Northwest Power and Conservation Council
Resource Adequacy/Demand Forecast Advisory Committee Meeting
November 1, 2016

Massoud Jourabchi, NPCC, began the meeting at 10:00 am and called for introductions. He explained what the DFAC is and how information generated by the group is used by the RAAC. John Fazio, NPCC, explained the RAAC's responsibilities, showing typical output from the GENESYS model and how the Loss of Load Probability (LOLP) is calculated.

Scope of the Long-Term Model

Tomas Morrissey, PNUCC, asked if energy efficiency shaping is hourly and if so, is it just split into heavy and light-load blocks. Jourabchi explained that one input is hourly shapes for end-use. He further stated that those shapes are mapped against the system load shape producing three points of information per month: end-use contributions to system peak, average and minimum load.

Tom Haymaker, Clark PUD, asked where codes and standards fit in the process. Jourabchi moved back to the Price Effect Forecast, explaining that these are economic as opposed to purely engineering assessments. He stated that the model calculates the efficiency the consumers would choose, compares that with standards and picks the higher number. Jourabchi said that this topic will be discussed further later in the day.

Will Price, EWEB, noted that utilities look at different rate structures and speculated that if one went with a residential demand structure it might drive efficiency and a price signal that would change the trajectory of the load shape. He asked how this would be dealt with. Jourabchi answered that the tool can work with a different pricing structure but on a regional level. Price asked if other structures should be considered. Jourabchi answered that it is being discussed internally but it hasn't been explicitly modeled.

Terry Morlan, Independent, stated that any effect this kind of price structure will have on demand is not yet clear. Price noted that better granularity would help drive a regional conversation. Jourabchi agreed.

Villamor Gamponia, Puget Sound Energy, asked about price elasticity's effect on the models. Jourabchi answered that elasticity is not explicitly modeled but back calculations to estimate the effects of different fuel prices produces an intuitive range for elasticity. Morlan explained problems encountered with early modeling attempts to calculate elasticity properly, short-term, long-term.

Scope of the Short-Term Model (Daily and Hourly)

James Adcock, NW Energy Coalition, objected to Jourabchi's statement that projections are not based on historic weather data, be it 20 or 80 years. He also noted that "weather modeling" is called "climate modeling" in the weather community. Jourabchi thanked him and stated that the Council doesn't forecast weather but uses past regional weather patterns.

Morrissey noted that the model uses information up to 2015 but GENESYS only goes to 2005. Jourabchi stated that Fazio synchronizes wind with temperature (load) and there is no synthetic wind data beyond 2005. Jourabchi noted that he has generated data for 2006 through 2015. Fazio explained that he stops his analyses at 2005 to capture the correlation between Gorge wind generation and temperature at the load sites, which can increase the LOLP by a percent or so.

Cam LeHouillier, Tacoma Power, asked Fazio to further explain the correlation. Fazio said that a negative correlation between wind generation and temperatures at load centers was discovered. Ben Kujala, NWPCC, did the analysis, created the synthetic wind data set and wrote a paper on it when he was working at BPA. **Fazio will send the paper to the group.**

Haymaker asked about post processing the 95/96 loads for DSI. Jourabchi explained the process for creating the temperature and load sides and DSI loads. He spoke to modeling DSI, mentioning the inherent difficulties of confidentiality and shrinking loads.

Tom Potiowsky, PSU-NERC, asked about a "Mt. St. Helens" dummy variable. Jourabchi stated that indicator variables for events like natural gas prices after a hurricane or the DSI crash impact on loads are included.

Overview of Analytical Steps in the STM

Price asked if historic weather data is modeled daily or stochastically. Jourabchi explained the process, calling it deterministic. Fazio stated that Resource Adequacy work using an hourly regression can only use data from 1995 forward because prior to 1995, there was no reliable hourly temperature data.

Adcock stated that weather variances are less of a concern than the changing likelihood of extreme temperature events in Seattle and Portland, noting that he's seen less extreme cold than in the past. Jourabchi stated that he will show regional findings but agreed that there could be pockets of other behavior. Fazio said that "regional" daily average temperatures, weighted by the loads in Portland, Seattle, Boise and Spokane, are designed to provide a good estimate for the regional load. He said that this approach can easily mask potential localized trends in climate that Adcock has observed.

