



Conservation Applied Research and Development (CARD), Clean Energy Resource Teams (CERTs), and Sustainable Buildings 2030 (SB 2030)

February 15, 2022

Minnesota Department of Commerce

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Pursuant to Minnesota Statute 3.197: This report cost approximately \$1,420.00 to prepare, including staff time.

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Executive Summary

Funding for the Conservation Applied Research and Development program (CARD), Clean Energy Resource Teams (CERTs), and Sustainable Buildings 2030 (SB2030) was established by Minnesota Statutes § 216B.241 in the Conservation Improvement Program (CIP). These funds originate from utility assessments that provide resources to the Minnesota Department of Commerce (Commerce) and other legislatively-named entities to support achievement of Minnesota’s statewide energy policy goals. Each of these programs is uniquely positioned to help continuously achieve energy efficiency and renewable energy project implementation throughout the state. The following report details the activities of each of these programs.

Conservation Applied Research and Development (CARD)

Major accomplishments of the CARD program overall include:

- Dissemination of CARD grant results to utilities and other stakeholders through project reports, articles, webinars and at regional and national conferences.
- Enhancements to utility CIP offerings and increased energy savings achieved toward utility energy savings goals.
- Use of CARD project results and insights to inform policy decisions in Minnesota.

Specific accomplishments of the CARD program for calendar year 2021 include:

- Twenty-three (23) new CARD projects added to the portfolio.
- Seven (7) previously funded CARD projects completed.
- Five (5) CARD webinars conducted to broadly disseminate results of CARD projects.
- Successfully navigated complications of COVID-19 pandemic to complete seven (7) CARD projects and keep another 30 ongoing CARD projects on track.

Clean Energy Resource Teams (CERTs)

Major accomplishments of the CERTs Partnership in 2021 include:

- Hosted 34 events with 1,635 attendees, connected with an additional 5,923 community members through 424 meetings, presentations, and other outreach activities across the state.
- Saved or offset 37 billion BTUs over the past year as a result of CERTs’ efforts.
- Wrapped up funding for the thirty-five 2020 community-based clean energy seed grant projects. Launched the request for proposals (RFP) for 2022 projects and received 137 applications.
- Awarded seed grants to 74 projects in communities across Minnesota. Applications were submitted by community projects in 2021, awarded in 2022. The number of projects awarded in 2022 was double the number of projects awarded in 2021. See [Commerce’s press release January 20, 2022](#) for more detail.

Sustainable Buildings 2030 (SB 2030)

Major accomplishments of the SB 2030 initiative through 2021 include:

- 217 buildings designed to the SB 2030 Energy Standard are predicted to save approximately 1,083 million kBtus/year.
- To date, 88% of all building projects enrolled in the SB 2030 program have documented designs that met or exceeded the SB 2030 Energy Standard.
- Buildings designed to the SB 2030 Energy Standard are predicted to save approximately \$20.0 million per year assuming an average cost of \$18.46 per mmBtu.
- Buildings designed to the SB 2030 Energy Standard anticipate a reduction in carbon emissions of 140,000 tons of CO₂e annually.
- Projects have reported anticipated energy consumption of 29% less than their 2030 Energy Standard.
- 168 completed SB 2030 projects are estimated to have saved 5,140 million kBtus, a reduction of 735,000 tons of CO₂e and a savings of \$94.9 million to-date.

Conservation Applied Research and Development (CARD)

Introduction

The Conservation Applied Research and Development (CARD) grant program is administered by the Department of Commerce, Division of Energy Resources (Commerce). Approximately \$2.6 million is available annually for the program. The grant funds benefit the State of Minnesota and Minnesota ratepayers through the Conservation Improvement Programs (CIP) that utilities operate. Significant CARD program metrics since its start in 2008 and for calendar year 2021 are summarized in Table 1.

Table 1. CARD program metrics

Description of Metric	Since Start of Program	For Calendar Year 2021 ^a
Successful CARD grant funding cycles	12	0
Request for Proposals (RFP) issued by Department	24	0
Request for Information (RFI) issued by Department	2	0
Letters of Intent (LOI) to Propose submitted by Responders and reviewed by Department staff	537	0
Full proposals submitted by Responders and evaluated by Department staff	513	0
R&D projects funded through the CARD grant program	160	23
Pending CARD grants	0	0
Completed CARD grant projects	113	7

a. Includes activities through December 1, 2021 when this report was compiled.

Overview of Projects

CARD projects quantify the savings, cost effectiveness and field performance of advanced technologies; characterize market potential of products or technologies within the state; study and characterize hard-to-reach market sectors; investigate and pilot innovative program strategies; and review and analyze relevant policy issues. Completed CARD projects provide utilities with informative and timely information to enhance energy efficiency program designs within their CIP portfolios.

Through 2021, the CARD program has funded 160 projects totaling over \$34 million. These projects received (or will receive) an additional \$8 million in matching funds (Table 2).¹

Table 2. Summary of CARD program funding to date

Project Type	Number	% of Total Projects	Dollars Awarded	% of Awarded Dollars	Estimated Match
<u>RFP Funded</u> Projects awarded through RFP process (includes 106 completed, and 15 ongoing projects)	143	89.4%	\$31,920,561	93.5%	\$7,515,681
<u>Pending RFP Funding</u> Projects anticipated as result of pending RFP evaluations (Approximations)	0	0%	\$0	0%	\$0
<u>Non-RFP Funded</u> Projects awarded outside of RFP process (includes 15 completed projects and 1 ongoing project)	17	10.6%	\$2,232,657	6.5%	\$496,605
All CARD Projects	160	100%	\$34,153,218	100%	\$8,012,286

Error! Reference source not found.he majority of CARD grants are funded through a competitive Request for Proposal (RFP) process. Based on a review of current Conservation Improvement Program (CIP) needs, with input from utilities and other stakeholders, the Department issues an RFP, and reviews and evaluates each submitted proposal based on specific criteria including:

- CIP priorities:

¹ Award amounts shown in Table 2 are based on initial awards and does not include additional amounts that might be added through amendments. To date additional funds added through amendments has totaled only 0.4% of initial awards. Amounts shown in the table also do not reflect funds left unspent after the close of contracts. To date, unspent money returned to the CARD fund has been about 2% of initially awarded funds. In addition, matches shown in Table 2 are based on match commitments in initial grant contracts; collected matches often exceed what was committed in the contract. On average, matching funds are approximately 17% **higher** than initially estimated.

- Proposal’s content, scope of work and work plan;
- Responder’s qualifications, skills and experience;
- Anticipated impacts of the project outcomes; and
- Project budget (which often includes matching funds from the responder).

To date, CARD grants funded by RFP number 143, representing almost \$32 million in funding, plus \$7.5 million in matching funds (Table 2).

Occasionally, Commerce will fund a CARD project outside of the competitive RFP process. This is typically in cases where a necessary project/service requires a sole source provider, or when Commerce can leverage CARD funds for a project already underway or being funded from multiple sources. To date, 17 such projects have been funded by this means, representing just over \$2.2 million of total funds (Table 2). These non-RFP grants also represent nearly \$500,000 in matching funds.

In summary, RFP funded grants account for 89.4% of all CARD projects awarded and 93.4% of all CARD funding. By comparison, sole source grants or professional/technical contracts only account for 10.6% of funded CARD projects and 6.5% of CARD dollars spent (Table 2, Figure 1).

Figure 1. CARD funding to date from RFPs versus sole source contracts

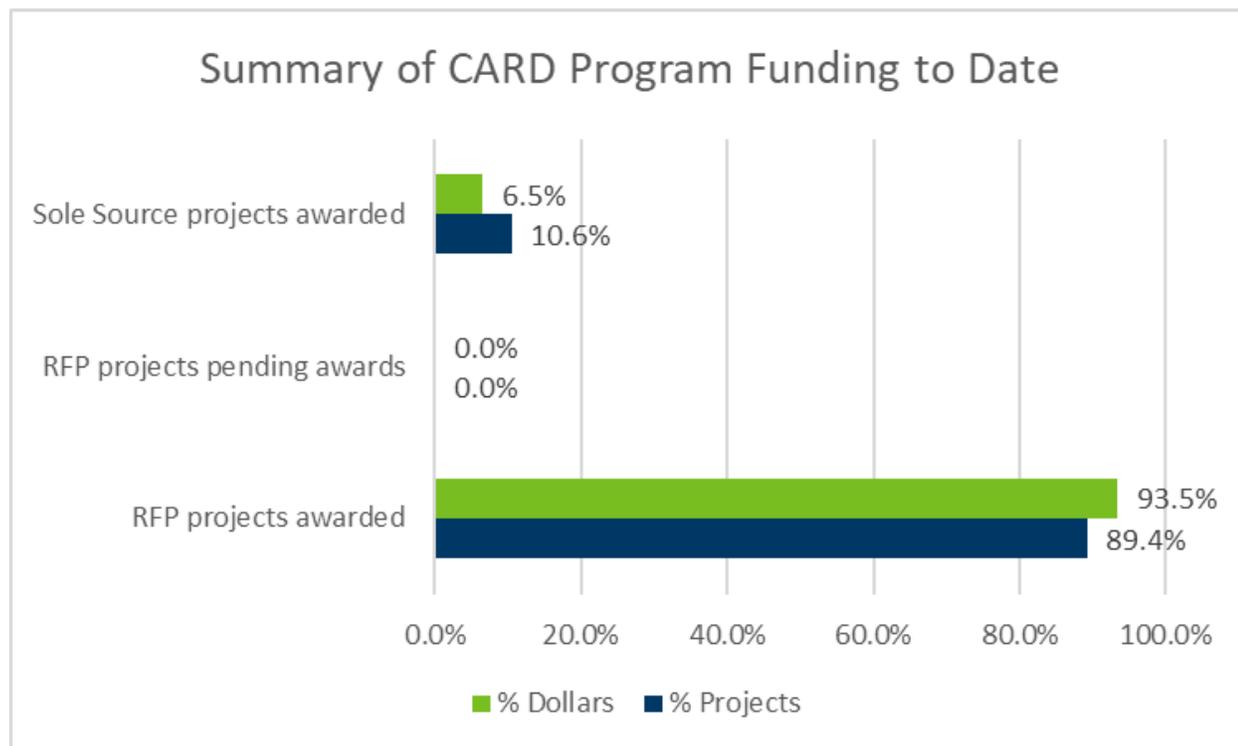


Table 3 lists completed CARD projects that were funded to date through the RFP process, including details on each project.

