

# 2018 Q3

# Emerging Technology Quarterly Report

## IN THE SPOTLIGHT:

### What's New



Summer is here and temperatures are heating up making cooling a “hot” topic (pun intended). NEEA staff are actively investigating a variety of cooling technologies ranging from a heat recovery ventilator to clothing that keeps people comfortable over a broad range of environments. The heat recovery ventilator by Ventacity provides fresh air even in hot conditions without losing the cool air from the building. It also provides full economizing and night flush capabilities to further reduce the cooling load. Textiles researched by Standard University demonstrated the ability to cool the skin by 2-3 degrees C, enabling higher HVAC set points while maintaining comfort.

While you are enjoying our beautiful summer, remember to email us any questions or suggestions you have about technologies you discover. We greatly appreciate your thoughts.

~ Mark Rehley, Sr. Manager ~

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# Readiness Levels\*

## AT A GLANCE

Ratings based on 1=low & 5=high

PRODUCT  
PERFORMANCE\*

MARKET/  
COMMERCIAL\*

PROGRAM\*



## Residential

Combo Electric Hot Water & Space Heat - CO2 (Carbon Dioxide)

1

1

1

Connected Thermostats

3

5

4

Ductless Heat Pump Product Innovations and Channel Developments

2

3

3

Ultra-High Definition TVs

3

5

5



## Commercial

Luminaire Level Lighting Controls

2

3

3

Luminaire Level Lighting Controls with HVAC Control

2

3

3

Very High Efficiency DOAS

6

4

4



## Industrial/ Agricultural

Compressed Air Saving Unit

2

3

3

Pivot Commissioning

1

1

1

Pump Operator Certification

2

3

5



## Cross-Sector

Advanced Research Projects Agency - Energy (ARPA-e)

1

1

1

Extended Motor Products

3

2

3

Inverter Driven Packaged Terminal Heat Pump

1

3

1

Split-system Heat Pump Water Heater

3

3

4

Switch Reluctance Motors

3

3

3

Window Attachments

3

3

3

\*Full Readiness Level Definitions provided on pages [9](#) & [10](#)

\*PRODUCT PERFORMANCE READINESS: Measurement of energy savings viability, fitness for use, and the Regional Technical Forum measure status if applicable

\*MARKET/COMMERCIAL READINESS: Measurement of supply chain maturity, product availability, presence of market failures, and lack of market maturity

\*PROGRAM READINESS: Measurement of cost effectiveness, program delivery and interventions, and a risk assessment of technical, market, program and regulatory risk



# Residential

## EMERGING TECHNOLOGY PROJECTS

### *Combo Electric Hot Water and Space Heat - CO2 (Carbon Dioxide)*

**Product description:** An integrated appliance providing space and water heating with CO2 as a refrigerant

**Product objective:** To demonstrate the performance and adaptability of Eco Runo heat pump-based space and domestic water heating systems in existing homes.

**Project update:** As of June 2018, eight Sanden 2.25-ton Eco Runo heat pump systems have been installed in recruited existing homes. Two more Electric Forced Air Furnace (EFAF) sites are needed, so please contact Charlie Stephens (503-688-5457, cstephens@neea.org) or Ken Eklund at Washington State Universtiy (WSU) (360-956-2019, or eklundk@energy.wsu.edu) if you are interested in partnering on this project.

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Product	1	Comm/Market	1	Program	1
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### *Connected Thermostats*

**Product Description:** Residential thermostats that control various heating and cooling equipment, utilize weather and occupancy data to better manage the systems, and engage homeowners to more closely manage energy use and comfort.

**Project Objective:** The Consumer Products Strategic Market subcommittee of the Region Portfolio Advisory Committee identified connected thermostats as a regional priority, and following a workshop on January 11, 2018, the committee recommended forming a savings task force to develop the following:

- A prioritized set of research questions to guide research project selection and design.
- A prioritized set of research projects with budget and timeframe estimates.

