New York ISO
Independent System Operator

Load Forecast Uncertainty (LFU) Models for the 2022 IRM Study

Riaz Khan

Demand Forecasting & Analysis

Load Forecasting Task Force

May 24, 2021, Teleconference

LFU Development Process

New York ISO

LFU Model Development

Two key steps:

Determine Load Weather Relationship

- Identify weather variable (e.g. CTHI*) with predictive power to predict peak load
- Develop model to establish the load-weather relationship accounting effects for calendar events (e.g. Month, Day of Week)
- From the relationship, find predicted load at various weather values at most recent hottest conditions

Apply Uncertainty due to Peak Producing (PP) Weather Variation

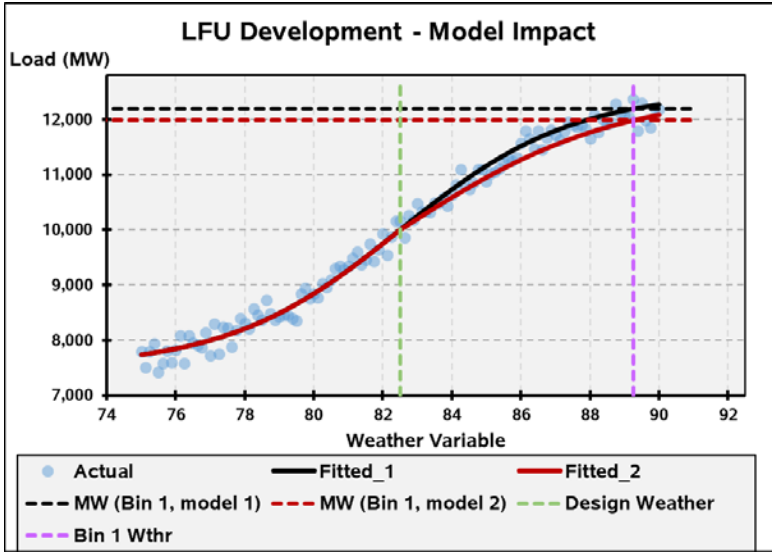
- Create design condition and bin scenarios from historical peak producing weather conditions
- Evaluate load levels at various weather conditions from the load curve developed in previous step
- Find ratios of load levels at different weather conditions relative to the design condition and report with associated probabilities

CTHI – Cumulative Temperature Humidity Index

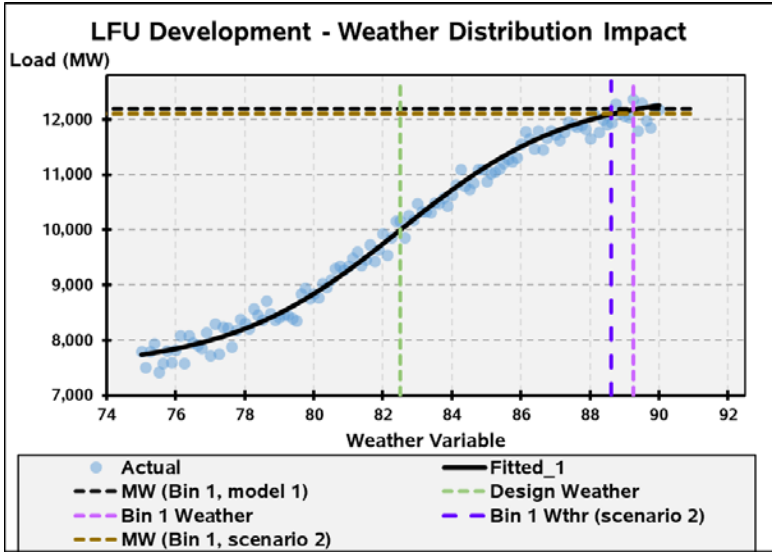
New York ISO

LFU Model Development - Sensitivity

Both steps are important contributors to the model results:



- Same weather distribution
- Same base load
- Updated load weather relationship



- Same load weather relationship
- Same base load
- Updated weather distribution

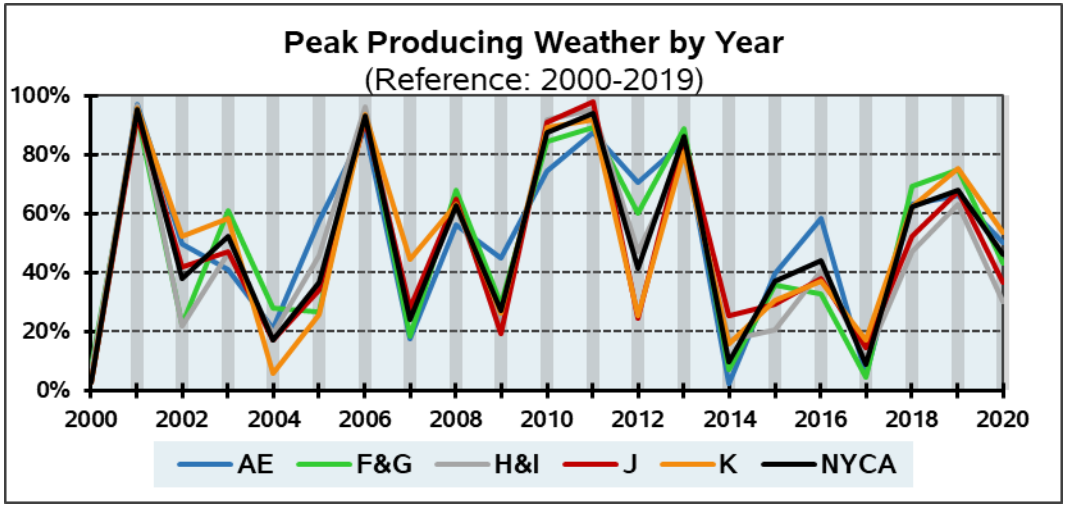
New York ISO

2020 Peak Producing Weather Summary

New York ISO

Peak Producing (PP) Weather 2020

Area	PP Weather 2020	Percentile PP Weather 2020	Design Condition	Percentile PP Weather 2019
A-E	82.1	50%	50%	66%
F&G	84.1	43%	54%	75%
H&I	83.8	30%	64%	63%
J	84.8	37%	67%	68%
K	85.0	54%	50%	75%
NYCA	83.6	46%	57%	68%



- Objective: Review 2020 load-weather relationship for inclusion in the current LFU Models (2021 LFU Models)
- Overall, 2020 peak producing weather below the design condition (Note: Design Condition Reference Period is 2000-2019)
- Only Zone K peak producing weather higher than design weather in 2020
- Only H&I area below design condition in 2019

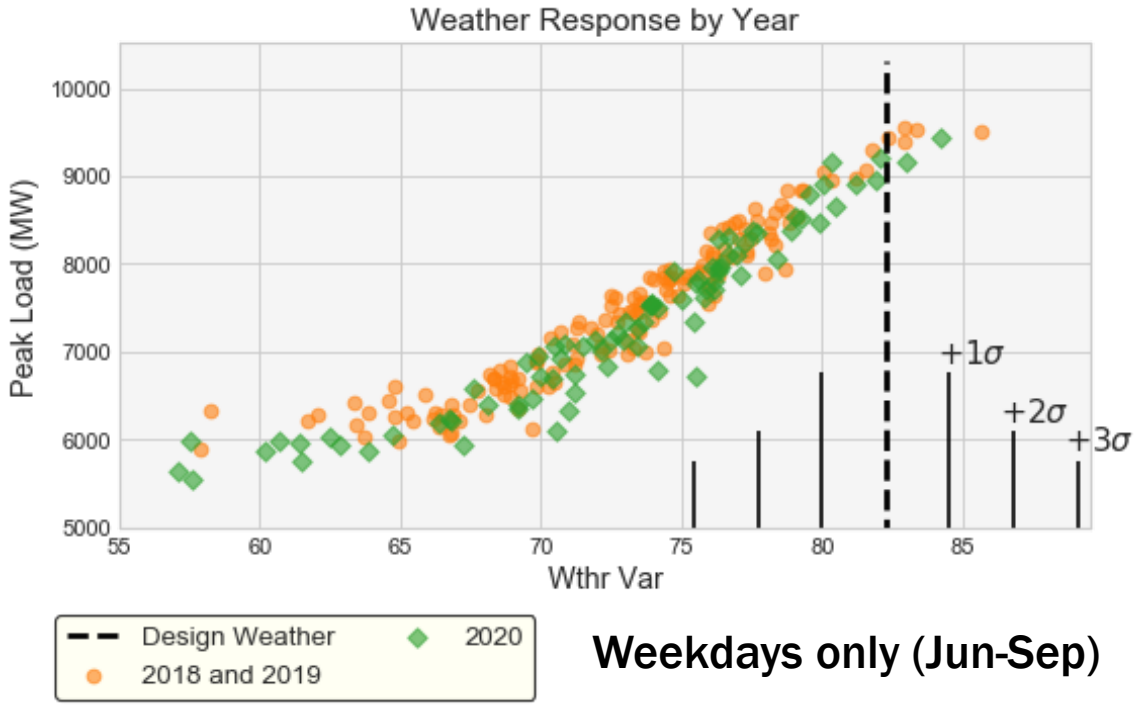
2021 LFU Models: https://www.nyiso.com/documents/20142/11883362/LFU_Summary.pdf