Table 3. Completed CARD projects funded through RFP process (as of December 2021)

RFP Year	Fund Cycle	Grantee	Project Description	Dollars Awarded	Estimated Match	Year of Completion
2008	1	Owatonna Public Utilities	Home Energy Reports Pilot Program	\$123,260	\$531,272	2011
2008	1	Center for Energy and Environment	Actual Savings and Performance of Natural Gas Instantaneous Water Heaters	\$160,495	\$281,905	2010
2008	1	U of MN - Sponsored Projects Admin. Grants & Contracts	Quantification of Changes in Residential/Multifamily Building Codes and Standards for Assessing Energy Conservation and Efficiency Impacts in a Cold Climate	\$90,606	\$15,912	2010
2008	1	Great River Energy	Home Energy Reports Pilot	\$165,000	\$424,300	2010
2008	1	Energy Center of Wisconsin	Plugging into Savings - Taming Home Electricity Use	\$285,700	\$60,000	2010
2008	1	U of MN - Sponsored Projects Admin. Grants & Contracts	Researching Energy Conservation Potential for Minnesota Business and Industry	\$203,177	\$0	2010
2008	1	Eugene A. Scales & Associates, Inc.	Quantification of Indirect Program Impacts (Re-Direct Program)	\$91,170	\$9,000	2010
2008	1	Franklin Energy Services LLC (Glacier Consulting Group)	Research to Inform Design of Residential Energy Use Behavior Change Pilot	\$47,305	\$0	2009
2008	1	Navigant Consulting (Summit Blue Consulting)	Demand Side Management (DSM) Potential Study	\$354,250	\$0	2010
2009-10	2	Northwind Sailing, Inc.	Angry Trout Cafe Kitchen Exhaust HR	\$22,450	\$8,650	2012
2009-10	2	Center for Energy and Environment	Capturing Energy Savings from Large Building Envelope Leakage Reduction	\$395,240	\$316,760	2014
2009-10	2	Class5 (Energy Efficiency Programs, Inc.)	Energy Efficiency in the Workplace (health care facilities).	\$395,444	\$5,000	2013

RFP Year	Fund Cycle	Grantee	Project Description	Dollars Awarded	Estimated Match	Year of Completion
2009-10	2	Franklin Energy Services, LLC	Emerging Energy Efficiency Financing Mechanisms - provide analysis of emerging energy eff financing models and assess the applicability and attractiveness to MN	\$46,284	\$0	2011
2009-10	2	Franklin Energy Services, LLC	Energy Management Teams - Coordinator Resource Pilot Study	\$340,464	\$76,284	2012
2009-10	2	Franklin Energy Services, LLC	Utility Infrastructure Improvements for Energy Efficiency: Best Practices Study	\$27,864	\$0	2010
2009-10	2	Energy Platforms, LLC	Energy Savings Platform (ESP) Creation of a standards-based Info Technology platform enabling MN utilities to design, implement, administer, & report on CIPs.	\$1,500,000	\$511,250	2012
2009-10	2	Franklin Energy Services, LLC	ASHP Efficiency Gains from Low Ambient Temperature Operation using Supplemental Electric Heating	\$55,792	\$0	2011
2009-10	2	U of MN (Bioproducts & Biosystems Engineering)	Residential GSHP Study. Monitor and analyze the performance of installed residential GSHP in MN.	\$780,816	\$89,738	2016
2009-10	2	Neighborhood Recycling Corp., (The Green Institute)	Develop an energy efficiency program model for small businesses based on low cost operations and maintenance conservation measures.	\$227,124	\$32,300	2014
2011	3	Energy Center of Wisconsin	Field Test of Drainwater Heat Recovery in Commercial Buildings	\$138,294	\$5,000	2013
2011	3	CLASS 5, Inc.	CLASS 5 Community (City-Wide)	\$162,226	\$146,000	2015
2011	3	Center for Energy and Environment	Advanced Rooftop HVAC Unit Controls Pilot	\$408,108	\$417,865	2014
2011	3	Energy Center of Wisconsin	Automatic Daylighting Control Commissioning in the Midwest	\$206,172	\$10,500	2013

RFP Year	Fund Cycle	Grantee	Project Description	Dollars Awarded	Estimated Match	Year of Completion
2011	3	Minnesota Project, The	LEDs: Energy Savings and Replicability in MN Livestock Facilities	\$185,130	\$75,000	2014
2011	3	Franklin Energy Services, LLC	Technical Review of the Minnesota Deemed Savings Database	\$146,880	\$0	2012
2011	3	Franklin Energy Services, LLC	The Energy Efficiency Potential in Minnesota's Multi-family Sector	\$599,056	\$0	2013
2011	3	Energy Management Solutions, Inc.	Street Lighting	\$49,000	\$0	2012
2011	3	Michaels Energy	Convenience Store Energy Efficiency	\$52,000	\$76,000	2013
2011	3	Franklin Energy Services, LLC	Single Recommendation Strategy Study	\$11,380	\$0	2013
2011	3	Minnesota Municipal Utilities Association	Smart Grid Technologies Installation & Assessment	\$283,825	\$283,825	2015
2011	3	Energy Management Solutions, Inc.	Variable Refrigerant Technology in Cold Weather Climates	\$65,925	\$0	2014
2011	3	Michaels Energy	Energy Savings from Demand Response and Load Management	\$100,000	\$0	2013
2011	3	Bright Power	Multi-family Energy Benchmarking with EnergyScoreCards	\$398,164	\$330,776	2015
2012	4	Center for Energy and Environment	Saving Energy by Reducing Duct Leakage in Large Commercial & Institutional Buildings	\$380,155	\$189,045	2016
2012	4	Center for Energy and Environment	Window Retrofit Technologies for Increased Energy Efficiency without Replacement	\$47,224	\$28,458	2014
2012	4	U of MN - MnTAP	Researching Energy Conservation Potential at Minnesota Data Centers	\$46,781	\$0	2014
2012	4	Weidt Group, The	Integrating Benchmarking and the Green Button Initiative into Utility CIP to Capture Greater Energy Savings	\$50,000	\$10,000	2016

RFP Year	Fund Cycle	Grantee	Project Description	Dollars Awarded	Estimated Match	Year of Completion
2012	4	Center for Energy and Environment	Condensing Boiler Optimization	\$209,232	\$105,488	2016
2012	4	U of MN - MnTAP	Motivating Manufacturing Energy Efficiency: E2 Assessments and GreenLean(SM) Training with Directed Implementation Assistance	\$177,488	\$150,000	2016
2012	4	Minnesota Project, The	Dairy Cooperative Partnerships for Improved Efficiency Program Adoption	\$210,232	\$5,557	2015
2012	4	Center for Energy and Environment	Heat Pump Water Heaters: Savings Potential in Minnesota	\$25,941	\$17,294	2014
2012	4	Center for Energy and Environment	Reducing the Energy Cost of Effective Ventilation in Multi-Unit Buildings	\$148,348	\$83,232	2015
2012	4	Gas Technology Institute	Advanced Heat Recovery System Field Deployment	\$743,603	\$19,000	2016
2012	4	Michaels Energy	Cost-Effective Recommissioning of Restaurants	\$276,410	\$12,600	2015
2012	4	University of Illinois at Chicago, Energy Resources Center	Increasing CHP Opportunities to Aid Minnesota's Energy Savings Goal: Analyzing Net Metering Rules and Standby Rates	\$23,040	\$7,680	2014
2013	5	FVB Energy Inc.	Combined Heat and Power (CHP) Policy Review and Potential	\$199,976	\$0	2014
2013	5	Seventhwave, Inc.	Improving installation & maintenance practices for Minnesota residential furnaces, air conditioners & heat pumps	\$437,950	\$52,175	2016
2013	5	Seventhwave, Inc.	Commissioning of demand control ventilation systems in cold climates	\$265,000	\$7,500	2015
2013	5	Gas Technology Institute	Field Study of High Efficiency Heating & Cooling Mixed-air Rooftop Units (RTUs)	\$236,382	\$66,275	2018
2013	5	Seventhwave, Inc.	Energy savings from institutional tuning in Minnesota	\$200,000	\$17,580	2015

RFP Year	Fund Cycle	Grantee	Project Description	Dollars Awarded	Estimated Match	Year of Completion
2013	5	Franklin Energy Services	Field Test of Large Battery Charging Technologies	\$67,512	\$10,210	2017
2013	5	Center for Energy and Environment	Improving Effectiveness of Commercial Energy Recovery Ventilation Systems	\$379,478	\$100,101	2017
2013	5	Center for Energy and Environment	Demonstrating the Effectiveness of an Aerosol Sealant to Reduce Multi-Unit Dwelling Envelope Air Leakage	\$280,996	\$74,549	2017
2013	5	Michaels Energy	Mainstreaming Motel Optimization	\$335,024	\$14,850	2015
2013	5	Seventhwave, Inc.	Research-based design of a residential high user program	\$297,956	\$28,000	2016
2013	5	Sustainable Engineering Group	The Energy Conservation Potential of Displacement Ventilation Technology in Minnesota Climate Conditions	\$90,170	\$0	2016
2013	5	Outsourced Innovation	Improving Energy Efficiency and Crop Production in Controlled Environment	\$126,970	\$14,368	2015
2013	5	Weidt Group	Net Energy Optimizer for Commercial New Construction	\$50,000	\$193,050	2017
2013	5	Center for Energy and Environment	Optimized Operation of Indoor Public Pool Facilities	\$240,000	\$60,000	2017
2013	5	Energy Center of Wisconsin	CIP: Stakeholder Meetings' Facilitator for Energy Savings Goal Study	\$59,978	\$0	2013
2013	5	Strategen Consulting	CIP: White Paper Analysis of Utility-Managed, On-Site Energy Storage in Minnesota	\$99,781	\$0	2014
2013	5	Meister Consultants Group	CIP: Value of Solar Thermal Study RFP	\$75,000	\$0	2014
2013	5	U of MN (The Minnesota Project)	Maximizing Rural Electric Cooperative Farm Energy Efficiency Programming	\$74,993	\$5,195	2016
2014	6	Burr Energy (Microgrid Institute)	Engagement Survey for CHP in MN	\$13,393	\$0	2015

RFP Year	Fund Cycle	Grantee	Project Description	Dollars Awarded	Estimated Match	Year of Completion
2014	6	Burr Energy (Microgrid Institute)	CHP Facilitator for Stakeholder Engagement	\$28,947	\$0	2015
2014	6	Center for Energy and Environment	Pilot Study of a Furnace Retrofit Device for High Efficiency Residential Heating and Humidification	\$401,201	\$93,373	2017
2014	6	Gas Technology Institute	Advanced Commercial Clothes Dryer Technologies Field Test	\$193,756	\$14,500	2018
2014	6	Center for Energy and Environment	Field Assessment of Cold-Climate Air Source Heat Pumps	\$201,445	\$103,155	2018
2014	6	Seventhwave, Inc.	Commercial Roof-top Unit Characterization and Performance	\$419,714	\$35,104	2017
2014	6	Center for Energy and Environment	Evaluation of New Domestic Hot Water System Controls in Hospitality and Commercial Buildings	\$200,599	\$42,235	2018
2014	6	Center for Energy and Environment	Small Embedded Data Center Program Pilots	\$272,829	\$71,490	2017
2014	6	Illume Advising, Inc.	Behavioral Programs Literature Review & Benchmarking Study, and Workshops	\$122,620	\$16,125	2018
2014	6	Center for Energy and Environment (86778 NEC)	Quality Installation and Retrocommissioning of High Efficiency Condensing Boilers	\$220,250	\$48,600	2018
2014	6	Seventhwave, Inc.	Assessments of Plug-Load Control Devices in Commercial Buildings	\$299,000	\$35,750	2017
2014	6	Cadmus Group, Inc., The	Economic Impact Analysis of the Conservation Improvement Program	\$120,012	\$3,820	2015
2014	6	Michaels Energy, Inc.	Continuous Commissioning for Small Outpatient Medical Clinics	\$220,296	\$33,700	2017
2014	6	Center for Energy and Environment	Commercial Energy Code Compliance Pilot	\$354,525	\$45,200	2018

