NYSRC Fall Forecast Update – Preliminary

2017 Weather Normalization

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Overview

1. Summary of 2017 Weather Normalized Peaks
2. Weather-Normalization Models
3. Update of Ratios of Non-Coincident Peaks to Coincident Peaks

1. Summary of Weather-Normalized Peaks

Acronyms used in this presentation

CE (or Con Ed)	Consolidated Edison
CH (or Cen Hudson)	Central Hudson
CP	Coincident Peak
CTHI	Cumulative Temperature Humidity Index
LI (or LIPA)	Long Island
N Grid (or Nat Grid)	National Grid
NYPA	New York Power Authority
NYSEG	New York State Electric & Gas
OR (or O & R)	Orange & Rockland
RGE (or RG & E)	Rochester Gas & Electric
NCP	Non-Coincident Peak
NYCA	New York Control Area

Actual and 20-Year Normal Peak-Producing CTHI Statistics – 1998-2017

Statistic	CE	CH	LI	N Grid	NYPA	NYSEG	OR	RGE	NYCA
Max	91.61	90.18	91.70	86.53	87.86	87.47	90.18	88.33	88.26
20 Yr Avg	86.22	85.38	85.21	82.08	81.92	82.21	85.38	83.31	84.01
Min	81.55	81.83	78.98	77.35	77.26	78.00	81.83	78.50	79.19
StDev	2.86	2.78	3.48	2.66	3.12	2.71	2.78	2.74	2.71
50th	86.22	85.38	85.21	82.08	81.92	82.21	85.38	83.31	84.01
67th	87.45	86.58	86.71	83.23	83.27	83.38	86.58	84.50	85.18
90th	89.88	88.94	89.67	85.49	85.93	85.68	88.94	86.83	87.49
2017	83.81	81.83	82.22	77.83	77.52	78.00	81.83	79.22	80.79
Percentile	20%	10%	19%	6%	8%	6%	10%	7%	12%
z (2017)	-0.84	-1.28	-0.86	-1.59	-1.41	-1.55	-1.28	-1.49	-1.19
CTHI Delta	-2.41	-3.55	-2.99	-4.25	-4.40	-4.21	-3.55	-4.09	-3.22

$$Z = \frac{(CTHI - Avg)}{Std\ Dev}$$

Peak-producing CTHI is the Cumulative Temperature-Humidity Index that occurs on the day of the NYCA peak each year.

Con-Ed and O&R use the 67th percentile for design conditions. All others use the 50th percentile.

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Two Models for Weather Normalization

- **Pooled models (2013, 2016 & 2017)**
  - Select the most recent year with weather above design conditions (2013)
  - Exclude 2014 and 2015 because weather in those years was below normal and will not provide much information about recent trends
- **Single Year Models (2017)**
  - Review weather response only for the current year

Two Methods for Weather Normalization

- **Load Level Method**
  1. Obtain a regression equation f(CTHI) and evaluate at design condition.
- **Weather-Response Method**
  1. Obtain a regression equation and take its derivative f'(CTHI) (i.e, the slope of the regression line).
  2. Evaluate derivative at design condition. Multiply by difference of (Normal – Actual) CTHI.
  3. Add this change in load to the actual observed MW value.

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Summary of 2017 Preliminary Weather Normalization

Model Results for Each Method & Composite Results

Transmission District	Load Level Method		Weather Response Method		Average of Four 2017 Estimates	2016 WN CP MW
	Y 2017	Pooled	Y 2017	Pooled		
Con Edison	13,182	13,088	13,240	13,300	13,203	13,340
Central Hudson	1,012	1,040	1,070	1,099	1,055	1,069
LIPA	5,125	5,283	5,316	5,474	5,300	5,419
National Grid	6,992	6,817	6,877	7,089	6,944	7,155
NYPA	334	337	332	332	334	314
NYSEG	3,063	3,170	3,114	3,232	3,145	3,228
O&R	1,028	1,058	1,070	1,113	1,067	1,163
RG&E	1,607	1,558	1,657	1,592	1,604	1,562
NYCA TOTAL	**32,343**	**32,351**	**32,676**	**33,231**	**32,650**	**33,250**

Notes

1. Con-Edison & O&R are at 67th percentile design conditions.
2. Con-Edison models are for its non-coincident peak, not its NYCA coincident peak.

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Summary of 2017 Preliminary Weather Normalization
Transmission District Weather Normalized Peak Loads
NYCA Coincident Peaks

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9a)	(9b)	(10)=(9b)-(6)	(11)=(10)/(9b)
Transmission District	2017 Actual MW, 8/11/2017 HB 16	Estimated Muni Self-Gen	Demand Response Estimate MW	Weather Adjustment MW	2017 Weather Normalized MW	Loss Reallocation MW	2017 WN MW, Adj for Losses	2017 ICAP Market Forecast MW	2017 Forecast, Without Loss Adjustment	TO Forecast, Over /Under MW	TO Forecast Error, Percent Over /Under
Con Edison	11,864	0	0	1,179	13,043	149	13,192	13,534	13,360	317	2.4%
Cen Hudson	1,000	0	0	55	1,055	-10	1,045	1,043	1,050	-5	-0.5%
LIPA	4,989	10	0	311	5,310	43	5,353	5,427	5,384	74	1.4%
Nat. Grid	6,202	56	0	742	7,000	-213	6,787	6,891	7,108	108	1.5%
NYPA	322	0	0	12	334	4	338	305	301	-33	-10.9%
NYSEG	2,878	0	0	267	3,145	0	3,145	3,223	3,241	96	3.0%
O&R	975	0	0	92	1,067	13	1,080	1,177	1,167	100	8.6%
RG&E	1,413	0	0	191	1,604	14	1,618	1,577	1,567	-38	-2.4%
Grand Total	29,643	66	0	2,849	32,558	0	32,558	33,178	33,179	621	1.9%

Weather normalization based upon composite model results.

Summary of 2017 Preliminary Weather Normalization Transmission District Weather Normalized Peak Loads Locality Peaks

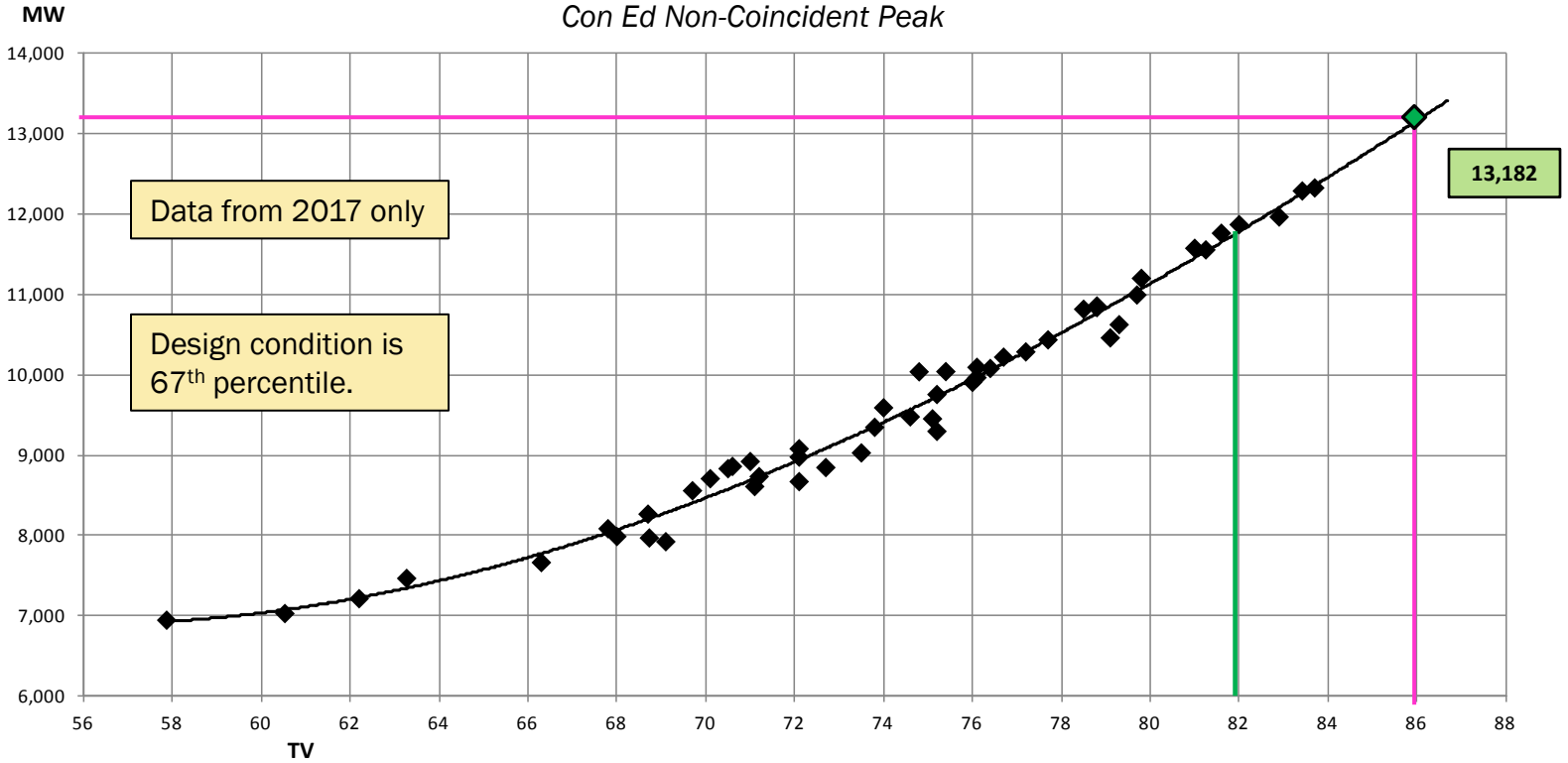
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Locality	Date and Time (Hr Beginning)	2017 Actual MW	Estimated Muni Self-Gen	Demand Response Estimate MW	Locality Weather Adjustment MW	2017 Adjusted MW	2017 ICAP Market Forecast MW	Over/Under MW	Percent Over/Under
Zone J - NYC	7/20/17 HB 16	10,668	0	0	790	11,458	11,670	212	1.8%
Zone K - LI	7/20/17 HB 16	5,137	10	0	317	5,464	5,427	-37	-0.7%
Zone GHIJ	7/20/17 HB 16	12,321	0	0	3,379	15,700	16,061	361	2.3%

