# PJM Load Model Selection for 2023 Reserve Requirement Study (RRS)

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Resource Adequacy Planning

RAAS

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- The Load Model Selection analysis is performed under Assumptions Set #1 (i.e., assumptions for PRISM)

- 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

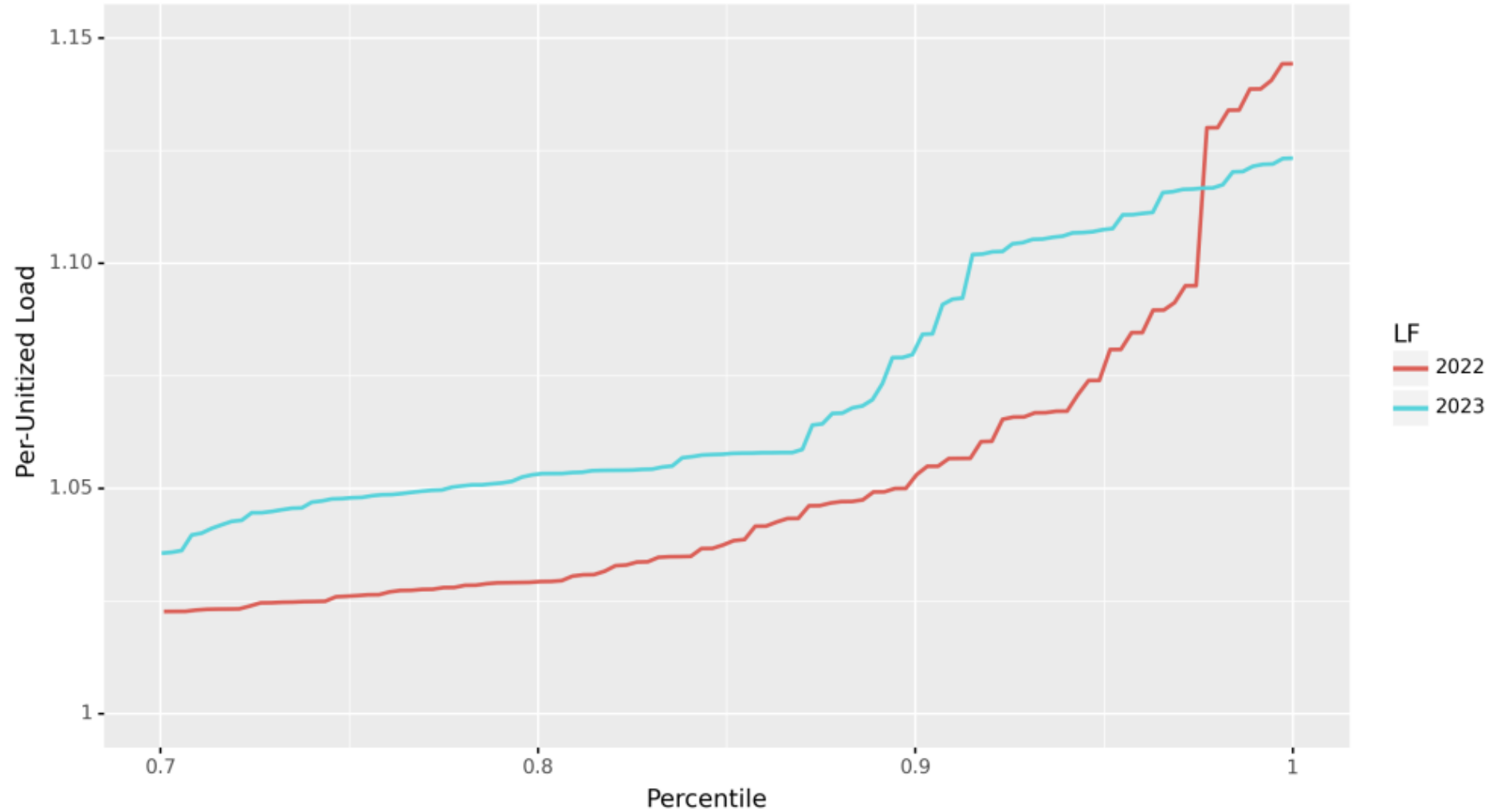- This year the analysis is based on the 