2023 Annual Report for Puget Sound Energy

INTRODUCTION

The Northwest Energy Efficiency Alliance (NEEA or "the alliance") is a nonprofit organization working in collaboration with Puget Sound Energy (PSE) and more than 140 other Northwest utilities and energy efficiency organizations to pool resources and share risks to transform the market for energy efficiency to the benefit of all consumers in the Northwest. With funding and engagement from Puget Sound Energy and these other entities, the alliance uses its regional leverage to intervene in the market to remove barriers and accelerate efficiency technologies and market opportunities in ways that create lasting change in the market. This results in cost-effective energy efficiency savings and local benefits to alliance funders.

NEEA achieves Market Transformation through five primary strategies that it has honed over the past two and a half decades: Emerging Technology, Portfolio Execution, Market Intelligence, Codes and Standards, and Convene and Collaborate. Individually, each workstream has broad value to the region. Together, they deliver permanent market change leading to energy savings for Puget Sound Energy. Alliance accomplishments in 2023 from each workstream are summarized below. For additional information about alliance programs and activities, NEEA's 2023 Operations Plan is available on neea.org.

PRIMARY BUSINESS PLAN STRATEGY: EMERGING TECHNOLOGY (ELECTRIC + NATURAL GAS)

To ensure the continued availability of energy-efficient products, services and practices to Northwest consumers, the alliance identifies emerging energy efficiency opportunities and works with manufacturers and the market to test and validate product performance and energy savings. Through lab and field testing, or small-scale pilots, NEEA ensures that these products save energy and meet the needs of Northwest consumers, including those in Washington. Once a technology is added to NEEA's portfolio, NEEA continues to monitor and test products as they naturally evolve in the market to identify market barriers and inform opportunities for program enhancement. NEEA staff coordinate these regional scanning efforts through the Regional Emerging Technology Advisory Committee (RETAC), which Puget Sound Energy participates in as a member.

In 2023, NEEA scanned the market to identify promising energy-efficient products, services, and practices, and conducted research, testing and vetting of a variety of opportunities. Key opportunities included:

1. **Central Commercial Heat Pump Water Heaters (HPWHs):** These products are used in multifamily buildings with a centralized water heating system that serves multiple units. In addition to several currently available models, new products from major manufacturers are

expected soon. In 2023, NEEA continued its ongoing support of two regional pilot projects. These projects benefit consumers in Washington by aiding the alliance in establishing design tools to support installers and manufacturers, in addition to determining whether the product is viable as an efficient electric solution for central water heating. Also in 2023, the alliance published the Central Heat Pump Water Heaters for Multifamily Supply Side Assessment Study, which sought to understand the current landscape of central HPWH adoption in multifamily buildings. These findings and recommendations will help the alliance understand the most effective mechanisms to increase adoption of central HPWHs in multifamily applications. Additionally in 2023, the alliance participated with the Association for Energy Affordability (AEA) on an Electric Program Investment Charge (EPIC) grant to understand better the barriers to retrofitting existing building stock with central HPWHs. AEA has completed two of the five installations, with monitoring underway; most retrofit installations are in low-income housing in urban and rural locations. Finally, the alliance posted the first version of the Commercial HPWH Qualified Products List (QPL) in 2022, which contains information on Residential Multifamily Commercial products that meet the alliance's Advanced Water Heating Specification (AWHS) requirements. Since the publication of the QPL, four commercial HPWH products from four manufacturers have been listed and NEEA anticipates three more manufacturers to submit products for inclusion on the QPL. By adding new products and manufacturers to the QPL, consumers in the Northwest and Washington have access to products that meet greater efficiency performance and quality.

2. **Combination Hot Water and Space Heat*:** An integrated system that provides both space and water heating, it can be used in both electric and natural gas applications. In 2023, the alliance convened a multifamily new construction design charrette with architects, engineers, installers, and raters to develop solutions for the proper integration of electric HPWHs into new construction low-rise multifamily structures. Additionally, performance testing of two natural gas combi units continued in 2023. This testing intends to demonstrate the performance and adaptability of these systems to provide space conditioning and domestic water heating systems in existing homes and small commercial applications. NEEA expects to publish performance reports for the two natural gas projects in early 2024.

3. **Hybrid Gas-Electric Heat Pump*:** An integrated modulating gas heat pump and electric air conditioner that uses natural refrigerants. The technology can provide heating and cooling with natural gas as the primary fuel source. In 2023, NEEA staff completed the evaluation of the performance of this integrated system in a laboratory setting to validate the product's efficiency. The technology is currently in the prototyping stage, and findings will determine the viability of a hybrid HVAC product in a real-world application. Goals had initially been set for a heating coefficient of performance (COP) of 1.45 at 47°F and a target seasonal energy efficiency ratio of 16. During testing, the alliance achieved a heating COP of 1.42 at the design condition, and the chiller portion achieved a COP of 3.0. These numbers demonstrate that hybrid gas-electric heat pumps are a viable efficient technology with the potential to support regional decarbonization efforts. Further product development is expected over the next two years.

*As a dual-fuel organization, the alliance manages a portfolio of natural gas and electric Market Transformation initiatives. Technologies with an asterisk indicate a dual-fuel opportunity.

4. **Industrial Heat Pumps:** Industrial heat pumps can harvest low-grade heat and turn it into useful heat for manufacturing processes or space conditioning. In 2023, NEEA staff began exploring an Industrial Heat Pump opportunity for energy savings and market potential with regional partners. Initial work will determine the opportunity's scale and scope, manufacturers and suppliers for the technologies, and barriers to adoption and possible solutions, ultimately leading to measure-based solutions and/or calculators.

5. **Micro Heat Pumps:** 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. In 2023, the alliance continued to conduct consumer research and field testing from Q4 2022. Phases 1 and 2 of the research concluded in May of 2023 and uncovered valuable feedback on the installation, use and comfort of the units tested. Additionally, the alliance is coordinating with three original equipment manufacturers on developing a test procedure and rating to enable the Consortium for Energy Efficiency (CEE) to define tax credit criteria for micro heat pumps. A future lab testing project and possible field pilots are under development, with the goal to gather data and validate real-world performance.

