Q1 2025 AGENDA

Regional Emerging Technologies Advisory Committee

DATE: March 13, 2025
TIME: 8:30 a.m. – 12:00 p.m.
WEBINAR: MS Teams – See link in calendar invite or register here
AUDIO: Web audio or telephone *971-323-0535, code 612 608 571#*

MEETING OBJECTIVES:

- RETAC members receive opportunities to share their emerging technology / new measure plans for 2025.
- Members can gain experience about and share their experiences at the AHR Expo / ASHRAE conference.
- GTI Energy and NW Power Council share updates and areas for collaboration.

AGENDA

Time	Topic	Lead	Packet Page #
8:30 a.m. (30 min)	**Welcome & Announcements** • Introductions and Agenda Review • Regional Conferences and Product Council Updates • Key announcements and highlights from ET newsletter • Stakeholder survey	Mark Rehley, NEEA All	Agenda pp. 1-2
9:00 a.m. (45 min)	**GTI Energy - Guest Presentation** • Ryan Kerr, Director, Emerging Technologies will share the background of GTI Energy, their capabilities, and their current emerging technology areas. **Outcome:** Awareness GTI Energy and opportunities to consider ways to collaborate.	Ryan Kerr, Director, Emerging Technologies GTI Energy	Memo p. 3

Time	Topic	Lead	Packet Page #
9:45 a.m. (15 min)	**Break**		
10:00 a.m. (30 min)	**RETAC Round Robin** • Share research and other efforts to develop new measures and technologies for your organization. **Outcome:** Awareness of emerging technology efforts by committee members	RETAC Members	
10:30 a.m. (30 min)	**9th Power Plan Update** • Kevin Smit will share an update on the 9th plan including new measures and technologies. **Outcome:** Feedback on measures and technologies that the Power Council should consider for the 9th plan.	Kevin Smit Manager, Power Planning Resources NW Power and Conservation Council	Memo p. 4
11:00 a.m. (45 min)	**AHR Expo / ASHRAE Conference Debrief** • NEEA staff and committee members who attended the AHR Expo / ASHRAE Conference in February will share their experiences and learnings. **Outcome:** Committee members receive an update on trends and new opportunities discovered at the AHR Expo / ASHRAE Conference	Christopher Dymond, Chris Wolgamott, Dana Bradshaw, Noe Contreras RETAC members	
11:45 p.m. (15 min)	**Wrap-Up** • Final Q&A, polling questions	Mark Rehley, NEEA	

Memorandum – *Agenda Item (Tier 1)*

March 7, 2025

TO: Regional Emerging Technology Advisory Committee (RETAC)

FROM: Mark Rehley, Director Emerging Technology, Codes, and Standards

SUBJECT: GTI Energy Presentation

Our Ask of You:

- Consider what opportunities exist to work with GTI Energy as they test emerging technologies for both natural gas and electric efficiency

During the March 13, 2025 RETAC meeting, Ryan Kerr, Director of Emerging Technologies at GTI Energy will provide an overview of GTI Energy's capabilities and current research areas. Ryan and his team have been a long-time partner for the Northwest on natural gas energy efficiency, but GTI Energy also has extensive experience with emerging technologies for electric EE.

https://www.linkedin.com/in/ryan-kerr-a5538ba/
https://www.gti.energy/

Memorandum – *Agenda Item (Tier 1)*

March 7, 2025

TO: Regional Emerging Technology Advisory Committee (RETAC)

FROM: Mark Rehley, Director Emerging Technology, Codes, and Standards

SUBJECT: Northwest Power and Conservation Council Presentation

Our Ask of You:

- Prepare to provide feedback about emerging technologies that the NW Power and Conservation Council are considering for the 9th Power Plan

During the March 13, 2025, RETAC meeting, Kevin Smit, Manager of Power Planning Resources will review progress and status of the 9th Power Plan. Kevin will review a list of emerging technologies and measures that are being considered for inclusion in the 9th plan.

