Agenda

Conservation Advisory Council
Wednesday, February 8, 2017 1:30 pm – 4:30 pm

Address:
421 SW Oak St., #300
Portland, OR 97204

1:30 **Welcome, introductions**

1:35 **Announcements and Old Business** *(discussion)*
Nov 2016 CAC minutes
Evaluations planned and in process in 2017

1:40 **2016 Preliminary Results** *(information)*

1:55 **Residential Assessment Project Update** *(information)*
Staff will provide a brief update on the January optional CAC workshop and summarize comments received.

2:10 **Key measure updates expected in 2017** *(information)*
Overview of measures undergoing review or development that could come to CAC in 2017

2:20 **Launch of 2017 CAC – part 1** *(discussion)*
Review CAC Operating Principles, update as needed.
Solicit CAC member feedback on 2016 meetings
Discuss criteria for new CAC members.

2:50 **Residential Air Conditioning Measure Opportunity Scan** *(information)*
Energy Trust and Cadmus staff will present and discuss the results of a recent assessment that was performed to try to identify potentially reliable, cost-effective residential air conditioning measures.

3:30 **New Buildings Pilots** *(information)*
Status update on Variable Refrigerant Flow (VRF) pilot and launching Luminaire Level Lighting Control with NEEA

4:15 **Public comment**

4:30 **Adjourn**

The next scheduled meeting of the CAC will be Wednesday March 15, 2017.

Conservation Advisory Council Meeting Notes

November 16, 2016

Attending from the council:
Brent Barclay, Bonneville Power Administration
JP Batmale, Oregon Public Utility Commission
Holly Braun, NW Natural
Warren Cook, Oregon Department of Energy
Tony Galluzzo, Building Owners and Manager Association
Wendy Gerlitz, NW Energy Coalition
Charlie Grist, Northwest Power and Conservation Council
Julia Harper, Northwest Energy Efficiency Alliance
Andria Jacob, City of Portland
Don Jones, Pacific Power
Don MacOdrum, Home Performance Guild of Oregon
Brendon McCarthy, Portland General Electric
Lisa McGarity, Avista
Jeff Mitchell, Northwest Energy Efficiency Alliance
Tyler Pepple, Industrial Customers of Northwest Utilities
Allison Spector, Cascade Natural Gas

Attending from Energy Trust:
Mike Bailey
Tom Beverly
Amber Cole
Kim Crossman
Juliett Eck
Sue Fletcher
Fred Gordon
Mia Hart
Susan Jamison
Marshall Johnson
Corey Kehoe
Steve Lacey
Scott Leonard
Spencer Moersfelder
Thad Roth
Julianne Thacher
Peter West

Others attending:
Alan Meyer, Energy Trust board
Amanda Potter, CLEAResult
Bob Stull, CLEAResult

1. Welcome and introductions

Kim Crossman convened the meeting at 1:30 p.m. The agenda, notes and presentation materials are available on Energy Trust's website at: www.energytrust.org/About/public-meetings/CACMeetings.aspx.

2. Old business and announcements

Members approved previous meeting minutes. The draft schedule for 2017 was made available.

3. Update on 2017 budget and 2017-2018 action plan

Peter West presented Energy Trust's round 2 changes to the 2017 budget and 2017-2018 action plan.

Wendy Gerlitz: Did you receive comments directed at sectors about more savings than identified in the budget? I'm wondering if that can be highlighted.
Amber Cole: We are still summarizing the comments, but I don't recall seeing that theme.
Wendy: I'm thinking of indoor agriculture and lost opportunities.

Peter West: We have completed 24 indoor agriculture projects, and its part of our action plan to accelerate in that area.

> As we look at the budget, keep in mind that our current economic recovery is different from other recoveries. Portland is a cheap and convenient location compared to Seattle and San Francisco. This draws more people and businesses to move to the area, including the high-tech software sector.
>
> Energy Trust's reserves exist to cover changes. Reserves ensure we can still get savings when savings exceed expectations, such as in an economic boom. We try to set reserves between 3 and 10 percent depending on the utility. The more variable the service area for savings, the more reserves are needed.

Brendon McCarthy: of the total $95 or $98 million request for PGE, how much is for reserves?
Peter: We are targeting a reserve of 2 percent for PGE.
Steve Lacey: We will be at about $4 million at the end of 2017, and we are working it down.

Wendy: Is there a board policy about the reserve level we should have at any given time? What are the guiding principles behind that decision?
Peter: We do have a written policy on using reserves.
Steve: It's a negotiation between Energy Trust and the utilities. Some utilities need more and some less. The spread was 2 to 10 percent.

Brendon: Does rebuilding the reserves have a big influence on the budget request?
Peter: We made a decision to bring down the reserves, and we asked the utilities for less money and used excess reserves to cover the full amount needed to get the savings we have achieved in the past few years. Now, with the reserves depleted, we need the revenue budgeted to meet the savings goals for 2017. We don't have reserves to cover part of the budget, so the budget this year is larger than in the past.

Brendon: So you don't intend to rebuild the reserves. Is the request more about the economy changing and that you've already spent the reserve?
Peter: That's correct. If we don't ask for the full amount, we would have to cut savings forecasts.

Don MacOdrum: In 2013, were the reserves 38 percent of expenses?
Kim Crossman: Here's an example of how that happens: 2013 was an anomalous year for Production Efficiency. We had big projects and cheap savings relative to the historical costs we used to budget. Strategic Energy Management (SEM) was far more successful than we expected. So, we saved more energy at a lower cost than expected, which led to carryover.
Peter: Production Efficiency and SEM were contributors, but there were multiple sources.

Wendy: We felt this information was missing in earlier materials, and it is important context. This should be shared with a broader audience than this committee. The reason the reserves were built up to begin with was that Energy Trust obtained a lot of savings at lower costs than planned. It's important for people to understand that this is a positive story. You saved people a lot of money, but now it's spent out. In the end, it's a great thing for everyone.
Peter: As much as we want our programs steadily acquiring savings, we also want steady revenue collection.

Charlie Grist: This looks like a management cash flow projection. You are always going to have lumpiness from multiple sources. If you can learn how wrong your forecasts can be, you can

perhaps temper that reserve. If you can get a scale, like how fast the economy rebounded, you can do better.
Peter: Agreed. You have to look at your process. This is an extreme event perhaps, and we don't want to replicate it.

JP Batmale: So it sounds like the lesson isn't about trying to improve revenue forecasting. Is it more about savings?
Peter: Our forecast seems pretty accurate within the current year and first year of the budget, but the second year of the budget isn't as accurate. When we forecasted 2017 in 2015, it wasn't what you see now. The variances in the second year and how we communicate these variabilities and uncertainties need attention.

Alan: Reducing reserves was intentional, but happened faster than expected.
Peter: Yes. Substantial shifts can happen. The action plan lays out that we will monitor savings and spending in multiple ways. For example, lighting savings in 2018 will be dependent on what we learn in 2017.

Don Jones: Have you gone back and compared your revenue to our revenue forecasts sis?
Peter: Once we set the revenue asks, we will.
Don Jones: The revenue is within 1 percent of your projections. It's a challenge to set forward-looking revenue.

Peter: Revenue over the last two years was close to predictions. Prior to 2015, there were years when revenue varied more.

Brendon: Did you spend more on what you acquired than you planned? Reserves seemed to all disappear suddenly.
Peter: When we decided to spend down reserves between 2014 and 2017, the economic recovery was not expected to be as strong as it has been. The 2016 budget was larger, and we saved more energy than expected. The utilities were surprised, and we learned that we could have communicated with them more effectively.
Don Jones: Pacific Power increased collections, and had hoped to get through 2017 without another ask. It doesn't look like that will happen.
Charlie: It's like managing things based on hydroelectric production. You have a minimum impound behind a dam, and the snow is variable. You have a negotiated settlement here, but having some known boundaries on it would limit surprises.

Don MacOdrum: How do you define transport customers for natural gas?
Lisa McGarity: A transport customer purchases their own gas but uses our pipelines to move it.

Charlie: These budgets look at measures and programs. Do they look at reserves?
Peter: These are the savings and expenditure side. The budget doesn't include reserves and is what we need to reach these savings numbers.

