

2017 Q4

Emerging Technology Quarterly Report

IN THE SPOTLIGHT:



Welcome to the New Emerging Technology Report!

Welcome to NEEA's emerging technology quarterly report. The report is a work in progress, as NEEA staff assembled this report by exercising our regional pipeline database available on ConduitNW. Over future quarters, we will continue to refine the report to make it more valuable. For this quarter we are testing a new report format along with a summary of technology readiness levels. We are interested in your feedback. Please let us know if you have any suggestions or questions.

Pipeline Health Update

NEEA's pipeline is healthy with a number of promising technologies. A new project was added, focused on advanced occupancy sensors supporting an ARPA-E (The Advanced Research Projects Agency-Energy) solicitation for test method development and product testing. The next generation occupancy sensors are considered a core element of advanced building control include HVAC (Heating, ventilation, Air Conditioning), lighting, and plug loads.

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Readiness Levels*

AT A GLANCE

Ratings based on 1=low & 5=high

PRODUCT
PERFORMANCE*

MARKET/
COMMERCIAL*

PROGRAM*



Residential

Combo 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

Very High Efficiency DOAS

4

3

2



Industrial/ Agricultural

Compressed Air Saving Unit

2

3

3

Pivot Commissioning

1

1

1

Pump Operator Certification

2

3

5



Cross-Sector

ARPA-e Advanced Occupancy Sensor

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

Window Attachments

3

3

3

*Full Readiness Level Definitions provided on pages [11](#) & [12](#)

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

To date, four Sanden 3-ton Eco Runo heat pump systems have been installed in the field and are collecting data to prove energy savings and good performance. All serve in-floor radiant heating systems, and all but one are also using the Sanden system to provide domestic hot water. Two are in McCall, ID, one is in Stevensville, MT, and one is in Portland.

We are currently recruiting 6 existing homes with electric forced air furnaces and electric resistance water heaters for a retrofit of both systems to a combined Eco Runo-based system. Hydronic air handlers for the project were manufactured by AirScape Fans in Medford, OR. They have permanent magnet DC (direct current) fan motors and are equipped for cooling (they have condensate drains).

Utilities that would like to partner in these projects and have a candidate home should contact Charlie Stephens (information below). Candidate homes should have a design heating load no greater than 30,000 Btu/hr and have reasonable access to building spaces and services for running power and water lines between the outdoor unit and the indoor air handler and water heater.

Product Manager: Charlie Stephens
 cstephens@neea.org
 503.688.54857

| | | | | | |
|-------------|---|---------|---|---------|---|
| Comm/Market | 1 | Product | 1 | Program | 1 |
|-------------|---|---------|---|---------|---|

Connected Thermostats

The Regional Emerging Technology Advisory Committee (RETAC) will be convening a group to discuss collaboration around tstats, and the Consumer Products Regional Market Strategy has identified it as a priority product.

Some of the regional projects regarding connected thermostats are as follows:

- Bonneville Power Administration (BPA) Smart Residential Thermostats Indoor Temperature Baseline Study
- Regional Technical Forum (RTF) Research Proposal - Regional baseline thermostat behavior
- RTF Research proposal - Determine energy savings and performance metrics
- Evaluating Smart Thermostats' Impacts on Energy Efficiency and Demand Response (TIP 272b)
- Field Test of Nest Smart Thermostat with Franklin PUD

Product Manager: Dave Kresta
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 503.688.5459

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



Residential

EMERGING TECHNOLOGY PROJECTS

Ductless Heat Pump (DHP) Product Innovations and Channel Developments

The current DHP product innovations are broken into the following three phases:

Phase 1 - Identifying current quick connect products

- More than 8 DHP companies offer a quick connect option, but only 2 come with warranties.

Phase 2a - Install 4 units into homes

- Four test units from 2 manufacturers have been installed in the Portland Metro Area to prove quick connect connector performance. Initial results look very promising. Leak tightness testing will continue for one year with regular check ins to verify performance. A 75 day leak test was completed with no leaks detected. NEEA has a report and recommendations for manufacturer improvements.

Phase 2b - Due diligence of connector quality regarding quick connectors (currently underway)

Phase 3 - Field test by homeowners to ensure similar connector quality results (pending phase 2 findings)

Product Manager: Christopher Dymond

| | | | | | |
|-------------|---|---------|---|---------|---|
| Comm/Market | 2 | Product | 3 | Program | 3 |
|-------------|---|---------|---|---------|---|

cdymond@neea.org
503.688.5454

Ultra-High Definition (UHD) TVs

DOE has issued a pre-publication Federal Register advance notice of proposed rulemaking (ANOPR) pertaining to the test procedure for television sets (January 19, 2017). DOE is seeking to determine if the existing TVs test procedure needs to be amended to ensure that a TV is configured for testing during a representative use cycle or period of use.

