2024 Q2 Emerging Technology Quarterly Newsletter

WHAT'S NEW:

Our Emerging Technology efforts are well underway this year. The U.S. Department of Energy (U.S. DOE) announced two major initiatives in early April 2024. As part of its new Better Building Initiatives, the U.S. DOE announced the Better Buildings Commercial Building Heat Pump Accelerator to improve the efficiency and availability of commercial heat pump rooftop units. U.S. DOE's second new initiative was the launch of the third and final phase of its commercial lighting sector-focused Lighting Prize (L-Prize®) competition.

On April 30, 2024, the U.S. DOE published the new federal efficiency standard for consumer water heaters, which will transition the majority of electric storage water heaters to heat pump water heaters (HPWHs) and improve gas storage water heater efficiency. The U.S. DOE cites NEEA's Advanced Water Heating Specification (AWHS) as reference material for its final rule. You can read more about the standard on neea.org.

Recent Product Councils:

- Low Load Efficient Heat Pump Research
- iFLOW Smart Hybrid Heating Controller
- AI Targeting of Energy Efficiency and Decarbonization Opportunities
- Simple Solutions for Complex Problems - Light Commercial HPWH

Information on upcoming Product Councils is always available at https://neea.org/get-involved/product-council.

Please reach out to Eric Olson or one of NEEA's product managers with questions or suggestions on NEEA's emerging technology work. NEEA staff would love to hear from you.

~ **Eric Olson,** Manager, Emerging Technology & Product Management ~

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Product Summary & Readiness Levels

	PRODUCT OR PROJECT	PROGRAM*	FUEL TYPE	SECTOR	ELECTRIC SAVINGS POTENTIAL[1]	GAS SAVINGS POTENTIAL[2]	PRODUCT PERFORMANCE[3]	MARKET/ COMMERCIAL[3]	PROGRAM READINESS[3]
Products	Ultra-High Definition TVs	RPP			57	N/A	4	5	5
	Residential Laundry Field Study	RPP			N/A	N/A	5	5	5
	Monitors and Commercial Displays	TBD			TBD	N/A	3	5	1
	Laundry Centers & All-in-One Washer-Dryers	RPP			TBD	TBD	4	5	5
	Commercial Heat Pump Dryers	TBD			TBD	TBD	1	3	1
HVAC	Very High Efficiency Dedicated Outside Air Systems	VHE DOAS			85	20†	4	5	5
	Efficient Rooftop Units	ERTU			N/A	9	4	3	4
	Heat Pump Rating Representativeness	AHP			TBD	N/A	3	5	4
	Heat Pump Advanced Features and Capabilities	AHP			35†	N/A	3	5	4
	Room Heat Pump Field Study	TBD			TBD	N/A	2	1	1
	Heat Pump Ready ENERGY STAR® Manufactured Homes	AHP			TBD	N/A	4	5	3
	Dual Fuel Gas-Electric Heat Pump	DFHP			TBD	TBD	5	3	1
Building Envelope	High-Performance Windows	HPW			60	30	4	3	4
	Secondary Windows	Window Attachments			35	23†	4	5	4
	Skinny Wall Retrofit Panels	TBD			TBD	TBD	2	1	1
	Advanced Prefabricated Zero Carbon Homes	TBD			TBD	TBD	1	1	1
Lighting	Luminaire Level Lighting Controls	LLLC			75	N/A	4	4	3
	LLLC with HVAC Control	LLLC			358	TBD	3	2	3
	Parking Lot Lighting with LLLC	TBD			TBD	N/A	3	3	1
Water Heating	Combination Hot Water and Space Heat	TBD			130	N/A	1-4	1-3	2
	Heat Pump Water Heaters in Confined Spaces	HPWH			TBD	N/A	2-5	3-4	2-5
	Integrated Residential GHPWH	GHPWH			N/A	200	3	1	2
	Central Commercial Heat Pump Water Heater	HPWH			50	N/A	3	3	3
	Advanced Commercial Gas Water Heating	TBD			N/A	64	3	3	2
	Split System Heat Pump Water Heater	HPWH			50	N/A	3	3	3
	Integrated Commercial Heat Pump Water Heater	HPWH			50	N/A	3	3	4
	Industrial Heat Pumps	TBD			TBD	TBD	2	2	1
Motors	Commercial & Industrial Fans	Fans			176	N/A	5	4	2
	Commercial Adjustable Speed Drives	TBD			292		5	4	1
	Power Drive System Technology Assessment	TBD			292	N/A	5	4	1
	Extended Motor Products (Pumps)	XMP			246	N/A	5	5	5
	Heat Pump Engine Block Heaters	TBD			TBD	N/A	5	5	2
Other Products	Flexible Load Management	TBD			TBD	TBD	5	5	2

