PJM Load Model Selection for 2022 Reserve Requirement Study (RRS)

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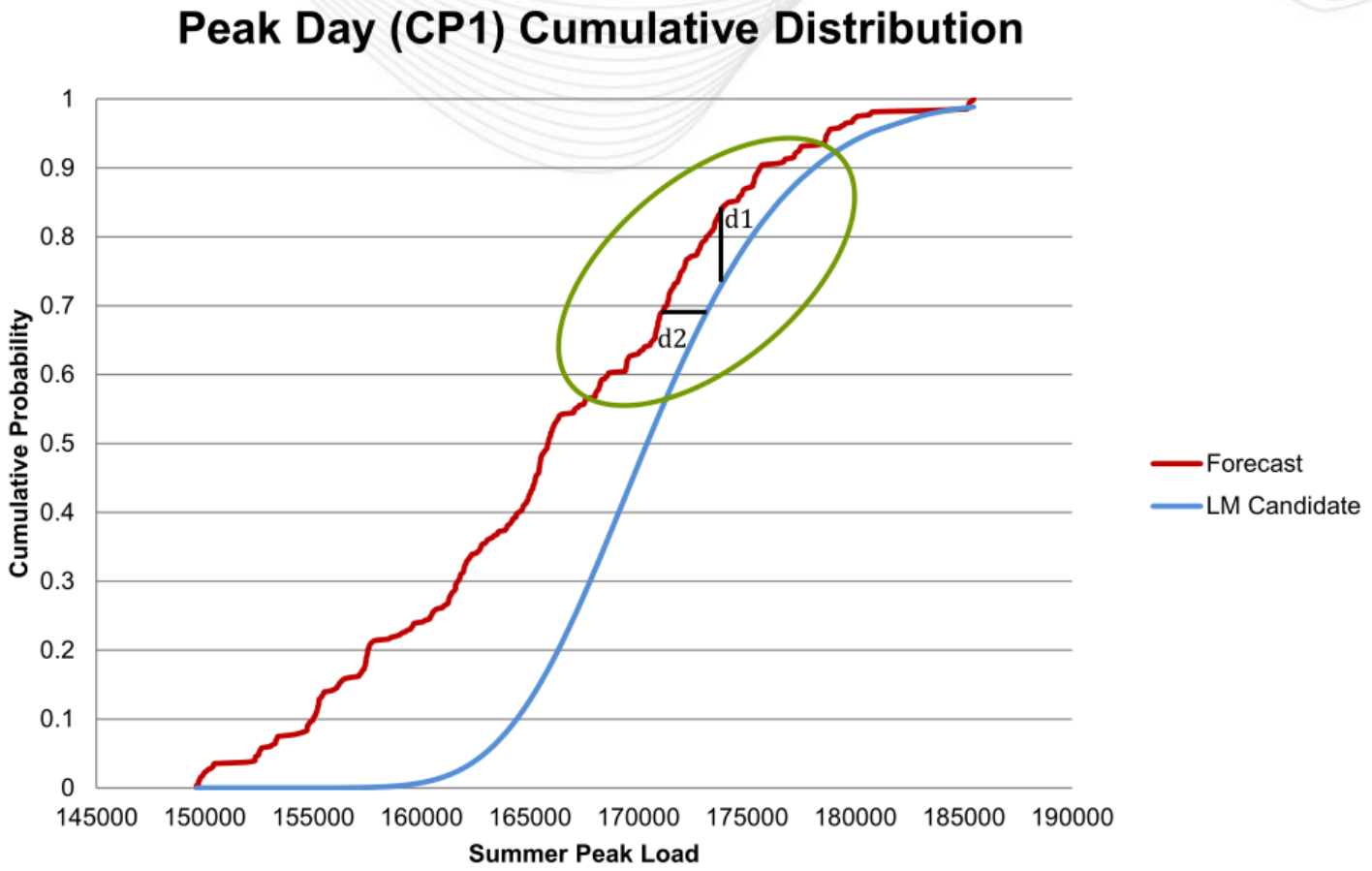
August 9, 2022