New York ISO

2020 Weather Response Review

New York ISO

Weather Response Zones A-E

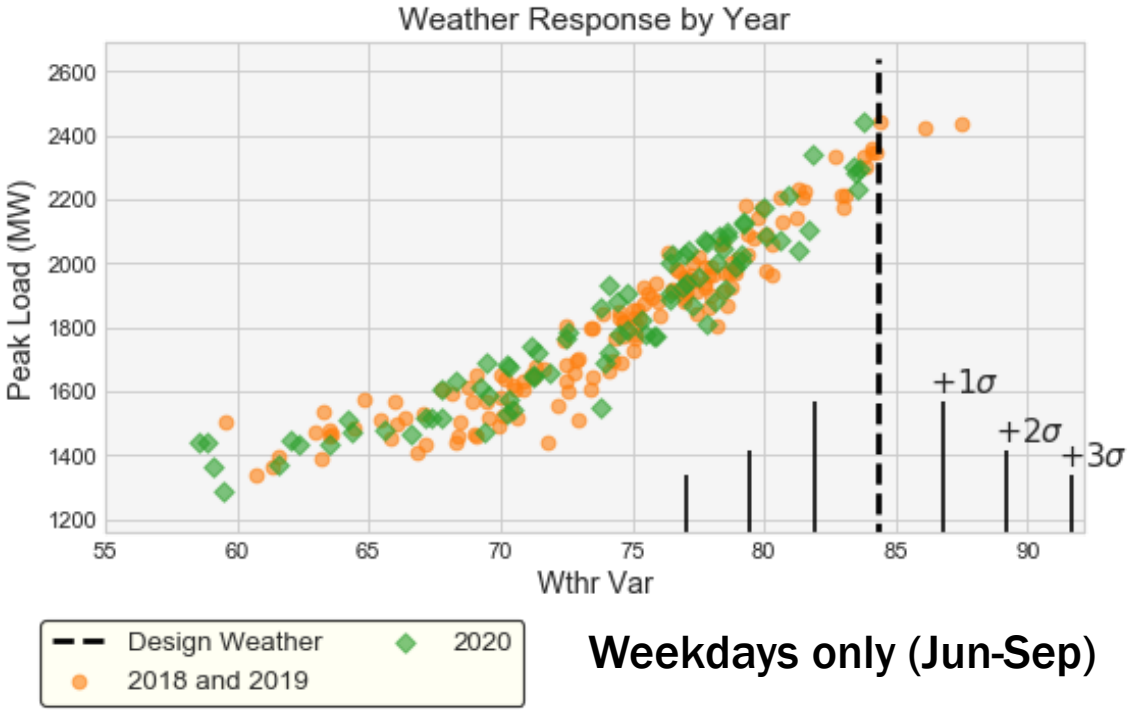


Weekdays only (Jun-Sep)

- **Few 2020 samples at upper temperature**
- **2020 level slightly below**
  - More pronounced at CTHI = 60~75

New York ISO

Weather Response Zone F

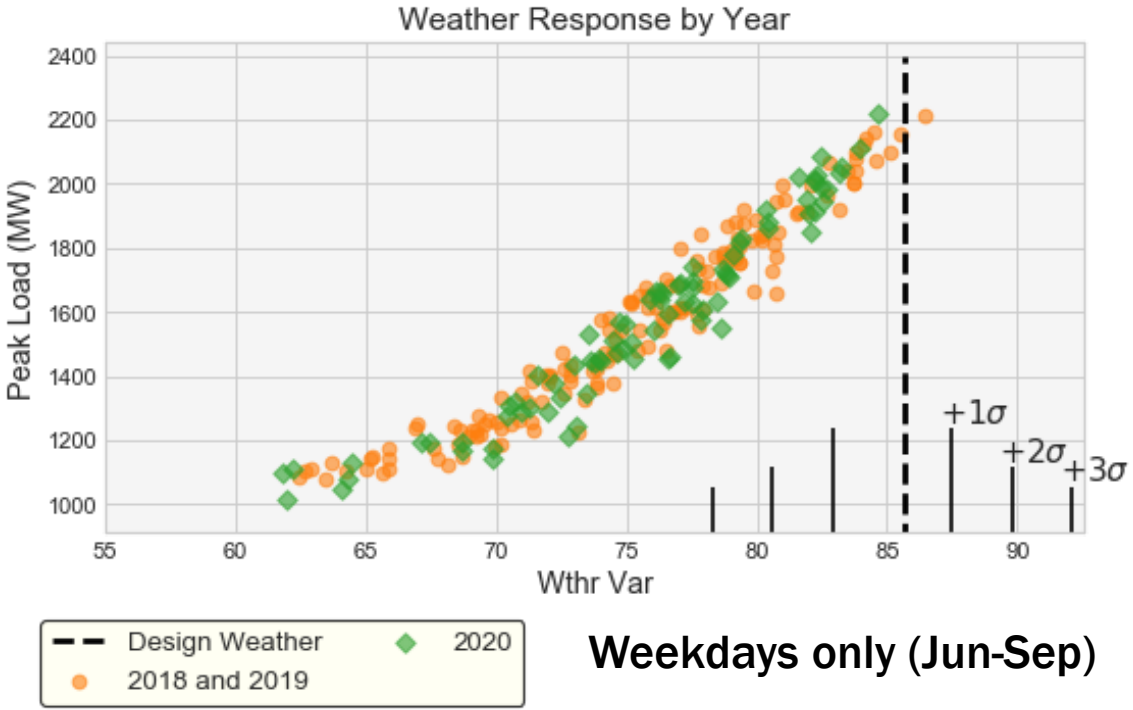


Weekdays only (Jun-Sep)

- No 2020 samples above design condition
- Slightly elevated level at CTHI = 70~75

New York ISO

Weather Response Zone G

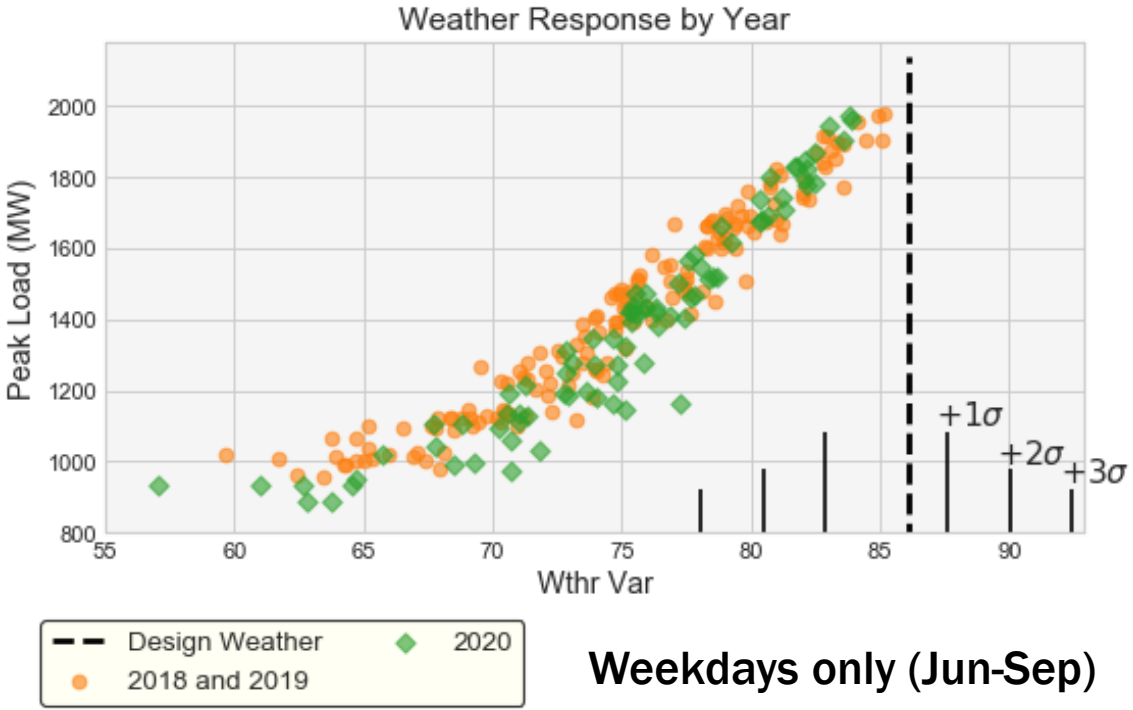


Weekdays only (Jun-Sep)

- No 2020 samples above design condition
- Lower 2020 level CTHI = 70~80, steeper curve at higher temperature

New York ISO

Weather Response Zones H&I

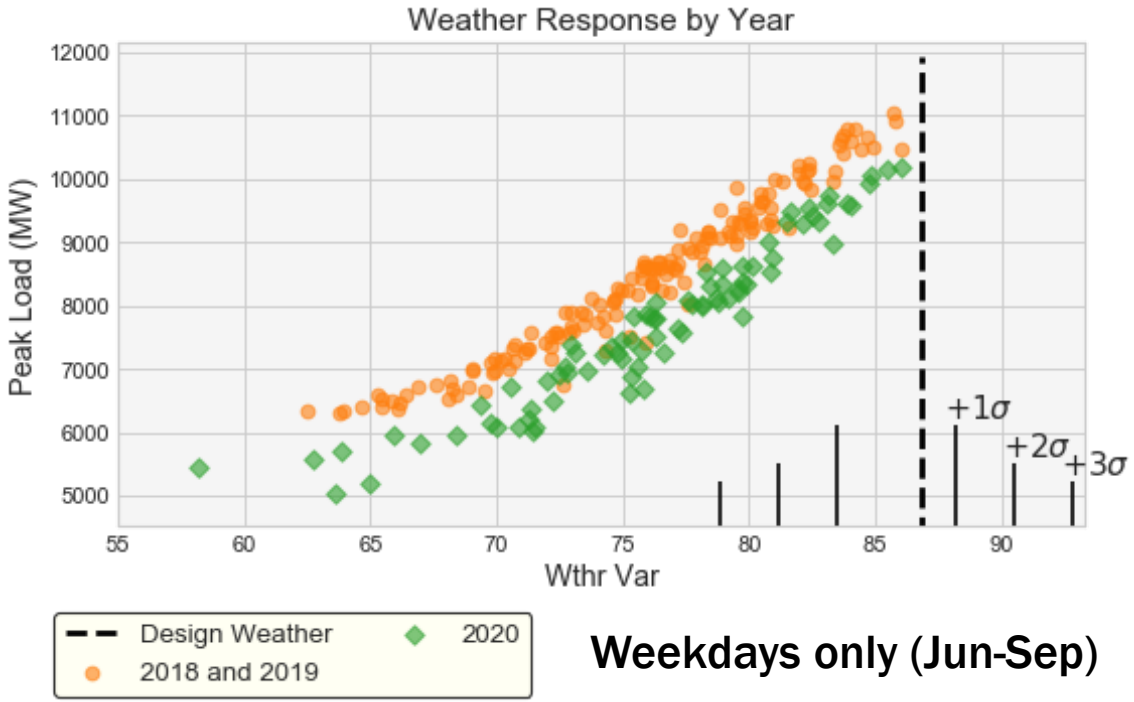


- No 2020 samples above design condition
- Lower 2020 level CTHI = 60~75, steeper curve at higher temperature

Weekdays only (Jun-Sep)

