



# Emerging Technologies

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# Emerging Technologies Update

Presented by:

Jack Callahan, Emerging Technology Program Manager

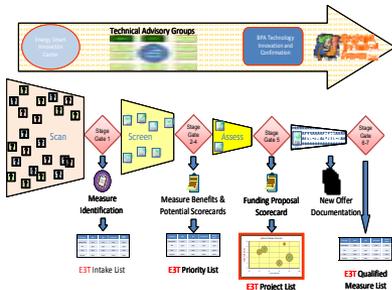
BPA Energy Efficiency

March 17, 2010



# BPA E3T – Energy Efficiency Emerging Technology Program

## Part 1 E3T -Technology Identification and Selection



**Selection Process**



**Collaboration**



**Web Site**

**Energy Management**

**Lighting**

**HVAC**

**Technical Advisory Groups**

**Lighting TAG** Ashland, NWPCC, E Source, Lighting Design Lab, LEI, Lighting Research Center, WSU Energy Program, e2co

**HVAC TAG** EWEB, NEEA, NYSERDA, SMUD, Davis Energy Group, NBI, MacDonald Miller, PSE, PAE, LBNL, SCE, Arip, SCL, AHRI, BC Hydro, PG&E

**Participation:** New members in Energy Management are needed for 2010.

# BPA E3T – Energy Efficiency Emerging Technology Program

## Part 2 Portfolio of Assessment Projects



LED Demo



Web-Enabled T-stats



Heat Pump  
Water Heater



PTHP with  
Occupancy Control



Ductless Heat  
Pump



VRF Systems



Smart Plug Strips



Demand  
Controlled  
Ventilation

# Current BPA Technology Assessment Projects

Technology	Team	Activity	Status
 Ductless Heat Pumps	NEEA, Fluid, Ecotope	Manufactured Homes Field Test	In Progress
		COP Monitoring	In Progress
 Multi-Family Reverse-Cycle Chiller Demo	SCL, Ecotope	<input checked="" type="checkbox"/> Feasibility Study <input type="checkbox"/> Demonstration <input type="checkbox"/> M&V	Demonstration in 2010 - 2011
 Heat Pump Water Heater	Ecotope	Lab Test	Testing to begin in April 2010
	EPRI, Snohomish, <b>Open</b>	Field Test	Begin April 2010

# EPRI HPWH Field Test

## Synopsis

- EPRI nationwide testing of 200+ residential HPWHs
- BPA will install 30 *Treatment Sites*
- Snohomish will install 10 *Treatment Sites*
- 10 *Control Sites* in our region
- Monitor for: efficiency, performance, reliability, electric demand, application issues and customer behavior
- Complimentary to HPWH Lab Testing

## Schedule

- March 2010 - Request for Utility Participants
- April 2010 – Start Installations



# Current BPA Technology Assessment Projects

Technology	Team	Activity	Status
 <p>Two uncontrolled outlets Six controlled outlets</p>	TBD	Field Tests	RTF Provisionally Deemed
	Inland Power, Flathead Electric, EMP2	Field Test	In Progress
	City of Eugene, EWEB, SUB, PECI	Multiple Field Tests	In Progress

# Current BPA Technology Assessment Projects

Technology	Team	Activity	Status
 <p>Variable Refrigerant Flow System</p>	<p>EPRI, Clark PUD , EWEB</p>	<p>Field Test</p>	<p>Scoping</p>
 <p>Web Enabled Thermostat</p>	<p>SCL, Clark PUD, Cadmus</p>	<p>Demonstration and Field Test</p>	<p>Scoping</p>
<p><a href="#">Example</a></p> <p>Monitoring Based Cx and Dashboard</p>	<p>City of Ashland, SOU</p>	<p>Development and Demonstration</p>	<p>Scoping</p>
 <p>Advanced Lighting</p>	<p><b>Open</b></p>	<p>Demonstration</p>	<p>Scoping</p>

# Emerging Technology Lighting Demonstration Projects

## Synopsis

- **LED down-light Demo:** *BPA* will provide up to ten, LED down-lights to up to twenty utilities
- **Emerging Technology Lighting Demonstration:** *Lighting Design Lab* to facilitate up to ten demos, working with serving utilities



## Outcomes

- Confirm product performance and installation barriers.
- Demonstrate and promote LED down lights to customers.
- Transfer of information through case studies.
- Develop incentive specifications and application guidelines.



# Emerging Technology Lighting Demonstration Projects

## LED Down-light Demo

- BPA will up to ten LED down-lights for up to twenty utilities.
- Utilities propose Demo location.

