negatively impacting the other two.

Source: Regulatory Assistance Project
A new era of electrification has benefited from

Three Enabling Trends

- Efficient Technology
- Renewable Energy
- Advanced Control

Source: Regulatory Assistance Project
MN Policy Context

- 2005 Fuel Switching Prohibition
- 2012 Low Income Exception
- 2017 Otter Tail Power Program Modification
A Hot Topic in 2018

Groups releasing papers or holding conferences about electrification this year:

> Regulatory Assistance Project
> American Gas Association
> Midwest Energy Efficiency Alliance
> Southwest Energy Efficiency Partnership
> National Renewable Energy Laboratory
> Rocky Mountain Institute
> Center for Energy and Environment
> Electric Power Research Institute
> And more…..
Modeling of Economy Wide Trends

Figure ES.2. High-level Overview of Modeling Results

Source: EPRI Efficient Electrification Report 2018
Other State Policy Efforts
How other states are addressing Fuel Switching Policy

- **Illinois**
  - Definition in state statute
  - TRM measures for Heat Pumps, CHP

- **Maine**
  - High fuel oil use
  - RGGI funds support carbon reductions

- **California**
  - Allowed under three-prong test
  - Test criticized as too onerous
How other states are addressing Electrification Policy

✓ Vermont
  > Energy Transformation included in RES

✓ Massachusetts
  > New language in statute as of summer 2018

✓ New York
  > REV emphasis on renewable heat

✓ British Columbia
  > Allow state-owned utility to pursue electrification
Action Without Specific Policy Direction

- Sacramento Municipal Utility District
  - Large rebates of home electrification
- Tennessee Valley Authority
  - Offering only electrification programs
Components

Primer includes:
- Description
- Metrics
- Other notes
- Gap analysis

Analysis includes:
- Site efficiency
- Source energy consumption
- Annual emissions
- First cost and operating cost
- Impact on coincident peak
In the weeds...

<table>
<thead>
<tr>
<th>Source Energy</th>
<th>Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Used DOE EERE “captured energy” approach</td>
<td>✓ Used average annual emissions for Minnesota</td>
</tr>
<tr>
<td>✓ Gives renewables a heat rate of 3412 Btus to 1 kWh</td>
<td>✓ Marginal emissions would improve the analysis</td>
</tr>
<tr>
<td></td>
<td>✓ Of keen interest to stakeholders</td>
</tr>
</tbody>
</table>
Home Heating with Heat Pumps

- Air and ground source
- Ductless and ducted
- Need to consider back-up heating source
- See MN CEE’s Cold Climate Air Source Heat Pump field assessment
<table>
<thead>
<tr>
<th>Heating System Type</th>
<th>Heating Efficiency</th>
<th>Annual Heating Energy Cost</th>
<th>Annual Source Energy</th>
<th>Annual Utility Emissions</th>
<th>Installed Cost</th>
<th>Impact on Winter Coincident Peak Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric-resistance heating</td>
<td>1.0 (COP)</td>
<td>$2,000</td>
<td>196 MMBtu</td>
<td>27,800 lbs CO2</td>
<td>$3,600 - $4,400</td>
<td>11 kW</td>
</tr>
<tr>
<td>Furnace (natural gas)</td>
<td>80% (AFUE)</td>
<td>$700</td>
<td>91 MMBtu</td>
<td>10,200 lbs CO2</td>
<td>$4,400 - $5,400</td>
<td>None</td>
</tr>
<tr>
<td>Condensing furnace (natural gas)</td>
<td>95% (AFUE)</td>
<td>$600</td>
<td>77 MMBtu</td>
<td>8,600 lbs CO2</td>
<td>$4,900 - $6,000</td>
<td>None</td>
</tr>
<tr>
<td>Furnace (propane)</td>
<td>80% (AFUE)</td>
<td>$1,600</td>
<td>88 MMBtu</td>
<td>12,100 lbs CO2</td>
<td>$4,400 - $5,400</td>
<td>None</td>
</tr>
<tr>
<td>Condensing furnace (propane)</td>
<td>95% (AFUE)</td>
<td>$1,400</td>
<td>74 MMBtu</td>
<td>10,200 lbs CO2</td>
<td>$4,900 - $6,000</td>
<td>None</td>
</tr>
<tr>
<td>Air-source heat pump (electric-resistance backup heat)</td>
<td>2.3 (COP)</td>
<td>$1,100</td>
<td>109 MMBtu</td>
<td>15,400 lbs CO2</td>
<td>$3,700 - $4,600</td>
<td>5 - 11 kW</td>
</tr>
<tr>
<td>Air-source heat pump (natural gas backup heat, 80% AFUE)</td>
<td>2.3 (COP)</td>
<td>$900</td>
<td>88 MMBtu</td>
<td>11,900 lbs CO2</td>
<td>$3,700 - $4,600</td>
<td>5 kW</td>
</tr>
<tr>
<td>Ground-source heat pump</td>
<td>3.7 (COP)</td>
<td>$400</td>
<td>43 MMBtu</td>
<td>6,100 lbs CO2</td>
<td>$9,800 - $12,000</td>
<td>2 kW</td>
</tr>
</tbody>
</table>
Heat Pump Water Heaters