ENERGY STAR Version 8 development process is still underway as of Sept 25, 2017 and is planned to be finalized within the next month. It will go into effect in 2018. E*v8 updates are focused on addressing manufacture certification testing irregularities around Automatic Brightness Control (ABC) and Motion Detection Dimming (MDD). NEEA has been active in the specification revision process.

UHD TVs are in NEEA's Retail Product Portfolio program.

Product Manager: Nick Leritz

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|-------------|---|---------|---|---------|---|
| Comm/Market | 3 | Product | 5 | Program | 5 |
|-------------|---|---------|---|---------|---|

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Commercial

EMERGING TECHNOLOGY PROJECTS

Very High Efficiency Dedicated Outside Air Supply (DOAS)

This work has evolved out of the previous advanced HVAC (heating, ventilating, air conditioning) and Roof Top Unit project. There are currently seven projects that have been installed and are collecting data to prove energy savings and good performance, while one additional project is in process. The early projects are in the wrap-up stage.

Three projects have a full year of post-installation utility bill data, and analysis is proceeding for the final reports and case studies.

Monitoring at the two Corvallis sites will be discontinued in the first week of October, and the analysis for the first project site – an office in Portland – is nearly complete.

The final whole-building EUI (Energy Use Intensity) from the Portland site, based on energy bills, is 19 kBtu/sf-yr, which is substantially lower than expected.

Product Manager: John Jennings
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 503.688.5471

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



Industrial/Agricultural

EMERGING TECHNOLOGY PROJECTS

Compressed Air Saving Unit

Based on the result of an early assessment of the Air Saver Unit by Parker Hannifin, NEEA staff is preparing to request that a new program be started to support market transformation efforts for this product. A request to the Regional Portfolio Advisory Committee (RPAC) is expected in Q2, 2018.

Product Manager: Geoff Wickes
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 503.688.5456

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|-------------|---|---------|---|---------|---|
| Comm/Market | 2 | Product | 3 | Program | 3 |
|-------------|---|---------|---|---------|---|

Pivot Commissioning

Proper commissioning of pivot irrigation systems should improve crop yield and quality and reduce water use and maintenance. Bonneville Power Administration's (BPA) research is complete, and NEEA staff is now considering the scope and research questions for irrigation. A research plan will be ready in Q1, 2018.

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 503.688.5456

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|-------------|---|---------|---|---------|---|
| Comm/Market | 1 | Product | 1 | Program | 1 |
|-------------|---|---------|---|---------|---|

Pump Operator Certification

This Pump Systems Assessment (PSA) Certificate Program will offer eight professional development hours and provides a certificate of completion from the Hydraulic Institute.

A fundamental understanding of centrifugal pump design with basic math skills along with understanding of entry level hydraulic engineering principles is recommended.

Registrants have 60 days to complete this program beginning on the day of registration.

NEEA staff is exploring ways to test if a link between a Pumps System Assessment Profession (PSAP) and energy savings exists.

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 503.688.5456

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



Cross-Sector

EMERGING TECHNOLOGY PROJECTS

Advanced Research Projects Agency-Energy (ARPA-e) Advanced Occupancy Sensor

The overall objective of the SENSOR program is to reduce energy used by HVAC systems in buildings by 30%, in both residential and commercial buildings, through development of new classes of sensor systems: human presence sensors (for residential use), people counting sensors (for commercial use), and low-cost CO2 (carbon dioxide) sensors (as a critical enabling technology for Variable Air Volume (VAV) actuation in commercial buildings). There is a key need in this application space for testing and validation research that can fully assess and validate these technologies in a variety of building spaces, under variable usage patterns, climates and HVAC systems in order to fully assess and validate the energy savings from these particular technologies.

In Q3, NEEA Staff reviewed and graded final proposals for ARPA-e. In Q4 NEEA staff will be traveling to meet with other reviewers in Washington, DC to make final review grades to determine who will advance to receive the ARPA-e funding.

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 503.688.5484

| | | | | | |
|-------------|---|---------|---|---------|---|
| Comm/Market | 1 | Product | 1 | Program | 1 |
|-------------|---|---------|---|---------|---|

Extended Motor Products (XMP)

Circulator water pumping systems received unanimous approval on March 21 for provisional energy savings from the Regional Technical Form (RTF). NEEA staff is continuing to participate actively with the American Council for the Energy Efficient Economy (ACEEE) and industry market actors to expand this approach to compressors and fans.