Background

- The Load Model Selection analysis is performed due to the fact that the Coincident Peak distributions from the PJM Load Forecast cannot be used directly in PRISM
- The analysis is based on method approved at June 9, 2016 PC meeting (Appendix V in 2016 RRS Assumptions Letter)
  - Selected Load Model should be a good match of CP1 distribution from PJM load Forecast
  - Consideration of historical PJM / World load diversity
- This year the analysis is based on the 2022 Load Forecast Report. Focus is on 2026/27 Delivery Year.

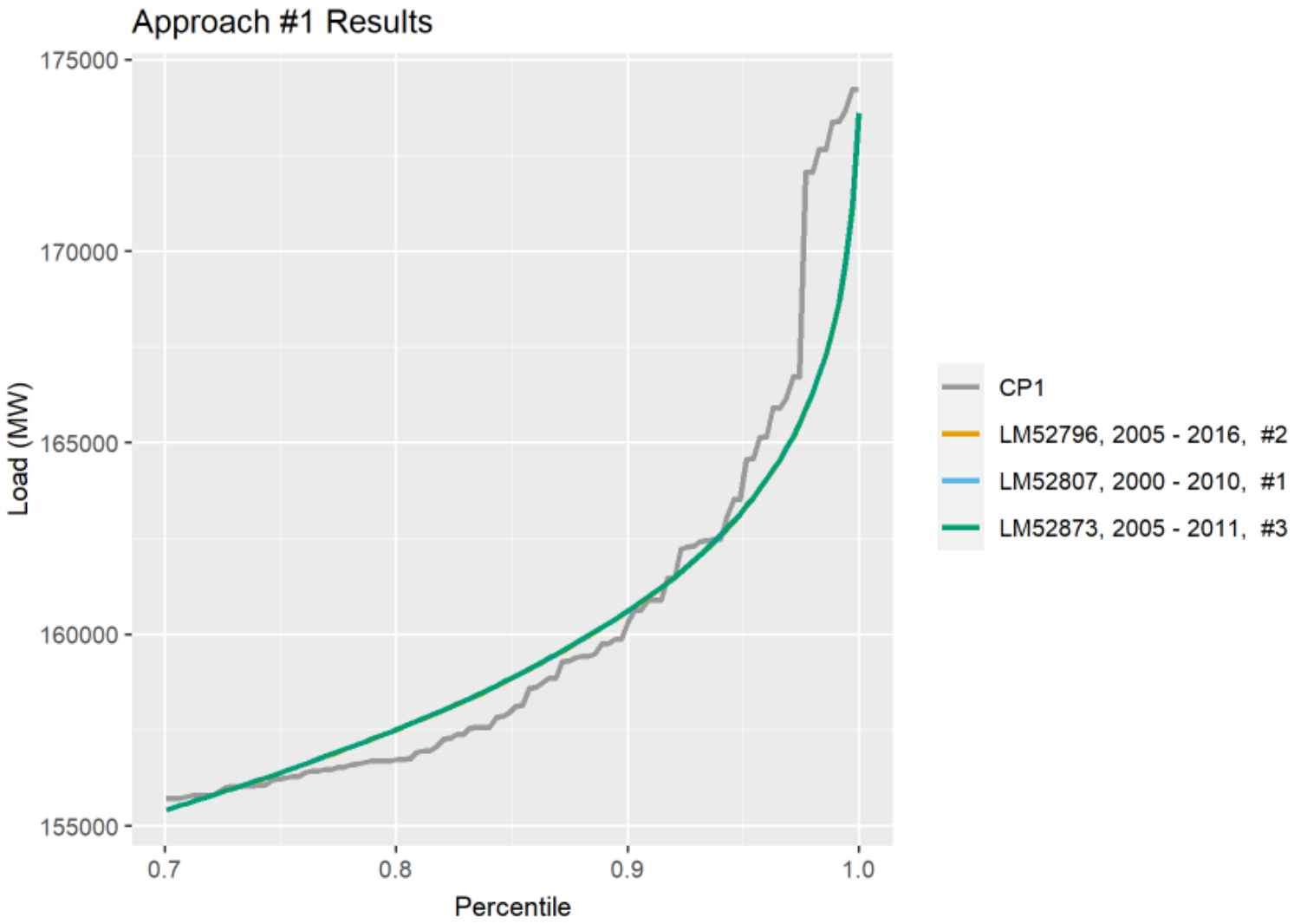
Load Model Candidate vs CP1 from Load Forecast



