QUESTION

So is there a load model that

1. Has a reasonable standard deviation in peak week (unlike your #50714, which is an outlier in this regard); and
2. Has World peaking in a different week from PJM (peaking in same week greatly overstates risk, due to representing "world" as a single thing, ignoring hourly diversity, etc. etc.); and
3. Has the World pattern such that it allows realizing nearly all of the 3500 MW of potential CBOT (unlike 50703);
4. Is a reasonable fit to CP1, of course.

ANSWER

Please see **Attachment A, LM Selection sheet**. Note that

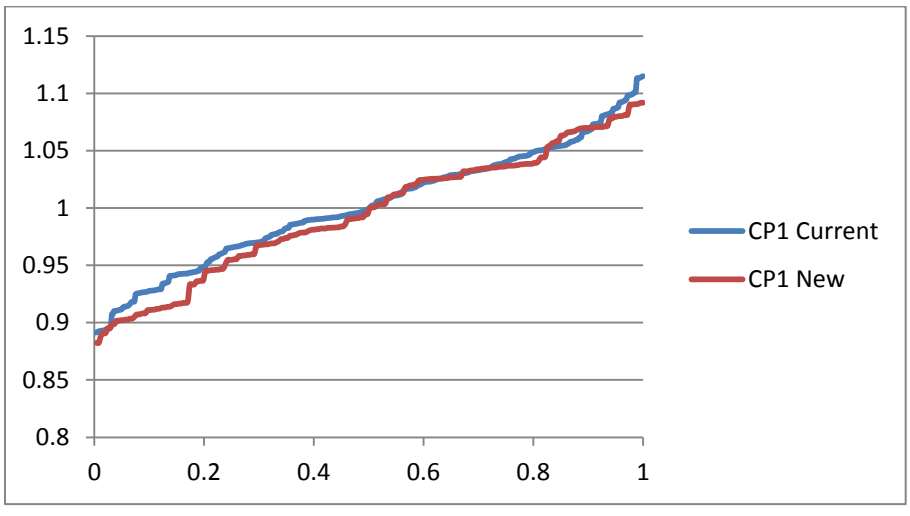
- The selected LM is highlighted in yellow
- There is no perfect correlation between Standard Deviation of the peak week and single area IRM or two-area IRM.
- The Load Model Selection methodology indicates that we should select a load model based on how well it fits the CP1 distribution from the Load Forecast via Approaches 1 and 2.
- We tend to favor Approach 2 since it does not rely on random number generation.

QUESTION

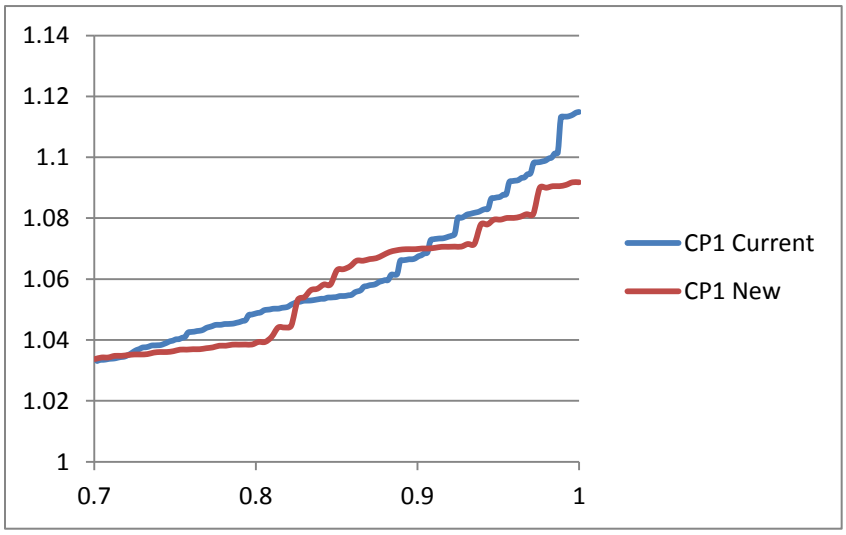
1. Also, are you comparing to CP1 from the old load forecasting model, or the revised methodology? The new methodology has revised weather splines and other changes that could affect the shape, and the fit of load models. If you had been comparing to the old CP1, can you provide a graphic that compares the old and new CP1 distributions, and then shows how the various short list candidate load models compare to the updated CP1.