2023 Load Forecast Report. Focus is on 2027/28 Delivery Year.
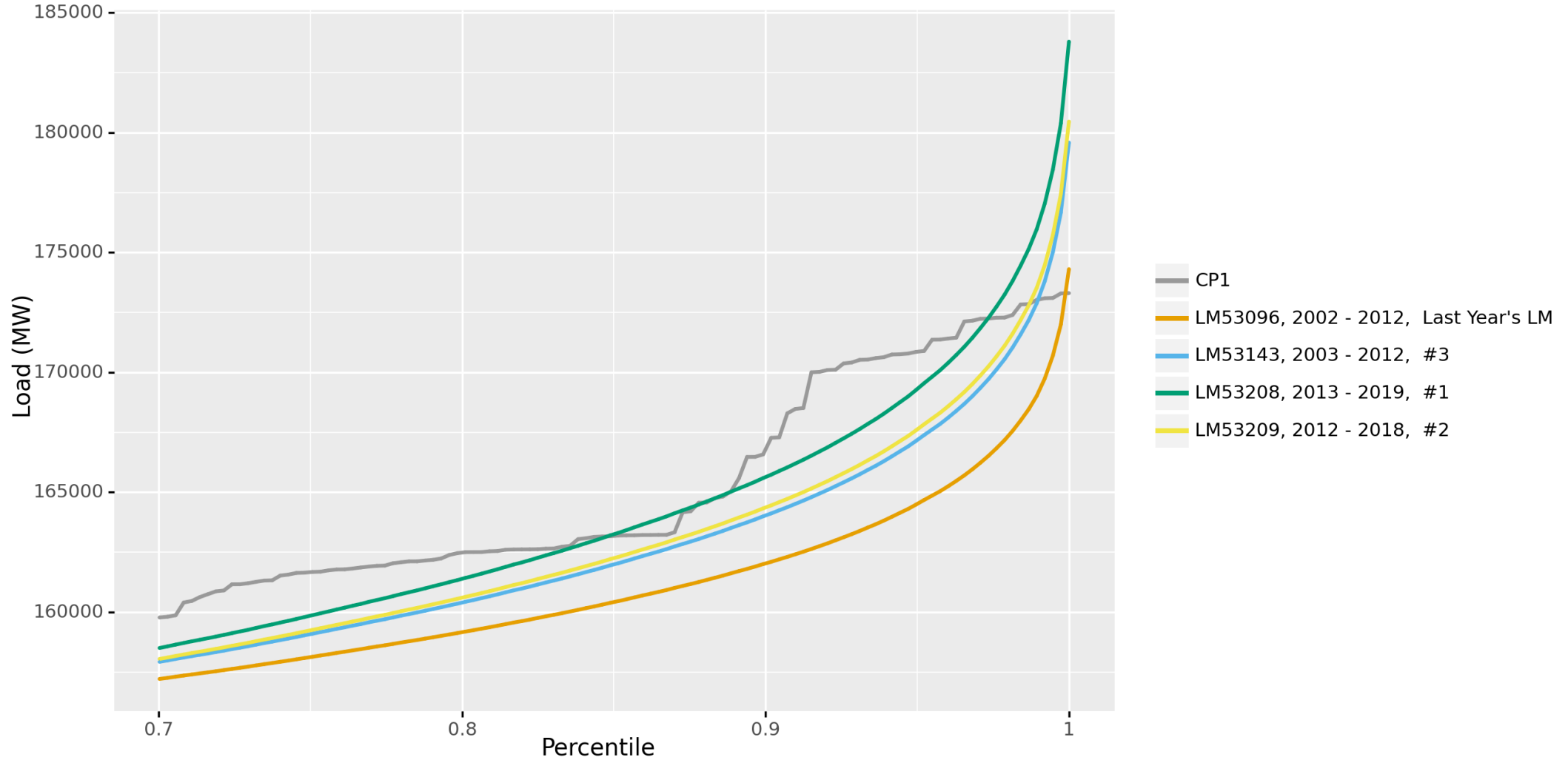
Peak Day (CP1) Cumulative Distribution
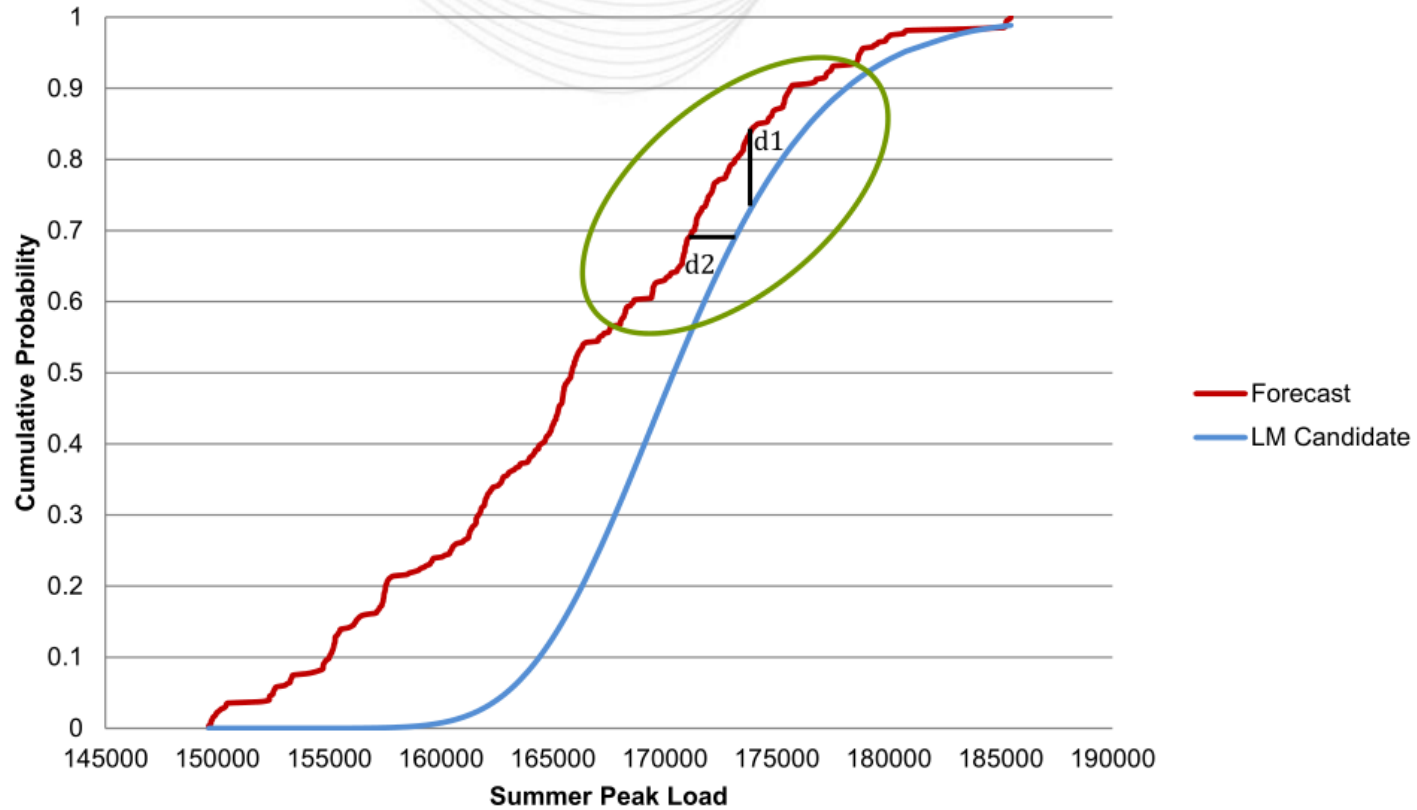
- A total of 153 Load Models are examined

