



**Public Service Commission of Wisconsin
Office of Energy Innovation
Energy Innovation Grant Program**

PSC REF#: 428997



Public Service Commission of Wisconsin
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ATTACHMENT A - COVER SHEET

SECTION I - Provide information summarizing the project proposal.				
Project Title:		Wisconsin Heat Pump Market Transformation Plan		
PSC Grant Request (\$):		Applicant Cost Share (\$):		Project Total (\$):
\$99,965		\$14,580		\$114,545
Choose one Eligible Activity				
<input type="checkbox"/> Renewable Energy & Energy Storage		<input type="checkbox"/> Energy Efficiency & Demand Response		<input checked="" type="checkbox"/> Comprehensive Energy Planning
Acknowledgement of ARRA Applicability. Check all that apply. (See Section 1.3 of Application Instructions)				
<input type="checkbox"/> Buy American: Alteration, maintenance or repair of a public building or public work.				
<input type="checkbox"/> Davis Bacon and Related Acts: Use of laborers or mechanics employed by contractors and subcontractors.				
<input type="checkbox"/> Historic Preservation: Project involves historical (over 50 years old), archeological or cultural resources.				
National Environmental Policy Act (NEPA): Review the list of covered activities in Attachment C (also discussed in Section 1.3.4) of the Application Instructions.				
<input type="checkbox"/> Environmental Questionnaire is attached . Project activity is not covered.				
<input checked="" type="checkbox"/> No Environmental Questionnaire needed. Project activity is covered.				
SECTION II - Provide information for your organization, signatory, and primary contact for the project.				
Applicant Type:	<input type="checkbox"/> City	<input type="checkbox"/> Village	<input type="checkbox"/> Town	<input type="checkbox"/> County
<input type="checkbox"/> Tribal Nation	<input type="checkbox"/> Manufacturer		<input type="checkbox"/> K-12 School District	
<input type="checkbox"/> University of Wisconsin System	<input type="checkbox"/> Wisconsin Technical College System		<input checked="" type="checkbox"/> 501(c)(3) nonprofit	
<input type="checkbox"/> Municipal Utility (water, wastewater, electric, natural gas)		<input type="checkbox"/> Hospital (public or nonprofit)		
Name (on W-9):		Slipstream Group, Inc		
Address (on W-9):		431 Charmany Dr, Madison WI, 53719		
County or Counties Served by Project:		All		
DUNS Number or CAGE Code:		04-217-2387		
NAICS Code:		541690		
FEIN		39-1356152		
Authorized Representative/Signatory (Person authorized to submit applications and sign contracts)			Primary Contact (if different from Authorized Representative)	
Name: Scott Hackel			Name: Justin Margolies	
Title: Director of Research & Innovation			Title: Researcher	
Phone: 6082107129			Phone: 6087296803	
E-mail: shackel@slipstreaminc.org			E-mail: jmargolies@slipstreaminc.org	
Signature of the Authorized Representative				

Slipstream

WI Heat Pump Market Transformation Plan

Summary of Project Budget

Line	Description	PSC Grant Request	Applicant Cost Share	Total Project Cost
1	Personnel	\$40,980	\$2,195	\$43,175
2	Fringe			\$0
3	Equipment			\$0
4	Supplies			\$0
5	Travel		\$3,000	\$3,000
6	Contractual	\$58,985	\$9,385	\$68,370
7	Other			\$0
8	Indirect			\$0
Totals		\$99,965	\$14,580	\$114,545
% of Total		87%	13%	

Applicant Comments: As core partners in this project CEE and Elevate collectively will receive \$58,985 and provide a cost share of \$11,385 (\$2,000 anticipated for travel). The cost share represents 60 hours of in-kind labor by Elevate and 7.5% of CEE's project funding that will be provided by in-kind labor. Slipstream will also provide 7.5% budget match with in-kind labor.



EIGP 2021 Heat Pump Market Transformation | January 14, 2022

Wisconsin Heat Pump Market Transformation Plan

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Executive Summary

In 2019, Wisconsin became the first state in the Midwest to commit to be 100% carbon free by 2050. To decarbonize its grid faster and mitigate climate impacts, the state's building sector needs to accelerate the transition of heating loads from fossil fuels to beneficial electrification.¹ Heat pumps offer a compelling energy efficiency opportunity over electric resistance heat.² However, early market experience indicates currently installed systems can be twice as expensive to operate as a typical gas furnace, and three times as expensive to install. Several other market barriers prevent quicker adoption as well, including contractor unfamiliarity, suboptimal controls configurations leading to poor performance, consumer unfamiliarity, and insufficient income-qualified program integration. These issues are compounded by each specific sector having its own unique set of challenges such as multifamily versus single-family or new construction versus retrofits. Unless addressed, these barriers will result in disastrously slow adoption and create distributional inequities across populations.

The State of Wisconsin can achieve rapid, equitable adoption of heat pumps through a well-orchestrated set of programs, policies, and market interventions.³ In this regard, the state's utilities are uniquely positioned to comprehensively address market barriers. Utility-funded programs and policy design that use both traditional resource acquisition and market transformation methods can engage the entire supply chain and reshape the heat pump market landscape. To be successful, this initiative must be collaborative and state-wide. However, the status quo on utility heat pump program interventions is fragmented and insufficient to the task. Therefore, we propose the creation of a heat pump market transformation plan directed at all the industry stakeholders and supply chain actors who will actively transform and drive adoption of Wisconsin's residential space heating market.

The project will be led by three leading Midwest organizations with prominent expertise in cold climate heating technology and utility-funded program design and implementation: Slipstream, Center for Energy and Environment (CEE), and Elevate. The collective efforts of these organizations will help pave the way for Wisconsin's rapid heat pump adoption as well as help to make the case for smart electrification and fuel switching policies. Taking this path will bring 2050 decarbonization commitments closer to realization.

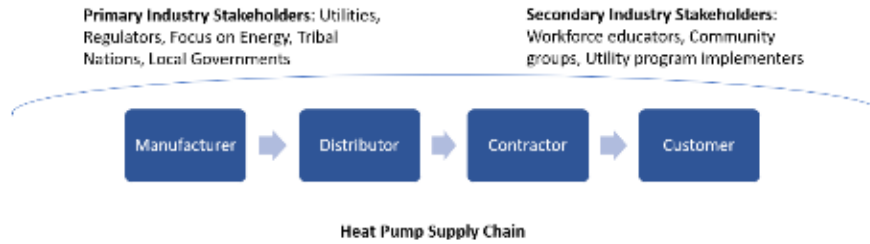
Scope Description

This heat pump market transformation effort will convene, educate, and motivate supply chain actors and industry stakeholders as shown in the following diagram. It will serve to jumpstart market and policy action that accelerates heat pump market adoption with equitable outcomes. Our work will address supply chain actors, primary industry stakeholders with decision-making power and the ability to enact systemic market changes, and various secondary stakeholders.

¹ [Governor's Task Force on Climate Change Report](#). State of Wisconsin. December 2020.

² "Minnesota Energy Efficiency Potential Study" published for the MN Department of Commerce (2018).

³ [Wisconsin Energy Distribution and Technology Initiative](#). M-WERC and Great Plains Institute. July 2020.



The project team will bring technical expertise to market opportunities, learn from stakeholders to identify major implementation hurdles and provide and facilitate expert recommendations for model programs and policy design that can be replicated across the state. The project outcomes will be captured as a program and policy playbook to guide a rapid and equitable transition towards heat pumps for residential space heating. This playbook will align utilities and communities toward coordinated approaches. It will tackle several critical barriers and opportunities identified by stakeholders. These include:

- A value proposition for the end-use residential customer to adopt a heat pump and drive increased customer awareness and demand based on successful messaging.
- Identification of important near- and mid-term market segments along with the market size and carbon saving opportunity of each.
- A plan for workforce transformation initiatives needed to reach scaled heat pump adoption and high-quality installations.
- Facilitating connections and recommending how stakeholders can work with upstream trade allies such as manufacturers and distributors.
- Guidance on rate designs to support an equitable transition to heat pumps for space heating.
- A pathway for state-wide coordination on heat pump market transformation efforts.
- Necessary policies to ensure equity around costs and benefits of a wholesale transformation.
- A model cost-benefit framework to encourage equitable electrification of space heating.

The project will have four components. An **industry stakeholder and supply chain needs assessment and engagement** will reach utilities, regulators, local governments, tribal nations, and technology trade allies to identify significant opportunities and barriers to technology uptake. Through this engagement, we will grow and diversify participation in the Wisconsin Heat Pump Coalition⁴ to help guide important questions and opportunities. Our team will **define value propositions** for heat pumps in Wisconsin. This will include modeling common applications of heat pumps and their performance and economic impacts on a variety of residential customers. As the principal deliverable for this project, we will draft and disseminate a heat pump market transformation **policy and program playbook** to synthesize necessary steps across Wisconsin with utilities, regulators, local governments, and tribal nations as the target audience. Finally, we will provide preliminary **analytical and technical support** to help inform decisions and recommendations by these stakeholders.

Key Partners and Stakeholders

Slipstream, CEE, and Elevate are well-positioned as a team to take on this initiative in Wisconsin. Each is a 501(c)(3) organization with missions that include leadership in programs and market transformation for cold climate heat pumps. The team currently collaborates on related initiatives throughout the upper Midwest. They base their market interventions on deep, applied heat pump research and implemented

⁴ WHPC is a new stakeholder group made up of heat pump manufacturers, distributors, local governments, Focus on Energy, and our team. This group was an inspiring force behind this proposal and will play a key role.

projects in this region. They understand the market actors, barriers, and potential challenges. The team's strong relationships with Midwest contractors and supply chain stakeholders are the basis of this endeavor and will allow the creation of a plan and playbook that are actionable and meaningful.

Slipstream will draw from a large portfolio of research projects and nine years implementing a heat pump program for Michigan's rural electric cooperatives. They will also draw on lessons learned through their current design and delivery of heat pump installer trainings for [ComEd's initiative](#) in Northern Illinois. CEE will rely on their extensive experience in heat pump field research, modeling, training, and market transformation initiatives. This experience is best exemplified by the creation and administration of the [Minnesota Air Source Heat Pump Collaborative](#). Elevate brings a deep understanding of the multifamily sector, having upgraded more than 100,000 affordable multifamily housing units. They also implement workforce development initiatives with local Wisconsin municipalities focused on minority, women-owned enterprise businesses (MWEB) to prepare them for accelerated heat pump deployment and the clean energy economy.

In addition to our three firms, as indicated by our letters of support, we will work directly with Dairyland Cooperative, Dane County's Office of Energy & Climate Change, La Crosse, Eau Claire, Sun Prairie, Auer Steel, Daikin, Mitsubishi Electric, and the Beneficial Electrification League. Many of these organizations are founding members of the Wisconsin Heat Pump Coalition, helping build consensus surrounding the need for this project, and have committed to being active contributors to benefit the communities and supply chain actors they serve.

Project Objectives and Metrics

The objectives and metrics to measure the success of this project include the following:

- Engage with key actors in the Wisconsin heat pump market, including top manufacturers, distributors, utilities, local governments, program designers/implementers, policymakers, and early adopting contractors. To measure success, we will seek to diversify and grow participation in Wisconsin's Heat Pump Coalition and enhance the experience of Coalition participants. To diversify participation, we will seek to recruit two HVAC contractors and two representatives from tribal nations. Overall, we will seek to grow participation in the Coalition by 10 members. To assess our team's impact on Coalition participants and their conception of a shared market transformation roadmap, we will request feedback.
- Develop value propositions showing multiple applications where a case can be made that heat pumps save customers money in the long run.
- Create a playbook that includes specific actions recommended to each of the primary industry stakeholders in terms of policies and programs in Wisconsin. Disseminate the written playbook to each key actor described in the first objective. We will also hold a presentation/webinar on the playbook for five primary industry stakeholder audiences.
- Begin to provide analytical and technical support for three to five stakeholders who actively adopt the playbook to strengthen their decision-making surrounding market and program interventions.

Reference Materials List

- Qualifications
- Resumes
- Letters of support

Application Narrative

The State of Wisconsin has pledged to be carbon-neutral by 2050. To accelerate decarbonization initiatives and mitigate climate impacts, the state's building sector needs to fast-track the transition of heating loads from fossil fuels to beneficial electrification. Through a state-wide heat pump market transformation initiative, Wisconsin can achieve rapid, equitable adoption of heat pumps and reach their climate goals. Success in this endeavor requires a sequence of tasks and deliverables, including 1) stakeholder engagement and needs assessment, 2) development of value propositions, 3) development of playbook, 4) playbook dissemination, and 5) technical support for stakeholders.