ANSWER

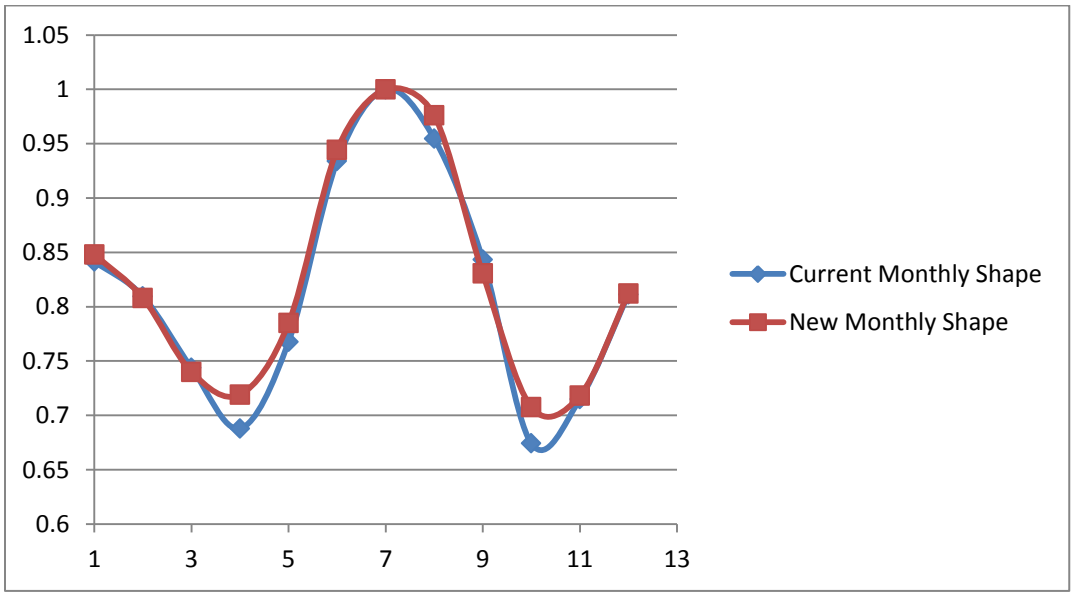
Comparison of CP1 – Entire Distribution



Comparison of CP1 – Top 30th Percentile



The new forecast specification also changes the PJM monthly shape as follows,



We ran the load model selection process using the new forecast specification. The selected load model decreases the single area IRM. However, when we computed the two-area IRM with the selected load model, the result was 16.6%. The explanation for this result is as follows:

- The new CP1 curve is less conservative which decreases the single area IRM.
- The new monthly shape is more conservative (due to a higher August peak as seen in the figure above) which decreases the CBOT (since now PJM needs additional help in August, at the time when the World cannot provide it).

- The overall impact of using the new load forecast specification to calculate the IRM is an increase of 0.1 percentage points with respect to what we have shown to the RAAS and PC.

QUESTION

2. Could you please post the data for the short list candidate load models (mean, s.d. values in Excel).

ANSWER

Please see **Attachment A, LM Shortlist sheet**.

QUESTION

3. Could you do a sensitivity analysis on the IRM/FPR where you remove the CBM constraint.

ANSWER

Addressed in IRM Study, Figure I – 6.

QUESTION

I'd like to check status on a few other PRISM-related issues. I believe these were dropped back in 2010 when we thought we were transitioning to using GE-MARS.

