Regional Technical Forum

September 17, 2024
Meeting Minutes

Welcome, Agenda Review, and Meeting Minutes
Mark Jerome, RTF Vice-Chair, greeted the room and called for attendance. He counted 19 voting members. Brian Owens, CLEAResult, moved to adopt the minutes from the August meeting. David Baylon, independent, seconded. The minutes were adopted unanimously.

Eric Miller, independent, moved to adopt the day's agenda. Rebecca Blanton, independent, seconded. The agenda was adopted unanimously.

Management Update
Laura Thomas, RTF Manager Presentation
Staff provided updates on the upcoming RTF meeting and subcommittee meeting topics and proposed the 2025 RTF meeting dates.

Baylon stated that about two years ago he proposed a whole building measure [Slide 3]. He lamented that it looks like that proposal has fallen off the agenda for the second year in a row, suggesting that the RTF doesn't care about this.

- Laura Thomas, RTF Manager: No, it's on our radar. We're still trying to figure out where this fits. We have contractors working on Industrial SEM and considering Commercial SEM. This year has been busy with 37 measure updates.
- Baylon: I mention this because a new Power Plan is coming up. The current Plan totally dodged this issue. We now have performance standards in Oregon. Washington has had them for a while. We need to plan for this landscape.
- Kevin Smit, NWPCC: The next Plan is under way. We do have a project, looking at whole building and the performance standards going on. A contractor is working on this now for the Plan.
- Baylon: Oregon is doing an analysis of their building stock now. Washington has already done this.
- Smit: We know. We are keeping an eye on this. If you have cost data, please send to us.
- Baylon: Cost data isn't necessarily relevant.

Baylon addressed refrigeration, asking if there is characterization of current practice for the high-speed door measure [Slide 4]. He stressed that he's seen this everywhere already.

- Thomas: We're just starting on this.

- Baylon: Are you considering a protocol of a current practice baseline?
- Paul Sklar, RTF Contract Analyst (CAT): We probably won't be able to pull off a market study for this.
- Baylon: It would be nice to know if the current practice baseline wipes your measure out or not.
- Sklar: Ideally, subcommittee members will have a sense of what the market looks like.
- Andi Nix, Energy Trust of Oregon: I'd like to join the refrigeration subcommittee.
- Thomas: Email me and we can get you added to the list.

Jackie Goss, Energy Trust of Oregon asked if older commercial fryer data would still be useful [Slide 5].

- Denis Livchak, RTF CAT: I'll take as far back as you have.
- Goss: Sounds good. We had to cancel our measure because of Oregon's standards.

Sunset Date Extension: High Efficiency Residential Central AC
Adam Hadley, RTF Contract Analyst Presentation
Staff sought a sunset data extension for the UES measure and requested high-level feedback on the plan to update the measure. After discussion on regional cooling demands, the usage of REEDR and SEER improvements, the RTF granted a sunset date extension to March 31, 2025.

Jerome noted that high SEER numbers are often variable speed equipment [Slide 7]. He thought it would be useful to look at 16, 17, and 18 SEER equipment on the market. Jerome thought that there might not be many single/dual stage air conditioners in the higher tier levels.

- Adam Hadley, RTF CAT: That's a good point. We'll look at AHRI to see what's available.
- Baylon: Humidity control is one reason you get high SEER ratings. That's not so relevant here. It's also why EER is used in dryer places like California. It's unclear if that's better. But there is one low-humidity test done in the SEER rating. The other two tests are for more humid conditions.
- Hadley: I have a slide on that to make sure we understand SEER and SEER2. We'll dive into this with the subcommittee. But a lot of what you're saying is different than my understanding. We'll make sure we get to the same page.

Bob Davis, Ecotope, asked how many sites with metered cooling data and heat pumps we have in HEMS [Slide 10].

- Josh Rushton, RTF CAT: I don't know off hand. RBSA 2 has 178 homes in HEMS version 7. The final sample is about twice as large. Central air conditioning and centrally ducted heat pumps are a subset of these homes.
- Davis: Thanks. Also, I'd like to address the assertion that HEMS homes aren't representative. What's that about?
- Rushton: It's just that these homes weren't selected to be a representative of the region.
- Davis: But we have a couple hundred homes, mostly in Zone 1. Even if they're not representative, we should make a lot of hay with those data points.
- Rushton: It's less than a couple hundred but that might be a path.

- Davis: We originally only had about 20 sites for DHPs. And we did a lot with that. However, unfortunate decisions were made in the HEMS study design.

Baylon addressed Hadley saying “known cooling load” asking if that is inferred and not directly metered.

- Hadley: HEMS has metered circuits. For example, on gas forced air furnace homes with central AC. Mostly, those are easy cases as the AC is labeled. Although there are nuances like mislabeled circuits.
- Baylon: I want to make sure that what we’re calling cooling load has been vetted as such.
- Thomas: We’re pretty confident it’s cooling. Rushton has looked very closely at this.
- Rushton: Yes. It’s cooling load. We’ve pretty confident of that from the data.

Baylon asked if the graph shows actual cooling estimates from VBDD.

- Hadley: Yes, the X-axis is VBDD cooling estimates from billing data. The Y-axis is metered.

Goss thought the REEDR data was already calibrated with RBSA data [Slide 11]. She asked how we did this work and are still not ready for this measure.

- Hadley: Christian Douglass, NWPCC, looked at the HEMS homes to see how REEDR compared. This is a matter of broadening the scope to make sure we have a representative set.
- C. Douglass: Hadley is right. We know cooling loads for HEMS homes. We also want to know them more broadly for the northwest.
- Hadley: We’re going to look at REEDR one more time to fine tune it for cooling.
- David Bopp, RTF CAT: Remember, at end of Douglass’s calibration effort, we said we’d pick it up further for any measure we approach with it. So, this will come up again for all measures that use REEDR for in the near future.