NEEA staff are also preparing to request a new program be formed to support market transformation efforts with motor systems. The request will likely be submitted to the Regional Portfolio Advisory Committee (RPAC) in Q4, 2017.

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 503.688.5456

| | | | | | |
|-------------|---|---------|---|---------|---|
| Comm/Market | 3 | Product | 2 | Program | 3 |
|-------------|---|---------|---|---------|---|



Cross-Sector

EMERGING TECHNOLOGY PROJECTS

Inverter Driven Packaged Terminal Heat Pump (PTHP)

NEEA has begun preliminary investigation of current equipment manufacturers and distributors. Only a few 9,000-15,000 BTU/hr options are currently available, costing roughly \$1.1k.

A potential do-it-yourself system that uses a 120V source could be an option for motels, manufactured homes and apartment buildings

Staff have identified two inverter driven PTHPs currently without a defrost capability. This limits them to above ~45F ambient temperature and presents an opportunity for product improvement.

NEEA is considering what steps should be taken next. To be effective energy savings devices that operate below 45F, a strategy is needed to deal with meltwater from the defrost cycle.

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503.688.5454

| | | | | | |
|-------------|---|---------|---|---------|---|
| Comm/Market | 1 | Product | 3 | Program | 1 |
|-------------|---|---------|---|---------|---|

Split-system Heat Pump Water Heater

The VKIN is a product from China currently being lab tested.

This product is available in the Northwest and North America in general. The Regional Technical Forum (RTF) issued a “Planning” status on the Tier 4 Sanden product, but it is currently challenged by the cost effectiveness. NEEA staff plan to publish the Advanced Water Heater Specification qualified products list after the working group has a chance to review the reports.

NEEA staff is preparing a proposal that split system water heaters should be incorporated into NEEA’s portfolio as a part of the heat pump water heater program, for the Regional Portfolio Advisory Committee (RPAC) that will be reviewed in 2017.

The Sanden split system CO2 (carbon dioxide) water heater is now listed on the Advanced Water Heater qualified products list.

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| | | | | | |
|-------------|---|---------|---|---------|---|
| Comm/Market | 3 | Product | 3 | Program | 4 |
|-------------|---|---------|---|---------|---|



Cross-Sector

EMERGING TECHNOLOGY PROJECTS

Window Attachments

The Secondary Glazing Systems (SGS) Regional Technical Forum (RTF) Calculator was submitted for review in Q4 2017.

Other important work being done here includes:

- Conducting Savings and Economic Analysis of Surface Applied Films (SAF) with Solarc in Q4 thru Q1 2018
- Working with Wausau Window and Wall Systems on recently completed large office building Secondary Glazing Systems (SGS) Case Study
- Testing the Performance and Dynamic Control of Energy-Efficient Cellular Shades (TIP 392)
- Examining cost-effective materials for existing homes, the persistence of savings through Automated Operation of Dynamic Systems, and the benefits of coordinating Cellular Shades with HVAC (Heating, Ventilation, Air Conditioning) Demand-Response Events

At this time, the blinds do not appear to be cost effective in Oregon. We are following the developments at the Attachements Energy Rating Council (AERC) and may re-examine options at a later date.

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|-------------|---|---------|---|---------|---|
| Comm/Market | 3 | Product | 3 | Program | 3 |
|-------------|---|---------|---|---------|---|

Removed/Moved Projects

| DATE RECEIVED | PROJECT | Previous Update (Q2) | DECISION | EXPLANATION OF DECISION |
|---------------------------|----------------------|--|------------------------------|---|
| <p>Quarter 3 2017</p> | <p>Dynamic Glass</p> | <p>Seattle Integrated Design Lab conducted a one-year evaluation study of a 90,000 SF six story UNICO office building in Seattle with electrochromic primary window replacement manufactured by VIEW. This (successful) study is now complete and is published on NEEA.org. NEEA staff are considering next steps.</p> | <p>Removed from pipeline</p> | <p>Dynamic glass was removed for now as we wait for more cost effective products to come to market.</p> |

Definitions

MARKET & COMMERCIAL READINESS

| | Level 1 | Level 2 | Level 3 | Level 4 | Level 5 | |
|--|--|---|---|---|--|--|
| Supply Chain Maturity / Product Availability | 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 | |
| Presence of Market Failures / Lack of Market Maturity | 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 |
|---|---|--|--|---|---|---|
| Energy Savings Viability | Concept not validated | Concept validated | Limited assessment | Extensive Assessment | Comprehensive analysis | Approved |
| Fitness for Use | 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 tests 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) |
| RTF Measure Status (if applicable) | | 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 | |

CONTACT US:

- Request feedback
- [Suggest technologies](#)



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TOGETHER We Are Transforming the Northwest