New York ISO

Weather Response Zone J

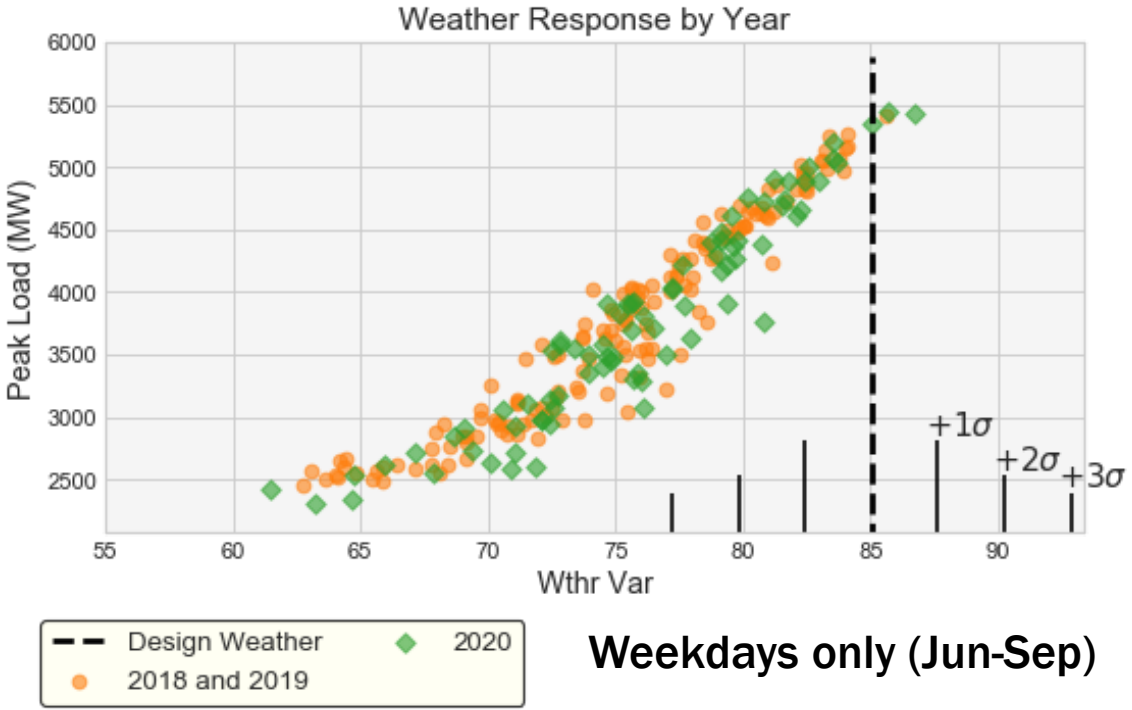


Weekdays only (Jun-Sep)

- No 2020 sample above design condition
- Clear shift in load curve
- Visibly parallel load curves

New York ISO

Weather Response Zone K



Weekdays only (Jun-Sep)

- **Few 2020 samples above design condition**
- **2020 load profile similar to the prior years**

New York ISO

Weather Response Summary

- **Few 2020 samples above design condition**
  - 2020 weather did not reach the 2018-2019 level except Zones J and K
- **Overall, 2020 weather response different from 2018-2019**
  - Visibly similar in Zone K
- **Parallel shift in Zone J**
  - Load levels were suppressed across all temperature conditions due to reduced economic activity during Summer 2020
- **Change in slope in A-E, G, H&I**
  - Steeper curve for CTHI > 75

New York ISO

2021 LFU Models With 2020 Data Included

New York ISO

Approach

- For each reliability area, two models were developed
  - A single LFU Model with 2020 load and weather data
  - A pooled model: 2020 data combined with 2018 and 2019

- For the pooled model:
  - 2020 impact was modeled as a constant shift of the load pattern
  - Interaction between month and 2020 (i.e., different impacts in different months) was investigated and appropriate interactions were kept based on statistical significance

- MW values were evaluated at the design and at different bin conditions so that they reflect the most recent hottest month(s) to calculate the LFU values

- Question: What impact will adding 2020 data to the current LFU models have?

New York ISO

LFU With 2020 Data – Zones A-E

	LFU			Delta	
Bin	2020 Model	Pooled Model	Current	2020 - Current	Pooled - Current
Design	100.0%	100.0%	100.0%	0.0%	0.0%
Bin_1	107.66%	108.51%	116.02%	-8.36%	-7.51%
Bin_2	106.34%	106.83%	111.11%	-4.76%	-4.27%
Bin_3	103.69%	103.90%	105.70%	-2.01%	-1.80%
Bin_4	100.00%	100.00%	100.00%	0.00%	0.00%
Bin_5	95.56%	95.43%	94.22%	1.34%	1.21%
Bin_6	90.67%	90.49%	88.58%	2.09%	1.90%
Bin_7	85.62%	85.45%	83.28%	2.34%	2.18%

- Similar results from 2020 model and pooled model
- LFU values significantly smaller than current values in upper bins
- Stronger saturation of the regression line, potentially caused by the steeper part just below design condition, ultimately trying to fit larger points with more curviness
- Suppressed load level in the upper bins contributing to the lower LFU values

New York ISO

LFU With 2020 Data – Zones F&G

	LFU			Delta	
Bin	2020 Model	Pooled Model	Current	2020 - Current	Pooled - Current
Design	100.0%	100.0%	100.0%	0.0%	0.0%
Bin_1	115.08%	113.07%	117.17%	-2.09%	-4.10%
Bin_2	110.54%	109.34%	111.70%	-1.16%	-2.36%
Bin_3	105.25%	104.73%	105.70%	-0.45%	-0.97%
Bin_4	99.40%	99.46%	99.36%	0.04%	0.09%
Bin_5	93.22%	93.75%	92.89%	0.33%	0.86%
Bin_6	86.90%	87.83%	86.48%	0.42%	1.36%
Bin_7	80.66%	81.93%	80.33%	0.33%	1.60%

- 2020 model produced slightly higher LFU values than the pooled model in upper bins
  - Pooled model exhibiting more saturation from prior years' data points
- LFU values smaller than current values in upper bins
- Contributing factors:
  - Elevated load levels around design condition
  - Stronger saturation in the upper temperature region

New York ISO

LFU With 2020 Data – Zones H&I

	LFU			Delta	
Bin	2020 Model	Pooled Model	Current	2020 - Current	Pooled - Current
Design	100.0%	100.0%	100.0%	0.0%	0.0%
Bin_1	120.20%	111.95%	113.56%	6.64%	-1.60%
Bin_2	112.57%	108.46%	109.46%	3.12%	-1.00%
Bin_3	104.95%	103.67%	104.06%	0.90%	-0.39%
Bin_4	97.33%	97.88%	97.68%	-0.35%	0.20%
Bin_5	89.71%	91.40%	90.66%	-0.95%	0.74%
Bin_6	82.09%	84.53%	83.35%	-1.25%	1.18%
Bin_7	74.47%	77.56%	76.06%	-1.59%	1.51%

- Large deviation between 2020 and pooled model; produced much higher and lower than current LFU values in the upper bins
- 2020 data alone did not yield a statistically reliable 3rd order model, so a linear model was used; extrapolation of linear model with no saturation produced large LFU values in the upper bins
- Both models produced elevated load levels around design condition
- Stronger saturation in the pooled model
  - Elevated base load (driven by 2020 points)
  - Lack of 2020 samples in the upper temperatures

New York ISO

LFU With 2020 Data – Zone J

	LFU			Delta	
Bin	2020 Model	Pooled Model	Current	2020 - Current	Pooled - Current
Design	100.0%	100.0%	100.0%	0.0%	0.0%
Bin_1	111.69%	110.79%	110.73%	0.96%	0.06%
Bin_2	107.65%	107.23%	107.33%	0.32%	-0.10%
Bin_3	102.92%	102.82%	102.89%	0.03%	-0.08%
Bin_4	97.69%	97.75%	97.67%	0.03%	0.08%
Bin_5	92.12%	92.22%	91.91%	0.21%	0.31%
Bin_6	86.36%	86.43%	85.86%	0.50%	0.56%
Bin_7	80.60%	80.57%	79.79%	0.81%	0.78%

- Similar results from both models
- Suppressed 2020 load levels; both models produced almost parallel downward shift of the regression line
- Marginally higher LFU values in the top bin
  - Potentially caused by smaller numerator and denominator values

New York ISO

LFU With 2020 Data – Zone K

	LFU			Delta	
Bin	2020 Model	Pooled Model	Current	2020 - Current	Pooled - Current
Design	100.0%	100.0%	100.0%	0.0%	0.0%
Bin_1	111.62%	111.42%	116.38%	-4.76%	-4.96%
Bin_2	110.06%	109.72%	111.97%	-1.91%	-2.25%
Bin_3	106.00%	105.75%	105.98%	0.02%	-0.24%
Bin_4	100.00%	100.00%	100.00%	0.00%	0.00%
Bin_5	92.60%	92.97%	91.88%	0.73%	1.09%
Bin_6	84.36%	85.14%	82.34%	2.02%	2.81%
Bin_7	75.83%	77.01%	75.52%	0.31%	1.50%

- Both models suggest slightly elevated load levels around design conditions
- Stronger saturation from both models in the upper bins
- LFU values– significantly smaller than current values in the upper bins
  - Potentially caused by smaller numerator (stronger saturation) and
  - Bigger denominator (higher base load)

New York ISO

Summary – LFU Models With 2020 Data

- **A-E**
  - Significantly smaller LFU values
  - Few 2020 data points above design condition; 2020 elevated load levels around design condition made the regression line flatter and hence there was stronger saturation
- **F&G**
  - 2020 and pooled model do not agree
  - Stronger saturation in the upper bin region, primarily derived from prior years' points (uncertainty whether the load level would follow similar load weather relationship)
- **H&I**
  - Stronger saturation in the upper bin region, primarily derived from prior years' points (uncertainty whether the load level would follow similar load weather relationship)

New York ISO

Summary – LFU With 2020 Data (Contd.)