Lisa Gartland, ODOE, cautioned that you’ll see lots of different cooling behavior [Slide 13]. She suggested possibly taking a step back and binning homes by cooling behavior, dividing them by all-day users, night-only users, etc.

- Hadley: Yes, we’ve considered that. There is a lot of variation in behavior here, and that has a big impact. It would be helpful to sort homes into behavior buckets.

Baylon asked if the blue dots on [Slide 16] represent cooling estimates from the meters.

- Hadley: Yes, it’s data from the meters.
- Baylon: So, we have substantial data for temperatures below 70°F? Did you drop any data points?
- Hadley: This is the actual data from the meters versus outdoor air temperature (OAT). Nothing has been removed.
- Baylon: I’d be concerned about significant amounts of cooling at non-cooling OATs
- Hadley: This is real data. From gas forced air furnace homes with central AC.

- C. Douglass: This is real data. You can see that there are non-zero points between 50-60°F, but the average there is close to zero. That can happen when you have a hot day that cools off quickly at night, but you're still cooling your house down instead of opening windows. Still, the average is zero for those temperatures.

Sarah Widder, Cadeo Group, fully supported diving into the weeds in this analysis [Slide 16], saying the region needs to do that to get a better handle on what drives cooling loads in the northwest. She asserted that this is not well understood as it is new in the northwest and handled in several ways. Widder insisted that the analysis has to be messy and exploratory for now but cautioned that we don't need to understand what goes on in every house. She emphasized that we do need to know what is driving cooling loads in the region and this—understanding behavior and site characteristics that lead to cooling loads—is part of getting there.

- Hadley: Yes.
- Davis: I agree with Widder. We might find out that there's not a measure here. Using SEER or EER or EER2 might not mean much. In fact, I think it is ridiculous.
- Hadley: A motion would be a good way to test that.

Gartland confirmed that the line at top of HEMS on [Slide 17] represents when a cooling system runs full out for the hour, right?

- Hadley: Yes.
- Gartland: I wouldn't put a lot of sway on that. The important difference between HEMS and REEDR is human behavior. REEDR isn't capturing the behavior of how people cool their homes.
- Hadley: That's right.

Baylon noted that a fair fraction of this has to do with behavior [Slide 22]. He said in places where cooling matters, the literature shows substantial variation in thermostat behavior. Baylon said we need two or three bins of behavior, and we need to know the size of those bins.

- Hadley: Yes. Behavior is a main focus of the exploration.

Blanton asked if this has been looked at by cooling zone. She guessed that zone 1 people are less experienced than zone 3 people.

- Hadley: That's a good point.
- Davis: Years ago, Idaho Power was working on DR for residential air conditioning. They struggled because a lot of people acted like zone 1 people. They came home from work and turned on the air conditioning, rather than leaving it on all day. They did this in BOISE! That means that reliable indoor air temperature data as a proxy for behavior is important.

Jerome stated that 2029 or 2030 is when SCORE will be introduced as a new metric [Slide 25].

- Baylon: That's good. One feature of this problem is it has been an issue in California for at least the last 30 years. Simulations are not comparing to actual data. They made

some progress on this in 2010. We should pay attention to that and see what happened. There are technical papers on the topic.
- Hadley: Please send them my way.

Goss asked if this work considers the earlier discussion about variable speed.
- Hadley: Currently the measure doesn't include variable speed. I'm dragging it along in the discussions in case we can include it.
- Goss: We haven't included it because we couldn't model it. But probably a lot of data we have is from variable speed systems. We can't ignore that.
- C. Douglass: You could check in with Tony Koch, BPA, about his high performance, high-capacity HP work. There is one-minute data, from fully instrumented HPs. Ben Larson and John Bush are also involved. They showed interesting charts at different conferences, where they tried to pull out HSPF, SEER, and EER from the data. Behavior is a huge signal, though.

Thomas pointed to all the work Hadley, Rushton and the other CATs have done for this [Slide 31]. She said the process might end up being a bit different but called this a well thought out plan. Thomas stressed that the RTF is not just kicking the can again but agreed that this is a lot of subcommittee work. Thomas stressed that staff are trying to figure when to bring materials back to the RTF for discussion, before the final decision in March. She highlighted that this is our first dive into REEDR, saying that interested parties should email her or Chad Madron, NWPCC, if they want to be involved in subcommittees.

Goss thought it would be helpful to think of the first few meetings as improvements to REEDR and not specific to this measure. She had some doubts around finding a cost-effective measure for central AC but thought that modeling it well in REEDR will be helpful. Goss said it's impossible to correlate SEER to efficiency or SEER to cost, so we can't have a measure. She thought there would be a need to build in time to address that issue.

Davis stated that there is nameplate information on the systems for RBSA and HEMS, thinking that would be the way to assign a SEER, even if a system is 15-years old. He said we also know things like duct condition, location, air flow, and system size, calling them way more important than SEER. Davis addressed the newer systems, like the BPA work C. Douglass mentioned earlier and work from John Winkler, NREL. He said this is delivering data on new systems like the importance of thermostat type and understanding why sites look like they do. He agreed that this is a lot of work, but also important.

Widder, adding to Thomas' and Goss' comments, called the amount of subcommittee intensity here appropriate because it's a continuation of REEDR calibration work. But she stressed that bringing what we learn from this process to other measures the ultimate goal, so we don't need to go through this process every time we want to use REEDR.
- Hadley: Noted. We're excited that this will grease the skids for heating work.

C. Douglass pointed to HEMS data cleaning, building up RBSA, and VBDD, saying he's finally seeing utilities wanting to use HEMS data and asking for R-scripts to handle it. He thought that providing all these work products was valuable beyond the measure. C. Douglass said documenting procedures and showing steps helps the region use this data consistently and repeatability into the future.

