Northwest Power and Conservation Council
Conservation Resources Advisory Committee
January 29, 2020

Charlie Grist, NWPCC, began the meeting at 9:30AM with a review of the agenda and introductions. Tina Jayaweera, NWPCC, announced that measure workbooks are being posted on the CRAC homepage as they become available. She added that the goal is to finish the work by the end of March 2020. Deborah Reynolds, WA UTC, confirmed that comments would also be due by the end of March. Jayaweera said she was hoping to get them earlier as RPM inputs are due at the end of March.

Jayaweera then pointed to the December 2019 DOE pullback on lighting regulation. She said staff plans to take this to the Council to address backsliding and other policy issues. Jayaweera suspected that they will continue with what's on the books but asked that CRAC members remain aware of the situation.

Ted Light announced starting his independent consulting company, Lighthouse Energy Consulting.

Update: Commercial Building Stock Assessment
Charlie Grist, NWPCC

Bobbie Wilhelm, Idaho Falls Power, asked if the CBSA looked at every building within the chosen Census block [Slide 9.] Grist answered no, explaining that they used the Census blocks as a pool to pick from. Aaron James, NEEA confirmed this method.

Dave Hewitt, Independent Consultant, noted that 5% of the largest buildings represent half of the overall square footage and asked if the CBSA picked up a large sample. Grist answered no, explaining that even though the sampling strategy aimed to get big building they can be hard to recruit.

Jack Cullen, Energy Trust of Oregon, asked about the plan to build up information on universities. Grist said that a university is a collection of building types and proposed using an estimate of total floor area and characteristics of those individual types. Wilhelm countered that it's hard to estimate university square footage and get billing data, adding that the university in her service area generates much of its own power. Grist agreed that extrapolating the data is worrisome.

Reynolds asked for clarity around Window U-value and Source of U-value on [Slide 12.] Grist stated that we know 5% of the U values for windows and of that 5% we know 100% of the source of that U-value.

Wilhelm questioned the 100% grand total on [Slide 13.] Grist said that's a typo.

Reynolds asked why some windows on [Slide 14] are "unknown." Grist answered that some windows are inaccessible.

Wilhelm explained Idaho Falls Power's difficulties in releasing billing data [Slide 17.] She collected billing data in a folder but can't release it because it lacks proper approval from the account holder. Grist called this a crying shame. Michael Coe, Snohomish PUD, said he has the same issue because of Washington state's data privacy law. Wilhelm said NEEA could have been more proactive adding that there are ongoing conversations on how to fix the issue. James said NEEA is working to get proper authorization for these cases.

Update: Customer Share of Measure Cost

T. Light thought that ProCost varies assumptions by sector [Slide 4.] Grist said it can do that but he is proposing using one number as year-to-year variances makes estimates "jumpy." Nicholas Garcia, WPUDA, suggested weighting by savings as he is troubled by using a blanket 50% for everyone. Grist answered that he needs more utility data for that approach. He added that forward predictions will be noisy and will also not make a huge difference as this financing is only a small part of the measure [Slide 5.]

Jessica Aiona, BPA, referenced an LBNL paper that matches Grist's assumption of 50%.

BREAK

Measure Review: Residential Heat Pumps
Tina Jayaweera, NWPCC
Gurvinder Singh, PSE, asked for further explanation about good/bad system controls and if the 2500kWh/yr savings come from a swap out or from other work like fixing duct leakage [Slide 5.] Jayaweera addressed controls, saying there was no system control requirements so the homeowner could have used the DHP only or had the two systems compete with each other.

Jennifer Light, RTF Chair/Manager, said these savings came from BPA and ETO evaluations and was not aware of duct sealing or any extra work. She said there may be more savings out there. Singh confirmed that these savings are for a DHP and not an ASHP. Jayaweera confirmed that this is just for DHPs.

Grist elaborated how a DHP, installed in the main living area, can compete with a Forced Air Furnace. He said billing data is crucial as behavioral uncertainties are not captured by the engineering model. Cheryn Metzger, PNNL, added that along with occupant behavior, lab home tests show a lot of variability when two systems compete to meet setpoints without controls.