https://www.linkedin.com/in/kevin-smit-0a150736/
https://www.nwcouncil.org/energy/ninthpowerplan/

Memorandum – *Agenda Item*

March 7, 2025

TO: Regional Portfolio Advisory Committee

FROM: Alisyn Maggiora, Sr. Stakeholder Relations Manager

SUBJECT: NEEA Reporting Audit & Potential Streamlining

Our Ask of You:

1) Please review the memo and bring any questions, recommendations, feedback, or concerns to the Q1 RETAC meeting on March 13, 2025, or contact me at the email below.
2) **Please complete the survey by Friday March 28, 2025.**

Context

NEEA staff are conducting an audit of the reports, newsletters and other materials communicated to alliance members to better understand what's useful and valuable. This effort seeks to achieve balance with the time spent compiling these materials and what's desired/useful, and/or duplicative. Feedback will help determine whether there's a need to streamline the number of reports/materials produced and possibly the communication channels used. Thank you in advance for taking a few minutes to provide us with feedback on what's most useful to you.

SURVEY LINK: https://www.surveymonkey.com/r/2025-Reports-Value-Assessment

REFERENCE ONLY: Current NEEA Reports with Linked Examples

NOTE: Please do not feel the need to review each of these reports. The survey is designed to capture the types of information that are valuable to you more generally. The list below / linked examples are provided so you have the formal names/purpose/content handy in case it's helpful. If you have a strong preference for any of these reports as they are structured today, please include that feedback in the survey.

1. Annual Report, Key Assumptions and Business Cycle Savings Update (electric + gas, reported to Cost-Effectiveness & Evaluation Advisory Committee in Q2 each year)
2. Coordinating Committees - Semi-annual Program Activity reports:
   - Q4 2024 Residential Program Activity Reports
   - Q4 2024 Commercial & Industrial Program Activity Reports
3. End of Business Cycle Report (2015-19)
4. Quarterly Natural Gas Portfolio Progress Report
5. Quarterly Market Progress Report (Program progress to annual goals: electric + gas)
6. Codes & Standards Newsletter
7. Emerging Technology Newsletter
8. Market Research and Evaluation Newsletter

Available by request:

1. Annual Operations Plan (2025)
2. Annual Cycle Scorecard (as part of Q1 2024 Quarterly Report)
3. Annual Report (2023 is latest available)
4. Quarterly ED Update, Report & Scorecard

Please contact **Alisyn Maggiora (amaggiora@neea.org)** if you have questions about this effort.

2025 Q1 Emerging Technology Quarterly Newsletter

WHAT'S NEW:

Welcome to 2025. This quarterly Emerging Technology update will highlight laundry products. As part of its long history with consumer products, NEEA started working on residential clothes dryers many years before ENERGY STAR® added that category. NEEA staff continue to explore innovations in laundry technology including residential and commercial heat pump dryers, all-in-one combination washers and dryers, and top load washer innovations.

The 2025 Consumer Electronics Show (CES) comprised demonstrations of several other laundry innovations, including smart dosing systems, AL wash optimization, and (a favorite) robotic sorting and folding. Smart dosing technology accurately identifies the washing needs of each load, adds the correct amount of detergent, and sets the wash parameters to ensure the best results. This technology offers many benefits including efficiency since it potentially reduces waste by accurately matching each load's need. NEEA will continue to track these technologies to determine their value for the Northwest and look for market transformation opportunities.