Weather normalization based upon coincident peak results and NCP/CP ratios for each Locality.

2. Weather Normalization Models

Preliminary 2017 Weather Normalization Model

Con Ed Non-Coincident Peak



Green line is temperature at time of NYCA Peak. Pink lines indicate normal weather conditions. Number in box is the NYISO's preliminary weather-adjusted peak load value using the load level method for 2017 only.

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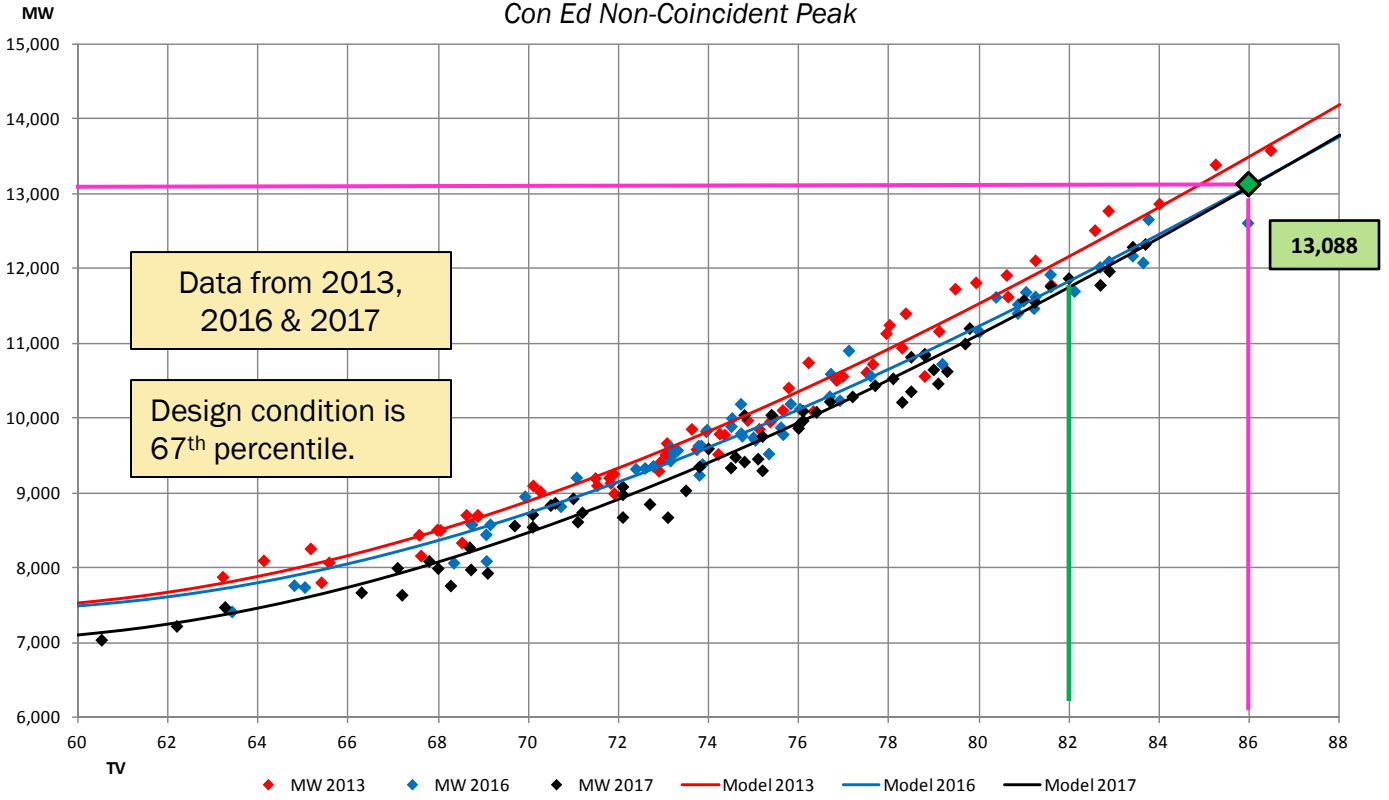
Preliminary 2017 Weather Normalization Pooled Model

Con Ed Non-Coincident Peak



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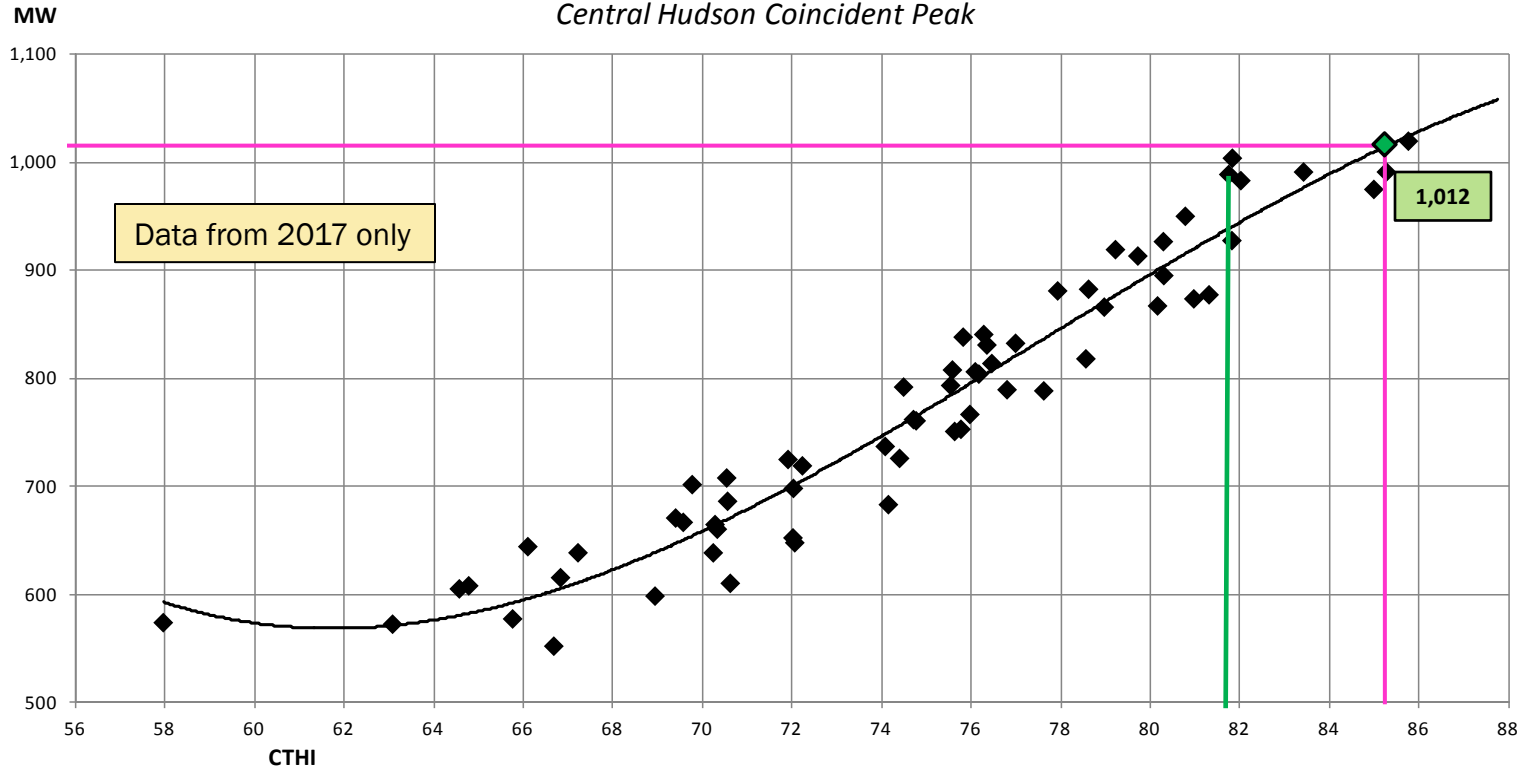
Preliminary 2017 Weather Normalization Model