Spencer Moersfelder: We have historically reported net savings. Beginning in 2017, we will also report gross savings. Gross savings are important to the utilities because they reflect the savings they see at the generator. The OPUC requested that Energy Trust report on gross savings in 2017. It aligns with regional and national reporting, along with meeting utility needs. It shows all savings we see regardless of if we deem them to be free riders later. Free riders are program participants who would have done the measures regardless of us or our incentives. They still receive an incentive, but they would have done the work anyway.
JP: There are other factors involved.

Kim: Technical realizations are in the first number.
JP: Gross shows what was achieved beyond free ridership.
Spencer: Engineering realization rates are factored into gross.

Alan: As an example, if you save 100 units, and after adjustments it decreases to 90, would this new way of reporting mean that you report 90 either way? If free riders brought it to 80, you used to report that. Now you won't?

Allison Spector: You also have people who don't file for incentives but did the work. Do you factor that in?
Spencer: We call that spillover, but it is not included in gross savings. It's a matter of definition. We are using a nationally accepted standard, which doesn't include spillover.

Kim: Both spillover and free ridership are part of market effects, which are all in net. Neither of those categories are in gross. Is that right?
Spencer: Free riders and spillover aren't in gross. Realization rates are in gross.

Peter: The impact evaluation and technical realization rate both take into account baselines and changes in how equipment is used over time.

Tyler Pepple: How do you identify the amount of spillover?
Spencer: We look at impact evaluations. We get information from customers, non-participants and national studies.

Tyler: Is spillover defined as people who took an action but didn't claim an incentive?
Spencer: Spillover describes are customers who were influenced to take action because we are in the market. These customers didn't receive an incentive.

Alan Meyer: This is a topic at the evaluation committee. We can determine free ridership because they used our program. Spillover is harder to judge because they didn't use our program. We don't know who they are.

Allison: I wonder if there are similar strategies in how market transformation is quantified.

Charlie: This is a good move to reporting gross. A lot of money can be spent trying to quantify these things that are very hard to quantify. It's important to look at overall market uptake outside of programs. Lighting is the poster child. We should look at what's going on in the marketplace.
Spencer: We are taking note of retail lighting, and helping our utility partners make adjustments based on baselines.

Allison: It's great you are going in this direction.

Holly: Are you moving to gross only, or showing both?
JP: Showing both.

Holly: I've wondered if maybe the notion of free riders is narrow or misguided. Because you are here, contractors do advertising and install measures. They wouldn't have advertised without the incentive, so the customer might not have understood that we made them act. But the contractor acted because of you. This is more of a full market picture.
Don MacOdrum: We know a little of that is going on in terms of wall and floor insulation right now. Incentives are low, but the signal from Energy Trust is that it's something good to do. Going back to the idea of spillover in the introduction to reporting gross savings, the number is

related to what utilities are generating. Spillover also means the generators are generating less, so savings are higher. We should have that number just as much as gross. The delta is important in terms of forecasting.
Peter: On one level it makes sense to include spillover. What Spencer presented conforms to some regional definitions of gross savings. Spillover doesn't change the needle much.
Fred Gordon: Where we can forecast a baseline and we can show a market shift or cause, we call it market transformation. Our estimates tend to be conservative when people didn't participate but they tell us they installed efficiency measures. It's difficult to know what they installed, what it saved and if it's in our territory.

Holly: In the presentation, is Washington marked N/A because we only report gross up there?
Peter: Yes.

Don Jones: We appreciate you reporting both.

Warren Cook: Where along the savings realization adjustment factor (SRAF) continuum is levelized cost calculated?
Spencer: Levelized cost is typically calculated using net savings.

Wendy: I also wanted to announce that the NW Energy Coalition Fall Conference is tomorrow at the Doubletree Hotel in Portland.

4. Residential sector assessment project
Thad provided a brief overview of the residential assessment project, and asked for input from Conservation Advisory Council members.

Don MacOdrum: Are there time limits for OPUC exceptions like wall and floor insulation?
JP: It varies by measure, but the baseline is about two years.

Brent Barclay: With Bonneville Power Administration, there are some similarities in consolidation of services. There could be potential gains from consolidating duplicative activities. However, relying on a single program management contract increases risk if something goes wrong.

Warren Cook: What kind of benchmarking did you do? Using a really wide net in benchmarking other programs will be helpful because other programs could teach us something.
Marshall Johnson: As part of an Existing Homes evaluation, we are asking evaluators to look at the top 10 American Council for an Energy-Efficient Economy (ACEEE) states for energy efficiency. Who are the leaders and how did we rank compared to them? The policy environment may be different, so it's not a perfect comparison. We've looked at utilities thinking of consolidating their residential programs. We've found that there is a trend toward consolidation.

Allison: It would be helpful to see scenarios mapped out with options, costs, pros and cons.

Lisa: With the explosion of Home Performance contractors, Avista has seen costs skyrocketing. Invoices are lumped together so it's hard to break costs out. American Recovery and Reinvestment Act funding is also part of it.

JP: I appreciate the professionalism of your team to bring this issue forward for discussion. It would be nice to have some scenarios. Warren brought up a good point about ACEEE at the

last meeting, and why we would be number five in rankings instead of seven. What does it mean to increase flexibility to target new opportunities?
Thad: We have been developing measures across multiple programs for about two years, including Nest thermostats and midstream water heating. It adds complexity to try and advance things across multiple PMCs or programs.

Marshall: We currently manage annual contracts, expenditures and benefits for three programs. Between 2014 and 2015, we developed an incentive for smart thermostats through Existing Homes and Products programs. We have a program manager for each program. There might be a better way to streamline oversight of contracting and measure development.

Julia Harper: Could you break the program into products versus services? For a product, the supply chain channel would be pretty similar whether purchased or put in a new home. Services cross boundaries between new and existing homes.
Thad: Would that be New Homes and another program that accommodates retail and Existing Homes approaches?
Julia: You need New Homes to deal with builders, but everything else splits into products or services. A product isn't unique to a builder.
Thad: Is there a necessity to have a unique contract and is that the best way to capture those savings, or could it work with a single PMC?
Julia: I don't know enough about your work with PMCs to have a strong opinion. I think of supply channels, but your contractors may work with both of them seamlessly.

Marshall: Each program portfolios rolls up into a single sector portfolio. We encourage cross-program referrals. You can sort customers by serving a builder or resident, shopper, multifamily resident, load profiles, technologies and other ways. We are trying to deliver in the most efficient way possible.

JP: Do you see the possibility of following the renewable energy and industrial sectors by making program management internal? Maybe you have a Program Delivery Contractor (PDC) contract to allow more ability to move things around. PMCs work well, but PDCs would allow more direct control. A PDC implements but you design. A PMC implements and designs.
Thad: We have looked at that and how we could use a PDC for targeted expertise. It does help spread the risk. We are still trying to define what role they would play. In the mapping described earlier, it was compelling that there was a lot of work we do with each PMC that is consistent. We want their capacity to deliver services, like field services. That's part of our consideration with this model. With a single PMC, we would expect a need for additional technical resources.

Brendon: There are people meeting about energy efficiency initiatives for the 2017 legislative session. One idea is to bolster codes and standards. We are going into an environment where we mandate and adopt a reach code. That may shrink acquisition even more. The Residential Energy Tax Credit is set to expire and it's not in the governor's budget to be extended. Given the failure of Measure 97, it may not be renewed.

Don MacOdrum: As structures get considered, we don't have any strong feelings about consolidating under one PMC. That's up to you to manage. If you want trade allies to continue helping deliver savings and be true allies, you need to maintain that they are special compared to other contractors in terms of what they can sell homeowners. Maybe you still have a business development fund and logo, but the trade allies don't necessarily have as many excuses to discuss Energy Trust with customers. If all incentives get buried upstream, it undermines the relationship with trade allies.

Thad: There are some opportunities related to the challenges we are facing. Relationships with customers remain our top priority and will be top of mind as we make program delivery decisions. We have to demonstrate our ability to drive customers to make efficient decisions.

Brent: Another thought is stepping back asking the service providers to tell us what they can do. A performance contract would be a possibility. Think of the sector as a meter.
Marshall: A request for proposals does encourage that, but you have to know that what's on paper can be done to our standards. Pay-for-performance may be good, but you have to think about free riders and spillover.

Brent: Bonneville Power Administration is thinking about how we define commercial versus residential. The program delivery mechanism may be one and the same. Maybe don't constrain this to what's in the residential sector now.