- J
  - Suppressed load levels
  - Very similar LFU values in the upper bins
- K
  - Similar overall load shape
  - Small changes in base load and load levels in the upper bins
  - Big change in LFU values in the upper bins

Recommendation for IRM 2022:

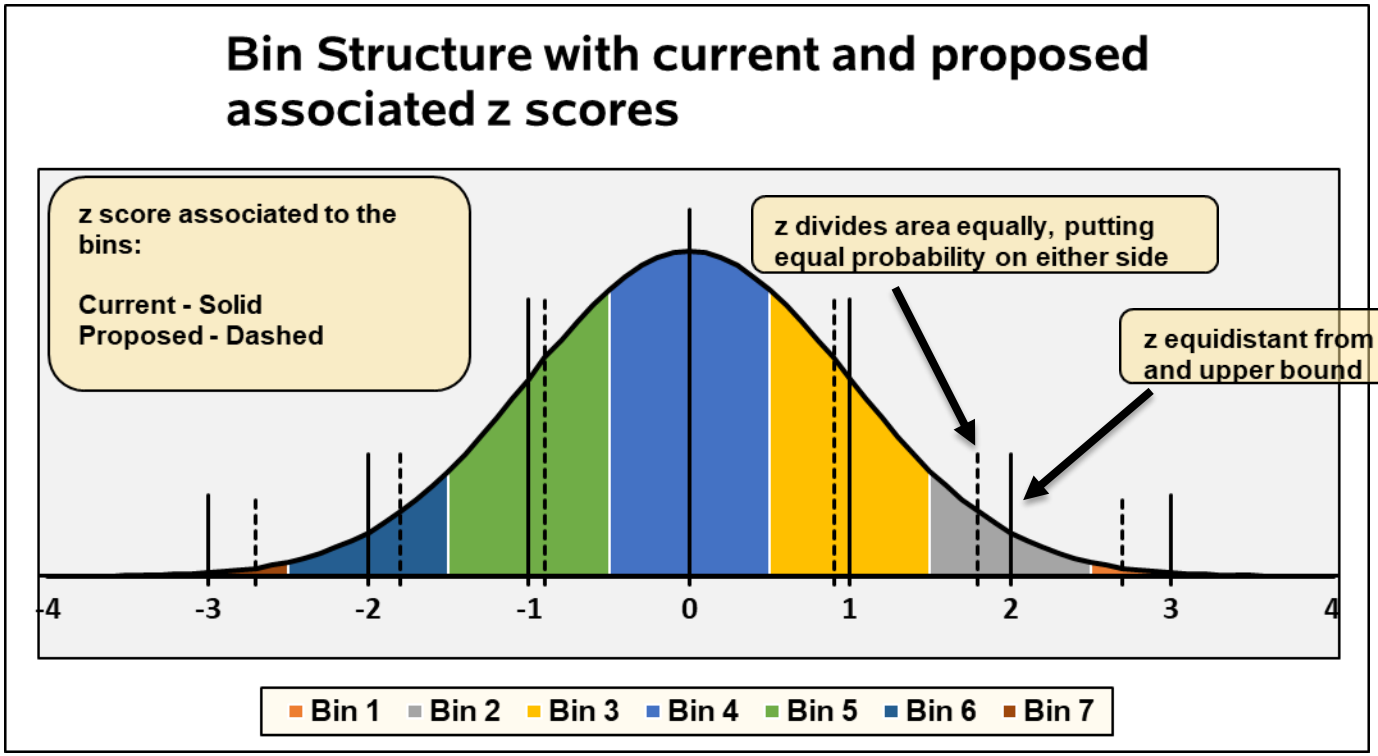
Different weather sensitivity, lack of data points above design conditions, and dynamic nature of COVID impact preclude us from recommending using 2020 data in the LFU models

New York ISO

2022 LFU Models Recommendation: Updated Bin Structure

New York ISO

Proposed Bin Structure



New York ISO

Proposed Bin Structure (Contd.)

Current Bin Structure								
Bin	Bin Lower Bound	Bin Upper Bound	Bin Probability	Associated z Score	Probabiltiy Left	Probabiltiy Right	Left Percentage	Right Percentage
1	2.5	+ Inf	0.0062	3.00	0.0049	0.0013	78%	22%
2	1.5	2.5	0.0606	2.00	0.0441	0.0165	73%	27%
3	0.5	1.5	0.2417	1.00	0.1499	0.0918	62%	38%
4	-0.5	0.5	0.3829	0.00	0.1915	0.1915	50%	50%
5	-1.5	-0.5	0.2417	-1.00	0.0918	0.1499	38%	62%
6	-2.5	-1.5	0.0606	-2.00	0.0165	0.0441	27%	73%
7	- Inf	-2.5	0.0062	-3.00	0.0013	0.0049	22%	78%

Proposed Bin Structure								
Bin	Bin Lower Bound	Bin Upper Bound	Bin Probability	Associated z Score	Probabiltiy Left	Probabiltiy Right	Left Percentage	Right Percentage
1	2.5	+ Inf	0.0062	2.74	0.0031	0.0031	50%	50%
2	1.5	2.5	0.0606	1.79	0.0303	0.0303	50%	50%
3	0.5	1.5	0.2417	0.89	0.1209	0.1209	50%	50%
4	-0.5	0.5	0.3829	0.00	0.1915	0.1915	50%	50%
5	-1.5	-0.5	0.2417	-0.89	0.1209	0.1209	50%	50%
6	-2.5	-1.5	0.0606	-1.79	0.0303	0.0303	50%	50%
7	- Inf	-2.5	0.0062	-2.74	0.0031	0.0031	50%	50%

New York ISO

Proposed Bin Structure (Contd.)

Proposed (based on equal area z-scores)							
Bin	Bin Probability	A-E	F&G	H&I	J	K	NYCA (Winter)
1	0.0062	114.78%	115.85%	112.55%	109.95%	115.63%	111.01%
2	0.0606	110.01%	110.53%	108.40%	106.49%	110.73%	106.89%
3	0.2417	105.06%	105.01%	103.36%	102.33%	105.30%	103.25%
4	0.3830	100.00%	99.36%	97.68%	97.67%	100.00%	100.00%
5	0.2417	94.88%	93.61%	91.50%	92.58%	92.96%	97.05%
6	0.0606	89.73%	87.77%	84.89%	87.13%	84.32%	94.34%
7	0.0062	84.63%	81.88%	77.98%	81.38%	76.60%	91.85%

Current (based on equidistant z-scores)							
Bin	Bin Probability	A-E	F&G	H&I	J	K	NYCA (Winter)
1	0.0062	116.02%	117.17%	113.56%	110.73%	116.38%	112.22%
2	0.0606	111.11%	111.70%	109.46%	107.33%	111.97%	107.77%
3	0.2417	105.70%	105.70%	104.06%	102.89%	105.98%	103.69%
4	0.3830	100.00%	99.36%	97.68%	97.67%	100.00%	100.00%
5	0.2417	94.22%	92.89%	90.66%	91.91%	91.88%	96.69%
6	0.0606	88.58%	86.48%	83.35%	85.86%	82.34%	93.76%
7	0.0062	83.28%	80.33%	76.06%	79.79%	75.52%	91.22%

Delta (Proposed - Current)						
Bin	A-E	F&G	H&I	J	K	NYCA (Winter)
1	-1.24%	-1.32%	-1.01%	-0.78%	-0.75%	-1.21%
2	-1.10%	-1.17%	-1.06%	-0.84%	-1.24%	-0.88%
3	-0.64%	-0.69%	-0.70%	-0.56%	-0.68%	-0.44%
4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5	0.66%	0.72%	0.84%	0.67%	1.08%	0.36%
6	1.15%	1.29%	1.54%	1.27%	1.98%	0.58%
7	1.35%	1.55%	1.92%	1.59%	1.08%	0.63%

New York ISO

LFU Model 2022 Recommendations

- Use the current (2021) models that describe load weather relationship
- Use equal area based z-scores for the defined bins
- Revisit this analysis in 2022 with an eye towards examining the load-weather relationship in 2021

Final Recommendations							
Bin	Bin Probability	A-E	F&G	H&I	J	K	NYCA (Winter)
1	0.0062	114.78%	115.85%	112.55%	109.95%	115.63%	111.01%
2	0.0606	110.01%	110.53%	108.40%	106.49%	110.73%	106.89%
3	0.2417	105.06%	105.01%	103.36%	102.33%	105.30%	103.25%
4	0.3830	100.00%	99.36%	97.68%	97.67%	100.00%	100.00%
5	0.2417	94.88%	93.61%	91.50%	92.58%	92.96%	97.05%
6	0.0606	89.73%	87.77%	84.89%	87.13%	84.32%	94.34%
7	0.0062	84.63%	81.88%	77.98%	81.38%	76.60%	91.85%

New York ISO

Questions?

New York ISO

Our mission, in collaboration with our stakeholders, is to serve the public interest and provide benefit 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 policymakers, stakeholders and investors in the power system

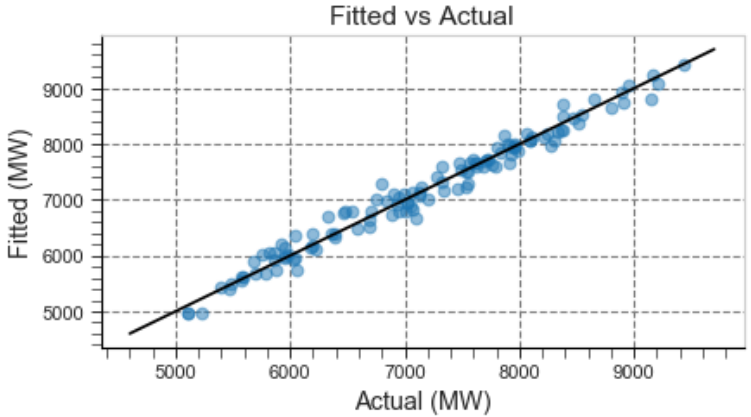
New York ISO

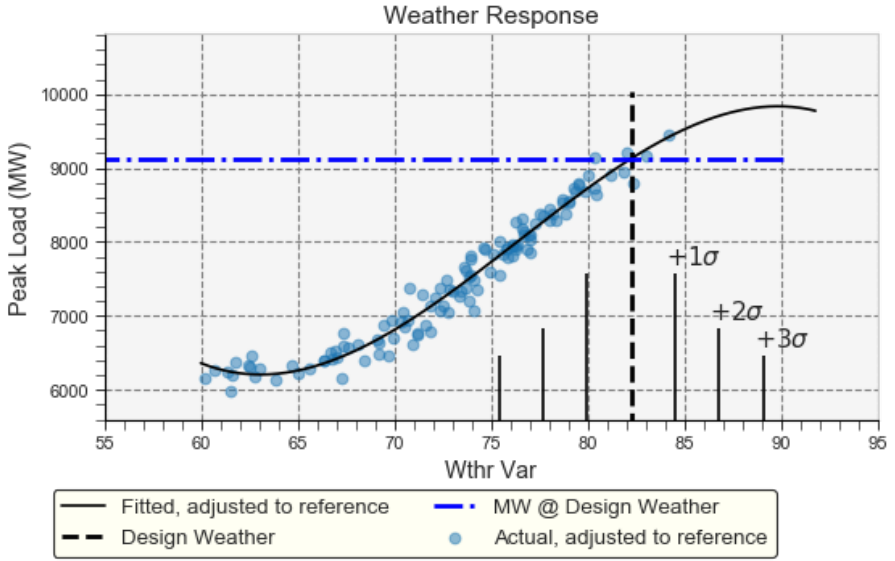
Modeling Reference Slides

New York ISO

2020 Model – Zones A-E

	Coef.	Std.Err.	t	P>|t|
Intercept	161690.34	26496.24	6.10	0.0000
wthr	-6435.98	1113.44	-5.78	0.0000
wthr2	86.83	15.53	5.59	0.0000
wthr3	-0.38	0.07	-5.26	0.0000
May	-806.94	57.66	-14.00	0.0000
Jun	-224.76	43.29	-5.19	0.0000
Sep	-279.11	49.93	-5.59	0.0000
Sat	-464.81	48.68	-9.55	0.0000
Sun	-429.90	46.10	-9.33	0.0000