Scope

Task 1: Stakeholder Engagement and Needs Assessment

Needs Assessment. The needs assessment will allow us to understand the opportunities, challenges, and biases among industry stakeholders and supply chain actors that will help create the playbook. To guarantee that a diverse set of perspectives are considered and understood, and that our planning remains grounded in Wisconsin's local environments, we will conduct a series of one-on-one interviews. These interviews will be with our intended playbook audience, including Focus on Energy, utilities, regulators, local governments, and tribal nations. In addition, we will gather feedback from upstream market actors in the heat pump supply chain, which could include manufacturer regional sales managers, utility liaisons, and trainers in addition to distributor territory managers and technical trainers. Representatives of home energy, energy assistance, and weatherization programs administered through the Wisconsin Department of Administration will be a vital source for insights into the low-income residential market.

To integrate residential customer and HVAC contractor perspectives, we will lean on our organizations' experience in heat pump research and program deployment in neighboring states. We'll also use insights gathered from interviews in the Focus on Energy heat pump study CEE and Elevate recently completed. We may follow up with individual HVAC contractors or residential customers that provide a valuable perspective according to recommendations from stakeholders and upstream supply chain actors.

We will develop a strategy to target individual stakeholder participants and organizations for the needs assessment so we achieve a representative group. We will remain manufacturer agnostic and do our best to extend invitations to all willing heat pump manufacturers and their distributors. In terms of local government and communities, we will target rural towns and cities with progressive climate goals. These two will be highly motivated by the economic value proposition (i.e., delivered fuels) and the environmental proposition (i.e., local climate goals). Rural electric cooperatives will be a priority utility audience due to the higher prevalence of delivered fuels and better economic proposition since some of them have lower electric rates for customers heated by heat pumps. Tribal nations are an important constituent as they house many of Wisconsin's more vulnerable population, have a high percentage of substandard housing and high heating bills.

Convening and Engaging Stakeholders. We plan to deploy a variety of mechanisms to convene and engage stakeholders. For example, we anticipate that we will facilitate a few workshops or focus groups with similar types of stakeholders, such as local governments or tribal nations or a mix of diverse

stakeholders. These sessions will focus on crafting a vision for market transformation and outlining roles stakeholders see for themselves and others in achieving this vision.

As a few of the founding members, we envision the Wisconsin Heat Pump Coalition will serve as the central organizing entity for those seeking market transformation of heat pumps in Wisconsin. Our team will encourage broader participation from those individuals interviewed as part of the needs assessment. We will also organize and facilitate conversations in this group to obtain ongoing feedback and build consensus surrounding a heat pump market transformation playbook.

Task 2: Develop Value Propositions

Utilities are beginning to grow their programs. According to an ACEEE survey of utility programs nationally, in 2020 alone, more than \$108 million were budgeted for utility electrification programs with over \$75 million in cold-weather states.⁵ In fact, the New York State Clean Heat Initiative incentive program anticipates investing \$454 million through 2025 to support the adoption of heat pump technology, including customer incentives and support and workforce development.

In Wisconsin, alignment of Focus on Energy goals with decarbonization and electrification program discussions will be part of the Quad IV Planning.⁶ However, as utility programs begin emphasizing beneficial electrification programs and incentive structures, those programs must align with the interests of key actors, including state administrators, municipalities, utilities, manufacturers, contractors. The programs should leverage opportunities in essential customer segments so the overall demand for beneficial electrification technologies increases. Our team completed research that shows the factors market actors influence to increase adoption across multiple types of customer segments, such as the availability of incentives, ease of installation (e.g., dual fuel options), carbon reductions, reliability, etc.⁷

To this end, our team will identify promising opportunities in the Wisconsin market for electrification based on resources such as the 2021 Focus on Energy Efficiency Potential Study and the recently completed Characterization of Cold Climate ASHPs in Dane County Residential Housing Stock. We will then identify drivers key market actors need to increase demand for electrification technology for each customer segment. We will complete a detailed analysis for three to five opportunities that provide compelling economic and carbon reduction cases as the basis to validate the value proposition to each key market actor. Analysis of each opportunity will include:

- System-level cost analysis including simple payback and rate of return
- Economic modeling, including rate sensitivity
- Aggregation potential including costs and carbon reduction
- Role of each key market actor

Table 1 provides examples of near opportunities that could be targeted at customer segments to increase market demand.

⁵ Steven Nadel, “Programs to Electrify Space Heating in Homes and Buildings” American Council for an Energy-Efficient Economy and Energy Efficiency for All, June 2020

⁶ Presentation on January 6, 2022 by PSC representative Jolene Shiels.

⁷ Focus on Energy EERD report (2021). [Air Source Heat Pump in Wisconsin Multifamily and Single-Family Applications](#). Completed by CEE and Elevate.

Single-Family	Multifamily
-Electric Hot Water system upgrades ⁸ -Delivered fuel -Cooling system upgrade -New Construction	-Electric resistant heating systems upgrade to heat pumps ⁹ -New Construction -Subsidized affordable housing

Task 3: Develop Playbook

An ASHP market transformation playbook will be built using the investigative work of stakeholder engagement, value proposition development, and the compilation of existing market characterization resources. This playbook will compile vital information involving Wisconsin’s market characteristics. It will map critical barriers and opportunities to ASHP adoption. These market barriers and opportunities will provide each stakeholder with guidance on which strategic actions and interventions to take based on timing and need. It will also recommend methods for groups to collaborate, coordinate, remove barriers, accelerate adoption to capture energy savings, and reduce carbon emissions in the state.

The primary stakeholder audience will be able to use the playbook to characterize barriers, opportunities, and actions they can take in state-wide coordination. Primary audiences with the ability to enact systemic changes include:

- Utilities (IOU, co-op, municipal, and communities)
- Local governments (cities and counties)
- Focus on Energy
- Regulators
- Tribal nations

Secondary audiences who will be impacted by and have implementation implications include:

- Utility Implementers
- Early supply chain adopters (contractors, distributors, manufacturers)
- Workforce educators (i.e., trade schools, vocational high schools)
- Community groups

Logic model(s). Logic models are often used to evaluate an initiative or project’s impact. However, the framework of a logic model can be used to develop strategy and align stakeholders to work in a coordinated and strategic manner. Our intention for employing a logic model is to accomplish the latter—to uncover barriers and opportunities and to underpin strategic interventions that can pave the way to a low carbon, energy-efficient future for the state of Wisconsin.

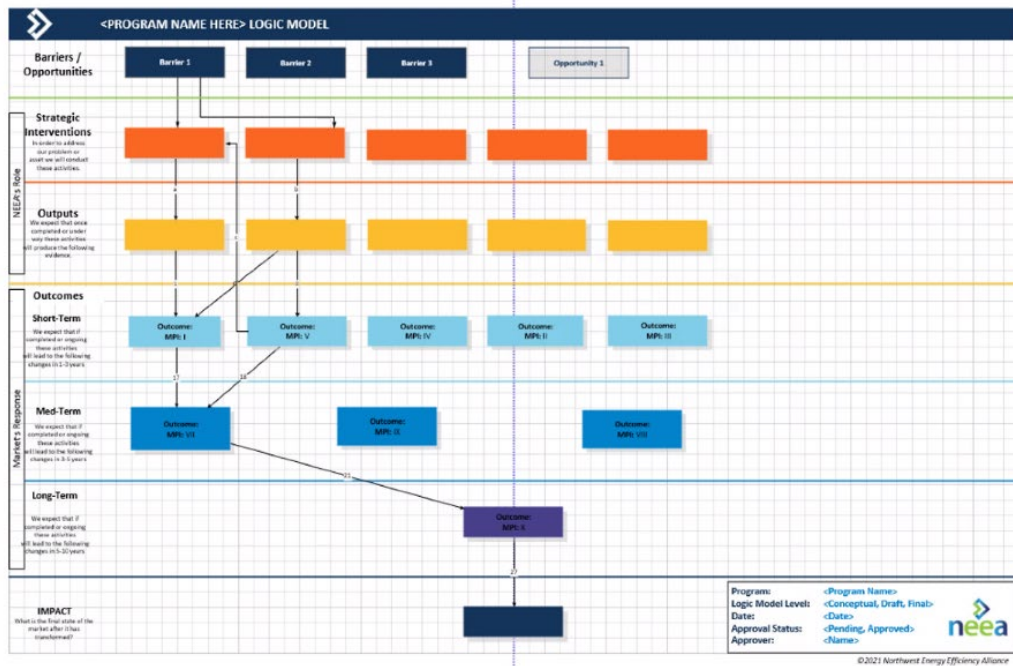
The logic model will incorporate all existing research and engagement from this project. It will outline the desired end state of a transformed market, the barriers and opportunities, and actions to overcome these barriers to achieve the desired end state. This method of strategic planning has been used by the

⁸ Garth et al. 2021 Focus on Energy Energy Efficiency Potential Study Report. September 10, 2021

⁹ Francisco et al. Characterization of Cold Climate Air Source Heat Pumps in Dane County Residential Housing Stock. Unpublished report. January 2022

Northwest Energy Efficiency Alliance (NEEA) for the past 25 years to reach their successful market transformation within energy-efficient market transformation initiatives.

NEEA Logic Model: Graphical Form



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Each intervention or action will be paired with expected outcomes so that stakeholders can achieve the desired market end state. Many of these actions will make step-by-step improvements in the technology's value proposition, which will aid in the market gaining momentum.

Policies, regulation, and rates. To layer detail onto the high-level logic model, this section of the playbook will include in-depth recommendations and analysis of policies, regulatory actions, and rate improvements that could enhance conditions for ASHP adoption. These recommendations will consist of best practices from other jurisdictions and incorporate the unique conditions present in Wisconsin. There will be a dissemination and support of these recommendations via technical support, which is described in tasks 4 and 5 below.

Inform deployment paths. This portion of the playbook will be geared towards program implementation and on how Focus on Energy, implementers and market partners can unlock ways that customers and the supply chain will increase ASHP uptake. This section of the playbook will include customer and contractor journey maps to reveal the most likely paths to adoption. In addition, there will be specific recommendations by audience type to show how the customer and contractor journey with ASHP adoption can be expedited and supported. This section will include recommendations on:

- Program design
- Implementation guidance
- Distributor engagement

- Workforce development education and training
- Customer awareness

This assembled team of bidders has extensive experience and resources that we will customize for use and make available to programs.

Task 4: Playbook Dissemination

Once the playbook is complete, the team will host a webinar to disseminate the playbook findings and recommendations along with follow-up communications to adapt to feedback and answer commonly asked questions. Separate webinars for each primary audience type will also be offered to dive deeper into levers of change that audience members have control over.

Task 5: Begin Technical Support for Stakeholders

Our team will work with a limited number of primary stakeholders to implement aspects of the playbook. We anticipate early support would be provided to municipalities or tribal nations as they begin developing electrification programs in their communities or implementing aspects of their climate change plans. Implementation will focus on organizing supply chain actors to focus on a specific customer class (e.g., single-family homes) and opportunity (e.g., upgrade cooling systems). Technical support for stakeholders will use the playbook to guide the program design process, including:

- Sector characterization to identify market uptake opportunities for ASHPs (note: analysis from the value proposition development will guide this activity)
- Identification and adoption, as needed, of key policy drivers, including incentives
- Collaborative program design process
- Stakeholder engagement and market organizing of supply chain (e.g., Manufactures, distribution, contractors)
- Outreach and engagement plan of end-user customer base

Eligibility and Ability to Achieve Objectives

All team members are 501(c)(3) nonprofit organizations with operations in Wisconsin. Our teams' status and mission approach make us eligible and a solid fit for receiving EIGP funds. Slipstream will subcontract to two nonprofit organizations, Elevate and the Center for Energy and the Environment (CEE). This team is well-positioned and staffed to complete the proposed scope of work. The three organizations have a long history of programming experience in heat pumps. They also have current complementary program efforts such as air source heat pump training in multiple states, the Minnesota Air-Source Heat Pump Collaborative, a vast body of heat pump demonstration projects, and heat pump field monitoring studies-both active and closed.