Holly: If the goal is to get all homes up to a certain level of performance, and the City of Portland's proposed home energy scoring requirement passes, it's for listing purposes. If you use that same mechanism and tie the incentive to a score, it may move the market up. You can measure how many homes are at a certain level each year and make that the goal. I applaud you for taking on this exercise.

Thad: We do need to go for bid, but do we take advantage of going to bid to make the changes? That's the feedback we're looking for. There are risks because of issues beyond our control. We've tried to identify the risks. We are taking a five-year look instead of a one- or two-year budget look. We have to be conscious of anticipating and managing opportunities. How do we use our PMCs to that end? Please email me directly with additional feedback. The next update on this will be at the February 2017 Conservation Advisory Council meeting.

5. Public comment
Don MacOdrum: Portland is exploring a home energy score ordinance using a scoring tool. It is going to city council on November 23. The policy is modeled from pilots that have been done in Berkeley, Austin and with Energy Trust. This is built from all of them and well designed.
Warren Cook: Home energy scoring could be a shot in the arm for the residential sector. New Homes and Existing Homes contractors aren't talking to each other, but this could cross programs. A combined management contractor could see both sides.

JP: A report came out this summer regarding mandatory scoring driving more energy efficiency to improve scores.
Thad: Would that forecast more work for us?
Holly: What we've done is push people to voluntarily do projects. You might not need as many incentives if it's being pulled instead of pushed.
Marshall: It could drive more awareness for higher-cost measures like insulation.

Tyler: How do you get a home energy score? Who pays for it?
Don MacOdrum: It's similar to a home inspection or radon test. The cost is estimated to be about $200.
Warren: Home inspections are performed by a licensed assessor through the state.

Holly: Attendees need to be ready to testify, but letters are welcome.

6. Meeting adjournment
The next scheduled meeting of the Conservation Advisory Council will be on February 8, 2017 at 1:30 p.m.

Project	Program	Sector	Evaluation Type	Evaluation Status (as of Jan. 2017)
Free-Ridership and Spillover Research Project	General	-	Other	Almost Done
Fast Feedback Surveying and Reporting	General	-	Survey	In Progress
My Campaigns Effectiveness Study	General	-	Other	In Progress
Measure Approval Workflow Project	General	-	Other	Not Started
2016 Customer Insights Survey	General	CCS	Survey	Almost Done
2017 Customer Insights Study	General	CCS	Survey	Not Started
2013-2014 Impact Evaluation	Existing Buildings	Commercial	Impact	Almost Done
Commercial SEM Impact Evaluation	Existing Buildings	Commercial	Impact	Almost Done
2015-2016 Impact Evaluation	Existing Buildings	Commercial	Impact	In Progress
2018 Process Evaluation	Existing Buildings	Commercial	Process	Not Started
Pay for Performance Limited Offer	Existing Buildings	Commercial	Process and Impact	Not Started
2017 Impact Evaluation	Existing Buildings	Commercial	Impact	Not Started
2017 SEM Process Evaluation	Existing Buildings	Commercial	Process	Not Started
TBD Qualitative Research	Existing Buildings	Commercial	Market Research	Not Started
Pilots - Advanced Power Strips, Tier I	Multifamily	Commercial	Pilot	Almost Done
Multifamily Showerhead Study	Multifamily	Commercial	Field Study	Almost Done
Pilots - MPower	Multifamily	Commercial	Pilot	Almost Done
2016 Process Evaluation	Multifamily	Commercial	Process	In Progress
Pilots - Ductless Heat Pump	Multifamily	Commercial	Pilot	In Progress
Pilots - Advanced Power Strips, Tier II	Multifamily	Commercial	Pilot	In Progress
2018 Process Evaluation	Multifamily	Commercial	Process	Not Started
Pilots - Cadet Heaters	Multifamily	Commercial	Pilot	Not Started
Pilots - Water Submetering	Multifamily	Commercial	Pilot	Not Started
Pilots - IoT Controls	Multifamily	Commercial	Pilot	Not Started
Large / Complex Projects Impact Evaluation	New Buildings	Commercial	Impact	In Progress
Pilots - VRF	New Buildings	Commercial	Pilot	In Progress
2016 Participant Surveys	New Buildings	Commercial	Survey	In Progress
2014 Impact Evaluation + 2011-12 Large Projects	New Buildings	Commercial	Impact	In Progress
NEEA Commercial Code Evaluation (2015-2016 Impact Evaluation)	New Buildings	Commercial	Impact	In Progress
Pilots - Luminaire Lighting Controls	New Buildings	Commercial	Pilot	In Progress
2017-2018 Process Evaluation	New Buildings	Commercial	Process	Not Started
Staff and Board Diversity Survey	General	Diversity Initiative	Survey	In Progress
Diversity Initiative Contracting and Procurement Evaluation	General	Diversity Initiative	Process	In Progress
PSU Research Projects	General	General	Other	In Progress
City of Portland Home Energy Score	General	General	Other	In Progress
City of Portland Commercial Benchmarking	General	General	Other	In Progress
2017 Staff Survey	General	HR	Other	Not Started
2012 Impact Evaluation	Production Efficiency	Industry and Agriculture	Impact	Almost Done
O&M Persistence Study	Production Efficiency	Industry and Agriculture	Other	In Progress
SEM Impact/Process Evaluation	Production Efficiency	Industry and Agriculture	Process and Impact	In Progress
2013-2014 Impact Evaluation	Production Efficiency	Industry and Agriculture	Impact	In Progress
Mega Projects Evaluation	Production Efficiency	Industry and Agriculture	Impact	In Progress
Market Research on Industrial Growers	Production Efficiency	Industry and Agriculture	Market Research	Not Started
2015-2016 Impact Evaluation	Production Efficiency	Industry and Agriculture	Impact	Not Started
2017 Impact Evaluation	Production Efficiency	Industry and Agriculture	Impact	Not Started
2016-2017 Process Evaluation	Production Efficiency	Industry and Agriculture	Process	Not Started
UCI Data Project	General	IT	Other	Almost Done
Measure Versioning Project	General	IT	Other	Not Started
Lighting Controls Study	Non-Residential	Non-Residential	Impact	Almost Done
MT&R Modeling Review and Analysis	Non-Residential	Non-Residential	Other	In Progress
Update SEM Follow-Through Analysis	Non-Residential	Non-Residential	Other	In Progress
SEM Baseline and Non-Participant Study	Non-Residential	Non-Residential	Market Research	Not Started
2016 Process Evaluation + ESK Installation Rates Survey	Existing Homes	Residential	Process	Almost Done
Billing Analysis - Ceiling Insulation	Existing Homes	Residential	Impact	In Progress
Billing Analysis - Heat Pumps	Existing Homes	Residential	Impact	In Progress
Pilots - Nest Seasonal Savings	Existing Homes	Residential	Pilot	In Progress
Pilots - Heat Pumps in Manufactured Homes	Existing Homes	Residential	Pilot	In Progress
Billing Analysis - DHPs	Existing Homes	Residential	Impact	Not Started
Billing Analysis - HPWHs	Existing Homes	Residential	Impact	Not Started
Energy Saver Kit Survey - 2017	Existing Homes	Residential	Survey	Not Started
2018 Process Evaluation	Existing Homes	Residential	Process	Not Started
Pilots - Behavioral EE (PGE)	Existing Homes	Residential	Pilot	Not Started
Energy Saver Kit Survey - 2018	Existing Homes	Residential	Survey	Not Started
Pilots - Contractor Installed Thermostats	Existing Homes	Residential	Pilot	Not Started
Windows Market Research	Existing Homes	Residential	Market Research	Not Started
Billing Analysis - DHPs and HPs in Manufactured Homes	Existing Homes	Residential	Impact	Not Started
Summary of Available Market Data	General	Residential	Other	Not Started
New Homes Gas Fireplace Survey	New Homes	Residential	Survey	In Progress
2018 Process Evaluation	New Homes	Residential	Process	Not Started
DHP Pilot	New Homes	Residential	Pilot	Not Started
Residential Grow Light Market Research	Products	Residential	Other	In Progress
2018 Process Evaluation	Products	Residential	Process	Not Started
Manufactured Homes Early Retirement	Products	Residential	Pilot	Not Started
Solar Soft Cost Survey	Solar	Solar	Survey	In Progress
Verification Process Evaluation	Solar	Solar	Process	Not Started

Energy Trust of Oregon 2016 Preliminary Annual Results

February 3, 2017

The following represents preliminary Energy Trust of Oregon 2016 annual savings and generation results, and progress to energy goals and IRP targets. This report contains the best available data at this time, and reflects net savings. Further review as part of Energy Trust's comprehensive annual reporting process may change the results reported here. The Energy Trust 2016 Annual Report to the Oregon Public Utility Commission will contain the most accurate and comprehensive Energy Trust data, and will be available on April 14, 2017.