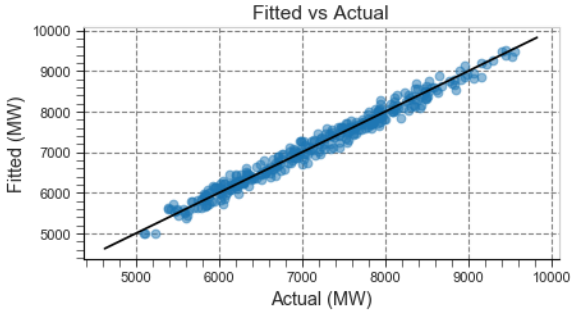


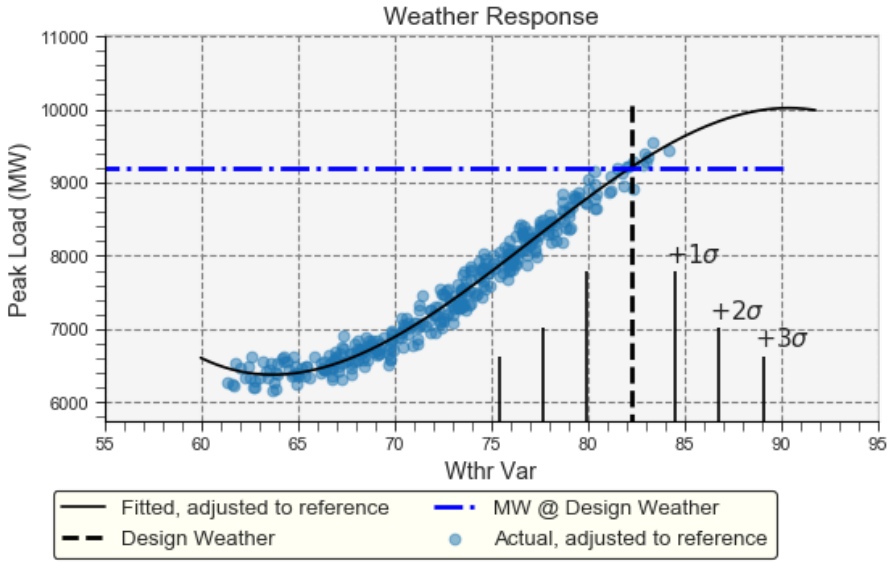
N	120
DF Model	8
R-Sq (%)	97.4
Adj. R-Sq (%)	97.2

New York ISO

Pooled Model – Zones A-E

	Coef.	Std.Err.	t	P>|t|
Intercept	167582.76	16926.12	9.90	0.0000
wthr	-6613.89	704.55	-9.39	0.0000
wthr2	88.48	9.74	9.08	0.0000
wthr3	-0.38	0.04	-8.55	0.0000
Y2018	152.82	17.74	8.62	0.0000
May	-556.44	35.48	-15.68	0.0000
Jun	-268.52	22.04	-12.19	0.0000
Sep	-169.63	26.98	-6.29	0.0000
May_2020	-304.51	51.77	-5.88	0.0000
Sep_2020	-147.43	40.91	-3.60	0.0004
Sat	-584.49	23.77	-24.59	0.0000
Sun	-532.67	22.72	-23.45	0.0000
Fri	-126.28	23.55	-5.36	0.0000

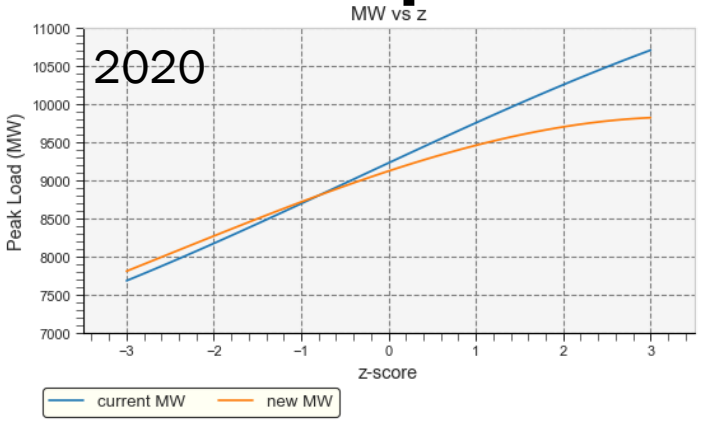


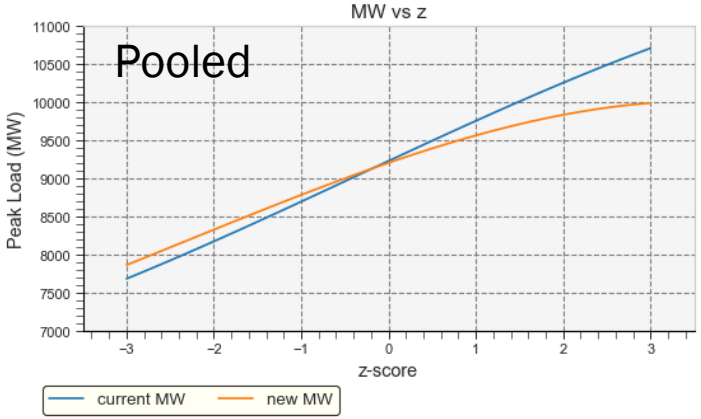


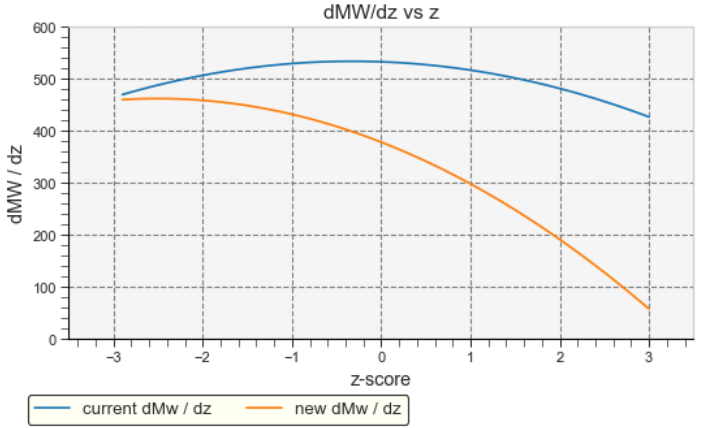
N	350
DF Model	12
R-Sq (%)	97.9
Adj. R-Sq (%)	97.8

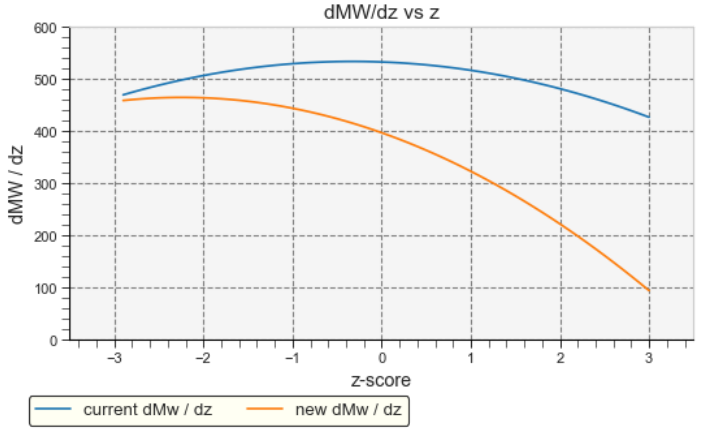
New York ISO

Weather Response – Zones A-E









New York ISO

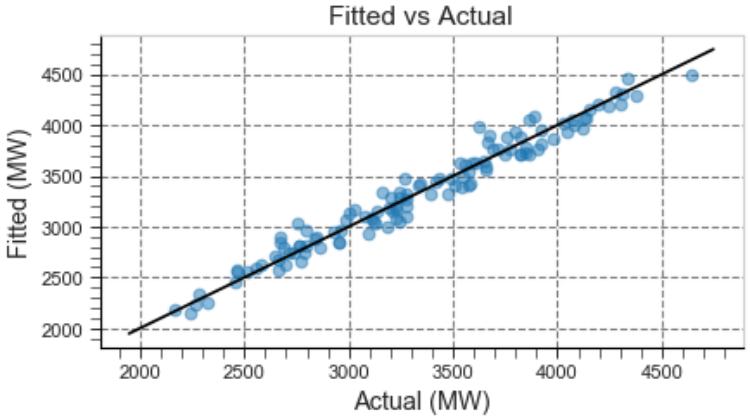
LFU Model Results – Zones A-E

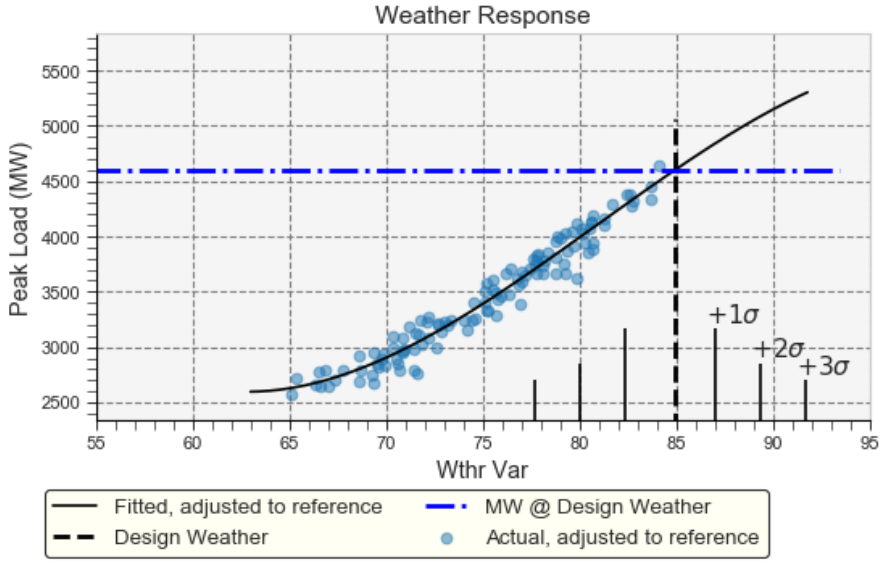
	LFU		
Bin	2020 Model	Pooled Model	Current
Design	100.0%	100.0%	100.0%
Bin_1	107.66%	108.51%	116.02%
Bin_2	106.34%	106.83%	111.11%
Bin_3	103.69%	103.90%	105.70%
Bin_4	100.00%	100.00%	100.00%
Bin_5	95.56%	95.43%	94.22%
Bin_6	90.67%	90.49%	88.58%
Bin_7	85.62%	85.45%	83.28%

