Northwest Power and Conservation Council
Conservation Resources Advisory Committee
May 16, 2019

Massoud Jourabchi, NWPCC, began the meeting at 9:30 with introductions.

GCM Selection Criteria and Impacts of Climate Change
Tomás Morrissey, PNUCC, said the CamESM2 shows the highest summer warming on [Slide 3] but [Slide 5 & 6] show summer peak events in the mid to lower range. Jourabchi agreed that he thought this model would have the highest peak effects but found that the timing of cooling degree day requirements becomes important. Jourabchi added that precipitation is also important and he is waiting for more flow information until he ranks the GCMs.

Trends in Extreme Temperatures and Events from Historical Period to 2030s
Dan Hua, NWPCC
Rachel Clark, Tacoma Power, asked what drives the acceleration of the trends found on [Total Number of Days with Extreme Temperatures by Year.] Jourabchi said these models find that over time the amount of energy increases causing the bigger swings. Clark asked if it comes from the assumptions around carbon emissions. Jourabchi said most GCMs see an increase in temperature over time but didn't know what caused that.

Jordan Prassinos, Idaho Power, said he lives in Boise and noticed an increase in extreme events in the 90s, which coincided with development. He theorized that a heat island effect, which may be more pronounced in the high desert, might be responsible. Fred Heutte, NW Energy Coalition, pointed to literature about heat island effects and suggested exploring this with experts.

Indirect effects of Climate Change
Massoud Jourabchi, NWPCC
Terry Morlan, Independent, asked if variation from the average is greater in the forecast year than in the historical record [Slide 20.] Jourabchi referenced Hua's presentation that showed that variations do increase in the forecast period.

Morlan asked how heat pumps fit into the picture [Slide 26.] Jourabchi said that technology allows existing homes to get air conditioning while most new homes are built with installed AC.

Heutte voiced confidence in the RBSA but admitted that it induces saturation effects when used to project trends [Slide 27.] Jourabchi agreed that geography, other site specifications and income issues might prevent 100% AC saturation. Morrissey agreed that 100% is too total but felt that the CDD equation slide [Slide 24] seemed too gradual. Heutte thought that picking the first and using the second as a sensitivity made sense. He then wondered if the Puget Sound would see a big upsurge in AC at some critical level.

Morlan asked why capital income is expected to go down because of in migration [Slide 46.] He asked if the increase in multifamily housing an economically-driven adaptive strategy. Jourabchi called the move to multifamily housing an indirect effect based on shifts in land use patterns. Morlan asked what will drive that approach. Jourabchi pointed to anecdotal evidence in Portland which allows single-family-zoned plots to be used for multifamily.

Morlan asked if the survey can be retaken [Slide 49.] Jourabchi answered yes.

Morlan called [Slide 51] counterintuitive. Jourabchi offered to send him information and wait for comments.

Morlan asked if [Slide 53] requires maintaining consistency with population and employment in aggregate. Jourabchi said this represents the rising tide will lift all boats effect topped with these changes. Jourabchi agreed that some professional judgment is needed but insisted that he can't put in a zero effect.

Morlan asked about effects on the fish side [Slide 55.] Jourabchi noted that salmon may no longer spawn in the Columbia so it might not make sense to remove the Lower Snake River dam. He noted that the question about reducing fishery and seafood processing output is in the survey.

Discussion

Morrissey voiced concern about using a 10% value based off of a single study and asked if there were more population increase projections that could be used to create a range. He noted that Texas and Florida were two of the fastest growing states and there are other trends besides temperature that pull people into locations. Jourabchi agreed that much of what he has shown is qualitative, but said other studies show a similar pattern. He asked for other studies for quantifying results.

Morrissey pointed to other baked-in assumptions, like housing demographics, that he is not fully confident in. Jourabchi thanked him for raising the issue and urged him to fill out the survey. Morrissey suggested that a sensitivity analysis would help quantify the impact.

Morlan agreed that a sensitivity would be helpful. He then asked if the Council required staff to do this work. Jourabchi said staff brought this to the Council's attention and got their approval to proceed. Jourabchi pointed to two studies he used to get to 10% that found that the NW will fare better than the South and Midwest. He called for more data, insights and reports noting that nothing is written is stone but re-iterating that he can't put in zero.

Someone from BPA asked when responses are due. Jourabchi said mid-June is ok as staff is waiting for hydro generation information.

Heutte called the presentation good as it highlights the interconnected nature of the issues. He noted that technology may help agriculture adapt or even improve. Heutte then said, based on [Slide 62] we're all living in Amazon's world whether we like it or not.

Jourabchi agreed that there are many trends that haven't been touched on and forecasts are always wrong. He was concerned about the different effects Climate Change will have on IOUs and Public utilities particularly if that utility is reliant on one industry.

Jourabchi ended the meeting at 11:30.

