



Results from Recent Projects to Drive Electric Utility Infrastructure (EUI) Efficiency in Minnesota

September 10, 2019



Housekeeping

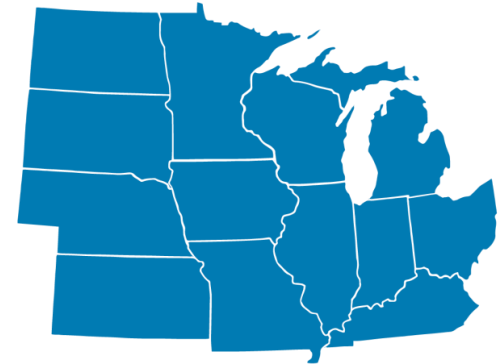
- Attendees are muted
- Questions? Enter them in the question box
- Webinar will be recorded and sent out after

About MEEA

The Trusted Source on Energy Efficiency

We are a nonprofit membership organization with **160+ members**, including:

- Utilities
- Research institutions
- State and local governments
- Energy efficiency-related businesses



As the key resource and champion for energy efficiency in the Midwest, MEEA helps a diverse range of stakeholders understand and implement cost-effective energy efficiency strategies that provide economic and environmental benefits.





Electric Utility Infrastructure Efficiency Projects in Minnesota



September 10,
2019

Presented by: Travis Hinck, PE, CEM - Project Manager

AGENDA

Overview

Background

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Findings/Outcomes

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Q&A

Three projects to examine infrastructure efficiency were recently completed in Minnesota

- Technical Reference Manual EUI measures
 - EUI Potential Study
- Stakeholder Engagement Process and Action Plan

Key today: What can this mean for other Midwest States?

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- Driven by state-level statutory conservation goals
 - In Minnesota, Conservation Improvement Program (CIP)
- Incent ratepayers to buy more-efficient end-use equipment
- Examples include: LED lighting, VFDs, recommissioning, etc.
- Almost exclusively focused on demand-side programs
- Utilities dedicate significant staff/budget to energy efficiency

OUR SERVICES

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PLANNING



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RETAIL PROCUREMENT



FINANCIAL ANALYSIS &
RATE SERVICES



RTO SETTLEMENT &
SCHEDULING SERVICES



UTILITY
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RENEWABLE ENERGY RESOURCES,
DISTRIBUTED GENERATION, AND
COMBINED HEAT & POWER



WATER & WASTEWATER
UTILITY CONSULTING



REGULATORY &
RESTRUCTURING



ENERGY EFFICIENCY &
DEMAND SIDE MANAGEMENT



NATURAL GAS
CONSULTING



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DATA ANALYTICS



ELECTRIC PLANNING &
DESIGN *(Hi-Line Engineering)*



STATISTICS &
MARKET RESEARCH



RISK MANAGEMENT
SERVICES



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WAY MANAGEMENT



INFORMATION
TECHNOLOGY



TRANSMISSION
SERVICES



NERC
COMPLIANCE



Definition of Electric Utility Infrastructure (EUI)

- EUI is Electric Utility Infrastructure
- Infrastructure is any equipment or facilities owned by a utility used to deliver electric energy to consumers
- Generation, Transmission, Distribution
- Everything upstream of the meter
- Also called supply-side



Why We Investigated EUI Efficiency

Minnesota's Conservation Improvement Program (CIP) is a long-term success

AND Statute specifically allows utilities to count **Electric Utility Infrastructure (EUI)** efficiency toward their CIP goals

BUT CIP has been historically focused on the demand-side; very few EUI projects

SO Commerce (our client) embarked on a series of projects to leverage existing, effective CIP tools to drive EUI efficiency implementation in Minnesota

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- Technical Reference Manual EUI measures
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CADMUS



- Estimate statewide potential for EUI efficiency
- Develop tools to help utilities capture EUI efficiency
- Clarify policy landscape surrounding EUI
- Reduce barriers

Ultimately: leverage existing conservation policy to drive implementation of Electric Utility Infrastructure efficiency

- Develop appropriate models based on TRM measures to estimate Generation and Transmission and Distribution potential