Recent and Upcoming Product Councils:

- November 5, 2024 – Heat Pump Water Heater Installation Tool
- December 3, 2024 – FEI Rated Fans and Flue Gas Thermo-Cooling: The Last Steps in Building Efficiency
- March 25, 2025 – Low Load Efficient Heat Pumps

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

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

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Questions about this report may be addressed to:

Mark Rehley
Director, Codes, Standards, New Construction and Emerging Technologies
mrehley@neea.org

PUBLISH DATE: MARCH 3, 2025

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]
Consumer 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	Efficient Rooftop Units	ERTU			N/A	9	4	3	4
	Heat Pump Rating Representativeness	AHP			TBD	N/A	3	5	4
	Low Load Efficient Heat Pump Investigation	AHP			TBD	N/A	4	3	2
	Air-Conditioning, Heating, and Refrigeration Institute (AHRI) 1380 HVAC Connectivity Standard	EULF			TBD	N/A	2	2	2
	Dual-Fuel Gas-Electric Heat Pump Modeling	DFHP			TBD	TBD	3	3	1
	Dual-Fuel Gas-Electric Heat Pump Field Study	DFHP			TBD	TBD	3	3	1
	Cold Climate Room Heat Pump Field Testing	AHP			TBD	N/A	3	3	2
	Tri-Mode Heat Pump Study	TBD			TBD	N/A	2	2	1
Building Envelope	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	2	2	1
Lighting	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	N/A			130	N/A	1-4	1-3	2
	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	N/A			TBD	TBD	2	2	1
	Residential Heat Pump Water Heater Quality Assurance	HPWH			TBD	TBD	4	5	4
	Residential Water Hearing Demonstration – HPWH, Circulation, and Drain Heat Recovery	HPWH			TBD	TBD	3	3	2
Motors	Commercial & Industrial Fans	Fans			176	N/A	5	4	2
	Power Drive System Technology Assessment	N/A			292	N/A	5	4	1
	Expanded Motor Products (Pumps)	XMP			TBD	TBD	3	5	3
Other	Flexible Load Management	N/A			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); End-Use Load Flex (EULF)

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 24; **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 Retail Products Platform has approved the addition of TVs to the product tiers that are eligible for incentives. The basic tier covers TVs <50" and the advanced tier covers TVs >/=50". Qualifying TVs must appear on the ENERGY STAR Qualified Products List (QPL).

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

Project Objective(s):

- 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.

Product Manager: Wendy Preiser
wpreiser@neea.org
503.688.5494

Product	4	Comm/Market	5	Program	5

Residential Laundry Field Study

Project Status: The study is complete. Results are being compared to other regional datasets to fine-tune energy use and cycle frequency projections. The final report is expected by end of Q2 2025.

Product Description: Residential appliances for washing and drying clothes.

Project Objective(s): 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. Department of Energy (U.S. DOE) rulemakings, and facilitate collaboration with other partners to replicate the study in their territories.

Product Manager: Wendy Preiser
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503.688.5494

Product	5	Comm/Market	5	Program	5

Monitor and Commercial Display Testing

Project Status: The test procedure modifications for monitors and commercial displays are complete. Testing is complete on monitors and is beginning on commercial displays to assess level settings. Test kit design modifications are being finalized. 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 Objective(s): 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 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.
- Succeed in having the new test procedure inform an update to the U.S. DOE federal energy test standard.

Product Manager: Wendy Preiser
wpreiser@neea.org
503.688.5494

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 continued to be strong in the first half of 2024, with national sales in July 2024 reaching 10% of total dryer sales. The NEEA team conducted outreach in Q3 2024 to manufacturers for input on crafting a test procedure. The response from manufacturers and other stakeholders led the team to redirect the work toward understanding potential post-purchase dissatisfiers that might impact long-term advances in heat pump dryer technology.

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 Objective(s): 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.
- Identify relevant regional program opportunities for laundry centers and single-drum washer-dryers.

Product Manager: Wendy Preiser
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503.688.5494

Product	4	Comm/Market	5	Program	5

Commercial Heat Pump Dryers

Project Status: Report is complete and is expected to be published by Q2 2025. Data has been shared with the Environmental Protection Agency (EPA) to support development of a new commercial clothes dryer specification in 2025.

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 Objective(s): 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 lbs. ± 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 vs. conventional commercial dryers.
- Utilize learning to inform future ENERGY STAR and U.S. DOE test procedure developments or rulemakings.