Gamponia asked about the calibration between the weather normalized load from the STM and the energy from the LTM. Jourabchi explained that energy load forecasts are very close among the Plan, BPA's White Book and PNUCC's NRF summary. He admitted that they are not close for peak loads but called the STM more robust. He concluded by saying the hybrid model uses the weather-normalized energy portion from the LTM and the temperature fluctuations from the STM.

2015 Summer Peak

Morlan called Mean Absolute Percent Error an interesting measure but wondered if it captured a systematic underestimation of peak. Jourabchi said he was comfortable with it. He did note that they are trying to improve the structural equation.

Potiowsky asked if Jourabchi looked at specification errors and other aspects so the models wouldn't compete. Jourabchi said yes and explained that corrections are regularly made to the structural equation. He noted the pressing question: "is there a need to apply the daily model back to 1928 or can we use the hourly model for 1995-2015?"

Gamponia asked which factors contributed to greater accuracy of the hourly model. Jourabchi said using daily temperatures can mask events, as does using

monthly data. **He asked the group for recommendations on daily versus hourly models.**

Price reiterated that the STM is econometric while the LTM is an end-use profile. He asked if you could use the end-use profile in the short term. Jourabchi stated that the LTM uses months not hours which doesn't give enough insight.

Fazio explained that the STM load forecast has always been used to assess adequacy but because in this year the Council was also releasing its Seventh Power Plan, efforts were made to ensure that loads used for resource adequacy were consistent with loads used to develop the power plan. He called the hybrid model a way to marry the best of both the STM and LTM forecasting models, using monthly average weather-normalized loads and weather-normalized peak loads from the LTM (including effects from standards and codes) and adding the hourly temperature effects from the STM.

Morrissey noted that 29,120 MW is a mild peak for the Northwest and asked if the more pronounced peak experienced in 2013 was examined [Slide 14]. Jourabchi stated that he doesn't have a slide for that but said it was one of the warmest winters in the past 88 years. Morrissey stated that the daily model results look higher than hourly model results and asked if Jourabchi looked at more peaks to see which is best. Jourabchi answered that the pattern looked the same for all three years.

Potiowsky wondered how you can look at a daily model for hourly data. Jourabchi explained the process of using allocation factors to adjust a daily model down to hourly data. In other words, he used the average historical hourly load shape to provide the hourly shapes for the daily model.

Morrissey expressed difficulty with accepting that the hourly model does a better job forecasting mild winter peaks [Slide 16]. Fazio explained that the MAPE metric draws on all of the years. Morrissey agreed with this explanation.

Jimmy Lindsay, PGE, asked if the hourly model consistently underestimates peak load. Jourabchi noted that it seems to but at this time we have not explored this from a statistical perspective.

Gamponia asked about the average MAPE for peaks in the hourly model from 2013-15. Jourabchi answered that the winter peak is 1.7% less for hour 18 in 2015. Morlan stated that it should be easy to calculate a Mean Absolute Percent Error instead of an Absolute Error to get a measure. Jim Litchfield, PNUCC consultant, noted that it is on energy and wondered if you could do that for peak. Jourabchi answered yes, if we collect a subsample.

Bud Tracy, Consultant, asked if the source data on [Slide 19] is the same data used to calculate global warming. Jourabchi answered no. Tracy asked how the information parallels global warming. Jourabchi said this will be touched on in the coming slides and noted that analysis changes depending on the time period. Fazio stated that the Power Plan Appendix M has more information.

Adcock noted that average (regional) temperatures and water conditions don't change much but the coldest local winter days on coastal cities (Portland and Seattle) do. He expects to see lower winter peak loads in these areas than in the last 80 years. He said this drives his interest in generation peaking units, winter peak loads and winter versus summer peaks. Morlan stressed that the Council doesn't estimate global climate change but gets it from other sources which might use different data sets.

Jourabchi explained the process of weather normalization for RA analysis [Slide 21].

Adcock reminded the group that climate change isn't a future phenomenon but a continuum from the past, which ties into the 80-year weather record.

Litchfield noted that [Slide 24] doesn't show much summer difference. Jourabchi answered that the standard deviation and variance is changing, but there are no fundamental differences.

Adcock disagreed with the peak load issue, noting that he sees a shift in skewness. He explained that historically extremely cold winter days were less likely to happen on coastal cities and extremely hot summer days are now more likely. Jourabchi moved to [Slide 26] to illustrate his case.