New York ISO

2020 Model – Zones F&G

	Coef.	Std.Err.	t	P>|t|
Intercept	61922.03	35499.10	1.74	0.0839
wthr	-2394.31	1431.43	-1.67	0.0973
wthr2	31.14	19.20	1.62	0.1078
wthr3	-0.13	0.09	-1.50	0.1373
May	-390.09	34.93	-11.17	0.0000
Jun	-130.02	25.80	-5.04	0.0000
Sat	-127.82	31.50	-4.06	0.0001
Sun	-146.51	31.13	-4.71	0.0000



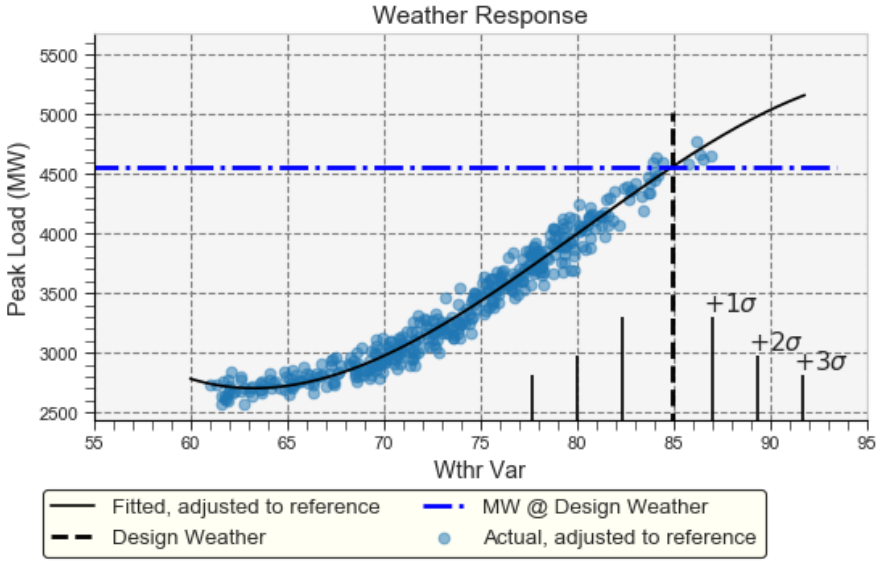


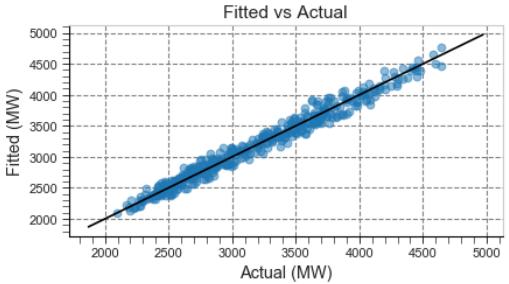
N	116
DF Model	7
R-Sq (%)	96.4
Adj. R-Sq (%)	96.1

New York ISO

Pooled Model – Zones F&G

	Coef.	Std.Err.	t	P>|t|
Intercept	64879.03	7424.14	8.74	0.0000
wthr	-2510.06	306.47	-8.19	0.0000
wthr2	32.75	4.20	7.80	0.0000
wthr3	-0.14	0.02	-7.14	0.0000
Y2019	-81.10	11.04	-7.35	0.0000
May	-249.64	20.77	-12.02	0.0000
Jun	-101.26	16.59	-6.10	0.0000
Sep	-65.88	16.43	-4.01	0.0001
May_2020	-161.26	27.98	-5.76	0.0000
Jun_2020	-48.64	23.57	-2.06	0.0398
Sat	-216.96	14.64	-14.82	0.0000
Sun	-167.32	14.76	-11.34	0.0000
Fri	-69.29	14.47	-4.79	0.0000

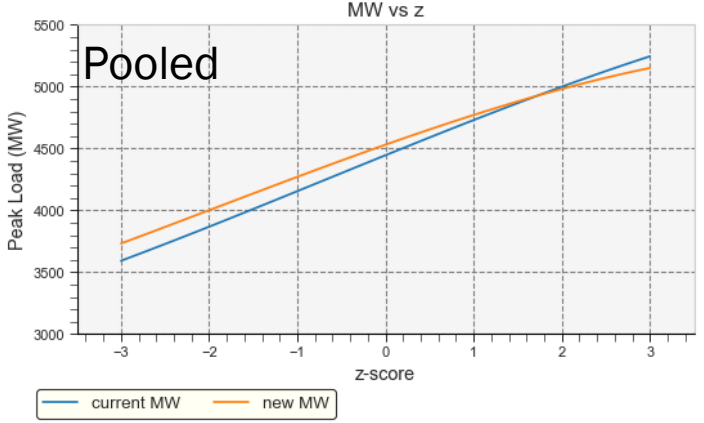


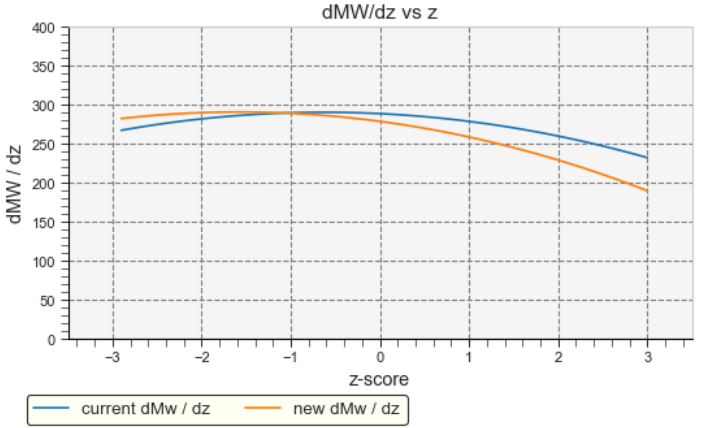


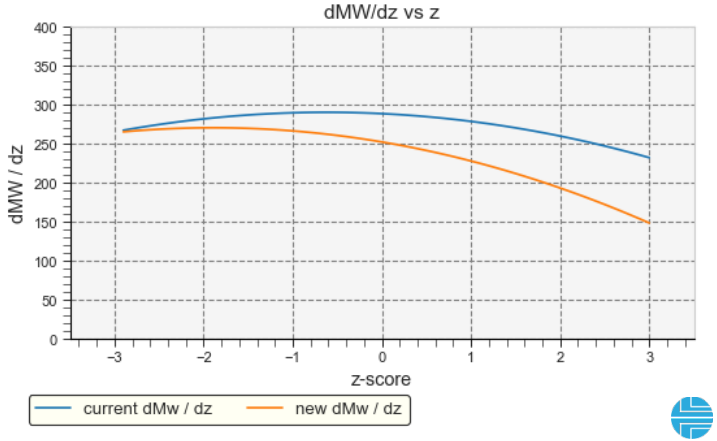
N	397
DF Model	12
R-Sq (%)	97.4
Adj. R-Sq (%)	97.3

New York ISO

Weather Response – Zones F&G







New York ISO

LFU Model Results – Zones F&G

	LFU		
Bin	2020 Model	Pooled Model	Current
Design	100.0%	100.0%	100.0%
Bin_1	115.08%	113.07%	117.17%
Bin_2	110.54%	109.34%	111.70%
Bin_3	105.25%	104.73%	105.70%
Bin_4	99.40%	99.46%	99.36%
Bin_5	93.22%	93.75%	92.89%
Bin_6	86.90%	87.83%	86.48%
Bin_7	80.66%	81.93%	80.33%

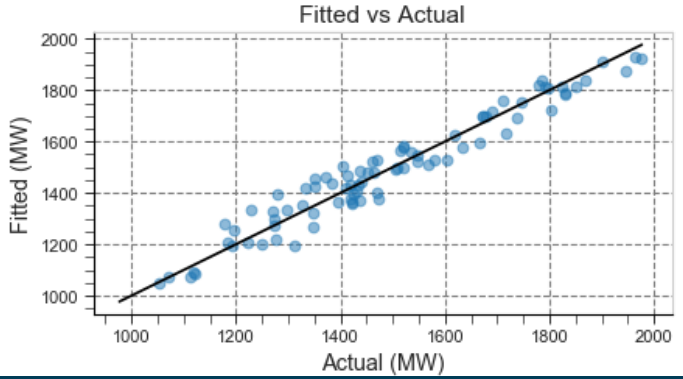
New York ISO

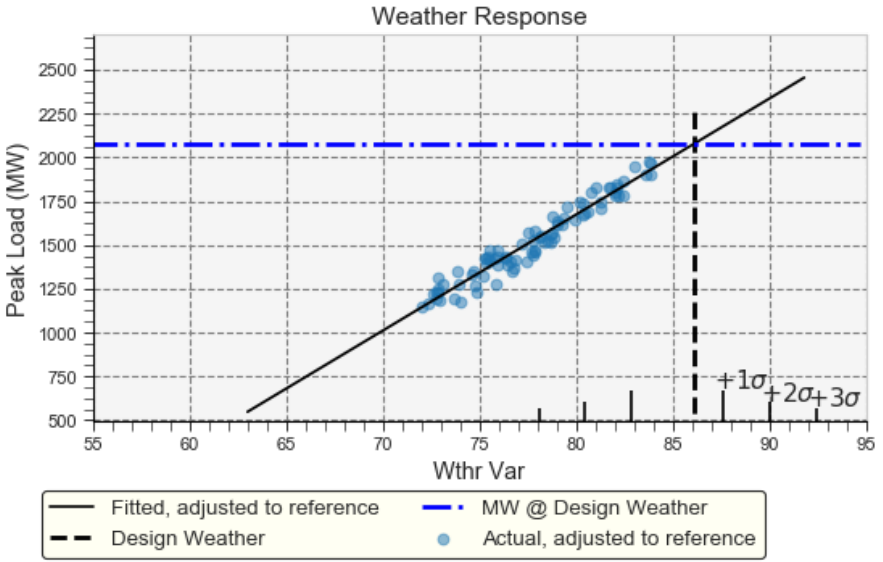
2020 Model – Zones H&I

	Coef.	Std.Err.	t	P>|t|
Intercept	17236.67	8274.11	2.08	0.0394
wthr	-617.97	343.45	-1.80	0.0745
wthr2	7.24	4.73	1.53	0.1288
wthr3	-0.02	0.02	-1.12	0.2633
May	-78.08	15.58	-5.01	0.0000
Sat	-81.73	13.23	-6.18	0.0000
Sun	-87.62	13.23	-6.62	0.0000