RFP Year	Fund Cycle	Grantee	Project Description	Dollars Awarded	Estimated Match	Year of Completion
2014	6	APPRISE, Inc.	Statewide Policy Analysis and Evaluation of Low-Income Programs in Minnesota Utility CIP Portfolios	\$245,096	\$23,760	2018
2014	6	Seventhwave, Inc.	Minnesota Manufactured Homes Characterization and Performance	\$346,208	\$27,200	2016
2014	6	Franklin Energy Services, LLC	MN Technical Reference Manual Update for 2017-2019	\$331,172	\$0	2019
2015	7	GDS Associates, Inc.	Identify & recommend prescriptive EUI measures for inclusion in TRM	\$110,470	\$0	2017
2015	7	Franklin Energy Services, LLC	T12 Socket Penetration Study	\$81,585	\$53,305	2017
2015	7	Seventhwave, Inc.	Enhancing New Construction Programs with Performance-based Procurement and Design	\$314,904	\$73,390	2018
2015	7	Seventhwave, Inc.	Characterizing Opportunities for Small Commercial Energy Programs	\$437,589	\$24,860	2018
2015	7	Illume Advising, LLC	Statewide Commercial Behavior Segmentation and Potential Study	\$448,022	\$14,578	2017
2015	7	Gas Technology Institute	Field Study of An Intelligent, Networked, Retrofittable Water Heat Controller	\$281,852	\$20,000	2018
2015	7	University of Minnesota	Industrial Compressed Air Demand Reduction through Air Tool Replacement	\$68,889	\$3,150	2018
2015	7	GDS Associates, Inc.	Direct Cooling Retrofit for Server Racks	\$158,987	\$231,103	2017
2015	7	GDS Associates, Inc.	Dairy Farm Precise Ventilation Control Electric Savings	\$36,867	\$56,153	2018
2015	7	GDS Associates, Inc.	Whole-Farm Energy Management Valuation	\$203,415	\$59,844	2018
2016	8	GDS Associates, Inc.	Electric Utility Infrastructure Potential Study	\$277,965	\$0	2018
2016	8	Center for Energy and Environment	Natural Gas & Electric Potential Study	\$1,656,252	\$86,439	2019

RFP Year	Fund Cycle	Grantee	Project Description	Dollars Awarded	Estimated Match	Year of Completion
2017	8	Synapse Energy Economics, Inc.	Updating the energy efficiency cost-effectiveness framework in Minnesota	\$49,860	\$0	2018
2017	8	Michaels Energy, Inc.	Stakeholder views on the emerging intersection of electrification, efficiency & decarbonization	\$44,462	\$8,283	2018
2017	8	American Council for an Energy-Efficient Economy (ACEEE)	Prepaid electricity plans as energy efficiency programs in Minnesota: Potential savings and concerns.	\$49,998	\$2,751	2019
2017	8	University of Minnesota	Driving Wastewater Treatment Energy Efficiency through a Cohort Training Model	\$50,000	\$7,980	2019
2017	8	Seventhwave, Inc.	Field study of Tier 2 advanced power strips	\$105,978	\$7,703	2019
2017	8	Center for Energy and Environment	Pay-For-Performance: A Development Tool to Incentivize Ongoing Building Performance	\$49,334	\$8,706	2020
2017	8	Evergreen Economics, Inc.	Future Emerging Technologies: Leveraging Public Research for Application in Minnesota	\$49,680	\$20,360	2019
2017	8	Center for Energy and Environment	Field Study of Stand-alone Dehumidification and Efficiency Opportunities in MN Single Family Homes	\$257,780	\$41,843	2020
2017	8	Center for Energy and Environment	Expanded Scope Commercial Boiler Tune Ups	\$250,960	\$38,605	2021
2017	8	Center for Energy and Environment	Cooling Loads: The diversity of potential residential cooling solutions and a best practices guide	\$49,946	\$8,814	2021
2017	8	Slipstream, Inc.	Field and market assessment of heat pump clothes dryers	\$376,598	\$45,620	2021
2017	9	Slipstream, Inc.	MN Residential Energy Baseline & Market Characterization Study	\$299,390	\$18,527	2020
2017	9	Slipstream, Inc.	MN Commercial Energy Baseline & Market Characterization Study	\$319,863	\$17,850	2020

RFP Year	Fund Cycle	Grantee	Project Description	Dollars Awarded	Estimated Match	Year of Completion
2019	10	Cadmus Group, Inc., The	Understanding the Market Barriers & Opportunities for Cold Climate Air Source Heat Pumps in Residential Households	\$206,077	\$0	2020
2018	10	Slipstream, Inc.	Market potential for saving energy and CO2 with load shifting measures	\$170,134	\$14,348	2020
2018	10	Slipstream, Inc.	Light level characterization in Minnesota commercial buildings	\$169,488	\$8,476	2020
2018	10	Center for Energy and Environment	Commercial and Industrial Refrigeration Market Assessment	\$226,850	\$21,366	2021
2018	10	University of Minnesota - MnTAP	Market Study to Determine the Energy Efficiency Opportunity Potential at Minnesota Drinking Water Utilities	\$70,000	\$7,845	2021
2018	10	Center for Energy and Environment	Revealing the Market for Strategic High-Performance Envelope Retrofits	\$120,170	\$21,206	2021
2018	10	2050 Partners, Inc.	Minnesota Codes and Standards Program: Concept to Realization Roadmap	\$343,212	\$6,646	2021
2018	11	Cadmus Group, Inc., The	Economic Impact of CIP	\$193,680	\$6,140	2020
Totals:			113 completed projects	\$25,458,547	\$6,429,601	

Figure 2 is an example result from a recently completed CARD project which estimated the market potential for utility program energy saving from optimizing existing refrigeration systems and installing new refrigeration technologies in existing Minnesota grocery stores, ice arenas, and industrial facilities. As the figure below indicates, the majority of potential program growth areas relate to optimizing existing refrigeration systems, while the total potential for further program advances for new equipment is small. Also note, that while existing grocery stores provide the largest share of the potential growth, industrial refrigeration and ice arenas also each have significant savings potential compared to current program savings.

Figure 2. Three-year Increased Program Savings Potential in Commercial and Industrial Refrigeration Market (MWh)

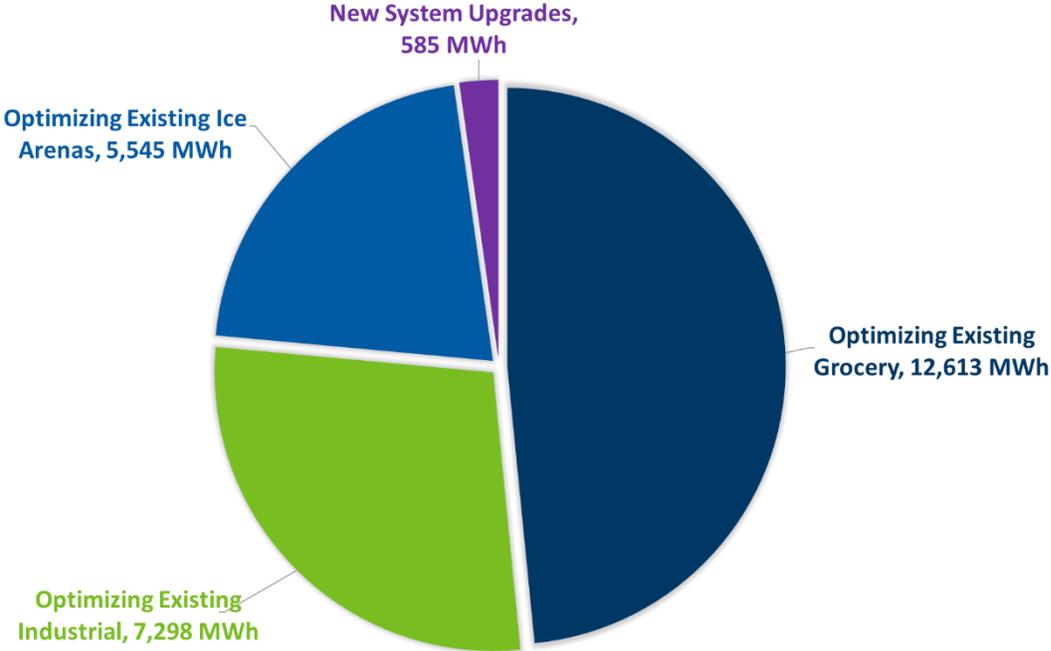


Table 4 lists CARD projects funded through the RFP process currently ongoing, including details on each project.

Table 4. Ongoing projects funded through RFP process (as of December 2021)

RFP Year	Fund Cycle	Grantee	Project Description	Dollars Awarded	Estimated Match
2017	8	Gas Technology Institute	Demonstration of packaged central condensing tankless water heating systems in multifamily buildings	\$334,667	\$20,555
2017	8	Center for Energy and Environment	The Operation and Control of Lighting, Plug Loads, and other Power over Ethernet (PoE) Technologies Using Network Switches in Small Commercial and Institutional Buildings	\$104,975	\$389,901
2018	10	Michaels Energy, Inc.	Energy Efficiency Potential of Nanofluids	\$266,837	\$89,680
2018	10	Franklin Energy Services, Inc.	Energy Savings Potential of Networked Lighting Control Systems in Small Businesses	\$141,631	\$8,320
2018	10	LHB, Inc.	Field study of phase change material (PCM) use for passive thermal regulation	\$321,631	\$13,507
2018	10	Center for Energy and Environment	Optimized Installations of Air Source Heat Pumps for Single Family Homes	\$360,707	\$52,007
2018	10	Center for Energy and Environment	Ductless cold climate heat pumps for multifamily applications	\$343,940	\$41,354
2019	11	Indian Land Tenure Foundation	CIP with Tribal Governments & Tribal Members	\$119,911	\$8,686
2020	12	Slipstream	Refrigeration Thermal Storage for Energy Efficiency	\$266,650	\$16,272
2020	12	Center for Energy and Environment	Heat Pump for ACs: Energy Savings and Modernization of Single-Family Cooling Systems	\$153,380	\$14,684
2020	12	U of MN – Center for Sustainable Building Research	The Market for Passive House Multifamily Projects in Minnesota	\$255,580	\$33,747
2020	12	Center for Energy and Environment	How Smart Do Intelligent Buildings Need to Be?	\$202,737	\$11,585
2020	12	Citizens Utility Board of Minnesota	Analysis of New or Modified Energy Efficiency Programs to Increase Energy Savings of Underserved Populations	\$50,000	\$21,574
2020	12	Cadmus Group	Measuring the Equivalent Full Load Heating and Cooling Hours for Residential HVAC Equipment in Minnesota	\$111,270	\$4,060

RFP Year	Fund Cycle	Grantee	Project Description	Dollars Awarded	Estimated Match
2020	12	Center for Energy and Environment	Advanced Controls for Residential HVAC Fan	\$288,659	\$23,983
2020	12	Slipstream	Cold-Climate Variable Refrigerant Flow Demonstration and Market Research	\$378,957	\$44,864
2020	12	Slipstream	Equity, Empowerment, and Energy Reduction through Community Engagement and Behavioral Interventions	\$449,885	\$24,010
2020	12	Center for Energy and Environment	Air-to-Water Heat Pumps: The cold climate solution for high-efficiency cooling, space heating, and water heating	\$330,048	\$26,772
2020	12	Michaels Energy	A Field Study of Ground Source Technology in Retrofit Applications in Urban (space constrained) Commercial Buildings	\$295,894	\$28,920
2020	12	Great Plains Institute	Electric Utility Energy Conservation Program Participation Rates and Barriers to Participation among Latinx-owned Businesses across Minnesota	\$50,000	\$8,390
2020	12	ThermoLift Inc.	Installation/use of patented thermal compression heat pump (TCHP) a refrigerant-free cold-climate natural-gas heating, cooling, and hot water system	\$100,000	\$74,125
2020	12	Cadmus Group	Measuring the Savings from Smart Thermostats Installed in Minnesota Homes	\$120,180	\$4,060
2020	12	Center for Energy and Environment	Optimizing the New Generation of Grocery Refrigeration Equipment	\$392,393	\$22,674
2020	12	GDS Associates	Field Study to Quantify Energy Efficiency Opportunity in Radio Wave Grain Drying Systems	\$125,520	\$28,057
2020	12	Slipstream	Field Demonstration of ASHRAE Guideline 36-2018 High-Performance Sequences of Operation for HVAC Systems	\$364,710	\$30,225
2020	12	EcoMetric Consulting	HVAC Contractor Decision Research	\$209,312	\$17,815
2020	12	U of MN – Center for Sustainable Building Research	Project Overcoat: Investigation of a process for affordable high-performance enclosure upgrades for multifamily buildings	\$50,000	\$0
2020	12	Center for Energy and Environment	Overcoming the Market Barriers for RTU Retrofit Enhancements	\$175,521	\$18,447

RFP Year	Fund Cycle	Grantee	Project Description	Dollars Awarded	Estimated Match
2020	12	Center for Energy and Environment	Energy Savings from Residential Zoned Air Distribution Systems	\$49,839	\$5,538
2020	12	Slipstream	Tribal Food Sovereignty: How Minnesota Utility CIP Participation Pathways can Enable Greater Food Security for Minnesota Tribes	\$47,180	\$2,815
		Totals:	30 Ongoing projects	\$6,462,014	\$1,086,627

Figure 3 and Figure 4 are examples of the types of equipment being installed as part of two cold-climate air-source heat pump CARD studies that are currently ongoing. These innovative heat pumps are designed to provide air conditioning and most of the heating for a single-family home or multifamily unit.

