

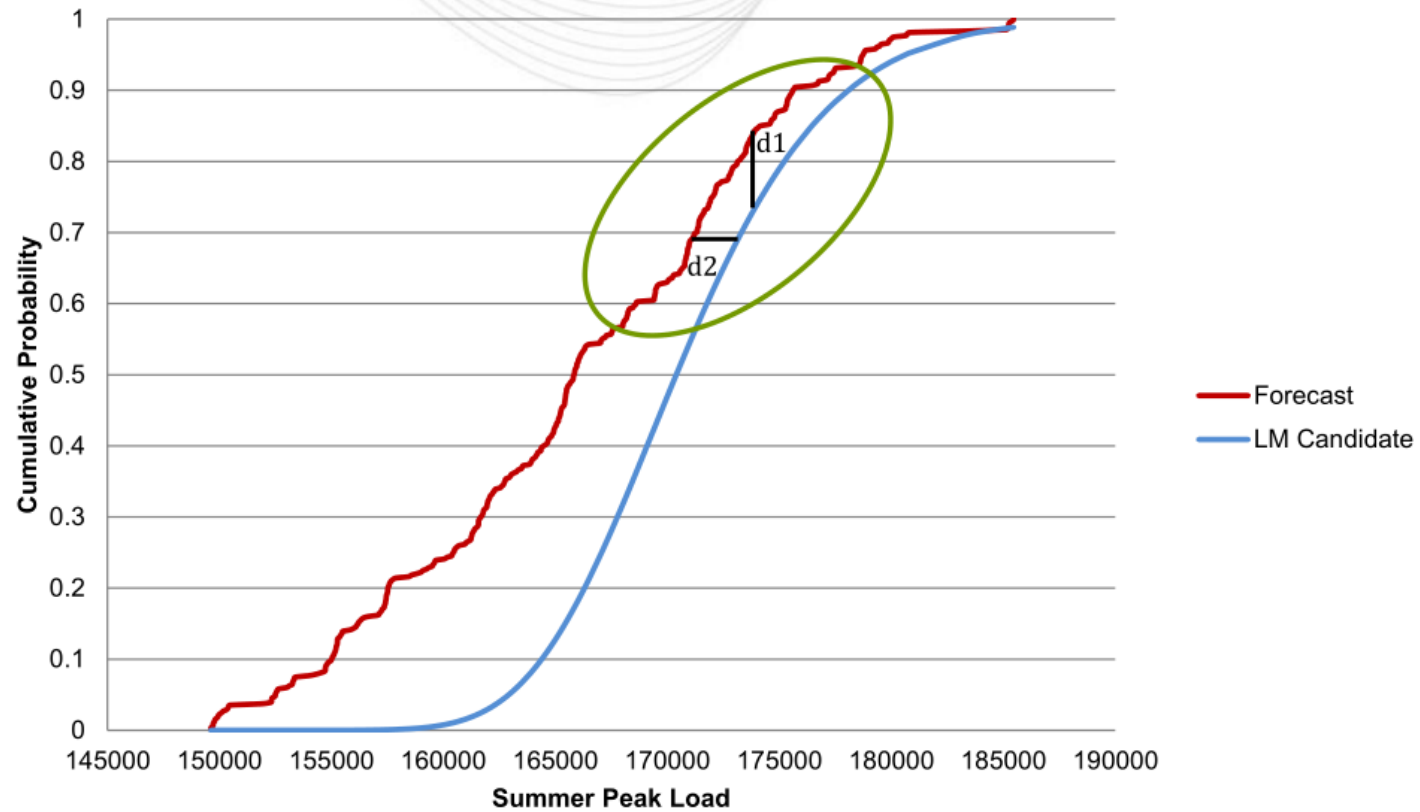
PJM Load Model Selection for 2020 RRS

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- Load Model Selection is performed due to the fact that the Coincident Peak distributions from the PJM Load Forecast cannot be used directly in PRISM
- Analysis 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 2020 Load Forecast Report. Focus is on 2024/25 Delivery Year.