6. **Power Drive Systems (PDS):** PDS combine an electric motor and variable speed controls to control the speed of the motor. By reducing the speed of the motor, the power consumption is reduced. In 2023, the alliance sought to better understand the market and savings opportunities associated with the use of an adjustable speed motor in both variable and constant loads (i.e. a PDS) in the Northwest. Findings from the report will allow the alliance to continue to characterize the energy savings opportunity for PDS in retrofit applications, clarify previously identified barriers, refine the target portion of the market, and establish a vetted product definition.

7. **Residential Laundry Field Study:** The residential appliances for washing and drying clothes. In 2023, NEEA began a study which 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 clothes dryers perform. These insights will allow updates to energy savings opportunities, inform future U.S. DOE rulemakings, and facilitate collaboration with other partners to replicate the study in their territories. NEEA anticipates publishing a final report of findings in 2024.

8. **Secondary Windows*:** 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 that is attached either to the interior or exterior of existing windows without replacing the primary glass or frame. In 2023, the alliance installed commercial secondary windows at six pilot sites throughout the Northwest, including one in Washington. The pilot sites seek to assess product performance in real world applications and will inform the opportunity for the product's adoption in the Northwest. Post installation metering was completed, and a final report is anticipated in 2024. Additionally, one of the pilot sites recently received a U.S. DOE Building Envelope Campaign Retro 30 Award, which recognizes envelope retrofits that achieve a >30% improvement in envelope efficiency.

9. **Ultra-High Definition (UHD) TVs:** These products are 4K UHD TVs with various forms of advanced display technologies. In 2023, the alliance secured all major TV manufacturers to sign on to a voluntary agreement to meet standby mode power of <2 watts and to establish an on-mode power compliance level in early 2024. This was enabled through several years of alliance efforts to support development of a new test procedure that has now been adopted by the Consumer Technology Association (CTA), ENERGY STAR®, the U.S. DOE and the California Energy Commission and is currently in use by TV manufactures worldwide. The test procedure (ANSI/CTA-2045-D) became a requirement for manufacturers in Q3 2023 and by the end of the year more than 315 TV models were tested using the new test procedure. ANSI/CTA-2045-D is much more reflective of actual energy use by TVs and will improve the efficiency of televisions, in turn allowing consumers in Washington and across the Northwest and nation to have access to more efficient products. Energy use data from multiple manufacturers' TV testing is expected to be available in 2024.

10. **Very High Efficiency Dedicated Outside Air System (very high efficiency DOAS):** A high-performance approach to commercial HVAC that pairs high-performance equipment with key design principles to provide cleaner and safer indoor air, enhance indoor comfort and reduce commercial building HVAC energy use. In 2023, NEEA staff continued to test very high efficiency DOAS approaches at three sites, including a site in Washington. This testing is intended to validate HVAC systems utilizing very high efficiency DOAS design principles with multiple HVAC designs, including forced air and chilled beam designs, against conventional equipment. Results will inform improved modeling of very high efficiency DOAS design principles in various building types and equipment selection. Monitoring at all three locations completed by the end of 2023 and final reports are anticipated in 2024.

PRIMARY BUSINESS PLAN STRATEGY: EFFECTIVE PORTFOLIO EXECUTION

In 2023, NEEA staff managed a portfolio of electric and natural gas Market Transformation programs in seven cross-sector Product Groups: Building Envelope, Consumer Products, HVAC, Lighting, Motor-Driven Products, New Construction and Water Heating. Each Product Group includes one or more programs and emerging technologies that share supply-chain opportunities with one another. Alliance programs strategically intervene in markets to influence decision-makers throughout the supply chain to remove barriers, find leverage and create lasting change. This approach allows the alliance to leverage shared relationships and market channels among programs, which delivers efficiencies for NEEA and its supply-chain partners.

BUILDING ENVELOPE PRODUCT GROUP

This Product Group engages the manufacturers, distributors, retailers and end consumers of the physical separator between the interior and exterior of a building, including walls, fenestration and roofs. In 2023, there was one program in the Building Envelope Product Group, High-Performance Windows. Window Attachments was discontinued as a stand-alone Market Transformation program in 2023, primarily due to program challenges with replicable measurability and inherent complexity of integration of envelope retrofits with other building upgrades. NEEA will continue to explore Market Transformation opportunities for commercial secondary windows, especially as the product is likely

more suited as a key tool for a whole building approach. Additionally, NEEA will continue key market relationships and activities under the Building Envelope Product Group work.

High-Performance Windows – The alliance's High-Performance Windows program accelerates the adoption of high-performing windows by advancing the latest ENERGY STAR criteria and influencing leading manufacturers to scale production of windows that reach a minimum 0.22 U-value. With strong support from NEEA, the ENERGY STAR v7.0 Program Requirements for Residential Windows, Doors, and Skylights was finalized in Q4 2022 and went into effect in October 2023, lowering the U Factor requirements from 0.27 to 0.22 for the Northern Climate Zone. The new specification supports the alliance's Market Transformation efforts in the Northwest for high-performance windows by providing manufacturers with the criteria to produce the most efficient products to put on the market.

Also in 2023, the alliance identified opportunities to work with market partners to install high-performance windows in real world applications. This included conducting a builder pilot to spread awareness of and generate greater demand for high-performance window solutions among residential builders and consumers. Additionally, it aimed to provide the business case for manufacturers to meet demand through scaled-up production, ultimately resulting in reductions in product costs. Two of the builders that participated in the volume builder pilot in 2022 have committed to continue their use of high-performance windows in future builds as their standard offering in new homes in the Northwest. Also in 2023, the alliance continued work with a national builder to install thin triple pane windows in a 100-home development in the region. Construction has begun, and windows have been installed in approximately two dozen homes. In addition, two new brands entered the thin-triple market in 2023, one of which is specifically targeting the northern climate zones and announced construction of a dedicated manufacturing plant. They join six other major manufacturers offering triple pane products in the northern climate zone, which helps to ensure high-performance window products are available and scalable to meet demand for consumers in the Northwest.