- Very efficient water heater in terms of site energy consumption
- Well established technology
- Natural gas condensing water heater is a strong competitor
- Controls could mitigate peak

https://www.greenbuildingadvisor.com/article/heat-pump-water-heaters-come-of-age
Electric Lift Trucks

- Long history of electrification
- Reduction of operating cost, emissions (including indoor emissions)
- 20-30% higher first cost
Electric Trailer Refrigeration Units

- Replace diesel fuel
- Requires access to “shore power”
- Clear savings in operating cost and emissions.
- Equivalent first cost.

Industrial Electrification

- Large variety of industrial applications
  - Especially process heat
- No one-size-fits-all solutions
- ROI depends on non-energy benefits

http://hartleycorp.com/?portfolio=powder-coating-ovens
Electric Vehicles

- Rapid sales growth
- Declining costs
  - Including battery costs
- Reduction of carbon emissions on today’s grid
- Customer and infrastructure barriers

Stakeholder Interviews
28 Interview Participants
## Participant Organizations

<table>
<thead>
<tr>
<th>ACEEE</th>
<th>Minnesota Chamber of Commerce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center for Energy and Environment</td>
<td>Minnesota Citizen's Utility Board</td>
</tr>
<tr>
<td>CenterPoint Energy</td>
<td>Minnesota Environmental Quality Board</td>
</tr>
<tr>
<td>Connexus Energy</td>
<td>Minnesota Municipal Utilities Association</td>
</tr>
<tr>
<td>EPRI (Electric Power Research Institute)</td>
<td>Minnesota Public Utilities Commission</td>
</tr>
<tr>
<td>Fresh Energy</td>
<td>Missouri River Energy Services</td>
</tr>
<tr>
<td>Fuels Institute</td>
<td>National Rural Electric Cooperative Association</td>
</tr>
<tr>
<td>Geothermal Exchange</td>
<td>Otter Tail Power Company</td>
</tr>
<tr>
<td>Great Plains Institute</td>
<td>Regulatory Assistance Project</td>
</tr>
<tr>
<td>Great River Energy</td>
<td>Rochester Public Utilities</td>
</tr>
<tr>
<td>GTI (Gas Technology Institute)</td>
<td>Southern Minnesota Municipal Power Agency</td>
</tr>
<tr>
<td>McKnight Foundation</td>
<td>Xcel Energy</td>
</tr>
</tbody>
</table>
Interview Goals:

1. Information Gathering
2. Input on Process and Policy
Stakeholder groups demonstrated **Cross-Cutting Cleavages**
Consensus
Broad agreement: Electrification *could* reduce carbon emissions

- Especially for transportation
- But not in all cases, at least not at this point in time
Stakeholder quote:

One of my big worries through a lot of this process is that people are taking a paint roller to what really needs to be a pretty fine brushed sort of picture.”
An Important Topic

24 out of 28 respondents
A Route to an Equitable Process

- Transparency
- Clearly defined goals
- Understand costs and who pays
- Determine metrics
Status Quo Needs to Change

19 out of 28 respondents
Stakeholder Quote #1:

“The reason those [fuel switching] provisions were put in place still exists. Electrification can certainly be done for the benefit of the utility only, increasing sales.”
Treat All Fuels in a Unified Manner