Slipstream: Our mission of energy equity, sustainability, and economic vitality drive our team to build vibrant solutions to the most challenging energy problems. Our commitment to thriving and equitable communities begins with our deep bench of technologists, engineers, practitioners, and outreach teams who connect hard-to-reach end-users with utility services. Slipstream designs and implements energy efficiency programs throughout the U.S. and is actively preparing for beneficial electrification programs in cold climates throughout the Midwest. Our team has analyzed the economics and emissions of electrifying space and water heating and other measures, designed a residential all-electric utility incentive program, and studied opportunities for bundling demand flexibility programs with innovative

rate design and beneficial electrification to promote grid optimization. In collaboration with the Beneficial Electrification League, Slipstream helped plan and hold the Electrify Minnesota! Electrify Wisconsin! and Electrify Iowa! events to raise awareness about beneficial electrification. We regularly strategize with energy utilities to quantify market potential and achieve their goals for the grid, members/consumers, and decarbonization of the environment.

Our extensive work in cold climate heat pump market transformation will provide the State of Wisconsin a path to rapid decarbonization. Examples of our heat pump work include:

- **Training and market transformation.** Currently leads ComEd's air source heat pump installer training and market transformation initiative. Implemented heat pump trainings for WI utilities and included heat pump training content at the B4 conference.
- **Michigan Energy Optimization heat pump program.** Delivered for more than nine years and has added beyond-rebate interventions that include contractor training and education, customer-facing resources, direct troubleshooting assistance, and distributor-based midstream incentives.
- **All-electric new homes assessments and program implementation.** Assessed opportunity for heat pumps in residential new construction in Dane County. Implemented all-electric new homes pilot which grew into a full program for ComEd, including heat pumps as core measures.
- **Heat pump pilots.** Detailed dual-fuel heat pump field monitoring study completed. Field study on mini-splits and electric baseboard controls, market research on heat pumps.

Slipstream researcher Justin Margolies will lead the overall project. Other Slipstream staff that will contribute include Dianna Cacko, Field Outreach Manager; Scott Hackel, Vice President of Research; and Robin Lisowski, Director of Service Solutions.

Elevate is a 501(c)(3) nonprofit organization with more than 20 years of experience delivering energy efficiency programs and supporting residents, nonprofit organizations, and small businesses in underserved communities. Elevate staff reflects the communities we serve with approximately 45% of our staff identify as Black, Latinx, Asian, or more than one race or ethnicity. Having upgraded more than 100,000 units of affordable multifamily housing, Elevate is currently leading electrification retrofits to air source heat pumps and other electrification technologies in over 200 units of affordable housing, with 40 of those units located in Dane County, Wisconsin, and another 225 units expected to come online in 2022. Below are a few examples of Elevate's body of work surrounding heat pumps.

- Convert natural gas systems to air source heat pumps and other electrification technologies in over 200 affordable housing units, with 40 of those units located in Dane County, Wisconsin, and another 225 units expected to come online in 2022.
- Establish a Dane County-focused Contractor Accelerator program that will support MWBE contractors to grow their business in the clean energy field.
- Complete an electrification characterization study for Dane County Characterization of Cold Climate ASHPS in Dane County Residential Housing Stock that models the energy, carbon, and cost-saving opportunities that would result from electrifying homes in the County.
- Support a technology accelerator program with the Lac du Flambeau tribe converting single-family homes from propane to heat pump technology.

Elevate staff leading this work include Abigail Corso, P.E., Keith Swartz, P.E., and Anne McKibbin, Elevate's Policy Director.

Center for Energy and Environment (CEE) is a 501(c)(3) nonprofit that has been serving customers since 1979, headquartered in Minneapolis and St. Paul, MN. CEE offers practical energy solutions so homes, buildings, and communities can reduce energy use. CEE's mission is to discover and deploy the most effective energy solutions that strengthen the economy and improve the environment. This mission is served through research, engineering, residential and commercial customer programs, financing, and policy work. CEE has been working extensively to understand and accelerate adoption of ASHP technology for the past decade. Below are a few examples of CEE's body of work surrounding heat pumps.

- MN ASHP [collaborative](#) – a state-wide ASHP market transformation program working with utilities, manufacturers, distributors, and contractors to accelerate the heat pump market in Minnesota.
- ASHP [Research](#) – Performed extensive in-field and modeling studies on air source heat pumps since 2013 to understand real-world performance, installation considerations, and beneficial application types.
- ASHP regional training – Partnered with utilities, manufacturers, and distributors to develop and deliver ASHP contractor training in emerging markets such as Minnesota, Colorado, and Illinois.
- Potential studies and technical analysis – Performed energy efficiency potential studies for ASHP technology and rate analysis to optimize utility program design.

CEE staff contributing to this project will include Emily McPherson, Program Development Manager who oversees the MN ASHP Collaborative, and Isaac Smith, Program Development Manager who leads ASHP research and technical analysis projects.

Budget Justification and Cost Share

We request \$99,965 for the proposed project from the State of Wisconsin. The total budget for the effort will be \$114,545, with the balance coming from cost share from our three organizations. The budget is roughly evenly divided among the four tasks and among the three project partners. Of the project budget total, Slipstream is anticipated to receive \$40,980, CEE is expected to receive \$26,745, and Elevate is expected to receive \$32,240.

As a market transformation planning project, nearly all the budget is devoted to labor in meeting the objectives. A small amount of the cost share, approximately \$3,000, is donated travel expenses for convening in person. The total cost share is 13% of the project budget, with Slipstream and CEE contributing 7.5% budget match spread across all project tasks, and Elevate contributing 60 hours specifically focused on using the playbook and beginning to provide technical support for stakeholders.

Savings and Payback

This market transformation effort will indirectly drive economic savings in Wisconsin by increasing adoption of efficient heat pumps and beneficial electrification more generally, over time. In today's market, the simple payback for a residential heat pump retrofit program averages about 20 years. This is based on current fuel prices, high installation costs because there are too few contractors, and lack of

market demand.¹⁰ Single-family all-electric heated homes present the most compelling payback of 10 years. Opting for dual fuel instead of all-electric, heat pump paybacks can be lower. When compared to a conventional furnace and central AC, eight dual fuel heat pumps achieved paybacks less than 9 years¹¹, according to a study Slipstream conducted in Michigan that used propane as the backup fuel. Higher incentives—through Focus on Energy—and an increase in the demand for heat pumps through education and demonstration projects will drive down first cost. Simultaneously, this will improve the numbers of qualified installation contractors. Rate design that offers lower rates for heat pump heating can also improve the customer payback. The scope of work proposed is designed to accelerate this transformation to heat pumps in Wisconsin by convening key stakeholders, identifying policy levers, and providing a playbook to guide decision making of key influencers.

Energy Savings and Environmental Impact

Energy savings from electrifying homes range from 25-50% based on the type of heating fuel replaced. Savings to the homeowner range from \$400 per year for a multifamily resident to \$1,200 for an electric resistant heated single-family home which, for many lower-income residents, can represent a significant portion of their monthly utility bill.

Correspondingly, the transition to electric technologies for heating will lead to grid emission savings. Analysis using Cambium and the NREL ReStock data completed on electrically resistant heated single-family homes show lifetime savings of carbon of approximately 80 to 100 tons per home. Lifetime carbon savings of 20 to 50 tons per unit are possible for propane and fuel oil-heated homes. Heat pumps can also achieve emissions savings when compared to natural gas. Using field monitored data of dual fuel heat pumps and modeling for emissions impacts from moving away from natural gas as a primary heating source, we found 6% emissions savings in 2019.¹² Further modeling shows that as the percentage of renewable on Wisconsin's grid increases, these carbon savings will only increase when homes using fossil fuels are converted to air-source heat pump technology.¹³

Energy and Equity Justice

Research shows that heating types, such as electric heating or propane heating, that are good candidates for heat pump technology are associated with census tracts with lower median household incomes. These homes are also most likely to not have cooling which could also be provided through an upgrade to air source heat pumps. Expected annual utility bill savings vary from single-family to multifamily. The average annual heating bill savings is about \$400 per unit for a multifamily electric resistance unit, and \$1,200 per home for single-family representing a significant portion of a lower income resident's monthly utility costs. This project is proposed as proposed is designed to lay out the opportunities for heat pumps to bring economic and other benefits such as increased comfort to low-income and underserved residents of Wisconsin.

Overall, there is a lack of contractors ready and able to convert the number of homes and buildings to electrification technology that will be needed to reduce carbon emissions at significant levels. The

¹⁰ Francisco et al. Characterization of Cold Climate Air Source Heat Pumps in Dane County Residential Housing Stock. Unpublished report. January 2022 Report is still in development at time of writing proposal.

¹¹ 2019. [Dual Fuel Air-Source Heat Pump Monitoring Report](#).

¹² 2020. ACEEE Summer Study. [The Best of Both Fuels. The Case for Dual Fuel Heating in the Upper Midwest](#).

¹³ Francisco et al. Characterization of Cold Climate Air Source Heat Pumps in Dane County Residential Housing Stock. Unpublished report. January 2022 Report is still in development at time of writing proposal.

project as proposed is designed to increase overall demand in the market for electrification technologies. This presents a unique opportunity for MWBE contractors and workers to step into the clean energy sector. Positioning MWBE contractors to do this work builds wealth in diverse communities by increasing the number of projects for BIPOC contractors, many of which live and work in disinvested communities, as well as increases the number of good-paying jobs in the energy field.

Financial Leverage and Economic Impact

We are attempting to secure foundation funding for similar work, but there are no foundations likely to finance work that is primarily focused solely in Wisconsin. Implementing this scope of work with a Wisconsin focus will require EIGP funding, or it will likely not be completed. Wisconsin has unique challenges but also unique assets, such as the Wisconsin Local Government Climate Coalition (WLGCC), the Midwest Decarbonization Coalition, the newly formed Wisconsin Heat Pump coalition, the Great Lakes Indian Housing Association. Wisconsin also has stakeholders, such as a strong manufacturing presence, already focused on the conversion to heat pump technology throughout the state. The objective of this project is to organize our state-based assets to address market barriers related to demand and installation capacity. The objective is to provide decision-makers with roadmap that will accelerate the conversion to heat pump technology in Wisconsin.

As a partnership, Slipstream, CEE, and Elevate are already working on these issues and are ready to leverage ongoing initiatives to support this project.

Slipstream and CEE will leverage insights from a project they are jointly delivering to ComEd, the major utility in northern Illinois. The team will collect market insights and develop and deliver heat pump installer training as well as identify further market intervention planning from a utility perspective. This project will strengthen the team's approach to defining a playbook for Wisconsin utilities.

Through Elevate's Building Electrification project, the team will leverage demonstration retrofit projects that are converting old fossil fuel and electric technology to air source heat pumps while adding solar in affordable multifamily buildings in Wisconsin. Such projects illustrate the opportunity to improve our critical housing infrastructure with more efficiency heating and cooling technology while ensuring that our most vulnerable populations are not left behind. Elevate expects to deploy approximately \$250,000 in grant funds in Wisconsin in 2022 related to electrification upgrades in buildings occupied by low-income residents.

Energy Resiliency

Alongside mitigation strategies, resiliency strategies—which enable quick recovery from shocks, stresses, and disasters and help prevent future risk of the same—are important for energy security and innovation in Wisconsin. The adoption of residential heat pumps in Wisconsin has potential to increase resiliency for individual households and a clean energy system overall. Resiliency potential and results are expected from intersections of multiple interventions and activities more than singular adoption of heat pump equipment. Five such intersections that are in consideration in proposing this work are:

1. Pathways need to be identified to bundle heat pump installations with envelope improvements. Because Wisconsin experiences both extreme heat and cold high performing home envelope measures are critical to maintaining heating and cooling in the event of an outage. Evaluating and improving the envelope to optimize a home's thermal storage at the time of heat pump consideration and installation can increase home resiliency in terms of health, safety, and comfort for occupants.

2. Best practices can be promoted to address weather risks. Studies show that climate change will affect Wisconsin specifically with more flooding and related severe weather events. Establishing and norming practices such as elevating outdoor heat pump compressor units on a platform and in enclosure can increase the opportunity to get through a flooding or other severe weather with maintained heating and cooling, or in the event of power loss, through prevented or minimized damage to the equipment itself. These practices can also increase occupant resiliency in terms of health, safety, and comfort. Avoided or minimized equipment damage further increases resiliency in financial terms as occupants can use resources not spent on heating/cooling equipment repair and replacement toward other needs resulting from a severe or catastrophic event.