- Thomas: We're talking to NEEA a lot. As we increase the use of HEMS data, we understand the RTF's role in sharing information. We do have a webpage for HEMS analysis. We're learning a lot and it's important to share out that data. We'll keep working on that while also looping in the folks managing that data.

MOTION
I, Bob Davis, move that the RTF extend the sunset date for the High Efficiency Residential Central Air Conditioner UES measure to March 31, 2025.
Miller seconded.

Baylon asked if March too soon, suggesting June 30 instead. He said there's a chance we don't have a measure here, making the timing less relevant.

- Thomas: We picked March because we really do want to move this forward. Hadley will be active on this for the next few months.
- Baylon: March is okay. But we do need to look at regions that have had cooling for a long time. California would be informative here.
- Thomas: The RTF can always extend the sunset again, but this means we need to at least give an update to the RTF by March. It's been two and a half years already.
- Baylon: The big difference this time is that we have an agenda now for what we're going to do.

Vote on the motion. The motion carries (20 yes, 0 no, 1 abstain).

BREAK

Update Planning UES: Griddles
Denis Livchak, RTF CAT Presentation
Staff presented proposed updates to the Griddles UES. Discussion centered around idle time and energy savings due to equipment improvements. The RTF approved the proposed updates.

Nick O'Neil, Energy 350, said [Slide 22] should be four feet and below, not four feet and greater.

- Denis Livchak, RTF CAT: Yes. Sorry, I have that wrong on the slides (the slides have been corrected since the meeting).

Baylon asked what the griddle is doing at idle, suggesting cooking [Slide 23].

- Livchak: The idle is at 375°F. When they are cooking, they're trying to maintain that 375°F, but the griddle loses temperature when you put the burgers on and when you flip them. Recovery is the time it takes to get back to at least 350°F.
- Baylon: So "idle" means keeping it at the same temperature as you cook at?

- Livchak: Yes. But in idle you may use 10,000 Btu/h. During cooking it can be ten times as much as you're getting back up to temperature.

Baylon confirmed that idle energy in gas equipment is an order of magnitude larger [Slide 29].

- Livchak: We're not proposing any changes to the gas idle energy. Efficient griddles have about a 30% lower idle rate than inefficient equipment.
- Baylon: I'm comparing gas to electric.
- Livchak: Sorry, this should be MBtu on the gas slide. I'll change that.

Jerome asked why production capacity changed.

- Livchak: The current measure assumes the consumer is choosing between products with the same production capacity. But they're much more likely to choose between products with the same griddle width. Finding production capacity data is hard.

Baylon noted that [Slide 30] shows using electric resistance elements with a baseline is 69%, calling that a lot of loss.

- Livchak: Things like insulation, control logic, analog versus digital controls, location of the thermocouple all impact efficiency. Faster recovery means less cooking time.
- Baylon: So, our measure delivers substantially more production capacity.
- Livchak: This impact is more significant on the gas side. It ends up lowering savings significantly because lower production capacity means more time cooking, less time idling. And idle time is the major driver of energy consumption.
- Baylon: I'm not quite sure what the metric is, but maybe it's Btu or watts per pound of food delivered?
- Livchak: The Btu per pound of food stays the same, but the griddle efficiency is divided by this to get energy consumed.
- Baylon: So, the food cooked per day is same in both cases?
- Livchak: Yes, we hold the amount of food cooked per day constant. For example, on [Slide 29], the non-Energy STAR® unit idles for four hours per day and the ENERGY STAR unit idles for six hours. It's all in the workbook, so you can compare the energy spent.

Baylon called this a big change, asking what motivated it.

- Livchak: The measure reflects the models that are available in the market and what drives customer decision.
- Baylon: So, there's no change in the ENERGY STAR standard?
- Thomas: This is a reflection on the improvement in the measure, thanks to Livchak's understanding of the food services market.

After looking through the workbook Goss said she was trying to understand how energy use went down as idle time went up and idle time uses less energy [Slide 37].

- Livchak: Some of the more efficient electric griddles have higher input rates. That allows cooking rate to be higher.

- Goss: And this assumes that restaurants cook in fully loaded batches, not ongoing partial batches?
- Livchak: They're tested as fully loaded. It should be the same energy consumption for the same griddle model. Although here we're comparing inefficient to efficient models.

Baylon called [Slide 38] another order of magnitude adjustment.

Jerome asked if all the Wells griddles are three foot [Slide 40].

- Livchak: Yes, all of these are three foot.

Baylon noted that the ENERGY STAR equipment has significantly more kW. He asked if that is why they're ENERGY STAR.

- Livchak: They do seem to have a higher kW. But there are also high kW griddles on the non-ENERGY STAR list.
- Baylon: That's true.
- Livchak: My theory is that the 9kW units use off-the-shelf elements and controls and are not made in the U.S., so their construction is less robust.

Gartland asked if Livchak looked at simple payback, saying she is used to seeing that.

- Livchak: I have the cost/benefit on a later slide.
- Thomas: Our cost reporting is in alignment with the Power Plan. We don't look at that metric. Also, it's common to see very low-end and high-end inefficient units in product market for foodservice equipment.

Hadley addressed Baylon's earlier question: does higher kW cause you to meet ENERGY STAR more easily. He thought the answer is no, as you don't have a low idle energy rate because of higher kW.

- Livchak: A higher kW means a higher recovery factor, which increases your energy efficiency. Controls are part of that, too. They need to sense the temperature drop.
- Hadley: But ENERGY STAR only looks at idle rates?
- Livchak: That's right. Controls should help here too so you don't overshoot temperature. Also, the griddle plate composition plays a role.
- Jerome: It seems counterintuitive, but we're getting an understanding of why that is.

