



Emerging Technologies: Field Tests and New Technologies

Presented 5/8/12 by:

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BPA Energy Efficiency

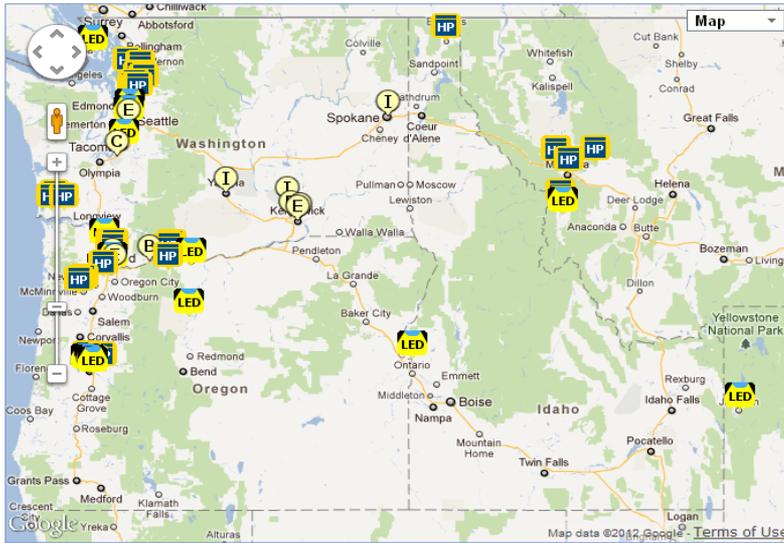


Agenda

- Current research
- New research methods – ET Field Test
- Potential future field tests
- Utility experience
- Keeping abreast

Collaboration

Northwest Utilities



Current Research

Focus Areas

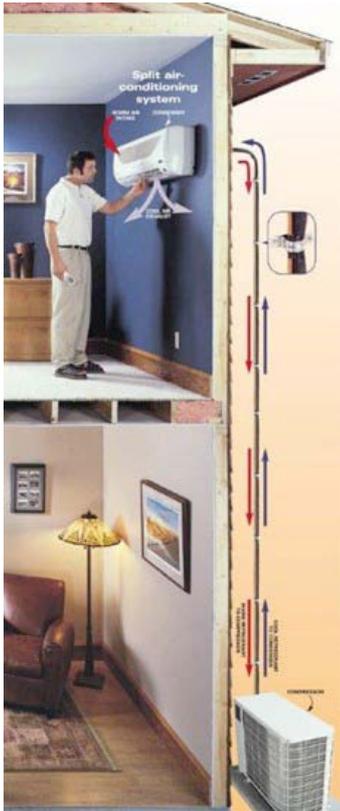
- Heat Pumps (of various types)
- Rooftop Units
- LEDs
- Energy Management

Heat Pump Waterheaters



Photo From Kate Hudon, NREL PIX # 18667

Inverter Driven Heat Pumps



Ductless HP

Innovation and the Environment

Over 100 years ago, a humble but determined engineer solved one of mankind's most elusive challenges by controlling the indoor environment. A leading engineer of his day, Dr. Willis Carrier would file more than 90 patents over the course of his career. His genius would enable incredible advancements in health care, manufacturing processes, food preservation, art and historical conservation, indoor comfort and much more.

Carrier's foresight changed the world forever and paved the way for over a century of once-impossible innovations. Yet in addition to being an accomplished inventor, he was also an avid outdoorsman. Carrier recognized the power and beauty of the natural environment. This appreciation of our world and its resources continues to guide Carrier Corporation today. We will never rest on our accomplishments, but instead consistently look for ways to improve our products, our environment and our world.

The Infinity²⁰ heat pump with Greenspeed[™] intelligence offers proof of our convictions, delivering unprecedented heating efficiency, superior performance, and the ability to make your home a more comfortable place to live.

Leaders in Technology

As an ENERGY STAR[®] partner, Carrier Corporation has determined that the Infinity 20 heat pump meets ENERGY STAR guidelines for energy efficiency. Proper sizing and installation of equipment is critical to achieve optimal performance. Split system air conditioners and heat pumps must be matched with appropriate coil components to meet ENERGY STAR criteria. Ask your dealer for details or visit www.energystar.gov.

