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Bringing the *Power* of good ideas *Together*.

Memorandum

To: **John Fazio and the Resource Adequacy Advisory Committee**

From: **Tomás Morrissey**

Date: **February 9, 2015**

Subject: **Loads used in the 2020/2021 Adequacy Studies**

PNUCC has taken a look at the forecasted loads being used in the 2020 and 2021 Resource Adequacy Advisory Committee studies. The attached slides include charts and figures that compare calendar year 2020 in the forecast to historical data and to the PNUCC Northwest Regional Forecast. Below are a few key observations and thoughts.

Key observations:

- Monthly energy loads look reasonable in magnitude and shape
- Average winter peak loads look similar to the average winter peak loads in the Northwest Regional Forecast
- Extreme winter peak loads look high in comparison to historical winter peaks
- Summer peak loads look low in comparison to historical summer peaks and the Northwest Regional Forecast

Thoughts:

Predicting peak one hour loads is, in many ways, an exercise in careful guessing. For power planning purposes, it may be safer to guess on the high side. Still, there are winter peak loads in the RAAC forecast that are growing more rapidly than expected.

The highest one hour winter peak load in the forecast is 42,120 MW. This is linked to historic temperature data that produced a winter peak of 35,316 MW in December 2009. The difference between the two values is 6,804 MW and represents an annual growth rate of 1.6%. This is notably higher than the average annual energy growth rate used in the forecast of around 0.5%.

Although it is impossible to say what the highest one hour load in 2020 could be, the current forecasted value seems high. Perhaps the RAAC would benefit from a discussion of how much higher winter extreme peak loads tend to be than average peak loads.

Forecasted summer peaks look low, especially when compared to winter peaks. In the forecast the highest summer one hour load is temperature linked to July 2009 and is 28,665 MW. Looking at historical data, the actual one hour peak in 2009 was 28,728 MW, 63 MW higher than the forecasted peak. Moreover, looking at data from 2007 to 2013, the summer peaks used in the forecast are lower than the historical peaks (except 2010) they share a temperature link with.

Part of the why the summer peaks are low could be due to the construction of the load forecast. The RAAC forecast is built off a historical temperature dataset starting in year 1928. Going forward, due to changing long term climate patterns, this may not be the best approach. Still, beyond temperature dataset issues, the lack summer peak growth in the forecast is puzzling.

The load forecast is a critical component in the adequacy analysis. Looking at preliminary data it seems that the new load forecast is the key driver in having a lower loss-of-load probability in 2020 than 2019. Going forward, it could benefit the analysis to incorporate, or perform a sensitivity of, higher summer loads. The Council will likely be exploring this topic in their 7th Power Plan, but it could be insightful to examine it in the RAAC studies as well.