A. Preliminary electric efficiency savings

In 2016, electric efficiency programs saved 60.0 average megawatts, achieving **109 percent of Energy Trust's 2016 electric savings goal** of 55.1 aMW.

Preliminary electric efficiency savings	Portland General Electric aMW	Pacific Power aMW	Total aMW
Existing Buildings	9.86	6.32	16.19
New Buildings*	4.28	2.49	6.77
Production Efficiency	7.14	4.61	11.75
New Homes and Products	8.73	5.13	13.86
Existing Homes	2.19	2.05	4.25
NEEA	4.25	2.95	7.2
Total electric efficiency programs	**36.46**	**23.56**	**60.02**

Electric efficiency savings numbers include transmission and distribution savings
**Includes Energy Trust electric market transformation savings acquired separately from NEEA efforts*

B. Preliminary natural gas efficiency savings

In 2016, gas efficiency programs saved 6.7 million annual therms of natural gas, achieving **117 percent of Energy Trust's 2016 gas savings goal** of 5.7 million annual therms.

Preliminary gas efficiency savings	NW Natural—Oregon therms	Cascade Natural Gas therms	Avista therms	Total therms
Existing Buildings	1,928,387	211,367	0	2,139,754
New Buildings*	651,054	82,638	0	733,692
Production Efficiency	1,317,927	14,769	0	1,332,696
New Homes and Products*	1,305,561	140,148	29,788	1,475,497
Existing Homes	963,002	67,962	4,920	1,035,884
Total gas efficiency programs	**6,165,931**	**516,884**	**34,708**	**6,717,523**

**Includes Energy Trust gas market transformation savings acquired separately from NEEA efforts*

C. Preliminary NW Natural—Washington gas efficiency savings

In 2016, gas efficiency programs for NW Natural customers in Washington saved 330,866 annual therms of natural gas, achieving **126 percent of Energy Trust's 2016 NW Natural—Washington gas savings performance metric** of 263,184 annual therms in NW Natural's 2016 Energy Efficiency Plan submitted to the Washington Utilities and Transportation Commission[1].

Preliminary NW Natural—Washington gas efficiency savings	NW Natural—Washington therms
Existing Buildings	112,709
Existing Homes	66,106
New Homes	152,051
Total NW Natural—Washington gas efficiency programs	**330,866**

D. Preliminary renewable energy generation

In 2016, renewable energy programs generated 2.78 aMW, achieving **67 percent of Energy Trust's 2016 renewable generation goal** of 4.13 aMW.

Preliminary renewable energy generation	PGE aMW	Pacific Power aMW	Total generation aMW
Solar Electric	1.57	1.20	2.77
Other Renewables	0.00	0.01	0.01
Total renewable programs	**1.57**	**1.21**	**2.78**

Renewable energy generation numbers include transmission and distribution savings, where appropriate

[1] Energy Trust's 2016 board-approved budgeted goal for NW Natural territory in Washington differs slightly due to timing. 2016 savings were approximately 125 percent of Energy Trust's 2016 budgeted goal of 265,089 annual therms.

E. Preliminary progress to 2016 annual goals by utility

Preliminary progress to goals by utility	Annual savings	Energy Trust annual goal		Annual IRP target	
		Goal	% Achieved	Target	% Achieved
PGE	36.46 aMW	33.66 aMW	108%	27.23 aMW	134%
Pacific Power	23.56 aMW	21.42 aMW	110%	16.84 aMW	140%
NW Natural—Oregon	6,165,930 annual therms	5,254,568 annual therms	117%	3,920,239 annual therms	157%
Cascade Natural Gas	516,885 annual therms	466,577 annual therms	111%	447,071 annual therms	116%
Avista	34,708 annual therms	31,574 annual therms	110%	N/A	N/A

Includes savings from NEEA and Energy Trust electric and gas market transformation savings acquired separately from NEEA efforts

G. Preliminary efficiency results by sector

Preliminary efficiency results by sector	Electric efficiency results			Gas efficiency results		
	Annual savings	Goal	% Achieved	Annual savings	Goal	% Achieved
Commercial	24.30 aMW	21.80 aMW	111%	2,873,446 annual therms	2,598,470 annual therms	111%
Industry and agriculture	11.88 aMW	13.59 aMW	87%	1,332,696 annual therms	1,036,453 annual therms	129%
Residential	23.85 aMW	19.69 aMW	121%	2,511,381 annual therms	2,086,222 annual therms	120%
2016 annual total	**60.02 aMW**	**55.08 aMW**	**109%**	**6,717,523** annual therms	**5,721,145** annual therms	**117%**

Includes savings from NEEA and Energy Trust electric and gas market transformation savings acquired separately from NEEA efforts

Residential Program Delivery Structure Proposal

February 8, 2017

Energy Trust of Oregon

Follow-Up from Residential Sector Assessment Workshop

More than 30 people in attendance

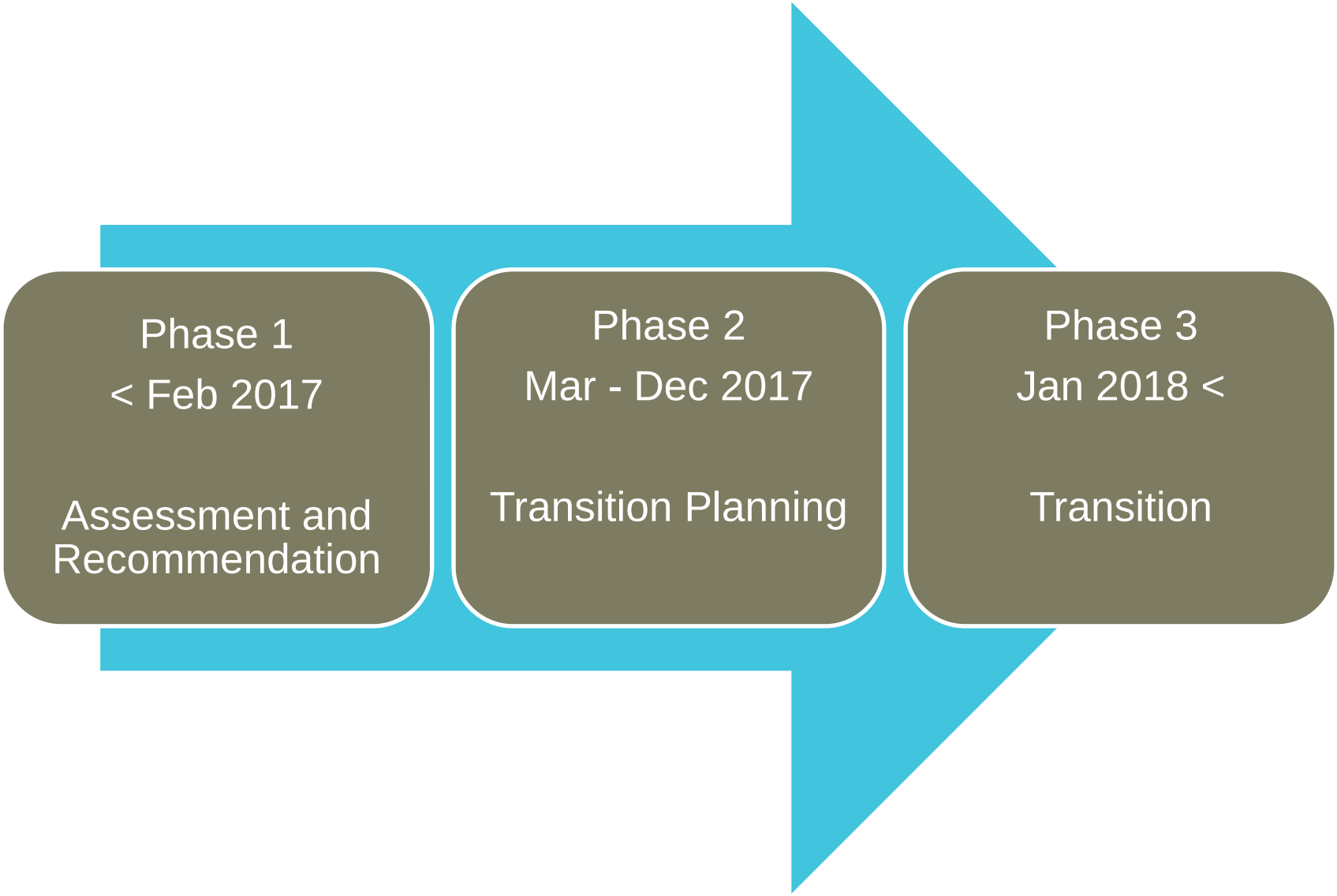
- CAC members
- Utilities
- Trade allies

