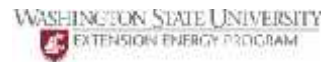


Thank you TAG members

Bill Livingood, NREL
Bruce Baccei, SMUD
Cindy Regnier, LBNL
Cindy Strecker, CleaResult
Eric Miller, Benton Rural Electric
Greg Douglass, Sky Heating
Harvey Sachs, ACEEE
Jackie Goss, Energy Trust of Oregon
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Mark Madero, Western Cooling
Efficiency Center
Mary Horsey, E Source
Pete Kramer, Trane
Reid Hart, PNNL
Rob Heeb, Oregon Trail Electric
Ron Domitrovic, EPRI
Sinh Tran, Snohomish PUD
Srinivas Katipamula, PNNL
Tom Reddoch, EPRI

Thank you TAG members



E3T 2015 Commercial-Sector HVAC TAG

**BPA E3T Commercial HVAC Emerging
Technology
Technical Advisory Group**

March 10, 2015 Meeting



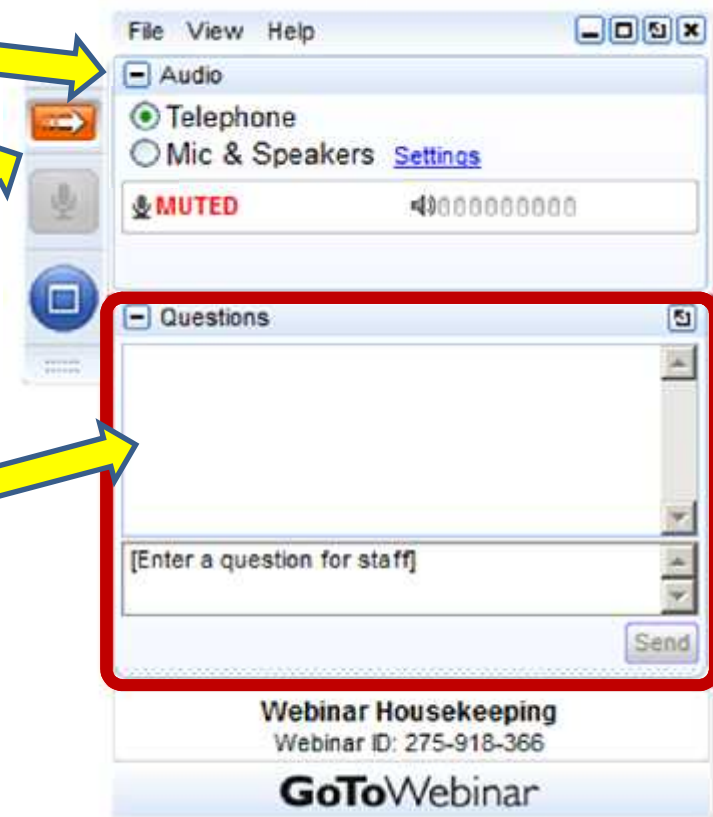
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GoToWebinar Logistics

- Please use your Telephone, not the Mic & Speakers! Remember to enter the PIN number!
- Minimize or maximize control panel
- Phone lines are muted
- Please use question field to ask questions during Q & A or if you have any technical issues



