Newsletter / September 8

Q3 2025: Emerging Technology

Highlights

The Q3 2025 Emerging Technology Newsletter showcases a range of impactful work led by NEEA's emerging technology and product management team. Some key activities include:

- Launching a new project focused on investigating small (less than 120 gallon) heat pump water heaters for commercial applications.
- Completing a number of projects, including studies on residential laundry systems, monitors and commercial displays, commercial heat pump dryers, and variable speed heat pump test methods.
- Wrapping up an incremental cost analysis for variable speed heat pumps, an evaluation of residential dual-fuel HVAC product options*, and* a tri-mode heat pump study covering water heating, space heating*, and* air conditioning.
- Conducting field studies on:
    - A gas-fired absorption heat pump in a multifamily building
    - Energy savings from power drive systems*, and*;
    - Exploring how line voltage thermostats can help with load flexibility.

Future newsletters will include links to the reports and activities above as they become available on neea.org.

NEEA staff scan for new emerging technologies for all sectors and end uses. Please let us know if you have a product or research idea. We'd love to hear from you.

NEEA has several interesting Product Councils scheduled and is always open to topic ideas. Information on upcoming Product Councils is always available on the NEEA website. Please reach out to any of NEEA's product managers with questions or suggestions on NEEA's emerging technology work.

RECENT AND UPCOMING PRODUCT COUNCILS

- *March 25, 2025 – Low Load Efficient Heat Pumps*
- *June 24, 2025 – Empowering Meaningful Measurement & Verification with EcoDash: A standardized tool for HPWH M&V*
- *July 1, 2025 – Distributed Pumping Solutions*
- *July 8, 2025 – Advanced Heat Pump Coalition Spring Meeting*
- *August 19, 2025 – Real World Energy Conservation by Controlling Resistive Heating Elements*

For Questions:
Mark Rehley, Director of Codes, Standards + Emerging Technology
mrehley@neea.org

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Building Envelope

Secondary Windows Field Study — Eric Olson

DESCRIPTION

Retrofit products comprised of one or more panes of material such as glass, polymer or acrylic, with or without Low-E coatings, which are mounted in a frame attached either to the interior or exterior of existing windows without replacing the primary glass or frame.

Fuel type: Electric + Natural Gas

Project Status	*GTI Energy concluded its work to compile an inventory of manufacturers that offer secondary windows. The California Energy Commission (CEC) extended the project due to unforeseen complexities, and the original project schedule was revised. Lawrence Berkeley National Labs continues investigating condensation mitigation testing and data analysis, which will continue through 2025. Selected test sites are comprised of multiple office spaces. Three manufacturers' products will be tested.*		
Project Objectives	*Primarily funded by the CEC, this multi-year, co-funded project, led by GTI Energy, seeks to:* • *Advance high-performance window technologies by addressing the retrofit technical and cost challenges such as replacement cost, existing window size and weight incompatibilities, and durability;* • *Demonstrate increased energy performance with a U-Factor ≤ 0.13, Solar Heat Gain Coefficient (SHGC) ≤ 0.20, Visual Transmittance (VT) > 0.42, and decreased HVAC energy consumption by at least 15% compared to current HVAC energy use with existing single pane windows;* • *Reduce installation costs compared to code compliant windows; and* • *Accelerate high-performance window uptake in the retrofit market through direct partnerships with manufacturers, suppliers and others.*		
Readiness Levels	***Product**: 4*	***Commercial/Market**: 5*	***Program**: 4*

Building Envelope

Skinny Wall Retrofit Panels — Eric Olson

DESCRIPTION

Product: Highly efficient, customizable vacuum insulated panels (VIP) including an insulation value of up to R30. This product is targeted for residential applications.

Project: A co-funded project with GTI Energy and NYSERDA to develop an easy-to-install, highly efficient, and customizable wall retrofit solution for residential buildings. Key innovations include using VIPs, 3D scanning and modeling of the building enclosure, and customized design and fabrication of retrofit panels.

Fuel Type: Electric + Natural Gas

Project Status	*This project is underway. A final report is expected by Q4 2025.*		
Project Objectives	• *Determine retrofit parameters affecting thermal performance, air, vapor and moisture drainage, and weather-resistive barriers;* • *Evaluate panel concept with the defined design characteristics;* • *Fabricate full-scale prefabricated prototype panels retrofitting a 10'x20' mock-up wall, including door, window and corner features;* • *Recruit sites and develop a screening process for demonstration site(s);* • *Construct and install VIPs; and* • *Conduct energy performance modeling, including comparisons to baseline building performance.*		
Readiness Levels	***Product**: 2*	***Commercial/Market**: 1*	***Program**: 1*

Building Envelope

Advanced Prefabricated Zero Carbon Homes — *Eric Olson*

DESCRIPTION

Product: Prefabricated net-zero homes that meet California Title 24 Building Efficiency Standards with efficient HVAC, heat pump water heating, photovoltaic (PV) energy generation and energy storage.