  – Ranging from a 23-year Load Model (i.e. calculated using data from a 23 year period) to several 7-year Load Models

  – Load Models built with less than 7 years of data are not considered

CP1 Comparison: 2023 vs 2022 - Upper 30th Percentile

Approach #1 Results

Legend:
- CP1
- LM53096, 2002 - 2012, Last Year's LM
- LM53143, 2003 - 2012, #3
- LM53208, 2013 - 2019, #1
- LM53209, 2012 - 2018, #2

Approach #2 Results
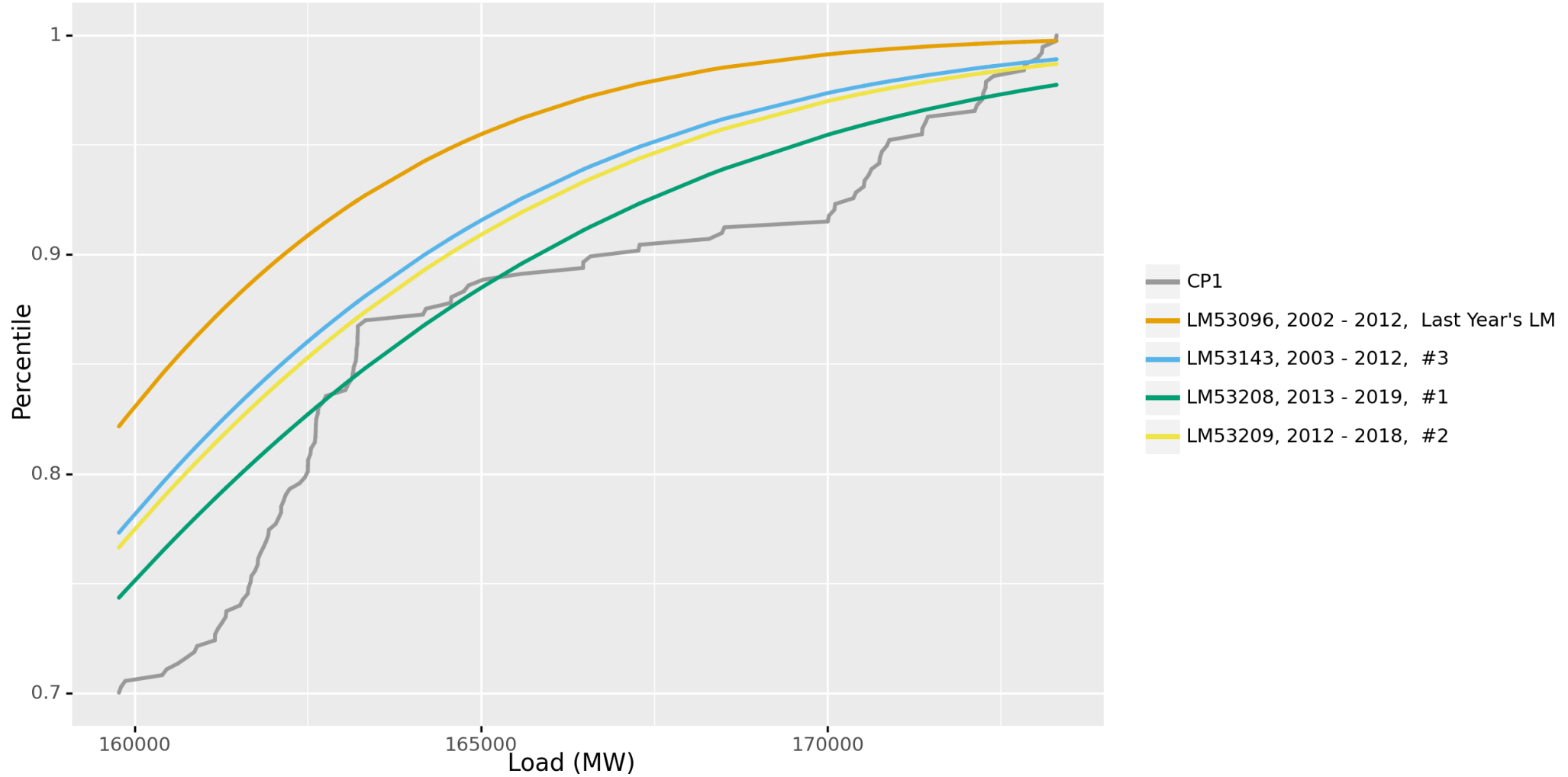
- Approach #1. Top Ranked
  - 53208: 2013-2019
  - 53209: 2012-2018
  - 53143: 2003-2012

- Approach #2. Top Ranked
  - 53208: 2013-2019
  - 53209: 2012-2018
  - 53143: 2003-2012

- There is **convergence** between Approaches #1 and #2 regarding the top ranked LMs in the 70th percentile and above of the CP1 distribution
  - Such convergence also occurs when examining the 90th percentile and above and the 70th to 95th percentile range of the CP1 distribution (not shown in slides)
- Therefore, the **shortlisted Load Models** are:
  - 53208: 2013-2019
  - 53209: 2012-2018
  - 53143: 2003-2012
- Last year's selected Load Model (2002-2012) is not in the shortlist

- 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.