Finally, to support the proliferation of high-performance windows in the Northwest, the alliance continued facilitating the national Partnership for Advanced Window Solutions (PAWS) Collaborative. PAWS promotes cost-effective, high-performance window solutions for the nation's new and existing building stock. By doing so, the collaborative aims to accelerate the national availability and adoption of advanced and highly efficient windows and window attachments that improve occupants' comfort and reduce building energy use. Funded by the U.S. DOE, PAWS is facilitated by NEEA and includes government agencies and research organizations, regional energy-efficiency groups, utilities, builders and window-solutions manufacturers.

CONSUMER PRODUCTS PRODUCT GROUP

This Product Group engages the manufacturers, distributors, physical and online retailers, contractors and installers that deliver consumer goods and services in high volume, as well as the end-customers who purchase them. In 2023, Retail Product Portfolio was the sole electric program in this Product Group.

Retail Product Portfolio (RPP) – RPP is a midstream retail program that partners with utilities and large retailers around the country to offer midstream sales incentives for a portfolio of consumer products. These incentives help to influence corporate retail buyer's purchase decisions and give the alliance access to full-category sales data. Additionally, by providing midstream incentives, retailers are encouraged to purchase, stock and promote higher-efficiency products. The data retailers provide allows NEEA to identify the most promising energy efficiency opportunities and gain insights to

influence the stringency of ENERGY STAR specifications and the advancement of federal standards. During 2023, three new utility sponsors joined the ENERGY STAR Retail Products Platform (ESRPP) program, bringing the share of U.S. households represented by program sponsors to more than 24%. Achieving greater scale helps NEEA to amplify the voice of the region, creating more opportunities for Northwest consumers through participating retailers and through ENERGY STAR to increase consumers' access to more efficient product options. In the Northwest, this program has coordinated with retailers and distributors to get energy-efficient refrigerators, clothes washers and clothes dryers on shelves in more than 300 store locations across the Northwest. More specifically, in Washington state, the RPP program provided midstream incentives on more than 41,000 qualified products which were sold through more than 115 participating retailers in 2023. Also, in 2023 the alliance submitted comments on the U.S. DOE's multi-product agreement proposal for new appliance efficiency standards that covers refrigerators, cooking products, clothes washers, clothes dryers and dishwashers. If adopted, the changes would provide significant efficiency benefits for consumers. Lastly, the alliance provided comments on the Environmental Protection Agency's (EPA) Dryer Discussion Guide as a precursor to the new ENERGY STAR specifications that will go into effect in 2024. The new specification will ensure that new features and functions that offer significant efficiency gains are available across brands, while also maintaining product performance.

HVAC PRODUCT GROUP

This Product Group engages the manufacturers, distributors, specifiers, designers, installers and consumers of commercial and residential HVAC products. In 2023, there were three programs in the HVAC Product Group: Advanced Heat Pumps (*formerly Variable Speed Heat Pumps*), High-Performance HVAC, and Efficient Rooftop Units (Efficient RTUs).

Advanced Heat Pumps – The Advanced Heat Pump program, formerly the Variable Speed Heat Pump program, aims to identify and drive adoption of product features, capabilities and ratings that will deliver higher efficiency in all residential two-stage and variable speed heat pumps installed in the Northwest. In 2023, the alliance identified opportunities to improve high value product features and capabilities that will enhance the efficiency of advanced heat pump products. To ensure availability of advanced heat pump products with improved efficiency, the alliance sought to gain manufacturer support of the identified improvements. To do so, the alliance attended the Air Conditioning, Heating and Refrigeration (AHR) Expo in 2023, the world's largest heating, ventilation, air conditioning, and refrigeration marketplace event with more than 1,800 exhibitors displaying the latest technology and an estimated 30,000 to 35,000 attendees. The program team met with 15 leading heat pump manufacturers to share research-to-date on the program's identified heat pump improvements to begin building buy-in and partnerships, collect feedback on market feasibility, see the newest technologies, and learn about new improvements on the horizon. As a result, six manufacturers agreed to collaborate with the alliance to develop the connected commissioning certification criteria, which is one of the high-priority improvements. And, due to the coordination and support from the alliance, the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Unitary Small Equipment Standards Technical Committee included elements that address four of NEEA's lower-priority improvements in its proposed changes to the test procedure and rating standard. This resulted in the AHRI test procedure draft expected to be proposed in the U.S. DOE's public process as early as 2024. By aligning manufacturers on advanced heat pump product improvements, the alliance is in turn aiming to provide consumers in Washington and across the Northwest with access to the most efficient product options.

High-Performance HVAC – This program aims to transform the commercial HVAC market in the Northwest by accelerating the adoption of high-efficiency HVAC systems and components, resulting in substantial energy and non-energy benefits throughout the region, such as healthier buildings, improved indoor air quality and improved tenant comfort. In 2023 the alliance continued to refine and socialize its system definition and design recommendations documentation, which provides manufacturers, designers and installers of very high efficiency DOAS with performance requirements and guidance for application in the Northwest climate zones. As a result of this effort, in 2023 the first lower-cost ventilation model was included in NEEA's compliant product list. By the end of Q4 2023, the total number of compliant products grew to 86 models, a roughly 100% increase over the total number of compliant products listed at the end of 2022. By increasing the number of compliant models, consumers have diverse choices to enhance the energy efficiency of buildings in Washington and the Northwest. Also in 2023, the alliance engaged in activities aimed at fostering interest and enhancing market capabilities for high-performance HVAC products in the Northwest. Specifically, the alliance coordinated eight events across the region centered around the discussion of very high efficiency DOAS targeted at engineers and architects within the industry, four of which were hosted in Washington. The University of Washington Integrated Design Lab represented the program at these industry-led events in the Seattle area to approximately 30 attendees, and the program team presented at the ASHRAE Puget Sound Chapter to approximately 50 attendees. Finally, NEEA staff completed work on market data/analysis in 2023 that will inform a proposed DOAS definition revision for 2024 IECC and parallel incorporation into ASHRAE 90.1-2025, a key step along the way to locking this into codes.