Load Model Candidate vs CP1 from Load Forecast

Peak Day (CP1) Cumulative Distribution





PJM Load Model Combinations to Assess

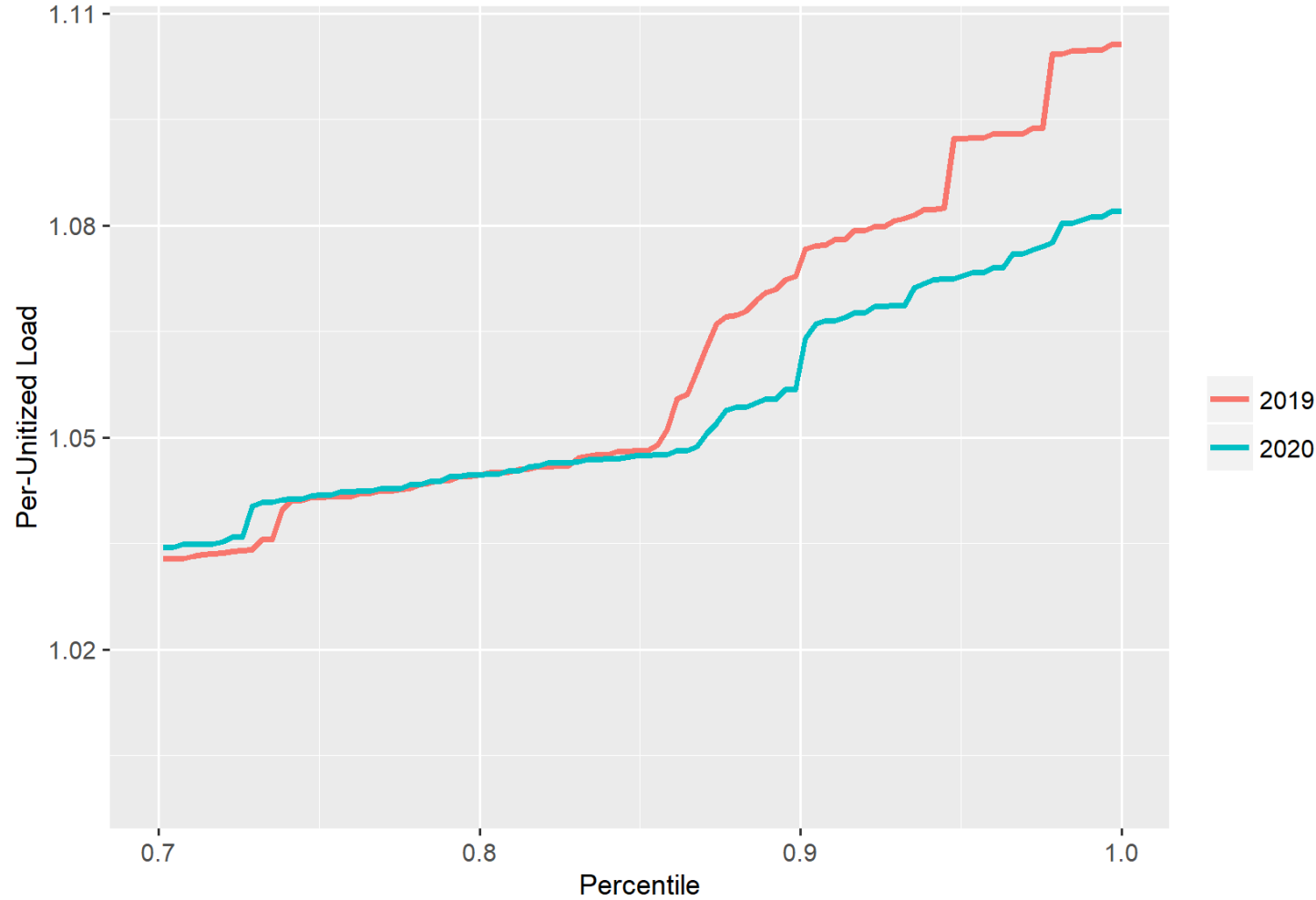
LM#	Description	LM#	Description	LM#	Description
52267	1998 - 2017 20 Year LM	52227	2005 - 2017 13 Year LM	52157	2002 - 2010 9 Year LM
52264	1998 - 2016 19 Year LM	52206	1998 - 2009 12 Year LM	52158	2003 - 2011 9 Year LM
52265	1999 - 2017 19 Year LM	52272	1999 - 2010 12 Year LM	52159	2004 - 2012 9 Year LM
52260	1998 - 2015 18 Year LM	52212	2000 - 2011 12 Year LM	52160	2005 - 2013 9 Year LM
52261	1999 - 2016 18 Year LM	52213	2001 - 2012 12 Year LM	52161	2006 - 2014 9 Year LM
52262	2000 - 2017 18 Year LM	52214	2002 - 2013 12 Year LM	52162	2007 - 2015 9 Year LM
52255	1998 - 2014 17 Year LM	52215	2003 - 2014 12 Year LM	52163	2008 - 2016 9 Year LM
52256	1999 - 2015 17 Year LM	52216	2004 - 2015 12 Year LM	52164	2009 - 2017 9 Year LM
52257	2000 - 2016 17 Year LM	52217	2005 - 2016 12 Year LM	52133	1998 - 2005 8 Year LM
52258	2001 - 2017 17 Year LM	52218	2006 - 2017 12 Year LM	52134	1999 - 2006 8 Year LM
52249	1998 - 2013 16 Year LM	52178	1998 - 2008 11 Year LM	52135	2000 - 2007 8 Year LM
52250	1999 - 2014 16 Year LM	52179	1999 - 2009 11 Year LM	52136	2001 - 2008 8 Year LM
52251	2000 - 2015 16 Year LM	52180	2000 - 2010 11 Year LM	52137	2002 - 2009 8 Year LM
52252	2001 - 2016 16 Year LM	52181	2001 - 2011 11 Year LM	52138	2003 - 2010 8 Year LM
52253	2002 - 2017 16 Year LM	52182	2002 - 2012 11 Year LM	52139	2004 - 2011 8 Year LM
52242	1998 - 2012 15 Year LM	52183	2003 - 2013 11 Year LM	52140	2005 - 2012 8 Year LM