Central Hudson Coincident Peak



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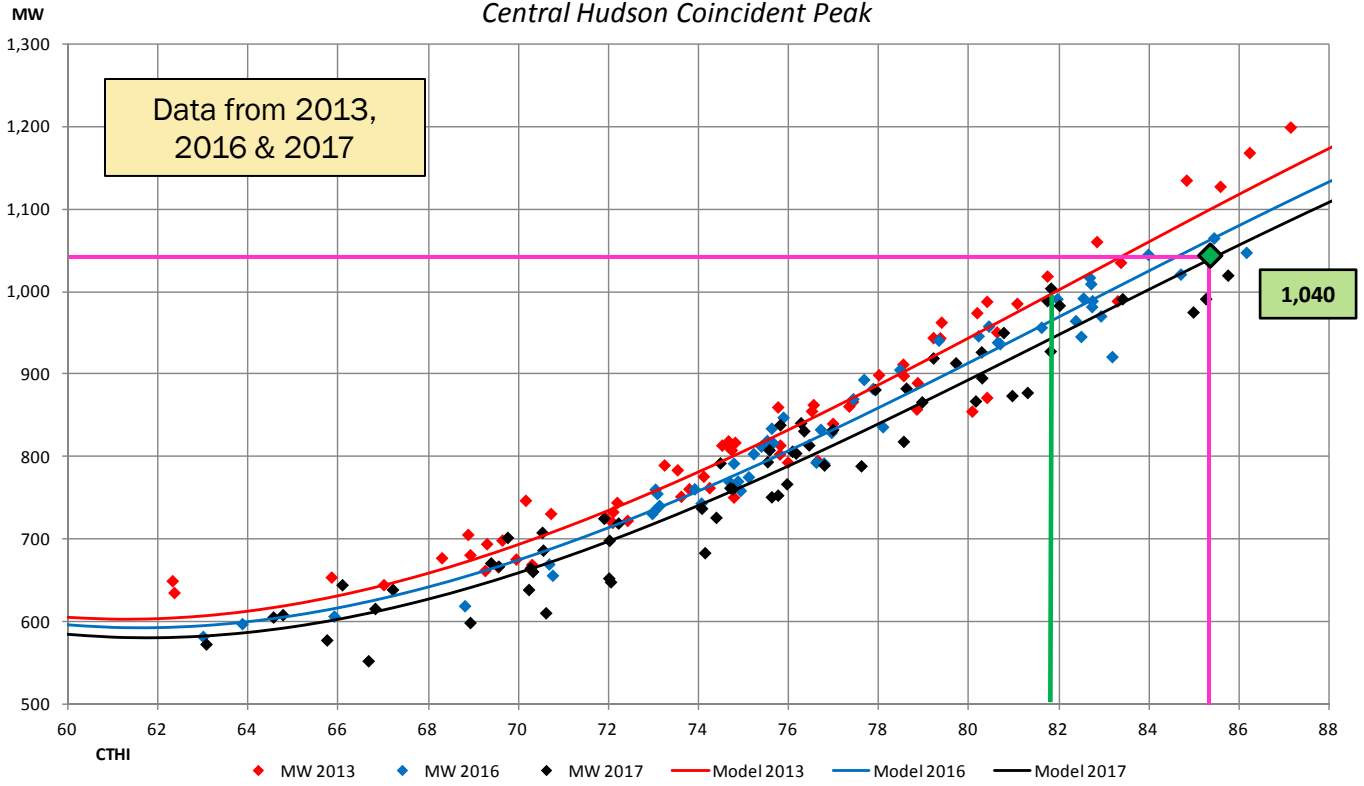

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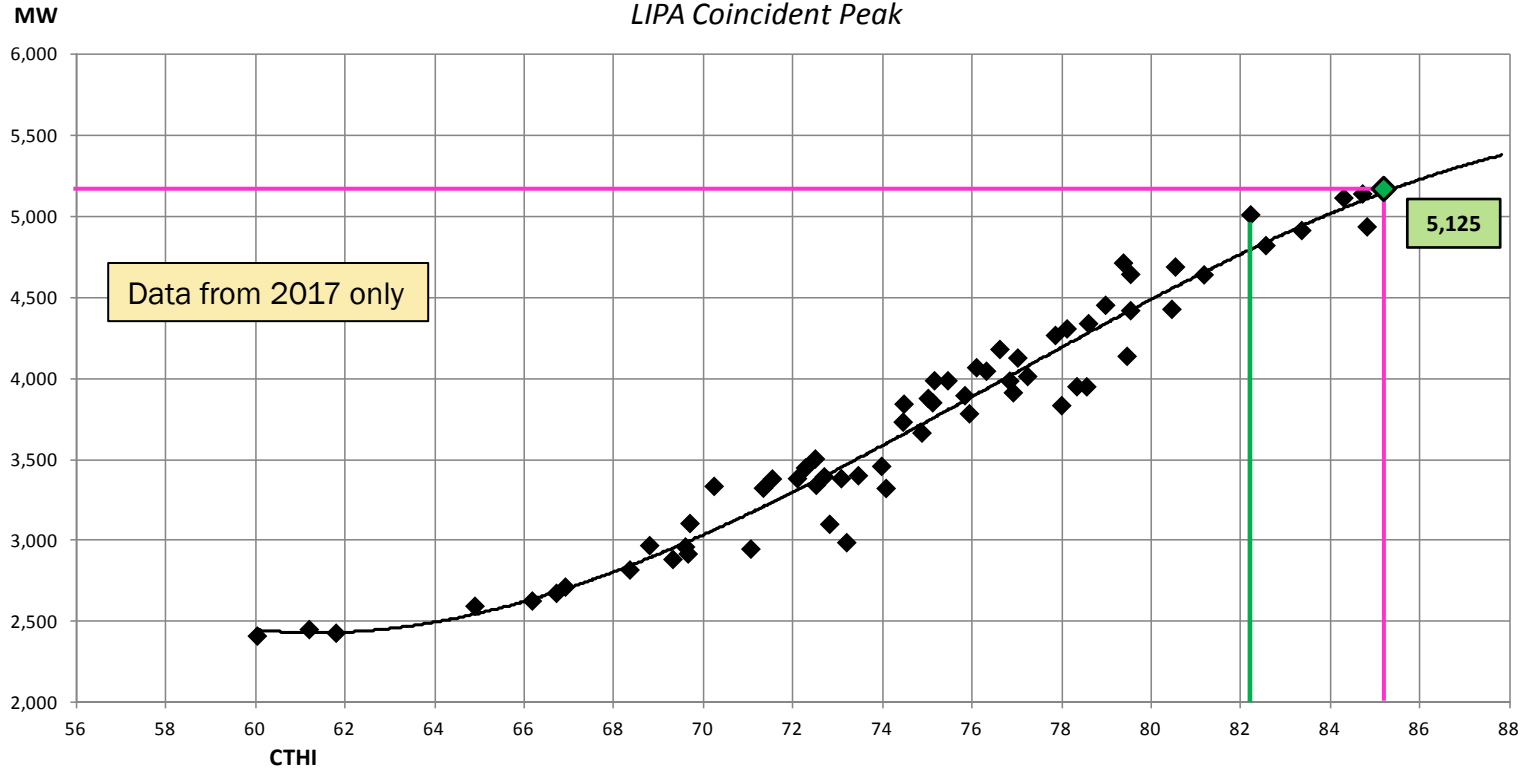
Preliminary 2017 Weather Normalization Model