Efficient Rooftop Units (RTU) – The Efficient RTU program works to increase the efficiency of RTUs through product differentiation, which can ultimately assist in elevating Federal Standards. In 2023, the alliance began working with Minnesota's Center for Energy and Environment (MNCEE), Nicor Gas and Resource Innovations to build a collective of North American utilities to collaborate on commercial HVAC measures, primarily around RTUs that are gas-fired, dual-fuel, or high-performance, and include common features included in the alliance's Efficient RTU specification. This alignment will show increased demand to manufacturers for qualifying products, in turn resulting in more qualifying products available to consumers in Washington and the Northwest. The installation of two units in Portland completed in late Q1 of 2023 and monitoring is underway. Results will inform plans to promote and accelerate the adoption of efficient RTU products in the Northwest and Washington.

LIGHTING PRODUCT GROUP

This Product Group works to increase promotion of energy-efficient lighting by engaging manufacturers, distributors, specifiers, designers and installers, and by educating decisionmakers. In 2023, the Luminaire Level Lighting Controls program was the sole program in this Product Group.

Luminaire Level Lighting Controls (LLLC) – This product combines LEDs with integrated controls and sensors to offer improved building performance and occupant comfort while increasing energy savings. In 2023, NEEA staff actively engaged with several organizations to align on shared priorities for advancing lighting controls adoption, including the Illuminating Engineering Society (IES), the Pacific Northwest National Laboratory (PNNL) and the U.S. DOE's Integrated Lighting Campaign. Additionally, the program is communicating with other LLLC market transformation programs to ensure alignment, such as the ones being launched by MNCEE and by Ameren Illinois. Additionally, the alliance continued its efforts to boost awareness and foster product adoption by partnering with local

manufacturer sales channels to engage and educate lighting specifiers. As a result of these efforts, the alliance participated in 12 industry events and held 16 strategic engagements with local manufacturing representative agencies. Finally, LLLC products are becoming a nationally recognized product category of lighting controls. They are being embraced by the supply chain with a range of products now available for consumers at different price points. As of 2023, there are 36 LLLC systems available on the DesignLights Consortium's (DLC) QPL from 30 manufacturers. The DLC QPL is the largest verified list of high performing and energy saving lighting solutions in the world. These numbers are continuing to increase, with most manufacturers expanding the types of products available that include integrated LLLC technology. These efforts all work to increase visibility and demand for LLLC, thereby increasing the availability of LLLC products for consumers in Washington and across the Northwest.

MOTOR-DRIVEN PRODUCTS PRODUCT GROUP

This Product Group works with the manufacturers, distributors, specifiers, designers and installers of a variety of motor-driven products, as well as the decision-makers who influence their purchase. Specific motor products include pumps, fans, compressed-air systems and high-performance motors. For 2023, there were two programs in the motor-driven product group: Efficient Fans and Extended Motor Products – Pumps.

Extended Motor Products – Pumps (XMP) – The XMP Pumps program works to accelerate the adoption of more efficient pumps and circulators. The alliance provides midstream incentives and other support to motivate pump and circulator distributors to preferentially stock and sell efficient pump products. In exchange, distributors provide NEEA with full-category sales data, which informs program strategy and enables the measurement of market progress. In 2023, the alliance continued to leverage relationships with pump manufacturers, distributors, and industry associations to accelerate the pace of smart pump and variable load pump sales growth. Activities included active participation with eight pump and circulator manufacturers' representative firms, resulting in an increase in Smart Pump market share over the previous year. In 2023, Smart Pump market share reached 18% and Smart Circulator market share reached 23%. Also in 2023, to raise awareness of energy-efficient pumps, the Hydraulic Institute Energy Rating label, and the specific benefits of smart pumps related to installation and maintenance cost, the alliance supported hands-on trainings, webinars, lunch-and-learns and special events with pump buyers and specifiers. More specifically, in Q3 2023, the alliance helped bring a 1-day Pump System Fundamentals training to Seattle at the Smart Buildings Center. Throughout the year, various participating manufacturers' representatives, most of whom have a strong presence in the Seattle market, held numerous lunch and learns, conducted webinars, and held and other forms of training with pump buyers and specifiers.

Efficient Fans – This program focuses on non-embedded (i.e., stand-alone) motor-driven fan systems that are not packaged by the manufacturer as part of any equipment with additional operating functions (e.g., HVAC, make-up air or outdoor-air units), and may include a fan, motor and drive (including controls). The alliance is working to develop a standardized specification, testing method and label to properly reflect the performance and energy use of each product. Currently, system efficiency is indicated using the new Fan Energy Index (FEI) label, which describes the fan efficiency at a design point compared to a "minimally compliant" reference fan at that same operating point. FEI is the best metric to characterize efficient fans at a particular operating point. Proper sizing of the fan for design conditions leads to more efficient operations; however, FEI is rarely used by designers and specifiers in their fan selection. In 2023, the first Federal Test Procedure on Fans and Blowers used FEI as the energy efficiency metric, marking an industry milestone and building on the momentum and visibility of

this metric. Also in 2023, the alliance completed a Fan Systems Market Characterization study, which focused on describing the path to purchase for efficient fans, including the roles, motivations, and perspectives of relevant market actor groups. The final report is expected in 2024. Additionally, the program collected fan sales data from two manufacturers and signed an agreement with one major manufacturer to work on updating their fan selection software to highlight the FEI, and to test targeted interventions to promote efficient fans.