Project: A co-funded project with GTI Energy and the CEC project EPC-23-018 to develop advanced, highly efficient manufactured homes that can achieve zero carbon operation with on-site PV power generation and battery energy storage. Homes will meet the California 2022 Title 24 Building Energy Efficiency Standards and will use heat pump water heaters (HPWH) and air source heat pumps.

Fuel Type: Electric

Project Status	*This project remains on hold due to the prior demonstration sites no longer being available. GTI Energy identified two alternative sites and is working on finalizing their participation in the study. Once the CEC approves the sites, work will resume.*		
Project Objectives	• *Design, build and commission energy-efficient, all-electric manufactured homes with integrated PV and battery energy storage.* • *Perform field validation of zero carbon operation.* • *Perform techno-economic analysis using as-built advanced home costs within this project as well as scaled future costs assuming broad adoption of energy efficiency and demand response technologies.*		
Readiness Levels	***Product**: 2*	***Commercial/Market**: 2*	***Program**: 1*

Consumer Products

Ultra-High Definition (UHD) TVs — *Wendy Preiser*

DESCRIPTION

Product: 4K UHD TVs with various forms of advanced display settings and technologies.

Fuel Type: Electric

Project Status	*Developed a tool for market characterization to monitor TV energy use changes overtime leveraging multiple data sources. Discussions continue among manufacturing participants in the voluntary test methods agreement to set TV on-mode specification levels.*		
Project Objectives	• *Influence adoption of key aspects of the NEEA test method and approach internationally.* • *Support ongoing implementation of the NEEA test method and approach in the U.S. by ensuring data integrity of tests submitted.* • *Support ongoing discussions of on-mode power levels within the TV Voluntary Agreement supported by TV test data*		
Readiness Levels	***Product**: 4*	***Commercial/Market**: 5*	***Program**: 4*

Consumer Products

Residential Laundry Field Study — *Wendy Preiser*

DESCRIPTION

This study focuses on an installed sample of residential appliances for washing and drying clothes. A user diary and metered data were collected on water usage, load sizes, textile mix, washer and dryer cycles selected, how efficiently washers remove water from the load, and how efficiently dryers dry clothes.

Fuel Type: Electric + Natural Gas

Project Status	*Results are being compared to other robust regional datasets to fine-tune energy use and cycle frequency projections which will enhance NEEA's confidence in the data and bring richer insights for those examining energy-efficiency opportunities with residential laundry. The final report is now expected by the end of Q3 2025.*		
Project Objectives	*Conduct research leveraging NEEA's Residential Building Stock Assessment (RBSA) by selecting a statistically representative sample of RBSA participant households and studying their laundry use patterns and equipment energy use. These insights will allow updates to energy savings opportunities, inform current ENERGY STAR® specification development, inform future U.S. Department of Energy (U.S. DOE) rulemakings, and facilitate collaboration with other partners to replicate the study in their territories.*		
Readiness Levels	***Product**: 5*	***Commercial/Market**: 5*	***Program**: 5*

Consumer Products

Monitor and Commercial Display Testing — *Wendy Preiser*

DESCRIPTION

High-definition and UHD monitors and commercial displays with various advanced display technologies.

Fuel Type: Electric

Project Status	*Testing is complete on monitors and displays. The final peer-reviewed report is in development.*		
Project Objectives	*Building upon its efforts to improve the efficiency of TVs, NEEA has identified an opportunity to also improve the efficiency of monitors and displays. Most displays and monitors are similar in design and construction to TVs. For TVs, the U.S. DOE has adopted ANSI/CTA-2037D, developed by NEEA, which represents true energy use better than the current industry standard. This project has three objectives:* • *Replace the current industry standard with the NEEA-developed test procedure adapted to monitors and displays;* • *Achieve adoption by ENERGY STAR of the NEEA-developed test procedure and methodology for monitors and displays, with buy-in by industry stakeholders including major manufacturers and energy efficiency advocates; and* • *Succeed in having the new test procedure inform an update to the U.S. DOE federal energy test standard.*		
Readiness Levels	***Product**: 3*	***Commercial/Market**: 5*	***Program**: 3*

Consumer Products

Laundry Centers and Washer-Dryer Combo Testing — *Wendy Preiser*

DESCRIPTION

Laundry centers are residential clothes washers and electric or gas clothes dryers that clean and dry clothes in separate, stacked drums. A combination all-in-one washer-dryer is a residential clothes washer and electric or gas clothes dryer that cleans and dries the clothes in a single tumble-type drum.