LIPA Coincident Peak



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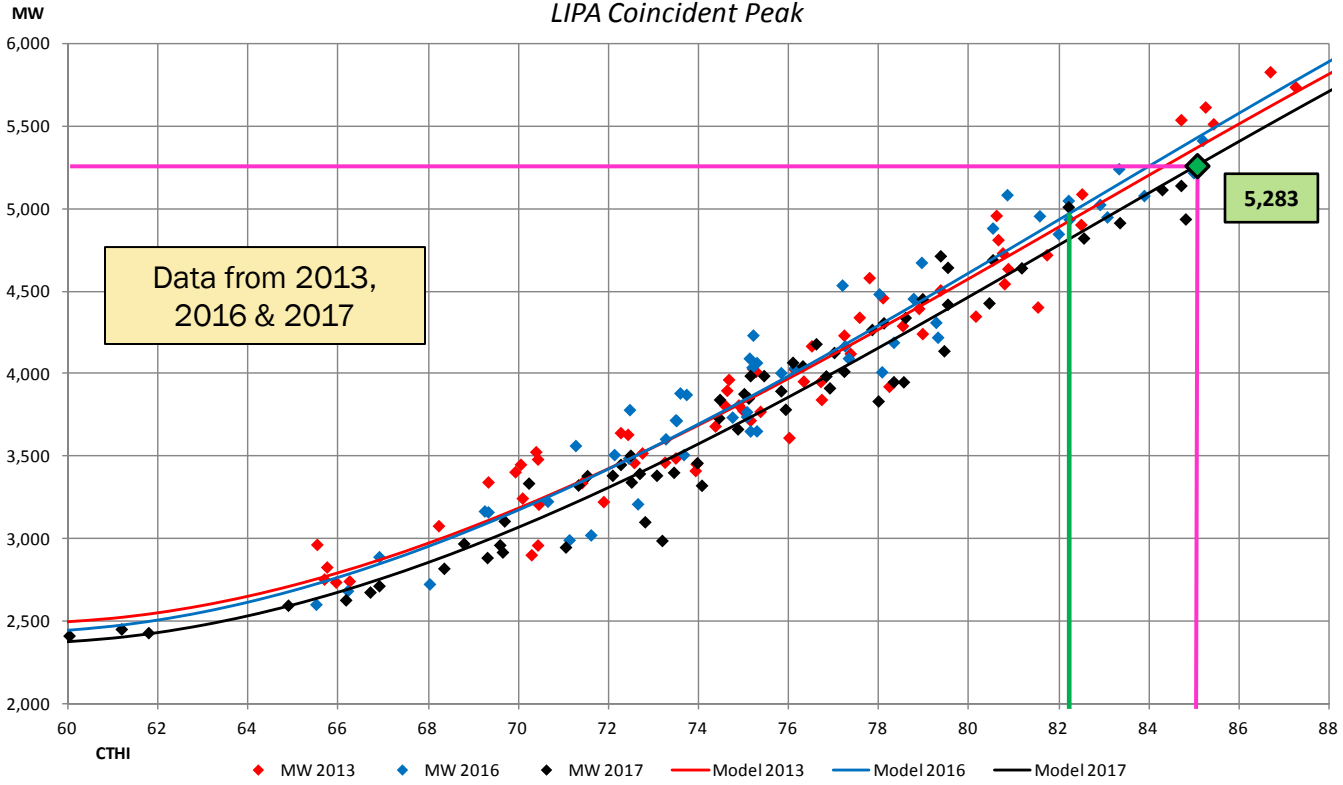
Preliminary 2017 Weather Normalization Pooled Model

LIPA Coincident Peak



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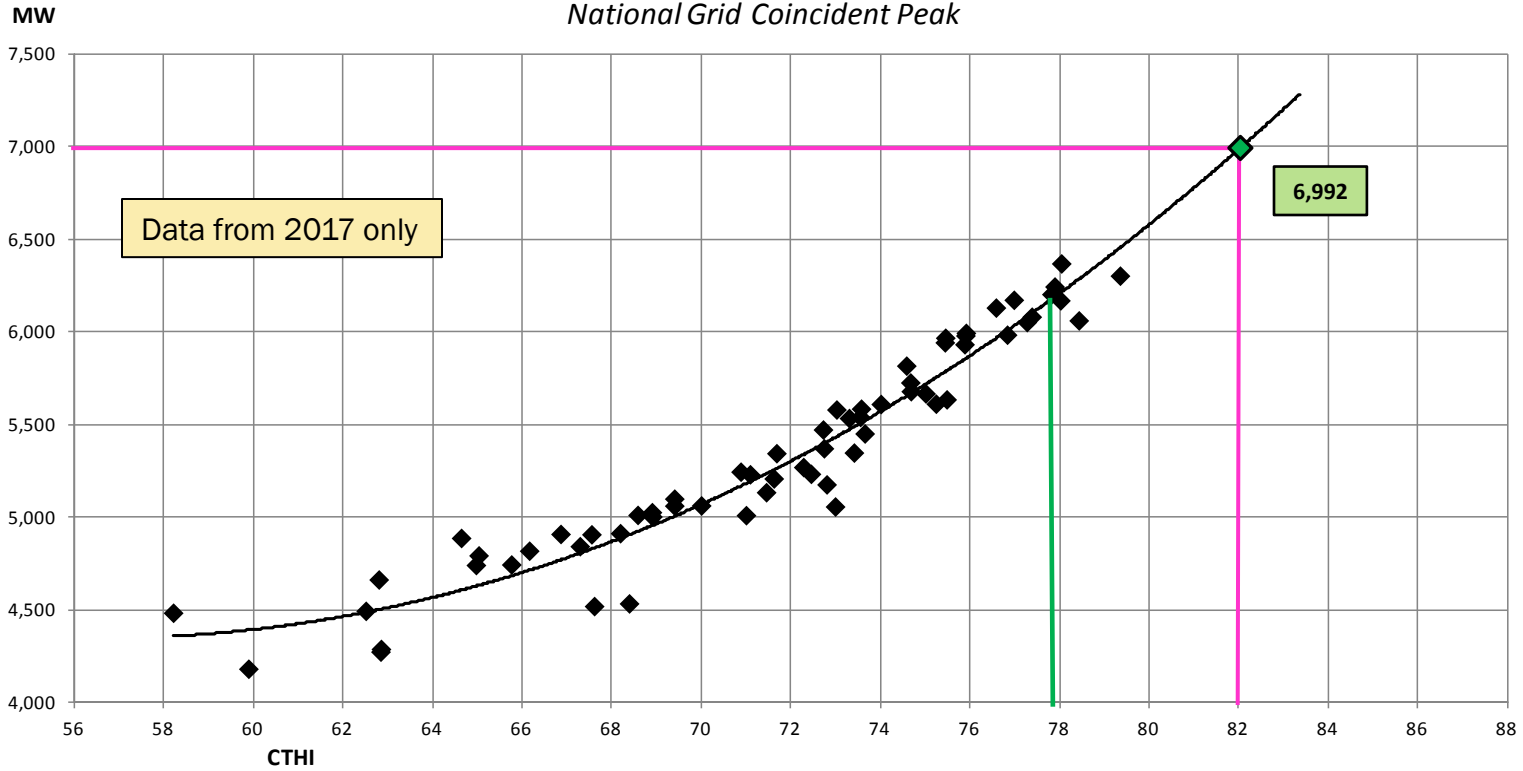
Preliminary 2017 Weather Normalization Model

National Grid Coincident Peak



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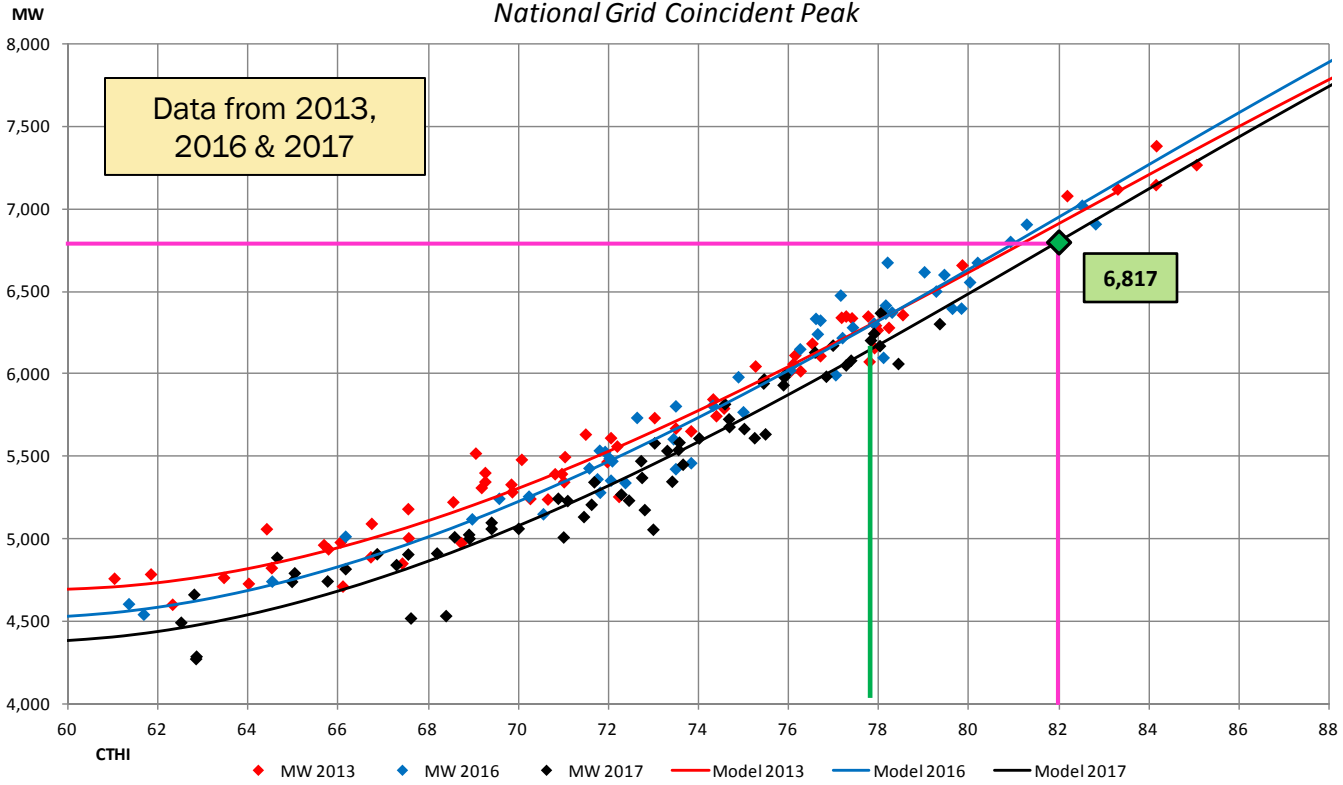