NEW CONSTRUCTION PRODUCT GROUP

Working closely with the alliance's Codes and Standards team, this Product Group maximizes energy efficiency opportunities for new residential and commercial buildings by enabling code advancement through the market adoption of energy-efficient products and practices. In 2023, Manufactured Homes remained the standalone Market Transformation program in the alliances New Construction Product Group. As the program is near the end of the Market Development phase it will transition to Long-term Monitoring and Tracking in 2024.

Manufactured Homes – This program works to increase voluntary adoption of NEEM+ manufactured homes, an advanced tier of energy-efficient manufactured homes that leverage the NEEM program. The program works with the supply chain to increase availability and demand for NEEM+ certified energy-efficient manufactured homes with the goal of supporting advancement of the Housing for Urban Development code (HUD) Federal Standard. In 2022, the U.S. DOE published a final rule on the manufactured housing Energy Conservation Standards that would make slight improvements for single-wide homes and significant improvements to double-wide and larger manufactured homes. However, due to uncertainty surrounding enforcement of the new rule, the U.S. DOE shifted the effective date from 2023 to 2025. Although delays to the new final rule will slow changes in the Northwest Manufactured Homes market, NEEA identified opportunities to support compliance with the new rule when it goes into effect. For example, as part of its emerging technology efforts, the alliance is investigating Heat Pump Ready ENERGY STAR Manufactured Homes. These are defined as homes that can be shipped as "Heat Pump Ready" to comply with the new ENERGY STAR manufactured home specification. The alliance is working with the U.S. DOE and the NEEM program administrator to define U.S. DOE program requirements that give credit for the NEEM program's continuous process improvement, air sealing and duct sealing aspects. An analysis of the Inflation Reduction Tax Act identified elements of the specification that would continue to allow manufacturers in the Northwest to easily certify that the homes meet ENERGY STAR specification requirements, which will in turn ensure that ENERGY STAR manufactured homes are available to Washington and Northwest consumers. Finally, NEEA's recently completed Manufactured Homes Market Progress Evaluation Report (MPER) indicated that the market will remain stable and found that NEEM+ sales have remained steady or increased. As a result, NEEA discontinued direct market engagement in the manufactured homes market in 2023 but will continue to monitor the market to ensure that NEEM+ homes remain a viable alternative for consumers across Washington and the Northwest.

WATER HEATING PRODUCT GROUP

This Product Group engages the manufacturers, distributors (wholesale and retail), specifiers, designers, installers and consumers of natural gas and electric commercial and residential water heaters. In 2023, there were two programs in the Water Heating Product Group: Efficient Gas Water Heaters and Electric Heat Pump Water Heaters. Additionally, NEEA staff developed a Market

Transformation program concept for Advanced Commercial Gas Water Heating that was added to the portfolio in Q4 2023. Program activities will begin in 2024.

Heat Pump Water Heater (HPWH) – The HPWH program aims to increase adoption of HPWHs for emergency and planned replacements in single-family homes, while also influencing the Federal Standard to require heat-pump-level efficiency for all electric storage tanks 45 gallons or larger. In 2023, the U.S. DOE published the proposed new federal efficiency standards for water heaters. The proposed standards will transition the majority of electric storage water heaters to heat pump technology and are generally similar to recommendations submitted to DOE in 2022 by members of a diverse stakeholder coalition of industry partners – including the alliance. The alliance participated in this joint recommendation in October 2022 to ensure that the needs of consumers in the Northwest were met, including those in cold climates, with challenging installation locations and across all income levels. To ensure the Northwest market is ready for these changes, the alliance conducted research in 2023 to understand any potential barriers to market acceptance of the standard. The study was geared to better understand any challenges installers and plumbers in the region might face around recommending and installing HPWHs in existing single-family homes and is available on neea.org as of Q1 2024. Also in 2023, the program sought to increase installer adoption of HPWHs in retrofit installations by providing training sessions and content around key topics including "The Pros and Cons of Mixing Valves for Customers" and "Dispelling Myths about HPWHs." This content is available HotWaterSolutionsNW.org.

Efficient Gas Water Heaters (EGWH) – This program works to 1) develop the market for efficient gas water heating products, 2) bring a natural gas heat pump water heater (GHPWH) to market, and 3) influence the passage of a Federal Standard by 2030. Residential GHPWHs are projected to have the technical potential to save more than 100 million annual Therms. In 2023, the program focused on understanding the likelihood of major manufacturers committing to commercializing a residential GHPWH and to assess utility support for the product once it is launched. As part of this effort, the alliance worked toward product advancement by partnering with a technology developer and additional co-funders to test adsorption of GHPWH technology product's potential to achieve a Uniform Energy Factor (UEF) of 1. Achieving a UEF greater than 1 will ensure GHPWHs are more energy efficient and cost less to operate. Also in 2023, to improve understanding around commercialization timelines, the alliance continued discussions with manufacturers and technology developers. These continued conversations will help to ensure the commercialized GHPWH products meet the needs of consumers in the Northwest and Washington.

INFRASTRUCTURE PROGRAMS

In addition to its Market Transformation programs, the alliance develops and implements enabling infrastructure programs that build market capability, awareness and demand for energy-efficient products, services and practices. NEEA's infrastructure programs in 2023 are: BetterBricks, Integrated Design Labs and Strategic Energy Management.