Loads in Calendar Year 2020

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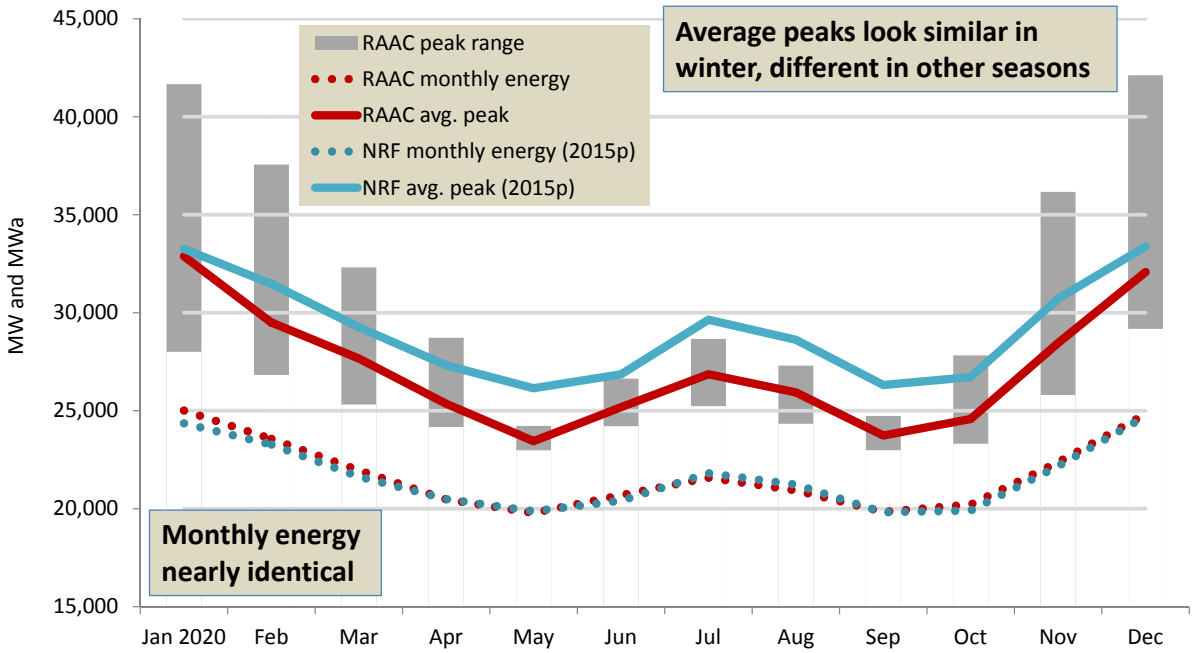
Comparison to Northwest Regional Forecast



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Monthly energy looks ballpark

- Similar monthly shape as Northwest Regional Forecast
- Annual energy growth of just under 0.5% from 2013 to 2020

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Winter extreme peaks seem high

- Looking at actual data the highest winter peak since 2006 has been **35,316 MW.** This occurred in December 2009.
- In forecast highest winter peak is **42,120 MW.** This is made using temperature data from the actual December 2009 event.

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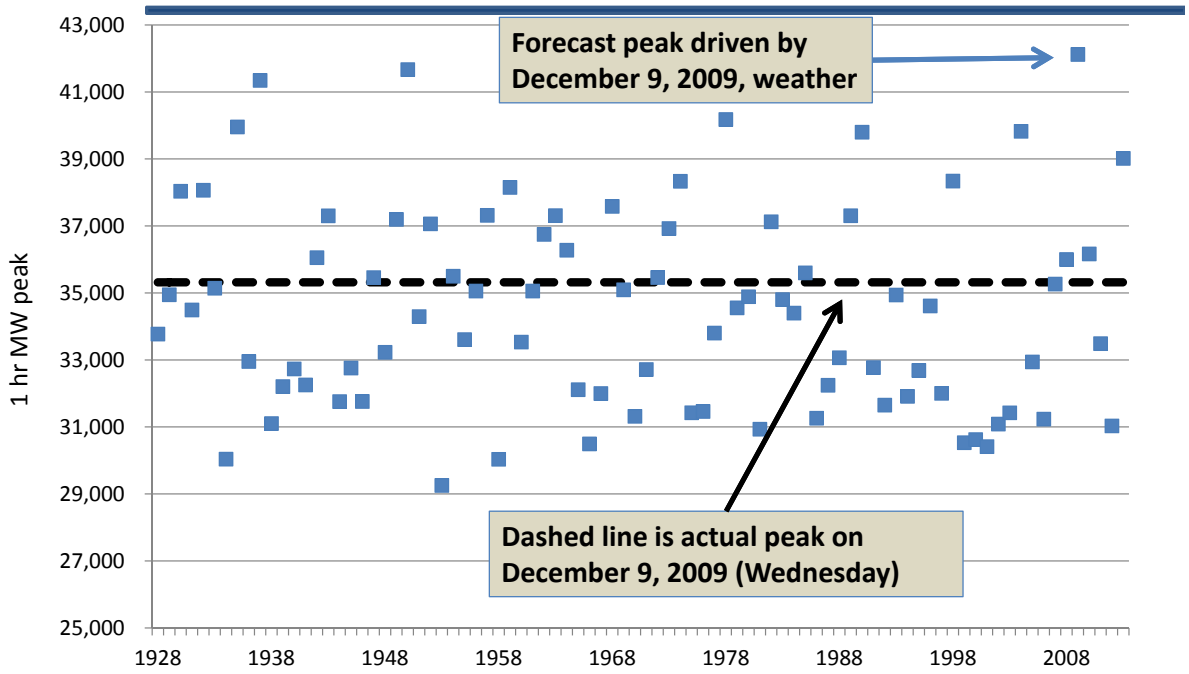
Data from NWPCC

Winter peaks seem high, cont.