J. Light added that the billing analysis numbers are quite robust.

Wilhelm asked if anyone looked at the thermostat vintage of zonal heat homes as she's seeing, anecdotally, that the 1970s thermostat controls are not working properly. She wondered if

installing better thermostat controls with the DHP would alleviate competition. Tom Eckhart, UCONS, said he did work like this in King County, WA by removing the baseboard. Wilhelm said removing baseboards may work in Seattle but would be too intrusive for ceiling-cable heat, adding that Idaho Falls needs back up heat.

Jayaweera agreed that better thermostats would help the two systems operate better and increase savings. Hewitt supported this, saying data from the Northeast proves you can optimize savings with control strategies. He added that the control industry is interested and aiming in that direction.

Garcia asked if bullet "No apparent difference in savings across home size" [Slide 7] means proportionally or absolutely no difference. Jayaweera answered that this is as a percent of baseline consumption.

Singh moved back to [Slide 5] and asked if the 2500 kWh/yr savings are from PNNL test homes. Jayaweera answered no, the RTF based this estimate on billing analysis. J. Light added they are looking for additional savings/additional measure that could be added for an optimally controlled set up.

Singh asked if the PNNL test home tried optimizing the control scheme with a two-stage controller. Metzger agreed that wired approaches are appropriate in other parts of the country that don't consider cost-effectiveness and don't mind a few extra $1000 per set-up. She said the Northwest's goal of finding cost-effective solutions made adding a contractor cost-prohibitive.

Eckhart added that trying to wire in mix of different vintage heating systems is challenging as well. Singh agreed.

Metzger said the PNNL "Complex Schedule" strategy tried to target a space the DHP could handle by itself and focused on turning it down at night [Slide 8.] Grist asked about optimization strategies to test the control set up. Metzger explained that one strategy set back the hall central/zonal thermostat, another used a remote temperature sensor in the back bedroom, while a third, unsuccessful strategy used the central system fan to help circulate air. Metzger stated that the complex schedule uses the living area DHP more throughout the day and switches to the bedroom at night. She acknowledged that this makes assumptions about occupancy and use but thought occupancy sensors could force the system to do this as well. She added that the zonal system also tested transfer fans.

Garcia questioned an occupancy-based complex schedule as many people, his family included, don't like to going into a cold room and are not willing to wait the 15 to 20 minutes it takes to warm up. Metzger understood and explained using an hour overlap to overcome the problem. Eckhart said he found the same issue in the Tacoma test homes where the system couldn't meet customer demand. Metzger thought the backup system would keep occupants comfortable while still forcing the DHP to do as much work as possible.

Eckhart noted that [Slide 9] includes a fixed number that's irrespective of the heating load and asked why a baseline wasn't used. Jayaweera answered that they do use a baseline for zonal applications. She then explained that the RTF used the data available at the time to come up with the 2500 kWh for Forced Air Furnace applications. Jayaweera added that the RTF is no longer basing estimates on the SEEM results because it's a single-zone model.

Eckhart said Phase 1 Tacoma billing analysis found that both systems were operating concurrently 40% of the time. Phase 2, according to Eckhart, added a better thermostat and that number dropped to 10%. Eckhart said the billing analysis will be available next month. Jayaweera said yes, that is what the lab home tests are trying to simulate.

Grist asked why Jayaweera is hesitant about extra savings from controlled baseboard. Jayaweera said she has faith that there are savings there but said it isn't an apples-to-apples comparison.

Metzger added that the project's advisory committee would have preferred a baseline of both systems working concurrently. She modeled both baselines and offered to send the information. Jayaweera thanked her, calling the information useful.

Jayaweera reiterated that she's looking for a thumbs up on adding the second tier of DHP savings along with some guidance on the portion of homes that will adopt it.

Wilhelm thought adding the tier was a cool idea. She asked if there's a plan to look at the back-end smart thermostat data to see if and when an occupant overrode the Complex Schedule. J. Light said the RTF will take this issue up on a deeper level.