Ducted HP



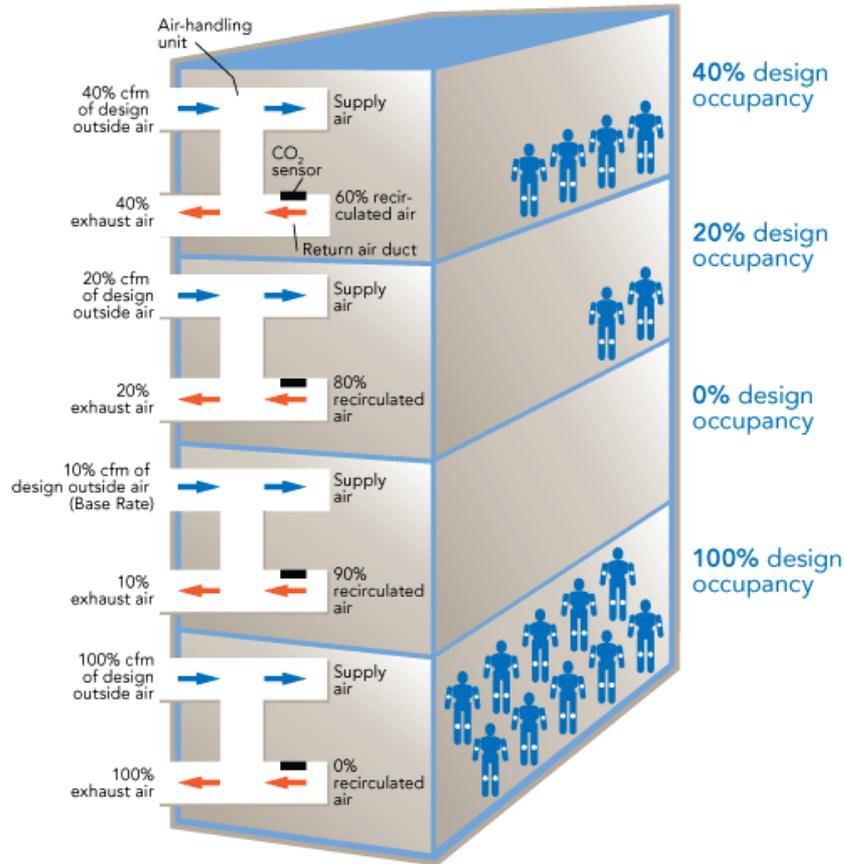
Photo From Ecohope

Variable Refrigerant Flow HP

Rooftop Units



Demand Controlled Ventilation



LED



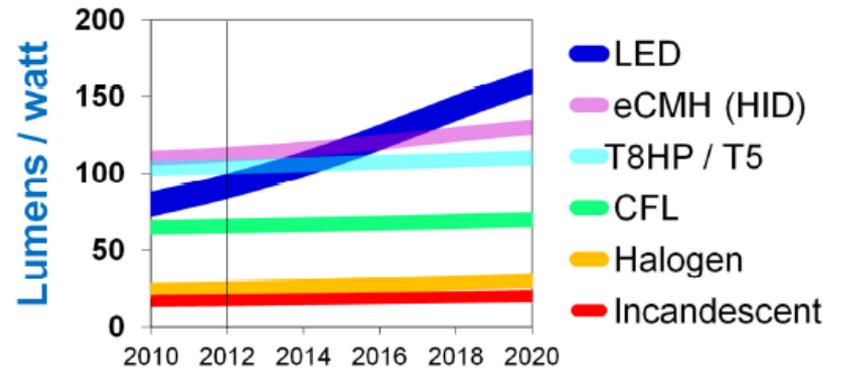
Figure 2.8. GE luminaires on top of poles
Photo From DOE Website