Fuel Type: Electric

Project Status	*Consumer adoption of all-in-one units continued to be strong. This research was rescoped to understand potential post-purchase dissatisfiers that might impact long-term advances in heat pump dryer technology. Testing is expected to begin Q4 2025.*		

Project Objectives	*Laundry centers and combination all-in-one washer-dryers with heat pump dryers are now available in the market. This research aims to:*
	• *Test equipment to understand actual performance and energy consumption compared to U.S. DOE and ENERGY STAR estimates:*
	  ○ *Are cycle times falling within reasonable expectations?*
	  ○ *Does lint accumulation impact performance and energy use over time?*
	  ○ *Does lint accumulation shorten usable life expectancy?*
	• *Craft laundry center and single-drum washer-dryer ENERGY STAR program recommendations; and*
	• *Identify relevant regional program opportunities for laundry centers and single-drum washer-dryers.*		

Readiness Levels	***Product**: 4*	***Commercial/Market**: 5*	***Program**: 5*

Consumer Products

Residential Refrigerator Test Procedure Exploration — *Wendy Preiser*

DESCRIPTION

Full-size residential consumer refrigerator-freezers with various advanced control technologies.

Fuel Type: Electric

Project Status	*Lab testing is expected to begin in Q4 2025.*		
Project Objectives	*Residential refrigerators are currently tested at one ambient temperature (90°F) per the U.S. DOE test method. Technologies such as advanced adaptive control systems, in combination with other technologies, can deliver energy savings that are not evident with the current test procedure.* *A 2020–2021 ENERGY STAR Emerging Technology Award qualified products through an alternate test procedure and demonstrated that these units can deliver a savings of 27% above the baseline efficiency. Models released after the conclusion of the Emerging Technology Award period may have similar savings that are not recognized due to the test method.* *This research aims to help the project team:* • *Advance refrigerator savings opportunities by supporting energy-efficient technologies, leveraging data for future comments on test procedures and ENERGY STAR specifications.* • *Develop a plan to influence test procedure updates that reflect energy savings of advanced invertor compressors and other advanced technologies.* • *Identify an alternative refrigerator test procedure that has a similar level of burden to the current U.S. DOE approach, but is more representative of real-world use, revealing the benefits of new technology.* • *Use testing to scan for top selling high efficiency models that could save energy for the region in the near term.*		
Readiness Levels	***Product**: 3*	***Commercial/Market**: 3*	***Program**: 2*

HVAC

Heat Pump Rating Representativeness — *Christopher Dymond*

DESCRIPTION

Product: Variable speed heat pumps and air conditioners.

Project: NEEA, in collaboration with Northeast Energy Efficiency Partnerships (NEEP); Air-Conditioning, Heating, and Refrigeration Institute (AHRI); BC Hydro; NRCan; New York State Energy Research and Development Authority (NYSERDA); Southern California Edison; Xcel Energy; and U.S. DOE, conducted a unique project to evaluate the accuracy of the test procedure for heat pumps. The study observed heat pump performance in a controlled field installation and compared those observations with corresponding laboratory test results. The results of this study were used to inform federal test procedure development and inform future Canadian standard CSA C700 load-based tests for heat pumps.

Fuel Type: Electric + Natural Gas

Project Status	*Project is complete. The final report is now available on the Northeast Energy Efficiency Partnerships (NEEP) website. In addition, Natural Resources Canada (NRCan) just completed a companion research project report on the representativeness of load-based testing to which NEEA also contributed.*		
Project Objectives	• *Identify how well U.S. DOE Appendix M1 represents field performance.* • *Identify how well CSA SPE07 represents field performance.* • *Identify which lab data is essential for accurate ratings.* • *Determine critical performance indicators that could effectively be used to differentiate efficient equipment in a Qualified Products List (QPL) in advance of wide availability of modified test procedures.*		
Readiness Levels	***Product**: 3*	***Commercial/Market**: 5*	***Program**: 4*
Link to Report	Rating Representativeness Report Phase 1 Rating Representativeness Report Phase 2		

HVAC

Low-Load Efficient Heat Pump Investigation — Christopher Dymond

DESCRIPTION

Variable speed heat pumps that are highly efficient when running under low loads. Some heat pumps are 40%–50% more efficient than single-speed systems under low load conditions. NEEA is especially interested in this because these conditions account for over 60% of the operating hours of a properly sized system in the Northwest.