- Identify data required to populate the models and source(s) of data



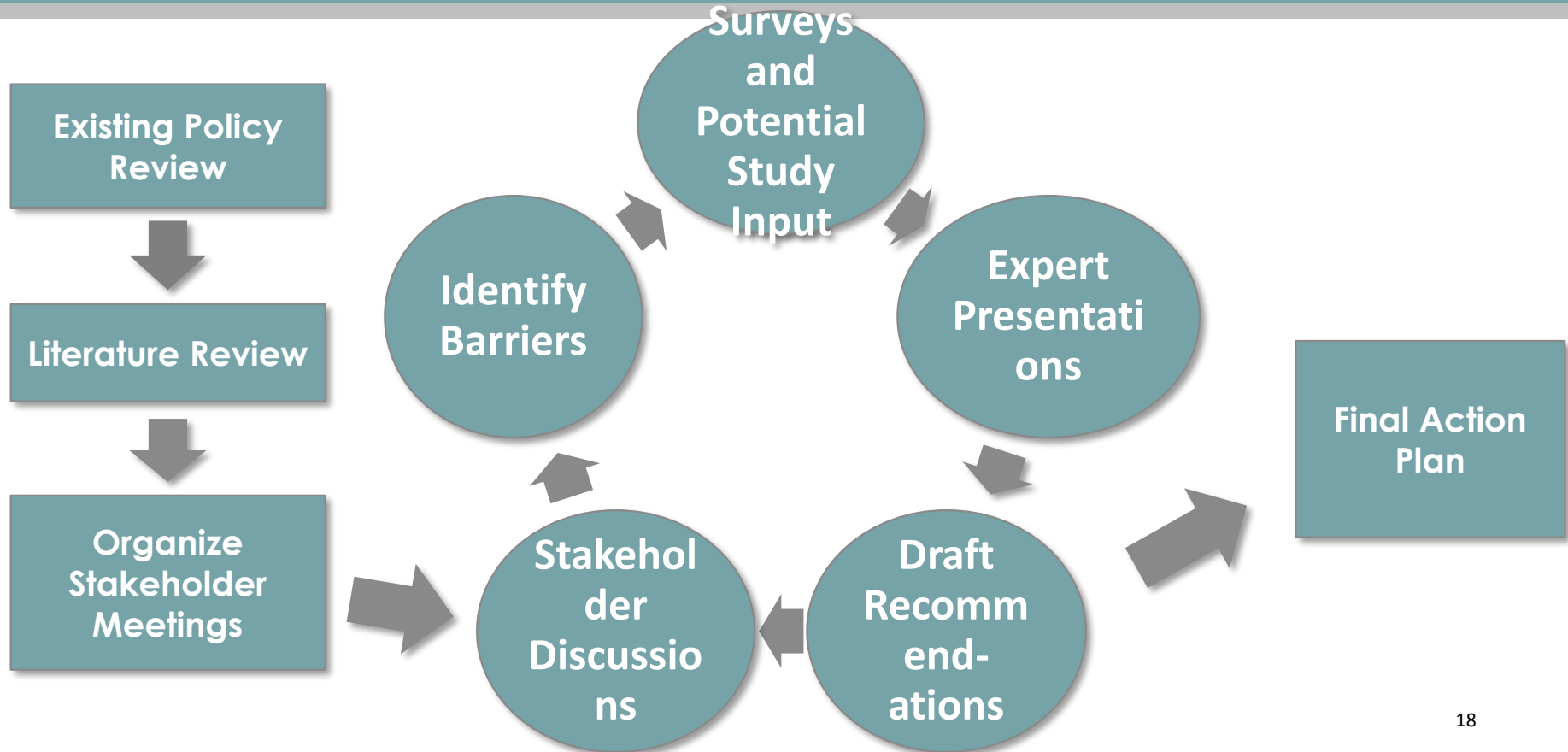
- Collect required data from stakeholders



- Present findings in terms of technological, economic, and achievable EUI efficiency potential with recommendations to capture it

- Four large, open stakeholder meetings
- Presentations from experts in: technology, policy, and infrastructure design from a variety of perspectives
- Incorporate findings from stakeholder surveys and Potential Study
- Advisory Committee to help guide the process and set agendas
- Develop an Action Plan with recommendations for stakeholders