BetterBricks – Launched in 1999, BetterBricks leverages its long-standing relationships and communication channels to support alliance programs by providing access to target-market audiences, including building owners, property managers, building staff, architects, designers, engineers and contractors. Multiple alliance programs utilize BetterBricks as a central investment to help overcome market barriers, including by raising awareness and demand for energy-efficient technologies in commercial buildings. In 2023, BetterBricks continued supporting its long-standing partners by

providing educational opportunities and resources. For example, an energy modeling guide for high-performance HVAC technologies was created in 2023 to enhance energy modelers' accuracy in predicting energy use and future savings for very high efficiency DOAS in typical commercial building applications. Additionally, a very high efficiency DOAS design guide was created to provide guidance to manufacturers, designers and specifiers regarding the key components of very high efficiency DOAS products. Also in 2023 the alliance updated and repackaged outdated resources on BetterBricks, including the creation of a new Building Renewal Series of educational articles, which helps commercial building owners and operators identify areas for energy efficiency improvements, financial planning and investment strategies, building and system upgrades and retrofits, and the ongoing operations and maintenance of a commercial property. And, a list of utility incentives available in the Northwest for LLLC products was added to the BetterBricks website to aid commercial building owners in the region to identify and take advantage of incentive opportunities from their local utilities, including Puget Sound Energy. In addition, two case studies on recent LLLC installs were posted to BetterBricks, one of which featured an installation in an industrial facility in Everett, WA. These case studies highlight the benefits of the technology for commercial and industrial buildings in the Northwest. Finally, throughout 2023, BetterBricks program team members attended and presented at over 30 Northwest conferences, webinars and/or lunch-and-learns covering topics ranging lighting and HVAC, to new programs like centralized HPWHs and efficient fans. Of these events, 16 were held in Washington, with 11 taking place in the Puget Sound area.

Integrated Design Labs (IDLs) – The IDLs work to transform the design, construction and operation of commercial, institutional and residential buildings to advance energy-efficient, high-performance and healthy buildings in the Northwest. The IDL in Northwest Washington exists at the University of Washington (UW) in Seattle and provides regional design teams access to the best building-performance knowledge available, while offering project-by-project support, education and training on designing, constructing and operating the healthiest, most productive and energy-efficient buildings. The alliance provides annual base funding to support each IDL, which serve as critical partners to alliance programs. The UW IDL regularly connects PSE's commercial building efficiency programs with design professionals to build understanding and knowledge about PSE efficiency programs and opportunities for participation. Additionally, to effectively support the market in engaging with PSE energy efficiency opportunities, the UW IDL connects projects that are in early design phases with potential PSE incentive program participation and delivers those project leads and other energy efficiency opportunities to PSE, as they arise. In 2023, the UW IDL delivered educational programs and experiences to support the next generation of leaders in the building industry and convene leaders in the design and construction industry together to drive innovation in practice. PSE staff have supported and participated in these programs – both as attendees and as presenters. In particular, the 2023 Integrated Design Tools and Methods course included eight half-day workshops that PSE staff participated in. Another example includes a webinar that shared information on Washington building energy codes, building performance standards, high performance technologies (including very high efficiency DOAS and LLLC), and PSE incentive programs. These educational opportunities help to build awareness in the market about PSE programs and objectives. Finally, the UW IDL develops and advances tools, methods and technologies to accelerate energy-efficient buildings through research and project-based education. This includes providing technical assistance to architecture firms and owners helping them to participate in and maximize energy incentive opportunities in PSE's grant programs.

Strategic Energy Management (SEM) – SEM is a specially funded program, which develops, maintains and delivers a holistic set of tools that support funders, including Puget Sound Energy, to deliver strategic energy management to their customers. These tools include the SEMHub.com website and its contents, the Energy Talk Cards, online learning modules through a learning management system platform, and support of the Northwest SEM Collaborative (NWSEMC). Throughout 2023, the alliance developed and deployed improvements to the SEMHub website including: developing new Collections and improving the Collections function, a redesigned Case Study layout, updated images, and improved navigation. Additionally, improvements to the Energy Management Assessment were made to enable greater customization of the reports including adding an Executive Summary and the ability to reorder recommendations and curate final report content. Also in 2023, five NWSEMC working groups met actively throughout the year, supported by the NEEA and the SEM Leadership Team. Working group topics in 2023 included an exploration into integrating diversity equity and inclusion, and lean principles into SEM delivery. NEEA and the NWSEMC leadership team also supported delivery of the annual SEM workshop, which took place in October 2023 with a record turnout of almost 100 attendees. Funding for the alliance's SEM program concludes at the end of Cycle 6 in 2024. To successfully transition the program, in 2023 NEEA conducted outreach to potential future partners who might take on future ownership and management of the region's SEM tools. NEEA staff reviewed the results of this outreach with alliance SEM funders and began contracting discussions with identified partners. As a result, the NWSEMC Leadership Team worked with the North American SEM Collaborative board members to move forward with forming a partnership between the two Collaboratives where the NWSEMC will be supported in a new chapter model under the North American SEM Collaborative and the American Council for an Energy-Efficient Economy (ACEEE).

PRIMARY BUSINESS PLAN STRATEGY: CODES AND STANDARDS

In 2023, NEEA continued to influence the development and successful implementation of energy codes, appliance and equipment standards, and test procedures to materially improve efficiency outcomes. The Codes and Standards program relies on and closely coordinates with the strategies and activities of the alliance's Market Transformation programs.

Codes – The Codes program provides ongoing training and technical assistance on current and upcoming commercial and residential Washington energy codes. In 2023, the alliance delivered over 30 live trainings on topics related to the 2018 Washington State Energy Codes (WSEC), serving more than 3,100 attendees. The program additionally offered 22 on-demand trainings and videos, 10 of which were specific to the 2018 WSEC codes, which accrued more than 1,100 views throughout the year. The alliance worked on development of the 2021 WSEC commercial code compliance tool edition, which will help builders and engineers verify their building design's compliance with the upcoming 2021 WSEC commercial code, which becomes effective March 15, 2024. Additionally, the program continued to support offering technical assistance for the Total System Performance Ratio (TSPR) analysis tool used to calculate the TSPR for Washington State's performance-based energy code compliance path for HVAC systems. Finally, the alliance completed a residential code evaluation in Washington, examining new construction single family homes built under WSEC 2018. The evaluation estimated compliance with the code and analyzed primary space and water heating fuel selection of homes built under the 2018 code. The final report can be found on neea.org.