Product Manager: Wendy Preiser
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503.688.5494

Product	1	Comm/Market	3	Program	1

Efficient Rooftop Units (RTUs)

Project Status: This study is complete, and the final report has been published on BetterBricks.

Product Description: Packaged, weatherized, commercial natural gas indirect air heating systems that may or may not include ventilation, air conditioning or both. Efficient RTUs are mounted externally to a building and capture heat from the products of combustion (flue gases) to achieve a minimum thermal efficiency or annual fuel utilization efficiency (AFUE) of 90%. Also includes non-condensing products that use modulating gas valves.

Project Objective(s): Evaluate the performance of efficient RTU products through field trials in multiple climates. The first test site in Winifred, MT, evaluated an AAON unit over a nine-month period that concluded in June 2022. The Montana State University (MSU) Integrated Design Lab managed this project.

The second site, in Portland, OR, is currently testing units from two manufacturers—a high-efficiency Daikin unit and a standard-efficiency Trane model. The units will be tested over nine months. Results will inform plans to promote and accelerate the adoption of efficient RTU products.

Product Manager: Chris Wolgamott
cwolgamott@neea.org
503.688.5484

Product	4	Comm/Market	3	Program	4

Heat Pump Rating Representativeness

Project Status: Field and lab testing, analysis and the final report are completed. Final edits and publication are pending.

Product Description: Variable speed heat pumps and air conditioners.

Project Description: 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.

Project Objective(s):

- 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.

Product Manager: Christopher Dymond
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503.688.5454

Product	3	Comm/Market	5	Program	4

Low Load Efficient Heat Pump Investigation

Project Status: All phases are complete. Preliminary findings were presented at the April 2, 2024 Product Council. A summary presentation will be given at a March 25, 2025 Product Council (register here).

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

Project Objective(s): 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 will perform a physical teardown of subcomponents to provide insight on component differences, the manufacturing costs, and components that enable low load efficiency.

Product Manager: Christopher Dymond
cdymond@neea.org
503.688.5454

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. NEEA is participating in the AHRI unitary equipment standards technical committee. Subgroup meetings are expected to start in Q1 2025.

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

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

Product Managers: Christopher Dymond
cdymond@neea.org • 503.688.5454

Product	3	Comm/Market	3	Program	1

Dual-Fuel Heat Pump Modeling

Project Status: Initial results from modeling multiple dual-fuel configurations have been reviewed and updated. Preliminary findings indicated that a hydronic furnace and air source heat pump (ASHP) is the most attractive configuration from an operational cost perspective. NEEA will consider conducting sensitivity analysis on the output and integrating water heating load for the hydronic furnace.

Product Description: A forced air gas furnace or hydronic furnace combined with an ASHP with integrated controls.

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

Product Manager: Noe Contreras
ncontreras@neea.org • 503.688.5412

Product	3	Comm/Market	5	Program	1

Dual-Fuel Heat Pump Field Study

Project Status: This project is underway. Washington State University is conducting the research funded by the Bonneville Power Administration and NEEA with support from Clark PUD, Chelan PUD, Energy Trust of Oregon, Puget Sound Energy and Idaho Power. Twenty-seven sites have been recruited and agreements signed (three more are available). Installations are expected to begin in February 2025.

Product Description: A forced air gas furnace or hydronic furnace combined with an ASHP with integrated controls.

Project Objective(s): Understand the efficiency and ability of residential dual-fuel systems to provide value through energy savings and grid flexibility by pairing highly efficient gas water and space heating with an electric heat pump and using a smart controller to increase fuel flexibility and dynamically control the system.

Product Manager: Noe Contreras
ncontreras@neea.org • 503.688.5412

Product	3	Comm/Market	5	Program	1

Cold Climate Room Heat Pump Field Testing

Project Status: Room heat pump units are expected to be installed in February 2025. As of January 29, 2025, 27 of 30 sites have been recruited. Participating utilities include Seattle City Light, Puget Sound Energy, Energy Trust of Oregon, Okanogan PUD, Ravalli Electric Co-op and Glacier PUD.