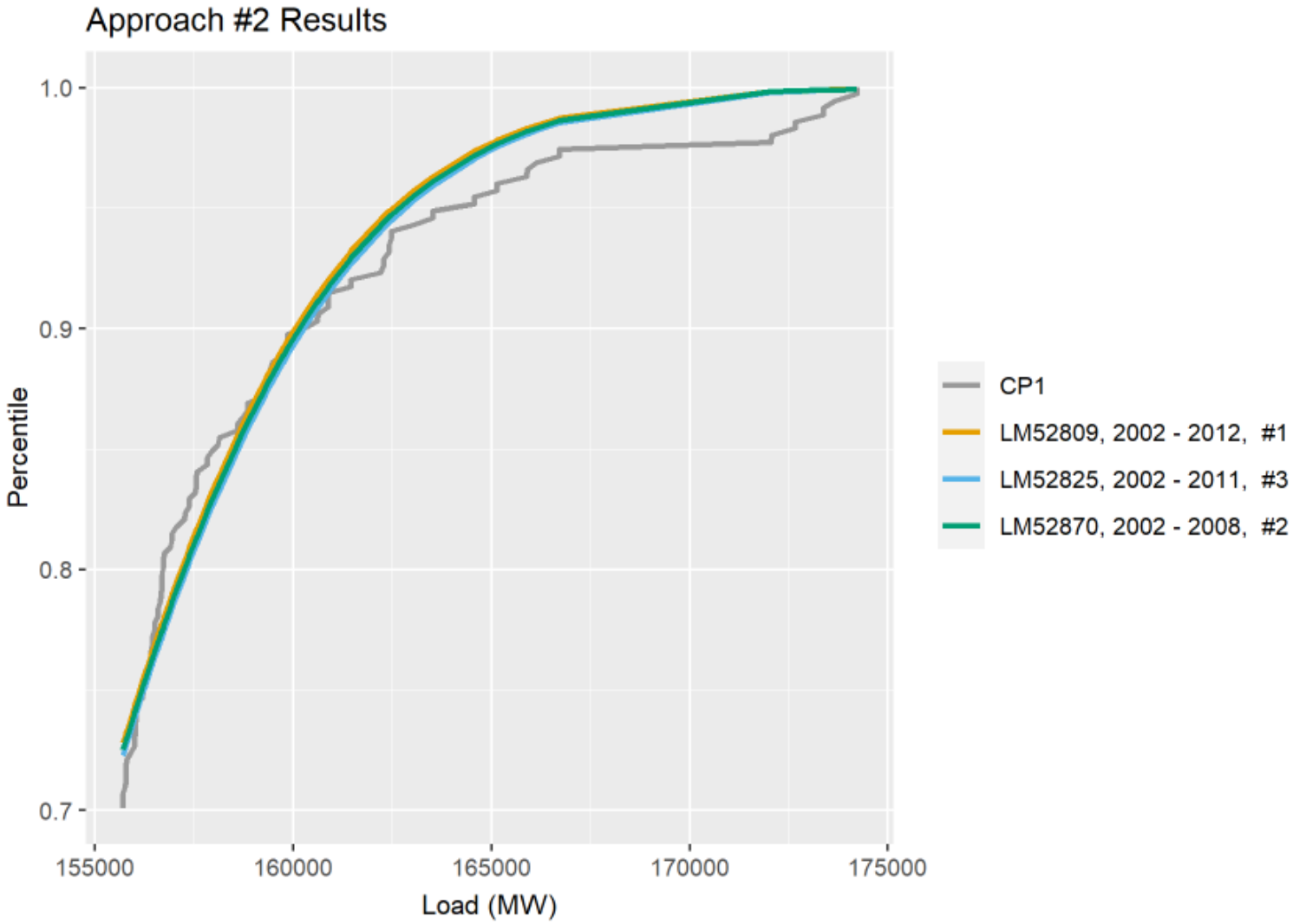
PJM Load Model Combinations to Assess

- A total of 136 Load Models are examined
  - Ranging from a 22-year Load Model (i.e. calculated using data from a 22 year period) to several 7-year Load Models
  - Load Models built with less than 7 years of data are not considered