Figure 3. Ducted Whole House Cold-Climate Air-Source Heat Pump, which Includes an Outdoor Condenser unit (left) that is connected to an Evaporator Coil installed in the Ductwork of the Forced-Air Furnace Inside the Home (right) (Pictures courtesy of the Center for Energy and Environment).



Figure 4. Ductless Cold-Climate Air-Source Heat Pump, which Includes an Outdoor Condenser Unit (left) and an Indoor Evaporator Unit or Head (right). (Pictures courtesy of the Center for Energy and Environment)



Ongoing Efforts

Each year, Commerce solicits input from utilities and other stakeholders to inform CIP needs and help develop appropriate topics for the RFPs. In 2021, this process was continued. Commerce began gathering feedback on the previous statewide demand-side management potential study, completed in 2018, to assist with planning for a possible updated study.

Beginning in 2012 and continuing in 2021, Commerce has reviewed policies and practice for CARD grant contract negotiation and project management to improve the quality and consistency of CARD project reporting and monitoring, and to produce deliverables that are more accessible to utilities and other stakeholders. In 2020, efforts focused on the implementation of a new grant interface website (GIW) first introduced in 2019. The interface has improved the application process for potential grantees and provided more consistent tracking and oversight of grantee applications for the Department.

The process was tested in late 2019 and early 2020 with a CARD-specific RFP. Given the successful results from that test, in 2020 the GIW was first utilized for a more complicated, multi-topic general CARD RFP. This effort was successful and involved a major re-envisioning of the CARD RFP process to interconnect with and conform to the GIW.

In 2013, a Letter of Intent (LOI) to propose procedure was added to the process for responding to general topic RFPs. This process allows Commerce to review project ideas and recommend only certain projects to proceed to full proposal. Both potential grantees and utilities appreciated this improvement as it improved the efficiency of the evaluation process and allowed respondents to focus on proposals more likely to be successful.

In 2017, Commerce further improved the LOI process by inviting utility representatives to participate in it. This initiative was well-received and resulted in a more robust process, as well as recommendations for projects more in line with utility goals and needs. In 2018 and 2019, Commerce further refined this process to make it more efficient and accessible to utilities. In 2020, the process was further updated and successfully incorporated into the GIW platform.

Starting in 2014, Commerce improved public accessibility of grant proposals and evaluation files by making them available electronically on the Department website through the Commerce Actions and Regulatory Document Search tool.² Previously, viewing these files required an appointment and in-person viewing of a hard copy of evaluation documents. In 2020, some minor improvements were made to the process of accessing these files.

In 2015, an updated CARD website was rolled out which includes a search tool for CARD projects allowing users to quickly obtain a list of past and ongoing CARD grants, search, or sort by market sectors or targeted technology, obtain more details on specific projects of interest and link to available final reports. The website underwent additional updates and improvements in 2020. In addition, CARD results continue to be presented at local, regional and national conferences with very positive feedback.

Starting in 2016 and continuing through 2021, Commerce improved stakeholder and public understanding of the CARD Grant Program's purpose and the role it plays in helping to achieve the State's energy savings goal. Commerce sought ongoing input from stakeholders regarding research needs, worked more collaboratively with utilities on ongoing CARD projects and encouraged grantees to seek more utility input and collaboration. Dissemination of CARD grant results have become more systematic, including regular articles for distribution through the CIP contact list, CIP Notifications and other publications, publicizing final CARD reports more broadly, holding webinars on CARD results and making the webinars available for on-demand viewing at a later date. In addition, Commerce standardized CARD webinars to give them a consistent look and add an introduction by Commerce's staff, which has raised the profile of the CARD program and received positive feedback from stakeholders.

In 2019, Commerce began a project to build a database of CARD projects that classifies projects according to the results. Classification categories include market sector, technology type, research approach, as well as notes on applicability in CIP and next steps for effective application in CIP. In 2020, feedback on classifications was collected from CARD stakeholders. This classification project is ongoing; once complete, will provide utilities with another tool for assessing CARD project results and applicability in their portfolios. All of these efforts have improved the quality of CARD project proposals and CARD project results.

The years 2020 and 2021 brought significant challenges to CARD project management due to the COVID-19 pandemic. Building lockdowns due to the pandemic affected the ability to freely access buildings and substantially changed operation of and energy use in buildings. Many projects had delays in recruiting appropriate research sites, installing new technologies at identified sites, and collecting data at research sites

² <https://www.cards.commerce.state.mn.us/CARDS/>

where monitoring of new technologies was in progress. In addition, changes in the way all building types (residential, multifamily, schools, commercial) are being utilized has altered energy usage compared to pre-pandemic operation, making analysis of technologies being assessed more complicated. Despite these challenges, seven (7) projects were successfully completed in 2021; eight (8) ongoing projects from 2020 were kept on track (albeit many with adjusted timelines for completion), and twenty-two (22) new research projects were successfully launched. These efforts were accomplished through the collective flexibility and diligence of Commerce project managers and grantees.

Clean Energy Resource Teams (CERTs)

Introduction

The Clean Energy Resource Teams (CERTs) are a statewide partnership³ with a shared mission to connect individuals and their communities to the resources they need to identify and implement community-based clean energy projects. CERTs empower communities and their members to adopt energy efficiency and renewable energy for their homes, businesses, and local institutions, and, increasingly, to electrify select end uses through electric vehicles and air source heat pumps. Through stories and decision tools, educational forums, programming cohorts, one-on-one assistance, and seed grants, CERTs catalyze clean energy projects. CERTs tailors assistance to five key audiences – government units, utilities, small businesses, agricultural producers and underserved communities – to ensure that a broad range of voices are part of advancing clean energy across Minnesota.

In 2021, key metrics from CERTs' work include:

- Saving or offsetting 37 billion BTUs, or enough to power over 1 million LED light bulbs annually. CERTs provides hands-on assistance to spur Minnesotans to move forward on clean energy action. Table 5 details actions that resulted in energy savings or offsets in 2021.
- Finalizing 35 seed grants from the 2020 round, and launching the 2022 seed grant round, which attracted 137 applications, with requests totaling over \$700,000 in project funding. These local projects provide key insights into community needs and priorities while also advancing community-based projects across sectors and geographies. (See row 1A in Table 5 for total energy saved in the 2020 round.)
- Awarding 74 seed grants in 2022
- Publishing 159 stories and news posts. CERTs' storytelling showcases an array of perspectives and voices so that all Minnesotans can see themselves in clean energy work.

³ The CERTs partnership joins the Minnesota State Energy Office, part of the Minnesota Department of Commerce, Division of Energy Resources; the University of Minnesota Extension Regional Sustainable Development Partnerships; the Southwest Regional Development Commission; and the Great Plains Institute.

- Reaching over 13,000 people through the MN Energy Stories email newsletter and reaching broader audiences through local media outlets that featured CERTs’ programs and partnerships in more than 70 stories. CERTs uses these venues to impartially meet stakeholders wherever they are on their clean energy journey.
- Hosting a total of 34 events, both in-person and online, with 1,635 attendees; and connecting with an additional 5,923 community members through 424 meetings, presentations, and other outreach activities. Through these forums, CERTs builds relationships within and among networks and provides learning opportunities to spark action.
- Empowering 123,000 individuals, who accessed stories, clean energy guides, job opportunities, and events on the CERTs website 235,000 times.
- CERTs’ online tools and guides⁴, some of which now offer multiple language options, are central to providing people with the step-by-step guidance they need to move forward with projects. The Clean Energy Job Board, CERTs’ most popular resource, hosted 222 postings.
- Engaging 87 Regional Steering Committee members across CERTs’ seven (7) regions. Relationships are central to all of CERTs’ clean energy work; steering committee members inform programming, serve as key connectors in and to their communities, and drive the seed grant process, from priority setting to reviewing and awarding funds.

The following sections provide details and examples of CERTs’ work with its primary audiences.

Activity Highlights

Governmental Units

CERTs engaged hundreds of cities, counties, schools, and tribal nations—through educational forums and networks, action cohorts, and direct technical assistance to local staff and officials—to help them advance their own clean energy projects. Highlights from 2021 include advancing a range of projects across the state, with solar and electric vehicles (EVs) as common themes.

Empowering Jurisdictions through Connections

CERTs’ mission speaks to connecting communities to the resources they need to identify and implement community-based clean energy projects, and with government units, connecting comes in many forms. An essential part of this work over the past year has been CERTs’ work, along with partners at the Great Plains Institute (GPI), to convene the Community Energy Network, a network of 20+ cities, a county, and a regional development commission. Members of the network meet quarterly to surface opportunities and barriers to clean energy action. Recent discussions have considered decarbonizing natural gas end uses, interconnection processes, and options to make clean energy more accessible to community residents.

⁴ <https://on.mncerts.org/tools>

CERTs also facilitate connections to national collaborators. As an offshoot of the Community Energy Network, CERTs worked with national partners (the World Resources Institute and Rocky Mountain Institute) to co-convene a cohort of three local governments and the University of Minnesota to explore procuring renewable energy via virtual power purchase agreements.

CERTs also connects the 130+ GreenStep city and tribal nations with clean energy best practice actions. A new CERTs-created Green Team Guide⁵ supports community-engagement actions. Storytelling showcases tangible actions that others could replicate and provides inspiration to go further, like the Mountain Iron podcast⁶ that detailed their work to capture the benefits of energy efficiency and scaling up local solar and an interview with Prairie Island Indian Community Tribal Council President and General Counsel⁷ about their Prairie Island Net Zero Project. These tools and stories are also critical pathways to connect with and empower government units beyond Minnesota.

Preparing Schools to Harness Solar

Over the past year, CERTs ramped up Solar for Schools activities to support students, teachers, and school administrators as they work to harness the benefits of solar energy. CERTs connected with schools in 22 districts about solar; these are all important relationships, given the launch of the new legislatively authorized solar on schools funding. CERTs also worked with Roseville Public Schools to issue a successful Request for Proposals (RFP) for onsite solar. (See row 2A in Table 5 for total energy generated.) To inspire and inform others considering projects, CERTs developed stories that showcased the people behind a Mounds View Public Schools project⁸ that installed solar at 13 buildings. CERTs also partnered with several MN science teachers and the Rural Renewable Energy Alliance to finalize a K-8 solar schools curriculum that was initially developed as part of a 2020 CERT seed grant.

Advancing Local Projects

Advancing projects is the ultimate goal of all of CERTs' work. For several years, CERTs have used cohort-based models to support jurisdictions taking action on a range of topics, including community solar, on-site solar, and electric vehicles. The cohort-based approach spurs participant action through shared learning and a peer-reinforcement approach that generates collective action.