Heard questions and feedback through January 20

Next steps

- Proposal to board on February 22

Project Phases and Timeline



2017 Measures

Mike Bailey PE
Engineering Manager

EnergyTrust of Oregon

Key Measure Updates Anticipated in 2017

About 50 Measure Approval Documents (MAD) expire in 2017

- Programs have until June to decide to update or let expire

All lighting measures are being reviewed

- Lamps, fixtures, controls – in all sectors
- Driven by technology, dynamic LED prices, possible code changes for New Buildings

- Showerheads & water conservation measures
- Windows (Residential and single family)
- Gas water heaters (retail tanks & tankless in MF)
- New Construction EPS (Oregon)
- Heat Pumps & DHPs (Residential)
- Measures Impacted by Oregon RETC

Key Pilots & Potential New Measures

- Manufactured Home Early Retirement
- Automated Thermostat Optimization (Nest “Seasonal Savings”)
- Multifamily Advanced Power Strips “Tier 2”
- Luminaire Lighting Control (LLC) Pilot with NEEA and New Buildings
- Research potential Cannabis standard measures

- Thank You

- Mike Bailey PE, Engineering Manager
- Mike.Bailey@energytrust.org
- 503.445.2446

EnergyTrust of Oregon

Conservation Advisory Council
Operating Principles

The Conservation Advisory Council (CAC) is one of several standing committees formed by the board of directors to provide advice in support of the Energy Trust efficiency programs.

From the CAC Charter:

> The purpose of the Conservation [and Renewable] Advisory Councils is to advise the board and staff of Energy Trust of Oregon, Inc., regarding issues associated with Energy Trust energy efficiency and renewable energy policies and programs.
>
> The Councils will:
>
> (a) Review and discuss selected energy efficiency and renewable energy issues prior to Energy Trust decision-making to ensure that the Board and staff have the best available information on such issues;
> (b) Help the Board and staff to identify alternative resolutions of such issues; and
> (c) Help staff identify matters for board consideration.

The CAC provides direct advice and input on budgets, program designs and strategies and the implications and programmatic response to policy or market changes. Final resolution of issues and all decision authority remains with the board of directors.

The following operating principles are a distillation of Conservation Advisory Council meeting discussions concerning the CAC role and meeting process. CAC Operating Principles were initially developed in 2004 to improve and enhance the CAC process. The Operating Principles are reviewed by CAC members and Energy Trust staff at the beginning of the year, updated as needed and adopted. The following items were generally agreed to be the way that CAC should operate in 2016.

Energy Trust staff has endeavored to incorporate these principles into the CAC meeting process as a way to enhance the effectiveness of advisory council meetings.

1. Meet in person at least 8 times per year, providing a phone conference line upon request if a CAC member needs to participate remotely.
2. Draft an annual CAC schedule to set expectations for the year and prioritize known issues/ topics for the year to inform annual schedule and meeting agenda development.
3. Whenever possible, distribute meeting agendas, related materials and notes from the previous meeting one week in advance so that CAC members can review and be prepared to engage on topics.
4. Identify agenda items as discussion, information, or recommendation needed.
5. Make presentations short and succinct; provide ample time for discussion. Structure the meetings to maximize dialogue between staff, CAC members and other interested parties who attend.
6. Assure sufficient CAC member input and discussion on warranted topics before polling members for opinions. Document minority viewpoints as well as prevailing opinions.
7. Provide summaries of CAC input in board briefing materials or decision documents where applicable. Summaries should reflect the degree of CAC unanimity.
8. Encourage board member attendance at CAC meetings. Include board members on CAC distribution list to allow board to review CAC minutes and to choose to attend meetings of interest.
9. Include time on agendas for open discussion and suggestions for future agenda items.
10. Brief new, incoming CAC members on their duties.




Air Conditioning Measure Opportunities Scan

Cost Effectiveness Results

Aquila Velonis, Cadmus

Spencer Moersfelder, Energy Trust of Oregon

February 8th, 2017

Project Overview

Background: Due to cost-effectiveness limitations, Energy Trust does not presently have any prescriptive measures in place for:

- Central or window AC for single-family homes
- Window AC or PTACs (electric resistance heat) in multifamily units

Purpose: Identify potentially cost-effective residential air conditioning (AC) measures using current Avoided Costs and assumptions from secondary sources. Perform additional analysis on measures that look promising in another phase.

THIS IS AN INITIAL SCAN, NOT A DETAILED ANALYSIS

Project Overview (continued)

Energy Trust released an RFP to pre-qualified pool of Planning and Evaluation Contractors and selected Cadmus

We reviewed the following AC types in the respective residential settings:

- **Central AC in existing and new single-family and existing manufactured homes.**
- **Window AC in existing single-family, multifamily and manufactured homes.**
- **Packaged terminal AC in new multifamily.**

Methodology

Data Sources:

- Energy Trust's avoided costs estimates
  - The value of efficiency-driven peak reduction is included
  - These will be updated mid-2017
- Regional Technical Forum (RTF) unit energy savings workbooks
- Residential Building Stock Assessment data
- US DOE Technical Support Documents (TSDs)
- ENERGY STAR®
- Previous Cadmus analyses

Methodology

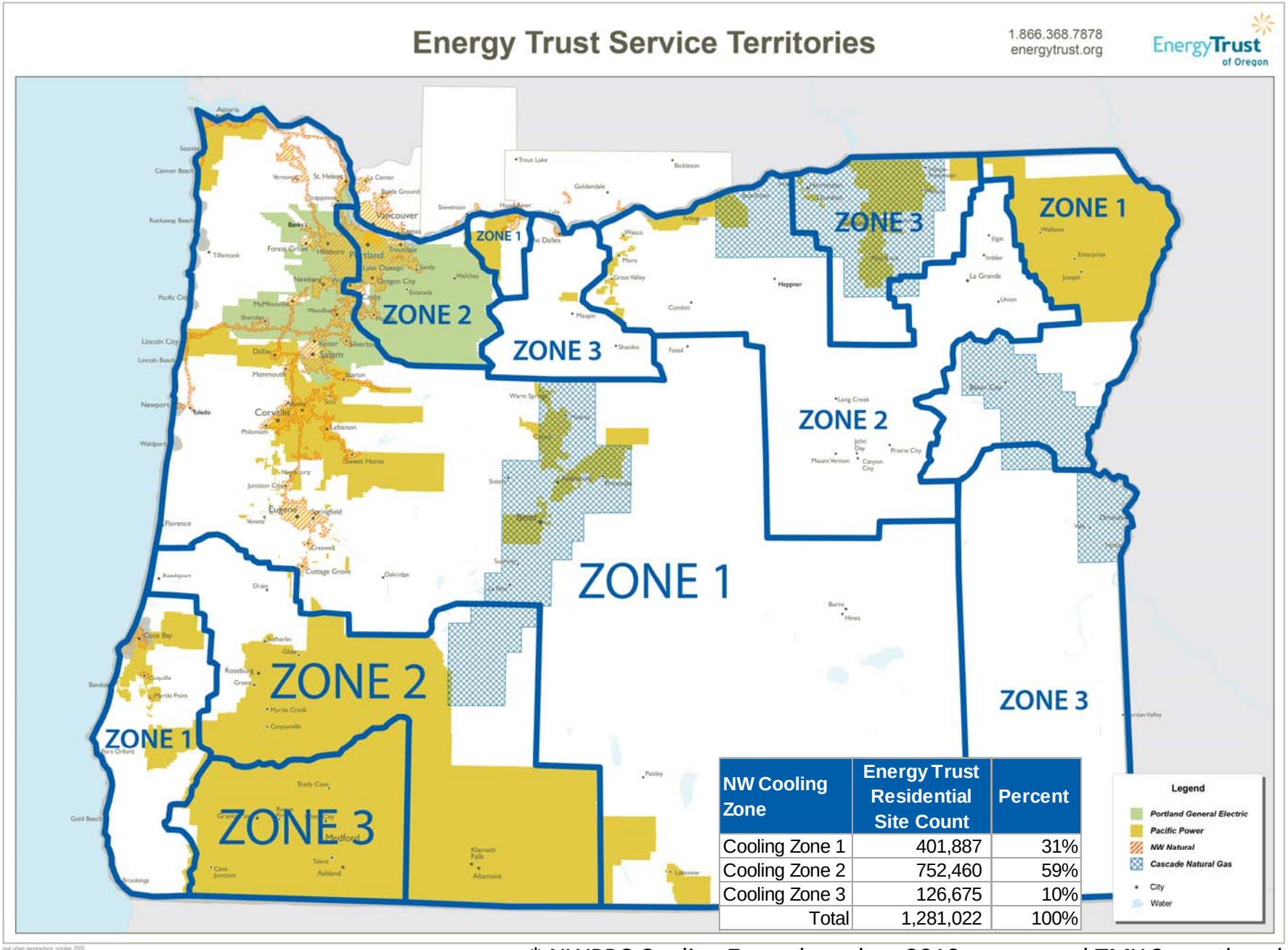
METHODOLOGY
Assessed cost effectiveness of 12 residential AC scenarios by:

Segment
New and existing housing stock
Equipment type
Measure efficiency
NW cooling zone: CZ1, CZ2, and CZ3

Where reasonable, applied liberal assumptions for savings and incremental costs

Cost-Effectiveness Measure Scenarios

Measure Iteration	Segment	Housing Stock	Equipment Type	Channel	Scenario
1	Single Family	Existing Construction	Window Unit A/C	Retail	Incremental Upgrade
2					Early Retirement (Retrofit)
3			Central A/C	Contractor	New Purchase
4					Early Retirement (Retrofit)
5		New Construction	Central A/C	Contractor	New Purchase
6	Multifamily	New Construction	PTAC	Contractor	New Purchase
7		Existing Construction	Window Unit A/C	Retail	Incremental Upgrade
8					Early Retirement (Retrofit)
9	Manufactured Homes	Existing Construction	Window Unit A/C	Retail	Incremental Upgrade
10					Early Retirement (Retrofit)
11			Central A/C	Contractor	New Purchase
12					Early Retirement (Retrofit)



NW Cooling Zone	Energy Trust Residential Site Count	Percent
Cooling Zone 1	401,887	31%
Cooling Zone 2	752,460	59%
Cooling Zone 3	126,675	10%
Total	1,281,022	100%

* NWPPC Cooling Zones based on 2010 census and TMY 3 weather data

Analysis Central AC

Key Assumptions:

- Savings estimated from RTF SEEM models using different climate data
  - TMY 3/TMY 2 - 367 CDD for Portland
  - Results proportioned using 2000-2014 climate data – 471 CDD for Portland
- Costs based on DOE TSDs
- 15 year measure life

Equipment Specifications	Baseline	Efficient Equipment
Upgrades at time of purchase	SEER 13	SEER 15.0, 16.0, 18.0
Early replacement/Retrofit	SEER 11.1	SEER 15.0, 16.0, 18.0

Scan Findings Central AC

- Early replacement/retrofit Central AC measures are not cost-effective in any CZ.

- Results for upgrades for Central AC at the time of purchase vary by CZ.
  - CZ3 is cost-effective, CZ2 is prospectively close and CZ1 is not.
  - Weighted CZ results merit a closer look
    - 0.58-0.94 BC-ratio depending on climate data and equipment efficiency

Analysis Window AC

Key Assumptions:

- Savings estimated using two different methods
  1. Adjusted tonnage capacity of RTF SEEM workbook with two sets of climate data:
     - TMY 3/TMY 2 - 367 CDD Portland
     - Results proportioned using 2000-2014 data – 471 CDD Portland
  2. ENERGY STAR calculator
- Costs based on review of 34 on-line retail products
- 10 year measure life

Equipment Specifications	Baseline	Efficient Equipment
Upgrades at time of purchase	CEER 10.9	CEER 12.0
Early replacement/retrofit	CEER 9.7	CEER 12.0

Scan Findings Window AC

- RTF SEEM workbooks are more reliable method for Energy Trust.
- Early replacement/retrofit Window AC measures are not cost-effective in any CZ.
- Results for upgrades for Window AC at the time of purchase vary by CZ.
  - CZ3 is cost-effective, CZ2 is prospectively close and CZ1 is not.
  - Weighted CZ results merit a closer look
    - 0.67 or 0.86 BC-ratio depending on climate data

Analysis Multifamily New Construction PTACs (electric resistance heat)

Key Assumptions:

- Savings estimated using a new construction multifamily RTF workbook
  - TMY 3/TMY 2
- Costs based on DOE TSDs
- 15 year measure life

Equipment Specifications	Baseline	Efficient Equipment
Upgrades at time of purchase	EER 11.0	EER 12.0

Scan Findings Multifamily New Construction PTACs (electric resistance heat)

- Measure is prospectively cost-effective in all cooling zones using TMY3/TMY2 climate data.
- This measure may also be cost-effective if equipment is upgraded at time of failure.

Conclusions

1. **Early replacement/retrofit options for central and window AC is not likely to be cost-effective.**

2. **Equipment upgrades at time of purchase for Central and Window AC in existing and new single-family and in existing multifamily are prospectively cost-effective.**

3. **PTACs in new multifamily are most likely cost-effective.**

Next Steps

1. **Discontinue investigation of early replacement/retrofit options for central and Window AC.**

2. **For equipment upgrades at time of purchase for Central and Window AC Energy Trust will follow-up with a more in-depth analysis of:**
    - **Climate data**
    - **Optimizing modeling assumptions for Oregon**
    - **Cost data**

3. **For PTACs New Buildings program will review the measure in relation to pending 2018 code release.**

Q & A

Spencer Moersfelder, Energy Trust of Oregon
Planning Manager
Office (503) 445-7635
spencer.moersfelder@energytrust.org

Aquila Velonis, Cadmus
Senior Associate, Energy Services
Office (503) 467-7156
aquila.velonis@cadmusgroup.com

Addendum Slides

BCR Results Central AC

Existing and New Single Family and Existing Manufactured Central AC*	
RTF Workbook Used to Quantify Savings*	
Equipment Upgrade at time of Purchase	**Early Replacement/Retrofit**
Using TMY3/TMY2 Climate Data: CZ1 TRC: 0.32-0.41 CZ2 TRC: 0.63-0.75 CZ3 TRC: 1.01-1.28 Weighted TRC: 0.58-0.70	**Using TMY3/TMY2 Climate Data:** CZ 1 TRC: 0.08-0.11 CZ2 TRC: 0.15-0.22 CZ3 TRC: 0.27-0.38 Weighted TRC: 0.14-0.20
Using 2000-2014 Climate Data: CZ 1 TRC: 0.41-0.53 CZ 2 TRC: 0.81-0.96 CZ 3 TRC: 1.30-1.64 Weighted TRC: 0.76-0.94	**Using 2000-2014 Climate Data:** CZ 1 TRC: 0.10-0.14 CZ 2 TRC: 0.20-0.28 CZ 3 TRC: 0.34-0.49 Weighted TRC: 0.18-0.26
*TRC ranges in this table are the result of analyzing multiple combinations of baseline and post installation SEER ratings for AC measures.	