3. Efforts are needed to increase the workforce of those who can service heat pumps. Training contractors and growing interest in the field are recognized as needed interventions to accelerate adoption of residential heat pumps. Growing the workforce capacity that is prepared to repair and service a heat pump in business-as-usual times also has resiliency benefit because this workforce can be deployed to service heat pumps pursuant to a severe or catastrophic event.

4. Scaled electrification of end uses, like heat pumps, can drive decarbonization of electricity in Wisconsin through generation by renewable resources and battery storage. Because renewable energy can be produced locally vs. imported, driving generation from renewable sources increases energy security and resiliency in Wisconsin's energy system. Similarly, storage is itself a resiliency measure offering backup power pursuant to a system stress or outage. In these ways, accelerating heat pump adoption in Wisconsin indirectly increases resiliency benefits from renewable energy and battery storage.

5. Dual-fuel systems are likely part of the bridge to full heat pump deployment, and dual-fuel systems offer a building owner two sources of heating. This inherently increases resiliency, especially where propane, natural gas storage, or supply has risk.

Education and Awareness

The proposed project focuses on organizing market actors and highlighting market opportunities to drive customer adoption and demand. Each task of this project is designed to provide primary industry stakeholders, including Focus on Energy, utilities, regulators, local governments, and tribal nations, with data and insights. This information will enable stakeholders to enact policies and programmatic decisions that increase the adoption of beneficial electrification projects in Wisconsin. Project activities leading up to the development of the playbook will tap multiple types of stakeholders, thus providing opportunities for more general outreach. They will also receive feedback and insights from various sectors, including distributors, contractors, and end-use customers. The final playbook will be disseminated to the primary and secondary audiences and through stakeholder groups such as the WLGCC, Great Lakes Indian Housing Association, and the Wisconsin Heat Pump Coalition. Finally, while the work products developed through this project focus on the Wisconsin market, the process and results will likely become a template for surrounding states and jurisdictions.

Innovation

Heat pumps are still considered a very innovative form of heating in Wisconsin. Most consumers have still never heard of heat pumps, and plenty of contractors don't deploy them in any form. Even 'early

adopter' contractors that do deploy them are often doing so only at the request of a few customers. Scaling (i.e., replicating) this innovation is the overarching objective of the work.

Furthermore, the notion of a broad market transformation effort for this type of technology would in itself be unique in Wisconsin. There are certainly other efforts to demonstrate and promote the adoption of heat pumps. These include program incentives and a few educational activities. But for a shift as fundamental as electrifying heating, a more holistic market transformation strategy will be needed to truly accelerate the market.

As discussed above, the barriers are quite broad and spread across different actors from policy to program to supply chain and more; smaller individual efforts will struggle due to barriers in the areas that remain unaddressed. We are proposing a holistic approach, based on a market-wide logic model, that will have each of the actors work on the barriers in their areas in lockstep. This approach is not being funded or proposed by any other stakeholders right now, including Focus on Energy.

Reference Materials

Qualifications

Heat Pump Education and Training

Slipstream, CEE, and Elevate have delivered award-winning in-person and virtual training for decades. Their training has covered all sectors and most energy performance topics. The examples below describe the most recent training efforts explicitly related to heat pumps.

Minnesota ASHP Collaborative. CEE implements this collaboratively funded market acceleration initiative for five utilities/utility aggregators in Minnesota—representing over 60 individual utilities. CEE provides technical resource development, contractor education and engagement, distributor and manufacturer engagement and coordination, marketing resource development, and data aggregation to accelerate the adoption of heat pump technology. A core activity of this work has been the development of four on-demand [training modules](#) for contractors, which focus on heat pump savings potential, installation best practices, sales, and marketing. In addition to the modules, the CEE team provides in-person training in partnership with local distributors and manufacturers. CEE also works with the network of Minnesota trade schools to include ASHP training curriculum in HVAC programming. Manufacturers and distributors also provide product-specific training with detailed installation guidance. The main topics of CEEs trainings include: Explaining how heat pumps fit into the future of the HVAC market; Proof points that ASHPs work in cold climates based on field research projects; Resources and incentives; Application types and system design choices; Installation best practices for energy efficiency; Successful sales approaches; How to generate high quality leads.

ASHP Contractor Training Development. Beginning in 2017, with CEE's completion of the cold-climate ASHP (ccASHP) field study, CEE has been providing ASHP training opportunities to HVAC contractors across Minnesota. The CEE research presentations initially focused on cold-climate ASHP measured performance and in-home comfort and control for the customers. From there, CEE's program team developed online training modules that have been delivered widely to utility partners and their HVAC contractor networks across Minnesota. CEE further customized and added to this core curriculum for training delivered to Xcel Energy Colorado HVAC contractors in spring 2021. Over 50 contractors participated in the Xcel Energy Colorado HVAC contractor training session, and CEE has been a contractor to deliver more training to that market in 2021.

Authorized Insulation Contractor Program. In partnership with the gas utility Minnesota Energy Resources, CEE launched the Authorized Insulation Contractor (AIC) training program, which added material and installation standards, on-site quality assurance, and Building Performance Institute (BPI) certification requirements to the insulation rebate program. CEE developed innovative training approaches, such as online options that require contractors to answer questions throughout.

Ductless Heat Pump Applications for High-Performance Homes. One of Slipstream's online webinars discusses the advancements in ductless heat pumps and the application for high-performance homes. Learn about the concept of high-performance homes and the application of residential variable refrigerant flow (VRF) systems to meet their design and efficiency requirements. We review the scale upon which high-performance homes are measured, the process to properly design an HVAC system for these homes, and ventilation and dehumidification strategies that are required in low-load homes.

Ducted mini-split applications and performance. This Slipstream webinar explores both ductless and ducted mini-splits, with a focus on the latter. Performance and operation for cooling and heating are discussed, with a focus on cold climate heat pump operation. Case studies on basic installations for older homes and on inverter-driven ducted mini-split systems are shared, highlighting the impact they have on low-load, high-performance homes.

HVAC technology enhancements for energy conservation. This course demonstrates how to get the largest energy savings in commercial buildings. HVAC as a single system is 45% to 70% of a building's energy use—making it the biggest energy user and a major retrofit target. For comparison, lighting is usually just 10% to 30%. Even though these percentages depend on climate, building type, and building usage, HVAC still has one of the largest impacts on energy use. We discuss the newest energy-saving HVAC technologies, improvements, and alternative solutions, so you can initiate change in commercial buildings.

ASHP Education Initiatives in Wisconsin. Slipstream brought the building community up to speed at the Better Buildings Better Business Conference in 2019 and 2020. We presented ccASHP advancements, opportunities, and applications. CEE discussed ASHP lessons learned from five years of installed monitoring. Mitsubishi Electric presented mini-split/multi-split best practices.

ASHP Videos. Slipstream is in a contract with WPPI to create videos regarding the benefits of ASHPs. We are working with partners to create a 6-minute video segment of a syndicated TV show called "Into the Outdoors." We are also in the process of creating a 10-minute video that can be repurposed across WPPI's 51 member communities. Slipstream will create multiple videos targeting a variety of audiences as part of its community-based mission objectives.

Contractor Accelerator. Elevate provides minority and women-owned contractors with opportunities to grow their businesses in the clean energy sector through the contractor accelerator program. The program facilitates a cohort-based training and mentoring curriculum focused on business growth and clean energy topics, including electrification and solar. Elevate piloted the accelerator with ComEd in Chicago and is developing similar programs in Madison, WI, and Detroit, MI.

Heat Pump Programs, Studies, and Market Intervention

Slipstream, Elevate, and CEE will leverage existing relationships with Midwest ASHP manufacturers, EESPs, and other supply chain stakeholders. We are well-positioned to deliver the proposed work based on prior work, which includes research through outreach, interviews, and surveys, among other information gathering techniques. Our combined research qualifications provide ongoing insights into ways ASHPs can be deployed more rapidly across Wisconsin.

Cold-Climate ASHP Field Assessment. CEE conducted its ground-breaking 2015-2017 field study of cold-climate ASHPs for the Minnesota Department of Commerce. CEE performed in-field monitoring of cold-climate ASHPs in single-family homes in a variety of locations throughout the state. The research team evaluated backup integration, defrost impacts, capacity, and occupant comfort. Detailed performance curves were developed. Analysis was conducted on energy savings, backup integration, switch-over temperature and sizing impacts, and the impact on customer costs. This study included two add-on field studies funded by Xcel Energy to measure ducted cold-climate ASHPs in all-electric applications.

Optimized Installations of ccASHPs for Single-Family. CEE is conducting field monitoring of ccASHP systems in electrically heated homes (2019–present). The research team is developing, testing, and validating protocols for quality installation and integrated controls based on CEE's knowledge of cold climate heat pump performance to develop evidence of reliable real-world savings.

Ductless Cold Climate Heat Pumps for Multifamily. CEE researchers installed ductless systems in approximately 15 multifamily buildings and conducting analysis on their performance (2019–present). Researchers will be evaluating the install cost, system design options, and barriers of this application, as well as monitoring the performance and energy savings from these systems. Analysis will determine typical state-wide performance and energy savings potential of this technology in multifamily applications.

ASHP Multifamily and Single-Family Market Study. CEE conducted interviews of contractor and multifamily building owners in Wisconsin for this 2020–2021 state-wide ASHP market study. Based on insights from the market, CEE developed program recommendations, including HVAC contractor network engagement and training recommendations. CEE researchers also ran data analysis of 40 utilities to determine the presence of electric resistance heating in utility territories.

Variable Capacity Heat Pump Product Assessment & Modeling Tool. In 2020–2021, CEE mapped the supply chain for the ducted, all-electric cold-climate heat pump market. The research team evaluated the market to identify features that could impact performance and capacity and developed a custom energy model to quantify the impact of these features, and additional variables, on energy use and peak demand.

Dual-fuel Heat Pump Field Study. Slipstream conducted a field performance study of dual-fuel heat pumps in Michigan. The study included four heat pumps with fixed-speed compressors and four heat pumps with variable-speed compressors. The study monitored gas and electricity consumption and quantified cost savings and emissions savings. The study also estimated the coefficient of performance (COP) for each heat pump. The study report can be found [here](#).

Mini-split Controls Monitoring Project. Slipstream is conducting a field research project related to the installation of controls to better integrate mini-split air-source heat pumps with existing baseboard resistance heating. The aim of the study is to see how the controls affect the operation of the heat pumps and to gauge their effectiveness in minimizing the use of resistance heat.

ComEd All-Electric Homes Program. In 2019, Slipstream was asked to collaborate with an Illinois utility to envision what the next generation of residential efficiency programs might look like. In 2020, Slipstream launched a pilot with the objective of recruiting Illinois builders to go all-electric while linking solar and EV offerings into an integrated, comprehensive package. In addition to outreach and education, the program provides a framework to reward builders for each qualifying home that meets core requirements for airtightness, indoor air quality, electric heat pump space and water heating, high-efficiency appliances, LED lighting, and more.

Heat Pump Working Group of the Midwest Building Decarbonization Coalition. Slipstream facilitated the Heat Pump Working Group of the Midwest Building Decarbonization Coalition. The objective was to convene, educate, and motivate industry stakeholders to jumpstart market and policy action that would drive equitable heat pump adoption in eight Midwestern states. We focused on four intervention areas,

including multifamily affordable housing, rural communities primarily served by propane, new residential construction, and AC replacement. Slipstream also prepared a playbook to guide further action toward accelerating heat pump adoption.

Michigan Heat Pump Incentive Program Implementation. Slipstream implements a residential heat pump incentive program for Michigan municipal and cooperative electric utilities as part of a comprehensive energy efficiency program portfolio. Services include program design, delivery, marketing and outreach, incentive management, reporting, evaluation support, and input and analysis for Technical Resource Manual Updates.

MECA Home Energy Assessment Pilot. Slipstream explored an innovative way to incorporate new technologies and approaches to deliver home retrofit programs with this pilot. We performed remote home assessments by analyzing connected thermostat data and compare the results with traditional home energy assessments for ~100 homes to determine value to contractors and customers.