Adcock asked how daily temperature is defined. Jourabchi answered that temperature from four airports, PDX, SEATAC, Boise and Spokane are used and weighted to create a regional daily and hourly temperature. Adcock stated that he sees a larger difference for Seattle. Jourabchi agrees. Fazio noted that this is regional analysis and will mask the effects on individual cities.

Adcock asked if these are daily average temperatures as opposed to coldest/hottest daily temperatures. Jourabchi answered that these are daily averages for the last 88 years.

Gamponia wondered about a number to represent extreme temperature. Jourabchi stated that 80-90 degrees would be a regional summer extreme but it depends on the individual service area. Gamponia asked about the expected return period for extreme weather as it might help define probability of extremes. Fazio explained that the frequency of extreme weather is not changing in our studies. Jourabchi stressed that the frequency of extreme temperatures is less important than the when they hit and how long they persist.

Potiowsky noted that there are many approaches to analyzing this data. Jourabchi agreed. Adcock asked for publication of weather and water data on LOLP events so it can be checked. Fazio stated that the data is available.

Morrissey asked if load factor changes between hourly and daily was looked at for peaks [Slide 30]. Jourabchi answered no. Morrissey stated that it would be good to know as it shapes the GENESYS outcome. Jourabchi summarized it by saying load factors are increasing during off peak. Morrissey expressed interest in looking at this data as it may lead to different solutions. Jourabchi agreed, but noted that difficulty comes from the non-static impact of temperature.

Potiowsky moved to [Slide 29] and said that back-of-the-envelope calculations show 30% of incidents are from the last 20 years while 14% are from the last 60 years. Jourabchi agreed, but stressed that he finds no clear pattern.

Amber Riter, PGE, asked if Jourabchi used the full time period when adapting the daily model to the hourly and created the allocation factors. Jourabchi answered yes and explained the process. Fazio noted that plotting the hourly loads from the daily model creates parallel lines because in each case the same hourly load

shaping factors are used. He noted that this phenomenon should not occur when using the hourly model.

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Treatment of Efficiency

Tracy asked if [Slide 37] represents dollars or units of conservation. Jourabchi answered that they are average MW. Tracy asked what that number is based on. Jourabchi explained that they are from utility reports, NEEA and codes and standards.

LeHouillier asked about year-to-year declines. Jourabchi stated that different conservation, recession and unregulated markets create an un-smooth pattern. LeHouillier asked specifically about the large drop in 1996-1997. Charlie Grist, NPCC, noted that these are incremental year-over-year numbers and that year had an unusual retail environment.

Morlan asked for clarity on the viewing of conservation achievement data. Jourabchi explained that codes and standards are known, and a new baseline with frozen efficiency comes with each Plan, which informs targets. Jourabchi notes that the market can come in above the targets. Morlan said he still had trouble understanding how consumer choices interact with programs and codes. Jourabchi stated that the STM does not express consumer choice. Grist further explained that tracked conservation doesn't include what the market had done absent of programs.

Gamponia asked if [Slide 38] the phenomenon of markets responding to stimuli should have been observed in the past. Jourabchi answered yes, and pointed to embedded conservation through 2008. Grist stated that this is a methodological issue of the STM and conservation targets. He called the 2015-16 adjustment due solely to the adjustment to the forecast baseline load.

Morlan said we have to see how it will be applied but assumed that the STM influences the Adequacy Analysis so the 2018-21 matters.

Morrissey asked if the 7th Plan was delayed until 2018 and there were no new targets would 637 aMW still be added or is it an artifact from changing the

baseline. Jourabchi answered that new conditions would warrant drawing a new baseline with different targeted conservation. Morrissey moved to [Slide 39] noting that embedded conservation looked close to estimated actual. Jourabchi stated that they are looking at 2022, explaining that this method avoids double counting.

Grist stated that without a Seventh Plan the Incremental Estimated Actual would continue down. Jourabchi noted that the Sixth and Seventh Plans are neck-and-neck. Morrissey asked why 637 aMW of load is added on [Slide 40]. Jourabchi explained it's a way to incorporate conservation. Morrissey asked why 2352 wasn't used. Jourabchi said this is the embedded amount that is already netted out.

Fazio clarified asking if Morrissey was wondering why we don't use the STM output directly. Fazio explained that the RAAC wanted to see the target conservation from the plan and not the embedded amount in the loads.

Morrissey said the modeling makes the load higher because the baseline goes down. Jourabchi asked if Morrissey means the structural equation suggests more conservation is happening than the target. Jourabchi didn't disagree, but said the old approach pushes the load.