### Schedule

- April 2010 - Request for Utility Participants
- May 2010 – Installations



## LDL Demos

- Utilities can propose Demos to LDL

### Schedule

- TBD



# What's Next: Lighting



## Integrated Classroom Lighting System

- User-friendly controls
- High quality indirect lighting
- 30% to 50% savings
- Dimming for audiovisual presentations
- Efficient fluorescent light fixtures



## Solid State Lighting



## Bi-Level/Occupancy Control

- 40% to 60% savings
- Stairwells, Parking Garages,
- Parking Lots, Offices
- Combine with Fluorescent, LED

## On the Horizon

- Mesopic Lighting
- Wireless Controls
- Plasma Lighting
- Electron Stimulated Luminescence
- OLED



# What's Next: Expanding Inverter-Driven Compressor Applications

## Refrigeration

...pleased to announce the development of a world first **inverter driven commercial freezer with CO2 refrigerant.**

## ASHRAE/AHR 2010 Innovation Awards



The Performer VSD **integrates a variable-speed scroll compressor, drive and control electronics for EEV, condenser fan and reversing valve.**



VRV III-C heat pump system **performs efficiently at outdoor temperatures as low as -13° F (-25° C).**

Heat Pump heating/cooling/hot water

The new VRF water heating units provide an energy efficient solution to **commercial heating, cooling and hot water supply.**

# Contact

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# Emerging Technologies

Presented by  
Mark Rehley, Emerging Technology Operations Manager  
Northwest Energy Efficiency Alliance