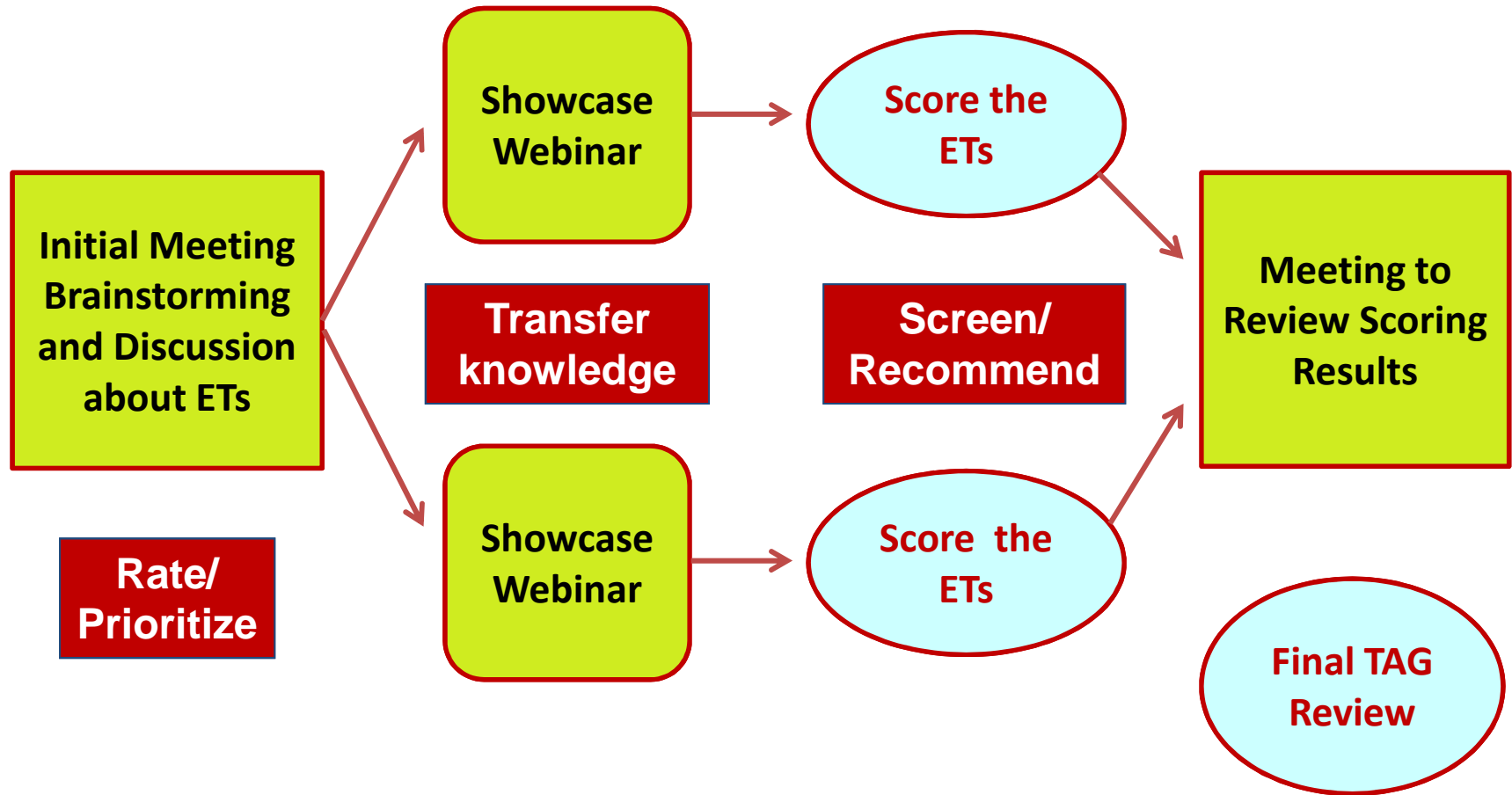
Meeting Agenda

9:10	Welcome	<i>Rob Penney</i>
9:15	Agenda review, logistics	<i>Karen Janowitz and Rob</i>
9:20	Meeting goals	<i>Karen</i>
9:25	TAG process & schedule	<i>Karen</i>
9:35	Value of TAGs in E3T process	<i>Keshmira McVey</i>
9:45	BPA EE Commercial Sector overview	<i>Erik Boyer</i>
9:55	TAG scope	<i>Rob Penney</i>
10:10	Break	
10:20	Technologies discussion	<i>Rob Penney</i>
11:50	Rating process and instructions	<i>Karen</i>
11:55	Wrap-up	<i>Karen and Rob</i>

Today's Meeting Goals

- Understand TAG process, and its significance within the E3T framework
- Review schedule
- Discuss technologies & strategies (ETs)
- Add ETs not on list, if appropriate
- Begin the rating process

Overview of TAG Process



2015 HVAC TAG Members Schedule

March 10	Initial meeting (that's today!)
March 16	Rating survey sent to you
March 18	<i>Rating surveys due</i>
April 2	Showcase Webinar Presentations #1
April 3	<i>Presentation #1 scoring surveys due</i>
April 8	Showcase Webinar Presentations #2
April 9	<i>Presentation #2 scoring surveys due</i>
April 14	Final meeting and scoring result discussion

