



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

The screenshot displays the Cisco Webex Events interface. On the left, the 'Event Info' section lists details for a webinar hosted by Mary Lobenstein, including audio connection information (US Toll Free: 8443020362, US Toll: +1 2065960378), access code (745 182 992), attendee ID (61), and event number (745 182 992). The main interface is divided into several panels: 'Participants' (Speaker: Mary Lobenstein (Host), Panelist: 2, Attendee: 1), 'Chat', and 'Q&A'. The 'Q&A' panel shows a question 'How are you doing?' and an answer 'Mary Lobenstein - 2:22 PM'. Below the Q&A panel is an 'Ask' section with a dropdown menu set to 'All Panelists' and a 'Send' button. A 'Connected' status indicator is visible at the bottom right.

Click “?” Icon to get the Q&A box to popup below

Chat box contains URLs for handouts

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

Enter Questions in Q&A box

Send Question to All Panelists

Minnesota Applied Research & Development Fund

- **Purpose - to help Minnesota utilities achieve 1.5% energy savings goal by:**

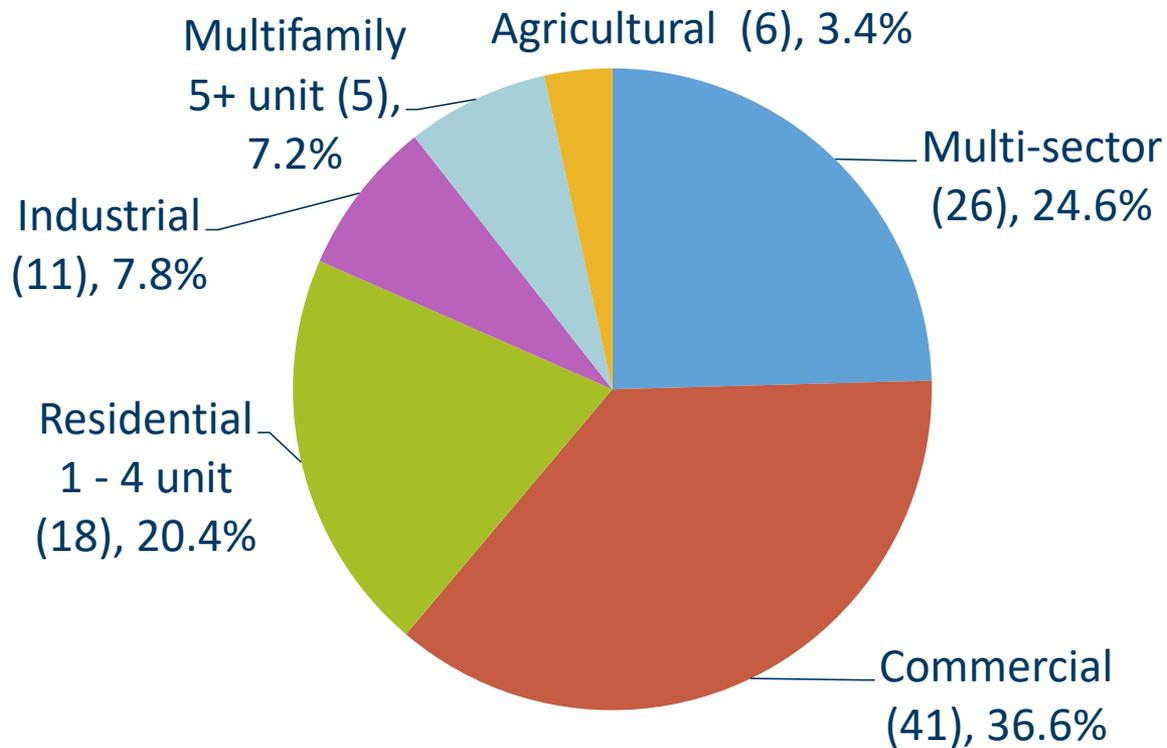
- *Identifying new technologies or strategies to maximize energy savings;*
- *Improving effectiveness of energy conservation programs;*
- *Documenting CO₂ reductions from energy conservation programs.*

[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

Current CIP Fuel Switching Policy

- 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



Michael'sEnergy

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



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



The image shows a close-up, slightly blurred view of a desk covered with stacks of papers and folders. In the foreground, a bright yellow envelope is partially visible, tucked under a stack of papers. The papers are mostly white, with some showing faint lines or text. The folders are in various colors, including green and red. The overall scene suggests a busy, cluttered office environment. The word "Background" is centered in the image in a white, sans-serif font.