Project activities included lab testing, field testing, teardowns, modeling, database evaluation and manufacturer interviews. The report will summarize research activities.

Fuel Type: Electric

Project Status	*All phases are complete.* • *Preliminary findings were presented at the Product Council on April 2, 2024.* • *A summary presentation was given at the Product Council on March 25, 2025.* • *Final report preparation is underway.*		
Project Objectives	*The core objectives are to determine the incremental cost and reasons why some variable speed heat pumps exhibit significantly better part load (low load conditions) operating performance.* • *Phase 1 of the project reviewed existing publicly available data.* • *Phase 2 conducted a virtual teardown of equipment to compare a dozen different heat pumps based on technical service manuals.* • *Phase 3 consisted of lab testing several variable speed heat pumps to validate and understand how heat pumps operate under part load conditions.* • *Phase 4 performed a physical teardown of subcomponents to provide insight on component differences, the manufacturing costs, and components that enable low load efficiency.*		
Readiness Levels	***Product**: 4*	***Commercial/Market**: 3*	***Program**: 3*

HVAC

Air-Conditioning, Heating, and Refrigeration Institute (AHRI) 1380 Residential Variable Speed HVAC Connectivity Standard

Eric Olson

DESCRIPTION

The AHRI-1380 standard applies to communication, infrastructure, and system functionality related to the implementation of energy management strategies for demand response-ready, variable capacity, HVAC systems in residential and small commercial applications. AHRI-1380 establishes standardized communication required to enable equipment to participate in load flexibility programs, defines the infrastructure or minimum pathways to allow direct communication between the equipment and utilities, and specifies the system functionality (including control modes, and how the system responds to requests.

Fuel Type: Electric

Project Status	*NEEA is participating in the AHRI unitary equipment standards technical committee. Work continues to update communication protocols to include OpenADR 3, CTA-2045-B and to add additional industry-used open, non-proprietary protocols. Efforts continue to address how equipment responds when exiting events to avoid snapback, and how to integrate non-electric auxiliary heating.*
Project Objectives	*This work supports efforts to:* • *Harmonize connectivity standards among several standards, including CTA-2045-B, ENERGY STAR, OpenADR 3 and others.* • *Ensure that equipment supports the needs of utilities with the necessary capabilities to respond to a variety of grid requests while maintaining customer comfort.* • *Establish industry guidelines for product performance to minimize the need for and use of electric resistance auxiliary heating.*

HVAC

Dual-Fuel Heat Pump Modeling — *Noe Contreras*

DESCRIPTION

A forced air gas furnace or hydronic furnace combined with an air source heat pump with integrated controls.

Fuel Type: Electric + Natural Gas

Project Status	*Gas and electric systems can be combined in multiple ways to provide residential space conditioning. Different combinations and control schemes will lead to different operating costs, energy use, and emissions. NEEA conducted an exploratory analysis to identify dual-fuel systems with lower operating costs, reduced energy use, and reduced emissions in the Northwest. Final report preparation is underway.*		
Project Objectives	*Understand energy and cost savings from centrally ducted dual-fuel systems across various representative applications in the Northwest.*		
Readiness Levels	***Product**: 3*	***Commercial/Market**: 3*	***Program**: 1*

HVAC

Dual-Fuel Heat Pump Field Study — *Noe Contreras*

DESCRIPTION

A forced air hydronic furnace combined with an air source heat pump with integrated controls.

Fuel Type: Electric + Natural Gas

Project Status	*This field study evaluates a dual-fuel HVAC system combining a tankless gas water heater with a hydronic air handling unit and an air source heat pump. The tankless unit supplies 100% of domestic hot water and circulates hot water through the hydronic air handling unit for space heating from a supplemental perspective. The heat pump provides space heating until a switchover point is reached. The system is fully commissioned with data collection planned for the upcoming heating season.*		
Project Objectives	*This research aims to understand the efficiency of residential dual-fuel systems, which combine highly efficient gas water and space heating with an electric heat pump. By using a smart controller, these systems can enhance fuel flexibility and dynamically manage energy use, offering both energy savings and grid flexibility.*		
Readiness Levels	***Product**: 3*	***Commercial/Market**: 3*	***Program**: 1*