Introduction

Commercial HVAC TAG



Technical Advisory Group
March 10, 2015



TAGS - BPA's Secret Weapon

- Help scan the environment for up and coming technologies
- Use expertise to prioritize the most promising technologies, best practices or protocols
- Identify research questions for further assessment
- Provide guidance on how to best implement recommendations into utility programs

History of E3T TAGs

- * 2009 HVAC
- 2009 Lighting
- * 2010 HVAC
- * 2011 Energy Management
- 2012 LED Lighting
- 2012 FLASHTAG Smart Residential Thermostats
- 2013 Lighting Controls
- * 2013 IT Data Centers
- * 2014 Commercial High Performance Buildings
- 2014 Residential High Performance Buildings

* Had Commercial HVAC Technology Recommendations

2009 - 2010 HVAC TAG Recommendations and Follow Up

Technology	Outcomes
Demand Controlled Ventilation	Moved to RTU Controls and Advanced Design
Demand Controlled Ventilation for Commercial Kitchens	BPA Qualified Measure
Variable Refrigerant Flow Heat Pumps	ET Field Tests 2013 - 2014
Variable Capacity Compressors	VCHP Proven Measure EPRI Variable Capacity Heat Pump Technology Transfer Award
Web Based Small Commercial Thermostats	BPA Qualified Measures for Small Commercial and Schools
Advanced Design Rooftop HVAC Unit	Watching DOE Advanced RTU Challenge
Advanced Rooftop Controls	Work lead to ARC Verification Study Utility Grant Program for ARC – Light Fan Savings