Background

Minnesota is behind on reaching its

State GHG Reduction Goal



Core premise

Electrification is Beneficial When...



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.

A new era of electrification has benefited from

Three Enabling Trends



Efficient
Technology



Renewable
Energy



Advanced
Control

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.....

EPRI Efficient Electrification Modeling of Economy Wide Trends

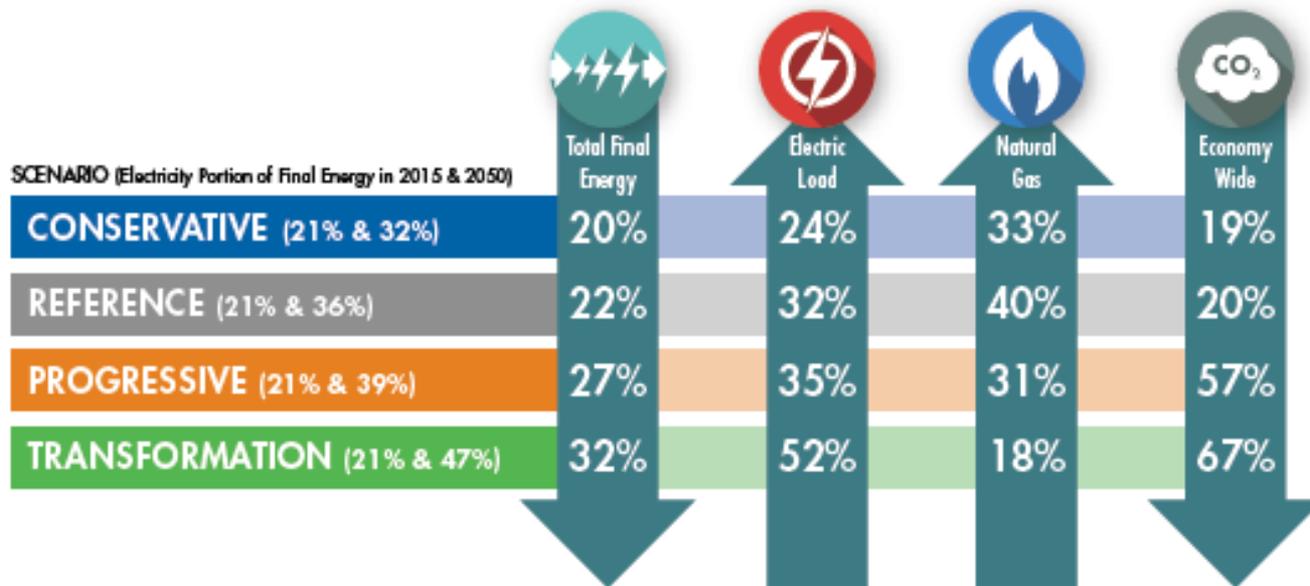


Figure ES-2. High-level Overview of Modeling Results

Source: [EPRI Efficient Electrification Report 2018](#)

A pair of black-rimmed glasses is positioned on the left side of the image, resting on a document. The document contains several mathematical formulas, including the addition and subtraction formulas for tangent and cotangent. A blue pen is visible in the upper right background. The entire scene is overlaid with a semi-transparent blue filter.