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Summer peaks look comparatively low

- Looking at actual data the highest summer peak since 2006 has been **28,728 MW.** This occurred in July 2009.
- In the forecast highest summer peak is **28,665 MW.** This is made using temperature data from the actual July 2009 event.

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Summer defined as Jun – Aug
Data from NWPCC

Summer peaks look low, cont.

- Historical one hour summer peaks tend to be higher than the peaks in the forecast
  - Forecasted peaks are day of week specific. If peak temperature falls on a weekend demand will be lower.

	2007	2008	2009	2010	2011	2012	2013
Historical peak MW	27,521	27,595	**28,728**	27,148	26,737	27,317	28,410
2020 forecast MW	27,119	26,609	28,665	27,189	26,096	26,796	27,024
Delta MW	(402)	(986)	(63)	41	(641)	(521)	(1,386)

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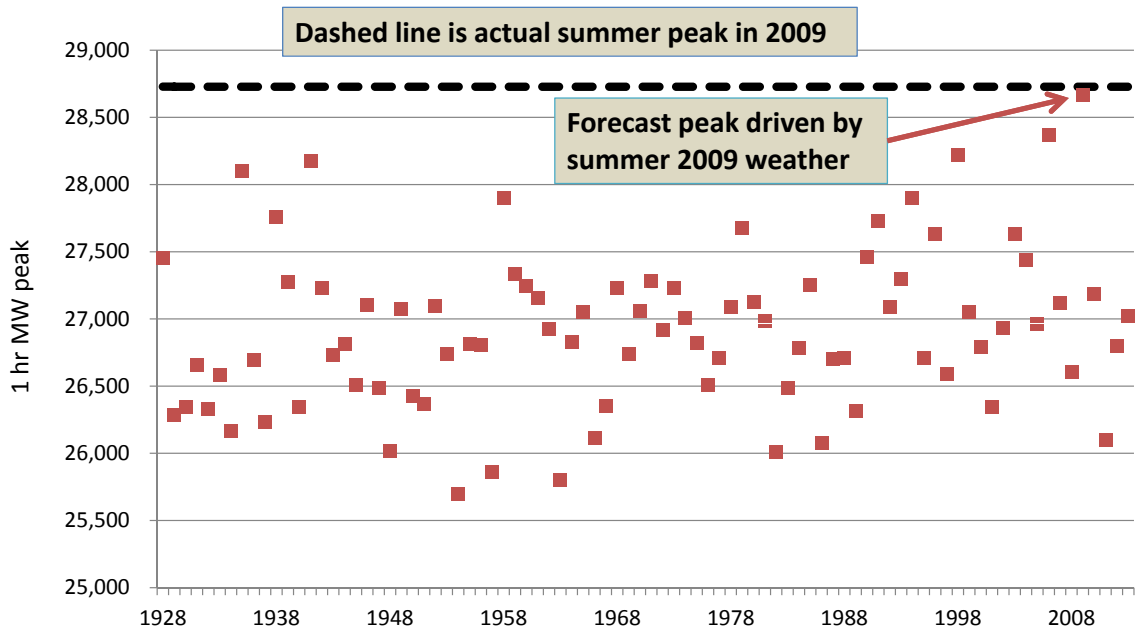
Summer peaks look low, cont.