1. It has long been recognized, including in PJM reports and work by PJM's consultants, that using normal distributions in PRISM is not very accurate. In 2009 there was analysis around this, and I had proposed truncating at 2.9 sigma, if I recall that resulted in a better fit to historical data. The 2009 RRS said the work is ongoing, but I don't recall seeing further work. What was the result of that investigation, or what is the status of it? Is a sensitivity analysis showing the truncation results for the current study (sensitivity analysis #10 last year) available yet?

ANSWER

We have made a few IRM runs using the CP discrete distributions from the Load Forecast. The resulting single area IRM is higher than the value computed with PRISM. Therefore, the uncertainty modeled by the PRISM load model selected this year in its current form is still less than the uncertainty modeled by the load forecast.

QUESTION

2. In 2009 I had pointed out that the median of the annual or summer peak distribution represented by PRISM (52 weeks of normal distributions) was not in fact the annual or summer median peak, due to the processing that goes into forming the load model, and how its used (assumption of independence, etc.). This was acknowledged through calculations by PJM staff at one time. At the time I had proposed recognizing this in the IRM calculation, by using the actual median of the load model in the denominator of the IRM calculation. That was rejected, and some rather confusing language was added to the RRS reports (later removed) to justify using the median of Week 10 instead in the calculation. Is this still a characteristic of the load model and IRM calculation, and can you estimate the impact this has on IRM in the current study? Would this perhaps be a good time to fix this?

ANSWER

There is nothing to be fixed regarding this subject. The load model used in PRISM is created by magnitude-ordering the historical loads so that the annual peaks (of the years used to create the load

model) always fall in the peak week assigned by PRISM. Therefore the 50/50 peak (median) that comes out of the load forecast corresponds to the Expected Weekly Maximum of the peak week in PRISM.

Certainly a new "median" can be computed by using the entire magnitude-ordered PLOTS load model. However, this "median" is not the correct median since it is computed under the assumption that the peak can occur at a week other than the peak week, which of course violates the original magnitude-ordering assumption used to construct the load model in the first place.

If the load model is created by calendar-ordering (instead of magnitude ordering), we agree that a fix would be needed.

QUESTION

3. It has long been recognized that the representation of the potential help from adjoining regions is understated in PRISM, and this was a topic of analysis and investigation in 2009. In particular, as I recall, the issues included diversity between weeks of PJM and World peak (addressed by load model selection process to some extent); diversity in the day and hour of peak (not possible in PRISM); and intra-world diversity (also not possible in PRISM really). Constraining assistance to the administrative CBM is also a deviation from the nominal goal of calculating a "one day in ten years" IRM, but apparently this is sacred. This was of course all dropped when we thought we were going to GE-MARS. Remind me, has any of this been changed since 2009?

ANSWER

Nothing has changed in this regard. As discussed back in 2009, PJM believes the representation of adjoining regions in PRISM is accurate when considering the full balance of assumptions used in the study

Just to clarify, PJM did not commit to using MARS in place of PRISM.

QUESTION

Thanks Patricio. Some additional requests based on the posted presentation (for 09/30 RAAS at http://www.pjm.com/~/media/committees-groups/subcommittees/raas/20150930/20150930-2015-irm-study-results.ashx):

Slide 8: can you post the hourly load data for the World subregions that underlies this analysis, as was done in the past.

ANSWER

Please see **Attachment B**

QUESTION

Slide 8: says the load model is best fit to the 2015 load forecast CP1. Can you run the test on that load model with the latest available CP1 with new methodology.

ANSWER

Please see **Attachment A, LM Selection New LF sheet**.

QUESTION

Slide 9 says you used new CP1 to select one different load model. Can you provide the short list of candidates that did well, their fit statistics and the load model mean/s.d. details.