Standards – In 2023, NEEA staff collaborated with partners to submit more than 27 comment letters in strategic response to the U.S. DOE's issuing multiple Requests for Information (RFI) and Notices of

Proposed Rulemaking (NOPR), initiating standard rulemaking for appliance and equipment products. These comment letters covered more than 25 products including consumer furnaces, water heaters, circulating pumps, and clothes dryers. NEEA's comments provided regional sales data, lab testing results, field validation data and other technical data to support recommendations for enhanced test procedures and improved efficiency levels that have the potential to provide energy efficiency benefits to consumers in Washington and the Northwest.

PRIMARY BUSINESS PLAN STRATEGY: MARKET INTELLIGENCE

NEEA's Market Intelligence strategy is delivered by the Analytics, Research and Evaluation Division, which is composed of three distinct functions: Market Research and Evaluation; Data, Planning and Analytics; and Energy-use Studies. In 2023, NEEA's Market Intelligence activities are focused on continuing to: 1) accurately assess results from alliance Market Transformation efforts; 2) provide research and market intelligence to support program and business planning needs of internal and external stakeholders; 3) bring more visibility to alliance Market Transformation outcomes and market progress indicators in addition to energy savings; and 4) build capacity for in-house data management and analysis.

Market Research and Evaluation (MRE) – MRE provides actionable insights for alliance Market Transformation programs throughout their lifecycles and conducts formal evaluations of programs in market development. These research and evaluation efforts provide data and analytical services for the benefit of Puget Sound Energy customers. In 2023, the alliance delivered more than 19 market research or evaluation reports to support both electric and natural gas opportunities for energy efficiency, all of which are publicly available on neea.org.

Stock Assessments – In 2023, the alliance's efforts included the completion of recruitment and data collection for the ongoing 2022 RBSA, a comprehensive study of single-family and multi-family building characteristics and energy use. NEEA staff held monthly workgroup meetings throughout the year to collect input from stakeholders, including Puget Sound Energy, on topics critical to the study's success, including revised multi-family recruiting and data collection approaches needed to adapt to low response rates due, in part, to the lingering effects of the COVID-19 pandemic. These discussions resulted in a decision to focus on tenant units and de-emphasize building-level data collection, such as central HVAC systems. NEEA completed building characteristic and energy use data collection for the 2022 RBSA in 2023 and anticipates publishing the accompanying data and reports in early Q2 2024.

Also in 2023, NEEA staff kicked off planning for the 2025 CBSA. Similar to the RBSA, the 2025 CBSA is a regional study that collects building characteristic and energy use data on commercial and multi-family buildings. The 2025 CBSA will be the first CBSA to include multi-family buildings.

Northwest End-Use Load Research (EULR) – The project continued collecting data for its Home Energy Metering Study (HEMS) and Commercial Energy Metering Study (CEMS) on select residential and commercial electric end-uses. The end-uses metered for the study include ductless heat pumps, ducted heat pumps, heat pump water heaters, central air conditioning, forced-air furnaces and baseboard heaters. One-minute-interval data are being collected by circuit for each participating residential and commercial building. As the largest end-use load research project in the Northwest since the 1980s, this work will greatly support regional planning and program design. Puget Sound Energy is a contributing funder and collaborator for the research, with its staff participating in technical advisory and oversight roles. In 2023, NEEA completed installations for 400 residential homes and 70

commercial office/retail buildings. Using the data, the Regional Technical Forum used the information from previous years to calibrate its new Energy Efficiency and Demand Response tool, which analyzes residential building energy models in EnergyPlus. Additionally, regional utilities and the National Renewable Energy Laboratory used the data to update/calibrate their energy use load shapes. Meanwhile, universities, consultants, utilities, and other organizations from all over the world are downloading the 15-minute interval public data available on neea.org.

PRIMARY BUSINESS PLAN STRATEGY: CONVENE AND COLLABORATE

The alliance's Convene and Collaborate strategy is carried out by NEEA's Stakeholder Relations, Corporate Strategy and Communications Division.

Efficiency Exchange (EFX) – EFX is an annual conference hosted in collaboration with Bonneville Power Administration and the Northwest Power and Conservation Council. In May 2023, the first hybrid conference was held in Portland with regional attendees meeting in person for the first time since 2019. The event included 430 in-person attendees and 116 virtual attendees with 24 sessions and two keynotes. The conference covered a range of topics including: the Inflation Reduction Act, demand flexibility, equity in energy efficiency, and advanced heat pump technologies. More information on the conference, including details for the Efficiency Exchange 2024 on May 14-15, 2024 in Coeur d'Alene, Idaho, can be found on neea.org.

Alliance Support of Clean Energy Implementation Plan (CEIP) PSE Indicators

Puget Sound Energy's participation in the alliance supports the achievement of its CEIP goals. In 2023, alliance activities contributed to several CETA Category Indicator Metric Baseline data (2020) Energy Benefits, including:

Non-energy Benefits Burden Reduction – *Improved participation in clean energy programs from highly impacted communities and vulnerable populations*

NEEA works within the supply chain to accelerate the availability and adoption of energy efficiency products that meet the needs of Puget Sound Energy's customers, including highly impacted and vulnerable populations. NEEA's portfolio of Market Transformation programs includes electric, natural gas and dual-fuel technologies, which contribute to healthier and more energy-efficient homes regardless of fuel choice. In 2023, the alliance participated with AEA on an EPIC grant to better understand the barriers to retrofitting existing building stock with central heat pump water heaters, most of which are located in low-income housing in urban and rural locations. Additionally, the alliance advanced the development of emerging technologies that have the potential to deliver benefits to vulnerable and impacted populations. For example, micro heat pumps are a DIY technology opportunity that could be an efficient and affordable option for existing multifamily and single-family households, including those that suffer from higher energy burdens, impacts from extreme weather events, and exposure to poor air quality. NEEA's work to support a test procedure and rating for these products will eventually enable products to become eligible for federal tax credits, reducing upfront costs for consumers in the Puget Sound Area.