Hewett was on board with the 50% increment for smart controls and agreed we need more data. He suggested picking up an outside temperature to start DHPs earlier. Hewett agreed with requiring smart controls in the program as manufacturers are aware of these issues and exploring smart phone apps.

Eckhart agreed, but said better thermostats don't solve for the occupant that wants systems to heat/cool quickly. Jayaweera said she's hearing the achievability and persistence will depend on education and program design. She said that information is not here yet and she's looking for a thumb-in-the-air estimate of what to use for the Plan. Grist offered a 70% adoption rate.

Aiona pointed to BPA research on persistence that found that settings don't persist even with training. Wilhelm said a smart thermostat could show when people change the settings. Aiona countered that the BPA can't override people's choices. Wilhelm explained that she's not talking about direct load control but a way to look at the changes on the back end. Aiona said that still bumps up against BPA customers' privacy concerns.

Garcia agreed that the approach will garner healthy savings but argued that it ultimately comes down to customer comfort and people won't give up control. He thought that, as people evolve (or devolve) over time, a single number might be challenging but suggested going with the lower 50%.

Velonis suggested adopting a different ramp rate for this higher tier as it will take more education and communication to make into a reality. J. Light liked that idea as they can't even confirm where in the house the DHP is located. She agreed that the lifetime could be short but you could get a lot of homes as this isn't complex.

Grist wondered what fraction of homes have a definitive enough occupancy schedule to successfully apply this approach. T. Light agreed that education needs could be addressed with a slow ramp rate.

Kurtis Kolnowski, Applied Energy Group, called this measure a cool idea and recommended moving forward.

Hewett confirmed that the furnaces in question on [Slide 10] are electric. Jayaweera confirmed.

Hewett asked if the approach lined out on [Slide 14] differs from the NEEP cold-climate spec. Jayaweera answered that the product list is the same but didn't know if the specs were identical. Jess Kincaid, BPA, clarified that NEEA's list is slightly more stringent than NEEP, with NEEA requiring "80% at 5°F" while NEEP only requires "operational at 5°F." Hewett thought the cold climate units would out perform throughout the Northwest, particularly in the coastal zones and called for a better look as they could dominate the marketplace.

Cullen agreed that Cold-Climate DHPs needed more study.

Kincaid pointed to finding an anecdotal difference in demand in low temperatures. She explained that the standard models' ability to use some compressor below the 17°F threshold can create a problematic load spike for some utilities in Zone 1. Kincaid thought a higher penetration of Cold-Climate-rated units would lead to a more gradual increase in demand as the temperature drops. Jayaweera said this sounds like energy savings may be negligible and she should focus on the much-more-difficult to quantify load profile.

Singh asked if the standard unit comes with backup strip heat. Kincaid answered that all but one extremely high-performance model has strip heat. Jayaweera added that the homeowner may be turning on back-up zonal heat.

Hewett asked if eFAF replacement could be outlawed and wondered if modern codes even allowed it [Slide 19.] Jayaweera said perhaps in the MCS but in today's world it' is still allowed. Hewett asked how an eFAF could possibly fail before agreeing that a DHP could be used to replace a CAC. Grist said this sounds like Hewett thinks that bullet two "Model as a retrofit" is a reasonable approach. Hewett agreed, pointing to the increased demand for AC.

J. Light explained that the RTF modeled two savings streams but Jayaweera is proposing one stream that treats everything like a retrofit where savings stay consistent throughout the lifetime. She said both are retrofits but the question is how to treat the second stream of savings.

J. Light then asked how Jayaweera planned to account for the natural turnover to ASHPs. Jayaweera said this application can't, but BPA's market model could capture a market shift. J. Light said you may be overstating long-term savings this way which is why the RTF came up with the 50/50 approach [RTF Slide 30.] Jayaweera countered that the savings are there, just not attributable to a program. J. Light agreed.