This past year, CERTs' Cities Charging Ahead 2.0, a local government Electric Vehicle (EV)-focused cohort empowered 28 cities and two Tribal Nations to further their EV efforts. The cohort built upon tools and resources developed through a 2019 cohort, providing targeted support to cities to move from plans to action.

⁵ <https://on.mncerts.org/GreenTeam>

⁶ <https://on.mncerts.org/podcast-IM>

⁷ <https://www.cleanenergyresourceteams.org/prairie-island-indian-community-powering-seven-generations-clean-energy>

⁸ <https://www.cleanenergyresourceteams.org/mounds-view-public-schools-installs-solar-13-buildings>

The cohort also introduced the concept of EV-readiness and explored approaches to engaging local dealerships in EV promotion. Apple Valley, Eden Prairie, Edina, Faribault, Fridley, Golden Valley, Rochester, Shoreview, and St. Louis Park together installed 15 Level 2 charging stations, all of which are “dual-head,” allowing two vehicles to charge at once. Faribault also installed a DC fast charger. Carver, Coon Rapids, Edina, Fridley, Shakopee, and Woodbury collectively added 8 electric vehicles to their municipal fleets, with the most popular model being the Mitsubishi Outlander, but also one Chevy Bolt and one Ford Mustang Mach-E. (See row 2B in Table 5 for net energy saved.)

Direct CERTs support to local jurisdictions led to six solar projects across Minnesota. This included a successful RFP from Hutchinson Utilities (a municipal utility) to install a 625-kW solar array and a project with the City of Morris that made use of the Otter Tail Power Publicly Owned Property Solar program to install 113 kW across four (4) city facilities. (See row 2C in Table 5 for total energy generated.) CERTs also supported Morris and Coon Rapids as they worked to achieve designation through SolSmart, a national program that seeks to ease and facilitate widespread solar adoption through streamlined local rules and processes (see row 2D in Table 5 for total energy generated).

Direct support through seed grants led to completion of the Leech Lake Band of Ojibwe project entitled “Guiding Leech Lake to Sustainability,” as well as an LED project at the Marshall-Lyon County Library, a citywide solar PV potential study for the City of Northfield, and Red Wing’s climate action plan. Finally, based on interest from several jurisdictions in the Community Energy Network, CERTs worked closely with several cities and the Just Solar Coalition to develop a new sample RFP for on-site solar gardens, geared toward facilitating participation among residents. CERTs will partner with these cities in the coming year to use the RFP to advance new projects.

Utilities

CERTs’ work with utilities is often cross-cutting in nature. CERTs partners with utilities to implement programs that connect with other audiences like small businesses or residents. This continues to be a common theme, one which generates fruitful connections, programming, and on-the-ground energy savings. Over the past year, this work has also led to innovative approaches to reaching and more deeply engaging customers and members – like manufactured housing park residents. This past year, innovation has been another common theme across much of CERTs’ utility connected work. CERTs provided convening and facilitation support to several utility innovation and learning processes, has worked to support utilities as they explore new opportunities emerging through vehicle electrification, and has developed stories that highlight utilities advancing new approaches.

Delivering Savings through Program Implementation

CERTs collaborated with Otter Tail Power Company (OTP) to connect with 444 small business customers in 15 communities and with Minnesota Power (MP) to connect with 80 small business customers in Long Prairie through “business blitzes.” These blitzes include direct outreach to businesses about utility programs and focused on scheduling free energy assessment visits, with the goal that businesses will complete projects recommended in their assessment reports. During the 261 assessments conducted, many businesses received free, installed energy-saving measures like LED bulbs, water-saving devices, and water heater insulation. (See

row 3A in Table 5 for total energy saved.) Communities served are noted in the Small Businesses and Organizations section below.

Throughout the past year, CERTs partnered with a variety of natural gas and electric utilities to advance an intensive approach to making manufactured homes more energy efficient. Building on 2016 research from Slipstream and a 2019 pilot project (involving both Detroit Lakes and Worthington Municipal Utilities), CERTs worked to advance a community-centered approach geared toward manufactured home park residents, engaging local champions in implementation. Utilities were an essential part of many of these efforts, including Minnesota Energy Resources (in Rochester, Stewartville and Clarks Grove), People's Energy Cooperative (in Stewartville and Rochester), New Ulm Public Utilities, Worthington Public Utilities, and Xcel Energy and CenterPoint Energy through their Home Energy Squad program in Bloomington, Mounds View, Minnesota City and Winona. In addition, a particular highlight from the year was a collaboration on a community event at a park in Willmar with Willmar Municipal Utilities, which is described in the Underserved Communities section below. (See row 3B in Table 5 for total energy saved.)

Beyond manufactured homes, CERTs continued to partner with utilities to advance efforts in multifamily housing buildings. In an ongoing collaboration, CERTs connected the Center for Energy and Environment (CEE) to 14 multifamily buildings, which were then served by Minnesota Energy Resources' Multifamily Energy Savings Program. This program serves centrally-metered multifamily buildings—like low-income housing, assisted living, and apartments—with direct installation of high-efficiency showerheads, faucet aerators, and pipe wrap, as well as identification of additional opportunities for energy savings through assessments of heating, boiler, and ventilation systems—all for free. (See row 3C in Table 5 for total energy saved.)

Convening for Innovation

Bringing people together – particularly in peer-to-peer networks– is something CERTs has focused on for the past several years. From community solar to air source heat pumps, CERTs' approach to convening has centered around providing space for utilities to learn from one another, ask questions, and explore new approaches with their colleagues. Over eighteen months, CERTs expanded on this approach through a U.S. Department of Energy Solar Energy Innovation Network funded effort. CERTs and GPI provided facilitation support to the "Organizational Innovation for Equitable Solar Deployment with Electric Cooperatives" project, led by the University of Minnesota Humphrey School of Public Affairs (Chan Lab) and East River Electric Power Cooperative, to engage member cooperatives in a process that explored how solar can provide value to cooperatives across the multiple co-op levels.

CERTs took on a similar role for the Demand Side Management Innovation Initiative on behalf of Great River Energy. In collaboration with the Chan Lab and GPI, CERTs helped facilitate a nearly year-long effort to support GRE and its member distribution cooperatives in planning and innovating for the future.

Advancing Electric Vehicle Programming and Adoption

CERTs completed its Powering Ahead with Vehicle Electrification (PAVE) municipal utility-focused EV cohort in late 2020 (just after our last annual report). Participants in the cohort included Austin, Brainerd, Chaska, Detroit Lakes, East Grand Forks, Grand Marais, Hutchinson, Lake City, Moorhead, New Ulm, Rochester, Roseau,

Shakopee, and Wadena. Since then, CERTs has continued to support a variety of utilities with advancing their EV efforts. As a result of the cohort, six utilities have installed six Level 2 charging chargers and five (5) DC fast chargers (all publicly-available); one utility added an electric fleet vehicle and Chaska upgraded to an EV Zamboni. (See row 3D in Table 5 for net energy saved.) In addition, the City of Wadena (municipal utility) wrapped up a CERT-funded seed grant to install an EV charging station downtown.

Following the passage of the Energy Conservation and Optimization (ECO) Act, CERTs worked with the Minnesota Municipal Utilities Association (MMUA), Minnesota Rural Electric Association (MREA), and the Minnesota Department of Commerce to organize a peer-to-peer utility session focused on ECO & EVs for Munis and Co-Ops. Austin Utilities, Hutchinson Utilities, and Wright-Hennepin Electric Cooperative each presented at the forum to share their experiences with EV charging, fleet conversion, EV education, outreach partnerships, and planning for EV programming and load growth.

In October, CERTs partnered with Roseau Electric Cooperative, the City of Roseau (municipal utility), Northern Municipal Power Agency, and Minnkota Power Cooperative to host the first EV Ride and Drive in Roseau, Minnesota. The Northern Exposure event was an opportunity to partner with local utilities and local dealerships – C&M Hallock and Roseau County Ford – and allowed participants to test drive and kick-the-tires on EV vehicles. Over 150 participants attended the event and several media outlets (MPR, Grand Forks Herald, and Duluth News Tribune) covered the event as part of Ride and Drive week.

Inspiring through Stories of Innovation

Austin Utilities has been at the forefront of Electric Vehicle (EVs) efforts for many years. CERTs have partnered with Austin on that journey since awarding a 2014 CERT Seed Grant for a solar-connected EV charger in downtown. Since that time, Austin has advanced innovative approaches to engage residents in an EV owners club with “Chamber Bucks” rewards, purchased their own Nissan Leaf, and installed additional chargers – both Level 2 and soon a DC Fast Charger – as part of their partnership with the Southern Minnesota Municipal Power Association. This past year, Austin Utilities was a frequent speaker at PAVE and other EV-related events and to culminate that work, CERT highlighted the range of work Austin has done in a dedicated piece about Austin’s EV journey.⁹

Moorhead Public Service (MPS) has a long track record of renewable energy innovation. From its initial adoption of wind in 1999 to their expansion of community solar across their service territory, MPS has repeatedly been at the cutting edge of new approaches. In 2021, CERTs worked with MPS and the City of Moorhead to document a new effort, made possible in collaboration with MPS’s power supplier, Missouri River Energy Services, to provide 100% carbon free energy to the entire community and to help the City of Moorhead advance its broader sustainability goals.¹⁰

⁹ <https://on.mncerts.org/AustinUtilities>

¹⁰ <https://on.mncerts.org/Moorhead>

Small Businesses and Organizations

Small businesses and organizations often confront constraints in accessing utility and other clean energy programs: awareness, time, and financial resources. CERTs works with utilities and other partners to help businesses and organizations overcome barriers to clean energy adoption by expanding program reach, including funding options.

Expanding Reach

This year, with CARD grant funding, CERTs conducted community-based research on Latinx-owned businesses' use of electric utility programs in Austin, westside St. Paul, Willmar, and Worthington. CERTs staff and partners, specifically Communities Organizing Latinx Power and Action (COPAL), interviewed business owners and utilities to understand current participation rates, barriers, and the potential to improve participation in the future. Additional collaborators included community based Latinx organizations (HACER and Navigate/UNIDOS), utility program implementers, and utilities, including Xcel Energy, the three municipal utilities, and Missouri River Energy Services. CERTs provides additional documents and information of the project.¹¹

As referenced in the Utilities section above, CERTs worked with Otter Tail Power to conduct direct outreach to businesses in 15 communities, including Battle Lake, Brooks, Carlos, Cass Lake, Clearbrook, Erskine, Gonvick, Gully, Mentor, Miltona, Oklee, Otter Tail, Plummer, Trail, and Winger, as well as with Minnesota Power in Long Prairie. (See row 3A in Table 5 for total energy saved.)

In the northeast region, a CERTs seed grant assisted small businesses in the electricity sector, recruiting five local electricians to participate in a solar installer certification program, expanding the region's clean energy workforce and diversifying the services provided by those businesses.¹²

Finally, CERTs supported the Solar United Neighbors' organization with its Driftless Area Solar Co-op by presenting about solar, responding to technical questions, and sharing information about financing programs. (See Row 4A in Table 5 for total energy generated).

Agricultural Producers

CERTs' work in agriculture has focused on expanding the reach of clean energy programs and resources, as well as exploring opportunities for synergies between the agricultural economy and clean energy.

¹¹ <https://on.mncerts.org/LatinxBiz>

¹² <https://www.cleanenergyresourceteams.org/expanding-qualified-solar-installers-northeast-minnesota>

Expanding Reach

The two-year Renewable Energy for Greater MN (REGM) program, with funding through the USDA Rural Energy Development Assistance, wrapped up in 2021. Through REGM, CERTs staff worked with farmers and rural small businesses from July 2019 to June 2021 to identify energy efficiency opportunities, prioritize renewable energy options, and connect them to resources (USDA REAP funding, PACE, etc.) to move forward on project implementation. CERTs resulted in 18 projects advancing and 4 projects installed to-date. (See rows 5A and 5B in Table 5 for total energy generated.)