***Program Acronyms Defined:** Retail Product Portfolio (RPP); Ductless Heat Pumps (DHP); Advanced Heat Pumps, formerly Variable Speed Heat Pumps (AHP); Very High Efficiency Dedicated Outdoor Air Systems (VHE DOAS); Luminaire Level Lighting Controls (LLLC); Heat Pump Water Heater (HPWH); Efficient Gas Water Heaters (EGHW); Extended Motor Products (XMP); High-Performance Windows (HPW); Gas Heat Pump Water Heaters (GHPWH); Dual Fuel HVAC (DFHP)

1: Technical achievable **electric savings potential** in the region aMW
2: Technical achievable **gas savings potential** in the region in MM Therms
3: **Readiness Level Definitions** provided on page 26; **Rating Scale** 1=low 5=high
†: Preliminary estimate or technical potential from the RTF

Fuel Type Symbols: Electric Gas **Sector Symbols:** Residential Commercial Industrial

Ultra-High Definition (UHD) TVs

Project Status: The ENERGY STAR® Qualified Products List (QPL) currently includes 92 TVs representing at least two major brands. Energy use data from multiple manufacturers' TV testing has been received and is informing negotiations on appropriate on-mode energy levels through the industry Voluntary Agreement.

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

Project Objectives:

- Update U.S. DOE TV test procedure and International Electrotechnical Commission (IEC) test clip to:
  1) Adequately address existing features such as Automatic Brightness Control (ABC) and Motion Detection Dimming (MDD) to prevent gaming of test results by manufacturers; and
  2) Incorporate emerging technologies such as UHD, true and upscaled high dynamic range (HDR), increasing panel brightness and stand-by power.
- Update ENERGY STAR specification to address issues with ABC/MDD, address new energy-consuming features such as UHD, and to account for the U.S. DOE test procedure and IEC test clip updates.
- Use data from TV manufacturers' TV testing to review current television energy use, which will help to define efficiency standards for potential incentives in 2025.

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Product	4	Comm/Market	5	Program	5

Residential Laundry Field Study

Project Status: The field monitoring phase of the study is complete and data analysis has begun. Preliminary results have been used to inform comments on the ENERGY STAR Dryer Discussion Guide and Federal Trade Commission (FTC) Notice of Proposed Rulemaking (NOPR) on mandatory Energy Label changes. The first results report is expected by early Q3 2024.

Product Description: Residential appliances for washing and drying clothes.

Project Objectives: Conduct research to leverage NEEA's Residential Building Stock Assessment (RBSA) households by selecting a statistically representative sample of households and studying their laundry use patterns and equipment energy use. This study collects data 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. These insights will allow updates to energy savings opportunities, inform current ENERGY STAR specification development, inform future U.S. DOE rulemakings, and facilitate collaboration with other partners to replicate the study in their territories.

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Product	5	Comm/Market	5	Program	5

Monitor and Commercial Display Testing

Project Status: The test procedure modification for monitors is complete, and modifications for commercial displays are underway. The potential for energy savings continues to be explored.

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

Project Objectives: The current monitor and display policy approach has several gaps. 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 better represents true energy use 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.

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Product	3	Comm/Market	5	Program	1

Laundry Centers and Washer-Dryer Combo Testing

Project Status: Three brands are currently in the market with all-in-one combination laundry units featuring heat pump dryer technology. Consumer adoption of all-in-one units accelerated in Q1 2024, indicating customers' acceptance of a single piece of equipment that runs a complete wash-and-dry cycle of a load of laundry. Collaboration with key manufacturers to develop a representative test procedure is now underway.

Product 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.

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;
- Develop possible U.S. DOE test procedure updates for laundry centers and combination washer-dryers and potential implications for standard washer and dryer tests;
- 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.

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Product	3	Comm/Market	5	Program	4

Commercial Heat Pump Dryers

Project Status: Testing of the commercial heat pump dryer is underway, and cycle optimization of the various textile loads is being processed.

Product Description: Commercial clothes dryers using electric heat pump technology in place of, or in addition to, electric resistance elements to dry textiles. Commercial heat pump dryers may be utilized in vended applications or as on-premises laundry.