EUI Stakeholder Engagement Process (continued)



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- Generation Heat Rate Improvements
- Conservation Voltage Reduction (CVR)
- High Efficiency Transformers
- Low Loss Transmission/Distribution Conductors
- 28 additional adapted C/I measures

Annual kWh Savings (Ref. 1)

$$= 8,766 \times \left(\left[\left(\frac{Load_{peak}}{FLC_{base}} \right)^2 \times FLL_{base} \times LossFactor + NLL_{base} \right] - \left[\left(\frac{Load_{peak}}{FLC_{ee}} \right)^2 \times FLL_{ee} \times LossFactor + NLL_{ee} \right] \right)$$

Peak kW Savings

$$= \left[\left(\frac{Load_{peak}}{FLC_{base}} \right)^2 \times FLL_{base} + NLL_{base} \right] - \left[\left(\frac{Load_{peak}}{FLC_{ee}} \right)^2 \times FLL_{ee} + NLL_{ee} \right]$$

- Achievable EUI conservation in MN is approximately 0.13% of utilities' forecasted annual electric retail sales 2020-2039
 - Approximately 106,465 MWh annually on average statewide
 - Or, approximately 9% of Minnesota's electric conservation goals
- Technical EUI potential is approximately 0.29% of sales

EUI efficiency potential is large enough that utilities should pursue it as part of their CIP portfolio, but not so large to significantly displace demand-side activities

Potential Study Results

Table 4-19 Total Statewide Conservation Potential 2020-2039

	Generation	T&D	Total
Technical Conservation Potential	1,399,850	3,248,092	4,647,942
Economic Conservation Potential	786,782	2,515,143	3,301,925
Achievable Conservation Potential	786,782	1,342,519	2,129,301

▲ Figure 4-2 Achievable Potential for Conservation by Generation Technology

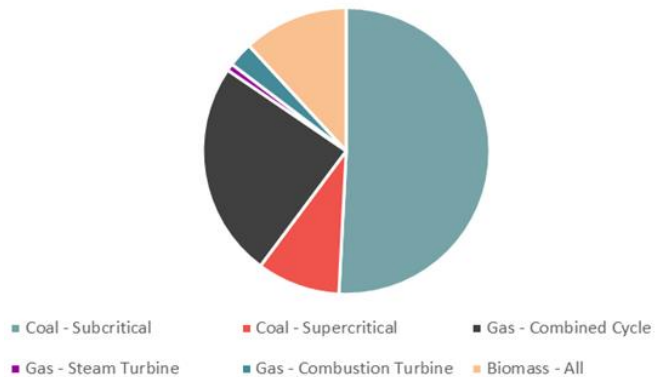
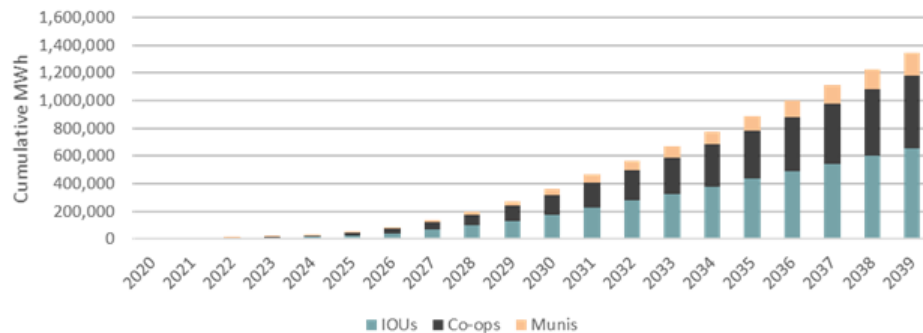


Figure 4-7 Cumulative Achievable T&D Potential



Stakeholder Findings



- Four large stakeholder meetings
- Expert presentations
- Incorporate findings from stakeholder surveys and the Potential Study
- Develop an Action Plan with recommendations for stakeholders