Month	WK #	PJM RTO LM #53208 7 Yr Load Model - 2013 - 2019			World Region LM #53214		
		PLOTS Mean	PLOTS STD	EWM	PLOTS Mean	PLOTS STD	EWM
June	5	0.9189	0.0989	0.9442	0.9495	0.0547	0.9565
June	6	0.8927	0.0788	0.8980	0.9352	0.0558	0.9433
June	7	0.7538	0.0615	0.7443	0.8311	0.0489	0.8319
July	8	0.9040	0.0937	0.9497	0.8792	0.0745	0.9059
July	9	0.7906	0.0825	0.8209	0.9201	0.0387	0.9118
July	10	0.9518	0.0937	1.0000	1.0000	0.0469	1.0000
July	11	0.8864	0.0566	0.8950	0.9177	0.0556	0.9265
August	12	0.7044	0.0620	0.8173	0.8198	0.0477	0.9926
August	13	0.8024	0.0832	0.9524	0.8109	0.0357	0.9690
August	14	0.8482	0.0565	0.9783	0.7893	0.0445	0.9523
August	15	0.7823	0.0587	0.9044	0.7796	0.0398	0.9358

Month	WK #	PJM RTO LM #53209 7 Yr Load Model - 2012 - 2018			World Region LM #53215		
		PLOTS Mean	PLOTS STD	EWM	PLOTS Mean	PLOTS STD	EWM
June	5	0.8859	0.0581	0.8934	0.9192	0.0414	0.9372
June	6	0.9246	0.0697	0.9442	0.9248	0.0543	0.9565
June	7	0.7970	0.0772	0.8204	0.8717	0.0493	0.8966
July	8	0.9247	0.1030	0.9455	0.9332	0.0656	0.9463
July	9	0.7864	0.0577	0.7662	0.8773	0.0772	0.9008
July	10	1.0000	0.0819	1.0000	1.0000	0.0528	1.0000
July	11	0.8935	0.0758	0.8878	0.9434	0.0710	0.9621
August	12	0.8025	0.0821	0.9483	0.8939	0.0520	0.9926
August	13	0.8511	0.0564	0.9783	0.8478	0.0500	0.9394
August	14	0.7422	0.0656	0.8618	0.7342	0.0564	0.8192
August	15	0.7872	0.0780	0.9263	0.7697	0.0435	0.8467

		PJM RTO LM #53143 10 Yr Load Model - 2003 - 2012			World Region LM #53216		
Month	WK #	PLOTS Mean	PLOTS STD	EWM	PLOTS Mean	PLOTS STD	EWM
June	5	0.8033	0.0551	0.8302	0.8526	0.0451	0.8757
June	6	0.9056	0.0632	0.9442	0.9189	0.0455	0.9442
June	7	0.8775	0.0421	0.8939	0.9288	0.0475	0.9565
July	8	0.9078	0.0434	0.8735	0.9059	0.0369	0.9073
July	9	0.9146	0.0673	0.9033	0.9483	0.0423	0.9556
July	10	1.0000	0.0788	1.0000	0.9990	0.0363	1.0000
July	11	0.9333	0.0755	0.9300	0.9586	0.0497	0.9738
August	12	0.9763	0.0634	0.9783	1.0000	0.0597	0.9926
August	13	0.9413	0.0735	0.9535	0.9784	0.0409	0.9513
August	14	0.8800	0.0576	0.8763	0.9209	0.0298	0.8845
August	15	0.8368	0.0714	0.8458	0.8797	0.0519	0.8659

- Both selected load models have PJM peaking on the same week as the World

- Load Model #53208: 2013-2019 has a better overall performance under both approaches.

  - Ranked 1st using both approaches when examining multiples ranges in the CP1 distribution:

    - 70th percentile and above

    - 90th percentile and above

    - Between 75th and 95th percentiles

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
2021	24-Aug-21	24-Aug-21	Yes

In the last 24 years, PJM and the World **have not peaked** on the same day 13 times.

Month	WK #	PJM RTO LM #53208 7 Yr Load Model - 2013 - 2019 Per-Unitized Peak	World Region LM #53214 Per-Unitized Peak
July	8	0.9497	0.9059
July	9	0.8209	0.9118
July	10	1.0000	0.9265
July	11	0.8950	1.0000

- PJM recommendation to RAAS on selection of historical time period for load model:

    – **Use 7yr (2013-2019, #53208) Load Model for 2023 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.**