HVAC

Cold Climate Room Heat Pump Field Testing

Christopher Dymond

DESCRIPTION

Washington State University is leading a field and customer experience study on a new generation of micro heat pumps designed to condition a single room that is plugged into a standard 15A 120V AC outlet. These are defined as Type 4 by Environmental Protection Agency (EPA) test method, meaning they feature active defrost capabilities, can operate in temperatures below 5°F, and maintain substantial heating capacity in cold weather. The project is jointly funded by the Bonneville Power Administration (BPA) and NEEA, with additional support from regional utilities including Energy Trust of Oregon, Glacier PUD, Puget Sound Energy, Okanogan PUD, Ravalli Coop, and Seattle City Light.

Fuel Type: Electric

Project Status	• *All systems are operational with data loggers in place since mid-April 2025.* • *First round of customer interviews complete (3 more to go).* • *Data loggers to be retrieved after summer and redeployed in the fall.*		
Project Objectives	• *Obtain lab test data collected from manufacturers to characterize heat performance vs. ambient temperature.* • *Conduct field testing to gather real-world operational data (runtime, consumer acceptance, etc.).*		
Readiness Levels	***Product**: 3*	***Commercial/Market**: 3*	***Program**: 2*

HVAC

Tri-Mode Heat Pump Study — *Christopher Dymond*

DESCRIPTION

Tri-Mode heat pumps use a single outdoor unit to drive indoor space heating, space cooling and domestic water heating. They are integrated systems that can use either refrigerant or water as the distribution fluid coupled to a variable speed vapor compression heat pump.

Fuel Type: Electric

Project Status	*Market research survey and interviews with manufacturers are complete. The final report and a NEEA Product Council presentation are pending.*		
Project Objectives	• *Conduct a detailed market survey of tri-mode heat pumps available in North America, Asia and Europe.* • *Generate a preliminary estimate of energy savings potential.* • *Conduct a preliminary evaluation of market barriers for these systems.*		
Readiness Levels	***Product**: 2*	***Commercial/Market**: 2*	***Program**: 1*

HVAC

Duct Loss Meta Study — *Christopher Dymond*

DESCRIPTION

A 2004 study revealed that residential HVAC in the average Northwest home lose more than 30% of heating energy due to duct leakage and conduction. This project will explore the current market landscape and evaluate efficient solutions aimed at reducing heating and cooling losses from ductwork. The study will include literature research, product reviews and interviews with subject matter experts. NEEA seeks to determine whether any changes in the duct sealing, indoor air quality and ventilation solutions over the past decade warrant further investigation as a potential Market Transformation program.

Fuel Type: Electric + Natural Gas

Project Status	*Review of literature and current technology options conducted in August 2025. Interviews with subject matter experts are expected in September 2025. Final report production is expected in Q4 2025.*		
Project Objectives	• *Provide an updated summary of current methods through secondary research and simple analysis.* • *Conduct a comparative analysis of existing methods.*		
Readiness Levels	***Product**: 2-5*	***Commercial/Market**: 2-4*	***Program**: 4*

HVAC

Gas High Efficiency Dedicated Outdoor Air System (DOAS) Modeling

Adam Gage

DESCRIPTION

The gas high efficiency DOAS system utilizes the same energy savings strategies (e.g., decoupled ventilation and space conditioning and a high-efficiency heat/energy recovery ventilator) as NEEA's Very High Efficiency DOAS system, but uses a natural gas-fired boiler as the central heating plant.

Fuel Type: Natural Gas

Project Status	*Modeling is underway to understand the energy savings potential for the gas high efficiency DOAS system across multiple building types and climates.*		
Project Objectives	• *Evaluate the energy use and savings of gas high efficiency DOAS in new and existing commercial and multifamily buildings.* • *Identify how climate and building type impact energy savings potential.*		
Readiness Levels	***Product**: 2*	***Commercial/Market**: 3*	***Program**: 2*

Lighting

Luminaire Level Lighting Controls (LLLC) with HVAC Control — *Chris Wolgamott*

DESCRIPTION

LLLC integration with basic HVAC systems (rooftop units with thermostats only), simplifying the equipment necessary to control thermostats.