Kolnowski confirmed that the Council's load growth forecast breaks out cooling by technology. Jayaweera said yes. Kolnowski thought limiting CAC growth there would solve the overlap problem. Jayaweera countered that the efficiency forecast is frozen. Kolnowski did not think that would matter.

LUNCH

Distribution Efficiency Status Update
Mike Starrett, NWPCC

Danielle Walker, BPA, recalled Seventh Plan assumptions that limited applicability to substations of a certain size [Slide 5] and wondered if that is still the baseline. Starrett said, based on literature reviews and expertise in the field, overall applicability has been expanded and can now even include some industrial customers.

T. Light voiced surprise at the steep rise in O&M costs, considering recent infrastructure investments [Slide 9.] Starrett blamed the rise on three factors: the structure that allows him to unitize O&M costs, him forgetting that he needed to come up with numbers and the possible inaccuracy of the Seventh Plan figure.

Grist asked what O&M is needed for this. Starrett called the 15-year measure life fair, agreeing that equipment will need some maintenance over that lifetime. Starrett said for future work [Slide 10] it would be good to know how much utilities are paying for capacitor maintenance. Grist talked through how this method differs from Seventh Plan work. Starrett voiced discomfort with the Seventh Plan's piecemeal approach and how a subject matter expert from BPA shed more light on what was actually needed to move to DER and CVR. Grist called this a big improvement. Starrett agreed, adding that the bottom-up transparency of this method should convey more confidence.

Kolnowski recalled that the Seventh Plan ramp rate pushed most of the potential into the second half of the Plan. He wondered if it would be modeled the same way this time. Starrett pointed to PGE's large investments that could make this work look cheaper further down the

line. He then referenced another utility's efforts to lower outages through software, adding that that same software could run a CVR add on.

Jeff Harris, NEEA, called these advancements exciting and asked about O&M costs going down due to reduced customer complaints about over-voltage issues. Harris also mentioned a cost calculator created to recognize this. Starrett said he didn't think about the customer side but the opportunity for savings is real, particularly for reducing wear-and-tear on expensive equipment like a tab changer. Starrett said the savings remain one half of 1% with a "wonderful narrative" on how to improve that number.

T. Light asked what was assumed for load and other EE measures. Starrett said sales were based on 2018 numbers and the Seventh Plan had an adjustment. Grist explained a Seventh Plan approach that acknowledged interaction while avoiding double counting. Starrett said the coming workbook will be spectacularly informative and thanked BPA for their help.

Industrial: Fresh Water Supply and Wastewater EE Supply Curves
Kevin Smit, NWPCC
Adam Hadley, Hadley Energy, RTF CAT
Harris asked if increases in energy intensity for health issues were considered [Slide 9.] Adam Hadley, Hadley Energy, answered no, calling for more data. Harris pointed to the City of Portland's commitment to a large construction project and Seattle's probably need for a similar approach which might yield data. Harris said the Northwest has typically gotten by with limited energy use for this application but that might be changing. Hadley agreed, noting that Wilsonville, OR might be another place to look for data as they pull water from the Willamette.

Grist suggested reaching out to the American Water Works Association for more data [Slide 10.] Harris thought the drop in per-person consumption coordinates well with efficient showerheads, low-flow faucets and aerators. He suggested contacting EPA WaterSense for national numbers.

Grist asked if the supply-side savings from reduced leakage was considered [Slide 11.] Smit thought some of that was possibly picked up in project data and the decline in per-capita consumption. Hadley added that the data they have doesn't include a change in flow.

Wastewater Treatment EE Potential
Kevin Smit, NWPCC
Adam Hadley, Hadley Energy, RTF CAT
T. Light recalled a 10-year-old impact evaluation on back gen that came in with very low/no savings that might yeild interesting information [Slide 27.] He also suggested looking at the Oregon Association of Clean Water Agencies' SEM efforts.

Harris questioned the .5% improvement per capita wondering if it's a symmetrical response to the reduction in water supply. Smit answered yes.