Non-energy Benefits – *Increase in quality and quantity of clean energy jobs*

The alliance provides energy efficiency training and education to a broad range of clean energy professionals to help differentiate themselves from competitors and build the skills necessary to promote, install, and maintain energy-efficient products, including luminaire level lighting controls, high-

performance HVAC and efficient pumps. NEEA also supports a broad network of regional energy efficiency contractors that it engages to support program implementation, research and data-collection efforts. Trade allies, building owners and other supply chain actors receive timely and informative information through NEEA's market-facing websites, including HotWater Solutions and via curated resource libraries like BetterBricks and BetterBuiltNW. And the alliance partners with organizations across the Northwest to provide technical assistance and training on the current and upcoming residential and commercial energy codes, ensuring that Northwest trade allies have equitable access to training and skills to meet evolving energy codes.

Non-energy Benefits – *Improved home comfort*

Many of the products and practices that NEEA advances through its Market Transformation programs directly increase home comfort by improving indoor air quality, enhancing space heating and cooling year-round, and contributing to a tighter building envelope. These products include heat pump water heaters, high-performance windows, manufactured homes, consumer products and advanced heat pumps. Through the alliance's codes and standards efforts, in 2023 NEEA staff collaborated with partners to submit more than 27 comment letters in response to U.S. DOE RFIs and NOPRs. NEEA provided regional sales data, lab and field-testing results, and technical data to support recommendations for enhanced test procedures and improved efficiency levels for more than 25 products that will deliver improved home comfort.

Reduction of Burdens – *Increase in culturally- and linguistically accessible program communications for named communities*

On behalf of the region, NEEA conducts market research, fields regional building stock assessments, and conducts training and education to advance Market Transformation. When language is identified as a barrier to participation, NEEA will often provide bilingual materials to increase accessibility. For example, all of the communications related to data collection for NEEA's Residential Building Stock Assessment were provided in both Spanish and English to enhance participant accessibility and ensure a more representative sample of study participants.

Cost Reduction Burden Reduction – *Improved affordability of clean energy*

Energy efficiency reduces energy bills and can help alleviate energy burden for vulnerable and highly impacted communities. NEEA supports Puget Sound Energy's affordability goals by accelerating the availability of efficient technologies and removing market barriers to adoption and awareness. Increased accessibility and awareness builds demand for more efficient products leading to higher market adoption, lower costs and reduced pricing to the customer.

Environment – *Reduced greenhouse gas emissions*

Alliance Market Transformation programs contribute to the reduction of greenhouse gas emissions and support Puget Sound Energy's carbon reduction goals by ensuring the most efficient products, technologies and best-practice applications become the standard practice. NEEA's Cycle 6 carbon reduction goal is 419,000–554,000 tons of avoided CO_2. In 2022, NEEA's electric and natural gas Market Transformation efforts resulted in an estimated 176,000 tons of avoided CO_2 emissions. The alliance will publish 2023 results with NEEA's 2023 Annual Report in June 2024.

Resilience – *Reduction in peak demand through demand response programs*

When timed right, energy efficiency programs can reduce demand on the energy system at times of peak load. Where it supports NEEA's Market Transformation objectives, NEEA works with manufacturers to incorporate demand response capabilities into efficient products. For example, the CTA-2045 port identified in NEEA's Advanced Water Heating Specification (AWHS) was officially adopted into Washington State code in 2023. The updated code requires that all water heaters must be CTA-2045 enabled. CTA-2045 supports load flexibility solutions by allowing the connection of an otherwise disconnected device to the electric grid. Also in 2023, the alliance convened the region around end-use load flexibility, a specially funded project that Puget Sound Energy is a participating member of, alongside nine other Northwest utilities and energy efficiency organizations. Flexible end-use load resources can help with system integration of the renewable resources and contribute to filling an expanding capacity gap by helping to meet system peaks and allowing for more flexibility in load control. The end-use load flexibility project officially kicked off in 2024 and will support and explore Market Transformation opportunities to enhance the region's capacity to manage electric loads.

Public Health – *Improved air quality and community health*

Energy efficiency contributes to reductions in emissions from coal-fired power plants, including sulfur dioxide, nitrogen dioxide and particulate matter, which are closely associated with adverse health outcomes from poor air quality. Alliance Market Transformation programs deliver energy efficiency savings to Puget Sound Energy, which supports Puget Sound Energy's CEIP Public Health goal.

REGIONAL COORDINATION

Alliance programs are coordinated through regional working groups and committees, whose membership includes representatives from Puget Sound Energy. NEEA staff formally solicits input from the Regional Portfolio Advisory Committee (RPAC) and Natural Gas Advisory Committee (NGAC), the bodies responsible for overseeing the alliance's Market Transformation portfolio at critical program decision points. NEEA staff is grateful for the time and energy Puget Sound Energy staff dedicates to participating in these forums and on NEEA's Board of Directors, with members including:

Board of Directors: Gilbert Archuleta

Regional Portfolio Advisory Committee: Jeff Tripp

Integrated Systems Coordinating Committee: Michael Lane, Mark Lenssen

Products Coordinating Committee: William Dixon, Patrick Weaver

Regional Emerging Technology Advisory Committee: Corey Corbett, Michelle Wildie

Natural Gas Advisory Committee: Michelle Wildie

Cost Effectiveness Advisory Committee: Kasey Curtis

Northwest End Use Load Research Steering Committee: Mark Lenssen

Northwest End Use Load Research Working Group: Nick Gemperle, Michelle Wildie

Residential Building Stock Assessment Working Group: Jesse Durst, Michelle Wildie

Commercial Building Stock Assessment Working Group: Corey Corbett, Kasey Curtis

ADDITIONAL INFORMATION

For additional information, NEEA's 2023 Quarterly Performance Reports, newsletters and the 2022 Annual Report are available online at neea.org. NEEA's 2023 Annual Report will be available in June 2024.

NEEA staff encourage stakeholder participation and appreciate input at all NEEA board meetings, committee meetings and energy efficiency events around the region. The next NEEA Board of Directors meeting will be held in Seattle, WA on March 12, 2024. Meeting details will be posted on neea.org in advance.

Please direct questions or comments about this report to info@neea.org.