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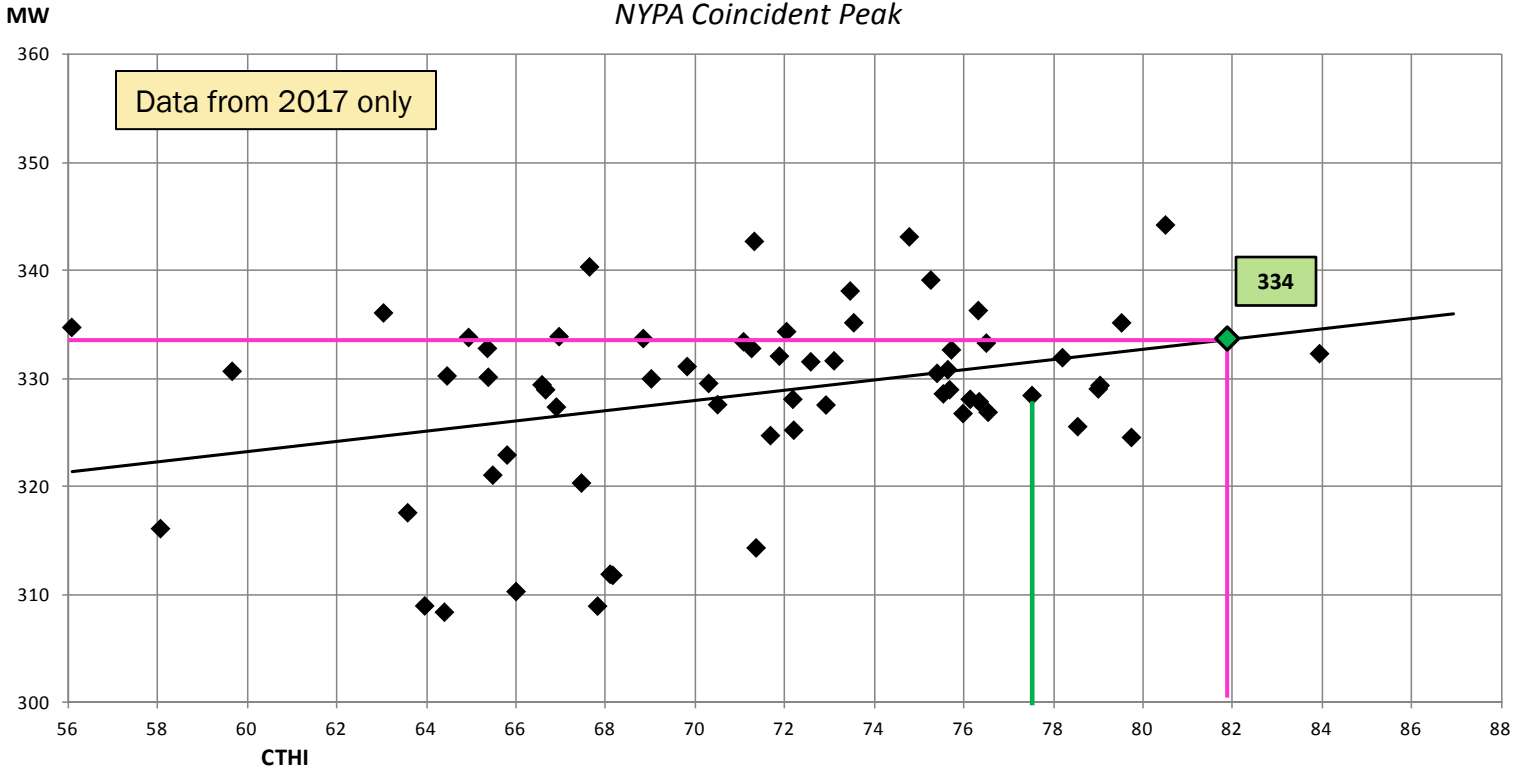
NYPA Coincident Peak



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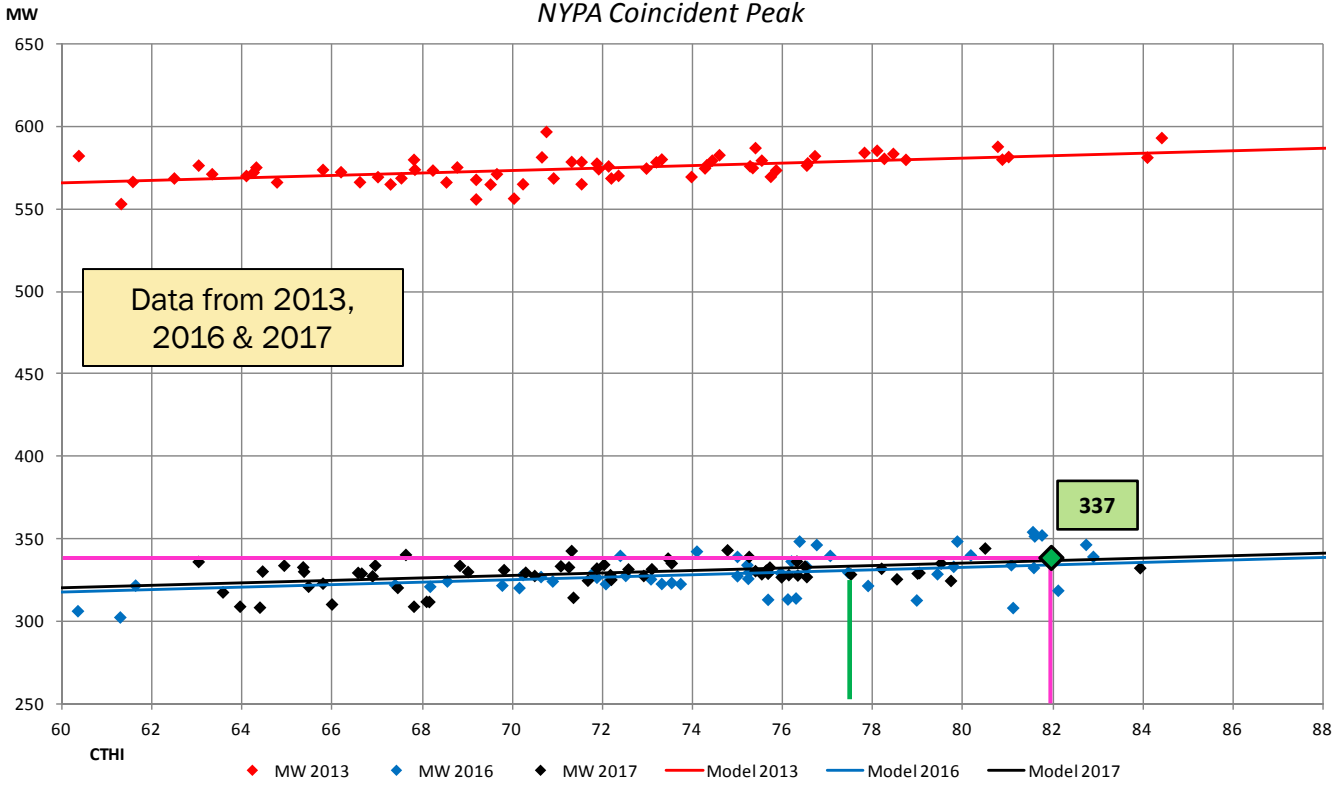
Preliminary 2017 Weather Normalization Pooled Model