To broaden awareness of its services and showcase tangible project examples, CERTs co-hosted successful farm energy events with the Minnesota Farmers Union and the Sustainable Farming Association in Osakis and at Central Lakes College in Staples. Both events included speakers and solar installation tours and the Staples event also included a tour of the “Sota Grown” Indoor Food Production Pod. CERTs also created a new landing page and supporting guides for this program¹³, highlighted the potential to use PACE funding for on on-farm solar with a story of a farm in Chisholm¹⁴ and partnered with the Morrison County Record to spread the word.¹⁵

Advancing Agriculture-Energy Synergies

Appropriate siting of renewable energy continues to be an important consideration in Minnesota, as communities seek to balance solar and wind energy expansion with the need to preserve farmland, expand habitat, and maintain a sense of place. That was the focus of CERTs’ June “Energy Futures” event, The Future of Renewable Energy Siting in Minnesota, which brought together speakers from the Great Plains Institute, The Nature Conservancy, and the University of Michigan.¹⁶ In a similar vein, CERTs published stories about synergies between renewable energy and agricultural production, including on how grazing livestock and growing pollinator-friendly plants add value to solar farms.¹⁷

On a county level, CERTs co-led Strategic Solar Siting in Murray County. The project’s goal was to inform future project development and county rules governing solar development. CERTs partnered with Southwest Regional Sustainable Development Partnership (RSDP), Southwest Regional Development Commission, GPI, Institute on the Environment, and Murray County to co-host virtual sessions and a survey for county residents to give input on solar energy. The project was not associated with any planned solar development but was instead proactive, designed to get input and insights from area residents about where solar should be—and should not be—sited,

¹³ <https://on.mncerts.org/renewables>

¹⁴ <https://www.cleanenergyresourceteams.org/harvesting-sun-new-crop-electricity>

¹⁵ <https://on.mncerts.org/MCR>

¹⁶ <https://on.mncerts.org/EnergyFutures>

¹⁷ <https://on.mncerts.org/AgRenewable>

how solar could help provide community benefits (including economic development), and what concerns residents had about solar, including on agricultural lands.¹⁸

The Wind to Green Ammonia project is another effort that focuses on synergies between agriculture and energy. CERTs partnered with the West Central Research and Outreach Center (WCROC) and the Agricultural Utilization Research Institute (AURI) on a feasibility study and opportunity assessment to better understand how Minnesota's abundant wind energy resources could be captured to produce ammonia and thereby enable locally-based production. Today, all of Minnesota's farm ammonia needs are supplied by out of state producers. Local production could help reduce the volatility and cost of ammonia inputs by shrinking the supply chain. Further, green ammonia can help reduce emissions in agriculture and could help lower ethanol's carbon intensity score for enhanced low carbon fuel standard payments. There are still many questions to answer—around policy, regulation, and siting—but this project highlights the potential for economic growth in an agriculture and energy cross-sectoral approach.

Underserved Communities

CERTs supports individuals, groups, and institutions who would otherwise experience barriers in accessing resources to advance clean energy projects. As such, an important focus of CERTs' work has been on underserved communities. CERTs' Under 5% Energy Burden campaign has become a major focus of this work over the past two years. This campaign, which aims to focus attention and resources on eliminating energy poverty, has led to many projects, pilots, and resources, all aligned toward this goal.

Supporting Home Energy Efficiency and the Energy Assistance Program

CERTs developed a series of four home energy guides for renters, landlords, and owners of manufactured and single-family homes.¹⁹ These were released in English and Spanish, and, thanks to a partnership with Community Grassroots Solutions (a St. Cloud-based Somali organization), guides are now also available in Somali.²⁰ The guides have been customized by 98 organizations and utilities, with self-reported reach totaling 133,450 Minnesotans. Additional resources have been developed and included on CERTs' Under 5% webpage.²¹

To increase awareness of the Energy Assistance Program, CERTs worked with Commerce to develop template letters, articles, and social media posts to help spread the word. 10 stories were placed in daily newspapers by CERTs Steering Committee members and other partners, with coverage in smaller papers as well. Staff also

¹⁸ <https://on.mncerts.org/StoryMap>

¹⁹ <https://on.mncerts.org/HomeEnergyGuide>

²⁰ <https://on.mncerts.org/CGS>

²¹ <https://on.mncerts.org/Under5>

presented resources to University of Minnesota SNAP-Ed staff and HomeLine. EAP was featured in CERTs' Energy Stories newsletters and the NE CERT Coordinator's radio show Energetic Talk.

CERTs seed grants also expanded resources for families. United Community Action Partnership's (UCAP) project, In-Home Education and Energy Saving Project, exemplified this approach. UCAP leveraged funding from two CERTs seed grants (West Central and Southwest regions), the Weatherization Assistance Program,²² the Energy Assistance Program,²³ and local utilities, to deliver a multifaceted energy efficiency and conservation program to 54 households.²⁴ Several other projects supported energy efficiency efforts with shelters and food shelves—like Care and Share of Crookston²⁵ and the Hubbard County Food Shelf²⁶ to ensure these organizations' resources could be invested in supporting families rather than energy bills.

Piloting Strategies for Manufactured Homes

A major focus of CERTs' work in underserved communities this year targeted the high energy burden common in manufactured home parks. This included developing and sharing new informational tools, such as the manufactured home energy guide described above, as well as a series of how-to videos relating to common energy challenges in manufactured homes.

Over the past year, CERTs also organized intensive community-based outreach in 13 manufactured home parks around the state, serving 805 homes. Thanks to funding from the Carolyn Foundation, CERTs was able to provide \$300 incentives to local park contacts to help coordinate efforts. In addition to creating energy savings for community members (see row 3B in Table 5 for total energy saved), this effort established and strengthened partnerships with numerous utilities (as described in Utilities above), community action agencies, and other organizations. Some of the first blitzes were shared out in a CERTs story on manufactured homes²⁷ in early 2021 and a recap of the two-year effort shares lessons learned for replicating this work in the future.²⁸

One highlight of this effort was the Sweet Savings on Your Bills event at the Willmar Regency Mobile Home Park. The event brought together a diverse array of partners (including interpreters). Partners shared conservation kits, EAP information, and more. Scheduling the event for when kids were getting off the bus and when parents were coming home after their shifts at the Jennie-O facility meant that at least 80 residents participated.

²² <https://on.mncerts.org/WAP>

²³ <https://on.mncerts.org/LIEAP>

²⁴ <https://on.mncerts.org/UCAP>

²⁵ <https://on.mncerts.org/CareShare>

²⁶ <https://on.mncerts.org/HCFs>

²⁷ <https://on.mncerts.org/ManuHome>

²⁸ <https://on.mncerts.org/Carolyn>

Another event that was a highlight: meeting with the Project FINE Advisory Group in St. Charles, where CERTs shared a manufactured home park energy efficiency video and provided a forum for Advisory Group members to share about their energy needs. The conversational approach and real listening led to participants “feeling seen as people.”

Advancing Access to Solar in Underserved Communities

As part of CERTs’ community solar work, our community solar garden resources were fully updated this year, with fresh language, refined FAQs, links to the new solar directory, and new factsheets developed in partnership with MN Department of Commerce.²⁹ A Spanish language version of the community solar guide was also published. To expand inclusive community solar efforts across Minnesota, CERTs and Commerce, with support from the U.S. Department of Energy, launched an Equitable Solar Access project in September. This project seeks to develop new community solar models through pilot projects that pair the expertise of local Energy Assistance providers and local utilities with the interests of their income eligible clients.

CERTs continues to work with the Met Council on the Solar for Vouchers pilot project, which provides solar technical assistance to multifamily housing owners in exchange for designating housing units for Section 8 vouchers. The program has secured 5 properties for the project, with 145 units.

In an innovative solar project in the northwest region, CERTs and the Northwest RSDP partnered with Middle River Veterans Outdoors (MRVO), a nonprofit organization that provides hunting and fishing experiences for disabled veterans. To access the natural areas, veterans use wheelchairs with tracks (in place of wheels). The chairs are electric and need to be charged, but the MRVO facility is off the grid. In partnership with CERTs/RSDP, MRVO has installed solar panels to charge the chairs and a separate battery that stores energy to power the building’s light and light up the flag.

Expanding the Clean Energy Workforce

Advancing clean energy in Minnesota requires expanding Minnesota’s clean energy workforce. – and that the diversity of this workforce more fully reflects all Minnesotans. CERTs partnered with a number of organizations to begin harnessing this potential. For example, in collaboration with Home Energy Squad, CERTs worked with two youth cohorts (16-20 years old) to develop career skills focused on the clean energy sector. The first of these cohorts was in partnership with the St. Paul YWCA, and the second with Urban Roots. CERTs also worked with Serve Minnesota (the MN branch of AmeriCorps), and their operating partner (Reading and Math, Inc.) to develop and launch the new Home Energy Corps program in collaboration with local Community Action Partnerships. Partnership opportunities abound, and CERTs maintains connections with FRAYEO, MIGIZI, Hmong American Partnership, and Ramsey YouthWorks!/Suburban Ramsey OSTN for potential future efforts.

²⁹ <https://on.mncerts.org/CSG>

To make more of these opportunities visible, CERTs further developed its Careers, Workforce & Training webpage to complement its popular job board.³⁰

Cross-cutting Efforts

Much of CERTs' work spans multiple audience areas, but there were two aspects of work this past year that cut across all aspects of clean energy work. These include beneficial electrification and storage. Though much of the attention on both beneficial electrification and storage, to date, has been focused on technologies, CERTs knows that technology is only as good as our collective ability to deploy it. CERTs' efforts are focused on how communities can inform deployment, lead model development, and benefit from the scaling of these technologies and the new opportunities they unlock. A few highlights from emergent work in these spaces are described below.

Beneficial Electrification

Electrification focuses on converting more thermal and transportation end uses to electricity, so that those uses can more readily use renewable energy. Beneficial electrification takes this a step further, integrating saving consumers money over the long run, enabling better grid management, and reducing negative environmental impacts. While the concept and its importance may be unfamiliar to the average energy user, the transition to EVs is a tangible example that many might recognize. Converting thermal energy uses to electricity, in a state where much heat is supplied by natural gas and propane, can be harder to grasp. To shape a broader understanding of the potential to electrify one's home, CERTs developed stories that document one family's journey to cap their gas line and go all electric³¹ and another family finding success with air source heat pumps in Northern Minnesota's colder climate.³² These sorts of stories help demystify the concept of beneficial electrification, show how one might go about doing it, and make visible the inner workings of a building.

Through two years of communication with consumers about cold climate air source heat pumps (ccASHPs,) a common barrier has become clear: availability of and access to contractors is essential. Contractor knowledge of and willingness to do the work is a requisite first step in addressing that barrier. Over the past year, CERTs partnered with the Cook County Local Energy Project (CCLEP) and the Minnesota Air Source Heat Pump Collaborative to pilot a community-based approach to accelerating ccASHP adoption to tackle this challenge.

The first phase of the project was a survey of 80 contractors, which identified 10 contractors willing to serve the area with ccASHP installations. The next phase includes contractors receiving Minnesota-specific contractor training on ccASHPs through the Collaborative. Once trained, CCLEP will promote contractors alongside resources for learning about ASHP and selecting a contractor. Cook County's two utilities, Grand Marais Public

³⁰ <https://on.mncerts.org/career>

³¹ <https://on.mncerts.org/decarbonize>

³² <https://on.mncerts.org/ASHP>

Utilities Commission and Arrowhead Electric Co-op, are supportive of this effort, and CCLEP will also promote their rebates. Through this approach, the intent is to drive consumer awareness of this heating option while simultaneously addressing the contractor barrier and aligning local information sharing and incentives to get more systems installed.