Project Objectives:
Commercial heat pump dryers are now available in the market. This research seeks to:

- Quantify the energy use of heat pump dryers compared to similar capacity (50 lb. ± 10 lbs.) electric resistance and gas commercial dryers;
- Develop a regional model of energy use and savings estimates looking at three locations in NEEA's territory and comparing them to a U.S. national average calculation;
- Understand the cycle time differences between conventional and commercial heat pump dryers by testing a variety of textiles, including Association of Home Appliance Manufacturers (AHAM) 100% cotton textiles, hotel linens and hotel towels;
- Quantify potential impacts in capital costs, operational and labor costs in using heat pump dryers versus conventional commercial dryers; and
- Utilize learning to inform future ENERGY STAR and U.S. DOE test procedure developments or rulemakings.

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Product	1	Comm/Market	3	Program	1

Heat Pump Rating Representativeness

Project Status: Field testing of the six heat pumps concluded in February 2023; lab testing with both AHRI 210/240 M1 and CSA SPE07:2023 test procedures was completed in late December 2023. Preliminary test results are available from the August 15, 2023 Product Council. The results of this project were presented during the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Unitary Small Equipment Test Procedure Committee meetings and helped redefine future federal test procedures. A published report of findings is expected to be presented at the 2024 Herrick Conference (Purdue University) in July 2024.

Product Description: Variable speed heat pumps and air conditioners.

Project Description: NEEA is working collaboratively with Northeast Energy Efficiency Partnerships (NEEP); AHRI; BC Hydro; NRCan; New York State Energy Research and Development Authority (NYSERDA); Southern California Edison; Xcel Energy; and U.S. DOE to determine the representativeness of different heat pump test procedures. The study will observe heat pump performance in a controlled field installation and compare those observations with corresponding laboratory test results. NEEA will investigate the heat pump test procedures prevalent in North America (CSA SPE07 and U.S. DOE Appendix M1) and identify which method more accurately represents energy use. Additionally, key conditions and sequences (e.g., defrost, variation of compressor speed at part load) affecting instantaneous power demand and overall energy use will be investigated.

Project Objectives:

- Identify how well U.S. DOE Appendix M1 represents field performance.
- Identify how well CSA SPE07 represents field performance.
- Identify essential pieces of information that must be captured by any heat pump test procedure to accurately represent heat pump performance (e.g., any controls sequences that are particularly impactful to performance).
- 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.

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Product	3	Comm/Market	5	Program	4

Room Heat Pump Field Study

Project Status: This project is complete. On April 1, 2024, the Environmental Protection Agency (EPA) and U.S. DOE released the final draft of the ENERGY STAR room heat pump test procedure as part of the room air conditioner specification, with feedback due April 15, 2024. Industry stakeholder feedback is generally supportive, with some suggestions for clarifying some aspects of the test procedure.

Product Description: A small heat pump designed to condition a single room. The heat pump may be installed in a window, like a window air conditioner, or portable so it can easily be moved from room to room. It is plugged into a standard 15A 120V AC outlet.

Project Objectives:
Conduct consumer research and field test micro heat pumps. This project consists of a small sample (16 total units) placed in a selected sample of homes. The principal research goal is to understand the customer experience and develop an assessment of the product's market readiness. The secondary goal is to gather information to guide estimates of energy savings potential and to determine the units' effectiveness at displacing energy used by the pre-existing heating system.

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Product	2	Comm/Market	1	Program	1

Low Load Efficient Heat Pump Investigation

Project Status: Phases 1 and 2 are complete; findings were presented at the April 2, 2024, Product Council. The initial findings confirmed that:

1) The product differentiation metric (coefficient of performance (COP) at minimum output at 47°F) provides a good representation of part load efficiency, and
2) No singular technology element is responsible for better part load efficiency. The improved efficiency is not driven by specific hardware choices but rather by how the control algorithms modulate and take advantage of the compressor and fan efficiencies under part load conditions.

Phases 3 and 4: Funding is secured and testing is expected to begin in June 2024. A physical teardown workshop will occur in September 2024.

Product Description: Variable speed heat pumps that are highly efficient when running under low loads.

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 will review existing publicly available data.
- Phase 2 will conduct a virtual teardown of equipment to compare a dozen different heat pumps based on technical service manuals.
- Phase 3 will consist of lab testing several variable speed heat pumps to validate and understand how heat pumps operate under part load conditions.
- Phase 4 will perform a physical teardown of subcomponents to provide insight on component differences, the manufacturing costs, and components that enable low load efficiency.