Photo From DOE Website

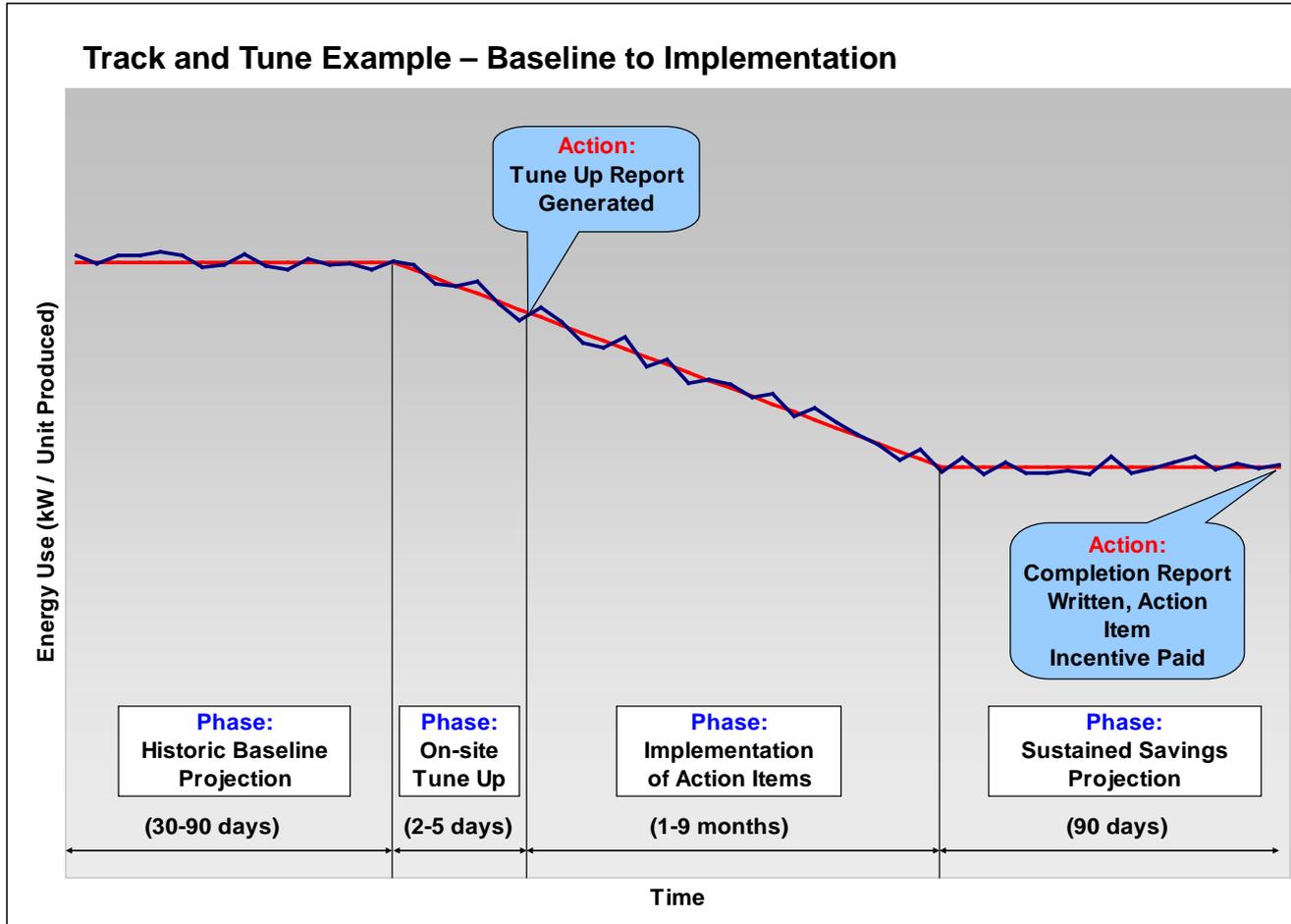
LED's Will Improve Rapidly

Efficacy of Good Luminaires of Each Technology



Adapted from Philips lighting presentation 2007, & Fig 3.4 "SSL R&D: Multi-Year Program Plan", 3/2010 DOE

Energy Management



PNNL Lab Homes



Photo From PNNL Website

Non-Intrusive Load Monitoring (NILM)



Photo From EPRI Website

Many new technologies....



Heat Pump
Water Heater



LED



Web-Enabled T-stats



VRF Systems



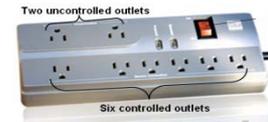
Advanced
Rooftop HVAC



Ductless Heat
Pump



PTHP with
Occupancy Control



Smart Plug Strips

Promising, but unproven...

1. *Is this technology reliable?*
2. *Will customers purchase it?*
3. *Are there any energy savings?*
4. *How can we measure and verify the savings?*
5. *Where are the good applications?*
6. *Is this cost effective?*
7. *What are the qualifying specs?*
8. *What is an effective program design?*