Storage

The first energy storage-focused webinar hosted by CERTs last spring began with, “It’s clear that Energy Storage is necessary to reach our clean energy goals, but the amount, technologies, and applications we need are still emerging.” The first webinar considered the broad array of potential technologies and resources that can be deployed to provide energy when it’s needed, while the second focused more on the community-scale deployment of energy storage technologies. These two sessions, hosted in collaboration with the Institute on the Environment, led to a more in-depth workshop that focused on battery storage and how the use case must drive system design, from the type of battery to the system size and related controls.

CERTs also partnered with the Natural Resources Research Institute (NRRI) to host several conversations with key stakeholders about the findings from its Long Duration Energy Storage report.³³ These discussions illuminated the need for further pilots to better understand how long-duration storage technologies – some locationally, geographically, or geologically specific – can be most cost effectively deployed toward meeting various industry and system-wide energy demands.

Clean Energy Impacts

Table 5 details efforts with energy savings or offsets in 2021³⁴ because of CERTs work, including a row identifier, the corresponding CERTs audience(s), a description of the effort, and the BTUs saved or offset. Cost savings in Table 5 reflect savings from energy efficiency projects only.

Table 5. CERTs Impacts Summary

ID	Audience(s)	Effort Description	BTUs ³⁵
1A	Government Units, Utilities, Small Business, Agricultural	CERTs 2020 Seed Grants: Wrapped up 35 projects funded by \$140,000 in seed grants. These projects leveraged \$1,330,000 from other sources and involved or reached nearly 61,400 Minnesotans. Sixteen projects had an implementation focus (as opposed to	1,276,857,340 Saved

³³ <https://on.mncerts.org/NLBS>

³⁴ Due to the timing of this report, data herein covers activities spanning November 1, 2020 – October 31, 2021.

³⁵ Calculations include conversions as follows: 3,412 BTUs per kWh; 100,000 BTUs per therm; 114,000 BTUs per gallon gasoline; 91,500 BTUs per gallon propane.

ID	Audience(s)	Effort Description	BTUs ³⁵
	Producers, Underserved Communities	education, outreach, research), with 11 energy efficiency projects (saving 302,867 kWh, 518 therms, and \$30,300 annually), 2 energy storage projects (metrics in 2022), and 3 electric vehicle charging station projects (2,330 gallons gasoline avoided, 21,672 kWh used for charging, and \$5,000 net annual savings).	
2A	Government Units	Solar Schools: Engaged Roseville Area Schools and provided technical assistance, resulting in a 296 kW solar installation in their district, which will generate an estimated 388,944 kWh annually.	1,327,076,928 Generated
2B	Government Units	Cities Charging Ahead 2.0: Hosted an electric vehicle cohort with 30 participating communities from Sept 2020-Apr 2021. Through the cohort and connected efforts, the cities of Apple Valley, Carver, Coon Rapids, Eden Prairie, Edina, Faribault, Fridley, Golden Valley, Rochester, Shakopee, Shoreview, St. Louis Park, and Woodbury installed 15 dual-head Level 2 charging stations and 1 DC fast charger (all publicly-available), as well as added 8 electric fleet vehicles, resulting in 26,573 gallons gasoline avoided, 252,120 kWh used for charging, and \$59,600 net annual savings.	2,169,088,560 Net Saved
2C	Government Units, Utilities	Onsite Solar for Jurisdictions: Provided Request for Proposal (RFP) template, process support, and other technical assistance. Hutchinson Utilities Commission installed 625 kW of solar. MNDOT regional headquarters in Morris installed a 149 kW solar system. The City of Morris has 113 kW of solar across 4 installations at city hall, community center, library, and liquor store. All of these systems are generating an estimated 1,165,518 kWh annually.	3,976,747,416 Generated
2D	Government Units	SolSmart: Supported Coon Rapids and Morris with SolSmart designation. Within one year of designation, Coon Rapids had 4 commercial systems and 9 residential systems installed totaling 1.42 MW and Morris had 4 residential systems totaling 33 kW. Combined these systems generate an estimated 1,904,071 kWh annually.	6,496,690,252 Generated
3A	Utilities, Small Businesses	Business Blitzes: Scheduled 253 assessments in 15 communities for Otter Tail Power Company's Commercial Direct Install Program, which included installation of energy-saving measures like LED bulbs	1,670,075,052 Saved

ID	Audience(s)	Effort Description	BTUs ³⁵
		and more, resulting in 306,260 kWh and \$27,600 savings annually. Businesses in the 11 communities that received assessments in 2020 have since completed 44 energy efficiency projects with 170,999 kWh and \$15,400 savings annually. Also, called Long Prairie businesses and signed up 8 for Minnesota Power's energy assessments; 3 are taking action with two completed projects to-date, saving 12,212 kWh and \$1,200 annually.	
3B	Underserved Communities, Utilities, Government Units	Manufactured Home Parks: Distributed 6,045 energy saving items (light bulbs, showerheads, faucet aerators, and do-it-yourself weatherization) and catalyzed 15 home energy squad visits with 5 partnering utilities and 7 organizations at 805 units across 13 manufactured home parks. In total, savings of 154,425 kWh, 24,067 therms, and \$40,400 annually.	2,933,598,100 Saved
3C	Utilities, Underserved Communities	Multifamily Energy Efficiency: Connected CEE with 14 multifamily buildings for MER Multifamily Energy Savings Program. One income-qualified building with 24 units moved forward in Hinckley. MER partnered with Minnesota Power for comprehensive savings of 540 therms, 3,914 kWh, and \$850 annually. Buildings in Appleton and Albert Lea that received visits in previous years implemented energy efficiency projects for another 740 therms and \$520 savings annually. Also, Staples Public Utilities deployed 50 LED bulbs in an income-qualified building, saving 2,792 kWh and \$330 annually.	150,880,872 Saved
3D	Utilities	Powering Ahead with Vehicle Electrification (PAVE): Hosted an electric vehicle cohort with 14 participating municipal utilities from Mar-Nov 2020. Municipal utilities in Chaska, East Grand Forks, Grand Marais, Hutchinson, Lake City, and New Ulm implemented 6 Level 2 charging stations, 5 DC fast chargers, 1 electric fleet vehicle, and 1 electric Zamboni, resulting in 15,685 gallons gasoline avoided, 1,250 gallons propane saved, 153,893 kWh used for charging, and \$37,600 net annual savings.	1,377,382,084 Net Saved
4A	Small Businesses	Solar United Neighbors Co-ops: Promoted solar bulk-buys in the Driftless Area. , ultimately resulting in 11 homes with 118 kW solar generating an estimated 155,052 kWh annually.	529,037,424 Generated

ID	Audience(s)	Effort Description	BTUs ³⁵
4B	Small Businesses, Agricultural Producers	Property Assessed Clean Energy (PACE) Financing: Engaged communities and businesses in PACE programs, which resulted in 11 solar projects and 10 energy efficiency projects being financed by PACE. The energy efficiency projects include upgrades to lighting, HVAC, and sometimes insulation, and are collectively saving \$811,200 annually.	11,415,888,520 Saved 1,805,540,000 Generated
4C	Small Businesses, Utilities	Direct Business and Organization Assistance: Assisted with 45.22 kW solar at 33rd Company in Woodbury, 43 kW solar at Excelsior United Methodist Church, 84 kW solar at St. Luke's Lutheran in Bloomington, and refrigeration and lighting upgrades at J&S Foods in Lancaster. Staples Public Utilities distributed 50 LEDs through a food shelf. Catalyzed 40 kW solar at Winona Habitat for Humanity and LED lighting at Centenary Church in Mankato. The 4 solar projects are generating an estimated 278,857 kWh annually. The three energy efficiency projects are saving an estimated 39,339 kWh and \$4,600 annually.	134,224,668 Saved 951,460,084 Generated
5A	Agricultural Producers, Small Businesses	Renewable Energy for Greater MN: Worked with farmers and rural small businesses from July 2019 to June 2021 to identify energy efficiency opportunities, prioritize renewable energy options, and connect them to resources (USDA REAP funding, PACE, etc.) to move forward on project implementation. CERTs provided 11 free solar site assessments, assisted 18 projects moved forward, and 4 projects are completed to-date, collectively producing 230,694 kWh annually.	787,127,928 Generated
Total CERTs Program Savings			37.0 billion

Allocation of Legislative Funding Resources and Leveraged Resources

CERTs have 16 staff members who account for 12 full time employees (FTE), all of whom are paid in part via this legislative allocation. Staff are based across CERTs' four partner organizations and across all seven regions. Given the people- and relationship-focused nature of CERTs' work, team members are essential to carrying out CERTs' clean energy work across the state and thus represent the largest share of CERTs spending, followed by seed

grants. Seed grants catalyze local projects, connect communities to clean energy efforts, and attract other dollars to further clean energy around the state.

Beyond legislatively-appropriated dollars, CERTs continue to leverage additional support for its work. Funding and related programmatic efforts include U.S. Department of Agriculture Rural Energy Development Assistance funding to assist farms and rural small businesses with renewable energy assessments, McKnight Foundation funding to spur support of solar school efforts and storytelling, Carolyn Foundation funding to advance Under 5% campaign related work with manufactured housing residents, and several contracts for services for specific projects and efforts.

These leveraged dollars reflect the value of the CARD investment in CERTs and how those core dollars have spurred and accelerated additional programming through complementary investments

Sustainable Buildings 2030 (SB 2030)

Overview

Pursuant to Minn. Stat. § 216B.241, subd. 9 (f), this section reviews the cost-effectiveness and progress of implementing the Sustainable Buildings 2030 (SB 2030) performance standards and shall make recommendations on the need to continue the program.

In 2013, the reporting requirements were changed to require an annual report to the Legislature every January. The 2010 report concluded that SB 2030 would be cost-effective when meeting the targets for projects during the first phase of the program (between 2010 and 2015).

In the 2013 report, this conclusion was verified with data from the first 40 projects in the program designed to the SB 2030 Energy Standard. As data has come in from projects in the last few years, the following savings have been reported, this trend continues for the subsequent phase of the project:

Table 6. SB 2030 Estimated Cost Savings

Report year	Number of reporting projects	Estimated energy savings per year, mmBtu	Estimated cost savings per year, million \$	Estimated energy savings to-date, mmBtu*	Estimated cost savings to-date, million \$*
2013	40	250	3.25	--	--
2014	66	327	5.24	--	--
2015	78	490	7.04	--	--

Report year	Number of reporting projects	Estimated energy savings per year, mmBtu	Estimated cost savings per year, million \$	Estimated energy savings to-date, mmBtu*	Estimated cost savings to-date, million \$*
2016	93	534	8.3	--	--
2017	126	634	9.8	--	--
2018	154	867	12.6	1,765	25.7
2019	166	923	14.8	1,817	29.1
2020	185	1,023	15.7	2,893	44.4
2021	197	1,067	17.5	4,581	75.0
2022	217	1,083	20.0	5,140	94.9

*Note that savings to-date were not estimated prior to the 2018 report.

History of Minnesota Sustainable Building 2030

The SB 2030 standards were enacted in 2008 and designated the Center for Sustainable Research (CSBR) at the University of Minnesota as the lead to develop a Minnesota program reflecting the goals of the national Architecture 2030 program.