Speaker	Organization	Title	Topic
Ron Schoff	Electric Power Research Institute (EPRI)	Senior Program Manager	Emerging grid technologies
Lisa Severson	Minnkota Power Cooperative	Energy Conservation Coordinator	Successful EUI efficiency projects in Minnesota
Rich Sedano	Regulatory Assistance Project (RAP)	President and CEO	Similar regulatory initiatives across the country
Mary Santori	Xcel Energy	Manager, Distribution System Planning & Strategy	Current distribution system planning process
Jeff Haase	Great River Energy	Leader, Member Technology & Innovation	Impacts of policy changes from cooperative utility perspective
Kevin Lawless	The Forward Curve	Principal	Metrics measuring EUI efficiency improvements
Joe Paladino	U.S. Department of Energy	Senior Advisor	Grid Modernization
Niels Malskær	Danish Embassy	Commercial Advisor	Importance of data-driven grid modernization
Anthony Fryer	MN Department of Commerce	CIP Coordinator	CIP and policy guidance
Greg Anderson	Otter Tail Power	Energy Efficiency Engineer	Rural utility perspectives on EUI
Tricia DeBleeckerer	MN Public Utilities Commission	Commission Staff	Minnesota's grid modernization initiatives
Nancy Lange	MN Public Utilities Commission	Commissioner	Minnesota's grid modernization and distribution planning initiatives
David Townley	CTC Global	Director of Public Affairs	Efficient transmission and distribution conductors
Jose Medina	OATI	VP of Smart Grid Development	Conservation Voltage Reduction applications and case studies

- Total of 17 unique barriers to EUI implementation identified
- Recommendations for Stakeholders
 - 15 major recommendations with 29 sub-recommendations
 - Future consensus items recommended for continued discussion
 - Collected tools developed to help utilities assess and plan EUI projects
- Addresses barriers to implementing EUI efficiency projects
- Summarizes stakeholder discussions for reference
- Final version published in May

Action Plan Recommendations

Technical	Apply excel-based high-level screening tools on Commerce website
	Refer to the TRM for standardized EUI measures
	Conduct internal, utility-specific assessments of EUI potential
Awareness	Connect infrastructure design teams with CIP personnel
	Review EUI Potential Study results
	Reach out to Commerce with ideas or questions
Planning Process	Combine EUI efficiency with overlapping Grid Modernization efforts
	Summarize findings to pass along to related, ongoing efforts
	Continue discussions of long-term vision for EUI within CIP
	Establish a repository for EUI project information
	Review EUI Potential Study further recommendations
Policies	Review EUI policy guidance documents issued by Commerce
	Clarify the large natural gas generation automatic CIP exemption clause
Cost Recovery	Discuss including some EUI projects in the performance incentive
	Streamline the cost recovery rider

Purpose: This tool is designed to evaluate possible Conservation Voltage Reduction projects in terms of estimating energy savings and cost effectiveness. The calculator tools were created to lower the barrier to implementing EUI projects by providing a starting point for utilities to consider whether projects are worth pursuing.

Disclaimers: All projects require approval from the Minnesota Department of Commerce in order to claim Conservation Improvement Program savings. This tool is not meant to be rigorous engineering design or financial planning resources.

Important Notes for using this measure

- Claiming savings for CVR projects toward CIP goals is a two-step process. In the first year, the utility can claim estimated savings. In the second year the utility can claim the actual measured savings (subtract the claimed estimated savings in year one)
- This tool only uses the first year estimated saving method. A more detailed calculation is necessary to determine measured savings
- The Utility Test calculation uses the full estimated annual savings to calculate cost benefit despite the fact the actual claimed CIP savings in year one has to be adjusted
- Refer to the "TRM Measures" tab for the full TRM Measure and more complete description of the measure (highly recommended)