Industrial Sector EE—2021 Plan Approach
Kevin Smit, NWPCC
Adam Hadley, Hadley Energy, RTF CAT

Harris asked if load growth in some sectors, particularly natural gas, was looked at along with a potential LNG facility coming in the south Puget Sound area [Slide 6.] Smit did not think so but said Massoud Jourabchi, NWPCC, would know for sure. Grist asked Harris for clarification. Harris described a mechanism designed to reduce CO2 emissions from the gas distribution system by replacing combustion compression engines with electric motors. Grist suggested bringing this up with natural gas expert Steve Simmons, NWPCC, adding that the Council is looking at some deep decarbonization scenarios where this may be appropriate.

Velonis suggested not using the lighting results for [Slide 17] considering the vintage of the data coupled with fast technological advancements. Smit agreed and thought using just the last few years of data may be appropriate.

Velonis then addressed the two different data sets, saying it may be more appropriate to look at what was installed as opposed to what could be installed. Hadley confirmed that Velonis is talking about the implemented identifier before saying that is examined at the six-to-nine-month check in. Smit said he would be mindful of that and will probably rely more on regional project data for implementation costs, admitting that the data often doesn't include total facility consumption.

Velonis asked if the plan is to break out savings by end use. Smit answered that this is a share of total plant and he has the end-use shares by industry that he can use if needed.

Grist asked what useful things Velonis found when he looked at the data. Velonis pointed to concerns about only characterizing small and medium facilities and work to gather data on larger facilities, with a focus on characterizing process loads.

Cullen commented that ETO used to rely on IAC for all industrial measures. He said he used IAC as a gut check against their new, internal method and found that it is still in line. Smit agreed that this will be used as a backup, unless there is no data. Cullen also felt the data lacks in process load information.

T. Light thought the data base could add more definition and clarity to the existing measure list as he's heard questions and skepticism from clients particularly around air compressors. Smit promised him great detail in fans, pumps and compressors.

Clean Water Pumps EE Assessment—Status Update
Kevin Smit, NWPCC

To save time Smit moved to [Slide 4] and asked for input on the first two proposed measures be sent to him.

Modeling Incrementalism

Tina Jayaweera, NWPCC
Aiona asked if excluding the lower tier from analysis means you can ‘t include it in reporting [Slide 7.] Jayaweera said no, but warned that you won’t get the full potential. Aiona confirmed that the lower-level tier can still be claimed by efficiency programs. Jayaweera said yes, as long as they’re cost effective.

T. Light spoke about ETO modeling work he did that looked like the first bullet. Jayaweera said that might be germane to the upcoming dryer example.

Kolnowski asked if this is an issue because of how the model selects from the supply curve. Jayaweera explained how the supply curve is built and binned and that the model buys by bin. Kolnowski said he understood the tradeoff, explaining that only modeling the higher tiers risks it being passed up completely and missing all of the potential.

Velonis called the examples on [Slide 8] not exactly representative because the incremental cost in all of those cases would be $0. Jayaweera said she’s thinking of going off a baseline market average of Vented_ENERGY STAR and doing the shares above that. Velonis thought that made sense in terms of distribution, but selecting just one presents a bigger risk because it will never show up if it’s not cost effective.

T. Light reframed the question as, “is this more accurate for the near-term potential or over the 20-year potential of the Plan.” He said he is not well versed enough in the Power Act to weigh in.

Walker mused about what BPA’s program people would do with this and though excluding would not be ideal. She suggested that they would look more holistically at the bundle of dryers and wondered if there was something in between individual measures and a whole bundle to consider. Jayaweera said collapsing meant there would have to be some weighting and asked what happens if they collapse into a levelized cost that isn’t cost effective.

Kolnowski suggested putting a soft cap on the highest levelized cost to screen them out.

Cullen said the potential to go to 100% still remains for the highest tier and this is a ramp rate issue. Jayaweera called that a possibility. Grist addressed T. Light’s early comment on near/long term potential, saying the near-term is more important as the Plan is reworked every five years.