Unstable 3rd order model

	Coef.	Std.Err.	t
Intercept	-3622.98	148.56	-24.39
wthr	66.21	1.91	34.71
May	-96.86	40.20	-2.41
WkEnd	-109.78	13.45	-8.16



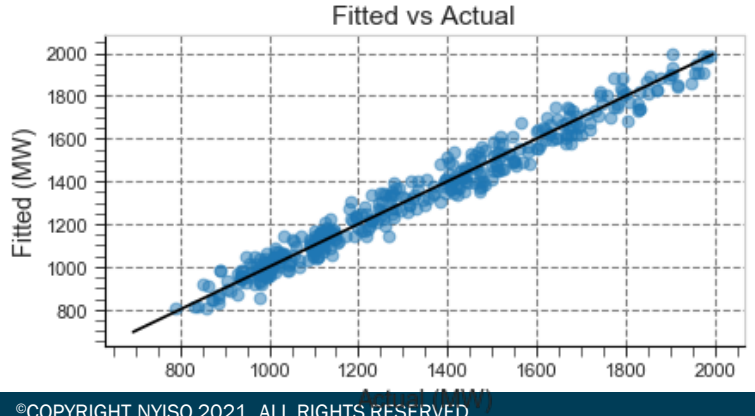


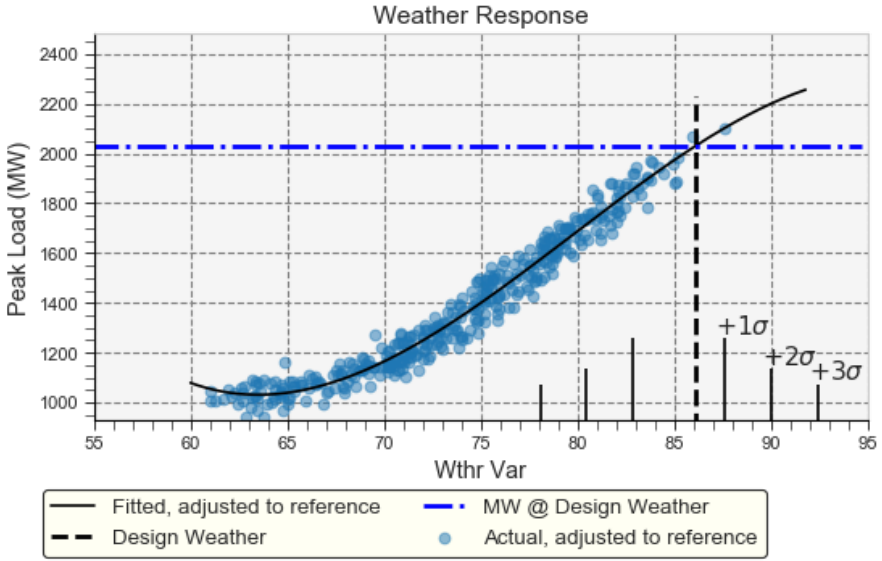
N	84
DF Model	3
R-Sq (%)	94.5
Adj. R-Sq (%)	94.3

New York ISO

Pooled Model – Zones H&I

	Coef.	Std.Err.	t	P>|t|
Intercept	34870.44	4200.42	8.30	0.0000
wthr	-1367.21	172.97	-7.90	0.0000
wthr2	17.89	2.36	7.57	0.0000
wthr3	-0.07	0.01	-6.97	0.0000
Y2018	66.89	6.93	9.65	0.0000
Y2019	37.32	6.95	5.37	0.0000
ıotJul_202(	-49.94	11.84	-4.22	0.0000
May	-69.31	8.80	-7.87	0.0000
Sep	-22.23	7.51	-2.96	0.0033
WkEnd	-104.26	5.98	-17.44	0.0000
Fri	-22.66	7.91	-2.86	0.0044

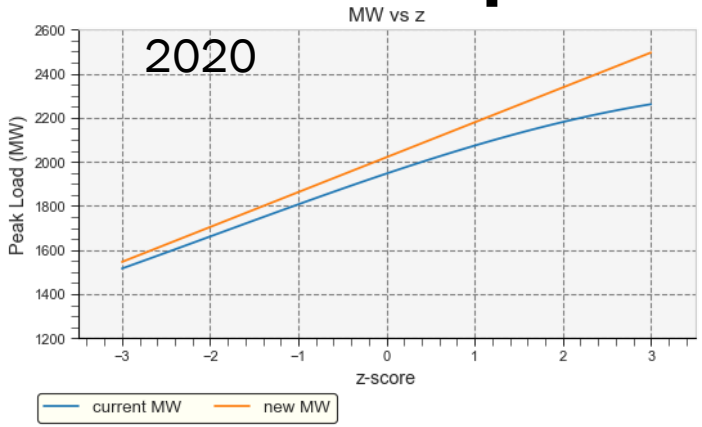


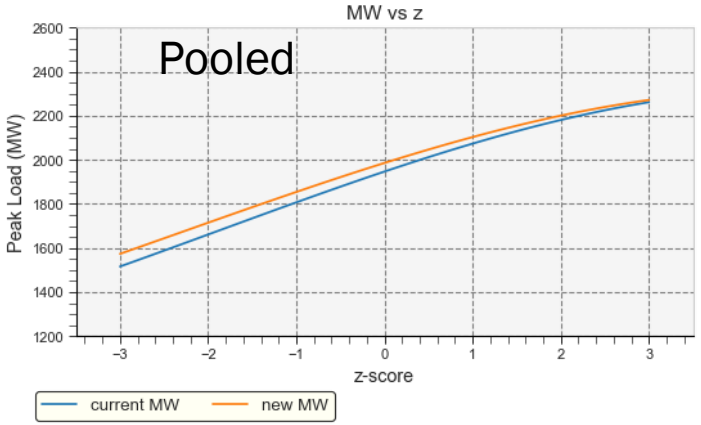


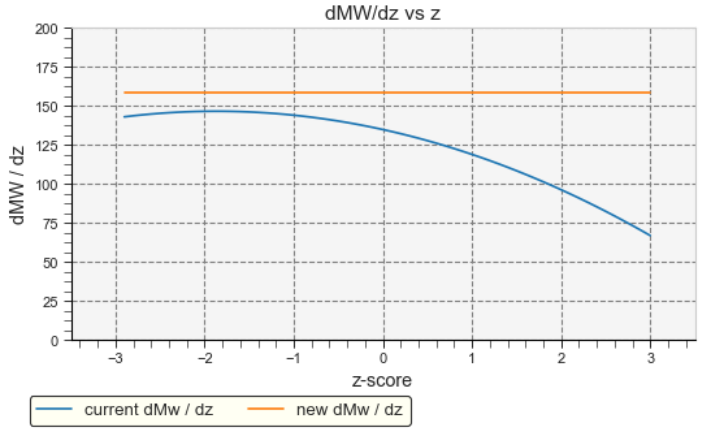
N	387
DF Model	10
R-Sq (%)	97
Adj. R-Sq (%)	97

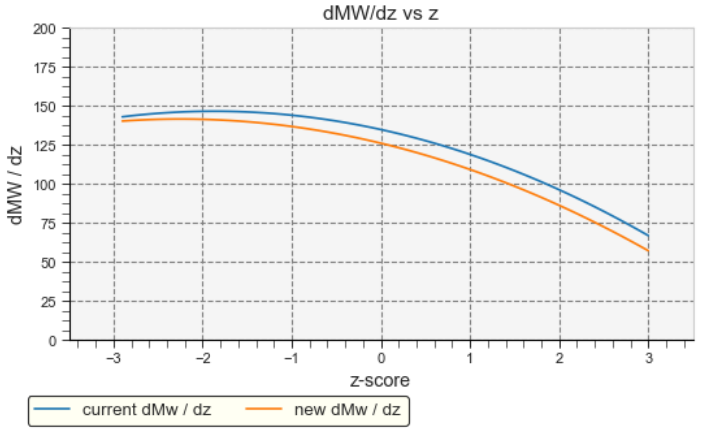
New York ISO

Weather Response – Zones H&I









New York ISO

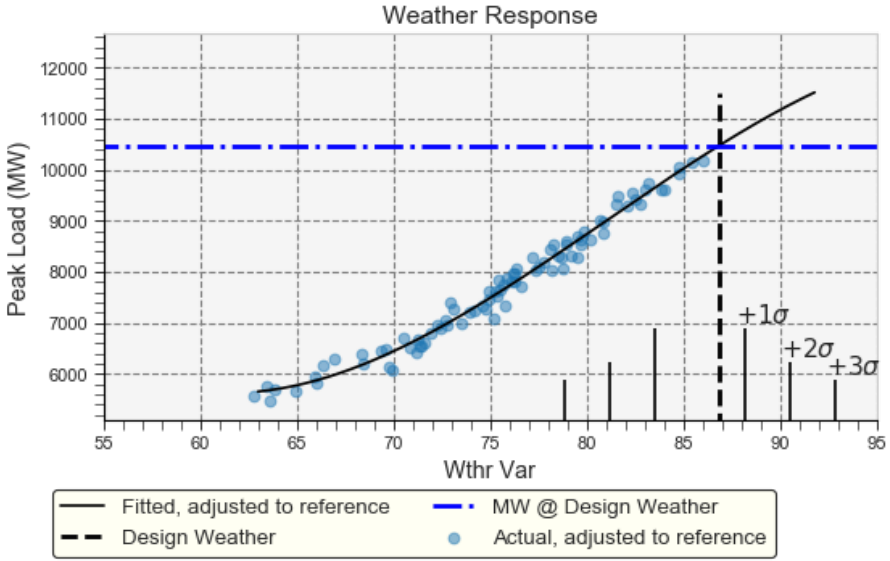
LFU Model Results – Zones H&I

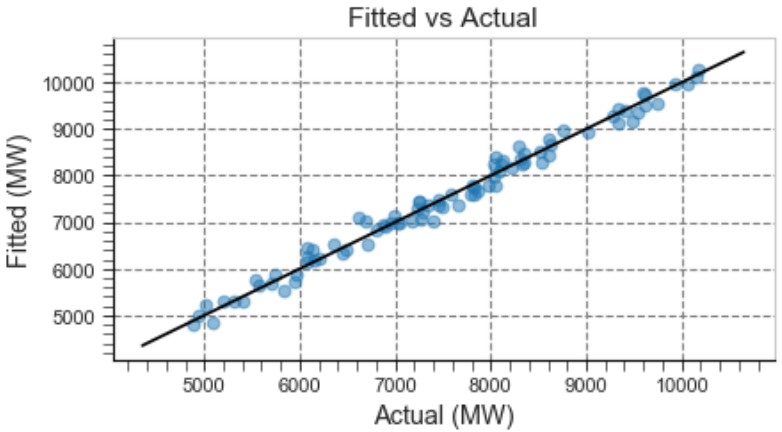
	LFU		
Bin	2020 Model	Pooled Model	Current
Design	100.0%	100.0%	100.0%
Bin_1	120.20%	111.95%	113.56%
Bin_2	112.57%	108.46%	109.46%
Bin_3	104.95%	103.67%	104.06%
Bin_4	97.33%	97.88%	97.68%
Bin_5	89.71%	91.40%	90.66%
Bin_6	82.09%	84.53%	83.35%
Bin_7	74.47%	77.56%	76.06%