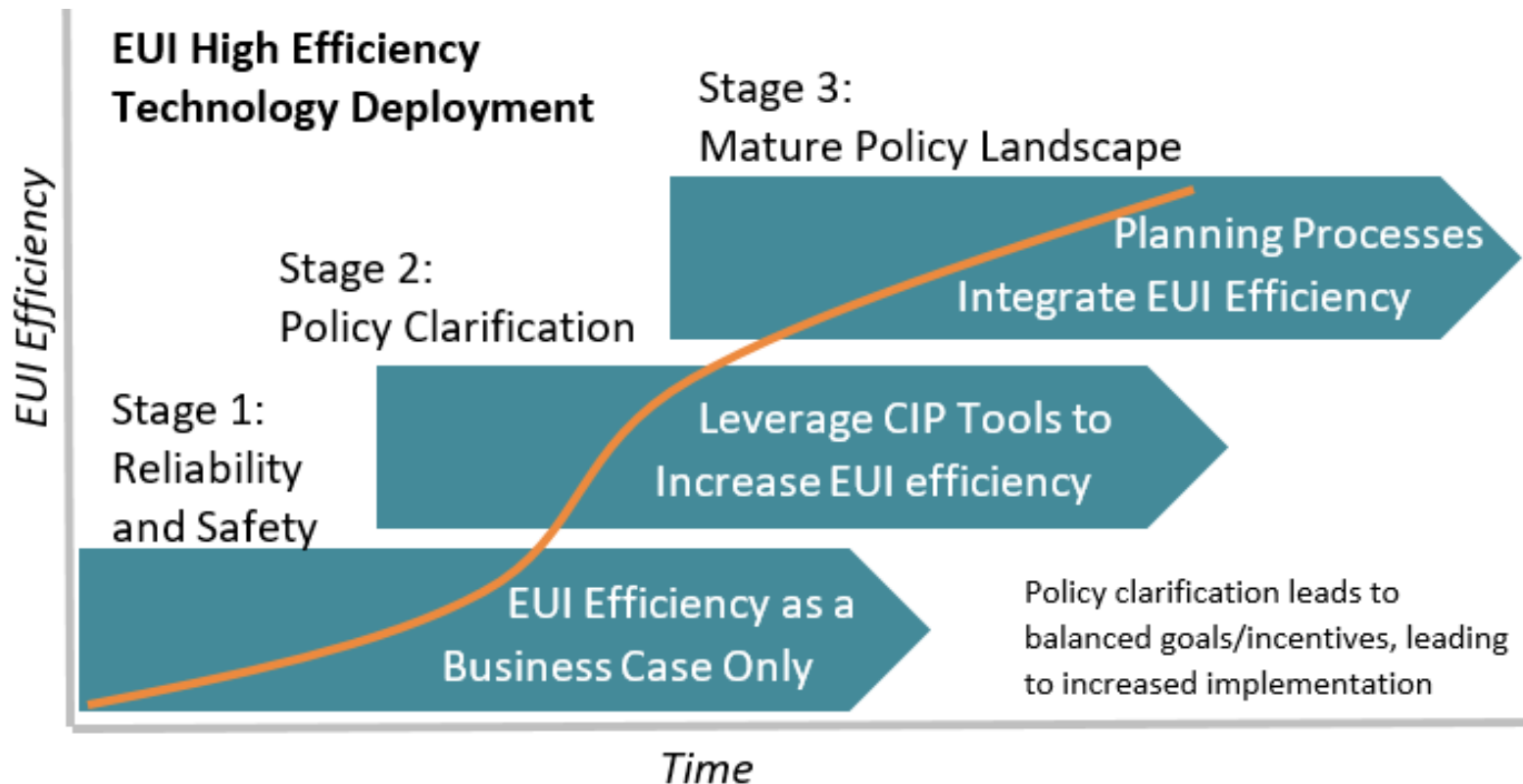
Savings Calculation Input values	
20,000,000	PreEnergy (kWh) - Annual energy delivered to the VCZ
1.0%	EstimatedPercentVVR - Estimated percent reduction in source voltage
<20%	Percentage of load used for electric space heating - if known
20-40%	Percentage of load used for mechanical air conditioning - if known

Cost Benefit Calculation Input values	
\$ 10,000	Estimated <i>incremental</i> project cost (\$)
\$ 35.00	Avoided cost of electricity (\$/MWh). See below for details
3.5%	Estimated annual growth rate of avoided cost of electricity
2018	Year of project completion
15	Estimated lifetime of project (years)
	Default lifetime for CVR projects is 15 years