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Product	3	Comm/Market	5	Program	4

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

Project Status: This project is currently in its planning phase.

Product Description: Hardware and software to make HVAC grid flexible and controllable.

Project Objectives: Support efforts to harmonize connectivity standards among several standards, including heat pumps, ENERGY STAR, OpenADR and others.

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Product	3	Comm/Market	3	Program	1

Dual Fuel Heat Pump

Project Status: AHRI is preparing to publish a performance metric for dual fuel systems. NEEA is working on modeling multiple dual fuel configurations on three types of homes with multiple Northwest climate zones and demand response impacts. GTI Energy will lab test a dual fuel unit in the second half of 2024. The market landscape of dual fuel units and controllers is complete, and NEEA continues to work with manufacturers to understand their respective differentiated value propositions and explore new equipment configurations.

Product Description: A forced air gas furnace or hydronic-furnace combined with an electric air source heat pump (ASHP) with integrated controls.

Project Objectives: Understand energy and cost savings from ASHPs as a centrally ducted air-conditioning replacement across various representative applications in the Northwest.

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Product	4	Comm/Market	3	Program	1

Primary High-Performance Windows

Project Status: Collaborative efforts continue through the U.S. DOE-funded Partnership for Advanced Window Solutions (PAWS). NEEA is influencing national window markets to benefit the alliance's Northwest stakeholders.

The high-performance window installation in 12 Grand Ronde, OR, residential duplexes is complete. The Confederated Tribes of Grand Ronde selected high-performance windows as part of their net-zero design for this project. Insights gained from the installation include comparable weight and installation to conventional double-glazed windows, improved energy performance by 40%, minimization of air leakage, and enhanced thermal, visual and acoustic comfort, among others. A complete overview of the project is available at betterbuiltnw.com.

NEEA's collaboration with a national builder started in Q4 2022 and has extended into 2024. High-performance windows are a path to code credits for this builder. Windows have been installed in approximately three dozen homes; interviews with the builder and window installers indicate no incremental labor is required, and installation has proven no different than for double pane windows.

Product Description: Primary window using three panes of glass (or film or rigid plastic), two of standard thickness and a center thin pane of glass (or film). The overall thickness and weight are similar to standard double pane windows.

Project Objectives:

- Identify manufacturing technical needs for production of thin triple pane windows.
- Provide technical assistance on production processes (adapting double glazed equipment or new lines).
- Research motivating factors for increasing production of thin triple pane windows.
- Identify barriers in the supply chain.
- Investigate enhancements in thin triple pane window technology.

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Product	4	Comm/Market	3	Program	4

Secondary Windows

Project Status: The final report is available on neea.org. The average annualized energy savings across the six sites was 6.7%, with the three highest performing sites averaging 10.6%.

Product 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.

Project Objectives: Increase familiarity with product costs (for both materials and installation in the Northwest), product energy savings, market opportunity in the Northwest, installer capability and market drivers, especially value proposition for owners and owner representatives.

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Product	4	Comm/Market	5	Program	4

Secondary Windows Field Study

Project Status: This project is underway, and the first quarterly update is anticipated in Q3 2024.

Product 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.

Project Objectives: Primarily funded by the California Energy Commission (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.

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Product	4	Comm/Market	5	Program	4

Skinny Wall Retrofit Panels

Project Status: This project is underway with the feasibility study expected to be completed by Q3 2024.

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

Project Description: 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.

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 comparison to baseline building performance.

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Product	2	Comm/Market	1	Program	2

Advanced Prefabricated Zero Carbon Homes

Project Status: This project is now underway, and the first progress update is due in Q3 2024.

Product Description: 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 Description: 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 photovoltaic power generation and battery energy storage. Homes will meet the California 2022 Title 24 Building Energy Efficiency Standards and will use HPWHs and air source heat pumps.

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.

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Product	1	Comm/Market	1	Program	1

Luminaire Level Lighting Controls with HVAC Control

Project Status: NEEA identified a site and is now in the contracting phase. The project should begin by Q3 2024 and be completed by Q3 2025.

Product Description: Luminaire Level Lighting Controls (LLLC) integrated with basic HVAC systems (rooftop units with only thermostats) simplifying the equipment necessary to control thermostats.

Project Objective: 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 not having a complex Building Management System, the NEEA team is seeking a cost-effective and straightforward way to use the occupancy data from the LLLC system to inform the HVAC on setpoints and setbacks based on who is in the space.