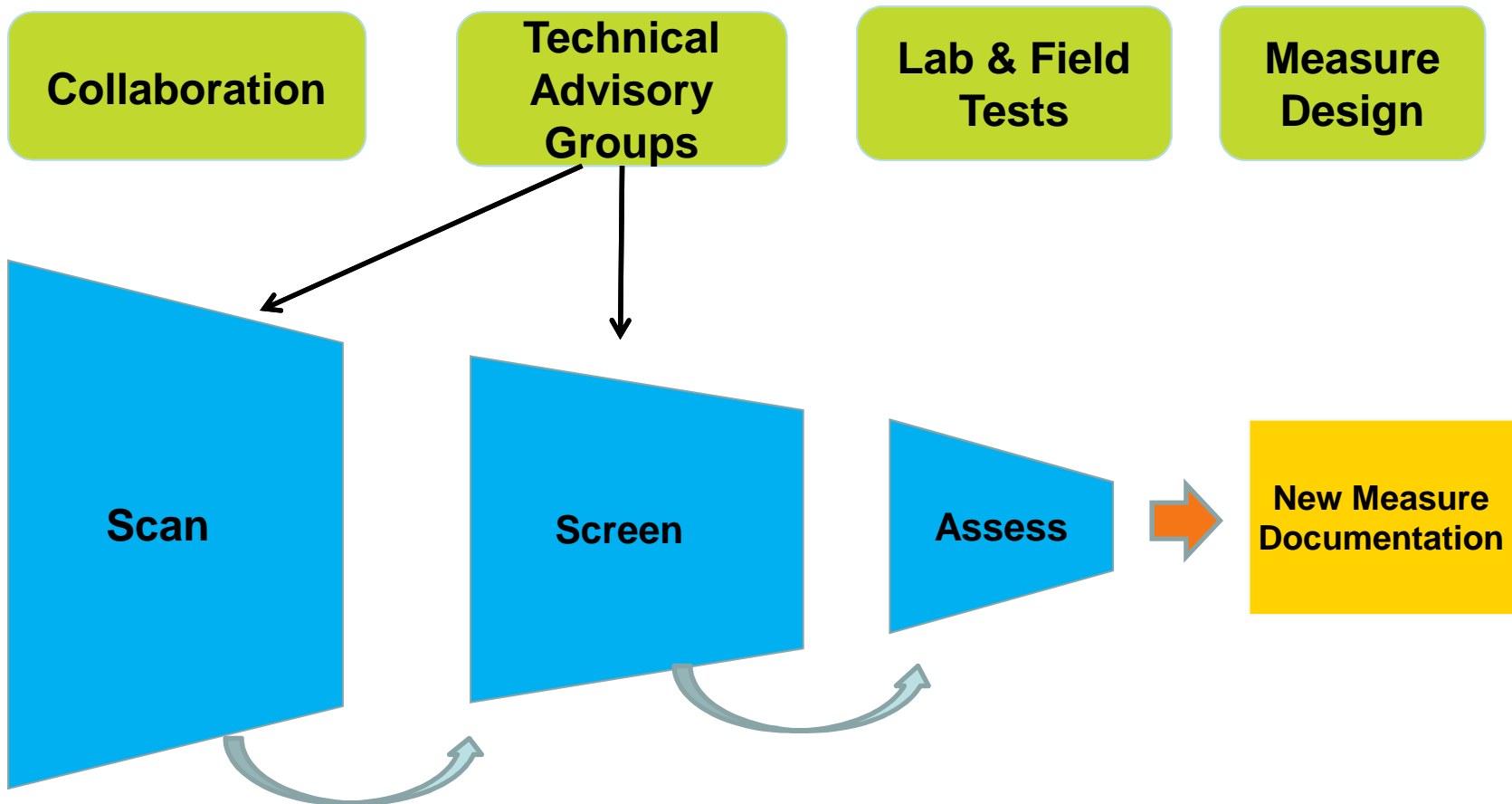
About this TAG

- Focus on Commercial HVAC
- 2010 last time we looked at HVAC
- Key objectives:
 - What new technologies or improvements are happening
 - Priorities for research/programs
 - Input to shape innovative program design and delivery for future implementation

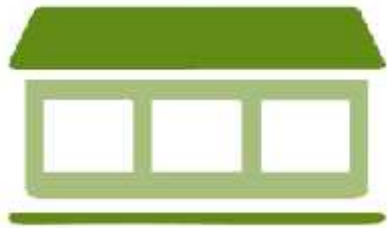
E3T's Definition of ETs

- Commercially available
- Potential energy savings
- Has non-energy benefits
- Shows promise for cost effectiveness
- Opportunities for adoption in the NW

How do TAGs fit into the E3T Framework



BPA Commercial Sector Overview



Less than 5 tons



Less than 25 tons



More than 25 tons

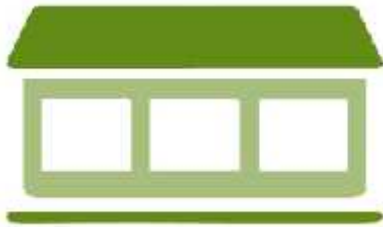
Commercial market made up of many players with different:

- Characteristics – size, type of business, functions
- Budgets
- Decision chains
- Distribution channels
- Technology options

One size does not fit all when it comes to solutions or measures.

Complexity of the Market

- Higher costs for solutions
- More technology choices
- Technologies more complex – more system focused
- Multi-party decision making in design and build
- Longer sales cycle – planned retrofits



- Huge number of players
- Hard to reach
- Focused on bottom line
- Limited funds
- Limited time

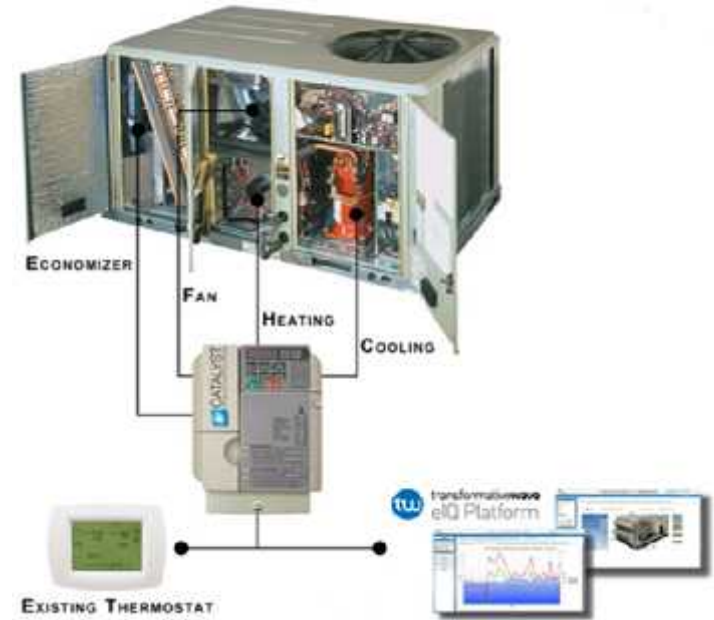
- Segments with different needs
- Expensive equipment
- Retrofit until it can't be fixed
- Complex solutions