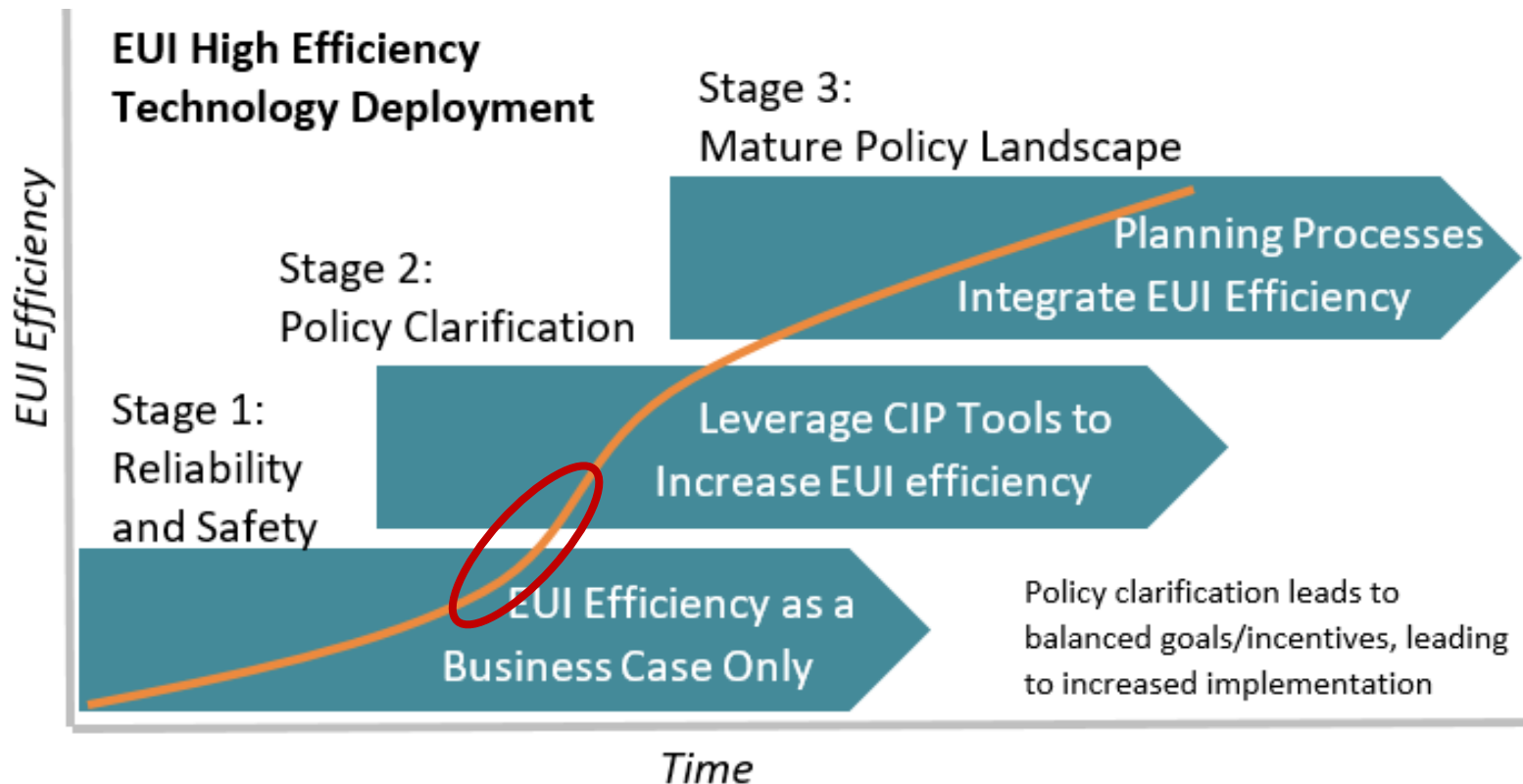
Estimated Annual CIP Energy Savings
82,500 kWh
This is the savings that can be claimed toward CIP goals in year one, including the adjustment factor

Estimated Annual Actual Energy Savings
165,000 kWh
This is the full estimated savings

