

**Northwest Power and Conservation Council  
Demand Response Advisory Committee  
March 15, 2018**

Tina Jayaweera, NWPCC, began the meeting at 9:30 by calling for introductions and reviewing the agenda. She explained that, as Council staff gets ready to build supply curves for the Eighth Power Plan, DRAC work will focus on getting comfortable with assumptions, mitigation of barriers and the achievability of DR. Jayaweera announced an upcoming RFP for developing a DR model. She then noted that the DRAC's charter will be up for renewal this summer. She asked members to consider who would be the correct person to represent their organization given the upcoming work.

Jayaweera then mentioned the re-start of PNDRP with a meeting on June 19, 2018 and noted some proposed topics for the agenda. Lee Hall, BPA, asked other DRAC members to propose agenda items and DR "success stories" from the Pacific NW.

**BPA Demand Response Potential Study**

Lee Hall, BPA

Tom Brim, BPA

Jayaweera asked if the 2016 peak demand illustrated on [Slide 3] is coincident to a particular hour. Hall believed that it was their own peak.

Tomás Morrissey, PNUCC, asked what Bonneville's peak is if one extrapolates the 6% peak on [Slide 5.] Hossein Haeri, Cadmus Group, answered 12,849 MW. Hall assured Morrissey that this will be discussed in deeper detail on upcoming slides.

Rob Pratt, PNNL, asked if this represents nameplate capacity. Haeri answered that this information came directly from FERC reports and the best way to interpret the numbers is "available DR." Fred Heutte, NW Energy Coalition, said these represent actual deployed DR and nameplate capacity is not a good way to frame the data as not every MW is available in every timeslot.

Greg Brownell, EWEB, asked what the numbers on the X axis represent. Hall answered that they are years.

Toni Usibelli, WA UTC, asked if you could glean any sense of the size distribution of the utilities represented on [Slide 6.] Haeri answered that the utilities on the right tend to be small, rural co-ops. Haeri added that they tend to sign up the majority, 50-60%, of residential customers. Morrissey asked if the average is straight or weighted by utility size. Haeri answered that this is a straight average.

Riley Peck, ICNU, asked what the programs look like. Haeri answered that 75% of the programmatic DR is residential direct control while 1/3 is commercial/industrial curtailment contracts, many of which are deployed by a third-party aggregator.

Heutte stated that he is not surprised by the results as small, rural co-ops are strongly incentivized. He noted that mid-sized IOUs often work under an RTO that allows a significant amount of DR. He stated that these numbers do not represent the total available capacity. He said the real question is, “what comparables in the East apply to us?”

Dave Nightingale, WA-UTC, asked what “target-driven,” means. Haeri admitted that it is hard to tell from reported numbers if it is potential or a constrained number. He gave the example of a utility with a target but was constrained by budget. He stated that using these numbers as market potential could be misleading. Hall added that there’s lots of technical potential but achievable is constrained by many factors. He stated that Cadmus used the nominal or expected average over a 20-year period.

Usibelli asked for a rundown of levelized costs and how to think about numbers that run from \$10 to \$160/KW-year [Slide 8.] Hall stated that the BPA demand charges are about \$100 a year, but cautioned that small utilities with a specific need, like Milton-Freewater, will develop great programs.

Brim noted that the final report is detailed and data-driven with benchmarked assumptions. Haeri added that, unlike conservation potential, DR is technology and a package of program attributes. He noted that the report describes these attributes in detail.

Brim addressed levelized costs, stating that creating an apples-to-apples comparison is an important first step for modeling. Heutte added that a combustion turbine runs \$125/KW-year, which makes this an appropriate cut off. Hall emphasized that this is not a cut off but a supply curve.

Pratt asked if these are cumulative numbers. Brim answered that there is some overlap and these are not additive numbers.

Nightingale asked for the difference between cumulative and incremental [Slide 10.] Hall explained that there is about 1550MW winter DR available and about 200MW comes from water heating. He further explained that the orange bar represents quantity while the blue represents the buildup. Heutte added that this is a way to deal with double counting, but Haeri corrected that this represents stand-alone potential (does not correct for double counting). Hall noted that the same information is represented on [Slide 8.]

Nightingale suggested removing the blue line from [Slide 10.] Haeri argued that it tells the story of the supply curve and a more conventional plotting would be harder to read. Adam Schultz, Oregon Department of Energy, stated that he liked the chart. Hall stated that it fits BPA’s needs.