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Product	3	Comm/Market	2	Program	3

Parking Lot Lighting with LLLC

Project Status: The contractor is conducting a market survey, including existing demand response systems and currently available parking lot luminaire technology, and is conducting industry interviews. The market analysis report is complete, and Phase 3 scope development and contracting are underway.

Product Description: Exterior lighting with LLLC.

Project Objective: 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.

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Product	3	Comm/Market	3	Program	1

Combination Hot Water and Space Heat (Gas)

Project Status:

- Stone Mountain Technologies, Inc. (SMTI) 80kBTU/hr gas heat pump: Testing complete. Early results illustrated a net efficiency of 136%, a 43% gas consumption savings for hot water-only mode, and 41% gas consumption savings for combined space heating and water heating mode.
- Vicot Solar Technology Co., Ltd gas heat pump 20 kW (68kBTU/h): The team resolved communication and control issues and commissioned the unit. The V20 can operate with high return temperatures, its firing rate can be controlled, and it can operate reliably.

Product Description: An integrated appliance providing space and water heating. Production options include different refrigerants and water, air and refrigerant working fluids.

Project Objective: Demonstrate the performance and adaptability of these systems to provide space conditioning and domestic water heating systems in existing homes and small commercial applications.

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Product	1-4	Comm/Market	1-3	Program	2

Heat Pump Water Heaters (HPWHs) in Confined Spaces

Project Status: An extension of this work has concluded. All three major brands have been tested in the confined space test chamber, achieving similar results. Pacific Gas & Electric (PG&E) leveraged the testbed and tested additional configurations for exterior closets, which informed NEEA on how best to recommend installations in mild climates in exterior closets. NEEA is partnering with Bonneville Power Administration (BPA) and some of its member utilities to monitor HPWHs in multifamily exterior closets operating in both hybrid and heat pump only modes, results to follow.

Product Description: An electric powered air-to-water heat pump, generally with a backup electric element, used for domestic hot water.

Project Objectives: Understand the performance impacts on HPWHs of different room volumes, specifically small spaces like utility closets, and test different interventions at restoring efficiency compromised by a small enclosure.

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Product	2-5	Comm/Market	3-4	Program	2-5

Integrated Residential Gas Heat Pump Water Heaters

Project Status: Testing of the prototype is complete. The manufacturer reported a UEF of 0.98, however subsequent testing identified opportunities to improve heat retention. They are now actively addressing these areas to enhance the design and ensure optimal utilization of the heat pumping process. NEEA is working on a small market research project to identify drivers for consumers to purchase higher efficiency storage water heaters.

Product Description: A HPWH using either an adsorption or absorption thermal cycle powered by natural gas.

Project Objectives: Evaluate the performance of a prototype, full-size, adsorption gas HPWH.

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Product	2-5	Comm/Market	3-4	Program	2-5

Integrated Commercial Heat Pump Water Heaters (Electric)

Project Status: NEEA continues to work closely with A. O. Smith, other manufacturers, and Ecotope on multiple installations to fine-tune performance and suggest improvements to manuals for product and installation. NEEA is working to better understand these products' market potential in commercial applications. A new AWHS section will be dedicated to this product category. Cadeo is finishing a study of the market size for "unitary commercial" water heaters in the Northwest, and a Product Council was held in Q2 2024 with those findings. The final report will be published in Q3 2024.

Product Description: Generally sized from 80–120 gallons and similar to integrated residential HPWHs, commercial HPWH applications cover a broad range of hot water uses.

Project Objectives: Conduct a feasibility study to determine in-field COP, resistance heat utilization and success in keeping up with hot water demand.

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Product	3	Comm/Market	1	Program	2

Central Commercial Heat Pump Water Heaters (Electric)

Project Status: Case studies and design tools are now available on BetterBricks.com, and additional content will be added as it is developed. NEEA, in coordination with the BPA, have commissioned D+R International to develop an interactive case study of the "Splash Block" to act as a tool to inform architects, mechanical engineers, building owners and plumbers.

The AWHS and HPWH QPL have both been updated and are available on the Advanced Water Heating Specification/ Resources section of neea.org. The AWHS now includes commercial unitary water heaters in the Commercial section. These changes will go into effect in Q3 2024.The QPL now has 52 products listed, and more models are expected. The industry is trending to a specified kit or skid with flexible load management embedded (CTA-2045). NEEA and Ecotope are providing technical assistance to AHRI 1300 (Performance Rating of Commercial Heat Pump Water Heaters) to help shape the specification and ensure it aligns with the AWHS. Additionally, the R-2 Occupancy (low-rise multifamily new construction) technical bulletin was updated and is available at betterbricks.com.