MECA Heat Pump market research. Slipstream completed market and technology research for the Michigan Electric Cooperative Association (MECA) as part of a multi-year effort to accelerate residential adoption of heat pumps. Manufacturers, distributors, contractors, and customers were surveyed. Home builders and HVAC educators were interviewed. The project investigated cost-effectiveness of heat pumps for space and water heating and analyzed grid and environmental benefits of the technologies. A second pilot outcome was the development of marketing, education, and outreach content.

Building Electrification Program. In 2020, Elevate launched its building electrification program to upgrade affordable multifamily buildings with heat pump technology. Through the program, 200 multifamily units are being retrofitted with heat pump technology with another 125 units scheduled for upgrade in 2022. The program provides housing owners with system design experience and general contracting services to complete the upgrades.

Resiliency Hubs. Elevate is completing design and construction on a resiliency hub in Detroit that will provide seniors with a cooling center as well as a source of backup power in the event of a power outage or other emergency event. This hub will be a prototype for other similar centers in other parts of Detroit and Midwest cities.

Dane County market characterization research. Elevate recently completed a residential housing characterization report for Dane County that examines the potential for upgrading to cold-climate air-source heat pumps (ccASHPs) across residential housing stocks in Dane County. The scope of this analysis includes residential units (single-family and multifamily) in buildings that do not use natural gas for heating (approximately 80,000 residential units). Opportunities within specific housing stocks were identified based on the carbon emission reduction potential, utility reduction, and implementation cost.

Resumes

Resumes for key staff working on this effort are appended below.

Scott Hackel, PE, LEED AP

Slipstream | P: 608.210.7129 | shackel@slipstreaminc.org

Slipstream—Director of Research and Innovation

Scott has established a national reputation for technical thought-leadership in high performance commercial building research and technologies. He leads ground-breaking field research in buildings to test the performance of new and emerging technologies. Scott designs and executes studies to determine typical installation practices, measure energy savings, and identify potential for recommissioning. Scott provides technical perspectives to shape design and implementation strategies to boost savings and decarbonization programs.

Selected projects—research

Compliance of complex code elements. Field study of the code compliance of design and construction teams for larger buildings for the most complex elements of the energy code such as advanced HVAC control.

Energy management information systems programs. Investigated EMIS capabilities, analyzed savings potential, and studied the market for EMIS in Wisconsin. Translated research into program recommendations for Wisconsin Focus on Energy.

IoT device market transformation for commercial buildings. Conducted product and market research on IoT devices that have the potential to increase energy savings through improved feedback, fault detection, and optimization via connection to the cloud and operator user interfaces.

Grid-interactive efficient buildings test beds. Testing control of building load and response to automated demand response (ADR) signals using a number of tools. These include proprietary tools (Synapse, Nantum OS) as well as the open-source VOLTTRON platform. Identified challenges in integrating these tools into buildings, methods for adjusting demand management, and operator lessons learned.

WiFi Location Based Services for building automation. Conducted applied research into use of WiFi beacons to identify occupancy and occupant locations in commercial buildings, and the subsequent control of building automation systems to reduce energy consumption or manage demand based on that occupancy.

ASHRAE Smart Grid guide. Scott and other co-authors created a guidebook to transfer smart grid basics and best practices to the community of building professionals served by ASHRAE. Key best practices on communication protocol, microgrids, building automation, storage, and other topics were gathered from secondary research and published in a succinct guidebook.

Integrated controls package for high performance interior retrofit. Scott is leading a DOE-funded project that will deliver a package of technology and control retrofits to envelope, lighting, plug loads and HVAC, allowing these systems to respond and optimize in real time, even in the most conventional existing buildings.

Retrocommissioning persistence for ComEd. Scott and his team are studying the energy improvements made in retrocommissioning and their ability to persist over time. This research informs the impact that building controls, which are increasingly leaned on for energy savings, are having on energy performance.

Select projects—programs and tech transfer

Training and convening. Scott is a regular participant and supporter of the Education and Training group at Slipstream. He has helped strategize, develop, and build curriculum for events focused on commercial building energy performance.

Accelerate Performance. Scott is on a DOE-funded team that is creating programs throughout the country to advance the practice of performance-based procurement for new commercial buildings, allowing owners to achieve aggressive energy performance while keeping costs in check. Scott is the technical lead on a pilot-scale Accelerate Performance project in Minnesota.

Past experience

Sustainable Engineering Group

Modeled sustainable building systems for commercial and institutional buildings. Assisted with fundamental and enhanced commissioning duties on several schools for a district-wide major mechanical renovation, including geothermal heat pump systems.

University of Wisconsin—Madison, Solar Energy Laboratory

Conducted research on the economic optimization of hybrid geothermal heat pump systems for commercial and industrial buildings. Researched optimal control and design specifications, built transient thermal and economic models of hybrid systems, and created design software.

Licenses and certifications

Professional Engineer in Wisconsin
LEED Accredited Professional, Building Design and Construction

Professional leadership and awards

- ACEEE Summer Study 2022 Track Chair: Net Zero New Construction
- Wisconsin Public Service Commission 119 Rules for Interconnecting Distributed Generation Facilities Advisory Committee, 2021-2022
- American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) Decarbonization Task Force; member of Grid-Building Intersection Working Group, 2021-22
- Standard Method for Evaluating Zero Net Energy and Zero Net Carbon Building Performance standard committee, ASHRAE/ANSI Standard 228, 2020-2022
- ASHRAE technical committees: TC 6.8 Geothermal Energy Utilization, TC 7.6 Building Energy Performance, TC 7.5 Smart Buildings

Education

Master of Science Degree, Mechanical Engineering, University of Wisconsin—Madison, 2008.

- Certificate in Energy Analysis and Policy

Bachelor of Science Degree, Mechanical Engineering, with certificate in technical communication, University of Wisconsin—Madison, 2003.

Justin Margolies

Slipstream | P: 608.729.6803 | jmargolies@slipstreaminc.org

Slipstream—Researcher II

Justin is a researcher specializing in emerging markets, technologies, and program designs that increase energy efficiency while fostering the use of renewable power sources. With a strong background in econometrics and consumer education, he is driven to bridge the gap between research and scaled impact in the clean energy transition.

Professional Experience

Slipstream | Madison, Wisconsin | 2016-present Researcher II

Collects and analyzes energy and utility market data to predict and synthesize energy efficiency program outcomes, enhance effectiveness, and lay the foundation for new initiatives. Conducts research into emerging markets, technologies, public policy, and program designs. Strong research focus on heat pumps and other electrification technologies. Key accomplishments at Slipstream:

- Managed a cross-functional team to deliver a multi-year residential heat pump pilot, which includes segmentation analysis, target market evaluation, customer outreach, launch of distributor-based midstream HVAC incentives and a heat pump field monitoring study.
- Co-authored a research paper describing the relationship between electrification and energy efficiency; presented the findings at the American Council for an Energy Efficient Economy (ACEEE)'s 2018 Summer Study on Energy Efficiency in Buildings.
- Co-authored a research paper on the role of dual fuel air source heat pumps in beneficial electrification; published findings at the American Council for an Energy Efficient Economy (ACEEE)'s 2020 Summer Study on Energy Efficiency in Buildings.

University of Wisconsin—Madison | Madison, Wisconsin | 2018-2020 Assistant Faculty Associate

Taught the Resource and Energy Demand Analysis (REDA) seminar to graduate students. Developed the course syllabus, assigned readings, led class discussion, and evaluated student performance.

Navigant | Madison, Wisconsin | 2016 Intern, Energy Customer and Retail Market Analyst

Compared econometric matching techniques and determined usability for an electric and natural gas energy efficiency program.

SunShare | Minneapolis, Minnesota | 2014-2015 Business Development Associate

Executed inside and outside commercial solar energy sales, resulting in more than 80 opportunities with businesses, units of government, and schools. Educated residential customers on the benefits of community solar programs.

Education, Affiliations, and Awards

- Master of Arts Degree in Applied Economics; concentration in Resource and Energy Demand Analysis (REDA), University of Wisconsin—Madison
- Bachelor of Arts in International Studies; Environmental Studies minor, Macalester College
- Treasurer, Association of Energy Services Professionals (AESP)—WI Chapter, 2018-present
- Member, Northeast Energy Efficiency Partnership (NEEP) Heat Pump Working Group, 2018-present
- AESP One to Watch Award, 2019

Robin Lisowski

Slipstream | P: 608.729.6918 | rlisowski@slipstreaminc.org

Director of Service Solutions

Robin is an operational and sustainability leader with more than 20 years of experience guiding governmental, utility, nonprofit, and commercial organizations to greater levels of efficiency and financial success. She leads Slipstream's new product development practice to innovate and operationalize new programs and services and is passionate about centering people in clean energy initiatives.

Previous employment

Slipstream | Madison, Wisconsin | 2008-present

Director of Research & Innovation, Director of New Business, Director of Client Services Support & Portfolio Management, Assistant Director of Business Programs

Directs the development of emerging products and services to deliver on Slipstream's mission while meeting the needs of the organization and greater community. Leads a team to conduct research, analysis, and strategy development necessary to support ideation, design, and pilot programs. Performs business modeling and prepares business cases for product and service selection, builds partnerships with complementary service providers and industry experts, and tracks market trends. Key accomplishments at Slipstream:

- Designed emerging energy and sustainability services to catalyze greenhouse gas emission reduction using carbon offset strategies and a diverse set of financing streams.
- Serves as the organization's sustainability officer, leading sustainability policy, planning, implementation, and reporting. Developed and implemented a net zero policy, including energy management planning, green energy purchase, and offset strategy.
- Developed new infrastructure for managing client program portfolios of more than \$150 million.
- Designed and implemented key performance indicators for monitoring business development functions, including a system for maintaining and reporting results.
- Led a team to achieve more than 100 percent of its annual energy savings goals multiple years.

Education, Affiliations, and Awards

- Master of Arts Degree in International Public Affairs, University of Wisconsin—Madison
- Bachelor of Arts Degrees in Political Science and Spanish, Augsburg College
- GHG Inventory Quantifier Certification, HRCarbon, 2015
- Lean Six Sigma coursework, 2006
- President, Sustain Dane, 2018-present; Board of Directors, 2015—present
- Member, RE AMP, 2016—present and Wisconsin Climate Table leadership team member 2018-2019
- Member, Association of Energy Services Professionals (AESP), 2008—present

Dianna Cacko

Slipstream | P: 608.669.9117 | dcacko@slipstreaminc.org

Slipstream—Field Outreach Manager

Passionate about saving energy to conserve natural resources, increase home comfort, and reduce utility expenses for residential and commercial natural gas and electric customers. All to ensure a healthy environment for many years to come.

Selected employment

Slipstream | Energy Services Representative (June 2016 – present)

- Account manager for the MECA Energy Optimization residential HVAC program
 - Maintain a network of 400 contractors across the state of Michigan
 - Provided program updates, assist with application submission
 - Perform QA/QC site visits to ensure proper installation of HVAC equipment
 - Designed and launched midstream HVAC incentive program to increase heat pump adoption in northern lower Michigan. Program provides incentives to the end user and administrative fees for the wholesaler.
- Conduct field research studies on new HVAC and water heating technologies to ensure owner satisfaction and quantify energy savings.
- Provide training and education to contractors and residential homeowners on heat pump options and operation cost.

HomeServe | Area Network Manager & Energy Efficiency Field Manager (January-June 2016)

- Recruiting contractor network to deliver superior customer service on a 24/7 basis for residential plumbing, electrical, and HVAC repairs while developing a residential energy efficiency contractor network to offer free comprehensive home assessments with on bill financing for improvements.
- Lead responsibilities rate negotiation, strategic job cost management and work in conjunction with the contractor recruitment team to ensure proper coverage within their geographic territory to meet or exceed HomeServe quality standards.

ICF International | Account Manager (July 2013-December 2015)

- Manage metro Detroit area contractors enrolled with the Consumers Energy and DTE Energy residential energy efficiency portfolio. This included recruitment and training of new contractors, supporting current contractors and providing quality control assessments for the residential HVAC and Home Performance with Energy Star portfolios.

ICF International | Field Coordinator (July 2011-July 2013)

- Manage 25 field-based employees who conducted in home energy assessments with direct install measures for Consumers Energy under the Home Energy Analysis program. Includes schedule management, inventory management of energy efficiency products maintain inventory at four warehouses, employee training, and resolution of customer complaints.