Other State Policy Efforts

$$\begin{aligned}\tan(A + B) &= \frac{\tan A + \tan B}{1 - \tan A \tan B} \\ \tan(A - B) &= \frac{\tan A - \tan B}{1 + \tan A \tan B} \\ \cot(A + B) &= \frac{\cot A \cot B - 1}{\cot B + \cot A} \\ \cot(A - B) &= \frac{\cot A \cot B + 1}{\cot B - \cot A}\end{aligned}$$

$$\tan(A - B) = \frac{\sin(A - B)}{\cos(A - B)}$$

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



Technologies

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...

Source Energy

- ✓ Used DOE EERE “captured energy” approach
- ✓ Gives renewables a heat rate of 3412 Btus to 1 kWh

Emissions

- ✓ Used average annual emissions for Minnesota
- ✓ Marginal emissions would improve the analysis
- ✓ Of keen interest to stakeholders

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

Heat Pumps:

Nuance Matters

Heating System Type	Heating Efficiency	Annual Heating Energy Cost	Annual Source Energy	Annual Utility Emissions	Installed Cost	Impact on Winter Coincident Peak Demand
Electric-resistance heating	1.0 (COP) 3.1 (HSPF)	\$2,000	196 MMBtu	27,800 lbs CO2	\$3,600 - \$4,400	11 kW
Furnace (natural gas)	80% (AFUE)	\$700	91 MMBtu	10,200 lbs CO2	\$4,400 - \$5,400	None
Condensing furnace (natural gas)	95% (AFUE)	\$600	77 MMBtu	8,600 lbs CO2	\$4,900 - \$6,000	None
Furnace (propane)	80% (AFUE)	\$1,600	88 MMBtu	12,100 lbs CO2	\$4,400 - \$5,400	None
Condensing furnace (propane)	95% (AFUE)	\$1,400	74 MMBtu	10,200 lbs CO2	\$4,900 - \$6,000	None
Air-source heat pump (electric-resistance backup heat)	2.3 (COP) 7.7 (HSPF)	\$1,100	109 MMBtu	15,400 lbs CO2	\$3,700 - \$4,600	5 - 11 kW
Air-source heat pump (natural gas backup heat, 80% AFUE)	2.3 (COP) 7.7 (HSPF)	\$900	88 MMBtu	11,900 lbs CO2	\$3,700 - \$4,600	5 kW
Ground-source heat pump	3.7 (COP)	\$400	43 MMBtu	6,100 lbs CO2	\$9,800 - \$12,000	2 kW

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.



<https://www.trucknews.com/products/carrier-transicolds-new-electric-refrigeration-unit/>

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



<https://www.caranddriver.com/reviews/2018-tesla-model-3-performance-track-mode>

Stakeholder Interviews

28

Interview Participants



Participant Organizations

ACEEE
Center for Energy and Environment
CenterPoint Energy
Connexus Energy
EPRI (Electric Power Research Institute)
Fresh Energy
Fuels Institute
Geothermal Exchange
Great Plains Institute
Great River Energy
GTI (Gas Technology Institute)
McKnight Foundation

Minnesota Chamber of Commerce
Minnesota Citizen's Utility Board
Minnesota Environmental Quality Board
Minnesota Municipal Utilities Association
Minnesota Public Utilities Commission
Missouri River Energy Services
National Rural Electric Cooperative Association
Otter Tail Power Company
Regulatory Assistance Project
Rochester Public Utilities
Southern Minnesota Municipal Power Agency
Xcel Energy

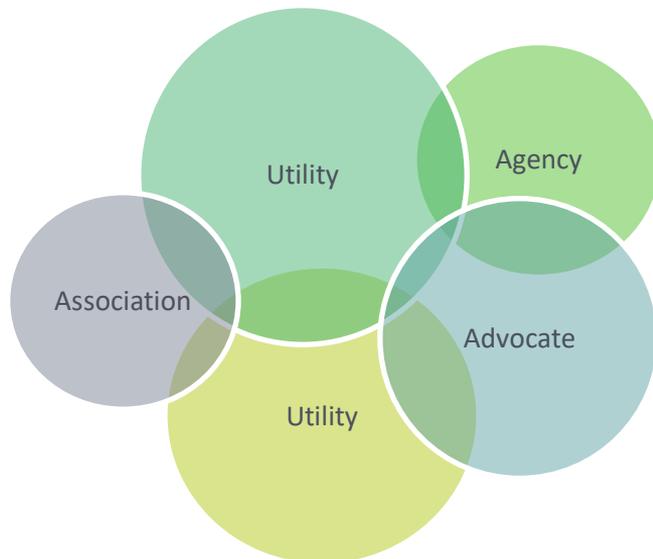
Interview Goals:

1 Information Gathering

2 Input on Process and Policy

Stakeholder groups demonstrated

Cross-Cutting Cleavages

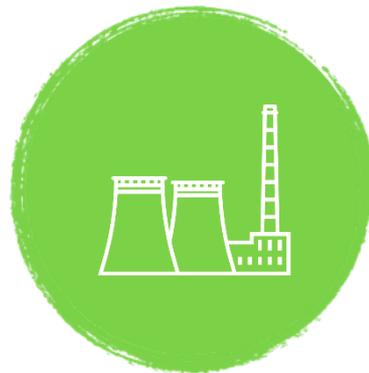




Consensus

Benefits: Carbon Reduction

- ✓ **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:

“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:

“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

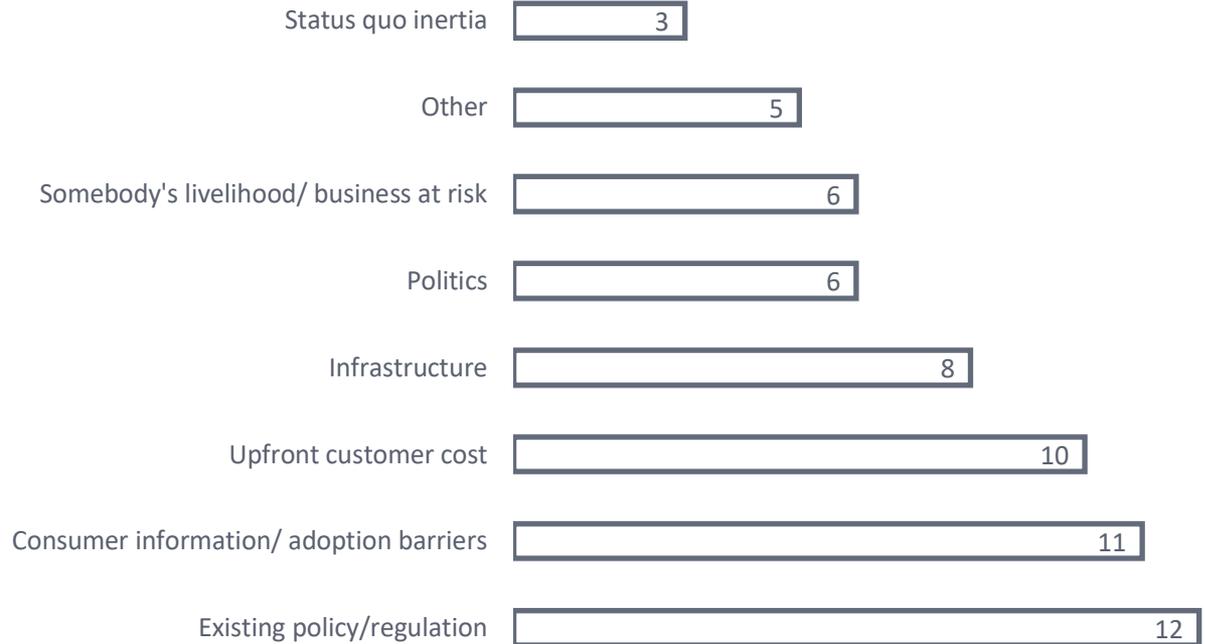
A blurred background image of a city street with a man in a suit and sunglasses in the foreground. The man is wearing a dark blue suit jacket, a patterned shirt, and dark sunglasses. He has a beard and is looking towards the left. The background shows a street with a white car and a large, classical-style building with many windows.