Cullen thought taking a case-by-case approach for ARC sounded reasonable [Slide 13.]

PUBLIC COMMENT
Wendy Gerlitz, NW Energy Coalition, voiced concern over the Council not doing enough to quantify the non-energy benefits of energy efficiency for the 2021 Plan. She said internal conversations with other NWEC staff and some fellow CRAC members point to agreement that this omission doesn’t serve the full body of efficiency as we continue to embrace the total

resource cost test. She asked if other work has been done, referencing Jim Lazar, RAP, suggestion of reviewing the EPA report on the public health benefits of energy efficiency.

Grist said this issue was discussed. J. Light confirmed that the EPA report, along with additional wood smoke studies, was examined and brought forward to the Council at two meetings. J. Light reported that the data did not seem usable for the 2021 Plan, pointing to several concerns including the EPA report caution to not use their numbers past 2022.

J. Light said the Council gave direction in October to not include those benefits at this time but remained open to reconsidering if new data was brought forward.

Gerlitz appreciated the update, even though she did not particularly care for it, and offered to look for more data. She said she will also follow up with written comments on the environmental methodology.

Gerlitz then addressed the system cost work presented earlier in the day. She called it concerning to see a detailed presentation on the customer's share when none of that is in fact a system cost but a cost to the customer. She said this shows unequal treatment of costs and benefits, calling it a mismatch in focus. Gerlitz said she would have preferred more rigor in tracking down valuable health benefits.

Grist said health is not on that list, according to the Council's interpretation.

Gerlitz reiterated that those benefits need to be included if the total resource cost test is going to be used. Jayaweera offered the caveat that it's not a total resource cost test in the purest sense as costs and benefits are aligned to the Council's framework. Jayaweera said the procedure was renamed the Northwest Regional Cost Test to avoid this confusion. Gerlitz thought there were flaws in this as well. Grist asked that she send her written concerns to help move the discussion forward.

J. Light said this can be brought up to the Council again but pointed to pressures like the upcoming pencils down deadline.

Smit announced the next meeting on March 31 and the possible need for more webinars. Chad Madron noted a SIF meeting on March 10th. Jayaweera suggested a placeholder webinar in about a month.

Smit adjourned the meeting at 3:30.

Attendees

Charlie Grist	NWPCC
Kevin Smit	NWPCC
Tina Jayaweera	NWPCC
Mike Starrett	NWPCC

Jennifer Light	NWPCC
Deborah Reynolds	WA UTC
Kurtis Kolnowski	Applied Energy Group
Danielle Walker	BPA
Ted Light	Lighthouse Energy Consulting
Aquila Velonis	Cadmus
Jessica Aiona	BPA
Wendy Gerlitz	NW Energy Coalition
Jack Cullen	Energy Trust of Oregon
David Hewitt	Independent Consultant
Greg Hurwitz	Evergreen Consulting Group
Aaron James	NEEA

Attendees via Webinar

Andrea Goodwin	NWPCC
Adam Hadley	Hadley Energy
James Anthony	BPA
Bill Saporito	Umatilla Electrical Coop
Bobby Wilhelm	Idaho Falls Power
Brandy Neff	PNGC
Cheryn Metzger	PNNL
Chris Johnson	Benton PUD
Christina Steinhoff	NEEA
Michael Coe	Snohomish PUD
David Bell	BPA
Eli Morris	Applied Energy Group
Elizabeth Osborne	NWPCC
Eric Mullendore	BPA
Greg Harr	Evergreen Efficiency
Jeff Harris	NEEA
Jess Kincaid	BPA
Kathryn Bae	NEEA
Kerry Meade	Smart Buildings Center
Leann Bleakney	NWPCC
Michelle Lichtenfels	BPA
Nicolas Garcia	WPUDA
Ryan Brown	NEEA
Shani Taha	UCONS
Gurvinder Singh	Puget Sound energy
Tim Runyan	NEEA
Todd Amundson	BPA
Tom Eckhart	UCONS
Tony Koch	BPA
Brian Dekiep	NWPCC