Attendees

Terry Morlan	Independent
Steve Simmons	NWPCC
Daniel Hua	NWPCC
Massoud Jourabchi	NWPCC

Attendees via Webinar

Aaron	NEEA
Amber Riter	PGN
Andrea Goodwin	NWPCC
Brian Booth	Snohomish PUD
Glen Booth	BPA
Bradley Cebulko	WA UTC
Daniel Avery	ODOE
David Rupp	OSU
Peter Eelkema	BPA
Elizabeth Osborne	NWPCC
Grant Forsyth	Avista
Fred Heutte	NW Energy Coalition
Mike Hopkins	FortisBC
Allison Jacobs	PSE
John Lyons	Avista
Jordan Prassinos	Idaho Power
Alisa Kaseweter	BPA
Ken Ross	ForisBC
Leann Bleakney	NWPCC
Lesley Jatarasami	Oregon
Mike Psaris-Weis	NEEA
Lorin Molander	
Phillip Popoff	PSE
Marah McCue	Chelan PUD
Rachel Clark	Tacoma Power
Andrew Rector	WA UTC
Rich Arneson	Tacoma Power

Rich Flanigan	Grant PUD
Brian Robertson	CNGC
Ryann Tobosa	Tacoma Power
Robert Schuster	ForticBC
Shirley Lindstrom	NWPCC
Ted Light	EES Consulting
Teresa Hagins	NW Pipeline
Tomás Morrissey	PNUCC
Zeecha Van Hoose	Clark PUD
Brian Dekiep	NWPCC

Additional material after the meeting.
During the meeting there were a few questions that needed response from David Rupp. He had mechanical difficulties and could not respond at the time. Subsequent to the meeting he provided the following responses.

DFAC Climate Change Impact Assessment Webinar, May 16, 2019

David Rupp

Below I have paraphrased and responded to questions/comments from the first part of the webinar regarding the effect of climate change on peak loads and extreme temperatures.

1. In Slide 5, why does CanESM2 show the (second) lowest peak loads in summer by 2040-2049 but the highest increase in summer temperatures?

Reply: I see that Slide 5 also has GFDL-ESM2M and INMCM4 showing the some of the highest peak loads, yet these 2 models project the least amount of warming of the group of models.

Massoud gave an answer that I understood to be related to the timing of temperature used to compute the cooling degree days, though admit I still find this result to be counterintuitive. With CanESM2 being the warmest model in all season, why would the cooling degree days not be highest?

An illustration could be very helpful here.

[the following text was added by Massoud in response to David's concern.

David,

As for your comment regarding the CanESM2 being the hottest temperature but not having the highest load.

The loads for each scenario are created by going from the four sites daily temperatures we go to four states temperatures.

We then calculate CDD for each day. Then aggregate each state's CDD from daily to Monthly values. This is done for each year.

These monthly values for each year is then provided to our long-term model.

The Long-term model makes the forecast for energy by month.

Then we have contribution to system peak for each enduse applied to monthly energy for each enduse.

It is from these contribution to peaks by enduse and month that we calculate peak for each enduse.

We then sum all these up to get to regional peak by month. So you see there are a lot of calculations between temperature projections and peak loads]

Back to additional comments from David.

2. What causes acceleration in decrease of days < 32 F from historical to future periods in Slide 11?

Reply: The acceleration in the rate of decrease is mainly due to the acceleration in the rate of increase in greenhouse gas concentrations over time assumed by the greenhouse gas emissions scenarios.

The rate of decrease is also affected by the shape of seasonal cycle of temperature. For example, sketch a hypothetical seasonal cycle of temperature and draw a horizontal line at 32 F. Where the 32 F line first occurs will affect how the number of days below 32 F changes as you shift the entire temperature cycle upward by 1, 2, 3, etc. degrees F.

3. Do the modeled temperatures in Slide 11 include the heat island effect?

Reply: No, not explicitly. The global climate models are run at too coarse of a spatial resolution to include the urban heat island effect for Boise. This is something to consider when comparing model output to observed temperatures.

However, the modeled data shown in Slide 11 have been bias-corrected to be statistically consistent with a gridded temperature dataset (Livneh et al. 2013, or L13 for short). L13 was derived from observations of minimum and maximum daily temperature from National Climatic Data Center (NCDC) Cooperative Observer (COOP) stations across the conterminous United States (DSI-3200). I was not able to find which exact stations in/around Boise were used from reading the paper.

If a Boise station with a significant urban heat island effect was used in L13, then the urban heat island effect would have been introduced during the bias-correction step, but the timing of the heat island effect would not. In other words, the increasing heat island effect from the 1990s to today would not be present as an increasing effect in the modeled data. Moreover, any

strengthening of the heat island effect as Boise grows in the future is not including the modeled temperature projections.

It is worth having a conversation about how the urban heat island effect may affect warming and cooling degree days in Boise and other cities in the region.

References

Livneh, B., Rosenberg, E. A., Lin, C., Nijssen, B., Mishra, V., Andreadis, K. M., ... & Lettenmaier, D. P. (2013). A long-term hydrologically based dataset of land surface fluxes and states for the conterminous United States: Update and extensions. Journal of Climate, 26(23), 9384-9392.