52243	1999 - 2013 15 Year LM	52184	2004 - 2014 11 Year LM	52141	2006 - 2013 8 Year LM
52244	2000 - 2014 15 Year LM	52273	2005 - 2015 11 Year LM	52142	2007 - 2014 8 Year LM
52245	2001 - 2015 15 Year LM	52186	2006 - 2016 11 Year LM	52143	2008 - 2015 8 Year LM
52246	2002 - 2016 15 Year LM	52187	2007 - 2017 11 Year LM	52144	2009 - 2016 8 Year LM
52247	2003 - 2017 15 Year LM	52166	1998 - 2007 10 Year LM	52145	2010 - 2017 8 Year LM
52229	1998 - 2011 14 Year LM	52167	1999 - 2008 10 Year LM	52087	1998 - 2004 7 Year LM
52230	1999 - 2012 14 Year LM	52168	2000 - 2009 10 Year LM	52088	1999 - 2005 7 Year LM
52231	2000 - 2013 14 Year LM	52169	2001 - 2010 10 Year LM	52089	2000 - 2006 7 Year LM
52232	2001 - 2014 14 Year LM	52170	2002 - 2011 10 Year LM	52090	2001 - 2007 7 Year LM
52270	2002 - 2015 14 Year LM	52274	2003 - 2012 10 Year LM	52091	2002 - 2008 7 Year LM
52234	2003 - 2016 14 Year LM	52172	2004 - 2013 10 Year LM	52092	2003 - 2009 7 Year LM
52235	2004 - 2017 14 Year LM	52275	2005 - 2014 10 Year LM	52093	2004 - 2010 7 Year LM
52220	1998 - 2010 13 Year LM	52174	2006 - 2015 10 Year LM	52094	2005 - 2011 7 Year LM
52221	1999 - 2011 13 Year LM	52175	2007 - 2016 10 Year LM	52276	2006 - 2012 7 Year LM
52222	2000 - 2012 13 Year LM	52176	2008 - 2017 10 Year LM	52096	2007 - 2013 7 Year LM
52271	2001 - 2013 13 Year LM	52153	1998 - 2006 9 Year LM	52097	2008 - 2014 7 Year LM
52224	2002 - 2014 13 Year LM	52154	1999 - 2007 9 Year LM	52098	2009 - 2015 7 Year LM
52225	2003 - 2015 13 Year LM	52155	2000 - 2008 9 Year LM	52099	2010 - 2016 7 Year LM
52226	2004 - 2016 13 Year LM	52156	2001 - 2009 9 Year LM	52100	2011 - 2017 7 Year LM