Education

EPA 608 | Universal Technician (November 2018)

- Completed and passed written exam for the safe handling and use of refrigerant.

Building Performance Institute (BPI) | Building Analyst (January 2020)

- Building Analyst certification renewed conduct thermal imaging analysis of homes and blower door testing to test air leakage and make thermal envelop improvement recommendations.

Michigan Technological University | B.A. Construction Management (May 2011)

- President of the Efficiency Through Engineering and Construction student run enterprise
- Co-Chair of ESAB the Enterprise student advisory board, and National Association of Women in Construction scholarship winner.

Keith Swartz, P.E.

Email: Keith.Swartz@ElevateNP.org

Phone: 608-572-2375 (mobile)

Professional Experience

2021 to Present: Associate Director, Elevate, Madison Wisconsin

- Engineering expertise in support affordable housing energy programs

2017-2021: Energy Engineer III, Franklin Energy Services, Madison, Wisconsin

- Provided technical assistance services for utility energy efficiency programs in three states, specializing in estimating energy savings for custom projects
- Wrote and edited several sections of Wisconsin's Technical Resource Manual

2007-2017: Senior Energy Engineer, Energy Center of Wisconsin (currently Slipstream, also formerly Seventhwave) Madison, Wisconsin

- Provided technical assistance services for utility energy efficiency programs in four states, specializing in building energy modeling and custom energy savings calculations
 - Managed the New Construction Design Assistance Program for WPPI Energy (2007-2017)
 - Achieved natural gas savings in the Nicor Gas New Construction Program (2011-2017)
 - Achieved kWh savings in the ComEd New Construction Program (2009-2017)
 - Achieved energy savings in the Focus on Energy New Construction Program (2007-2011)
 - Achieved kW reduction in the We Energies New Construction Program (2007-2008)
- Created 24 spreadsheets with custom calculations for energy efficiency upgrades that are not easily modeled in common building energy modeling programs. One was presented at ASHRAE's national Energy Modeling Conference in 2012.
- Led 2-day training programs, teaching the building energy modeling program eQUEST
 - 16 training sessions in 6 states of approximately 40 students each
- Performed energy audits for more than 20 buildings
- Mentored junior engineers
- Determined standard practice for energy-related building characteristics in new building design for Focus on Energy by examining building drawings that were submitted to the State of Wisconsin

1999 - 2007: Senior Mechanical Engineer, Mead & Hunt, Inc., Madison, Wisconsin

- Provided engineering consulting services for clients in several states, specializing in the design of mechanical systems, including heating, ventilating and air conditioning (HVAC), plumbing, and fire protection systems.
 - Developed scope of work with clients, which included presentations and written reports
 - Selected mechanical systems for the client's buildings; evaluated different options
 - Modeled annual energy use of buildings
 - Prepared construction drawings, specifications and cost estimates

- Provided construction administration services
- Served as lead mechanical engineer for many projects, including the additions and renovations at the Dane County Regional Airport in Madison, Wisconsin. The cooling system included a thermal energy (ice) storage system.

1992-1997: Mechanical Engineer, Dow Corning Corporation, Midland, Michigan

- Designed mechanical components and systems for chemical manufacturing processes, including pumps, heat exchangers, compressors, pressure vessels, and piping
- Managed multi-discipline projects, including a new chiller system

Education

- BS, Mechanical Engineering, Iowa State University, Ames, Iowa
 - Three co-op work terms with Dow Corning Corporation in Kentucky and Michigan
 - Non-destructive testing, rubber research and chemical process design
- BA, Math (Pre-engineering), Minor in Physics, Wartburg College, Waverly, Iowa
 - Two physics research internships at Oak Ridge National Laboratory in Tennessee

Professional Licenses, Certifications and Organizations

- Registered Professional Engineer in Wisconsin and Michigan
- American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
 - Madison Chapter Historian (2011-2015)
 - Certified Building Energy Modeling Professional (BEMP)
- U.S. Green Building Council: LEED-AP

Publications and Presentations

- *Sustainable Building Design for Sustainable Stoughton*, Stoughton, Wisconsin, March 2, 2017
- *Assessing Your Building Energy Costs: Benefits of Energy Modeling to Owners*, BUILDINGchicago Conference, Chicago, Illinois, September 11, 2013
- *Modeling a Unique Dedicated Outside Air System*, ASHRAE Energy Modeling Conference, Atlanta, Georgia, October 1, 2012
- *Assessing Your Building Energy Costs: Benefits of Energy Modeling to Owners*, Illinois ASHRAE Modeling Conference, Chicago, Illinois, February 14, 2012
- *Design Trends Toward Energy Efficient Buildings*, Greening the Heartland Conference, Minneapolis, Minnesota, May 19, 2010
- "Madison Airport's Energy-Efficient HVAC Systems," Wisconsin Perspective Magazine, March-April 2006

Computer Skills

- Proficient with building energy modeling programs Trane TRACE and eQUEST
- Proficient with AutoCAD
- Proficient with Microsoft Office Suite—Excel, Word, PowerPoint, Outlook

Community Leadership and Personal Interests

- Toastmasters - Served as club president and other officer positions in three clubs since 1994
- Chapter co-leader, Madison chapter of the National Stuttering Association
- Biking - I have biked to work my entire career
- Backpacking - Hiked from Georgia to Maine on the Appalachian Trail in 1997 and continued travelling around North America through 1998, including building houses with Habitat for Humanity



ELEVATE

Equity through climate action

Abigail Corso, P.E., LEED AP O+M

Email: Abigail.Corso@ElevateNP.org

Phone: 773-321-2663

Professional Experience

Chief Strategy Officer

Current

Elevate, Chicago, IL

- Develops strong relationships and partnership opportunities across the country
- Coordinates development of new lines of business that will diversify revenue structure including financial services program, building remote monitoring technology, and consulting services.
- Responsible for Elevate's expansion to markets outside of Illinois including Michigan, Missouri, Oregon, and Wisconsin.
- Manages strategic partnerships to further Elevate's national presence including building owner portfolios and Elevate's national partner role in Energy Efficiency for All.
- Part of Elevate's Executive Team that is responsible for overall organizational fundraising, finances, program quality, and human resources.

Chief Program Officer

2015 – 2019

Elevate, Chicago, IL

- Responsible for strategy and management of Elevate's programmatic services including: energy efficiency programs, dynamic pricing, water services, health and safety, and expansion of services to new markets.
- Part of Elevate's Executive Team.

Director, New Market Initiatives

2012 – 2015

Elevate, Chicago, IL

- Responsible for market expansion of affordable multifamily energy efficiency programs throughout Midwest
- Managed over \$12 million dollars in program funds to support Elevate's new market expansion
- Led the team to establish energy efficiency programs in Indiana, Missouri, Pennsylvania, Michigan, and Louisiana including business model, staffing, program design, and operational components.

Managing Director

2001 – 2012

Delta Institute, Chicago, IL

- Secured grants from both federal agencies and private philanthropy to support program areas and projects.
- Initiated a fee-for-service program focused on sustainability and environmental certifications consulting that support alternative funding and business development opportunities.
- Management of technical professionals engaged in program implementation and development in the areas of Energy Efficiency, LEED for Existing Building, Sustainability Consulting, and Resource Management (Waste).

Project Engineer

1998 – 2001

Citizens for a Better Environment, Chicago, IL

- Provided technical support to communities on neighborhood environmental quality and improvement. Succeeded in engaging technical assistance providers and industrial representatives in the Good Neighbor

process to target facility-specific pollution reduction opportunities. Provided assistance and community meetings and public hearings.

Senior Project Engineer

1989 – 1997

O'Brien & Gere Engineers, Edison, NJ

- Conducted technology feasibility studies for RCRA and site remediation clean-up activities.
- Managed compliance audits for a variety of industrial facilities including pharmaceutical plants and natural gas suppliers.
- Designed and conducted large scale investigation and remediation activities.

Key Projects

Energy Efficiency Programs.

- Wisconsin: Leading an a multi-agency effort to complete program design for providing efficiency services to naturally occurring affordable housing. Initial focus is Dane County.
- Michigan: Conceptualized rural solar program for affordable multifamily housing including financing, installation, and owner engagement.
- Illinois: As Elevate's CPO managed the team responsible for over \$8 million dollars in utility contracts to support energy efficiency in low income homes.
- Illinois: As Elevate's CPO oversaw the team that administered and implemented the State of Illinois grant for providing energy efficiency services to affordable multifamily buildings.
- Illinois: Developed program design and financial model for application for a \$5 million dollar Program Related Investment loan program that Elevate would administer. Awaiting confirmation of receipt of the PRI funds.
- Delaware: Part of the core team to establish an innovative affordable multifamily efficiency program design that includes incentives for retrofits, mod-rehabs, and new construction linked to building financing cycles.
- Various states: Led the team to establish energy efficiency programs in Indiana, Missouri, Pennsylvania, Michigan, and Louisiana including business model, staffing, program design, and operational components
- State of Michigan: Part of the core team that developed the Michigan Saves commercial and industrial energy efficiency financing program for the State of Michigan. Program design elements and on-the-ground implementation include: energy assessments and opportunity development; contracting mechanisms; financial underwriting; financial analysis, program funding, and outreach strategies.
- Racine, Wisconsin: Developed the financial model for the residential on-bill financing program.
- Madison, Wisconsin: Developed the MadiSUN solar installation group purchasing program. Worked with local partners to design the program and led the installer RFP and contracting activities.
- Cook County, Illinois. Responsible for design and oversight of the Cook County commercial and energy efficiency audit program that provides free investment-grade energy audits to eligible businesses located throughout Cook County.
- Illinois and Michigan: Provided various types of manufacturing facilities with energy, water, and waste audits which include process mapping to highlight opportunities for reductions.

Resource Management.

- Ohio: Developed an electronics purchasing and e-waste communication and outreach program for Lucas County, Ohio and Cuyahoga County, Ohio
- Various locations: Provided businesses with process waste audits that focus on cost savings from source control and waste minimization.

Sustainability Consulting.

- Dayton, OH: Developed portions of a corporate level ISO 14001 Environmental Management System for a national company.

- Chicago, IL: Created a sustainability plan for a small local company that resulted in over \$20,000 in initial cost savings.
- Illinois: Partnered with the Illinois Environmental Protection Agency, Illinois Department of Natural Resources, and Department of Agriculture to develop and launch the Illinois Conservation Climate Initiative. Role includes contract development, program material development, carbon trading, recruitment, and coordination with the Chicago Climate Exchange. Worked extensively with managed forest landowners on sustainable management and certification associated with carbon sequestration.

LEED for Existing Building Consulting.

- Chicago, IL: Managing all aspects for LEED certification for existing buildings for several Chicago landmark buildings including the Merchandise Mart, Prudential Plaza, NBC Tower, One East Delaware (first Midwest residential high-rise).

Education

- MBA, New York University, New York, NY
- B.S. Civil Engineering, Drexel University, Philadelphia, PA
- Secondary Teaching Certificate, Calumet College of St. Joseph, Whiting, IN

Professional Affiliations

- National Partner, Energy Efficiency for All- Current
- Advisory Council, Network for Energy, Water and Health in Affordable Buildings (NEWHAB)- Current
- Board Member Michigan Energy Options- Current
- Board Member U.S. GBC Illinois Chapter- 2011 to 2014
- Discoveries Unlimited STEM Mentor, Valparaiso, IN - 2010
- Board Member Chicago chapter of the Institute of Supply Management- 2007 to 2009
- Fellow of the Sustainability Institute Dana Meadows Fellows Program- 2005 through 2006
- Board Member Illinois Environmental Council- 2003 to 2006
- NACEPT Compliance Assistance Advisory Committee- 2002 to 2004
- Wisconsin Mercury Rule Technical Advisory Committee- 2002



EMILY MCPHERSON

Program Development Manager



EDUCATION

**Willamette University –
Salem, OR**
BA Studio Art

AFFILIATIONS

- CSBA
- National Sustainable Building Advisor Program

SELECT PROJECTS

**Smart Thermostat
Direct Install Pilot**
Xcel Energy

**Heat Pump Water
Heater Market
Adoption**
Northwest Energy
Efficiency Alliance

**Northwest Energy Star
Homes Program**
Northwest Energy
Efficiency Alliance

**Ductless Heat Pump
Project**
Northwest Energy
Efficiency Alliance

CENTER FOR ENERGY AND ENVIRONMENT Minneapolis, MN
Program Development Manager 2018–Present

Conducts development of new energy efficiency programs and services that build on CEE's portfolio. Manages new program ideas through a process of product definition, market assessment, and creation of business and work plans. Develops operation and launch plans for new programs. Assists implementation teams with launching.