Field Testing

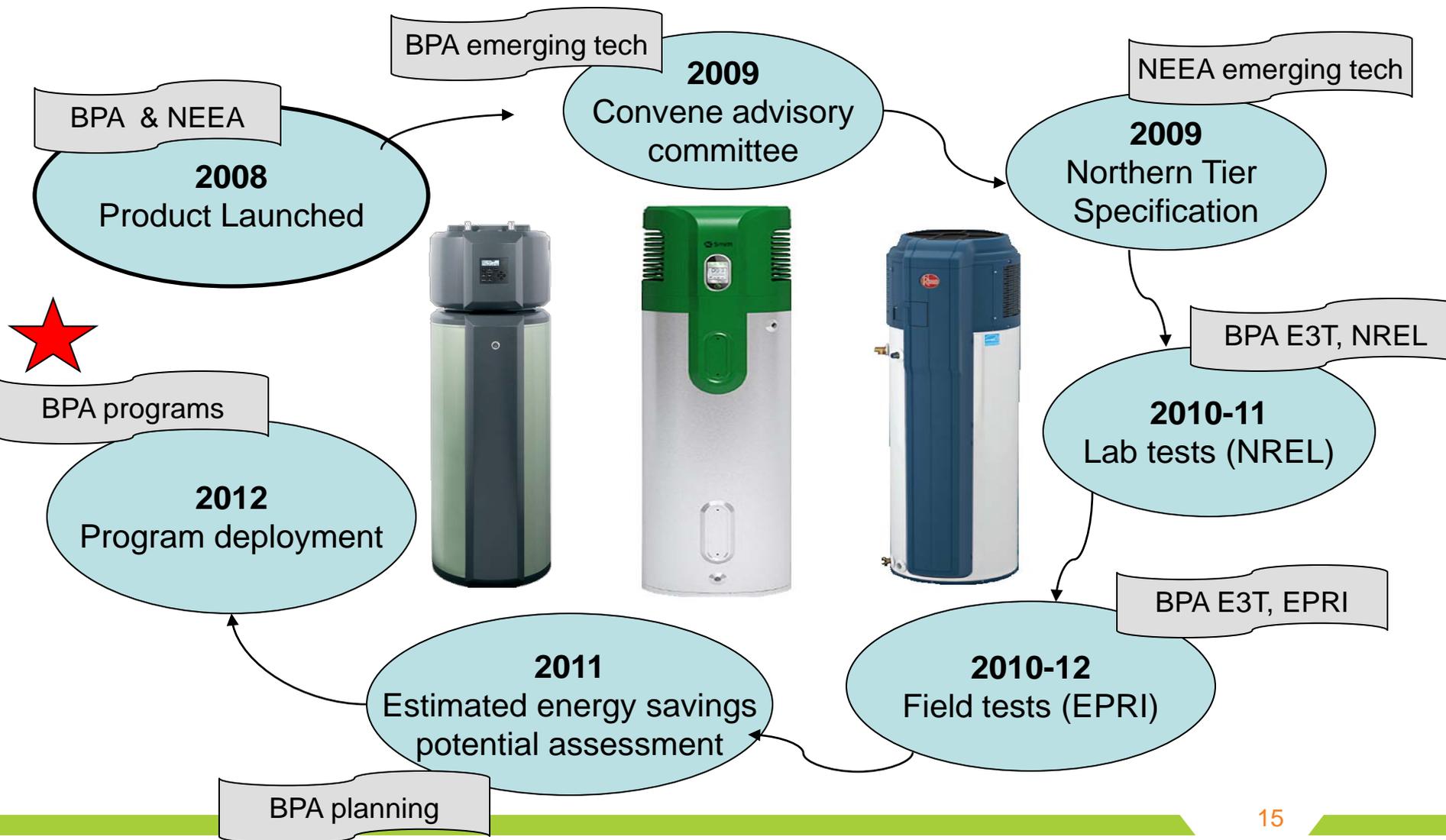
Required for measuring independent variables and user interactions

Opportunities

- Starting Field Tests Sooner
- Getting Results Sooner
- Applying results directly to new measure creation.



Example: Heat Pump Water Heaters (HPWHs)



Example Emerging Technology Timeline

HPWH Timeline

2008	2009				2010				2011				2012			
Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Product Investigation