105 Candidate Load Models



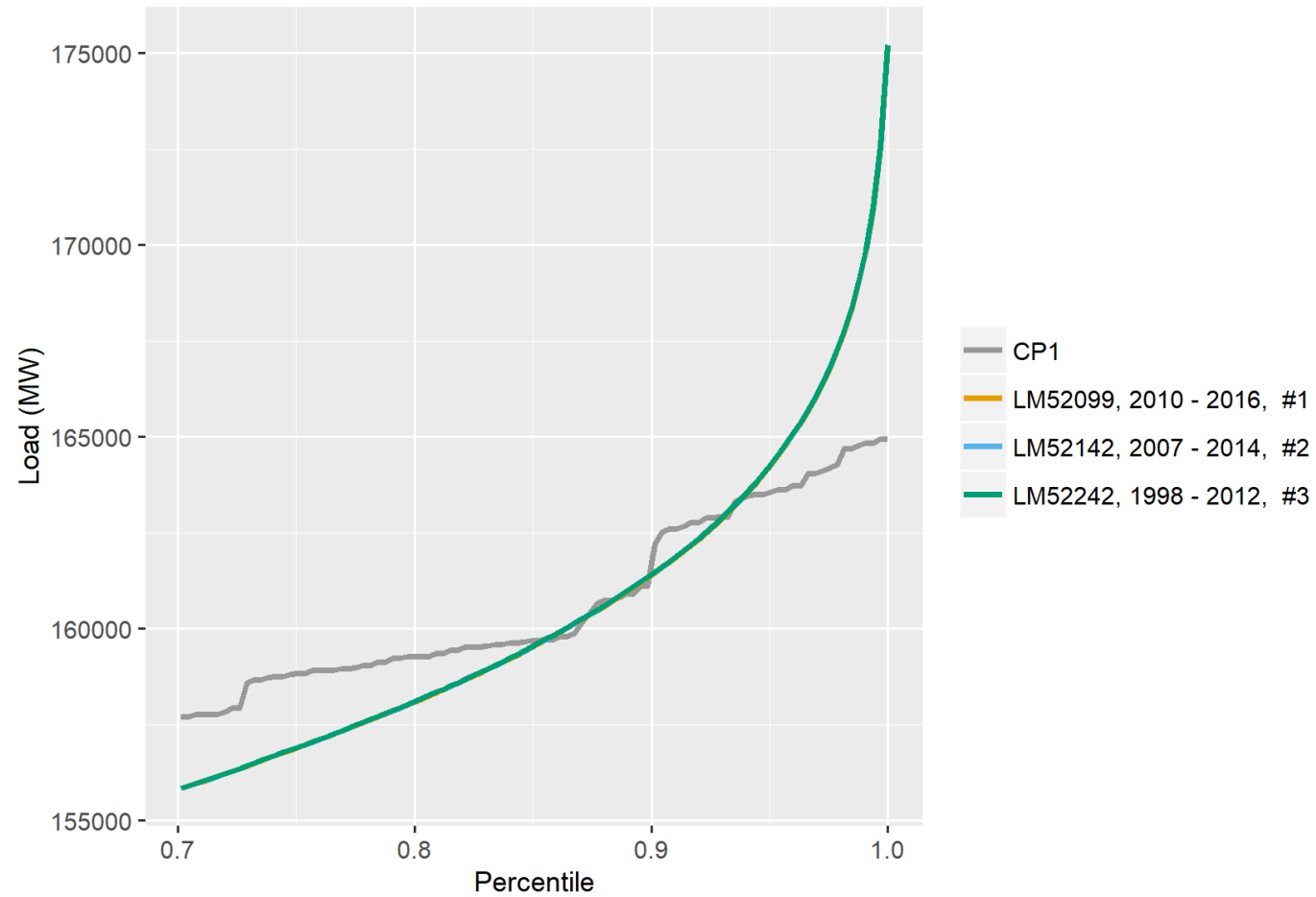
Load Forecast Model CP1 Distribution - 2020 vs 2019