Minnesota Air Source Heat Pump Collaborative *Program Manager*

Manages CEE's implementation of the Minnesota ASHP Collaborative, a utility-funded initiative aimed at increasing ASHP market adoption. Oversees development of technical resources, such as an ASHP use application matrix, installer trainings and guides, and a utility rebate tracking map and spreadsheet. Oversees the vision and direction of the collaborative and the engagement of utility collaborators.

CLEARRESULT CONSULTING, INC. Portland, OR
Program Associate and Manager 2012–2018

Heat Pump Water Heater Program *Manager, 2014–2018*

Managed program implementation for the Northwest Energy Efficiency Alliance's Heat Pump Water Heater (HPWH) program, which helped transform the Northwest water heating market to adopt the HPWH technology. Collaborated with product manufacturers to advance technologies, provide feedback from installations, and partner on strategic marketing. Developed installer training strategies and curricula to increase trade participation and adoption. Created value propositions and facilitated stakeholder engagement processes. Established a retail intervention strategy to change sales associate behaviors and increase technology sales.

NEEA Ductless Heat Pump and HPWH Programs *Program Associate, 2012–2014*
Administered program delivery activities for Northwest Energy Efficiency Alliance programs including the Ductless Heat Pump and Heat Pump Water Heater Programs. Developed understanding of emerging technologies and crafted market intervention strategies, tracked program metrics, and optimized program activities.

FLUID MARKET STRATEGIES Portland, OR
Program Associate 2010–2012

Supported program delivery of Northwest Energy Efficiency Alliance's residential programs including the Northwest Energy Star Homes Program and the Ductless Heat Pump Project. Performed incentive processing, trade ally engagement and support, marketing support, performing quality control inspections, and general program reporting and administration.



ISAAC SMITH

Program Development Manager



CENTER FOR ENERGY AND ENVIRONMENT Minneapolis, MN
Residential Program and Development Manager 2011–Present

EDUCATION

University of MN – Twin Cities

BS Residential Building Science and Technology

Minor in Corporate Environmental Management

AFFILIATIONS

- Minnesota Building Performance Association (Treasurer)

SELECT PUBLICATIONS

[Really Selling Efficiency: Leveraging Existing Home Inspection at Time-of-Sale to Promote Energy Upgrades](#)
(2018)

[Transforming the Market for Energy Efficiency in Minneapolis](#)
(2018)

[Energy Fit Homes: A Tool to Transform the Market for Energy Efficiency in Existing Homes](#)
(2014)

Truth in Sale of Housing (TISH) Inspector Program Manager 2018–Present

Developed and implemented a pilot program for housing inspectors that was jointly funded by CenterPoint Energy and the City of Minneapolis. Conducting planning for roll-out of this program in 2019. TISH leverages Minneapolis' home health and safety inspection requirements for residential energy efficiency efforts, and includes new energy inspection protocols and successful passage of an Energy Disclosure policy in January, 2019. Pilot research included in-person interviews with inspectors and realtors, data from 40 selected homes, and trainings and focus groups.

Home Energy Squad Program Manager 2014–2017

Supervised program staff, designed operational protocols, developed new energy scoring and trade ally collaboration components, and currently manages utility relationships. Home Energy Squad is an award-winning, joint gas-electric, direct-install and audit program which CEE implements for large utility customers, like Xcel Energy and CenterPoint Energy, as well as smaller utilities.

Energy Fitness Score *Lead developer, manager for six years*

Developed an energy asset rating for existing homes that can rate multiple housing types and help customers set energy efficiency spending priorities based on cost effectiveness and maximizing savings potential. This score motivates the customer to complete projects that save the most energy and helps them select next steps. It has been included in the Home Energy Squad program since 2013.

CEE-Track Software Development *Oversight and improvements for seven years*

Created specifications and overall design for custom software application to meet program operational needs for Home Energy Squad. Worked with CEE's in-house software development team (led by Tom Spielman) to create a customized software package for CEE's energy auditors. Simplified energy modeling algorithms to create an easy visualization and score to demonstrate a home's energy efficiency.

Home Energy Squad Trade Ally Pilot *Led this one-year pilot*

Designed this contractor pilot program to improve homeowner conversion rates for Home Energy Squad audits. Worked with insulation contractors to develop standardized bid specifications for insulation jobs. Incorporated bid specs into CEE's customized software system so that energy auditors could provide qualified bids on site. This pilot tripled the conversion rate of homeowners moving forward with recommendations and has been fully incorporated into the Home Energy Squad program.



ELEVATE

Equity through climate action

Anne McKibbin

Email: Anne.McKibbin@ElevateNP.org

Phone: 773.269.2225

Professional Experience

Policy Director

Elevate, Chicago, IL

2010 – present

- Develop and implement policy initiatives and advocacy efforts related to energy efficiency, dynamic electricity pricing, clean water, workforce development, and solar energy programs
- Advise CEO and directors on strategy and risk management related to public policy
- Monitor state and federal legislation, develop legislative proposals, advise CEO and external allies on legislative negotiating positions, and manage contract lobbyists
- Manage participation in state and federal regulatory proceedings
- Oversee efforts to engage energy efficiency contractors in policy-related advocacy
- Maintain constructive relationships with Illinois' environmental and consumer advocate community
- Oversee participation in energy policy coalitions in Illinois, Michigan and Missouri
- Advise Elevate's New Markets team on policy landscape in markets targeted for expansion
- Advise functional and program teams on compliance with regulatory and legislative requirements
- Publish research reports and white papers to educate policymakers and stakeholders on mutual interests
- Represent Elevate in state and regional policy forums and at national conferences
- Consult for Elevate clients on energy planning processes and regulatory matters
- Develop grant proposals and manage production of grant deliverables and reports
- Supervise policy managers, policy analyst, and policy interns

Adjunct Assistant Lecturer

University of Illinois at Chicago

2014-present

- Co-teach biennial Energy Planning and Policy course to masters degree students in College of Urban Planning and Public Affairs.

Senior Policy Manager

Midwest Energy Efficiency Alliance, Chicago, IL

2008 – 2010

- Tracked energy efficiency legislation in a 13-state territory and provided information and relevant contacts to in-state allies, including environmental and consumer advocates and MEEA members
- Led RE-AMP working group of Midwest environmental organizations that promote energy efficiency
- Served on the RE-AMP network's Steering Committee and Global Warming Strategic Action Fund Board, which distributed over \$4 million to Midwest environmental advocates in 2009
- Supervised up to 3 research and policy staff in coordination with Director of External Affairs

Attorney and Senior Policy Analyst

Citizens Utility Board, Chicago, IL

2006 – 2008

- Evaluated economic and legal aspects of legislative and regulatory proposals in the electricity, natural gas, and telecommunications industries
- Provided expert testimony before the Illinois Commerce Commission on telecommunications deregulation
- Prepared strategy, coordinated with expert witnesses and allies, and participated in discovery and settlement negotiations at the Illinois Commerce Commission

Senior Economist

1998 – 2000

Public Utility Commission of Texas, Austin, TX

- Advised Commissioners on deregulation of Texas long-distance telephone market
- Testified as expert witness on telecommunications matters
- Drafted rules, conducted industry workshop, and made recommendations on utility rate change proposals

Education

- Juris Doctor, with honors, The George Washington University Law School, Washington, DC
- Master of Science, Economics, Texas A&M University, College Station, TX
- Bachelor of Science, Economics, Berry College, Rome, GA

Professional Affiliations

Illinois Environmental Council, Board Member, 2013 – Present, Secretary 2015 – 2017, President 2017 - Present
Chicago Metropolitan Agency for Planning, Environmental and Natural Resources Committee, 2011 – 2015
AESP Chicago Chapter, Board Secretary, 2011 – 2014

Publications and Awards

- McKibbin, Anne, and Laura Goldberg, *Breakthroughs in Energy and Equity in Illinois*, Proceedings of the 2018 ACEEE Summer Study on Energy Efficiency in Buildings. Report discusses improvements in equity of both process and outcomes obtained in passage of Illinois' Future Energy Jobs Act. August 2018.
- Finalist, 2015 U.S. C3E (Clean Energy Education & Empowerment) Awards
- McKibbin, Anne, *Multifamily Energy Efficiency Opportunities in the States*, Elevate. Report examining the benefits of energy efficiency improvements in multifamily buildings, the continued opportunity in multifamily efficiency and the role of efficiency potential studies and cost-benefits tests in determining the size and quality of local efficiency efforts. March 2015.
- McKibbin, Anne, *Unleashing the Power of Big Data on Energy Efficiency? Not So Fast*, Proceedings of the 2014 ACEEE Summer Study on Energy Efficiency in Buildings. August 2014.
- McKibbin, Anne, *Engaging as Partners in Energy Efficiency: A Primer for Utilities on the Energy Efficiency Needs of Multifamily Buildings and Their Owners*, CNT Energy and the American Council for an Energy-Efficient Economy. March 2013.
- McKibbin, Anne, et al. *Engaging as Partners in Energy Efficiency: Multifamily Housing and Utilities*, CNT Energy and the American Council for an Energy-Efficient Economy. February 2012.

Letters of support

Letters of support are appended below.



PLANNING AND DEVELOPMENT

400 LA CROSSE STREET | LA CROSSE, WI 54601 | P: (608) 789-7512



January 4, 2022

Energy Innovation Grant Program
Wisconsin Office of Energy Innovation
4822 Madison Yards Way
Madison, WI 53705

Dear Grant Administrator:

I am writing to indicate the City of La Crosse's support for Slipstream and their partners, Elevate and CEE, in their effort to create a market transformation plan for heat pumps in the State of Wisconsin. Expanding heat pump adoption is critical to reaching both Wisconsin's climate change mitigation goals and economic development goals.

We are committed to supporting the team with input. Outcomes from this project will help La Crosse achieve its goal of carbon neutrality by 2050 by increasing access to heat pumps, transitioning our community to cleaner electricity.

We are excited about this project and the opportunity for heat pump adoption to be accelerated across Wisconsin.

Sincerely,

Lewis Kuhlman, AICP
Environmental Planner

ANDREA TRANE, DIRECTOR OF PLANNING, DEVELOPMENT AND ASSESSMENT
TIM ACKLIN, AICP, PLANNING ADMINISTRATOR
JULIE EMSLIE, ECONOMIC DEVELOPMENT ADMINISTRATOR
LEWIS KUHLMAN, AICP, ENVIRONMENTAL PLANNER
JACK ZABROWSKI, ASSOCIATE PLANNER
LINZI WASHTOCK, PLANNING & DEVELOPMENT ASSISTANT

DIANE MCGINNIS, COMMUNITY DEVELOPMENT ADMINISTRATOR
DAWN REINHART, NEIGHBORHOOD HOUSING DEVELOPMENT ASSOCIATE
TARA FITZGERALD, EDFP, PROGRAM COORDINATOR
KEVIN CLEMENTS, HOUSING SPECIALIST
KEVIN CONROY, HOUSING REHABILITATION SPECIALIST
BRIAN SAMPSON, HOMELESS SERVICES COORDINATOR



January 14, 2022

Energy Innovation Grant Program
Wisconsin Office of Energy Innovation
4822 Madison Yards Way
Madison, WI 53705

Dear Grant Administrator:

I am writing to indicate our support for Slipstream and their partners Elevate and CEE in their effort to create a market transformation plan for heat pumps in the State of Wisconsin. Expanding heat pump adoption is critical to reaching both Wisconsin's climate change mitigation goals and economic development goals. We are committed to supporting the team with input and spreading the work about the results of this program at events, such as our Electrify Wisconsin meeting in Madison, our meetings in other states, and across our national network of beneficial electrification stakeholders.

The Beneficial Electrification League's mission is to increase understanding on the benefits of electrification by promoting the market acceptance of beneficial electrification, educate policymakers on the value and benefits of beneficial electrification, and to serve as a conduit and facilitator of beneficial electrification resources.

We are excited about this project and the opportunity for heat pump adoption to be accelerated across Wisconsin.

Sincerely,

Keith Dennis
President
The Beneficial Electrification League
www.be-league.com



Daikin North America, LLC.