Jason Salmi-Klotz, PGE, asked how DLC thermostats and space heating avoid cannibalizing each other. Haeri acknowledged that there is no good way to account for overlaps until deployment is decided.

Heutte said he was thinking about the Low Case and asked if the BPA rate structure will induce some DR regardless [Slide 12.] Hall stated that he was not ready to comment on BPA's rate making structure.

Nightingale asked about the timing of the release of the three reports [Slide 14.] Hall said all reports will come out in a few weeks.

Salmi-Klotz noted that the levelized costs of the High Case Achievable are similar to the base case and asked if there were different assumptions around the marketing costs to get to that level of participation. Haeri noted that the technical potential is identical in both and the products have a relatively small fixed cost. He noted that 75-80% of the cost is incentives so as quantity goes up the average levelized cost will go down.

Suzanne Frew, Snohomish PUD, noted that the levelized costs for water heaters differed significantly between winter to summer [Slide 13.] She asked what drives the difference. Haeri answered that most of that cost comes from the switch gear and cost of installation. Brim added that there is less yield out of a water heater in the summer.

Usibelli noted that BPA's footprint is 40% of the region and asked if there is any reason to expect that the potential or costs would be the same for the rest of the region. Haeri answered that, relative to peak, there is about the same amount. He pointed to PacifiCorp's, PGE's and PSE's DR potential studies that produced comparable cost and potential numbers.

Hall cautioned against an exact extrapolation but felt confident that these numbers are a good benchmark for the region and beyond. Haeri added that incentives will push up the levelized costs.

Pratt noted that a water heater offers both winter and summer DR but install costs were one time. He thought the water heater numbers might drop depending on that. Brim agreed. Frank Brown, BPA, noted that there are less expensive water heaters approaches and these numbers might be in the high range. Haeri added that most water heating DLC piggybacks on AC DLC to save on installation costs.

Heutte asked what the cost profile of a DLC timer looked like. Haeri answered that the report does not reference a particular product. Brim stated that Central Electric in Redmond, OR did a timer program and there might be some costs in that report.

## **BREAK**

Jayaweera called for more reports to post on the DRAC web site.

**BPA—Energy Northwest Partnership: Two successful DR Demonstrations**  
**John Steigers, Energy Northwest**  
**Lee Hall, BPA**

Peck asked if the industrial customer on [Slide 3] are large companies or a collection of smaller firms. John Steigers, Energy Northwest, answered that in both cases it was single large companies: NORPAC in Cowlitz PUD and a TMP paper mill in Pend Oreille PUD. Steigers then thanked both companies, singling out NORPAC for their extraordinary, top-down level of commitment.

Usibelli asked what was learned by the 6% of failures on [Slide 4.] Steigers answered that most of them were from missed minutes because of unanticipated events on the contributor end. He noted that Energy NW has a command and control infrastructure to remotely initiate events and in one instance there was a coding error. Brim added that the one-minute intervals was a very high bar for Energy NW to meet. Hall pointed to a detailed study that closely examines the failures.

Jayaweera asked if a one-hour event would not have the same constraints as an under-one-hour event [Slide 6.] Steigers was not sure about the rules but noted that schedules were set on an hourly basis.

Jayaweera asked if it was all reductions or were there some increases as well. Steigers noted that, as a generator, University of Oregon increased their generation while everyone else reduced loads. Brim added that they tested both INCs and DECAs for Port Angeles.

Jayaweera asked if there is any process evaluation about end-use customers reactions [Slide 8.] Hall said it's included in the report.

Peck asked for an explanation of the blue line that runs through the bars on [Slide 8.] Steigers said that was his contractual obligation and there was no extra payment for overperformance. Peck asked if overperformance was a feature or a bug. Steigers answered that it's a function of how NORPAC operates and BPA sees anything above the blue line as noise. Hall added that the demonstrations were about more than quantities.

Haeri asked how difficult it was to get the 36MW and how much more is possible. Steigers noted that demonstrations like these are constrained by timelines so recruiting is mostly limited to customers that already have the capability, with the exception of Pend Oreille PUD paper mill and NORPAC which already had sophisticated controls. Steigers added that human error is always a factor and noted specific issues relating to the rapid ramping up and down of the paper mill.

Usibelli asked about contractual issues like liability and insurance. Steigers discussed learning curves, BPA's contractual model and security concerns. He added that Energy NW's business model directs them to work with utilities so utilities were given a choice to contract with Energy

NW or let us go directly to the customers. Hall stressed that BPA never touches a load without going through the utility, which adds a level of complexity. Hall then said he believed that this resource will allow Bonneville to avoid building the I-5 project.