Disagreement

Diversity of

Challenges

Challenges for Electrification



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:

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

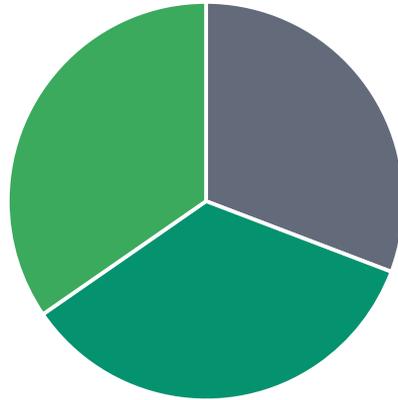
Cost-Effectiveness



- ✓ Address cost-benefit testing methodology
- ✓ Program and project level
- ✓ Cost effectiveness matters to stakeholders
 - > Businesses
 - > Consumers

Within CIP or Outside of CIP

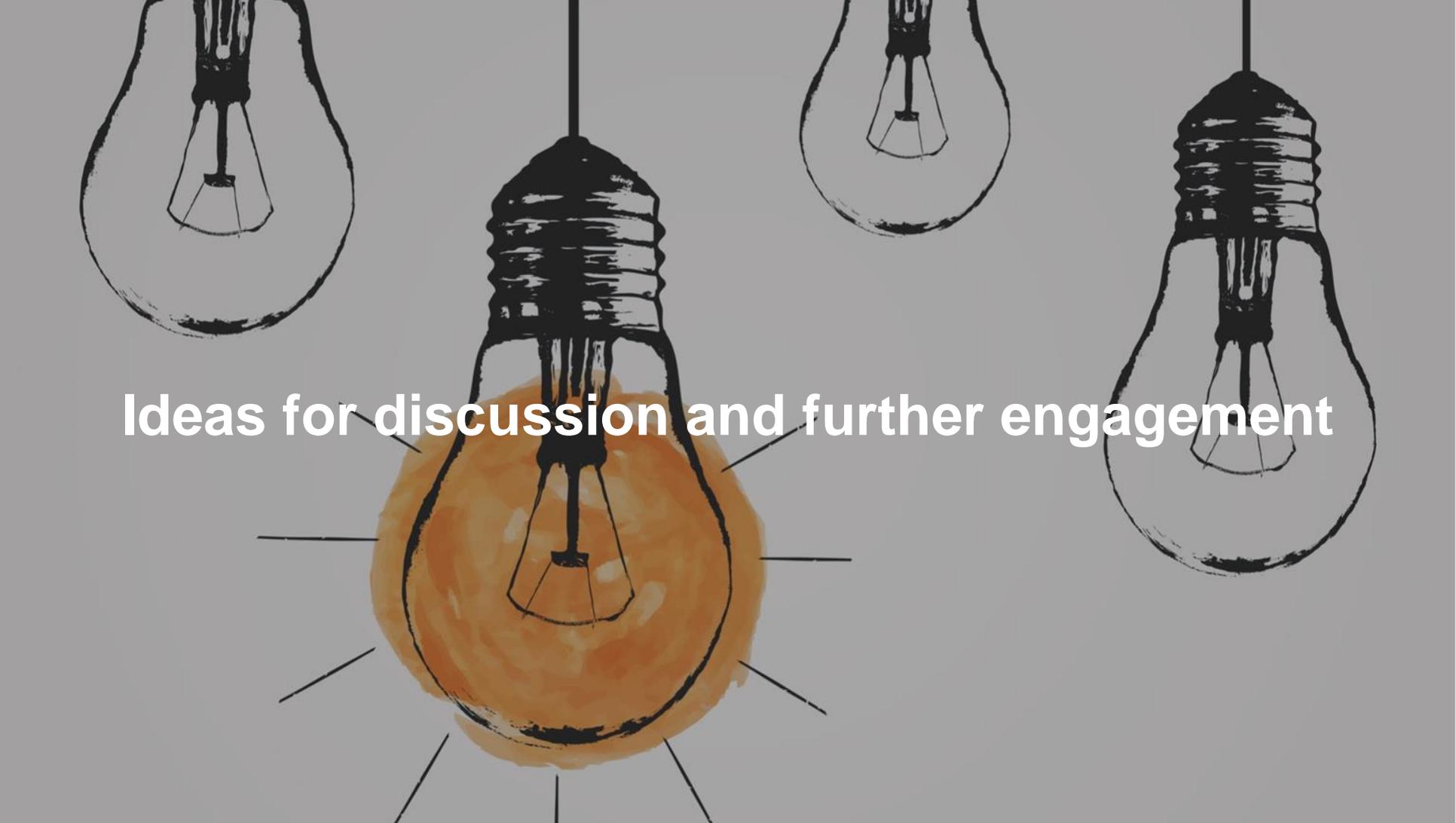
Does electrification belong in CIP?