NYPA Coincident Peak



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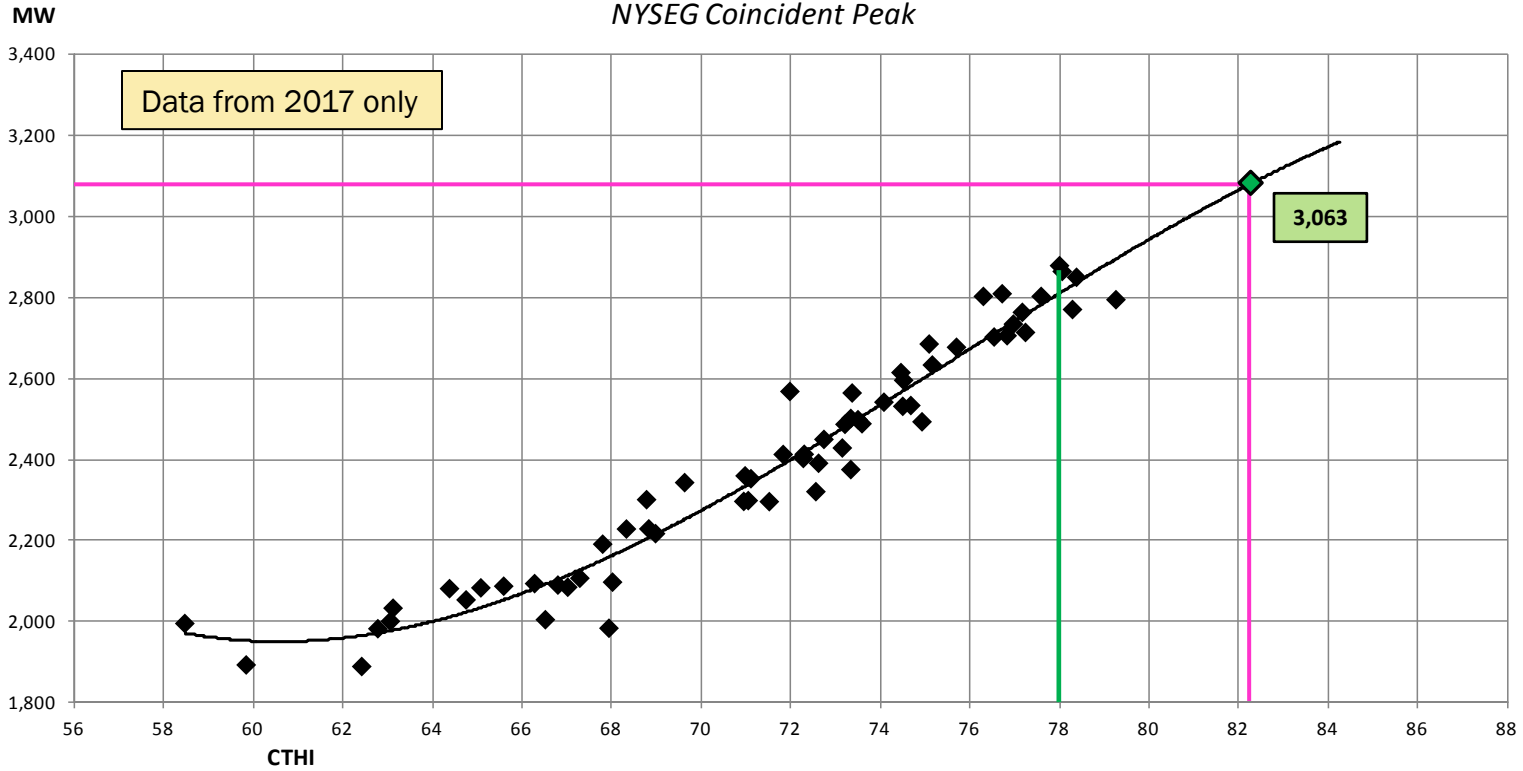
NYSEG Coincident Peak



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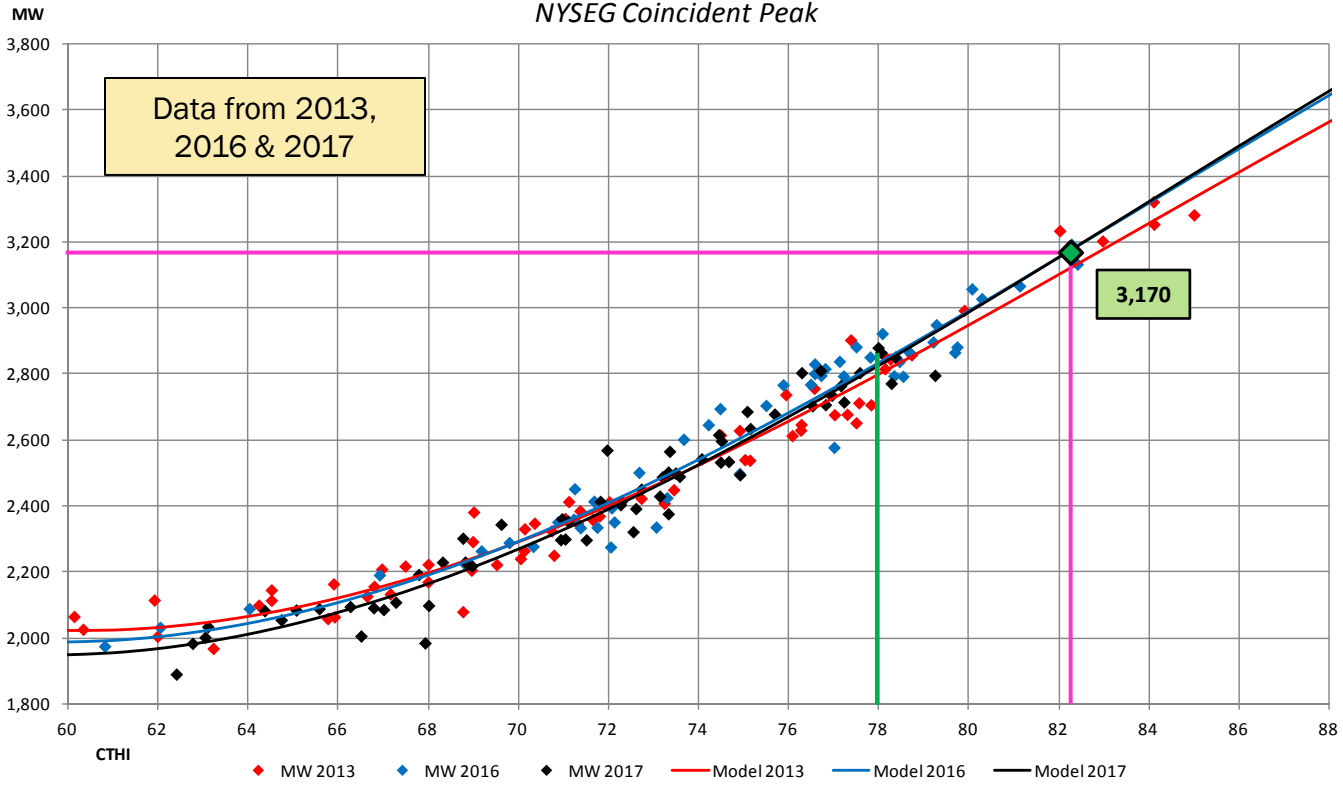
Preliminary 2017 Weather Normalization Pooled Model

NYSEG Coincident Peak



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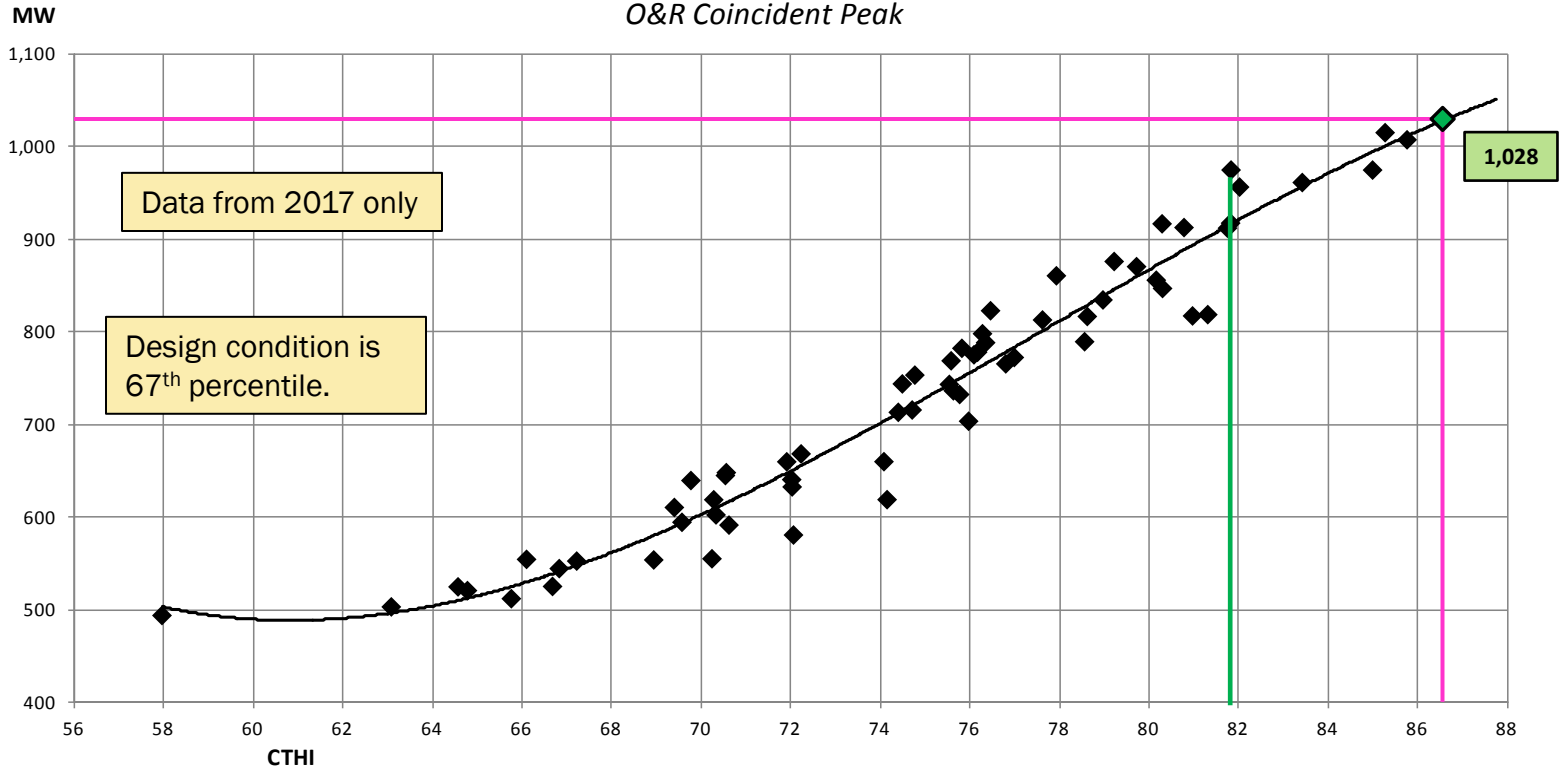
Preliminary 2017 Weather Normalization Model