- Larger buildings - Even more complex and expensive solutions
- Multi-decision makers

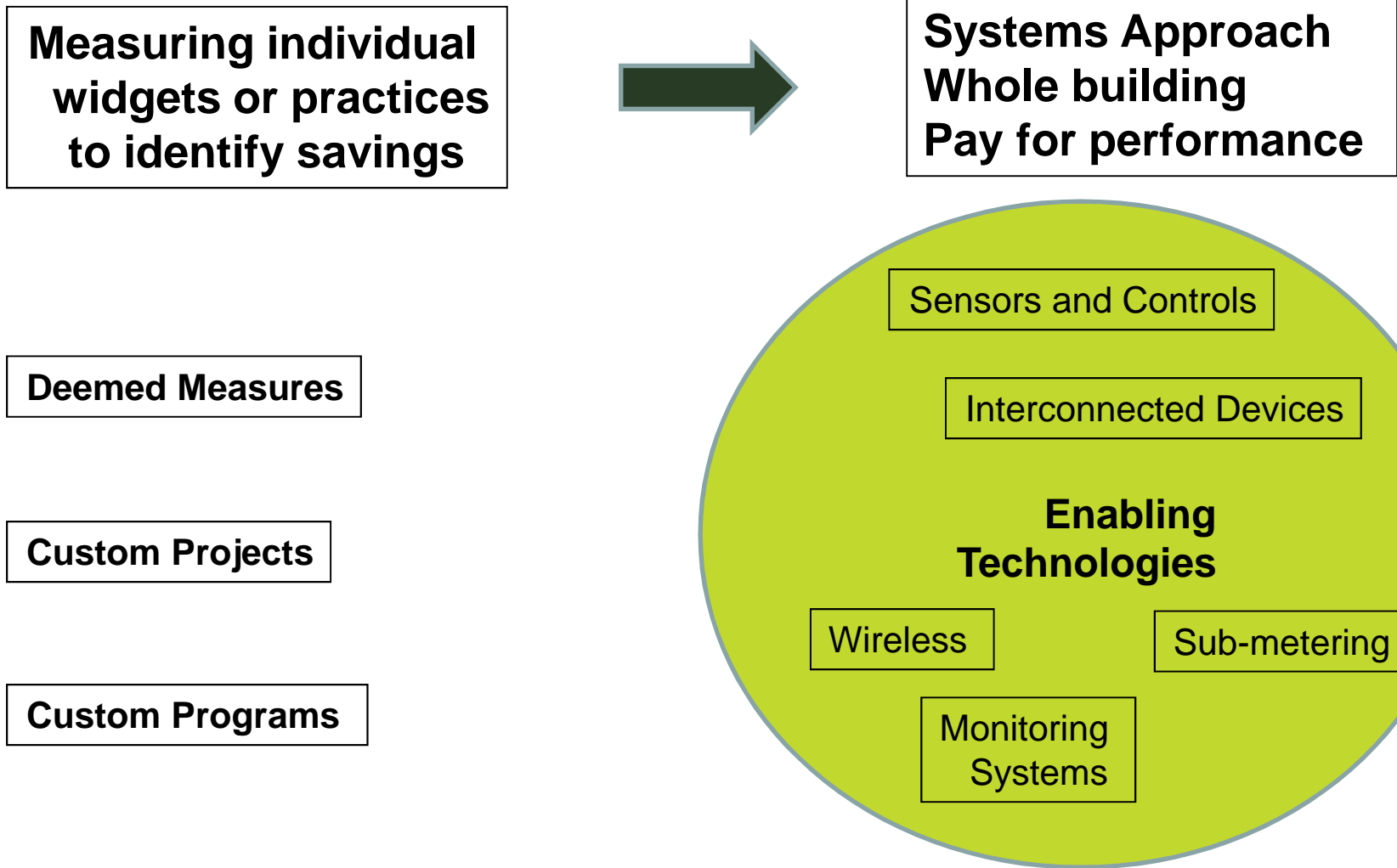
According to DOE small and medium sized businesses make up 95% of floor space and use 50% of energy for commercial buildings.