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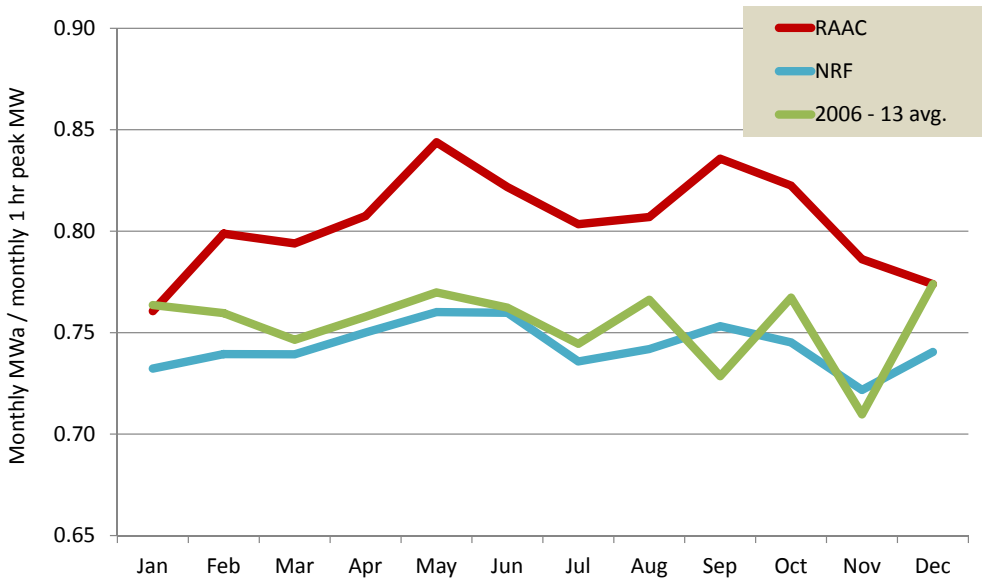
Load factors (monthly energy / monthly peak)



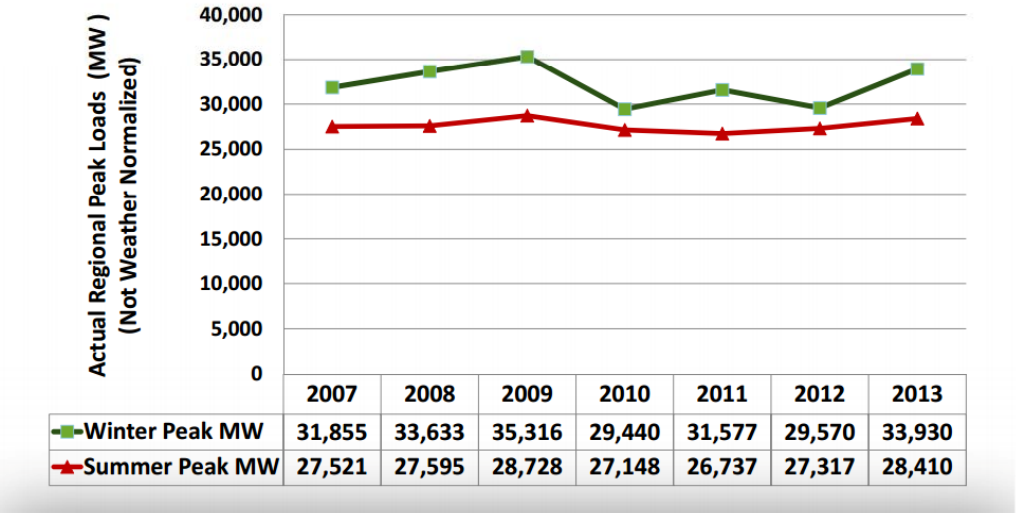
Actual load factor data from FERC. Includes 1/3 of NorthWestern, does not include PACE, **small sample due to data availability**

Observations

- **Extreme winter peaks look somewhat aggressive**
- **Summer peaks look low**
  - Could be *in part* due to use of historic temperature data
    - This could be impacting load shape as well

Extra slide 1

Actual Winter and Summer Peak Loads



	2007	2008	2009	2010	2011	2012	2013
Winter Peak MW	31,855	33,633	35,316	29,440	31,577	29,570	33,930
Summer Peak MW	27,521	27,595	28,728	27,148	26,737	27,317	28,410

From Nov 2014 RAAC presentation