ANSWER
Please see **Attachment A, LM Selection New LF sheet.**

QUESTION
Some follow-up on your responses:

As to August peak and World, I think the main purpose of the 2009 load model selection process was to ensure that we chose one that had PJM and World peaking at different times, mainly because we know the representation of World is conservative and understates assistance in about four different ways (hourly diversity, daily diversity, intra-world diversity, CBM constraint, etc.). PRISM operates weekly, not monthly so I don't understand the comment about August.

ANSWER
The monthly shape is an important component of the IRM computation since the monthly peaks in the Load Model are adjusted to match the monthly shape (per unitized monthly peaks) that comes out of the load forecast. This is the reason I included the chart comparing the new monthly shape (new forecast spec) versus the old monthly shape (current forecast spec).

QUESTION
As to claim that using actual load forecast distribution results in higher IRM, I guess I'll just have to accept that unless you can show some results. If you can use the actual forecast distribution, why use PLOTS with all the assumptions (normal, independent, etc.) and potential inaccuracy introduced?

ANSWER
Please see **Attachment C**. Note that we only included the CP 1-20 since the rest of CPs have no LOLE risk. Also, we included the Cumulative Probability Table for one of the summer weeks since all of the other summer "cumprobs" are exactly the same (no maintenance is allowed in the summer). It is fairly straightforward to figure out the computations but if you have any issues, let us know. The cell B1 in the Scale CPS sheet is the one that you should change if you want to see a different LOLE in the LOLE sheet.

Also note that we used the CP distributions using the new forecast specifications and they are subject to change (if I use the CPs with the current load forecast specifications, the single area IRM is even higher)

From a single area perspective, we agree with you comment/question. From a two area perspective, we do not agree since we would have to come up with CP distributions for the World.

QUESTION
On the denominator for IRM calculation: In your PRISM simulation the weeks are treated as probabilistically independent. This means that the summer or annual peak most certainly can occur outside of week ten. It is easy to calculate the summer or annual distribution as represented in PRISM, and, as I hope you know, its median is higher than the week 10 median.

You seem the claim that that violates the intention that week 10 be the peak week, but I'm simply observing that the load model that you use has a higher summer or annual median than the week 10 median. The magnitude ordering results in means and standard deviations, that are then used as 52

independent, normally-distributed weeks. I have a spreadsheet that calculates the probability of the peak being in each week for any load model, and the summer or annual median, if that helps.

ANSWER
Please see next response.

QUESTION
Please calculate and report the actual median for the load model as used in PRISM. And please do the one additional request: "Could you put into PRISM the amount of capacity equal to your recommended IRM x the forecast 50-50 peak load (not the week 10EWM), and (without optimizing) simply report the resulting LOLE (which will be a bit better than 1-in-10)."

ANSWER
Please see next response.

QUESTION
Patricio, to make sure we're on the same page: The attached has an additional sheet (**Attachment D**) in which I calculate the actual median of load model 50714, which turns out to be 1.1% higher than the nominal forecast annual median, used as week 10 median. So if actual LM median is used in IRM calculation, IRM drops to 15.2%. Please review and comment.

ANSWER
We see what you did in **Attachment D** and we understand it. However, what you are overlooking is the following:

1. The means and standard deviations of all the weeks in the load model were estimated conditional on the peak occurring on week 10. Otherwise, the per-unitized means and standard deviations in weeks such as 9, 11, 12 (cells p3-p4-R3-R4 and such) in July and August would have been higher than what they are (since peaks were likely to have taken place in those weeks during the time period used to build the load model).
2. When you compute the probability of not exceeding each of the values in the CP1 distribution during the entire year, you have to reflect that conditionality in the computation (because you are using the means and standards deviations that were computed based on that condition)
3. Therefore, the probability of not exceeding each of the peak load values in CP1 in a week other than the peak week is always 1 if that same value was not exceeded in week 10.
4. It follows that the Expected Weekly Maximum of the peak week is the annual 50/50 (since the range of cells H9-BG701 should have a 1 in there, except for the column corresponding to week 10, obviously)

We can scale when that magnitude-order condition is not applied to the construction of the load model.