BCR Results Window AC

For Existing Single Family, Multifamily, and Manufactured Home Window AC			
Tonnage Adjustment of RTF SEEM Workbook		**ENERGY STAR® Method**	
Equipment Upgrade at Time of Purchase	**Early Replacement/ Retrofit**	**Equipment Upgrade at Time of Purchase**	**Early Replacement/Retrofit**
Using TMY3/TMY2 Climate Data: CZ1 TRC: 0.37 CZ2 TRC: 0.73 CZ3 TRC: 1.27 Weighted TRC: 0.67	**Using TMY3/TMY2 Climate Data:** CZ1 TRC: 0.15 CZ2 TRC: 0.30 CZ3 TRC: 0.52 Weighted TRC: 0.28	**EFLH Calibrated to OR:** CZ1 TRC: 0.51 CZ2 TRC: 1.02 CZ3 TRC: 1.55 Weighted TRC: 0.91	**EFLH Calibrated to OR:** CZ1 TRC: 0.19 CZ2 TRC: 0.39 CZ3 TRC: 0.60 Weighted TRC: 0.32
Using 2000-2014 Climate Data: CZ1 TRC: 0.48 CZ2 TRC: 0.94 CZ3 TRC: 1.63 Weighted TRC: 0.86	**Using 2000-2014 Climate Data:** CZ1 TRC: 0.20 CZ2 TRC: 0.39 CZ3 TRC: 0.67 Weighted TRC: 0.36	N/A	N/A

BCR Results Multifamily New Construction PTACs

New Construction Multifamily Package Terminal AC
RTF Workbook
Equipment Upgrade at Time of Purchase
Using TMY3/TMY2 Climate Data:
CZ 1 TRC: 1.00
CZ2 TRC: 1.59
CZ3 TRC: 2.26
Weighted TRC: 1.47

Data Sources

- Savings: RTF workbooks (CAC) and ENERGY STAR/RTF (RAC)
  - Existing home CAC consumptions assumed poor insulation from SEEM represented regional cooling zone 1, 2, 3
  - RAC ENERGY STAR EFLH (higher than other data sources)
- Incremental costs: DOE's Technical Support Documents or TSDs (CAC) and on-line research (RAC)
  - TSDs had lowest incremental cost compared to 3 other sources
- Life Times: Used the median EUL from various sources (DOE's TSD, DEER 2014, NEEP, TRMs and ENERGY STAR)
- Used “Energy Trust of Oregon Cost Effectiveness Calculator 2017 v1.2” to rank each measure by TRC

Central AC Cost-Effectiveness Inputs

Central AC Scenario	Savings Range by Efficiency-Level and Cooling Zone 1-3	Savings Source	Incremental Cost Range by E-Level	Incremental Cost Source
Single Family New Construction	56 - 367 kWh (TMY3/TMY2) 71 - 471 kWh (2000-2014)	RTF supporting workbook "NewConstructionSingleFamilySEEM94Runs_OR_2_2-AC_baseline.xlsm“ / 2000-2014 Portland climate data (PGE)	$190 - $511	DOE's TSD - Residential Central Air Conditioners and Heat Pumps. August 2015. Table 8.4.3
Single Family Existing Construction	94 - 653 kWh (TMY3/TMY2) 120 - 839 kWh (2000-2014)	RTF supporting workbook "SEEMruns_SingleFamilyExistingASHPConversion_May2015“ / 2000-2014 Portland climate data (PGE)	$351 - $843	DOE's TSD - Residential Central Air Conditioners and Heat Pumps. August 2015. Table 8.4.3
Single Family Early Replacement	107 - 611 kWh (TMY3/TMY2) 137 - 785 kWh (2000-2014)	RTF supporting workbook "SEEMruns_SingleFamilyExistingASHPConversion_May2015" and RBSA Single Family Table 63/ 2000-2014 Portland climate data (PGE)	$1,906 - $2,248	Net present value of DOE's TSD - Residential Central Air Conditioners and Heat Pumps. August 2015. Table 8.4.3
Manufactured Home Existing Construction	80 - 558 kWh (TMY3/TMY2) 103 - 717 kWh (2000-2014)	RTF supporting workbook "ResMHExistingHVAC_v3_2.xlsm" conversion calculation/ 2000-2014 Portland climate data (PGE)	$300 - $721	DOE's TSD - Residential Central Air Conditioners and Heat Pumps. August 2015. Table 8.4.3
Manufactured Home Early Replacement	91 - 523 kWh (TMY3/TMY2) 117 - 671 kWh (2000-2014)	RTF supporting workbook "ResMHExistingHVAC_v3_2.xlsm" conversion calculation and RBSA Single Family Table 63 / 2000-2014 Portland climate data (PGE)	$1,629 - $1,921	Net present value of DOE's TSD - Residential Central Air Conditioners and Heat Pumps. August 2015. Table 8.4.3

We assumed a 15 year measure life for this analysis based five sources: DEER 2014, DOE's TSD, NEEP Measure Life Report, Technical Reference Manuals and ENERGY STAR.

Window AC Cost-Effectiveness Inputs

Window AC Scenario	Savings Range by Cool Zone 1, 2, and 3	Savings Source	Incremental Cost	Incremental Cost Source
Single Family, Multifamily, and Manufactured Existing Construction	ENERGY STAR: 17 - 54 kWh (ES) RTF: 13 - 44 kWh (TMY3/TMY2) 17 – 56 kWh (2000-2014)	ENERGY STAR Room Air Conditioner Calculator (ES) / Tonnage adjustment of RTF "SEEMruns_SingleFamily ExistingASHPConversion _May2015"/ 2000-2014 Portland climate data (PGE)	$39	Average of On-line Retailers
Single Family, Multifamily, and Manufactured Early Replacement	ENERGY STAR: 19 - 60 kWh (ES) RTF: 15 - 52 kWh (TMY3/TMY2) 20 - 67 kWh (2000-2014)	ENERGY STAR Room Air Conditioner Calculator (ES) / Tonnage adjustment of RTF "SEEMruns_SingleFamily ExistingASHPConversion _May2015"/ 2000-2014 Portland climate data (PGE)	$111	Net Present Value of Average of On-line Retailers

We assumed a 10 year measure life for this analysis based three sources: DEER 2014, NEEP Measure Life Report, and ENERGY STAR.

Package Terminal AC Cost-Effectiveness Inputs

Package Terminal AC Scenario	Savings Range by Cool Zone 1, 2, and 3	Savings Source	Incremental Cost	Cost Source
Multifamily New Construction	53 - 120 kWh	RTF supporting workbook "ResMFEstarHomes2012_v1.2"	$80	DOE's TSD - Packaged Terminal Air Conditioners and Packaged Terminal Heat Pumps. July 2015. Table V-4

We assumed a 15 year measure life for this analysis based three sources: DEER 2014, DOE's TSD, and Technical Reference Manuals.

Central AC Cost-Effectiveness Results

Number	Measure	TRC BCR (TMY3/TMY2)	TRC BCR (2000-2014)
1	New_SingleFamily_AC_SEERbase13-SEERee15_CZ1	0.41	0.53
2	New_SingleFamily_AC_SEERbase13-SEERee15_CZ2	0.75	0.96
3	New_SingleFamily_AC_SEERbase13-SEERee15_CZ3	1.19	1.52
4	New_SingleFamily_AC_SEERbase13-SEERee16_CZ1	0.38	0.49
5	New_SingleFamily_AC_SEERbase13-SEERee16_CZ2	0.69	0.89
6	New_SingleFamily_AC_SEERbase13-SEERee16_CZ3	1.09	1.40
7	New_SingleFamily_AC_SEERbase13-SEERee18_CZ1	0.35	0.45
8	New_SingleFamily_AC_SEERbase13-SEERee18_CZ2	0.64	0.82
9	New_SingleFamily_AC_SEERbase13-SEERee18_CZ3	1.01	1.30
10	Existing_SingleFamily_AC_SEERbase13-SEERee15_CZ1	0.38	0.48
11	Existing_SingleFamily_AC_SEERbase13-SEERee15_CZ2	0.74	0.95
12	Existing_SingleFamily_AC_SEERbase13-SEERee15_CZ3	1.28	1.64
13	Existing_SingleFamily_AC_SEERbase13-SEERee16_CZ1	0.35	0.45
14	Existing_SingleFamily_AC_SEERbase13-SEERee16_CZ2	0.68	0.87
15	Existing_SingleFamily_AC_SEERbase13-SEERee16_CZ3	1.18	1.52
16	Existing_SingleFamily_AC_SEERbase13-SEERee18_CZ1	0.32	0.41
17	Existing_SingleFamily_AC_SEERbase13-SEERee18_CZ2	0.63	0.81
18	Existing_SingleFamily_AC_SEERbase13-SEERee18_CZ3	1.09	1.40

Early replacement: none of the iterations were cost effective (TRC 0.08 – 0.49)