HVAC Technologies

- Tend to be part of a system or systems
- Harder to isolate savings
- EE savings may not be key driver
- Slower evolution of products and services development
- Longer market adoption
- More expensive replacement or retrofit costs



Trends in Commercial Measures



BPA Commercial HVAC Programs

Incentivizing individual widgets or practices for savings

Deemed Measures

DCV CKV

Insulation measures



Challenges
Harder to find
Slow Uptake

Custom Projects

Streamlined Processes

Calculators



Custom Programs

Tools i.e. ECAM

Modeling

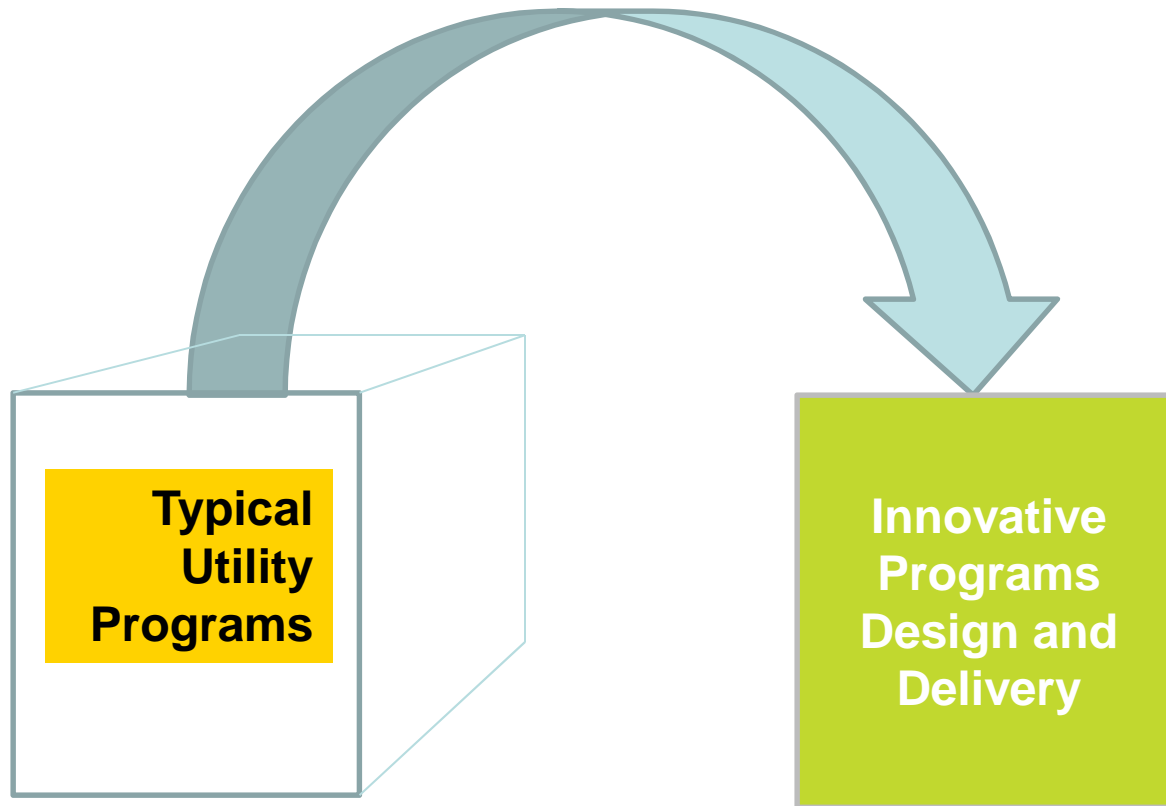
Takes resources
Cannot be easily replicated

Status Quo Just Won't Do



- **Business as usual not bringing the EE savings**
- **Need new solutions**
- **New technologies and new ways to deliver measures will be critical to long term success in Commercial Sector**

Asking this TAG to Think Outside of the Box



Deliver aMWs savings to the region and incentive dollars to utilities and end users

TAG Scope

- Commercial-sector HVAC
 - Existing ETs, limited market share
- Reduce electric-resistance heat
- Retrofit
- Not in BPA utility programs
- Excluded technologies:
 - Data center
 - Residential only

ETs Brainstorm

E3T Qualifying Criteria

1. Commercially available and new – that is, not in common use – in the Northwest.
2. Quantifiable and reliable electric energy savings in the Northwest?
3. Will it work as intended?