Approach 1 – 70th percentile and above



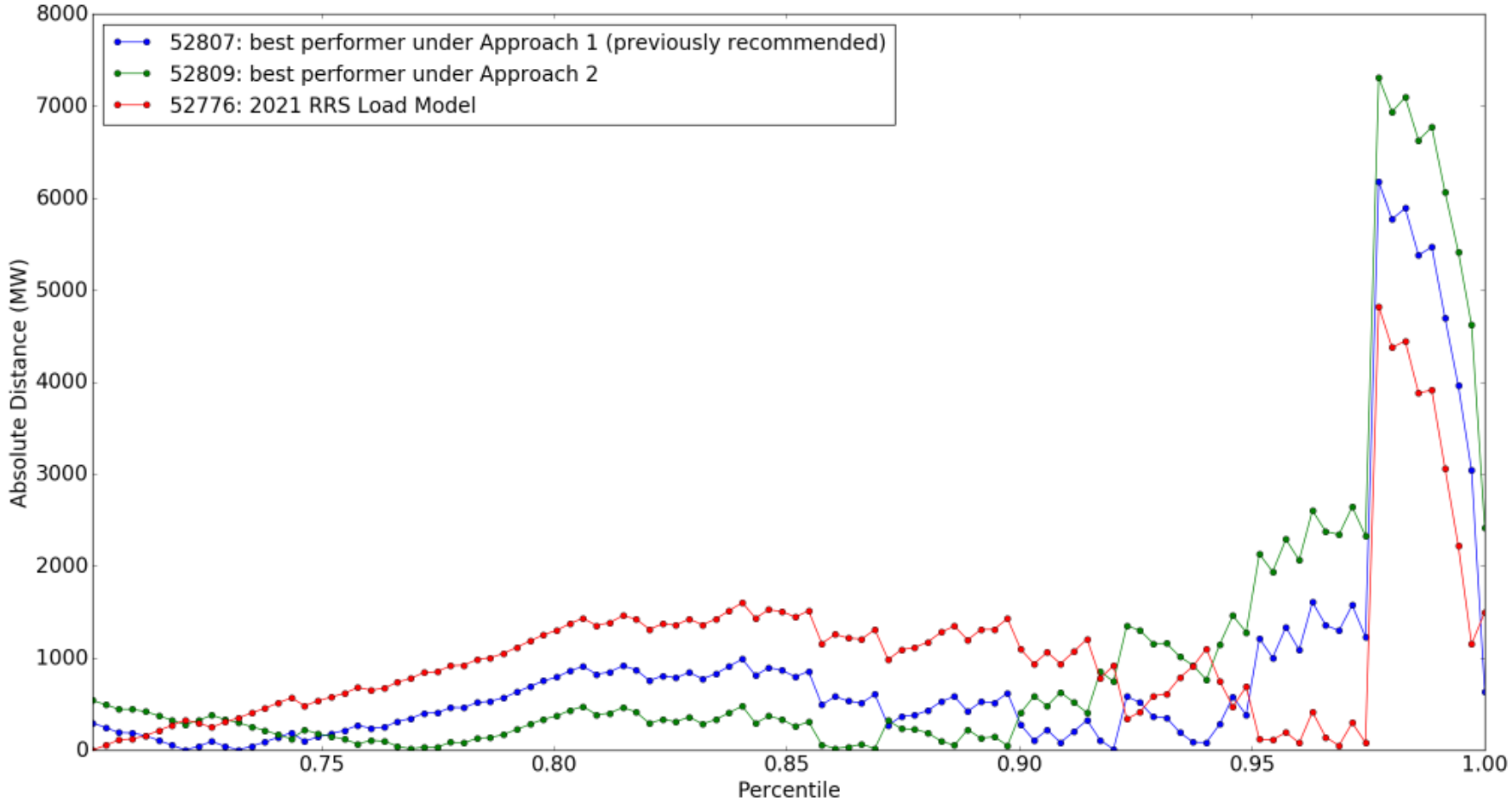
Approach 2 – 70th percentile and above



Recommendation made at July PC

- At the July PC, PJM had shortlisted two load models as the main 2022 RRS LM candidates
  - 52807: 2000-2010 (best performer under Approach 1)
  - 52809: 2002-2012 (best performer under Approach 2)
- Furthermore, PJM recommended and the RAAS endorsed the recommendation of LM 52807: 2000-2010, the top ranked load model under Approach 1
- Further analysis of the results under Approach 1 has caused PJM to modify its recommendation

Approach 1 point-to-point distance in upper 30th percentile of CP1 distribution



Distances in the extreme upper portion of distribution distort the total distance calculation and therefore, the ranking of load models

PJM **Newly** Selected Load Models

- Given the issue with Approach 1, PJM has decided to rely on the results from Approach 2 to issue a new recommendation
- Load Model Choices
  - 52809: 2002-2012 (Ranked #1 Approach 2)
  - 52870: 2002-2008 (Ranked #2 Approach 2)
  - 52825: 2002-2011 (Ranked #3 Approach 2)
- The above selected load models are the top 3 performers in Approach 2