Product Description: A small heat pump designed to condition a single room that is plugged into a standard 15A 120V AC outlet. 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. Cold climate-capable room heat pumps can actively defrost and provide 100% capacity down to 17°F.

Project Objective(s):

- Obtain lab test data collected from manufacturers to characterize heat pump performance vs. ambient temperature.
- Conduct field testing to gather real-world operational data (runtime, consumer acceptance, etc.).

Product Manager: Noe Contreras
ncontreras@neea.org • 503.688.5412

Product	3	Comm/Market	5	Program	1

Tri-Mode Heat Pump Study

Project Status: An initial market research survey has been completed and interviews with manufacturers are underway. The final report is expected by end of Q1 2025.

Product 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.

Project Objective(s):

- Conduct a detailed market survey of tri-mode heat pumps available in North America, Asia and Europe.
- Calculate a preliminary estimate of energy savings potential.
- Perform a preliminary evaluation of market barriers for these systems.

Product Manager:
Christopher Dymond
cdymond@neea.org
503.688.5454

Product	2	Comm/Market	2	Program	1

Secondary Windows Field Study

Project Status: On behalf of NEEA, GTI Energy is continuing to work with Lawrence Berkeley National Laboratory (LBNL) in condensation mitigation testing and data analysis, and the preliminary techno-economic assessment (TEA) is being drafted. Selected test sites are comprised of multiple office spaces in multiple buildings, and three manufacturers' products will be tested. The monitoring and validation plans are under development.

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 to either the interior or exterior of existing windows without replacing the primary glass or frame.

Project Objective(s): 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, 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.
- Accelerate high-performance window uptake in the retrofit market through direct partnerships with manufacturers, suppliers and others.

Product Manager: Eric Olson
eolson@neea.org
503.688.5435

Product	4	Comm/Market	5	Program	4

Skinny Wall Retrofit Panels

Project Status: This project is underway, with a final report now expected in Q1 2025.

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 Objective(s):

- 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.
- Conduct energy performance modeling, including comparisons to baseline building performance.

Product Manager: Eric Olson
eolson@neea.org
503.688.5435

Product	2	Comm/Market	1	Program	1

Advanced Prefabricated Zero Carbon Homes

Project Status: This project is underway; the next major milestone, the Advanced Manufactured Home Design report, is pending. The next major phase of building and commissioning will run through 2025.

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 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 (HPWHs) and air source heat pumps.

Project Objective(s):

- 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.

Product Manager: Eric Olson
eolson@neea.org
503.688.5435

Product	2	Comm/Market	2	Program	1

Luminaire Level Lighting Controls with HVAC Control

Project Status: Data collection is underway and will continue until Q3 2025. The project is getting a lot of interest from multiple extra-regional agencies, including the U.S. DOE, the Pacific Northwest National Laboratory (PNNL), the DesignLights Consortium (DLC) and others.

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(s): 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, 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 the occupants of the space.

Product Manager: Chris Wolgamott
cwolgamott@neea.org • 503.688.5484

Product	4	Comm/Market	4	Program	3

Parking Lot Lighting with LLLC

Product 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. Phase 3 is underway and should be completed by the end of Q2 2025.

Product Description: Exterior lighting with LLLC.

Project Objective(s): 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.

Product Manager: Chris Wolgamott
cwolgamott@neea.org • 503.688.5484

Product	3	Comm/Market	3	Program	1

Combination Hot Water and Space Heat (Gas)

Project Status: NEEA provided feedback to the draft report for the Stone Mountain Technologies, Inc. (SMTI) combination project in Chicago. The final report is expected in Q1 2025.

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

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

Product Manager: Noe Contreras
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Product	1-4	Comm/Market	1-3	Program	2

Integrated Residential Gas Heat Pump Water Heaters

Project Status: The manufacturer updated its product, and GTI Energy confirmed improved COPs for the most recent prototype.

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

Project Objective(s): Evaluate the performance of a prototype, full-size, adsorption gas HPWH.