O'Neil asked how people typically buy griddles, wondering if they would compare a 9kW unit to a 17kW griddle and consider both.

- Livchak: Newer or independent restaurants go for the cheapest equipment. Large quick service restaurants go for high-end equipment. Also, brand loyalty plays a role. Some of the American manufacturers make ovens, friers, steamers, etc., so customers could stick with one manufacturer for their entire line. That means only one contact for repairs. Also, availability plays a part. Lower end products are often available off the shelf and higher end equipment needs to be ordered.

- O'Neil: So, customers could be looking at products with very different production capacities. Or are you never going to buy a 17kW model and have a 9kW model as another choice.
- Livchak: It's case by case.

Baylon asked if the average is unweighted.

- Livchak: Yes, and we picked an equal number of low- and high-end products.
- Jerome: Let's move on because of time.

Goss asked if it's possible to think about production capacity as a non-energy benefit, as it would deliver faster customer service [Slide 47].

- Thomas: We're still getting guidance from the PAC on non-energy benefits. We're not able to consider that for this measure. While there's the potential for more production capacity, it doesn't mean that the restaurant uses that extra capacity. Quantifying it would be challenging.
- Livchak: McDonalds and other places that do a lot of production usually go for double sided griddles.

MOTION

I, Dave Baylon, move that the RT approve the Griddles UES as presented, and: Update the Category to Small Saver, Keep the status at Active, Set the sunset date to May 31, 2028. Blanton seconded.

Blanton thought that the delivery verification came with a lot of caveats including the brand specification, the front grease trough and more. She was concerned about the time involved in verifying that, noting that these are big pieces of equipment.

- Livchak: ENERGY STAR and the California QPLs should have the square footage and model number, so that wouldn't be a problem.
- Thomas: This isn't a fast-moving market. The products don't change much. There are resources for a program to create their own QPL, they wouldn't need to update it very often. We want to make sure that we're excluding double-sided griddles.

Goss thought that if the last bullet covers it, and it doesn't sound like we need the prior ones [Slide 46].

- Thomas: You can't just use the QPL because some models are potentially labeled incorrectly. They are labeled as single-sided but are actually double-sided.

Goss addressed the grease trough issue, asking if that is mislabeled in ENERGY STAR. She said this sounds like splitting hairs.

- Livchak: I saw an issue with one model in the California QPL on this topic and notified them. There may be other QPLs being used.

Baylon confirmed that the real concern is the single- versus double-sided griddle.

- Thomas: That's right. We can bring this part back to the RTF if needed.

Vote on the motion. The motion carries. (17 yes, 0 no, 2 abs).

Standard Information Workbook Update: Energy Efficiency Ratio
Paul Sklar, RTF CAT Presentation
Staff presented updates to the Energy Efficiency Ratio metric in the Standard Information Workbook. After discussing the marginal efficiency ratio metric (MER), the RTF approved the updates.

Jamie Anthony, BPA, confirmed that "circuit" on [Slide 4] means a refrigeration circuit: a single suction group connected to a set of compressors. He said the suction group is really what makes the circuit.

- Paul Sklar, RTF CAT: Thanks for that clarification.

Goss asked what "marginal efficiency ratio" (MER) means.

- Sklar: We just invented it. We want to use it to know the change in electric power for a given change in cooling load. That's the marginal piece.
- Baylon: Is this the same as what EER used to be?
- Sklar: Yes, but you have different EERs at different times. This is an average across the year.
- Baylon: We should probably call this something different than EER if it's not EER.
- Sklar: That's why we're calling it "marginal refrigeration efficiency."
- Goss: "Marginal" sounds like a measure of change, but this just sounds like a new efficiency ratio.
- Sklar: This is intended to estimate change. EER doesn't tell us how much more or less energy is required, but that's what we want. This is not an efficiency rating. You wouldn't try to get this from a specific system. It's more of a tool for the RTF. It's for when you make a change to refrigeration system, it finds how the energy consumption changes.

Owen asked if capacity was measured in real time in these sites.

- Sklar: The temperature and pressure were measured. Calculations were done to get capacity.
- Anthony: Yes, the pressure and temperature before and after the compressor are measured. There's a proxy for refrigerant mass flow. That's the power consumption of the compressor. There's no true mass flow measurement being done. I'd have to look up more detail than that.

Baylon asked if MER in our spreadsheets is not actually getting EP$auxsecw$.

- Anthony: EP$comp$ is the power consumption of compressor. EP$auxsecw$ is the condenser power consumption. It's a three-phase true power measurement of compressor and condenser. RCAP$cool$ is proxied by compressor kW to get at mass flow. It's a weak link.

- Baylon: So, each variable is a product of the study and that's what we're going to use? Or do you calculate MER?
- Sklar: MER is an invention of the RTF.

Baylon asked if there is a good reason to be so detailed by climate zone [Slide 5], noting that the values aren't that different.

- Sklar: We did this because we didn't know how big of a factor it was. We'll use the variation because we have estimated it, though.

Goss asked if there is something missing from the equation noting that an extra term has been added since the previous equation [Slide 9].

- Sklar: It's a similar equation. This derates efficiency to account for condenser fan power. It's different than the equation on [Slide 4]. For single compressor, we have to get at this a different way because we don't have condenser power for the single compressor systems. For multi-compressor systems, we do.

Eric Mullendore, BPA, was not sure how worthwhile his comment was, but said the assumption that the condenser fan run time has anything to do with the compressor run time is false. He said they are maintaining different things. Mullendore explained that a condenser fan will barely run in the winter but will run full out in the summer, regardless of load. He thought it might be more effective to look at the relationship of compressor and condenser fan power in multiplex systems where we have this data and use the same ratio. Still, he was not sure that it matters much given all of the other uncertainties in this but called it his recommendation.