Lindsay expressed concern that the estimated conservation structural equation doesn't include the supply curve information. He then wondered if future employment makes sense for the supply curve. Jourabchi agreed but pointed to all of the factors that influence the counterfactual. He noted that the baseline change introduced an anomaly of raised loads.

Morrissey asked if the hybrid model changed from last year to the 2016 Resource Adequacy Assessment [Slide 42]. Jourabchi said the methodology is the same but the structural equations vary from year to year.

Fazio asked if the temperature is applied to the sales load in the hybrid approach. Jourabchi answered yes. Gamponia asked what was used for 1928-95 hourly profiles. Jourabchi answered that the daily model has a daily forecast and allocation factors are extracted from the hourly model.

Morlan asked about the role of econometrically-estimated load in the Hybrid approach. Jourabchi answered that it supplies the temperature effects.

Gamponia asked if the LTM gives you the variation caused by economic growth. Jourabchi answered yes, and more information will be presented.

Grist voiced support for expressing uncertainty in loads and conservation in Adequacy Assessments.

Morlan agreed that the Hybrid approach is more suitable but not stable, as it consistently uses the best information we have. Gamponia agreed and asked if there is a correlation between temperature draw and targeted savings. Jourabchi stated the embedded method reflects more savings in extreme weather and some of that is retained thanks to shapes they are using.

Gamponia expressed a need for weather-sensitive savings. Grist agreed, and said it speaks to the need for end-use load shape research. Jourabchi agreed with the need for better conservation load shapes.

Morrissey called for more information on and examples of embedded and hybrid shapes. He noted that applying the Hybrid approach to last year's assessment did not give representative shapes for the region historically or represent the energy efficiency trends found in the Seventh Plan. Because of this, he is hesitant to agree that the Hybrid approach is better.

Jourabchi reminded Morrissey that it is difficult to apply the Hybrid approach's load forecast historically. Morrissey countered that you also wouldn't expect loads to be peakier but it was. Jourabchi stated that models are not static and noted that he has a paper that examines three time periods where the structural equation has changed. Morrissey agreed that it could be a shape issue.

Morlan referenced high economic growth [Slide 50] noting that a recession results in fewer appliances bought which slows efficiency improvement.

Gamponia asked if the low end of the economic driver is from low employment. Jourabchi answered that it's a mix of homes, square feet of commercial buildings, industrial output and others. Gamponia asked if these numbers were judgments

or come from Moody's or Global Insight data. Jourabchi stated that they start with data from Global Insight and run it through the DFAC. He said state economists have their own forecasts as well, which are reviewed in the development of LTM economic assumptions.

Lindsay moved back to [Slide 48] saying the methodological change would lower the 2022 winter peak load by 3000 MW. He called the change substantial.

Adcock stated that utility modeling turns into actual build and called for a "sanity check" about regional imports and exports from the California interchange. He noted that cold winter days historically mean more California imports and if we continue doing the right job in modeling and building peak capacity, imports would stay the same over time. He notes that California imports have gone away which supports his theory that we are overbuilding.

Adcock then called Mid-C market prices another "sanity check." He stated that periods that are peak capacity short see volatile Mid-C prices but we have unusually low or stable prices which again points to overbuilding peak capacity.

Haymaker asked about the timeframe Adcock used to look at Mid-C prices. Adcock answered that he looked at publicly available data from the last few years. Haymaker pointed to cold weather events in December 2013 and February 2014 where Mid-C prices were volatile.

Adcock stated that his main concern was speculatively building peak capacity in advance of coal plant closures.

Grist explored the possibility of a link between hybrid model on its peak prediction capability and overall reduction in total peak, noting that there hasn't been enough recent peak weather to fully gauge the situation. Haymaker pointed to December 2013 and February 2014 as examples of recent peak weather. He wasn't sure about absolute peaks but stated that Clark PUD's system peak was in 2009 and the cold events in 13 and 14 had similar peaks. Haymaker concluded by saying Clark didn't see much growth or decrease.

Potiowsky asked which forecasting mistake is more damaging when comparing the two models. Jourabchi answered peak. Fazio stated he sees a mix of energy

and peak needs, explaining that peak doesn't mean a single hour but a curtailment spread over many hours. He noted that 30-40% endure for 16-18 hours.