- As a side note, last year's selected load model (2001-2013) is not one of the choices above

World Load Models

- To analyze PJM/World peak load diversity, World Load Models were created using the PLOTS program, observing the same historical time periods
  - Uses historical coincident peak pattern
  - World defined as MISO, NY, TVA, and VACAR.

LM #52809 (2002-2012) - PJM vs World Assessment

Month	WK #	**PJM RTO** LM #52809 11 Yr Load Model - 2002 - 2012 Per-Unitized Peak	**World Region** LM #52897 Per-Unitized Peak
June	5	0.8419	0.8870
June	6	0.8930	0.9332
June	7	0.9121	0.9562
July	8	0.9290	0.9406
July	9	0.9415	0.9534
July	10	1.0000	1.0000
July	11	0.9677	0.9745
August	12	0.9650	0.9919
August	13	0.9045	0.9493
August	14	0.8502	0.8873
August	15	0.8043	0.8670

LM #52870 (2002-2008) - PJM vs World Assessment

Month	WK #	**PJM RTO** LM #52870 7 Yr Load Model - 2002 - 2008 Per-Unitized Peak	**World Region** LM #52903 Per-Unitized Peak
June	5	0.8367	0.8835
June	6	0.8593	0.9112
June	7	0.9121	0.9562
July	8	0.8779	0.9136
July	9	0.9342	0.9527
July	10	1.0000	1.0000
July	11	0.9642	0.9741
August	12	0.9650	0.9919
August	13	0.9092	0.9468
August	14	0.8564	0.8896
August	15	0.8444	0.8971