Heutte approved of including a process evaluation, as storytelling captures the value of a program beyond KW saved.

Nightingale asked about voltage reduction, wondering why operators didn't always operate at those levels. Hall answered that, while it is an ongoing debate, industrial customers want higher voltages. Haeri suggested reaching out to Bob Fletcher at Snohomish PUD for more insight.

Steigers agreed that there are a lot of opinions and data about this but said that CVR effectiveness is questionable and used home heating—which spreads out the time needed to heat a space—as an example. Nightingale agreed that heating works like that but lowering voltage would realize some savings. Nightingale also agreed that industrial customers might require higher voltage.

Morrissey asked if any cost data, like cost/KW-year, is publicly available. Hall said he couldn't answer that as it's commercially sensitive. Steigers added that the numbers do not look great as the demonstration is a three-month program and need to be taken with a spoonful—and not a grain—of salt. Steigers said if this was a longer program they could have doubled their response. Haeri called that significant as 36MW is 15% of the total, long-term potential Cadmus estimated for the region.

## **LUNCH**

### **Unlocking Residential DR at Scale Through Standards Conrad Eustis, PGE**

Pratt asked if the standard interface on [Slide 9] does diagnostics. Conrad Eustis, PGE, answered that A.O. Smith did this to accommodate Lowe's Iris Control System.

Heutte asked how difficult or easy it was to sign up customers [Slide 13.] Eustis stated that program design is not on the objectives list as we knew smart tanks would not be an easy sell. He said he got the expected 10% of Heat Pump users while plumbers were the only hope to reach resistance tanks. Eustis noted that they only got one or two tanks signed up that way, calling that approach the wrong channel.

Nightingale asked how the market transformation would be implemented. Eustis said that will be in the upcoming NEEA presentation.

Heutte called the mixing of treatment and control groups unusual [Slide 15] noting that it resembled a double blind medical study. Eustis pointed to the hundreds of events studied. Heutte remained intrigued by the approach and wondered about any downsides.

Jeff Harris, NEEA, asked if there was a difference in peak demand of Heat Pump Water Heaters versus electric resistance heaters [Slide 21.] Eustis answered about double and moved back to [Slide 18] to illustrate his point.

Harris then asked why the HPWH storage on [Slide 21] was half of the resistance tank. Eustis said he was examining this as a battery equivalent which takes the COP into account. Harris stated that all HPWHs have an electric element which could be optimized. Eustis countered that he would not want to give his customers a sudden jolt of energy. Harris noted that the battery size, in the sense of stored thermal energy, is not represented on this slide. Eustis agreed.

Geoff Wicks, NEEA, pointed out that thermal resistance tanks are installed in multi-family residences. Eustis said that half of them are in single-family homes in PGE's service territory. Wicks countered that, in this study, the vast majority are in multi-family homes.

#### QUESTIONS [Slide 24]

Bill Henry, EQL, referenced the week-prior baseline saying you would have events in the baseline if you're dispatching every day. He asked if this would be the same in the real world. Eustis said his largest concern was being cost effective at the bottom of the uncertainty band and justify a market transformation.

Henry stated that there can't be a traditional baseline if every day dispatching is expected. Eustis said he has a unique opinion about rich, flexible load environments. He stressed that there are only 6000MW of DR in the whole US residential sector and cheaper, easily-controlled batteries will soon be available.

Heutte noted other highly-valued ancillary services that this technology could provide. Eustis stuck to his argument about batteries, noting that water heaters and thermal storage are a great way to shift energy.

Pratt asked if customers could find the plug and plug it in. Eustis said yes, pointing to minute-by-minute data received. Pratt then asked about the cost split wondering how much the plug cost in comparison to the dongle. Eustis said the vendor causally estimates \$15 per tank for modifications.

Tom Eckhart, UCONS, asked about direct load control for old, existing water heaters. Eustis said the controls have to be installed in existing tanks and retrofit programs have existed for three decades. Eustis added that, in his experience, these programs are not cost effective. Eckhart said they will be and thanked him.

#### **Transforming NW Water Heating Markets for Flexible Demand Management** **Jeff Harris, NEEA**

Hall noted that California is presently going through the open comment period [Slide 5] and BPA endorsed the effort. Harris stated that the comment period is still open.