Product Manager: Noe Contreras
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Product	2-5	Comm/Market	3-4	Program	2-5

Advanced Commercial Gas Water Heating

Project Status: Modeling gas absorption heat pumps and electric heat pumps installed in commercial gas-fired water heating products such as boilers, storage tanks and tankless water heaters. Site identification is underway to secure field site demonstrations in the Northwest. One promising site is considering participating in the study.

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 Objective(s): 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.

Project Manager: Noe Contreras
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Product	3	Comm/Market	3	Program	2

Industrial Heat Pumps

Project Status: NEEA continues to explore the industrial heat pump (IHP) opportunity with the Bonneville Power Administration and Cascade Energy with identification of sites underway. The 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 Objective(s): Determine the energy savings opportunity from industrial-scale thermally driven heat pumps, market potential, currently available products, barriers to adoption and potential solutions.

Product Managers: Adam Gage
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Product	2	Comm/Market	2	Program	1

Residential Heat Pump Water Heaters

Project Status: NEEA contracted with Larson Energy Research and Cascade Engineering Services to complete a study in which multiple characteristics were observed, and tests were performed on four residential HPWHs qualified to Tier 4 of NEEA's Advanced Water Heating Specification (AWHS).

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

Project Objective(s): The evaluations were designed to randomly select products listed in the AWHS to validate they are performing as efficiently as expected. Findings have been shared with the manufacturers.

Product Managers: Dana Bradshaw
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Product	4	Comm/Market	5	Program	4

Residential Water Heating Demonstration—HPWHs, Circulation and Drain Water Heat Recovery

Project Status: As part of the ACEEE Hot Water Forum, the demonstration event is scheduled for March 3, 2025 at the UA 290 Training Facility in Tualatin, OR. Seven manufacturers' HPWHs will be demonstrated along with three circulation pumps and a drain water heat recovery system.

Product Description: Partnering with the UA 290 Training Facility in Tualatin, OR to build from Piping & Instrumentation Diagrams (P&ID) provided by NEEA to demonstrate the three different technologies surrounding residential water heating systems (HPWHs, drain water heat recovery and circulation pumps).

Project Objective(s): Demonstrate, train, and test rigs for HPWHs, drain water heat recovery and circulation pumps.

Product Managers: Dana Bradshaw
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Product	3	Comm/Market	3	Program	2

Commercial and Industrial Fans Product Research

Project Status: To better understand how fan efficiency is affected when operating point differs from design point, NEEA has started to investigate the feasibility and necessity of developing a methodology for measuring the in-situ Fan Energy Index (FEI) of fans once they are installed and operating in-field.

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

Project Objective(s): 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. 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.

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

Expanded Motor Products (Pumps)

Project Status: This project is in the scoping phase to eventually compare the efficiency between clean-water pumps and similar pump designs that pump non-clean water.

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

Project Objective(s): Identify energy savings opportunities for pumps that are not classified as "clean water" pumps.

Product Manager: Kristen Aramthanapon
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Product	5	Comm/Market	4	Program	1

Flexible Load Management – Specially Funded Project

Project Status: Field studies are underway for connected line voltage thermostats and connected water heaters. Additionally, NEEA continues to influence AHRI by requiring CTA-2045B Level 2 for residential and commercial HPWHs. AHRI 1430 applies to 40–80-gallon electric water heaters, and AHRI 1530 applies to electric commercial water heaters over 80 gallons.

Product Description: Connecting informed autonomous behind-the-meter applications.

Project Overview: NEEA has 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 with, 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.

Project Objective(s): Create pathways for behind-the-meter loads that can help support the integration of renewables on the grid.

Product Manager: Eric Olson
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Product	5	Comm/Market	5	Program	2

	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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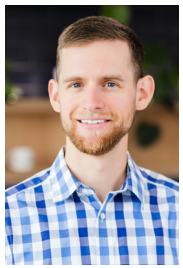

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TOGETHER We are Transforming the Northwest

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