Long-Term Vision



Long-Term Vision



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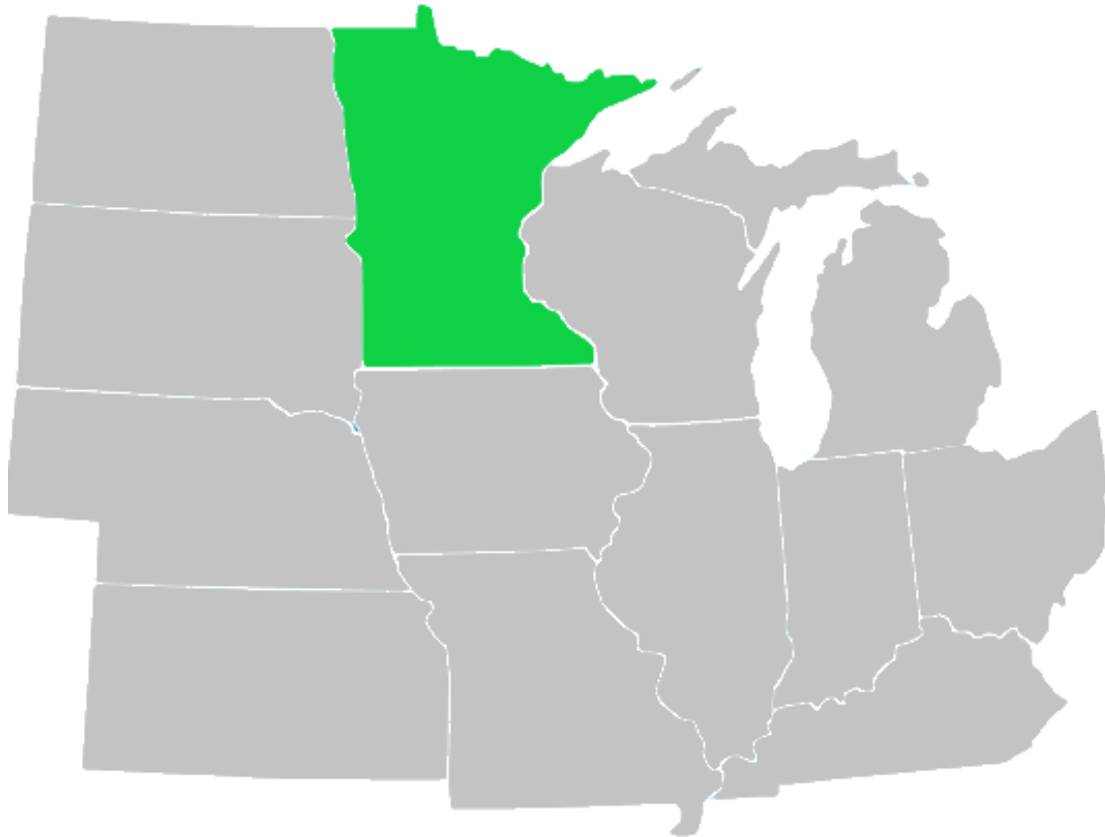
In principle, all findings from these projects can broadly apply anywhere beyond Minnesota with minimal adjustments...

under one, very important condition

Statute specifically allows utilities to count Electric Utility Infrastructure (EUI) efficiency toward their Conservation Improvement Plan (CIP) goals in Minnesota...

Answer this question: Does your state allow infrastructure projects to count toward established energy efficiency goals?

MEEA Map - Infrastructure Eligibility



Infrastructure in
Efficiency Programs:

- Explicitly Allowed
- Explicitly Disallowed
- Uncertain

- Step 1: Answer the Big Question - does your state allow infrastructure projects to count toward established energy efficiency goals?*
- Step 2: If yes, all findings from these projects can broadly apply anywhere beyond Minnesota with minimal adjustments
- Step 3 (optional): Reply back and help fill in the gray areas in the MEEA map from the previous slide

*This may not be immediately clear. Worth investigating – or working with stakeholders to clarify



GRID MODERNIZATION

Advanced Metering Infrastructure, Smart Grid, Robust Security, Microgrids, Renewable Integration, Improved Resiliency, Electric Vehicle Charging, Grid-Scale Battery Storage, **Utility Infrastructure Efficiency**, Dynamic Rate Structures, Smart Appliances, Internet of Things, Demand Control Management, Voltage Optimization, Data Analytics, Improved Load Forecasting, Real-Time Fault Detection, Integrated Distribution Planning, Improved Market Signals, Non-Energy Market Pricing, On-Site Storage, Informed Power Purchase Decisions, Retail Market Services, Hosting Capacity, Siting Optimization, Etc. Etc. Etc. Etc.