19001 Kermier Road

Waller, TX 77484

Tel: 1-713-861-2500 (Main)

www.daikinac.com

January 11, 2022

Energy Innovation Grant Program
Wisconsin Office of Energy Innovation
4822 Madison Yard Way
Madison, WI 53705

Dear Grant Administrator,

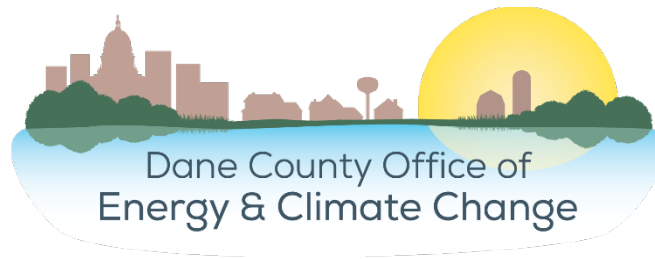
As a part of the Daikin North America organization that is assigned to support utility and government programs in Wisconsin, I am writing to say I am authorized to support the proposal submitted by the team comprised of Slipstream, Elevate and CEE. Daikin is a global leader in the research, engineering, and manufacturing of heat pumps, and Daikin is committed to supporting communities that seek to mitigate climate change through the application of heat pumps. In fact, Daikin's corporate goals appear to align nicely with Wisconsin's regarding climate change mitigation and economic development.

I am excited about this project and the opportunity to further support Slipstream, CEE, and Elevate, with whom I already collaborate and with whom I have good working relations.

Sincerely,

A handwritten signature in blue ink that reads "Jonathan".

Jonathan Moscatello
Business Development Manager – NW Division
Electrification, Utility and Government Programs
Daikin North America



January 7, 2022

Energy Innovation Grant Program
Wisconsin Office of Energy Innovation
4822 Madison Yards Way
Madison, WI 53705

Dear Grant Administrator:

I am writing to express our support for Slipstream's proposal to work with Elevate and CEE to create a market transformation plan that will accelerate heat pump adoption in the State of Wisconsin. Accelerating heat pump adoption is critical to reaching Wisconsin's climate change mitigation goals and the efforts have substantial potential to spur economic development. This is an important effort and Dane County's Office of Energy & Climate Change is delighted to support this proposal. If this project is funded we commit to working closely with the team to support their efforts in a variety of ways including providing strategic input, facilitating conversations with other local governments, and supporting project outreach efforts.

In 2020 Dane County's Office of Energy & Climate Change issued a Climate Action Plan that sets out strategies for reducing countywide emissions in half by 2030. Building electrification is an important priority in the Climate Action Plan so our office has been actively engaged with the HVAC industry, with other local governments that have ambitious climate goals, and with Slipstream, Elevate and CEE to strategize about Wisconsin's heat pump market. Through these discussions it has become clear that while Wisconsin is currently behind some of our neighbors in terms of promoting beneficial electrification, we can definitely catch up. Wisconsin has local government momentum for electrification; HVAC industry partners who are increasingly active in discussions and, most importantly, there is a terrific triad of mission-based organizations—Slipstream, Elevate and CEE—bringing diverse expertise and momentum to this issue. (Honestly, with all of that, I think we can lead again, as we did on high efficiency furnaces in past decades—provided we have a plan.)

The key now is to create a market transformation plan for the heat pump market. And that will happen if the Office of Energy Innovation funds this proposal. As you can likely tell, I am pretty excited about the possibilities here and I hope that you are too.

Sincerely,

A handwritten signature in black ink that reads "Kathy Kuntz".

Kathy Kuntz
Director



ELEVATE

Equity through
climate action

821 E Washington Ave 2nd floor
Madison, WI 53703

January 14, 2022

Energy Innovation Grant Program
Wisconsin Office of Energy Innovation
4822 Madison Yards Way
Madison, WI 53705

Dear Grant Administrator:

I am writing to indicate our support for Slipstream in their grant for a planning project to develop a market transformation Playbook to increase the uptake of heat pumps in Wisconsin homes. This project will provide a roadmap for a wide variety of stakeholders to understand the market and ultimately design and implement programs.

We are committed to the success of the project and will provide the team with policy and technical expertise related to heat pump technology and market dynamics, specifically for affordable housing. We believe this is an important project for policy leaders, municipalities, and utilities as we collectively navigate the path to decarbonization. As a mission based 501(c)3 nonprofit organization, Elevate is committed to ensuring the benefits of clean energy and related technologies are available to individuals and communities that need them most.

Please do not hesitate to reach out to me at Abigail.corso@elevatenp.org with questions.

Sincerely,

Abigail Corso, P.E.
Chief Strategy Officer
Elevate



January 11, 2022

Energy Innovation Grant Program
Wisconsin Office of Energy Innovation
4822 Madison Yards Way
Madison, WI 53705

Dear Grant Administrator:

I am writing to indicate our support for Slipstream and their partners Elevate and CEE in their effort to create a market transformation plan for heat pumps in the State of Wisconsin. Expanding heat pump adoption is critical to reaching both Wisconsin's climate change mitigation goals and economic development goals. We are committed to supporting the team with input about the unique needs of rural homeowners.

Dairyland Power Cooperative is an electric generation and transmission cooperative formed in December 1941. Headquartered in La Crosse, Wisconsin, Dairyland provides the wholesale electrical requirements for 24 distribution cooperatives and 17 municipal utilities. These cooperatives and municipals, in turn, supply the energy needs of more than a half-million people in the four-state service area (Wisconsin, Minnesota, Iowa and Illinois).

We are excited about this project and the opportunity for heat pump adoption to be accelerated across Wisconsin.

Sincerely,

A handwritten signature in blue ink that reads "Jeffrey W. Springer".

Jeffrey W. Springer
Manager, Innovation and Efficient Electrification

A handwritten signature in blue ink that reads "John M McWilliams".

John McWilliams
Senior Innovation Engineer

A Touchstone Energy® Cooperative 

3200 East Ave. S. • PO Box 817 • La Crosse, WI 54602-0817 • 608-788-4000 • 608-787-1420 fax • www.dairylandpower.com

Dairyland Power Cooperative is an equal opportunity provider and employer.



865 Xenium Lane North | Plymouth, MN 55441
www.auersteel.com | 800-969-2792

Dear Grant Administrator:

I am writing to indicate our support for Slipstream and their partners Elevate and CEE in their effort to create a market transformation plan for heat pumps in the State of Wisconsin. Expanding heat pump adoption is critical to reaching both Wisconsin's climate change mitigation goals and economic development goals. We are committed to supporting the team with input on new and more innovative ways of heating homes with less impact.

Auer Steel is a closely-held corporation owned and operated by the Curtes Family. The company's growth and success has depended on a commitment to service forward relationships with our customers and their trusted HVAC local businesses.

Taking direction from our mission statement's 'products so good', it is clear that climate friendly solutions exist within our warehouses. The role of the heat pump in a clean energy future stands out from all other emerging markets.

We are excited about this project and the opportunity for heat pump adoption to be accelerated across Wisconsin.

Sincerely,

A handwritten signature in black ink, appearing to read "Jeff Curtes".

Jeff Curtes
Executive Special Projects
Auer Steel & Heating Supply Co.



MITSUBISHI ELECTRIC TRANE HVAC US

December 29, 2021

Energy Innovation Grant Program
Wisconsin Office of Energy Innovation
4822 Madison Yards Way
Madison, WI 53705

Dear Grant Administrator:

Mitsubishi Electric Trane US is a leading global manufacturer of commercial and residential high efficiency heat pump technology. We are proud of our evolving best in class ducted and ductless products that achieve energy savings and deliver superior customer comfort.

While our products deliver excellence, our commitment to the industry is second to none as we seek to provide unmatched support as a true partner to the industry that is eager to transform clean and efficient space heating and cooling with heat pumps.

I am writing to indicate our support for Slipstream and their partners Elevate and CEE in their effort to create a market transformation plan for heat pumps in the State of Wisconsin. Expanding heat pump adoption is critical to reaching both Wisconsin's climate change mitigation goals and economic development goals. We are committed to supporting the team sharing our objective experience and insights gained from support of initiatives around the Midwest and across country. We have a strong track record of support for all the partners collaborating on this effort, including utilities and communities seeking market transformation. In Wisconsin alone Mitsubishi distributors and contractors demonstrated our commitment to heat pump adoption by utilizing 80+% of the Focus on Energy Midstream rebates in both 2020 and 2021.

Our sustainability commitment states, **“Mitsubishi Electric promotes environmental sustainability through the electrification of residential and commercial heating and cooling products. We continue to advance technologies that reduce waste, promote sustainable resources, while increasing energy efficiency and eliminating dependence on fossil fuels. We have an ongoing commitment to improving energy efficiency in all of our operations. Our vision is clear: to align personal comfort with the greater societal good.”** This project will further support the momentum that is beginning to meet timely objectives to reach the states goals on climate and economic development and I am personally committed to contributing to these local efforts to accelerate heat pump adoption here in WI.

Sincerely,

Kevin DeMaster

Sr. Mgr, Utilities & Electrification



January 11, 2022

Energy Innovation Grant Program
Wisconsin Office of Energy Innovation
4822 Madison Yards Way
Madison, WI 53705

Dear Grant Administrator:

At Center for Energy and Environment (CEE), we offer practical energy solutions so homes, buildings, and communities can reduce energy use. As a non-profit working in energy efficiency since 1979, our mission is to discover and deploy the most effective energy solutions that strengthen the economy and improve the environment. Recently, this has included work for Focus on Energy around air source heat pumps and a rural communities residential behavior pilot (“Save to Give”), which we are excited to expand upon with this project.

I am writing to voice our commitment to pave the way for energy efficiency and decarbonization in the state of Wisconsin by creating a heat pump market transformation plan. Our organization has researched cold climate air source heat pump technology extensively since 2013 and implements market intervention work in Minnesota, Illinois, and Colorado. We are committed to accelerating adoption of ASHP technology in practical and beneficial ways to improve economics and environmental impact of residential customers. We see enormous potential to advance heat pump adoption in the state of Wisconsin in a well-researched and coordinated manner to reach Wisconsin’s climate change mitigation goals and economic development goals.

We are committed to supporting this project with staff expertise in ASHP field research, rate design recommendations, stakeholder facilitation, market intervention strategies and developing a market transformation playbook. Additionally, we are providing a 7.5% budgetary match if awarded this funding to advance the outcomes. With the collective expertise and talent between CEE, Slipstream and elevate, combined with the strong support from the market as exemplified in our letters of support; we will pave the way for an energy efficient and healthy environment and economy in the state of Wisconsin.

Sincerely,

A handwritten signature in black ink that reads 'Carl Nelson'.

Carl Nelson
Director of Program Development



300 East Main Street
Sun Prairie, WI 53590-2227
(608) 837-2511
Website: <https://cityofsunprairie.com>

January 5, 2022

Energy Innovation Grant Program
Wisconsin Office of Energy Innovation
4822 Madison Yards Way
Madison, WI 53705

Dear Grant Administrator:

I am writing to indicate our support for Slipstream and their partners Elevate and CEE in their effort to create a market transformation plan for heat pumps in the State of Wisconsin. Expanding heat pump adoption is critical to reaching both Wisconsin's climate change mitigation goals and economic development goals. We are committed to supporting the team with input and would encourage the research to explore the following topics:

- Utility-facing research and customer resources supporting heat pump deployment.
- Addressing HVAC contractor/installer awareness, education, and promotion of heat pump technology. Consideration of training programs or demonstration projects.
- Economic analysis and fuel cost comparison for various space heating technologies.
- Consideration of a clean heating utility rate, and changes to winter peak load that would result from significant heat pump adoption in colder climates.
- Examples or case studies of existing installed heat pump systems across a range of building types in Dane County/WI.
- Analysis of non-energy benefits of heat pumps (comfort, control, flexibility, emissions reductions, modular installation).

As a municipal government, Sun Prairie strives to support the facilitation of technologies that cost-effectively reduce the consumption of fossil fuels, and see heat pump technology playing a major role in this effort; whether it's installing heat pump technology at municipal facilities, working with our municipal electric utility on planning, or educating our resident and businesses.

We are excited about this project and the opportunity for heat pump adoption to be accelerated across Wisconsin.

Sincerely,
Scott Semroc, Sustainability Coordinator