- Sklar: Yes, we made a simplification. Maybe it was an oversimplification.
- Owens: Is the compressor efficiency constant?
- Sklar: It's an output from the calculator.

Baylon asked if ammonia is excluded from single- and multiple-compressor systems [Slide 11].

- Sklar: Ammonia would be for bigger systems like refrigerated warehouse. We'll look at those next. Today's data is for commercial applications.
- Anthony: I think these numbers look quite reasonable, given that we're using them for multiple measures to look at marginal changes. Those of us who worked at PECI, our shot from the hip was about 10° for medium temperature and 5° for low temperature. The arguments about the nuances are probably not warranted given this.

Baylon asked if these are EER or MER.

- Sklar: It should be MER.

Baylon stated that, right now, HFO are used as additives to other refrigerants [Slide 12]. He said they have near zero GWP, so they bring down the average GWP. Baylon added that they're expensive, so they won't be used on their own.

MOTION

I, Dave Baylon, move that the RTF approve updating the Standard Information Workbook with the proposed Refrigeration System Marginal Efficiency Ratios expressed in Btu per W to replace the Energy Efficiency Ratios in the current workbook.
O'Neil seconded.

Vote on the motion. The motion carries (13 yes, 0 no, 4 abstain)

LUNCH

Update Planning/Proven UES: Ductless Heat Pump for Forced Air Furnace SF and MH
David Bopp, RTF CAT, Presentation
Staff presented updates. Lively conversation ensued about short duct runs and refrigerant warrantees. The RTF approved the updates as presented.

Jerome insisted that he did, in fact, follow the manufacturer instruction [Slide 12] during these installs, adding that installations were done by him and Bruce Manclark.

Goss confirmed that getting rid of short duct runs is appropriate for replacing electric forced air furnaces (eFAF) with site-specific ducts [Slide 16]. She asked what the case for zonal is.

- David Bopp, RTF CAT: You can't use existing or new ducting for this. Zonal would be no ducts.

Phillip Kelsven, BPA said, as someone running a program, he understood the issues with this, listing cost and pressure. He then said it's extremely difficult to know as BPA doesn't do onsite QC, and he didn't think other programs did either. Kelsven thought you could maybe tell by model number, which is difficult, adding that BPA uses AHRI certification.

- Bopp: The AHRI certificate for the indoor unit should state the type of system. So, you'd just need the model number of the indoor unit to check this.

Anthony asked for the reasoning around excluding ducted equipment.

- Bopp: They're a growing portion of the market, and we don't know what goes on with them. The alternative would be delivery verification to check static pressure, penetrations sealed, no duct booster fans and more. It's not a low lift for programs to do delivery verification on these.
- Anthony: Those sound hard to do, but why does it all have to be done in order for the heat pump to save energy?
- Bopp: We're looking at the efficiency of ductless heat pumps (DHP) replacing electric resistance (ER). But it eats away at our savings if the penetrations aren't sealed. We want to make sure we're retaining energy savings if there's a short duct run.

Anthony asked if there is evidence that we don't get energy savings with these, or if that that is our guess.

- Bopp: We don't have data on the performance of these.
- Anthony: OK, we have concerns. But if we exclude them, it won't get done programmatically and we won't get data on it. How about we include it, let programs

decide if they want to include it, and let evaluation decide if it needs to be evaluated. Maybe programs can be more exclusive later on.

- Bopp: We've allowed this in the measure for ten years and we haven't gotten any data on them. And now they have medium static pressure systems which look more and more like centrally ducted system. This looks like a separate measure.
- Jerome: Note that with a short-run duct run, it's all new ducting and not connected to existing central system.

Baylon voiced concern about how much refrigerant leak we're signing up for when we allow quick connect without someone who knows what they're doing. He called it bad, by any standard, to let a lot of refrigerant leak into the environment, saying it's detrimental to the environment and heat pump performance.

- Bopp: We did think of this holistically for all measures. Maybe all of our measures with refrigerant should have this same requirement for a warranty. We didn't propose it here, but the RTF could take that up, at which point it's not specifically a quick connect line-set issue.
- Baylon: That's not a bad idea. These are manufactured homes. They have ducts which tend to be leaky and ineffective and get worse with age. Duct leakage has a lot to do with how much savings you get because occupants have heat in their living room for the first time. They don't turn it off. For other sites this wasn't an issue. They turned the DHP off when winter weather started. This is a displacement measure. We're not trying to replace the furnace. It's a worthwhile endeavor, but we do need to pay attention to the quality of equipment, the quality of controls, and the ability of occupants to operate it properly. Otherwise, we don't get savings.

Kathy Yi, Idaho Power, said the AHRI only shows outdoor unit number, and not if they're ducted.

Anthony addressed refrigerant leaks, saying he gets the point, noting he participated in a study on refrigerant leakage. Anthony said the RTF is just trying to figure out if it saves energy or not, suggesting letting programs worry about leakage if they want to do it or not.

Anthony then said pretty much all systems leak at around 10 to 15% per year. He asked if self-install equipment leaks more than contractor installs, wondering how often a recharge is needed in both of these types.

- Mullendore: I agree that refrigerant leakage is an important component to performance. But there are already regulations around this. If we add more requirements, we're going to have fewer measures installed. It's a tradeoff between program requirement and the amount of work we can support in the field.
- Thomas: It is important to think about the long term of our measures. This is a displacement measure. We have data in HEMS that show a lot of centrally-ducted HPs (CDHPs) don't work as we want them too. And now to put a HP in somewhere we already have a central system makes this even more of an issue. I think we need to

come back to this and ask if it's the right measure for the region. I know these are different than CDHPs, but we need to be mindful of how homes achieve savings.
- Jerome: I think there are challenges here. We don't have the data to quantify it. California has monetized this with avoided refrigerant cost. But we're not there yet.
- Baylon: I mostly agreed with Thomas. We have been remiss in taking care of the complexities of heat pumps and that has cost us severely in our savings numbers. For years, we did evaluations on HPs and found no savings because of electric resistance heat, bad charge, ivy growing in the compressor, or whatever. In the land of electrification, we can't keep getting away with this. Utilities in the electrification business use RTF work, so we need to be able to give guidance to what we expect in installation, controls, and long-term QC. Maybe it's not the utility that does it, but someone needs to.