O&R Coincident Peak



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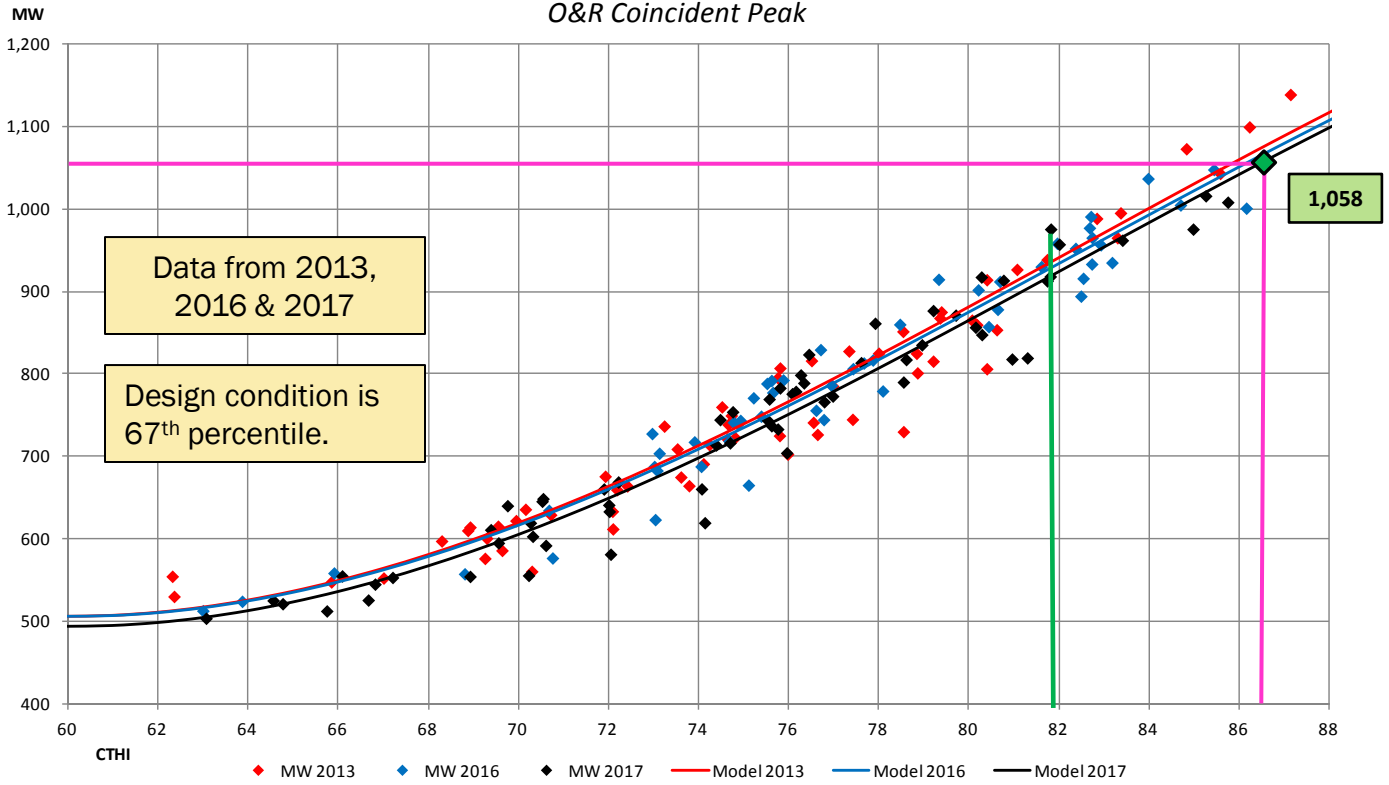
Preliminary 2017 Weather Normalization Pooled Model

O&R Coincident Peak



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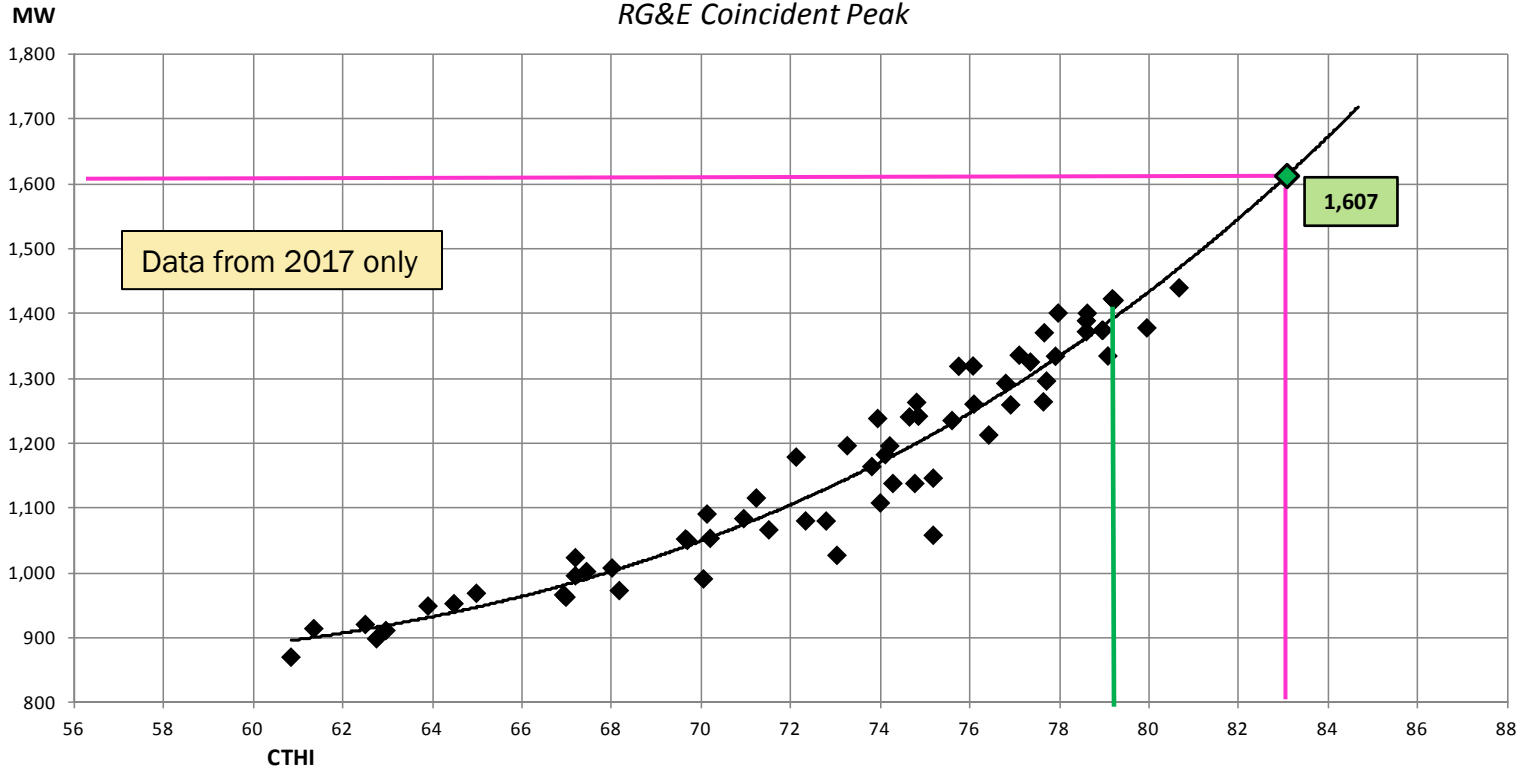
Preliminary 2017 Weather Normalization Model