Morrissey asked if the green line [Slide 48] is equivalent to last year. Fazio answered no, every model is different and can't be compared, but hourly shapes are being looked at side by side. Morrissey stated that there can be big LOLP differences based on loads and they tend to bounce around a lot. He suggested further discussion in the RAAC technical advisory committee.

Jourabchi explained that as long as the structure is being updated it will be hard to compare years. Morrissey said it's always a good idea to test as there's a new model and load forecast every year. He suggested running this year's load on last year's model and so on for better clarity.

Fazio pointed to earlier discussion on 2021 where medium loads led to an LOLP of 10%. He explained with caveats that the hourly hybrid matches peaks better and better incorporates energy efficiency. He stated that the embedded, 3% daily model yields an LOLP of 8.3% for 2021 while the hourly shows 5.8%. He stated that the hybrid models showed less than 1% LOLP. Morrissey suggested that this reduces the validity of the Research Adequacy process when the LOLP bounces around.

Fazio admitted to being puzzled by the findings but stated that last year's assessment showed that 2021 would have a 10% LOLP and a need for about 1000 MW of new capacity. He noted that the RAAC and most utilities agreed with the findings.

Morlan stated that this stresses the need to talk about addressing uncertainty in modeling, data, weather and peaks. Fazio pointed to looking at other adequacy metrics, such as the conditional value at risk for peak, noting that it provides a less "lumpy" result than the LOLP. He stated that LOLP is too narrow a metric to assess Adequacy in the detail that we need.

Adcock wondered why the industry wants to replace coal with peakers instead of combined cycle. Adcock noted he hasn't heard any information about the

changing operations of the BPA system as we change baseload versus peak, wind and solar.

Haymaker stated that the BPA doesn't have the ability to change operations to shape for power requirements. He characterized them as running at full-tilt to optimize and can't do anything additional until non-power constraints like flood control, water management and fish flows are relaxed. Adcock stated that there is discussion on more Banks Lake pump storage and batteries.

Lindsay moved to [Slide 38] and asked if (bullet 3) the drop in 2016-2025 change in the Power Plan baseline is an assumption or is demonstrated. Jourabchi stated that the same analysis for the Sixth Plan showed similar lines. He attributed the change in baseline to codes and standards. Lindsay asked if a structural equation for the blue line, that didn't have employment, would it do a good job reflecting the historical period. Jourabchi stated that this structure explains 93% of the load variation and the drop is due to the 7th plan base line for energy efficiency targets.

Morrissey suggested a structural equation without the 3% adjustment as a third option for energy efficiency. Jourabchi stated that would be double counting which equals about 600 MW. Morrissey stated the 600 MW is an artifact of the changing baseline [Slide 39] and one could assume that the closeness of the equation would continue for the next five years.

Jourabchi stated that these numbers are incremental. Morrissey stated that the drop is not real. Jourabchi agreed saying it's an artifact of the approach.

Potiowsky stated that it seems like an index problem. Gamponia pointed to the coefficients of the short-term equations having the impacts of conservation already embedded in them and the constants or parameters being estimated already reflect it. Gamponia suggested including this in the estimation of the STM and parse out the impacts of employment. Jourabchi offered to further discuss it offline but stated his preferred method would be to subject an hourly forecast to uncertainty. Gamponia agreed.

Morrissey stated that it was never explained that accounting for the Seventh Plan targets would raise loads. Fazio stated that the difference was small, within 20-30 MW in the past and the real issue is explicitly handling codes and standards.

Grist explained that over 40 federal standards were adopted in the last five years. Haymaker said this assumes rollover and products may become so expensive that people don't replace them. Grist answered that this is America and people replace things.

Morlan asked if limiting loads to 1995-2015 loses any extreme situations. Fazio stated that 1932 and 1950 had extreme cases. Jourabchi suggested explicitly representing those years and adding them in. Morlan felt that would give too much weight to the extreme.

Adcock stated that due to climate change extreme winter events are going away.

Popoff asked if using 1995 to 2015 creates issues if you use different hydro conditions. Fazio answered no and explained the phenomenon.

Gamponia asked Jourabchi if he's seen the hourly temperature from Sea-Tac Airport. Fazio reminded him that we need all four airports.

Fazio explained that his group is gearing up for the next Adequacy Assessment which is due in May 2017 and he is looking for some decisions on load by January 2017. He suggested summarizing today's meeting and gathering again to share ideas.