CP1 Comparison: 2020 vs 2019 - Upper 30th Percentile



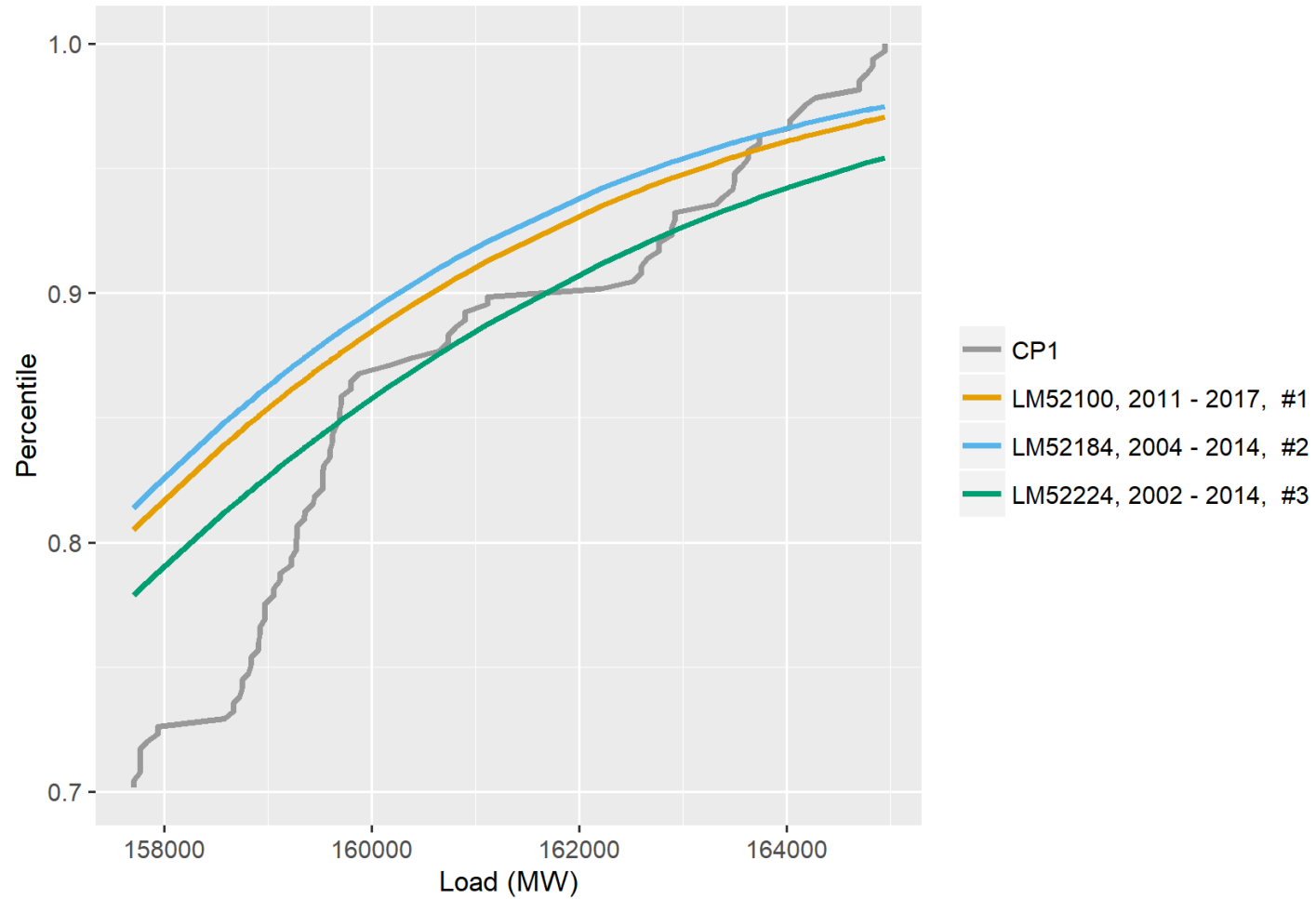
Approach 1 – 70th percentile and above

Approach #1 Results



Approach 2 - 70th percentile and above

Approach #2 Results



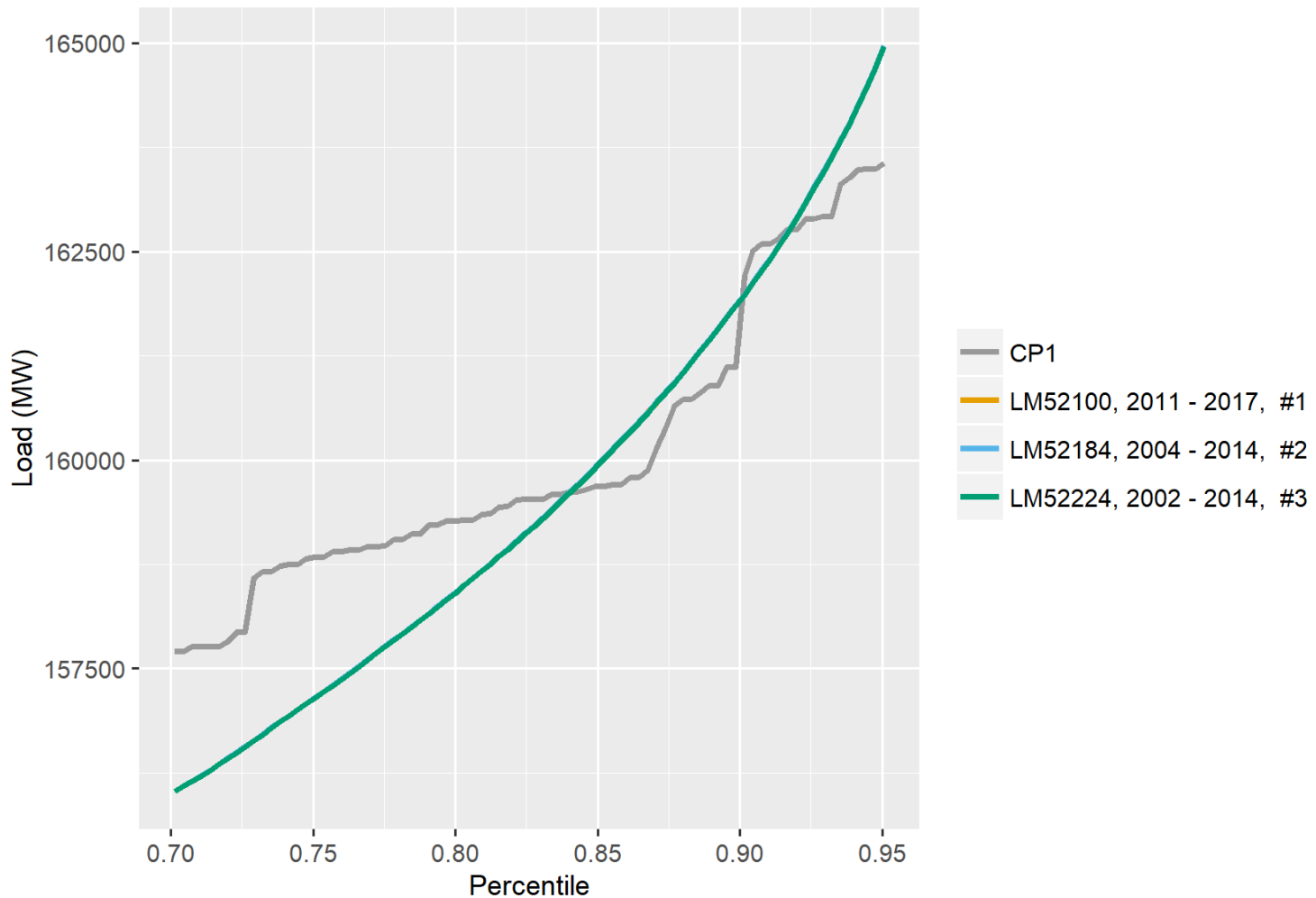
- The top ranked models from Approaches 1 and 2 do not match
- Approach #1. Top ranked
 - 52099: 2010-2016 (#38 in Approach #2)
 - 52142: 2007-2014 (#36 in Approach #2)
 - 52242: 1998-2012 (#35 in Approach #2)
- Approach #2. Top Ranked
 - 52100: 2011-2017 (#74 in Approach #1)
 - 52184: 2004-2014 (#75 in Approach #1)
 - 52224: 2002-2014 (#73 in Approach #1)