LM #52825 (2002-2011) - PJM vs World Assessment

Month	WK #	**PJM RTO** LM #52825 10 Yr Load Model - 2002 - 2011 Per-Unitized Peak	**World Region** LM #52904 Per-Unitized Peak
June	5	0.8298	0.9002
June	6	0.8911	0.9339
June	7	0.9121	0.9562
July	8	0.9147	0.9105
July	9	0.9402	0.9538
July	10	1.0000	1.0000
July	11	0.9648	0.9737
August	12	0.9650	0.9919
August	13	0.9066	0.9469
August	14	0.8656	0.9102
August	15	0.8054	0.8989

Summary

- All selected load models have PJM peaking on the same week as the World
- Load Model #52809: 2002-2012 is the top performer under Approach 2 and includes more historical data

Historical Peak Load Coincidence PJM / World

Year	PJM Peak - Actual Date	World Peak - Actual Date	Peak Coincidence?
1998	21-Jul-98	21-Jul-98	Yes
1999	30-Jul-99	28-Jul-99	No
2000	9-Aug-00	31-Aug-00	No
2001	9-Aug-01	8-Aug-01	No
2002	1-Aug-02	1-Aug-02	Yes
2003	21-Aug-03	14-Aug-03	No
2004	3-Aug-04	2-Aug-04	No
2005	26-Jul-05	25-Jul-05	No
2006	2-Aug-06	1-Aug-06	No
2007	8-Aug-07	8-Aug-07	Yes
2008	9-Jun-08	21-Jul-08	No
2009	10-Aug-09	10-Aug-09	Yes
2010	7-Jul-10	4-Aug-10	No
2011	21-Jul-11	20-Jul-11	No
2012	17-Jul-12	17-Jul-12	Yes
2013	18-Jul-13	18-Jul-13	Yes
2014	7-Jan-14	7-Jan-14	Yes
2015	28-Jul-15	28-Jul-15	Yes
2016	11-Aug-16	22-Jul-16	No
2017	19-Jul-17	20-Jul-17	No
2018	28-Aug-18	29-Jun-18	No
2019	19-Jul-19	19-Jul-19	Yes
2020	20-Jul-20	20-Jul-20	Yes

In the last 23 years, PJM and the World **have not peaked** on the same day 13 times.

LM #52809 (2002-2012) - Switching of World peak week

Month	WK #	**PJM RTO** LM #52809 11 Yr Load Model - 2002 - 2012 Per-Unitized Peak	**World Region** LM #52897 Per-Unitized Peak
July	8	0.9290	0.9406
July	9	0.9415	0.9534
July	10	1.0000	0.9745
July	11	0.9677	1.0000

2022 RRS Load Model Recommendation

- PJM recommendation to PC on selection of historical time period for load model:
  - **Use 11yr (2002-2012, #52809) Load Model for 2022 RRS Base Case and switch World peak to a different July week so that PJM and World peak in the same month but not in the same week.**
    - Switch in World peak week is performed to match historical diversity observed between PJM and World

Contact

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PJM Load Model Selection for 2022 Reserve Requirement Study (RRS)