Scoping



Laboratory Testing



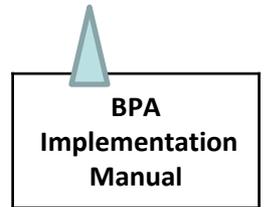
Field Testing



Program Development



Milestones



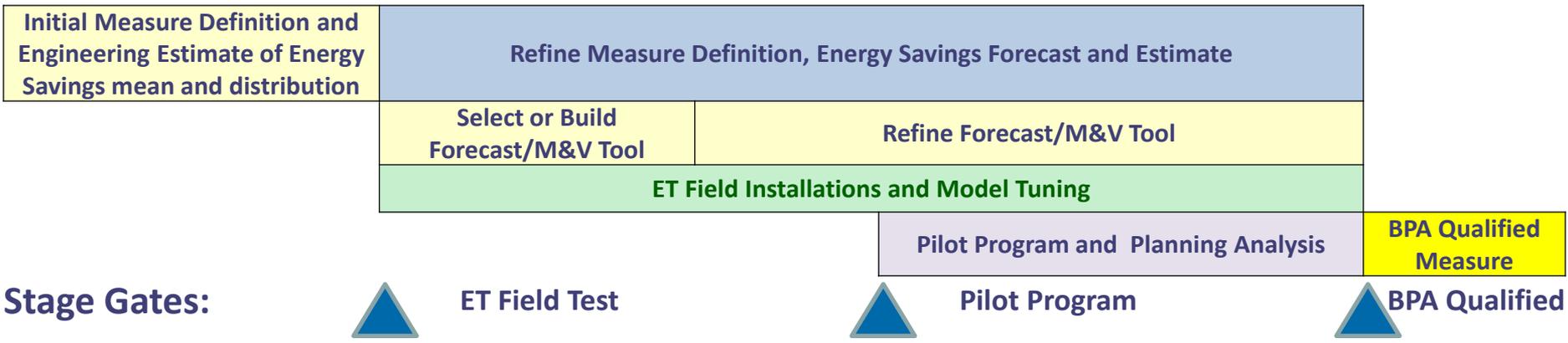
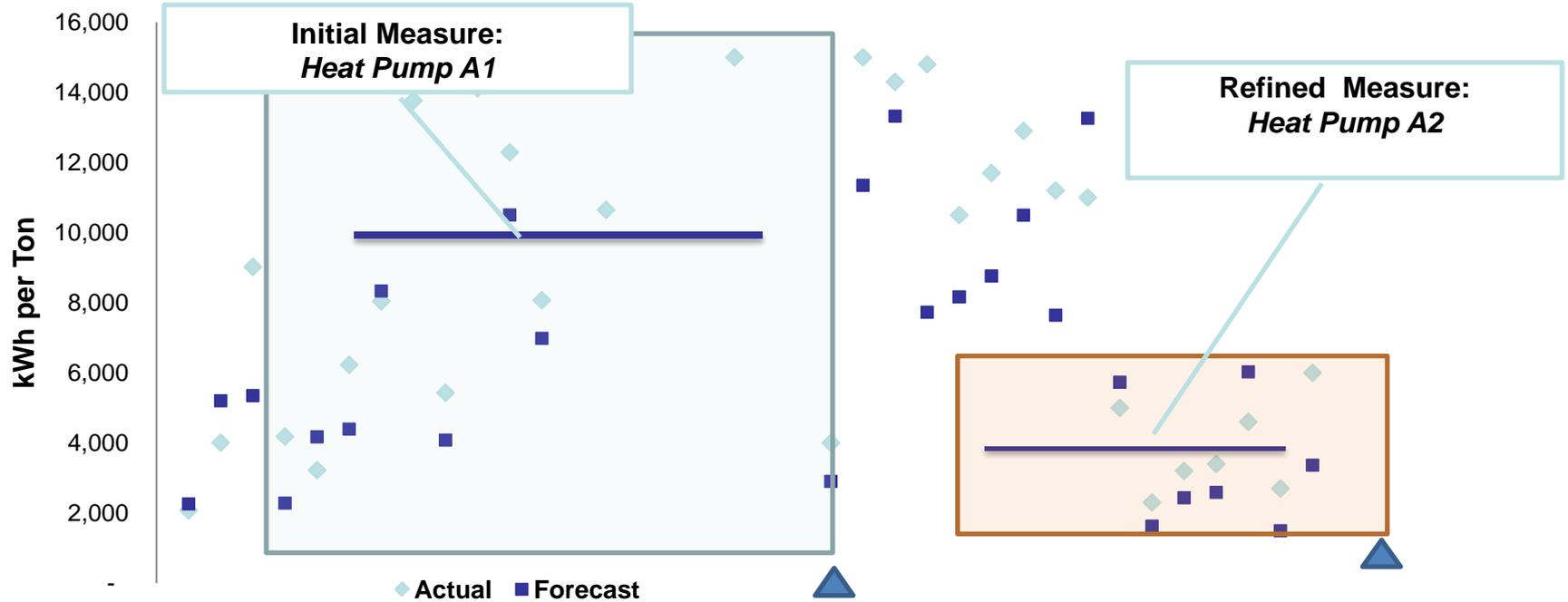
There is a better way!

Introducing: ***Limited Availability ET Field Tests***

1. New Reimbursement Method
2. New Field Test Approach
3. BPA M&V Support

- *Get field experience sooner, rather than later*
- *Quick approval and pre-defined reimbursement*
- *Quick feedback, aggregate results*
- *Make Progress: Measures are redefined, eliminated, or advanced to pilot stage or RTF*

Overview of ET Field Test Approach



BPA 4/1/12 Implementation Manual

Limited Availability Emerging Technology Field Test Projects

- On the BPA web site, BPA maintains a list of currently available emerging technology projects with defined:
 - Eligibility Requirements
 - Number of installations targeted
 - Participation obligations
 - Savings
 - Reimbursement
- Energy Savings and Reimbursement are pre-determined and fixed
- Field Tests projects are submitted as Option 1 Custom Projects.
- BPA will assist in development of the proposal, completion report, and M&V

ET Field Test Candidates

- Variable refrigerant flow heat pumps
- Rooftop unit packaged controls and VSD (e.g. Catalyst)
- Residential ducted heat pump water heaters (tier 2)
- Residential variable speed ducted heat pumps (e.g. Carrier Green Speed)
- Advanced design rooftop units (e.g. Daiken Rebel)
- Engine Generator Block Heaters
- Demand Controlled Ventilation for Commercial Kitchens
- Web Enabled Thermostats

Website Reference

The screenshot shows a web browser window displaying the BPA website. The page title is "BPA - Energy Efficiency | Emerging Technologies for Energy Efficiency - Windows Internet Explorer". The address bar shows the URL "http://www.bpa.gov/energy/n/emerging_technology/index.cfm". The page content includes a navigation menu on the left, a main text area with a map of the Northwest region, and several sections: "Projects and Reports", "Collaboration", "Technology Selection Process", and "Send us your ideas!".

BPA Home > **EE Home** > **Emerging Technologies For Energy Efficiency**

- Emerging Technology
- Technology Selection Process
- Projects and Reports
- Collaboration

Across North America, electric utilities are realizing that greater investment in energy efficiency helps to ensure a reliable, low cost supply of electricity for homes and businesses. BPA continues our leadership in this area by exploring opportunities to expand our current portfolio of energy efficiency measures.