Goss said that listening to this she's finding that some people are talking about ducts, while others are talking about refrigerant. She asked that speakers please clarify their comments.

- Bopp: Let's put this in the parking lot for now.

Goss explained that the Energy Trust of Oregon differentiation between overall and 2022 had to do with product changes and not with COVID [Slide 21].

- Bopp: I didn't realize this. Regardless, we used all years.

Baylon said the disadvantage of a control group is that you use unconnected macro-economic factors from across the street to adjust savings [Slide 26]. He insisted that doesn't help you understand the equipment or how to improve it. Baylon guessed that if we had Energy Trust of Oregon data without a control group, it would change but was not sure about which direction it would go.

Baylon thought the RTF should bring in the performance without control group when we want to compare how something is doing compared to the previous system. He called this a technical question, saying it doesn't matter what happened to the guy down the street, as that person may be changing their consumption in response to something else. Baylon said the region should know what the savings are before and after the control group adjustment.

- Bopp: The control group in the Energy Trust of Oregon research had a very small impact here.

Kelsven pointed to stark differences between Energy Trust of Oregon and BPA/EWEB, especially in single family. Noting that this is not only for DHP, he said they see the same thing with ASHP. Kelsven called this a trend and was not sure if it's weather related or about the housing stock, adding that Energy Trust of Oregon is primarily in Portland.

- Bopp: BPA could be more one-on-one systems where you're not increasing conditioned space. ETO could be increasing conditioned space.
- Goss: We have also wondered about this. All of those theories probably add up to something. Also, we have updated to new weather normalization techniques. We have used billing analysis software and gotten slightly different savings numbers with the same data. Also, the volume of installs and the volume of contractors is a factor too.

- C. Douglass: Program design is always important, but especially with this measure. If this is adding conditioned space, it's a load building measure, not a conservation measure.

Davis recalled that field research on some of this was done more than a decade ago [Slide 33] noting that it was in mostly zone 1 and mostly manufactured homes. He reported being surprised by the magnitude of savings in some cases, citing 6000-7000 kWh. Davis thought that could be due to turning off duct losses, but said it was key that residents know how to control the DHP versus the central system. He pointed to another group who didn't change their behavior and didn't get much savings.

Davis moved to single family, which has more diverse floor plans, saying installers didn't provide instructions on how to run the two systems. He noted that MHs were some of the best savers because of simple floor plans, saying even a MAP home saved 4500 kWh with one DHP in the main part of the house.

Davis said he didn't get to run field studies in zone 2, theorizing that the back rooms get too cold if you don't use the central furnace. He thought there may be ways to get the savings in zone 2 but lamented that they didn't get to do the research. Davis stressed his point: that savings can be substantial if the floor plan is simple, and people know what to do.

Christopher Dymond, NEEA, recalled that in 2020, NEEA did a study on how to maximize performance of DHP in eFAF and found five strategies, adding that the results are published on NEEA's website. He called for the RTF to review it, saying the big strategy is targeting homes that actually need this.

- Goss: I think targeting is tough because these measures aren't driven by utilities. Customers are sold this equipment by contractors, or when they're neighbors do it. Also, I suspect contractors are not considering floorplan. They're installing these in any kind of home. Targeting would mean we're providing incentives for some and not for others.

Goss thought that it's just as likely that customer would buy a room AC if not a DHP [Slide 39]. She addressed control groups, saying they included homes that added room ACs and still saw summer savings, which implies that control groups added a significant amount of AC. Because of this she said it's already accounted for in our savings.

- Bopp: Okay.

Dymond said 169 kWh for cooling seems low.

- Bopp: Thanks.

Goss was surprised that we're not valuing production capacity for griddles, but we are valuing homeowner labor for handling wood [Slide 45].

- Thomas: With griddles, we don't know if people cook more because they can.
- Jerome: This seems more like an O&M value.
- Bopp: That's right.

- Jerome: I think consistency across measures is important. We should be including this.
- Baylon: I did this once a long time ago. It was $200 in 2010 dollars. So yes, $400 now sounds about right.

Jerome addressed the prevalence of supplemental fuel in MH, saying he's been in a lot of MHs and haven't seen a lot of supplemental fuel [Slide 47].

- Bopp: Maybe in heating zone 1 and 2 but I saw a lot in heating zone 3.
- Baylon: RBSA 1 had a MH study with saturation of supplemental fuel.
- Bopp: I'm not sure why we haven't picked that up in our measure.
- Baylon: We looked at this in 2010. It was $3500, $6500 in Seattle.

Mullendore asked if program cost data includes short run ducts [Slide 53].

- Bopp: Yes. If I knew how to screen those out, I would. We could make an adjustment, but it would be judgement.

Goss asked if there is such a thing as a 16 kBtu portable AC or if someone is actually installing multiple units [Slide 55].

- Bopp: No, you can find 16kBtu or 20 kBtu. There were quite a few 15 kBtu units.
- Jerome: I once had a two-ton window unit. It was big.

Gartland confirmed that portable units are usually smaller than window units in capacity [Slide 56].

- Bopp: Yes, they tend to be smaller. But you can get larger ones, and we don't know what size the counterfactual would have bought.

Jerome stated that some room ACs do have a filter similar to a DHP [Slide 58].

Baylon asked if this includes checking refrigerant charge [Slide 63].