Architecture 2030 establishes the goal of achieving net-zero energy use in buildings by 2030 and outlines specific incremental performance targets to meet this goal. Every five years, total carbon output due to energy use in buildings is to be reduced by an additional 10% compared to the average energy use of existing buildings in 2003. Reflecting this national program, the SB 2030 program requires all state bonding projects that began schematic design after August 1, 2009 to meet an energy reduction of 60% compared to the average building. Starting in 2015, projects have begun to meet the 70% reduction standard. In 2020 this target moved to 80% better than a baseline building.

The SB 2030 legislation requires CSBR, in cooperation with Commerce, to “establish cost-effective energy-efficiency performance standards for new and substantially reconstructed commercial, industrial, and institutional buildings that can significantly reduce carbon dioxide emissions by lowering energy use in new and substantially reconstructed buildings.” All program elements are to be based on scientific or real-world

experience in building energy conservation, and all buildings are to be scientifically benchmarked and real reduction in energy consumption measured.

The energy standards for all types of buildings are to be comprehensive, reliable, and equitable and provide procedures for the ongoing monitoring of energy use in buildings that have adopted the performance standards. Minnesota Statutes 216B.241 also requires that utilities develop and implement programs that help building owners achieve the energy savings goals through design assistance, incentives, and verification.

Finally, continuing education and training programs for Minnesota designers, engineers, and building operators are fundamental to the initiation of the SB 2030 standards and the law made education and training a primary goal.

Expected Cost-Effectiveness of the Sustainable Building 2030 Program

The significant improvements in building performance required by the SB 2030 energy performance standards must be achieved in a cost-effective manner. Projects and activities are generally considered cost-effective if the project or activity results in a net benefit to the consumer or society. In the case of utility-administered conservation programs, benefits are based on the energy savings over the assumed lifetime of a particular measure.

In 2009, Center for Energy and the Environment (CEE) performed a preliminary cost-effectiveness analysis on a set of 115 buildings in the region.³⁶ This initial review shows that the energy performance level required by the SB 2030 standards can be achieved cost-effectively for most building types and situations. This analysis has been updated in 2019 to reflect changes in utility pricing and will inform further implementation of cost-effectiveness for projects in the program. Through 2019, a 15-year simple payback period was also used as a measure of cost-effectiveness after an in-depth evaluation of societal, participant, and utility costs and using methodology consistent with Conservation Improvement Program (CIP) calculations.

The measure was developed as a metric to be used by design teams and by the SB 2030 Review Team when evaluating cost-effectiveness because implementing CIP-style calculations for individual strategies is not a viable approach. During the last half of 2019, the cost-effectiveness evaluation was updated and concluded that a payback period of 12 years is an appropriate cost-effective boundary for measures under the SB 2030 program, using the analysis method outlined above for updated utility factors. The SB 2030 Project Team anticipates moving to a regular update of the cost-effectiveness evaluation, coordinated with triannual CIP filing schedule.

Projects that demonstrate that they cannot meet the SB 2030 standards cost-effectively using on-site measures (efficiency and renewable energy) are permitted to provide sufficient carbon-neutral renewable energy through off-site development or procurement of renewable energy sufficient to meet the SB 2030 Target. Projects may access these methods only after a project team demonstrates that appropriate energy saving design options and

³⁶ This document is available online through the Minnesota Legislative Reference Library at <http://www.leg.state.mn.us/docs/2009/mandated/090892.pdf>

energy efficiency upgrades were investigated to achieve the SB 2030 performance level and shown that on-site only options to meet the SB 2030 Standard are not cost-effective for the project. An appropriate on-site Energy Standard is then set by evaluating the set of all cost-effective measures for that project. This path is anticipated to include on-site renewable generation more often as the cost-effectiveness of this strategy is improving. To ensure this cost-effectiveness is also present for projects where energy modeling may place a significant burden, smaller projects and those with limited mechanical upgrades are afforded a path to compliance through comprehensive prescriptive efficiency requirements. Wastewater treatment facilities are also provided a pathway to document energy efficiency measures pursued and anticipated performance metrics.

State-Bonded Project Cost Effectiveness Actual Results

From 2009 through December 2021, 217 building projects have been involved in the SB 2030 process and have reported Energy Standard and Design Energy Consumption values. Of these 217 projects, 147 of the 162 state-required building projects and 44 of 55 volunteer building projects have reported as on track to meet the required SB 2030 Energy Standard. To date, 88% of all buildings project enrolled in the SB 2030 program have reported meeting or exceeded the SB 2030 Energy Standard in design. On average, these projects have reported anticipated energy consumption of 29% less than their 2030 Energy Standard.

When compared to buildings that just met the minimum energy code requirements, the buildings designed to the SB 2030 Energy Standard are predicted to save approximately 1,083 million kBtu/year, a reduction in Carbon emissions of 140,000 tons of CO₂e, and a savings of \$20.0 million per year assuming an average cost of \$18.46 per mmBtu³⁷. As new projects are added each year and projects meet the 2020-2025 energy standard, ongoing annual savings to the State and other building owners will increase. Based on submitted anticipated performance the 168 completed SB 2030 projects are estimated to have saved 5,140 million kBtu, avoided 735,000 tons of CO₂e and saved \$94.9 million as of January 1, 2022. The total cost of the program using CIP funds is approximately \$6.676 million through September 2021.

Example projects recently participating and contributing to this savings, and which were recognized as finalists at the 2021 Best of B3 Award Event are noted in Figures 5 to 10 as follows.

³⁷ The average cost per kBtu from the B3 Benchmarking database is \$0.01846063 for the most recent available estimate (assuming a mix of electricity, gas, and other fuels). Beginning in the 2019 report the data used to estimate program savings was improved from prior years – restricting the evaluation to only Minnesota buildings in the B3 Benchmarking program and eliminating outliers that skewed this rate. Earlier reports have not been amended to reflect this change.

Figure 5 (left) & 6 (right). Richard M. Schulze Family Foundation Saint Paul Opportunity Center and Dorothy Day Residence: 163,797 square foot (sf) building in Saint Paul. Annual savings over code are estimated at 7,043 mmBtu, \$130,023 and 1,036 tons of carbon.



Figure 7 (left) & 8 (right). Bell Museum: 91,990 sf building in Saint Paul. Annual savings over code are estimated at 1,605 mmBtu, \$29,663 and 258 tons of carbon.



Figure 9 (left) & 10 (right). Fergus Falls Public Library: 25,600 sf building in Fergus Falls. Annual savings over code are estimated at 1,234 mmBtu, \$22,779 and 65 tons of carbon.



SB 2030 Program Progress

Initial efforts have focused on the development of the tool that will be used to establish customized Energy Standards and development of the administration of the program. Ongoing efforts include the creation of a case study database, the development of a sustainable building operations system, and the integration of SB 2030 with the utilities' CIP programs, hosting education classes for designers and building operators, and assisting design teams in the integration of the SB 2030 Energy Standards into projects. Below are listed details of these program components.

- **Case Studies Database**—as part of the program, predicted building performance has been documented for 169 SB 2030 projects. Reported metrics may include predicted energy use, carbon emissions and construction costs, along with several water, waste, and indoor environmental quality metrics. These case studies, which are in various stages of the design process or operation, are displayed online on the B3 Case Studies Database,³⁸ where owners and project teams can market their successes, and design teams can search for strategies that may help them reach the SB 2030 Standards. As operations data is collected for these projects the case studies database will update, allowing the evaluation of their actual performance.

³⁸ <https://casestudies.b3mn.org/>

- **Sustainable Building Operations**—it is essential that SB 2030 designed buildings are operated at the energy standards that they were designed to achieve. To do this, building operators need methods to ensure that each significant energy consuming device is using only as much energy as needed to perform its intended function. A web-based application has been developed to enable building operators to perform this function by completing occasional routine checks on large energy consuming equipment in the building. This application performs four critical functions:
 - Enables users to create a customized set of tasks for a particular building,
 - Notifies building operators when tasks are due to be completed,
 - Supplies detailed instructions on how to perform the task, and tracks completion and status of tasks for a building, and
 - Notifies facilities managers when tasks uncover malfunctioning systems.

Eight tasks are currently supported in the online tool. Two methods have been developed to check on correct operation of heat recovery devices, and one for demand-controlled ventilation (DCV). The DCV module is undergoing refinement to make it more broadly applicable to numerous operation schemes that have been discovered during pilot projects. CEE has completed manuals for three pilot buildings. CSBR is working with CEE on these pilots.

- **SB 2030 Utility Programs**—as the SB 2030 energy performance standard has been implemented, the project team has worked cooperatively with utilities to develop and/or modify CIP programs to encourage new buildings to meet the SB 2030 standards. Priority items are listed below.
 - A. Comprehensive design assistance services.
 - B. Bonus incentives (per unit of savings) for achieving SB 2030 standards.
 - C. Comprehensive whole-building performance program for small buildings.

No utilities have yet provided financial incentives related specifically to achieving the SB 2030 Energy Standard. New construction programs do provide incentives based on energy savings for performance over and above the energy code, as well as no-cost services for projects committing to a high level of savings, including reporting of the SB 2030 Energy Standard, and B3 Guidelines tracking tool entry of data and submittals which has assisted in streamlining submissions and program compliance verification.

- **Sustainable Building 2030 Education**—educational programs for the designers continue to be delivered. Presentations on the B3 Guidelines and SB 2030 programs have been given at the AIA Minnesota Conference as a session outlining case studies of projects using the B3 Guidelines and SB 2030 process. A training on the B3 Life Cycle Assessment process was developed and delivered in December. An overview of off-site renewable energy procurement was also delivered in December. These and other presentations were recorded are available online at the B3 Guidelines Training page.³⁹

³⁹ <https://www.b3mn.org/guidelines/training-and-education/>

SB 2030 Next Steps

All work on the SB 2030 program completed to-date shows it is cost effective to meet the SB 2030 target. Eighty-eight (88%) percent of all buildings involved in the program were able to meet the SB 2030 Energy Standard with little additional cost to the overall projects. Total project costs are approximately \$6.676 million through September 2021.

The 217 buildings designed to the SB 2030 Energy Standard are predicted to save approximately 1,083 million kBtu/year, 140,000 tons of CO₂e and a savings of \$20.0 million per year. When new projects are added each year the annual savings to the State and other building owners will continue to grow. Savings from the 168 SB 2030 projects currently in operation are estimated at 5,140 million kBtu, 735,000 tons of avoided carbon at a cost savings of \$94.9 million.

The SB 2030 program has demonstrated the value of establishing customized performance targets early in the design process, which permits projects flexibility in how to best achieve those targets. Savings to-date reflect the significant energy, cost and carbon reductions achieved by the program. More educational opportunities are needed for architects and engineers to facilitate more SB 2030 designs. Two of the three largest electric investor-owned utilities have developed comprehensive design assistance services, but not all utilities have fully integrated SB 2030 programs.

Future areas of consideration in the SB 2030 Program development include the consideration of time-of-day CO₂ emissions factors, which could allow the SB 2030 Program to encourage strategies that decrease energy use when the grid is the most fossil fuel dependent and could be used by design teams to accurately adjust the carbon intensity relative to the efficiency strategies that they select.

Work continues on the next stages of the SB 2030 program to support the reduction requirement for new projects, which increased from a 70% to 80% reduction in January of 2020. Program updates as part of this transition included an expansion of renewable resources available for project teams to consider, elimination of a reduced standard for renovation projects, implementation of a parallel carbon and energy standard, improving carbon emissions factors for electric utilities, and expanding the cost-effectiveness test to include a hierarchy of renewable energy generation options. This and other program development efforts will require continued research from the project team led by the Center for Sustainable Building Research at the University of Minnesota, to ensure that projects are able to comply in a cost-effective manner with the SB 2030 Standard while ensuring that the robust program goals are maintained.