Fuel Type: Electric + Natural Gas

Project Status	*Data collection is underway and will continue through Q3 2025. The project is getting a lot of interest from multiple extra-regional agencies, including the U.S. DOE, Pacific Northwest National Laboratory (PNNL), DesignLights Consortium (DLC) and others. Project staff are working with funders to find additional sites for more field testing.*		
Project Objectives	• *Determine whether additional energy savings are possible from more granulated sensors in every general lighting fixture.* • *Analyze the data using simple thermostats (as a cost-effective way to do LLLC + HVAC) and LLLC to help reduce HVAC usage.* *With more than 50% of the building stock being less than 15,000 square feet and lacking a complex Building Management System, NEEA is seeking a cost-effective and straightforward way to use occupancy data from the LLLC system to inform HVAC setpoints and setbacks based on who is in the space.*		
Readiness Levels	***Product**: 3*	***Commercial/Market**: 3*	***Program**: 3*

Lighting

Parking Lot Lighting with LLLC — Chris Wolgamott

DESCRIPTION

Exterior lighting with LLLC.

Fuel Type: Electric

Project Status	*A market survey is underway examining existing demand response systems and currently available parking lot luminaire technologies, along with interviews with industry stakeholders. The market analysis report is complete and Phase 3 of the project concluded at the end of Q2 2025. The final report is expected to be made available in Q4 2025.*		
Project Objectives	*Develop and field test a simple, cost-effective parking lot lighting LLLC technology that will reduce electric demand from parking lot lighting during times of peak electric demand.*		
Readiness Levels	***Product**: 3*	***Commercial/Market**: 3*	***Program**: 1*

Motor-Driven Systems

Commercial and Industrial Fans Product Research — Kristen Aramthanapon

DESCRIPTION

Stand-alone fans that are not packaged as part of an efficiency-rated product.

Fuel Type: Electric

Project Status	*To better understand how fan efficiency is affected when operating point differs from design point, NEEA investigated the feasibility of developing a methodology for measuring the in-situ Fan Energy Index (FEI) of fans once they are installed and operating in-field. The results of this project were published in July 2025.*		
Project Objectives	*The FEI describes the fan efficiency at a design point compared to a "minimally compliant" reference fan at that same operating point and is accepted as the best metric to characterize "efficient fans" at a particular operating point. This project sought to identify which fan systems and corresponding applications can best achieve efficiency through proper selection using the FEI, proper sizing, speed control, design and other efficiency options.*		
Readiness Levels	***Product**: 5*	***Commercial/Market**: 4*	***Program**: 2*
Link to Report	Calculating In Situ Fan Energy Index - Northwest Energy Efficiency Alliance (NEEA)		

Motor-Driven Systems

Extended Motor Products (XMP) – Pumps — *Kristen Aramthanapon*

DESCRIPTION

Process pumps that meet American Society of Mechanical Engineers (ASME) B73 specifications and are generally used to pump light, non-viscous fluids.

Fuel Type: Electric

Project Status	*Conducted research to compare the efficiency between clean-water pumps and similar pumps that are designed to pump non-clean water. Research is complete and NEEA staff are analyzing the data to determine next steps.*		
Project Objectives	*Identify energy savings opportunities for pumps that are not classified as "clean water" pumps.*		
Readiness Levels	***Product**: 5*	***Commercial/Market**: 4*	***Program**: 2*

Power Drive Systems — *Kristen Aramthanapon*

DESCRIPTION

Power drive systems (PDS), also referred to as complete drive modules (CDMs), combine an electric motor and variable speed controls to provide feedback to the equipment.

Fuel Type: Electric

Project Status	*The motors coalition completed lab testing of motor and drive combinations to validate the calculation method for the PI metric. A final report is anticipated by the end of Q3 2025.*		
Project Objectives	*This project builds off NEEA's work developing the Power Index (PI) metric with the National Electrical Manufacturers Association (NEMA), which reports the power savings expected from a complete PDS. This project will continue researching how PI can be used to calculate savings when retrofitting an adjustable speed drive (ASD) to a motor-driven system, establishing minimum PI values, and understanding power quality requirements for PDS. Additionally, the research will provide a high-level market characterization and an initial technical potential estimate for the region.*		
Readiness Levels	***Product**: 5*	***Commercial/Market**: 4*	***Program**: 2*

Water Heating

Hybrid Field Study — Noe Contreras

DESCRIPTION

This project focused on extended monitoring of a gas-fired absorption heat pump installed in a multifamily building and later expanded to include hybrid gas-fired absorption heat pump/boiler systems in single family homes.