**Project Status:** Team members have been recruited and planning for meetings in July is under way.

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Product	3	Comm/Market	5	Program	4
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# Residential

## EMERGING TECHNOLOGY PROJECTS

### *Ductless Heat Pump (DHP) Product Innovations and Channel Developments*

**Product Description:** HVAC split systems, including ductless split systems, utilize variable speed (inverter-driven) compressors and fans.

**Project Update:** Maximizing Mini-Split Performance: NEEA staff are working with PNNL and other partners on a project to identify 2-4 low cost standards of practice and/or technology solutions to maximize the annual performance of a DHP (mini-split) when installed in a home with a pre-existing heating system. Phase 1 is complete (identifying all use cases and currently available products). Phase 2 is underway (multi-zone building simulation to estimate performance).

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Product	2	Comm/Market	3	Program	3
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### *Ultra-High Definition (UHD) TVs*

**Product Description:** 4K Ultra high definition (UHD) TVs with various forms of advanced display technologies.

**Project Objectives:**

- Support new revision of ENERGY STAR specification and federal test procedure for standard definition resolution (SDR) TVs to address eco feature persistence
- Collaborate on development of new IEC (International Electrotechnical Commission) test clip to address UHD and HDR (high dynamic range)

**Project update:** Completed testing in preparation of the Department of Energy's (DOE) Notice of Proposed Rulemaking (NOPR) for test method revision and proposed revised SDR test clip approach.

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Product	3	Comm/Market	5	Program	5
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# Commercial

## EMERGING TECHNOLOGY PROJECTS

### *Luminaire Level Lighting Controls (LLLC)*

**Product Description:** Advanced lighting control systems, either with wireless sensors or with luminaire integrated lighting controls, providing occupancy-sensor and light-level control plus energy metering.

**Project Update:** The Next Generation Lighting Systems (NGLS) competition in 2017 selected connected lighting for testing its installation, commissioning and energy performance in a real world test location. Competition Two is now closed for entries. Installations took place in January 2018, and the installed systems will join the Competition One systems in the Living Lab at Parson's School of Design in NYC. NEEA staff have participated as observers and judges.

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Product	Comm/Market	Program	
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### *Luminaire Level Lighting Controls (LLLC) with HVAC Control*

**Product Description:** Luminaire level lighting controls with additional sensors and supports for HVAC control

**Project Update:** The goal is to have a site located in Q3 2018 and to start testing before the end of the year. NEEA Staff will be monitoring a couple of pilots that include LLLC and HVAC done by Seventhwave, out of the Mid-West.

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Product	2	Comm/Market	3	Program	3
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# Commercial

## EMERGING TECHNOLOGY PROJECTS

### *Very High Efficiency Dedicated Outside Air Supply (VHE DOAS)*

**Product Description:** Replacing packaged rooftop units with a combination dedicated outdoor air system, heat recovery ventilator, and high efficiency heat pump. Key distinguishing feature is the separation of ventilation from heating and cooling via Dedicated Outside Air System (DOAS) with high efficiency heat recovery ventilation system.

**Project Objectives:**

- Demonstration of feasibility and savings potential in different building types and climates.
- Energy modeling improvements for DOAS/HRV (heat recovery ventilator) systems and development of design tools.

**Project Update:** Four pilot projects are complete with draft technical reports prepared. Three additional projects have completed data collection and are in the analysis stage with reports expected in Q4 2018. Two projects have equipment installed and are collecting data into Q1 2019. Three additional projects (strip retail, big box retail and primary school) are being sought to fill data gaps.

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Product	6	Comm/Market	4	Program	4
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# Industrial/Agricultural

## EMERGING TECHNOLOGY PROJECTS

### *Compressed Air Saving Unit*

**Product description:** Variable control air nozzle for compressed air open blowing applications.

**Project Objectives:** Savings value for Regional Technical Forum (RTF) to review.

**Project update:** Moving forward to get 10 test sites metered up to validate savings and present findings to the RTF. RTF has assigned analyst and will be on the docket later this year or early 2019.