- Existing policy only applied to propane, fuel oil, and CIP-exempt natural gas
- Consensus recommended no technical distinction
- Some pragmatic justifications
Stakeholder Quote #2:

“I think that we should be evaluating fuel switching on a list of criteria, not simply by fuel.”
Electric Vehicle Enthusiasm

Advantages:
- Clear market demand
- Every stakeholder was tracking EV opportunities
- Plenty of room for utility-customer engagement

Opportunities:
- Not a clear fit within CIP
- Need for regulatory guidance
Disagreement
Challenges for Electrification

- Status quo inertia: 3
- Other: 5
- Somebody's livelihood/ business at risk: 6
- Politics: 6
- Infrastructure: 8
- Upfront customer cost: 10
- Consumer information/ adoption barriers: 11
- Existing policy/regulation: 12

Diversity of Challenges
Desired Outcomes for Regulation

✓ Policy Outcomes
  > Modest adjustments
  > Drastic changes
  > Maintain commitment to efficiency

✓ Consumer and Market Outcomes
  > Protect consumers
  > Be cost-effective
  > Enable market expansion
Stakeholder Quote #3:

“I hope we get to, not to a point where [electrification] is required, but allowed.”
Cost-Effectiveness

- Address cost-benefit testing methodology
- Program and project level
- Cost effectiveness matters to stakeholders
  - Businesses
  - Consumers
Within CIP or Outside of CIP

Does electrification belong in CIP?

- Within CIP
- Separate
- It's complicated
Stakeholder Quote #4:

“If electrification is simply lumped into CIP, I think there's a real risk of a zero-sum game adversely affecting energy efficiency.”
Ideas for discussion and further engagement
Stakeholder Engagement Needed

Relationship with CIP
- Policy direction
- Effect on goals
- Utility compensation

Goal of CIP
- EE as a resource, time and place specific value
- Methodology

Costs and Benefits
- Carbon emissions, marginal emissions
- Value to non-participants, regulators responsibility to customers

Equitability
- Accessibility, price concerns for business and consumers
Questions?

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Send us your questions using
WebEx Q&A Box
CARD Project Resources

Applied Research and Development
Funds projects to identify new technologies or strategies to maximize energy savings, improve the effectiveness of energy conservation programs, or document the carbon dioxide reductions from energy conservation projects.

Background
The Next Generation Energy Act of 2007 (the Act) established energy conservation as a primary resource for meeting Minnesota's energy needs while reducing greenhouse gases and other harmful emissions. The Act also established a savings goal of 1.5 percent of annual retail electricity and natural gas sales for all utilities in the state. The utilities may reach this annual goal directly through its utility Conservation Improvement Program (CIP) and, indirectly, through energy codes, appliance standards, behaviors, and other market transformation programs.

To help utilities reach their energy savings goals, the Act authorizes the commissioner to assess utilities $3,600,000 annually for grants for applied research and development projects:
- $2,600,000 for the Conservation Applied Research and Development (CARD) program through which Commerce awards grants in a competitive Request for Proposal (RFP) process.
- $500,000 for the Center for Sustainable Building Research to coordinate activities related to Sustainable Building 2030 (SR2030).
- $500,000 for the Clean Energy Resource Teams (CERTs) for community energy/technical assistance and outreach.

CARD Project Information
CARD projects quantify the savings, cost effectiveness and field performance of advanced technologies, characterize market potential of products and technologies in the state, and investigate and pilot innovative program strategies. Completed CARD projects provide utilities with informative and timely information to enhance energy efficiency program designs within their CIP portfolio.

Webinar Recording & Final Report
available in few weeks

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For Other research documents use CARD Fact Sheets, Guidelines & Tools Quick Link

R&D Web Page (https://mn.gov/commerce/industries/energy/utilities/cip/applied-research-development/)
Upcoming CARD Webinar:

- Dec 12: Examining Potential for Prepay as an Energy Efficiency Program
- Dec 17: Center for Energy and Environment (CEE) – MN DSM Potential Study

Commerce Division of Energy Resources e-mail list sign-up

If you have questions or feedback on the CARD program contact:
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651-539-1872