■ Within CIP ■ Separate ■ It's complicated

Stakeholder Quote:

“If electrification is simply lumped into CIP, I think there's a real risk of a zero-sum game adversely affecting energy efficiency.”

The image features four light bulbs hanging from above against a light gray background. The central bulb is illuminated with a warm orange glow and has several short black lines radiating from its base, symbolizing light or an idea. The other three bulbs are unlit and shown as simple black outlines. The text "Ideas for discussion and further engagement" is centered horizontally across the middle of the image, overlapping the glowing bulb.

Ideas for discussion and further engagement

Stakeholder Engagement Needed

Relationship with CIP

Goal
of CIP

Costs and
Benefits

Equitability

Policy
direction

Effect on goals

Utility
compensation

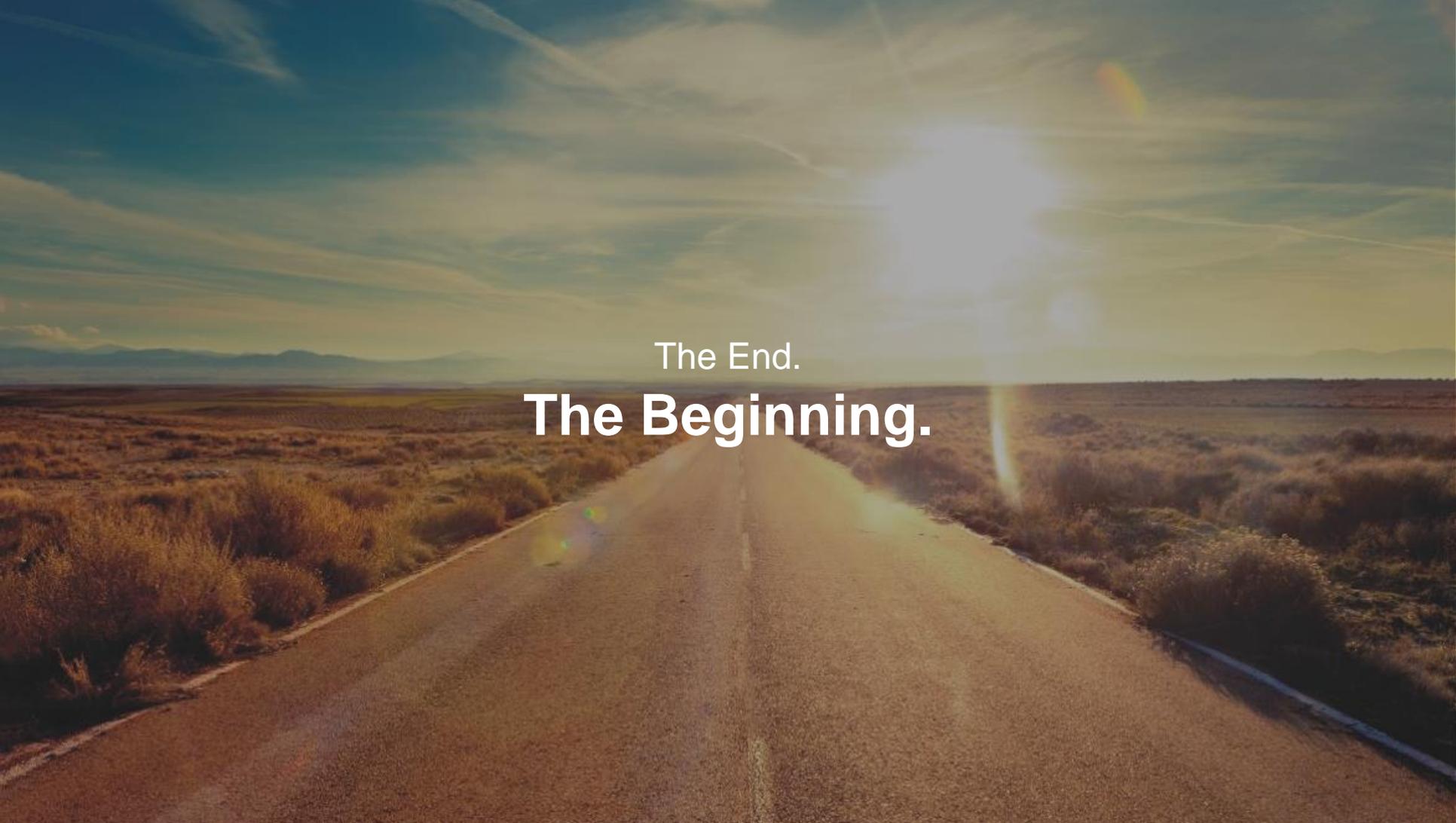
EE as a
resource, time
and place
specific value