# Emerging Technology Definition

## Emerging

- Commercially Available
- Low Northwest Market Share

## Technology

- Product
- Service
- Best Practice

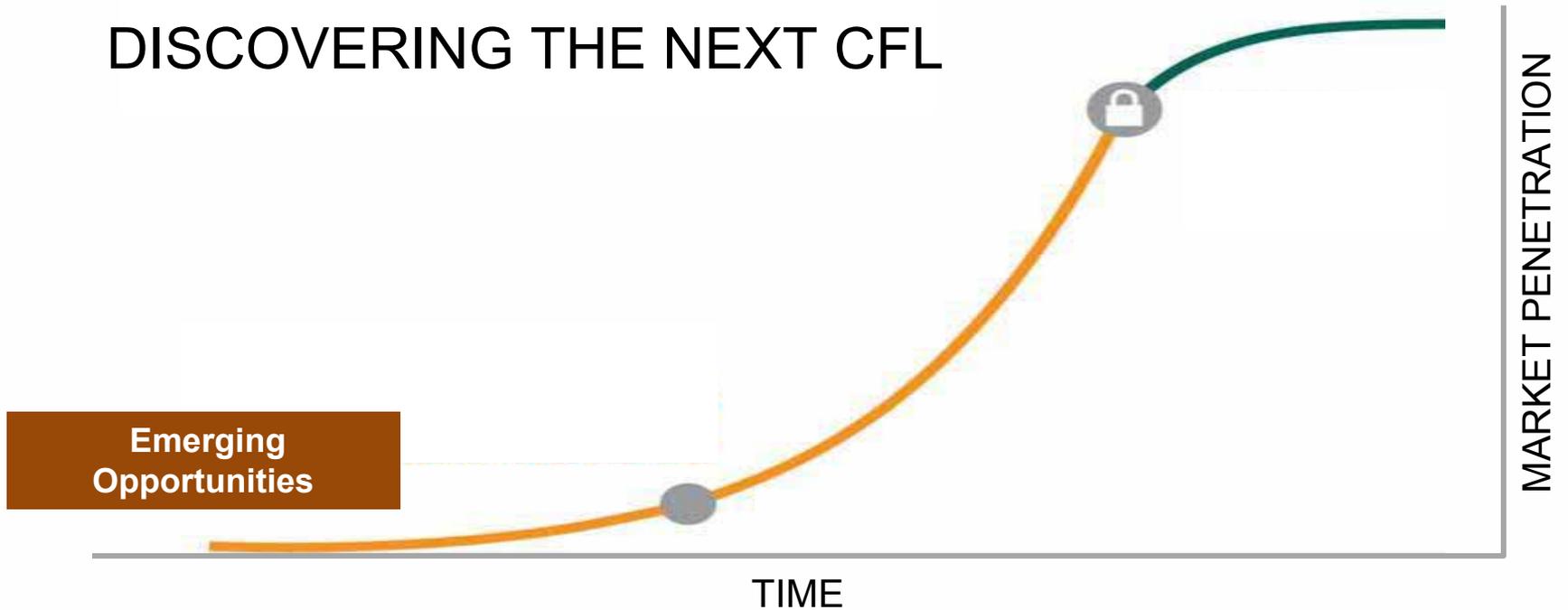


# Better Together

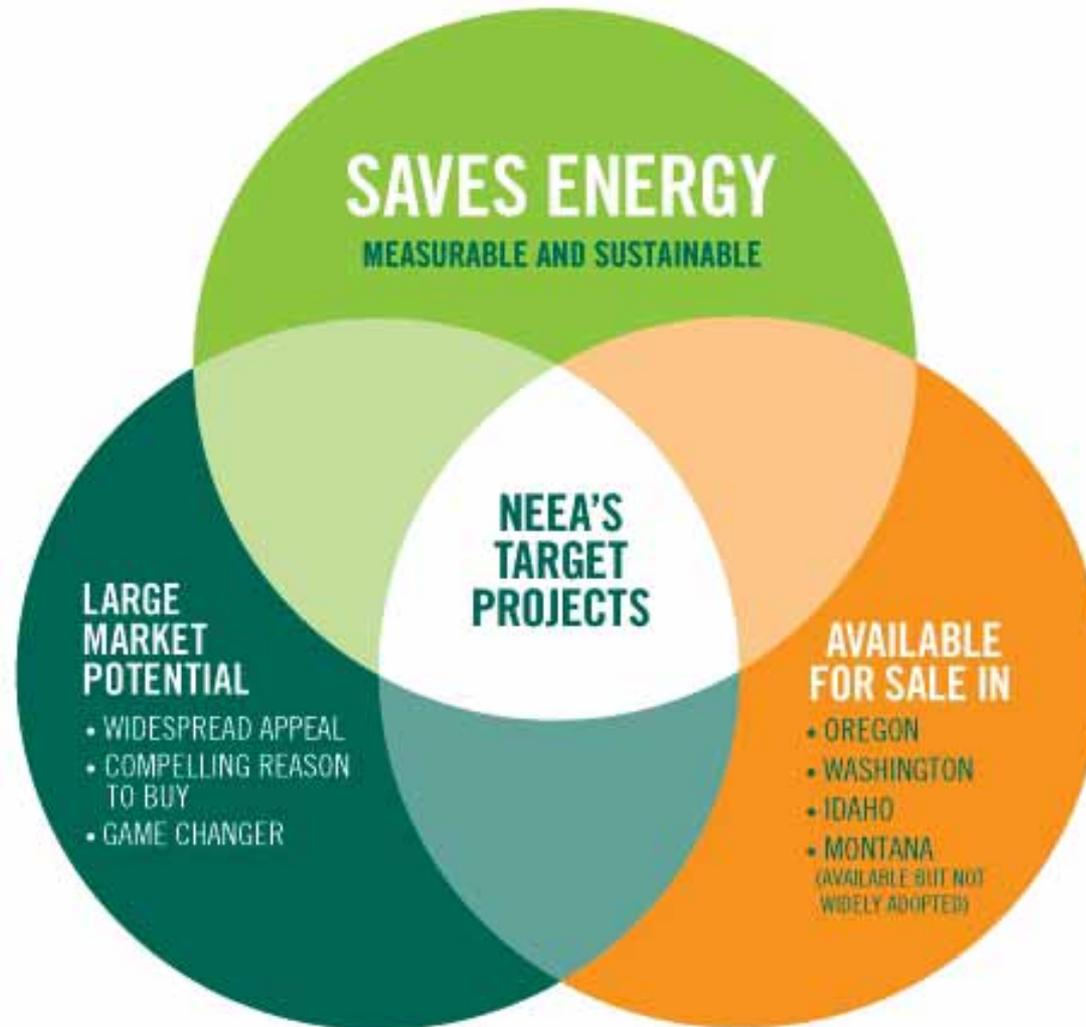


# Defining Success

## DISCOVERING THE NEXT CFL



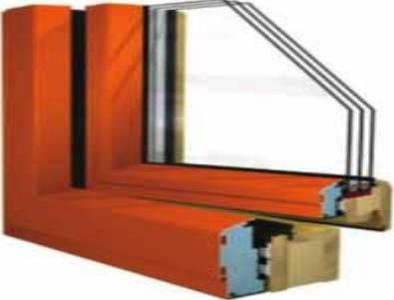
# NEEA's Target Projects



# NEEA 2010 Projects

Technology	Barriers	Activities	Status
 <p><b>Ductless Heat Pump</b> <b>Cold Climate</b></p>	<p>Performance in cold climates</p>	<p>Field test performance of new systems: 100% capacity @ 0 F 75% capacity @ -15 F</p>	<p>In Progress</p>
 <p><b>Heat Pump Water Heater</b> <b>Northern Climate</b></p>	<p>Product Availability  Product Knowledge</p>	<p>Training:</p> <ul style="list-style-type: none"> <li>• Manufacturers</li> <li>• Retailers</li> <li>• Contractors</li> <li>• End Users</li> </ul> <p>Other manufacturers  Lab tests</p>	<p>In Progress</p>

# NEEA 2010 Projects

Technology	Barriers	Activities	Status