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Product	2	Comm/Market	3	Program	3
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### *Pivot Commissioning*

**Product description:** Assessment services designed to maintain efficiency of pivot irrigation equipment.

**Project Objectives:** Develop Pivot Commissioning protocol and method, and measure energy savings potential.

**Project update:** On hold while NEEA staff consider options for irrigation emerging technologies.

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Product	1	Comm/Market	1	Program	1
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### *Pump Operator Certification*

**Product description:** Certification program for key processes, important steps and proven methodologies to manage and conduct any type of pumping systems audit, available through Pump Systems Matters.

**Project Objectives:** Identify ways that a Pumps System Assessment Professional (PSAP) can support energy savings.

**Project update:** The Hydraulic Institute (HI) is continuing to work on getting enough pump system assessment professionals to take the test to validate the exam. Following this, NEEA staff will access the projects to determine if energy was saved and if the certification is useful to our region.

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Product	2	Comm/Market	3	Program	3
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# Cross-Sector

## EMERGING TECHNOLOGY PROJECTS

### Advanced Research Projects Agency-Energy (ARPA-e)

Approximately every three years, ARPA-E issues OPEN Funding Opportunity Announcements (FOAs) as a means to address the full range of energy-related technologies and fund those potentially disruptive technology concepts not currently supported through an ARPA-E focused FOA. ARPA-E selects individuals and organizations with experience in the energy sector to review and rate applications for funding. NEEA staff was invited by ARPA-E to review 20+ initial OPEN funding proposals, including LED lighting, window attachments, and HVAC. Later this year NEEA staff will review the second round of full proposals. The proposals give NEEA staff visibility of a range of pre-commercialized technologies that might impact future energy efficient products for our region.

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Product	1	Comm/Market	1	Program	1
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### Extended Motor Products (XMP)

**Product Description:** Integrated motor systems with optimized performance to a system curve. Includes motor, controller, and fan / pump / compressor combinations

**Fan Product Description:** Fan, motor and integrated controls

**Fan Project Objectives:** Develop standardized specification, testing method and label to make fan selection reflect performance and energy use.

**Fan Project Update:** NEEA staff are continuing to work with ACEEE committee to develop test method, specification and label for fans.

**Pump Project Objectives:** Validate RTF planned savings for clear water pumps and circulators.

**Project update:** Scope of research is defined; the contract has been let for both primary and secondary research. It looks like PG&E will be adding funding. Research should be complete in 12-18 months. It will then go to the RTF for “proven” status.

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Product	3	Comm/Market	2	Program	3
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# Cross-Sector

## EMERGING TECHNOLOGY PROJECTS

### *Inverter Driven Packaged Terminal Heat Pump (IPTHP)*

**Product description:** All-in-one packaged heat pumps that use inverter driven variable refrigerant compressors found in mini-split systems. Similar to conventional packaged terminal air conditioners (PTAC) found in many hotels but significantly quieter and more efficient.

**Project Update:** In Q4, 2017 modeling analysis showed that IPTHPs have good savings potential if they have cold temperature performance. NEEA staff continues to look for inverter driven PTHPs that have a defrost strategy. The National Renewable Energy Lab (NREL) is developing a mini-split version of a PTAC that NEEA staff hope to use in a field test in Q4 of 2018. Friedrich has a variable speed version of their Vert-I-Pak that NEEA staff is considering for the new CSA Heat Pump test procedure.

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Product	1	Comm/Market	3	Program	1
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### *Split-system Heat Pump Water Heater*

**Product description:** Split-system heat pump water heaters separate the heat pump from the water tank. These products offer a heat pump alternative for locations where the integral product doesn't fit.