- Bopp: No.
- Jerome: That's a good thing. You're only supposed to check charge during installation. Once you check the pressure, you risk contamination and other issues.

Davis understood the idea of this but struggled with including it in the measure. He pointed to similar issues with central systems.

- Bopp: Yes, but for central system measures, you have maintenance in both the base and efficient case.
- Davis: I'm pretty vigilant with my DHP and I don't spend this much time per year on it.
- Bopp: Yes, how much maintenance is required to maintain savings is a big question. But if it's not needed, we should be communicating that. We just don't know.
- Jerome: I think these costs are appropriate. I've spent a lot of time maintaining these systems. This looks about like what it is.

MOTION

I, Eric Miller, move that the RTF approve the DHP for Electric Forced Air Furnaces (Manufactured and Single-Family Homes) UES as presented, and: Keep the category at Proven for HZ1 and HZ2 and Planning for HZ3, Keep the status at Active, and Set the sunset date to March 31, 2026.
Blanton seconded.

Baylon said the presentation was so long that he can't remember all of the details.

- Bopp: The parking lot has short duct runs. The motion is not to include them.

Davis asked about the five-year warranty, wondering if the intent is to make sure no one is willing to put their name on one of these.

- Bopp: In essence, yes.
- Davis: Equipment or workmanship warranties I get, but you'd have to be an idiot to provide a five-year warranty on this. This effectually prevents it.
- Bopp: Yes, that's right.

Amendment
Anthony proposed including short duct and self-install refrigerant line.
Goss seconded

Anthony said we should include short duct equipment until we see data that shows these save less or costs are very different. He added that all equipment is going to leak refrigerant.

- Jerome: So, for short duct runs – is this a proposed amendment?
- Anthony: Yes.

Goss said Energy Trust of Oregon data includes short duct run systems. She said if savings are worse, it would be captured in these savings number.

- Bopp: Yes, our concern is that they're starting to look too different, or at least have the potential to look more like CDHP.
- Goss: There are all kinds of things happening in the market. There are DHPs added to central systems, DHPs connecting two rooms.
- Bopp: My concern is about systems that connect to more than two rooms.
- Goss: Those are probably more of a concern in zonal homes. Not sure it's much of an issue in eFAF homes.

Hadley moved back to Davis' comment saying DHP for eFAF is still an experiment in the region. He said the original question is: do we have a valuable resource here. He said the key links are the homeowner, where the equipment is placed, and how it's controlled. Hadley said short duct runs are more expensive and offer less savings. He said that means the original experiment already doesn't look so good, the savings are low and the costs too high.

- Anthony: If we have the data and it says what you say…how bad was it? Hadley is saying we have data to show these impacts.

- Bopp: We have data showing program costs going up and savings going down. And we suspect that part of this is the increasing popularity of short-duct systems.

Vote on the amendment. The amendment does not carry (9 yes, 6 no, 1 abstain)

Miller noted that the majority voted yes and wondered how it failed.

- Thomas: You need a minimum of 12 people to vote yes to approve and you need 60% majority to pass.
- Jerome: That's in our guidelines.

After reviewing the charter, section 11, Jerome called for a revote to make sure members understood what they are voting on.

Revote on the amendment. The amendment does not carry (9 yes, 6 no,1 abstain).

Amendment
Anthony proposal to amend the measure to remove the five-year warrantee on pre-charged line-sets.
Mullendore seconded

Anthony stated that any system pumped with refrigerant will leak within five years and grocery stores replace refrigerant all of the time. He thought that a home would need to be at 100% charge all of the time, and he didn't know if pre-charge systems leak more or less.

- Rushton: This was discussed at the subcommittee. A program mentioned that they've had bad experiences with these DIY systems. This is the reason they provided as to why they shouldn't be included in programs.
- Jerome: When installed properly refrigerants don't leak. They're in a sealed system.

Goss asked if DIY equipment has our required AHRI certifications.

- Bopp: Yes.
- Yi: Would this amendment allow DIY? My coworker, Greenwell, is very concerned about DIY.
- Bopp: No, this would allow pre-charged line sets but would still require a contractor install it.

Sam Rosenberg, PNNL, pointed to preliminary research on the failure of this kind of equipment at PNNL, saying the failure often has nothing to do with the installation quality but with the quick-connect itself. He said it's a rubber O-ring, which deteriorates in the presence of refrigerant or oil. Rosenberg asked if we have evidence of contractors providing such a warranty, saying this is out of their hands. He wondered why the contractor should provide the warranty and not the manufacturer as it's an equipment shortcoming.

- Bopp: We have required warranties in the past but never for refrigerant leakage. We've included some language as to what the contract might say. But, no, we've never seen it.

- Rosenberg: I'd hope we'd see this for other refrigerant systems as well, but I'd recommend that the manufacturer provide it, not the contractor. I have a slide deck showing a bunch of these failures. They're almost impossible to repair because of all of the debris in the line set.
- Davis: This is takeout language. Very few, if any, contractors, would do this. They would laugh you out of the room.
- Blanton: It sounds to me like the quick connect is a separate measure with a shorter measure life.
- Bopp: That's an option. Someone could propose it as a new measure.

Hadley recalled that it was proposed that it has to be a manufacturer or a contractor, but it sounds like its changed.

- Bopp: I removed the manufacturer route because their limited liability warranties wouldn't work well for this. For other systems, where the installation quality could lead to leak, the contractor would have to provide that warranty.

Rosenberg asked if this discussion is about MRCOOL and the patented quick connect system.

- Jerome: There are a lot of different manufacturers with three distinctly different quick connect systems.
- Rosenberg: I believe the push-through part of the system is the same patent. MRCOOL does provide a five-year warrantee on the O-rings.

Vote on the amendment. The amendment does not carry (6 yes, 8 no, 0 abstain).