 <p><b>Windows</b></p> <p><b>R-5</b></p>	<p>Product differentiation</p> <p>Limited availability</p> <p>Credibility</p> <p>Installation issues</p>	<p>Research</p> <ul style="list-style-type: none"> <li>-Channel</li> <li>-Manufacturers</li> </ul>	<p>Developing contract</p>
 <p><b>Green Pumps</b></p> <p><b>Service</b></p>	<p>Evaluation of energy savings</p> <p>Supplier base</p> <p>End user knowledge</p>	<p>Specification</p> <p>Pilot project</p> <p>Develop supplier base</p>	<p>Developing contract</p>

# NEEA 2010 Projects

Technology	Barriers	Activities	Status
 <p><b>Net Zero Office Building</b> <b>Commercial</b></p>	<p>High risk for designers</p> <p>Perceived cost barriers</p>	<p>Update integrated design practices</p> <p>Prove cost and savings with prototype design</p>	<p>Developing needs statement and workplan</p>
 <p><b>Agricultural Energy Savings</b></p>	<p>Opportunities not clearly defined</p>	<p>Market assessment study</p>	<p>RFQ</p>

# Other Technologies

- Network controls for outdoor lighting
- Refrigeration controls
- Residential energy monitoring
- Small commercial data centers
- High efficiency clothes dryers

# Contact

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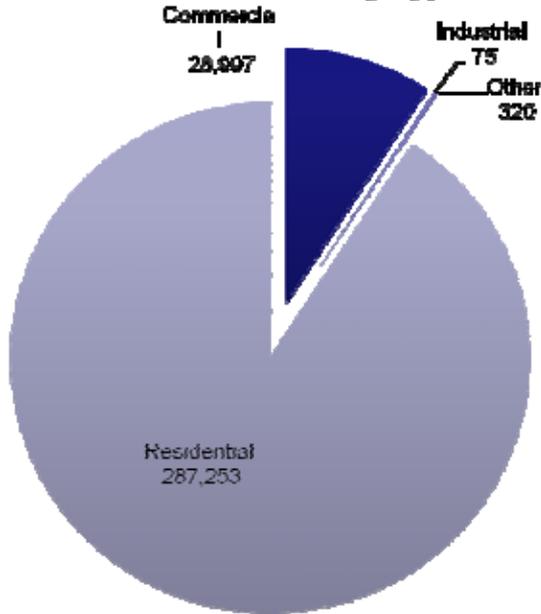