RG&E Coincident Peak



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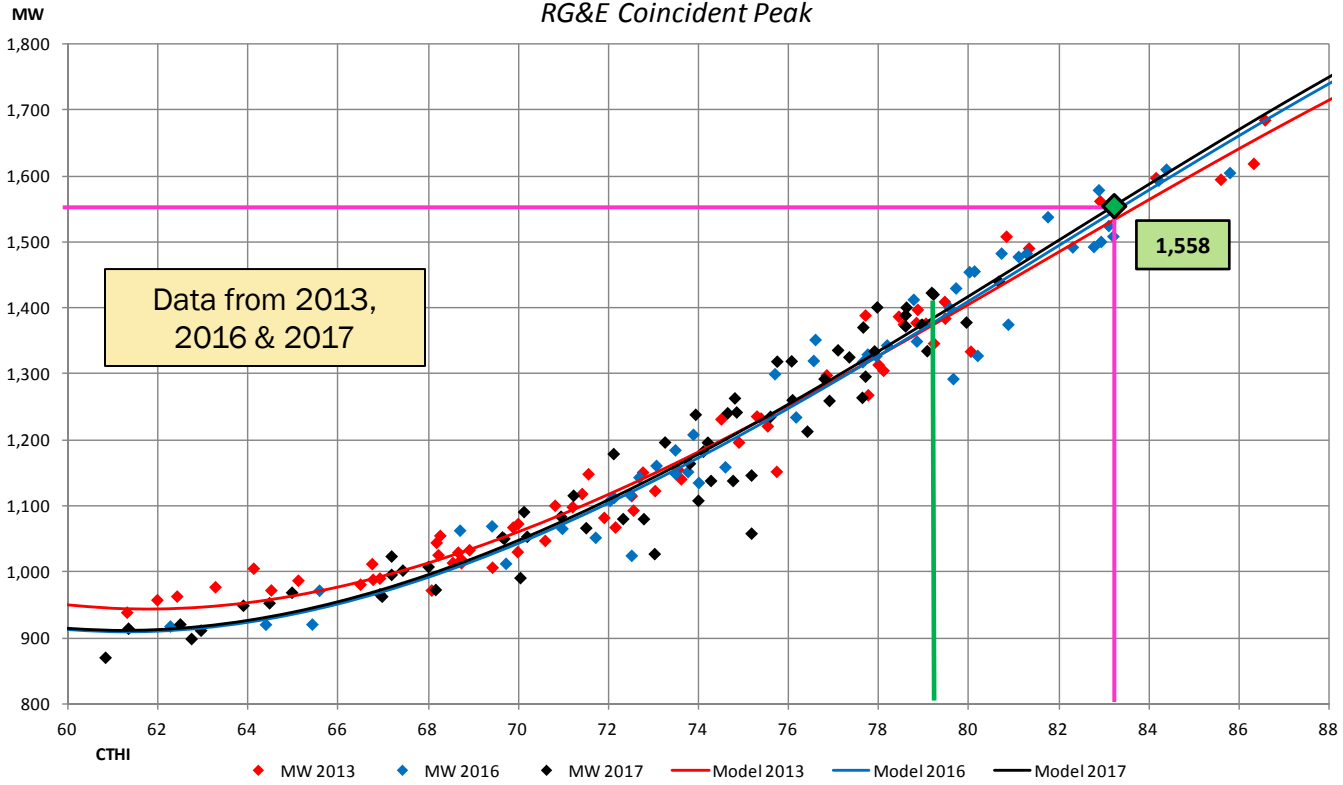
Preliminary 2017 Weather Normalization Pooled Model

RG&E Coincident Peak



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3. Ratios of Non-Coincident to Coincident Peaks

Update of Ten-Year Rolling Average of Coincident and Locality Peaks To Obtain NCP/CP Ratios for 2018

NYCA Coincident Peak Dates & Times & Zonal MW						
Year	NYCA Date	Hr Beg	Zone G	Zones H+I	Zone J	NYCA CP
2008	6/9/2008	17	2,277	2,056	10,979	15,311
2009	8/17/2009	16	2,159	1,875	10,366	14,400
2010	7/6/2010	17	2,399	2,187	11,600	16,186
2011	7/22/2011	16	2,482	2,239	11,826	16,546
2012	7/17/2012	14	2,282	2,082	11,405	15,769
2013	7/19/2013	17	2,384	2,253	11,736	16,373
2014	9/2/2014	16	2,036	1,917	10,567	14,520
2015	7/29/2015	16	2,070	1,930	10,455	14,455
2016	8/11/2016	16	2,069	1,993	11,006	15,068
2017	7/19/2017	17	2,011	1,898	10,249	14,158

G-to-J Locality Peak Dates & Times & Zonal MW						
Year	G-to-J Date	Hr Beg	Zone G	Zones H+I	Zone J	G-J NCP
2008	6/10/2008	17	2,338	2,101	11,262	15,701
2009	8/21/2009	15	2,117	1,879	10,661	14,657
2010	7/6/2010	17	2,399	2,187	11,600	16,186
2011	7/22/2011	16	2,482	2,239	11,826	16,546
2012	7/18/2012	13	2,288	2,071	11,424	15,783
2013	7/19/2013	17	2,384	2,253	11,736	16,373
2014	9/2/2014	17	2,046	1,933	10,572	14,551
2015	7/20/2015	16	2,059	1,996	10,675	14,730
2016	8/11/2016	16	2,069	1,993	11,006	15,068
2017	7/20/2017	16	2,046	1,936	10,722	14,704

All data is from DSS.

Update of Ten-Year Rolling Average of Coincident and Locality Peaks To Obtain NCP/CP Ratios for 2018

Zone J Locality Peak Dates & Times & Zonal MW

Year	Zone J Date	Hr Beg	Zone G	Zones H+I	Zone J	G-J NCP
2008	6/10/2008	17	2,338	2,101	11,262	15,701
2009	8/21/2009	15	2,117	1,879	10,661	14,657
2010	7/6/2010	17	2,399	2,187	11,600	16,186
2011	7/22/2011	12	2,375	2,107	11,876	16,358
2012	7/18/2012	15	2,115	2,002	11,438	15,554
2013	7/19/2013	17	2,384	2,253	11,736	16,373
2014	9/2/2014	17	2,046	1,933	10,572	14,551
2015	7/20/2015	16	2,059	1,996	10,675	14,730
2016	8/11/2016	16	2,069	1,993	11,006	15,068
2017	7/20/2017	17	2,046	1,936	10,722	14,704

Zone K Locality Peak Dates & Times & Zonal MW

Year	Zone K Date	Hr Beg	Coinci-dent Peak	Non-Coin. Peak	NCP/CP Ratio	Differ-ence
2008	6/10/2008	16	5,139	5,276	1.0268	138
2009	8/21/2009	15	5,059	5,191	1.0260	132
2010	7/6/2010	16	5,755	5,822	1.0115	66
2011	7/22/2011	15	5,896	5,914	1.0030	18
2012	6/21/2012	16	5,079	5,510	1.0848	431
2013	7/18/2013	16	5,589	5,764	1.0314	175
2014	9/2/2014	16	5,054	5,054	1.0000	-
2015	7/20/2015	16	5,136	5,247	1.0216	111
2016	8/12/2016	16	5,190	5,411	1.0426	221
2017	7/20/2017	16	4,989	5,137	1.0297	148

All data is from DSS.

Calculation of G-to-J NCP/CP Ratio

Coincident Peaks				
Period	**Zone G**	**Zone H+I**	**Zone J**	**G-to-J CP**
3 Yr Avg	2,050	1,940	10,570	14,560
5 Yr Avg	2,114	1,998	10,803	14,915
10 Yr Avg	2,217	2,043	11,019	15,279

15,430/15,279 = 1.0099

G-to-J Locality Peaks				
Period	**Zone G**	**Zone H+I**	**Zone J**	**G-to-J NCP**
3 Yr Avg	2,058	1,975	10,801	14,834
5 Yr Avg	2,121	2,022	10,942	15,085
10 Yr Avg	2,223	2,059	11,148	15,430

Period	**Zone G**	**Zone H+I**	**Zone J**	**G-to-J NCP**
3 Yr Avg	8	35	231	274
5 Yr Avg	7	24	140	170
10 Yr Avg	6	16	129	151

Period	**Zone G**	**Zone H+I**	**Zone J**	**G-to-J NCP**
3 Yr Avg	1.0039	1.0178	1.0218	1.0188
5 Yr Avg	1.0033	1.0120	1.0129	1.0114
10 Yr Avg	1.0027	1.0077	1.0117	1.0099

Calculation of Zone J NCP/CP Ratio

Coincident Peaks				
Period	**Zone G**	**Zone H+I**	**Zone J**	**G-to-J CP**
3 Yr Avg	2,050	1,940	10,570	14,560
5 Yr Avg	2,114	1,998	10,803	14,915
10 Yr Avg	2,217	2,043	11,019	15,279

11,155/11,019 = 1.0123

Zone J Locality Peaks				
Period	**Zone G**	**Zone H+I**	**Zone J**	**G-to-J NCP**
3 Yr Avg	2,058	1,975	10,801	14,834
5 Yr Avg	2,121	2,022	10,942	15,085
10 Yr Avg	2,195	2,039	11,155	15,388

Period	**Zone G**	**Zone H+I**	**Zone J**	**G-to-J NCP**
3 Yr Avg	8	35	231	274
5 Yr Avg	7	24	140	170
10 Yr Avg	(22)	(4)	136	110

Period	**Zone J**
3 Yr Avg	1.0218
5 Yr Avg	1.0129
10 Yr Avg	1.0123

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Calculation of Zone K NCP/CP Ratio

Period	K CP	K NCP	Ratio
3 Yr Avg	5,105	5,265	1.0314
5 Yr Avg	5,191	5,323	1.0253
10 Yr Avg	**5,289**	**5,433**	**1.0272**

Period			Diff.
3 Yr Avg			160
5 Yr Avg			131
10 Yr Avg			144

5,433/5,289 = 1.0272

The Mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefits to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policy makers, stakeholders and investors in the power system

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