**Project update:** Lab testing has been completed on the VKIN split system heat pump. The performance of the hot water delivery was not acceptable. The manufacturer is reviewing the results and future work is on-hold pending product updates.

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Product	3	Comm/Market	3	Program	4
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# Cross-Sector

## EMERGING TECHNOLOGY PROJECTS

### Switch Reluctance Motors

**Product Description:** A Switched Reluctance Motor (SRM) is a type of stepper motor, an electric motor that runs by reluctance torque. It is easier to control and has greater efficiency at part load conditions.

**Project Description:** Documentation from manufacturers and the market look promising, but a research project hasn't been started. Several utilities around the country are also evaluating SRM, and NEEA staff are hoping to learn more from those efforts before starting a research project in our region.

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Product	3	Comm/Market	3	Program	3
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### Window Attachments

**Product Description:** Products that attach to existing low performance windows to increase their energy performance; includes films, blinds, storm windows, secondary glazing systems, awnings, etc.

**Project Objective:** Estimate savings potential for films.

**Project Description:** NEEA staff are now finalizing a savings potential and economic analysis of Low-e Surface Applied Films (SAF). A computer energy modeling study was commissioned and the preliminary report is initially estimating a building savings range of from 5-12%. NEEA staff is also closely following new product research and development including a suspended laminated films light bending dynamic films for a lightweight Secondary Glazing Systems (SGS) product.

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Product	3	Comm/Market	3	Program	4
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# Definitions

## MARKET & COMMERCIAL READINESS

	Level 1	Level 2	Level 3	Level 4	Level 5	
<b>Supply Chain Maturity / Product Availability</b>	Not commercially available or limited, pre-commercial availability	Commercially available outside of the Northwest  Requires special order in Northwest	Commercially available in NW from 1 manufacturer through standard channels	Commercially available in NW from at least two manufacturers  Stocked throughout the region	Commercially Available from 2+ manufacturers, well developed supply chain  Widely and easily available	
<b>Presence of Market Failures / Lack of Market Maturity</b>	N/A	Existing market not ready, but similar to other successfully transformed markets warranting further efforts  Limited market awareness	Limited market research suggests market failures/barriers and opportunities to intervene  Growing market interest	Market characterization provides details on barriers and opportunities, some barriers already being addressed  Growing desire for product	Market is starting to function well and appears on path to sustainable, financial viability	

## PRODUCT PERFORMANCE READINESS\*

	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
<b>Energy Savings Viability</b>	Concept not validated	Concept validated	Limited assessment	Extensive assessment	Comprehensive analysis	Approved
<b>Fitness for Use</b>	Claims of energy savings may not be credible due to lack of documentation or validation by unbiased experts	An unbiased expert has measured technology characteristics and factors of energy use through one or more tests in typical applications with a clear baseline	An unbiased expert has measured technology characteristics and factors of energy use through one or more test in typical applications with a clear baseline	Additional testing in relevant applications and environments has increased knowledge of performance across a broad range of products, applications, and system conditions	Results of lab and field tests have been used to develop methods for reliable prediction of performance across a broad range of products, applications, and system conditions	Protocols are established and approved (by reaching RTF “approved” level)
<b>RTF Measure Status (if applicable)</b>		Planning	Planning	Provisional	Provisional	Proven

# Definitions cont...

## PROGRAM READINESS

	Level 1	Level 2	Level 3	Level 4	Level 5	
Cost Effectiveness	N/A	Not cost effective, but preliminary analysis shows a pathway to cost effectiveness	Not cost effective, but shows pathway to cost effectiveness with higher volumes, more competition, improved technology	Marginally cost effective levels	Cost effective	
Program Delivery/ Interventions	No program design	Limited program design	Preliminary program design, small-scale pilots	Program design complete, larger scale pilots underway	Ready for full-scale programs	
Risk Assessment (Technical, 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 in place	



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**TOGETHER** We Are Transforming the Northwest