BPA's Emerging Technologies for Energy Efficiency (E3T) initiative is a collaborative effort. We work with experts to identify promising new technologies. Through research and demonstration, we select for those technologies with greatest potential benefits to the region. Finally, we present a short list of investment opportunities to BPA and our partners. These opportunities include providing quality assurance in Northwest markets, subsidies for purchase of energy-efficient equipment, and incentives for manufacturers to develop better products. Through these efforts, we hope to sustain and enrich economic and environmental value in the Pacific Northwest.

The map shows the Northwest region with several nodes connected by lines, representing stakeholders and their relationships. The nodes include:

- USA
- EMERGING TECHNOLOGIES FOR ENERGY EFFICIENCY
- BPA
- WESTERN ENERGY EFFICIENCY TECHNOLOGY ROADMAP PORTFOLIO
- THE LIST
- WESTERN ENERGY EFFICIENCY TECHNOLOGY ROADMAP PORTFOLIO

Projects and Reports

E3T staff apply a wide range of research methods to assess the case for investment in emerging technologies. Criteria are supplied by [Energy Efficiency's Conservation Programs](#). These include technology risk, regional energy savings potential, and barriers to delivery of cost-effective programs. Where gaps exist in our knowledge, we may choose to fund research that advances our understanding in those areas.

Introduced in the April 1, 2012 [Implementation Manual](#), Emerging Technology Field Test Projects will test promising new technologies at a small scale. Findings will inform larger scale research. BPA is creating the list of pre-approved technologies. Check here in coming months for details.

E3T project details and links to reports are located [here](#).

Collaboration

Bonneville Power Administration provides all funding and administration for the E3T initiative. However, this initiative draws from the tremendous expertise of a broad network of collaborators and research partners, which provide research, partnership and other program support.

These collaborative efforts are supported by social networking resources, such as [E3T Connect](#) and [Conduit](#).

Technology Selection Process

Only a select few technologies will advance through the rigorous E3T Technology Selection Process to qualify for further assessment. E3T's vision also benefits from the Northwest Energy Efficiency Technology Roadmap Portfolio. This Portfolio of residential, commercial, and industrial energy efficiency technology roadmaps details a shared research agenda involving BPA's Technology Innovation initiative and stakeholders throughout the Northwest and beyond.

[Portfolio Appendix A](#) provides more information about the roadmapping process, and [Portfolio Appendix B](#) identifies existing relevant research and development projects throughout the world.

For more on E3T's technology selection process, click [here](#).

Send us your ideas!

You can help by suggesting new emerging technologies for E3T to screen and assess for potential measure development in the Northwest. Here is a list of emerging technologies that are [already under review](#) by E3T. You may wish to look at the list to determine if your idea has been suggested already.

[This form](#) will instruct you to enter some basic information about your emerging technology of interest.

Up and Coming Technologies

Variable Refrigerant Flow HP



Photo From Ecotope

VRF Heat Recovery Technology

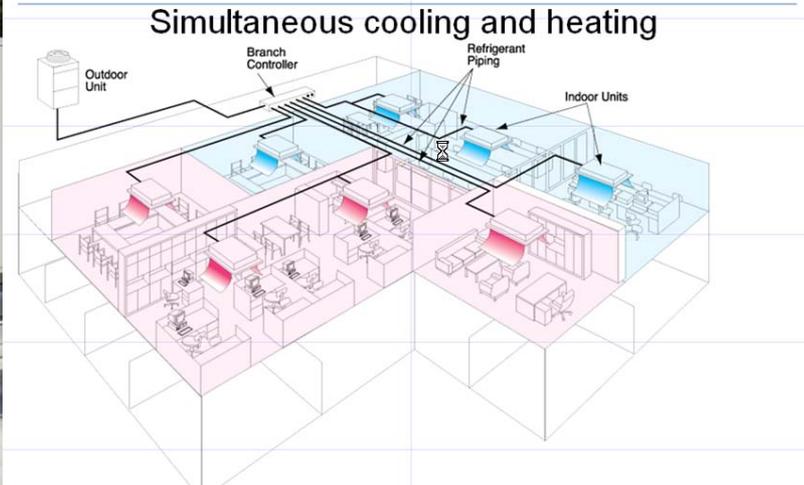


Photo From PG&E

Variable Refrigerant Flow (VRF)

Also referred to as:

- Inverter Driven compressor
- Ductless Heat Pump with multiple indoor units
- Variable Capacity Heat Pumps
- Variable Speed Drive fan and variable refrigerant flow compressor
- Commercial Ductless Heat Pumps
- Variable Refrigerant Volume

Rooftop Unit Packaged Controls & VSD



Welcome Danny | [logout](#)

[< Site Report](#)