- There is potential for infrastructure efficiency improvement
- Policy guidance and technical tools have been developed to capture that potential in Minnesota by adjusting and applying the proven, successful CIP framework
- EUI efficiency fits well with many current grid initiatives
- With one first step, most findings from Minnesota can be extrapolated to other jurisdictions

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Minnesota EUI Projects Resources

[Department's Energy Data & Reports Webpage](#)

Energy Data & Reports

The following is a list of recent energy studies and reports from the Minnesota Department of Commerce. It includes legislative reports/studies, CARD project reports, meetings, and more.

You may filter the results below using the sort tools in the sidebar. You will need Acrobat Reader or a similar application to read any documents you download.

Two other document databases are available (at right) to help you find what you are looking for:

- Use our **Conservation Applied Research and Development (CARD) Research Project Search**
- Use our **Commerce Actions and Regulatory Search tool** to access public materials related to specific areas of your interest including additional energy data and reports, requests for proposals issued by the Division of Energy Resources, and a variety of other public regulatory or informational documents.

[Local Energy Efficiency Program \(LEEP\)](#) reports are contained in a separate list.



Fuels Monitoring Report: November 30, 2018
Fuels Monitoring Report: November 30, 2018

Sort

Newest Oldest



Minnesota Renewable Energy Update, November 2018
Renewable sources fueled 24.9% of the electricity generated within Minnesota's borders in 2017, according to figures compiled by the Minnesota Department of Commerce and the U.S. Energy Information Administration (EIA). This report reviews trends in Minnesota's renewable energy growth, including discussion of future development.

TYPE

Reports

Studies



Minnesota Energy Efficiency Potential Study: 2020-2029
Minnesota has a thirty-plus year history of leadership in energy efficiency policy and achievements. This has been the result of common sense state policy focusing on cost-effective prioritization of efficiency as a resource that has had broad support from utilities and other stakeholders. However, state efficiency leaders recognize some significant challenges ahead for utility-driven efficiency that will need to be addressed. In particular, lighting

TOPICS

CARD

Efficiency

Solar

DOCUMENT DATABASES

Conservation Applied Research and Development (CARD) Research Project Search

Commerce Actions and Regulatory Documents Search (CARDS)

[Direct Link to EUI Potential Report](#)

LEARN MORE
EUI Projects Webpage
(hosted by CEE)
EUI Action Plan
Stakeholder Webinar
Recording

[EUI Efficiency Potential Projects Webpage](#)

Project Resources

Electric Utility Infrastructure Efficiency Potential Projects

Learn More

PROJECT PARTNERS

GDS Associates, Inc. ENGINEERS & CONSULTANTS

cee Center for Energy and Environment

CADMUS

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Helpful Links
CARD Grant Information
Conservation Improvement Programs

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Project Resources Tab

- **Minnesota EUI Policy Guidance**
 - [EUI Project Review Process and Determining Normal Maintenance](#)
 - [Claiming Energy Savings through EUI Improvements and the Energy Savings Carry Forward Provision](#)
- [EUI Project Screening Tools](#)

Excel spreadsheet high-level screening tool for EUI conservation projects also developed by GDS
- [Minnesota Technical Reference Manual v3.0](#)

Includes calculations for EUI measures developed by GDS

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Questions?



Travis Hinck
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GDS Associates



SAVE THE DATE

NOVEMBER
13-14
Omaha, NE



2019 *Midwest*
**Building Energy Codes
Conference**

SAVE THE DATE

2020
MIDWEST
ENERGY
SOLUTIONS
CONFERENCE

FEBRUARY 26-28, 2020

CHICAGO, IL

Thank you!

Anna Connelly

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