# Snohomish County PUD

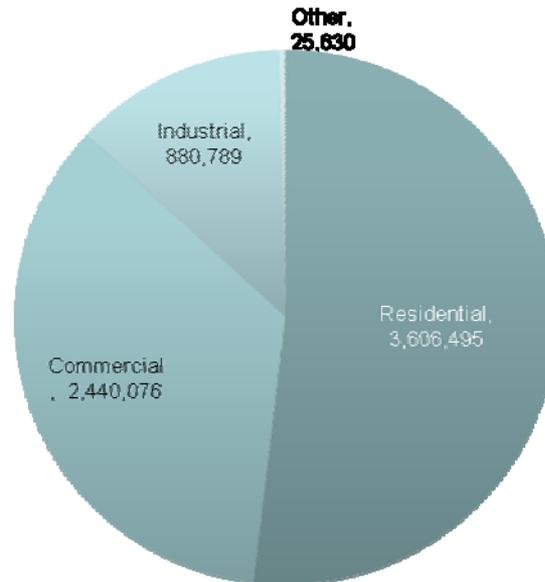


# SnoPUD Customer information

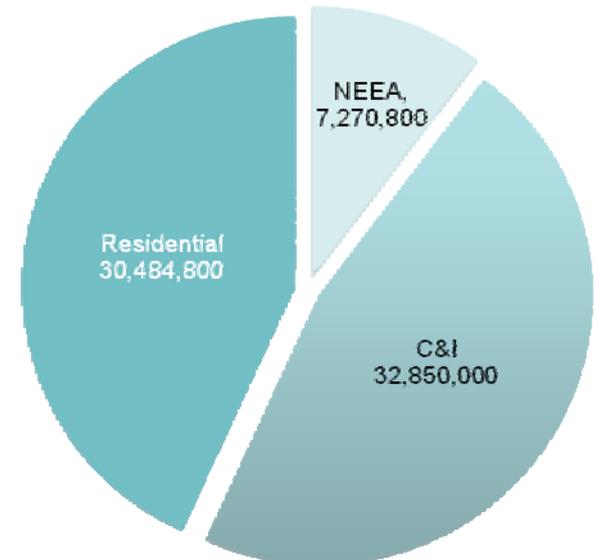
**Total Customers by Type**



**Total kWh by Customer Type**



**2009 Conservation Acquired (kWh)**



# SnoPUD Energy Efficiency Goals

- **Energy Savings/Renewables**  
... achieving base goal of 6.6 aMW; 7.25 aMW stretch goal
- **Strong organizational capabilities**  
...ensuring long-term success of energy efficiency programs with talented employees and strong analytical capability
- **Customers and trade allies**  
...understanding what it takes to motivate customers to adopt cost-effective conservation measures
- **Innovation**  
...implementing best practices, leveraging partnerships, incorporating new and early-stage technologies

# Innovative Technology

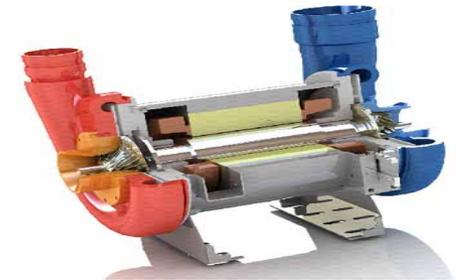
## In Place Today:

- Neuros & Kturbo blowers for wastewater treatment
- Evaporative cooling in manufacturing
- Magnetic bearing oil-free compressor in data center
- 99% efficient UPS in data center
- LED canopy lighting at convenience stores and gas stations
- Induction lighting in a high bay hangar and a marina boat yard
- T5 HO's w bi-level motion control in multiple parking lots
- Ductless Heat Pumps – 200 installations in SnoPUD area
- EPRI Energy Efficiency Demonstrations
  - HPWH, LED Street Lighting, Data Center



## Project Summary-Mukilteo WWTP - 2009

- Existing: (2) 40 HP Brush rotors (43.44 kW) 380,534 kWh/Yr
- Installed: (1) 50 HP K-Turbo / Sanitaire Diffusers (17.12kW) Anticipated use is 150,000 kWh/Yr
- *Est. Min Savings Per Year/ 8760 Hrs Operation Projected 230,534 kWh/Yr or 61% of original load*
  - \$.07 Avg rate per kWh for C&I customers schedule 20 medium load
  - \$15,970.70 per year Savings
  - Snohomish PUD Incentive \$39,171



# Advanced Chiller Technology

## Smardt Chillers

- Oil Free – Magnetic Bearings
- 46% More Energy Efficient Than Code Requirements
- Variable Speed Operation
- Slows to Meet Low Cooling Demands
- Precise Cooling Operation
- Highly Efficient At Part Load
- Quiet



# Advanced UPS Technology: Eaton 9395



An Eaton Green Solution

- 99% efficiency over wide load range - above 20% load
- Maximizes efficiency by eliminating unnecessary power conversion when the input is within acceptable voltage and frequency windows
- UPS seamlessly transitions through different operating modes as needed - only possible with transformerless topologies
- Frequency-independent topology

# Innovative Technology

## In the works:

- Controls *integration*, i.e., lighting and VAV
- Patient rooms VAV at large regional medical center
- 575-1000 W dimmable electronic ballast for high bay hangar metal halide
- ~30 ton VRF system in medical building retrofit

## On the horizon:

- IP-addressable gateways for small commercial HVAC
  - Web-enabled controls for RTUs
  - PCTs

# Industry Connections

- Northwest
  - BPA
  - NEEA
- National
  - EPRI
  - CEE
- Shaping the research agenda
- Setting program direction
- Leveraging technical expertise
- Hosting pilots

# Contact

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