Selected System
GP-2
 Location Served:
Unit-2
 Make:
Trane
 Model:
YCD240B3LAJB
 Serial Number:
536100610D
 Tons: **20.00**
 Indoor Fan Kw: **3.090**
 Comp 1 Kw Rating: **9.000**
 Comp 2 Kw Rating: **9.000**

Equipment Reports

[GP-1](#)
[GP-2](#)
[GP-3](#)

GP_2 CATALYST Communication Status

Supply Air Alert Normal Supply Air Alarm Normal

Live View Overall Unit Costs Gas Use Electrical Use Cooling Mode Hours Mode Hours Fan Mode Hours Month by Day - Costs

Space Temperature	70.7 °F
Occupancy Schedule	Occupied
Occupied Heating Setpoint	69.0 °F
Occupied Cooling Setpoint	72.0 °F
Unoccupied Heating Setpoint	60.0 °F
Unoccupied Cooling Setpoint	80.0 °F
Heating Load	0 %
Cooling Load	0 %
CO2Sensor	453.5 ppm
CO2Setpoint	1000 ppm
Outside Air Damper	12 %
Return Air Temperature	69.9 °F
Supply Air Temperature	68.1 °F
Mixed Air Temperature	69.1 °F
Outside Air Temperature	40.7 °F

Mixed Air 69.1 °F

40.7 °F Outside Air

OSA 12 %

Fan Speed 40 %
Fan Power 0.32 kW

Supply Air 68.1 °F
Return Air 69.9 °F

- ESM Mode
- Occupied
- Fan Cmd
- Vent
- Cool Mode
- EconMode
- Compressor1
- Compressor2
- Heat Mode
- Heat1
- Heat2

[Unit Details](#)

CATALYST
Efficiency Enhancing Controller

HPWH Tier 2 - Ducted



Variable Speed Ducted Heat Pumps

Innovation and the Environment

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The Infinity® 20 heat pump with Greenspeed™ intelligence offers proof of our convictions, delivering unprecedented heating efficiency, superior performance, and the ability to make your home a more comfortable place to live.



Leaders in Technology



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Advanced Design Rooftop Unit

Daikin McQuay's Rebel Heads to the Department of Energy

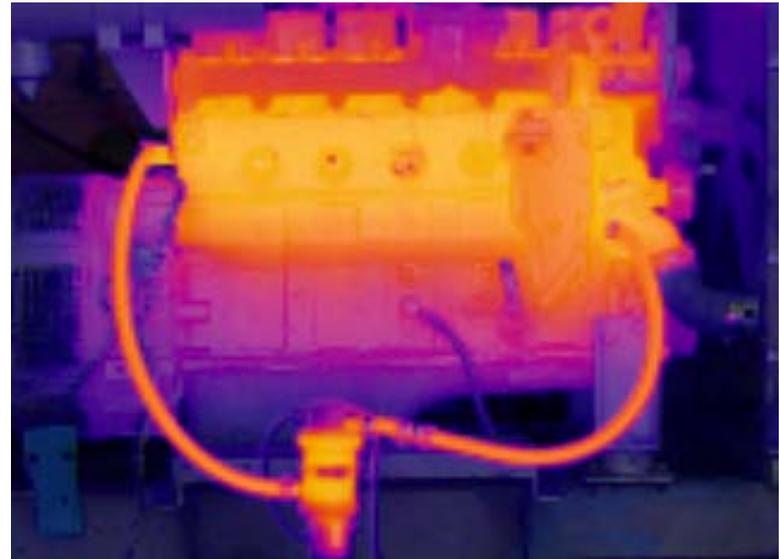
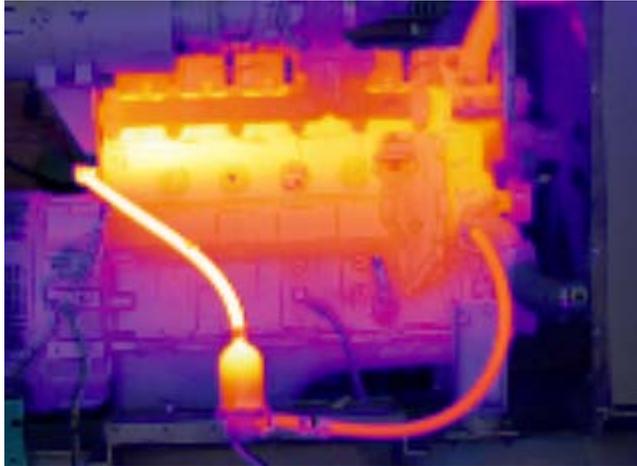
Posted by: htsexternalblog on: October 5, 2011

In: HVAC [Comment!](#)