Methodology

Carbon
emissions,
marginal
emissions

Value to non-
participants,
regulators
responsibility
to customers

Accessibility,
price concerns
for business
and
consumers



The End.
The Beginning.

Questions?

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Send us your questions using
WebEx Q&A Box

CARD Project Resources

Industries & Agencies

- Energy
 - Solar Industry
 - Wind Industry
 - Bioenergy Industry
 - Energy Environmental Review & Analysis
 - Energy Efficiency
 - Distributed Energy Resources
 - Financial Assistance
 - Technical Assistance
 - Commercialization Assistance
 - Utilities
 - Annual Reporting
 - Rate Cases
 - Conservation Improvement Programs
 - Planning & Policy Guidance
 - Technical Reference Manual
 - Applied Research & Development**
 - Fact Sheets, Guides & Tools
 - CARD Program Webinars
 - Projects & Rates
 - Service Providers
 - Financial Institutions

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, behavioral and other market transformation programs.

To help utilities reach their energy savings goal, 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](#) (SB2030)
- \$500,000 for the [Clean Energy Resources Teams](#) (CERTs) for community energy technical assistance and outreach.

Project Info Stakeholder Info Grantee Info

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 portfolios.

RESOURCES

- CARD search
- CARD Webinars & Videos
- Request for Proposals
- Proposals & Evaluations
- Fact Sheets, Guides & Tools

QUESTIONS?

For questions related to the CARD program, upcoming events, or if you'd like to provide feedback or suggestions, contact:

Department of Commerce
Mary Sue Lobenstein, R&D Program Administrator
marysue.lobenstein@state.mn.us

For Reports use **CARD Search Quick Link**

For Webinars use **CARD Webinars & Videos Quick Link**

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

Webinar Recording & Final Report available in few weeks

[R&D Web Page \(https://mn.gov/commerce/industries/energy/utilities/cip/applied-research-development/\)](https://mn.gov/commerce/industries/energy/utilities/cip/applied-research-development/)

Thanks for Participating!

Upcoming CARD Webinar:

- **Dec 12:** Examining Potential for Prepay as an Energy Efficiency Program
-

[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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