Morlan stated that the Hybrid approach makes sense as does using the range of economic drivers in the LTM consistently. Jourabchi recommended using the -10%/+7% error bounds on the structural equations with the underlying economic variations.

Morlan noted that for the first five Plans the load forecast range was designed to have a 95/5 range. He wondered what the objective is for the range of probability to cover an Adequacy Assessment.

PNUCC Load Forecasting Workshops
Tomas Morrissey, PNUCC

Gamponia stated that exclusively using an econometric approach accounts for energy efficiency differently than a bottom-up, end-use load forecasting approach. He stated that PSE uses an econometrics approach that is similar to the STM. He wonders if there is a missing variable that under or overstates the estimating coefficients. Because of this he voiced support for the Hybrid approach.

Fazio asked if PSE reports their conservation savings. Gamponia answered yes saying what we report and what we achieve are two different things. Fazio asked if cost effective evaluations are independent of load. Gamponia added that most savings are coming from lighting which may or may not be weather sensitive.

Morlan referenced [Slide 3] asking if it represents economic growth or the end of conservation programs. Gamponia answered that it's ramping up conservation.

Grist stated that PSE is doing advanced adoption of efficiency targets which probably dampens the forecast. Grist then stated that utilities will give a different answer to PNUCC than to the Council for many reasons. He suggested there would be a benefit to creating common definitions. Morrissey agreed that there is a drive to do a better job at uniting terminologies.

Tracy stated that answers we get are absolutely biased by who answers the question and you will get a different answer from a conservation professional than someone in management. Tracy commended Grist for making this important point.

Potiowsky wondered about the pros and cons of using an artificial neural network approach. Jourabchi pointed to Michael Starrett, NPCC, who has been working on machine learning.

Tracy stated that he didn't hear anything about hourly usage and time zones. Jourabchi answered that adjustments are made for daylight savings and time zones.

Fazio thanked the group for their participation. He noted the next RAAC meeting is scheduled for December 8 and asked for questions and comments to be sent to

him and/or Jourabchi. Fazio stated that a summary of today's discussion and a possible poll for next steps will be posted or sent out.

Grist asked why the RAAC chose to explicitly treat conservation. Fazio said that resource criteria changed over the years and the targets in the Power Plan mirror the criteria of "sited and licensed."

Morrissey felt that the issue of rising loads was not raised with incorporating targets. Rob Diffely, BPA, noted that messaging played a role in the choice.

Jourabchi stated that a white paper about the forecasting methodology along with background will be sent with today's minutes.

Morrissey expressed a desire to get a better idea on how load shapes are changing in the model. Fazio stated that he will send the shapes to Morrissey. Jourabchi stated that if the group found joint meetings like this helpful there could be more of them.

Jourabchi closed the meeting at 3.

Attendees on Site

Massoud Jourabchi	NPCC
John Fazio	NPCC
Tom Haymaker	Clark Public Utilities
Bud Tracy	Non-affiliated Consultant
Will Price	EWEB
Adam Schultz	ODOE
Rob Diffely	BPA
Ryan Egerdahl	BPA
Steven Simmons	NPCC
Tomas Morrissey	PNUCC
Terry Morlan	Independent
Patricia Byrne	BPA
Jimmy Lindsay	PGE
Tom Potiowsky	PSU-NERC

Amber Riter	PGE
Jim Litchfield	PNUCC (Consultant)
Villamor Gamponia	Puget Sound Energy
Phillip Popoff	Puget Sound Energy
Pete Eelkema	BPA
Michael Starrett	NPCC

Attendees via Webinar

Adam Rue	EWEB
Allison Campbell	Redwood Energy
Ben Kujala	NPCC
Bret Bertolin	WA ERFC
Glen Booth	BPA
Brian Dekiep	NPCC
Frank Brown	BPA
Carsten Croff	SCL
Cindy Wright	SCL
Grant Forsyth	Avista Corp.
James Adcock	NW Energy Coalition
James Gall	Avista Corp.
John Ollis	NPCC
John Rudolph	SCL
Jordan Prassinos	Idaho Power
Becky Keating	
Kevin Smit	NPCC
Michael Deen	Public Power Council
Ahlmahz Negash	Clean Energy Institute
Patrick Watson	
Rich Arneson	Tacoma Power
Saul Villarreal	SCL
Scott Levy	
Barr Smith	Idaho Power
Bradford Snow	
Zac Yanez	Puget Sound Energy
Cam LeHouillier	Tacoma Power

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