Window AC Cost-Effectiveness Results

Number	Measure	TRC BCR (ES)	TRC BCR (TMY3/ TMY2)	TRC BCR (2000-2014)
1	Existing_SingleFamily_WAC_CEERbase10.9-CEERee12.0_CZ1	0.51	0.37	0.48
2	Existing_SingleFamily_WAC_CEERbase10.9-CEERee12.0_CZ2	1.02	0.73	0.94
3	Existing_SingleFamily_WAC_CEERbase10.9-CEERee12.0_CZ3	1.55	1.27	1.63
4	Existing_Multifamily_WAC_CEERbase10.9-CEERee12.0_CZ1	0.51	0.37	0.48
5	Existing_Multifamily_WAC_CEERbase10.9-CEERee12.0_CZ2	1.02	0.73	0.94
6	Existing_Multifamily_WAC_CEERbase10.9-CEERee12.0_CZ3	1.55	1.27	1.63
7	Existing_ManufacturedHome_WAC_CEERbase10.9-CEERee12.0_CZ1	0.51	0.37	0.48
8	Existing_ManufacturedHome_WAC_CEERbase10.9-CEERee12.0_CZ2	1.02	0.73	0.94
9	Existing_ManufacturedHome_WAC_CEERbase10.9-CEERee12.0_CZ3	1.55	1.27	1.63

Early replacement: none of the iterations were cost effective (TRC 0.15 – 0.67)

Package Terminal AC Cost-Effectiveness Results

Number	Measure	TRC BCR
1	New_Multifamily_PTAC_EERbase11.0-EERee12.8_CZ1	1.00
2	New_Multifamily_PTAC_EERbase11.0-EERee12.8_CZ2	1.59
3	New_Multifamily_PTAC_EERbase11.0-EERee12.8_CZ3	2.26

CZ Weighted AC Cost-Effectiveness Results

Number	Measure	TRC BCR (TMY3/ TMY2)	TRC BCR (2000-2014)
1	New_SingleFamily_AC_SEERbase13-SEERee15	0.70	0.89
2	New_SingleFamily_AC_SEERbase13-SEERee16	0.64	0.82
3	New_SingleFamily_AC_SEERbase13-SEERee18	0.59	0.76
4	Existing_SingleFamily_AC_SEERbase13-SEERee15	0.68	0.87
5	Existing_SingleFamily_AC_SEERbase13-SEERee16	0.62	0.80
6	Existing_SingleFamily_AC_SEERbase13-SEERee18	0.58	0.80
7	Existing_ManufacturedHome_AC_SEERbase13-SEERee15	0.68	0.94
8	Existing_ManufacturedHome_AC_SEERbase13-SEERee16	0.62	0.87
9	Existing_ManufacturedHome_AC_SEERbase13-SEERee18	0.58	0.80
10	Existing_SingleFamily_WAC_CEERbase10.9-CEERee12.0	0.67	0.86
11	Existing_Multifamily_WAC_CEERbase10.9-CEERee12.0	0.67	0.80
12	Existing_ManufacturedHome_WAC_CEERbase10.9-CEERee12.0	0.67	0.80
13	New_Multifamily_PTAC_EERbase11.0-EERee12.8	1.47	1.47

Window AC: RTF method shown

PTAC: no climate adjustment made

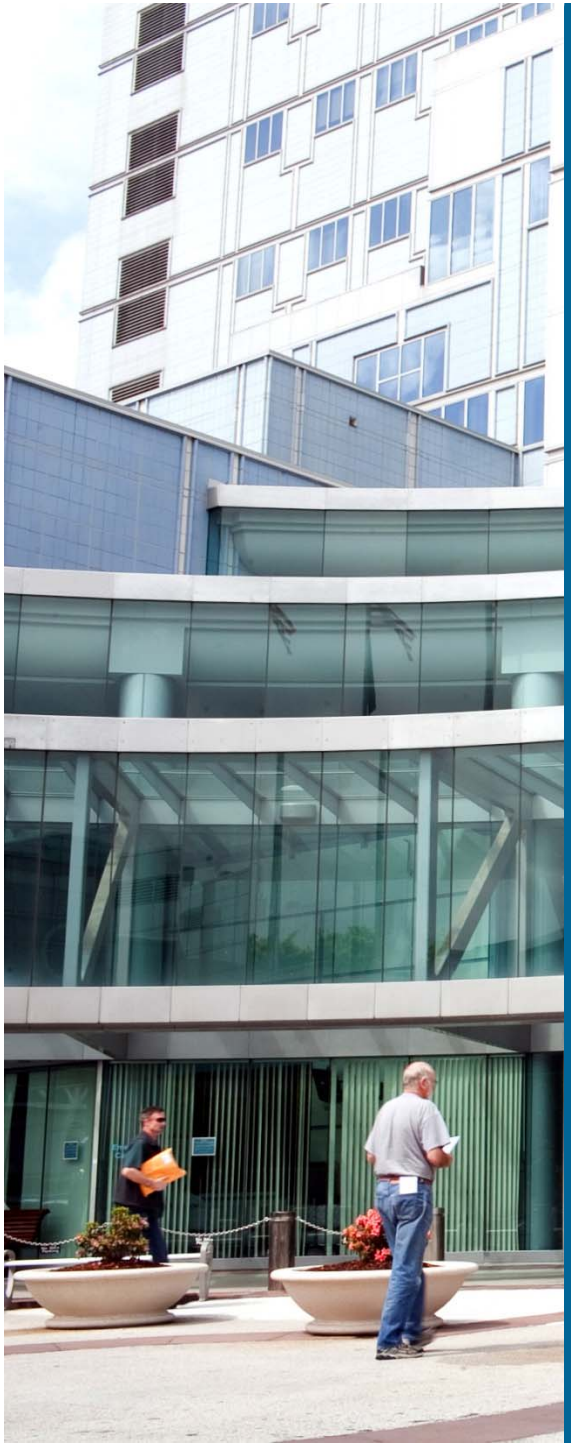
New Buildings

Topics

- VRF Pilot – status update
- LLLC – new pilot

VRF Opportunity

- Small-medium commercial market
- Segments: multifamily, schools, office, lodging
- Vision: simplify the incentive to enable uptake and deploy through market solutions



Milestones

- 2014
  - Conducted research on savings and costs
- 2015
  - Pilot development and launch
  - First project enrolled in October
  - Identified 23 potential pilot projects
- 2016
  - Pilot evaluation began – first review
  - Majority of projects MF

Early Findings

- Limited uptake
- Difficult for contractors to estimate baseline costs (theoretical system plus time required)
- Market push toward ducted unit installations

Pilot Evaluation

- Ecotope reviewed energy models and other pilot documentation
- Provided feedback on savings analysis and pilot offering
- Suggested changes being incorporated, including updates to include ducted units
- Currently review documentation on first 3 pilot projects

Next Steps

- Obtain detailed costs from SKANSKA
- Update savings estimates and determine cost effectiveness using new costs
- Develop prescriptive offering based on analysis

Collaborative Research on LLLC Pilot

Luminaire Level Lighting Controls

- Integrated controls and sensors
- Occupancy sensing, daylight harvesting, continuous dimming, high end trim

Image used with permission of Cree, Inc.

Why LLLC

- Potential for energy savings
- Path to address challenges holding back previous generations of controls

Image: Amerilux Stellina with Enlighted Controls

Research Objectives

Gain deeper understanding of installations to:

- Refine energy savings estimates
- Inform program strategies

Research Focus Areas

- Purchase considerations
- Design / install / set up / operations
- Occupant experience
- Energy savings
- System costs
- Data availability

Learning Along the Way

- Interim findings every 2 months
- Preliminary report mid way
- Final report

Research Activities

- Design charrette observation
- On-site installation observation
- Interviews
- Surveys and focus groups
- Document review
- 8 month metering
- Energy reporting system data analysis

LLLC Pilot Incentives

Early Design Incentive

- $1,000 per project
- Early design meeting with owner and lighting designer

Installation Incentive

- $70/fixture
- Also eligible for incentives for LPD reductions through the Lighting Calculator

LLLC Pilot Incentives

Commissioning Incentive

- $3,000 per project
- Can be completed by lighting installation contractor

Evaluation Incentive

- $2,500
- Paid at completion of 8 month evaluation

Wide Range of Market Actors

- Lighting designers
- Installers
- Commissioning agents
- Owners / Managers
- Maintenance staff
- IT staff
- Occupants

Image used with permission of Cree, Inc.