Nightingale asked if the 250MW peak is region wide [Slide 9.] Harris answered yes. Eustis stated that their CEO recommended the DOE push for water heater standards. Harris noted that states are not pre-empted on DR standards, which gives west coast states an opportunity.

Eckhart said it would be helpful to resolve the differences between this presentation and the last one. He then stated that California has 85-90% gas water heaters while the Pacific Northwest has a higher electrical saturation. Eckhart then said that he sees tanks installed for 17 years, which is a higher number than Eustis presented. Wickes said his data shows a 12-14-year life in the Northwest and lower nationally. Harris added that California has 35 million people, so 10-15% is a large number.

Eustis agreed that getting on the same page with assumptions is an important deliverable.

Wickes noted that California is aggressively moving to electric water heating.

Pratt asked if the control is located at the dongle or the manufacturer's internals. Eustis pointed to a shed command in CTA, noting that it's up to the manufacturer to decide what to do with it. Pratt stated that the manufacturer controls the customer experience. Harris said the communications vehicle can be very low cost, and an HPWH already has a sophisticated microprocessor.

Hall asked, once this virtual power plant is developed, how it will be modeled and who gets to use it. Harris agreed that this is a hard question. Hall added that the Balancing Authority and WECC-wide aspects add to the problem.

## **BREAK**

### **Proposed Tacoma Power Demand Response Pilot Ahlmahz Negash, Tacoma Power**

Steigers addressed the [Benefit-Sharing Incentive Slide] asking if the red line on the middle graph (real time price) is established after the fact on the trading floor. Ahlmahz Negash, Tacoma Power answered that the customer wants to know what their incentive will be so it's the day-ahead market. Steigers stated that the value is not in the price but the deviation. Negash agreed.

Henry asked if the blue shaded areas are what the customer nominated. Negash stated that the red line represents the nomination. She said this allows customers to use more energy as long as it's shaped properly.

## **Discussion**

Hall said this looks like an economic optimization which is a different model than a flat rate or demand charge. He then said it depends on the industrial process and some industries are not as flexible. Still Hall called this good work and was interested in further results. Negash agreed

that some customers are not interested in this but others are excited because they have flexibility.

Pratt asked if there is any residential or commercial analysis. Negash stated that residential customers don't have a demand charge, but Tacoma Power did just start a DR group to look at residential programs.

Steigers pointed out that there are no penalties for missing their bid just lower incentives or their usual tariff structure. He said there is a big difference between not giving an incentive and imposing a penalty. Negash admitted that they thought about penalties but phased it out.

Usibelli voiced concerns over extreme events that would cause periods of high prices and asked if there were any parameters put forward by the trading floor. Negash answered yes, and an analysis showed that CAISO volatility is higher than what they expect. She stated that while this is not the right signal, a 50/50 split between them and the customer provides the right cushion.

Jayaweera discussed upcoming topics for the next DRAC meeting on June 20 (which is also Rob Pratt's birthday.)

She ended the meeting at 3:30 pm.

#### **Attendees on Site**

Suzanne Frew	Snohomish PUD
Hossein Haeri	Cadmus Group
Lee Hall	BPA
Tom Brim	BPA
Adam Schultz	Oregon Department of Energy
Tomás Morrissey	PNUCC
Larry Voos	North Pacific (NORPAC) Paper
John Steigers	Energy Northwest
Rob Pratt	PNNL
Riley Peck	ICNU
Karen Horkitz	Cadmus Group
David Nightingale	WA UTC
Tony Usibelli	WA Dept of Commerce
Fred Heutte	NW Energy Coalition
Jason Salmi-Klotz	PGE
Bill Henry	EQL
Ahlmahz Negash	Tacoma Power
Tina Jayaweera	NWPCC

#### **Attendees via Go-to-Meeting**

Greg Brownell	EWEB
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Carl Linvill	RAP
David Lowrey	Itron
Elaine Markham	PSU
Elizabeth Osborne	NWPCC
Frank Brown	BPA
James Gall	Avista
Joel Swisher	Western Washington University
John Ollis	NWPCC
Nathan Kelly	BPA
Kyla Maki	Montana
Megan Stratman	NRU-NW
Chuck Murray	WA Dept of Commerce
Quentin Nesbitt	Idaho
Paul Notti	Itron
Elaine Prause	Oregon PUC
Will Price	EWEB
Tom Eckhart	UCONS
Tyler Rogers	EnergyHub
Zeecha Van Hoose	Clark PUD
Jim Lazar	RAP