Comments about Approaches #1 and #2

- Approach #1 relies on sampling
- Approach #2 relies on an analytical approach
- Approach #2 is superior to Approach #1. Sampling is usually used when analytical approaches are not available.
- This suggests that the results from Approach 2 should take precedence

Approach 1 – Between 70th and 95th percentiles

Approach #1 Results



If we discard the upper 5th percentile, there is convergence between the results from Approaches 1 and 2

- Load Model (LM) Choices
 - 52100: 2011-2017
 - 52184: 2004-2014
 - 52224: 2002-2014
- Last year's selected LM (2003 – 2012) is **not** one of the top candidates this year.
 - This is because of the new CP1 distribution

- World Load Models were created using PLOTS program, observing the same historic time periods. In so doing, we consider the PJM/World diversity.
 - Uses historic Coincident Peak pattern
 - World defined as MISO, NY, TVA, and VACAR.



LM #52100 (2011-2017) - PJM vs World Assessment

		PJM RTO LM #52100 7 Yr Load Model - 2011 - 2017	World Region LM #52277
Month	WK #	Per-Unitized Peak	Per-Unitized Peak
June	5	0.8442	0.9056
June	6	0.9462	0.9389
June	7	0.9111	0.9544
July	8	0.9670	0.9662
July	9	0.9247	0.9494
July	10	1.0000	1.0000
July	11	0.9306	0.9338
August	12	0.9194	0.9928
August	13	0.9677	0.9585
August	14	0.9033	0.9291
August	15	0.8533	0.9099



LM #52184 (2004-2014) - PJM vs World Assessment

		PJM RTO LM #52184 11 Yr Load Model - 2004 - 2014	World Region LM #52278
Month	WK #	Per-Unitized Peak	Per-Unitized Peak
June	5	0.8482	0.8782
June	6	0.9140	0.9419
June	7	0.9462	0.9541
July	8	0.8744	0.8891
July	9	0.9002	0.9282
July	10	1.0000	1.0000
July	11	0.9226	0.9446
August	12	0.9677	0.9943
August	13	0.9382	0.9830
August	14	0.8461	0.9003
August	15	0.8131	0.8688



LM #52224 (2002-2014) - PJM vs World Assessment

		PJM RTO LM #52224 13 Yr Load Model - 2002 - 2014	World Region LM #52279
Month	WK #	Per-Unitized Peak	Per-Unitized Peak
June	5	0.8443	0.8748
June	6	0.8932	0.9090
June	7	0.9462	0.9541
July	8	0.8806	0.9053
July	9	0.9072	0.9308
July	10	1.0000	1.0000
July	11	0.9296	0.9508
August	12	0.9677	0.9943
August	13	0.9360	0.9819
August	14	0.8638	0.9163
August	15	0.8341	0.9037

- All 3 selected load models have PJM peaking on the same week as the World
- The 3 selected load models perform similarly under Approach 2 and under Approach #1 (70th to 95th percentiles)
- However, Load Model 52224: 2002-2014, is built with data from a longer time period
 - Also under Approach #1 (70th percentile and above), Load Model 52224: 2002-2014 performs better than the other 2 LMs

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	3-Aug-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	21-Jul-16	No
2017	19-Jul-17	20-Jul-17	No
2018	28-Aug-18	29-Jun-18	No

In the last 21 years, PJM and the World **have not peaked** on the same day 13 times.

LM #52224 (2002-2014) - Switching of World peak week

		PJM RTO LM #52224 13 Yr Load Model - 2002 - 2014	World Region LM #52279
Month	WK #	Per-Unitized Peak	Per-Unitized Peak
July	8	0.8806	0.9053
July	9	0.9072	0.9308
July	10	1.0000	0.9508
July	11	0.9296	1.0000

World peak week is now on Week 11. Originally, it was in Week 10.

- PJM recommendation to RAAS on selection of historical time period for load model:
 - **Use 13yr (2002-2014, #52224) Load Model for 2020 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