Finally, the development of a standard unit energy savings (UES) based on the AWHS 8.1 by the Regional Technical Forum (RTF) and BPA is temporarily on hold.

Product Description: Commercial HPWHs used in multifamily buildings with central water heating and a distribution system. Several products are available and new products from major manufacturers are expected soon.

Project Objective: Test design tools and new HPWHs as efficient electric solutions for central water heating. The results should lead to an updated product specification, test method and potentially a QPL. NEEA staff are supporting a couple of projects in this area, one with the Bonneville Power Administration and one with New Buildings Institute and the California Energy Commission.

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Product	3	Comm/Market	3	Program	4

Advanced Commercial Gas Water Heating

Project Status: Planning continues on a market characterization with the North American Heat Pump Collaborative to further understand the market. NEEA is working with a partner to model gas absorption heat pumps installed in commercial water heating applications.

Product Description: Central water heating systems utilize a thermally driven heat pump, buffer tank, indirect storage tank and other smaller components to deliver domestic hot water.

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.

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Product	3	Comm/Market	3	Program	3

Industrial Heat Pumps

Project Status: NEEA continues to explore the Industrial Heat Pump opportunity with the Bonneville Power Administration and Cascade Energy. Initial work will determine the opportunity's scale and scope, manufacturers and suppliers of the technologies, barriers to adoption and possible solutions, ultimately leading to measure-based solutions and calculators.

Product Description: Industrial heat pumps can harvest low-grade heat and turn it into useful heat for manufacturing processes or space conditioning. Current performance levels can achieve working temperatures of 212°F–570°F (100°C–300°C) for process heat.

Project Objectives: Determine the energy savings opportunity from industrial-scale thermally driven heat pumps, market potential, currently available products, barriers to adoption and potential solutions.

Product Manager: Eric Olson
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Product	2	Comm/Market	2	Program	1

Commercial and Industrial Fans Product Research

Project Status: NEEA is investigating the overlap between manufacturer product lines, their applications and efficiency options to develop a better understanding of fan systems and how they are represented by the Fan Energy Index (FEI).

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

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 seeks 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.

Product Manager: Kristen Aramthanapon
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Product	5	Comm/Market	4	Program	2

Power Drive System Technology Assessment

Project Status: NEEA continues to clarify previously identified barriers that impede the widespread adoption of retrofit drives and characterizes variable torque systems as the most appropriate and cost-effective power drive systems (PDS).

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

Project Objectives: This project builds off NEEA's work developing the Power Index (PI) metric with the National Electrical Manufacturers Association (NEMA), describing the percent of 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 initial technical potential estimate for the region.

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Product	5	Comm/Market	4	Program	1

Heat Pump Engine Block Heaters for Backup Generators

Project Status: This project is in the planning phase and is seeking an appropriate test site in the region.

Product Description: An air source heat pump engine block heater for 1 MW and greater backup generators.

Project Overview: Engine block heaters are a critical component for large (1 MW and greater) emergency backup generators designed to keep critical systems operating in the event of a power emergency. Backup generators (also called stand-by generators) typically use continuous-use electric resistance heaters to keep the engine warm and ready to start.

Project Objective: This project seeks to quantify the energy savings potential of next generation heat pump engine block heaters compared to the current generation of heat pump engine block heaters, and electric resistance engine block heaters.

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Product	1	Comm/Market	3	Program	1

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

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 of product features and energy use in typical applications with clear baseline established	Lab and small-scale field 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

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 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

CONTACT US: Ask questions • Request feedback • Suggest technologies

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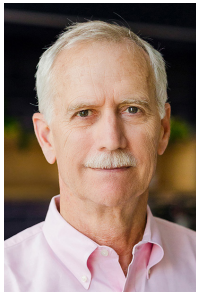

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TOGETHER We Are Transforming the Northwest

AVISTA · Bonneville Power Administration · Cascade Natural Gas Corporation · Chelan County P.U.D. · Clark Public Utilities · EnergyTrust of Oregon · Idaho Power An IDACORP Company · NorthWestern Energy · NW Natural · Pacific Power · Portland General Electric · PSE Puget Sound Energy · Seattle City Light · Snohomish County PUD Public Utility District No. 1 · Tacoma Power Tacoma Public Utilities