Fuel Type: Natural Gas

Project Status	*Project is complete and a final report development is underway.*		
Project Objectives	*Demonstrate the performance and adaptability of these systems to provide space conditioning and domestic water heating systems in existing homes and small commercial applications.*		
Readiness Levels	***Product**: 3*	***Commercial/Market**: 2*	***Program**: 2*

Water Heating

Integrated Residential Gas Heat Pump Water Heaters — *Noe Contreras*

DESCRIPTION

An integrated gas HPWH using adsorption thermal cycle powered by natural gas.

Fuel Type: Natural Gas

Project Status	*Design improvements implemented to enable a COPgas >1 at a larger range of buffer tank water temperatures.*		
Project Objectives	*Evaluate the performance of a prototype, full-size, adsorption gas HPWH.*		
Readiness Levels	***Product**: 3*	***Commercial/Market**: 1*	***Program**: 2*

Water Heating

Advanced Commercial Gas Water Heating Modeling

Noe Contreras

DESCRIPTION

Central water heating systems utilize gas and electric heat pumps, indirect storage tanks and other smaller components to deliver domestic hot water in key commercial buildings.

Fuel Type: Electric + Natural Gas

Project Status	*Modeling of heat pumps continues. Early findings from restaurant study participants were submitted with feedback provided to the partners.*		
Project Objectives	*Understand energy and cost savings from thermally driven heat pumps as replacements for boilers, natural gas-fired storage tanks and tankless systems across various representative applications in the Northwest.*		
Readiness Levels	***Product**: 3*	***Commercial/Market**: 3*	***Program**: 2*

Water Heating

Advanced Commercial Gas Water Heating Field Study

Noe Contreras

DESCRIPTION

Central water heating systems utilizing a gas heat pump or dual-fuel heat pump and other components to deliver domestic hot water.

Fuel Type: Electric + Natural Gas

Project Status	*The team is metering hot water use at two key commercial buildings to confirm load requirements.*		
Project Objectives	*Understand energy and cost savings from hybrid or dual-fuel commercial water heating systems across various representative applications in the Northwest.*		
Readiness Levels	***Product**: 3*	***Commercial/Market**: 3*	***Program**: 2*

Water Heating

Split-System Heat Pump Water Heater Innovation

Adam Gage

DESCRIPTION

Electric water heaters in single-family and manufactured homes tend to have larger tank sizes with high draw patterns. The updated federal water heating standard will generally require HPWHs in these housing types. However, in-dwelling electric water heaters in low rise multifamily buildings have smaller tank sizes and draw patterns and are typically installed in space constrained locations. These product and application types are not required by the new federal water heating standard to be HPWHs.

Fuel Type: Electric

Project Status	*The Hot Water Innovation Prize contest is underway. Participating manufacturers will supply their split-system HPWH prototype units for lab testing beginning in January 2026. NEEA is actively seeking co-sponsors to join the effort.*		
Project Objectives	*Innovate and manufacture energy-efficient split-system HPWH technologies for water heaters in space constrained locations in low-rise multifamily buildings that are not required to be HPWHs by the updated federal water heating standard to ensure all consumers have access to low cost, easy to install, efficient water heating options.*		
Readiness Levels	***Product**: 4*	***Commercial/Market**: 2*	***Program**: 2*

Water Heating

Northwest Small Commercial HPWH Field Study

Adam Gage

DESCRIPTION

Heat pump water heaters used in small commercial applications. “Small commercial” refers to unitary products, up to 120 gallons and similarly sized split-system products where the heat pump and tank are sold together.

Fuel Type: Electric

Project Status	*NEEA is supporting a larger New Buildings Institute study. Site recruitment in the Northwest is underway.*		
Project Objectives	*For small commercial HPWHs:* • *Evaluate field performance.* • *Determine associated costs.* • *Collect perspectives of building owners.* • *Identify best practices.*		
Readiness Levels	***Product**: 3*	***Commercial/Market**: 4*	***Program**: 2*

Other

Flexible Load Management – Specially Funded Project — *Eric Olson*

DESCRIPTION

Connecting informed autonomous behind-the-meter applications.

NEEA received special funding to explore connected devices capable of operating under flexible load management. These devices can be used for traditional demand response opportunities and may also enable leveraging future energy imbalance markets and potential carbon markets. To start, NEEA is focusing on open architecture connected pathways that work with the marketplace and operate in the background with limited awareness by the end customer. Initial technologies are water heating and line voltage thermostats. Future products may include inverter driven HVAC, electric vehicle (EV) charging, consumer appliances, battery storage, commercial buildings, street lighting and others.