Commercial-Sector HVAC Emerging Technologies Discussion and Brainstorm

Rating Criteria

- **Energy Savings** – How significant and reliable are the energy savings per unit?
- **Non-Energy Benefits**– How great are the non-energy advantages for the end user for adopting this technology?
- **Technology Readiness** – How ready are the product(s) and providers to scale up for widespread use in the Pacific Northwest?
- **Ease of Adoption** – How easy is it for the end user to change to the proposed technology?
- **Value** – Considering all costs and all benefits, how good of a buy is this technology for the owner?

Example of Rating Survey

Domestic Water Heating from Condensing Air Conditioning Units - 8

Installation of waste heat recovery units on residential air conditioning condensing (outside) units to supplement domestic water heating.

[Click here for technology info.](#)

- 0- I do not support this technology
- 1- I support this technology with significant reservations
- 2- I mildly support this technology
- 3- I support this technology
- 4- I strongly support this technology
- 5- My support for this technology is enthusiastic and unqualified

Your comments are welcome

Rating Example – Data Center TAG

2013 IT TAG Weighted Rankings

Title	Average Rating	Highest rating	Lowest rating	# Responses	RANK by avg score
Air-Side Economizer for Data Centers *	4.00	5	1	13	1
Airflow Management in Data Centers *	3.92	5	3	13	2
Server Virtualization *	3.85	5	2	13	3
High-Efficiency UPS Equipment for a Data Center *	3.85	5	3	13	3
Efficient Power Supplies for Electronic Devices	3.62	5	2	13	5
Premium HVAC Equipment	3.54	5	1	13	6
Ongoing Commissioning of Economizers in a Data Center *	3.38	5	2	13	7
Storage Area Network (SAN) and Network Core Consolidation *	3.36	5	2	11	8
Power Management for IT Equipment *	3.33	5	1	12	9
Solid State Drives (Flash Memory) *	3.23	5	1	13	10
Optimizing Data Center Controls	3.18	5	1	11	11
Direct Server Cabinet Cooling *	3.15	4	2	12	12

E3TNW.org



HOME ABOUT DATABASE TAG PORTAL WEBINARS SUBMIT NEW ET

Emerging Technologies Database:

[Database](#) | [TAG](#)

a collection of energy efficiency emerging technologies submitted and scanned by energy experts and engineers; the technologies consist of basic and detail level information that highlights commercially available electricity saving technologies. You may [submit](#) new technologies, use the [search](#) and [browse](#) features in the above menu, or see the complete list of technologies.

Featured Emerging Technologies

Lighting Technologies (by Energy System)



LSI INFINITY LED 14'

Energy Management Technologies (by Focus Area)



Smart Thermostat

Residential Technologies (by Sector)



Heat Pump Water Heater
courtesy of DOE's Office of Energy Efficiency and Renewable Energy

Communications

- Listserv: tag-hvac@listserv.energy.wsu.edu
- Technical Lead: Rob Penney,
penneyr@energy.wsu.edu, 360-956-2053
- Communications Lead: Karen Janowitz,
janowitzk@energy.wsu.edu, 360-956-2096
- <http://E3TNW.org>
- The HVAC TAG Portal
<http://e3tnw.org/TAGPortal/2015HVACCommercialTAG.aspx>

HVAC TAG Roles

BPA E3T Steering Committee

- Erik Boyer
- John Wilson
- Janice Peterson
- Mira Vowles
- Chris Wolgamot
- James Anthony

Other BPA E3T Staff

- Keshmira McVey
- Debra Bristow
- Tyler Dillavou
- Jack Callahan
- Bonnie Watson

WSU E3T Staff

- Rob Penney
- Karen Janowitz
- Karen Messmer
- Jennifer Carter
- Lisa Terefenko
- Nels Christianson

Next Steps

- Rating survey sent to you March 16
- Rating survey due back to use March 18
- Discuss ETs with each other -
tag-hvac@listserv.energy.wsu.edu

2015 HVAC TAG

THANK YOU!

We so appreciate your participation!