Friendly Amendment

Learning that MRCOOL offers a five-year warrantee, Blanton and Baylon suggested saying "either contractor or manufacturer."

- Miller: How substantial is the MRCOOL warranty?
- Rosenberg: The MRCOOL warranty doesn't cover labor, just parts.

Davis asked how old the systems with the O-ring issues were.

- Rosenberg: Out of 15 systems inspected, they failed in within the first few years. These are disposable HVAC systems.

Hadley suggested saying "manufacturer and/or contractor" to cover the full cost.

- Miller: It sounds like MRCOOL doesn't include the whole costs.
- Hadley: They could change their warranty, MRCOOL, or someone else could do it.

Miller chose not to accept this is a friendly amendment.

Amendment

Baylon made the motion to amend the language to: "pre-charged line set installations include a five-year contractor and/or manufacturer warranty."

Mullendore second.

Davis doubted people realize what a manufacturer warranty actually covers, saying it's not much. He said this isn't a good amendment.

Vote on the amendment. The amendment does not carry (9 yes, 8 no, 0 abstain).

Vote on the motion as originally presented. The motion carries (13 yes, 3 no, 1 abstain).

Update Planning UES: Ductless Heat Pumps for Multifamily
David Bopp, RTF CAT, Presentation
Given the lack of remaining time, Thomas proposed asking for a sunset date extension to October 31, 2024. The RTF voted to approve the sunset date extension.

Realizing the time, Thomas proposed bringing this item back in October.

MOTION
I, Jackie Goss, move the RTF extend the sunset date for Heat Pumps for Multifamily UES to October 31, 2024.
Miller seconded.

Vote on the motion. The motion carries (15 yes, 0 no, 1 abstain).

Jerome ended the meeting at 3:50pm.

Voting Record: September 17, 2024

Motion Language	Yea	Nea	Abs	Motion Passes?	Percent of Yea Votes		Number of Voting Members Present
					RTF Voting Members (40% min)	Members Voting (60% min)	
MOTION: Approve the agenda for the September 17 meeting (Miller/Blanton)	18	0	0	Yes	60%	100%	18
MOTION: Approve the minutes from the August 20 meeting as posted (Owens/Baylon)	18	20	0	Yes	60%	100%	18
MOTION: Extend the sunset date for the High Efficiency Residential Central Air Conditioners UES Measure to March 31, 2025 (Davis/Owens)	20	0	1	Yes	67%	100%	21
MOTION: Approve the Griddles UES as presented, and: Update the Category to Small Saver,	17	0	2	Yes	57%	100%	19

Keep the Status at Active, Set the sunset date to May 31, 2028 (Baylon/Blanton							
MOTION: Approve updating the Standard Information Workbook with the proposed Refrigeration System Marginal Ratios expressed in BTU per W to replace the Energy Efficiency Ratios in the current workbook (Baylon/O'Neil)	13	0	4	Yes	43%	100%	17
MOTION: Approve the DHP for Electric Forced Air Furnaces (Single Family and Manufactured Homes) UES as presented and: Keep the Category at Proven for HZ 1 and 2 and Planning for HZ 3, Keep the status at Active, Set the sunset date to March 31, 2026	13	3	1	Yes	43%	81%	17
MOTION: Extend the sunset date for the DHP for Multifamily UES to October 31, 2024 (Goss/Miller)	15	0	1	Yes	53%	100%	16

December 5, 2023, Meeting Attendance

* Designates Voting Member

Name	Affiliation
Jamie Anthony*	BPA
Sofya Atitsogbe	WA UTC
Landon Barber	Idaho Power
David Baylon*	Independent
Rebecca Blanton*	Independent
Jonathon Belmont	BPA
David Bopp	RTF Contract Analyst
Bob Davis*	Ecotope
Scott Dimetrosky	Apex Analytics
Emily Donohue	Evergreen Energy
Christian Douglass	NWPCC
Logan Douglass	RTF Contract Analyst
Christopher Dymond	NEEA
Ryan Firestone	RTF Contract Analyst
Wesley Franks	WA UTC

Trevor Frick	Clark PUD
Lisa Gartland	ODOE
Jackie Goss*	Energy Trust of Oregon
Todd Greenwell	Idaho Power
Adam Hadley	RTF Contract Analyst
Rick Huddle	Cadeo Group
Aaron Ingle	NEEA
Mattias Jarvegren	Clallam PUD
Peter Jensen	NWPCC
Mark Jerome*	CLEAResult
Phillip Kelsven*	BPA
Rick Knori*	Lower Valley Electric
Noah Lieb	Apex Analytics
Denis Livchak	RTF CAT
Ben Mabee	BPA
Eric Miller*	Independent
Eric Mullendore*	BPA
Andi Nix	Energy Trust of Oregon
Alex Novie*	Energy Trust of Oregon
Nick O'Neil*	Energy 350
Sorochukwo Okam	RTF CAT
Brian Owens*	CLEAResult
Craig Patterson	independent
Andrew Paul	Avista Corp
Joe Prijyanonda	Applied Energy Group
Laney Ralph*	NW Natural
Mark Rehley*	NEEA
Samuel Rosenberg*	PNNL
Tim Runyan	NEEA
Josh Rushton	RTF Contract Analyst
Blake Shelide	ODOE
Justin Sharp	Sharply Focused
Blake Shelide*	ODOE
Paul Sklar	RTF Contract Analyst
Kevin Smit	NWPCC
Jennifer Snyder	WA UTC
Kenji Spielman	Energy Trust of Oregon
John Stainaker	BPA
Jason Talford	Idaho PUC
Laura Thomas	RTF Manager

Jim White*	Chelan County PUD
Sarah Widder*	Cadeo Group
Kathy Yi*	Idaho Power
Amanda Zuniga	Energy Trust of Oregon