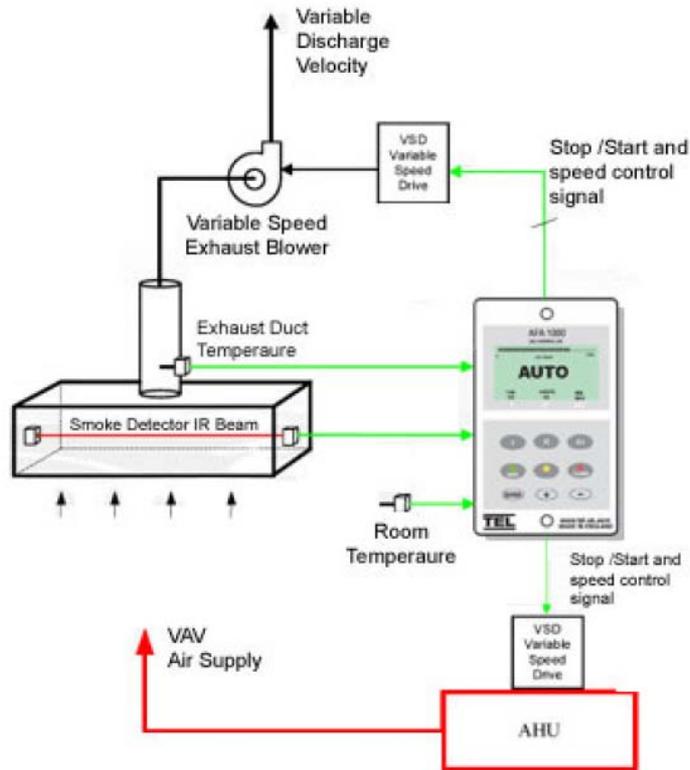


Photo From DOE Website

Engine Generator Block Heater



DCV Commercial Kitchen



- C
- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.



Photo From Food Service Technology Center Case Study

Web-Enabled Thermostats (WEPT)



You Can Help Fill the Pipeline



Keeping Abreast

RETAC

- Regional Emerging Technology Advisory Committee
 - Advise NEEA's portfolio
 - Forum for Regional ET Coordination and Collaboration



CA – ET Coordinating Council

Etcc-ca.com

ETCC
EMERGING TECHNOLOGIES
COORDINATING COUNCIL

HOME savings WORK savings INDUS sav

search... go
PROJECT SEARCH

- Home
- Markets
- News & Trends

ABOUT ETCC

The Emerging Technologies Coordinating Cou
Coordinates among its members to facilitate the assessment
promising energy efficient emerging technologies that will
benefit California customers.

nuCAB™ ELEVATOR LIGHTING CONTROL SYSTEM

nuLEDs
Simplified LED Solutions

ONE SIMPLE SYSTEM for

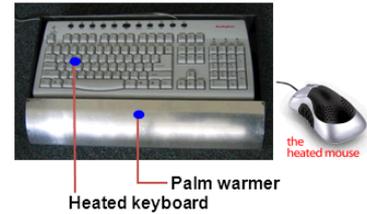
- Lighting w/ controls
- Fan
- Bell
- Emergency Back-Up

COMPLETE PACKAGED SOLUTIONS

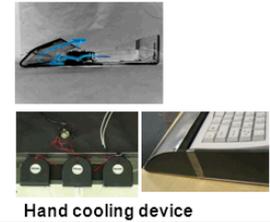
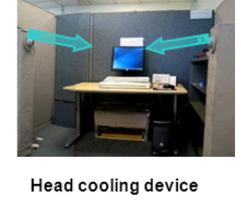
High Quality LED Lighting
Tri-Level Illumination
Smooth Fades

PEC system components, as tested

Cold conditions



Warm conditions



CENTER FOR THE BUILT ENVIRONMENT MARCH 2012

Other Websites

- BPA Database of ETs www.e3tnw.org
- BPA Research Reports
http://www.bpa.gov/energy/n/emerging_technology/index.cfm
- Consortium for Energy Efficiency www.Cee1.org
- FEMP http://www1.eere.energy.gov/femp/technologies/new_technologies.html
- EPRI <http://portfolio.epri.com/Research.aspx?sId=PDU&rlD=203>
- E Source <http://www.esource.com/>
- NW National lab <http://www.pnnl.gov/>
- Center for Built Environment <http://cbe.berkeley.edu/index.htm>
- American Council <http://www.aceee.org/topics/emerging-technologies-and-practices>
- European council <http://www.eceee.org/>
- LED journal <http://www.ledsmagazine.com/features/9/2/9>
- DOE LED work www.ssl.energy.gov

Contact

For more information, contact:

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Name: Jennifer Williamson

Title: Emerging Technologies Technology Transfer Manager

E-mail: jcwilliamson@bpa.gov

Telephone number 503-230-4536

Alternate slides

Examples of Coordinated BPA/NEEA ET Activity: Heat Pump Water Heaters



NEEA:

- Focus on next generation units made for Northern Climates
- Specification Development
- Identification of European and Asian Sources
- “Golden Carrot” for US manufacturers
- Revised test standards

BPA:

- Focus on current generation units
- Lab testing 3 domestic manufacture units
- Modeling of Lab performance
- EPRI field testing and demonstration of up to 30 units