Fuel Type: Electric

Project Status	*The final line voltage thermostat field study report is anticipated by the end of Q3 2025.* *The connected water heater field study is ongoing, with participant enrollment concluding at the end of July 2025. Data collection will continue through October 2025. Research is also progressing on emerging technologies with a high potential for load shifting, such as central HPWHs and advanced building controls.* *In parallel, NEEA is collaborating with industry stakeholders to advance standards improvements such as CTA-2045B Level 2 for residential and commercial HPWHs. AHRI 1430 applies to 40–80-gallon electric water heaters, while AHRI 1530 applies to electric commercial water heaters over 80 gallons. Additionally, the industry is actively exploring updates to other connectivity standards to further enhance grid flexibility.*		
Project Objectives	*Create pathways for behind-the-meter loads that can help support the integration of intermittent resources on the grid.*		
Readiness Levels	***Product**: 5*	***Commercial/Market**: 5*	***Program**: 2*

Readiness Level Criteria Definitions

Rating Scale: 1 = Low, 5 = High

PRODUCT PERFORMANCE READINESS

	Level 1: Unvalidated	Level 2: Engineering Validation	Level 3: Lab Validation	Level 4: Limited Field Validation	Level 5: Confirmed
Savings Reliability & Fitness for Use	Manufacturer claims energy savings but not validated by unbiased experts	Concept validated by unbiased expert via technical review and engineering calculations	Independent lab testing and product features and energy use in typical applications with clear baseline established	Lab and small-scale testing across broader range of applications and systems conditions	Reliable prediction of performance across the range of intended applications; fully evaluable savings via established protocols by regional or national bodies

COMMERCIAL / MARKET READINESS

	Level 1: Pre-Commercial	Level 2: Limited	Level 3: Niche	Level 4: Growing	Level 5: Wide
Supply Chain Maturity & Market Demand	Not commercially available or limited, pre-commercial availability	Commercially available outside of region; Requires special order; Limited market awareness	Commercially available in Northwest from one manufacturer through standard channels; Niche market demand	Commercially available in Northwest from at least two manufacturers; Growing market demand	Commercially available from 2+ manufacturers, well developed supply chain across region; Wide market demand

PROGRAM READINESS

	Level 1: None	Level 2: Exploratory	Level 3: Preliminary Pilots	Level 4: Full-Scale Pilots	Level 5: Ready
Cost Effectiveness Knowledge *(technical and market potential, product cost at scale, non-energy benefits)*	None or very limited	Performance readiness at 2; initial market size calculated (units per year)	Performance readiness at 3; product cost at-scale estimated	Performance readiness at 4; product costs at or trending towards at-scale levels; preliminary estimates of non-energy benefits	Performance readiness at 5; CE calculations based on solid estimates or proven values
Market & Program Knowledge	None or very limited	Preliminary research exposes barriers and/or or similarities to other successfully transformed markets warranting further efforts	Market research illuminates barriers and opportunities to intervene; preliminary logic model developed; small-scale pilots	Formal market characterization underway; larger-scale pilots to test program elements and barrier removal	Formal logic model developed; market characterization and large-scale pilots prove out program design and barrier removal
Risk Assessment *(market, program regulatory)*	No risk assessment	Limited risk assessment	Preliminary risk assessment complete – major categories of risk understood	Well-developed risk assessment – no major unresolved risks	Periodic risk assessment process in place

Questions? Contact Us

Kristen Aramthanapon
Sr. **Product Manager**, Motor Driven Systems
karamthanapon@neea.org

Juan Carlos Blacker
Sr. **Product Manager** Whole Building
jblacker@neea.org

Noe Contrares
Sr. **Product Manager**, Gas Products
ncontreras@neea.org

Christopher Dymond
Sr. **Product Manager**, Residential HVAC
cdymond@neea.org

Adam Gage
Sr. Product Manager, Water Heating, Commercial HVAC
agage@neea.org

Chuck Karras
Sr. Product Manager Gas Products
ckarras@neea.org

Lynne Mosley
Sr. Program Coordinator, Emerging Technologies
lmosley@neea.org

Eric Olson
Sr. Product Manager, Emerging Technology
eolson@neea.org

Wendy Preiser
Sr. Product Manager, Consumer Products
wpreiser@neea.org

Mike Smith
Sr. Manager, Emerging Technology
msmith@neea.org

Chris Wolgamott
Principal Product Manager, Lighting, Commercial HVAC
cwolgamott@neea.org