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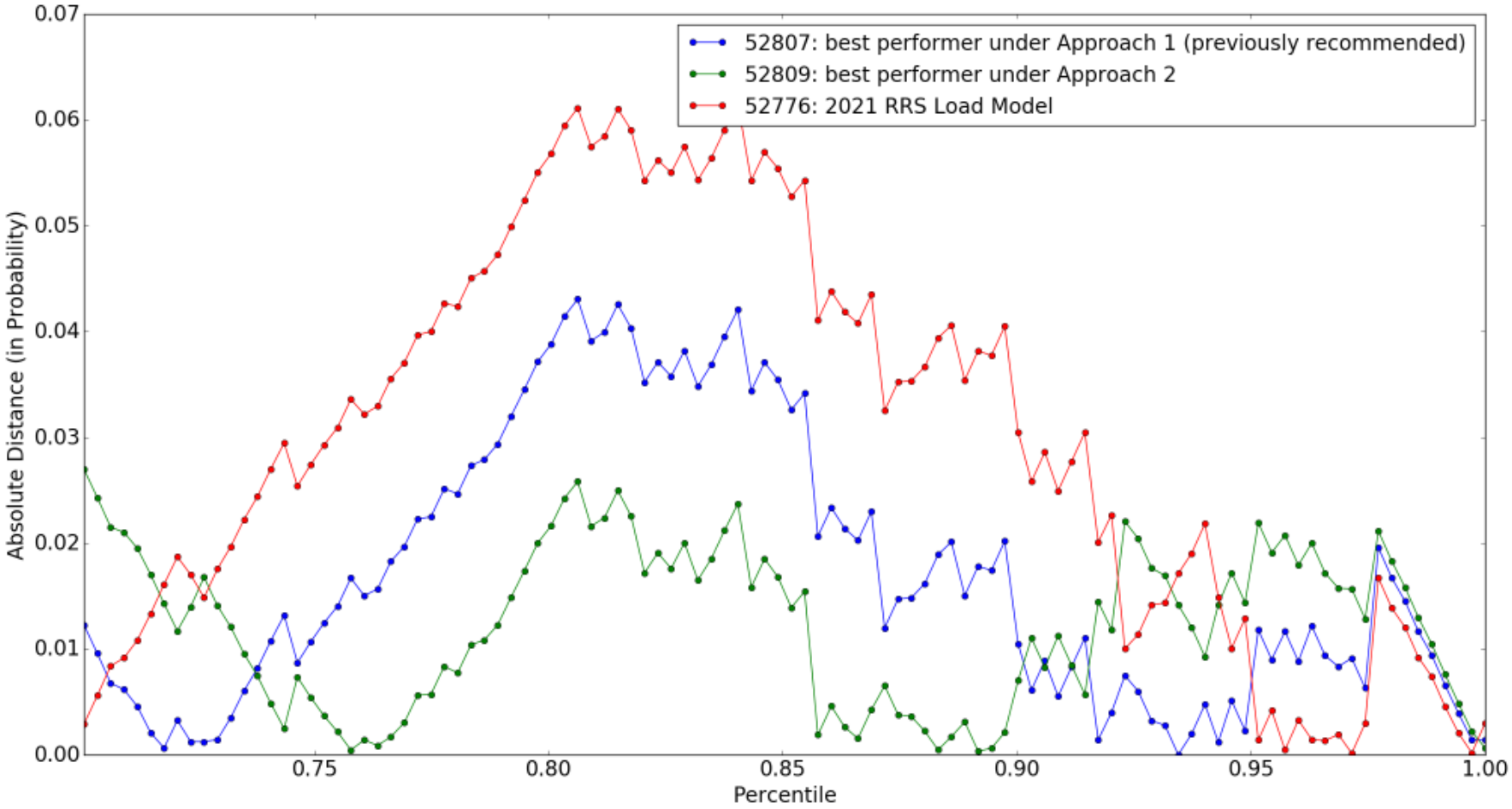
Appendix

Approach 2 point-to-point distance in upper 30th percentile of CP1 distribution



Comments on Graphs from Slides #8 and #21

- Approach 2 provides a more accurate representation of the difference between the LM candidates and the CP1 distribution, particularly in the extreme upper portion of the distribution.
  - Approach 2 relies on an analytical method that provides an accurate and precise answer to the question: what percentile of LM candidate X does a CP1 load value equal to 168,000 MW represent?
  - Approach 1, on the other hand, would require a significantly large number of Monte Carlo runs to accurately answer the question: what MW value produced by LM candidate X is representative of a 99.7150997 percentile (note that all the decimal points matter in the percentiles located at the extreme portion of the distribution)?