New York ISO

2020 Model – Zone J

	Coef.	Std.Err.	t	P>|t|
Intercept	109668.15	36077.68	3.04	0.0032
wthr	-4247.99	1467.53	-2.89	0.0049
wthr2	55.65	19.82	2.81	0.0063
wthr3	-0.23	0.09	-2.58	0.0118
May	-882.36	78.34	-11.26	0.0000
Jun	-455.20	47.22	-9.64	0.0000
Fri	-178.36	54.09	-3.30	0.0015



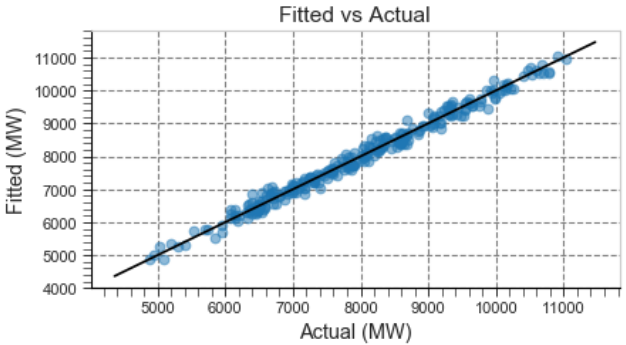


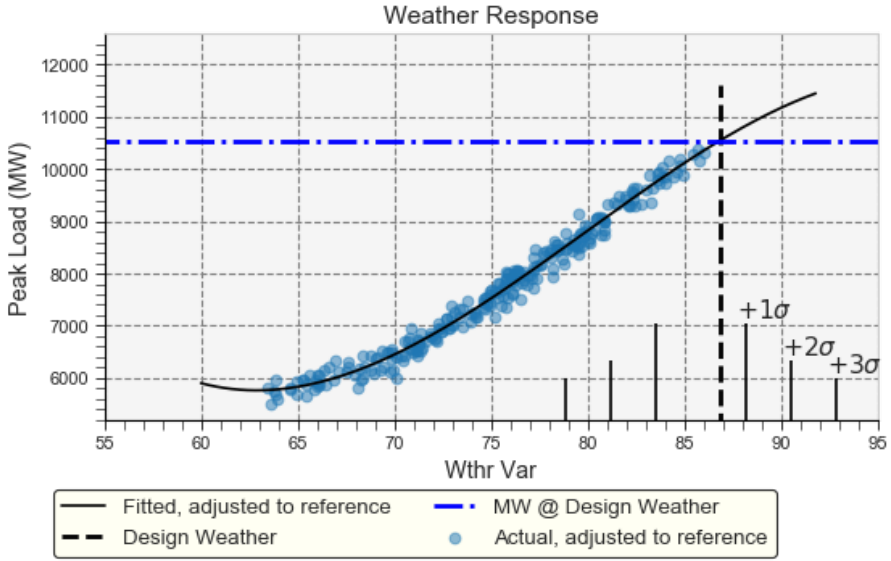
N	86
DF Model	6
R-Sq (%)	98.4
Adj. R-Sq (%)	98.3

New York ISO

Pooled Model – Zone J

	Coef.	Std.Err.	t	P>|t|
Intercept	128486.96	16887.84	7.61	0.0000
wthr	-4996.01	691.11	-7.23	0.0000
wthr2	65.48	9.39	6.97	0.0000
wthr3	-0.27	0.04	-6.41	0.0000
Y2018	743.11	33.22	22.37	0.0000
Y2019	621.07	32.87	18.89	0.0000
May	-231.04	36.24	-6.38	0.0000
Thu	-61.00	26.16	-2.33	0.0205
Fri	-158.79	27.64	-5.75	0.0000
May_2020	-669.35	72.95	-9.18	0.0000
Jun_2020	-484.59	44.83	-10.81	0.0000
Jul_2020	-117.44	49.10	-2.39	0.0175

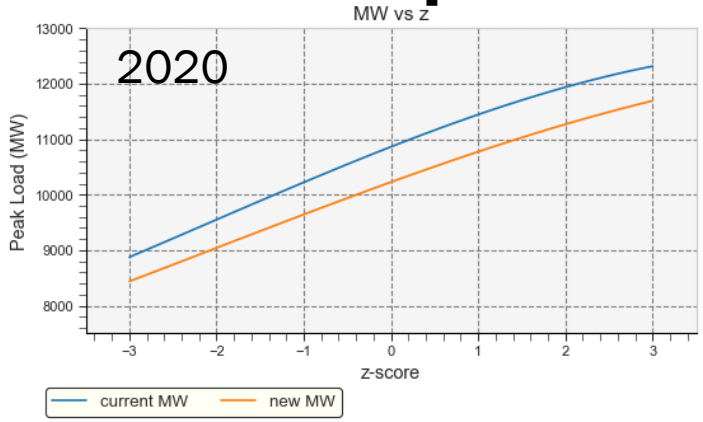


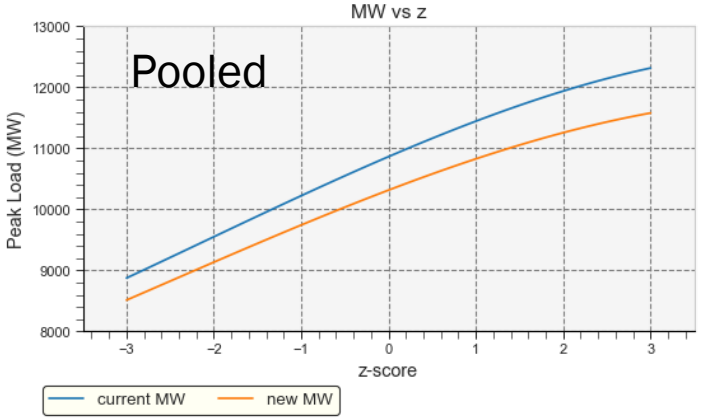


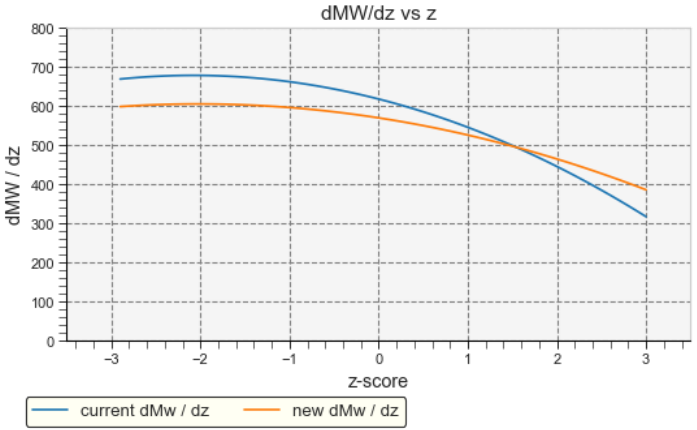
N	268
DF Model	11
R-Sq (%)	98.6
Adj. R-Sq (%)	98.6

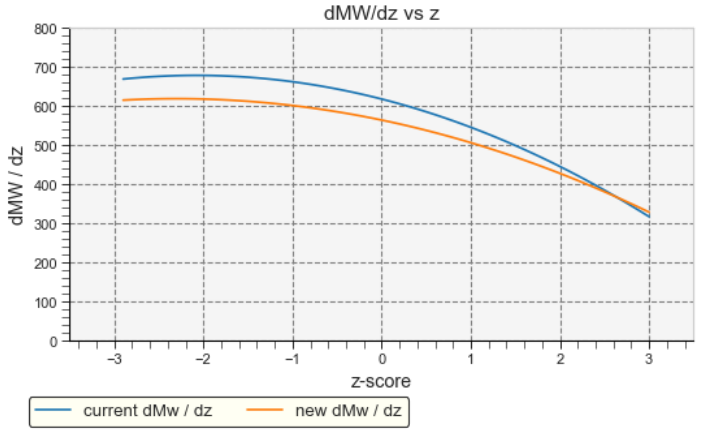
New York ISO

Weather Response – Zone J









New York ISO

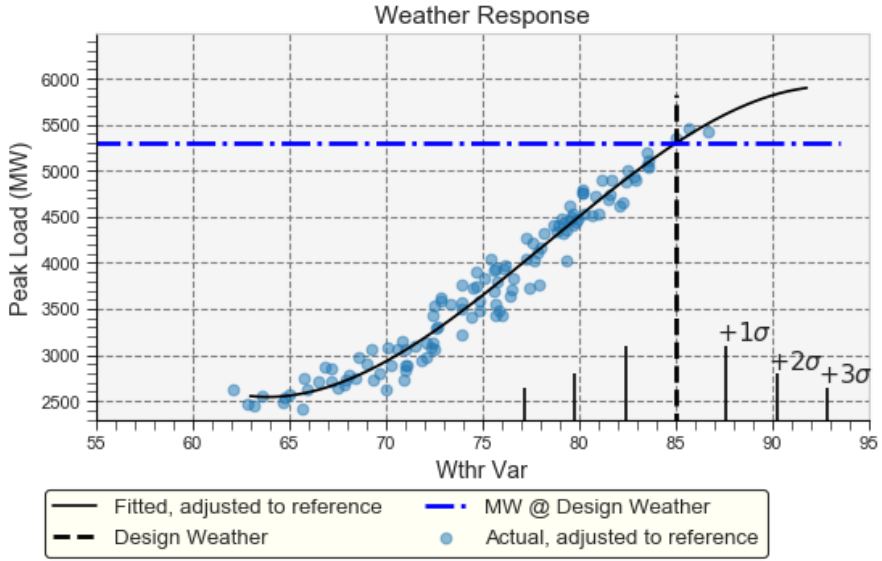
LFU Model Results – Zone J

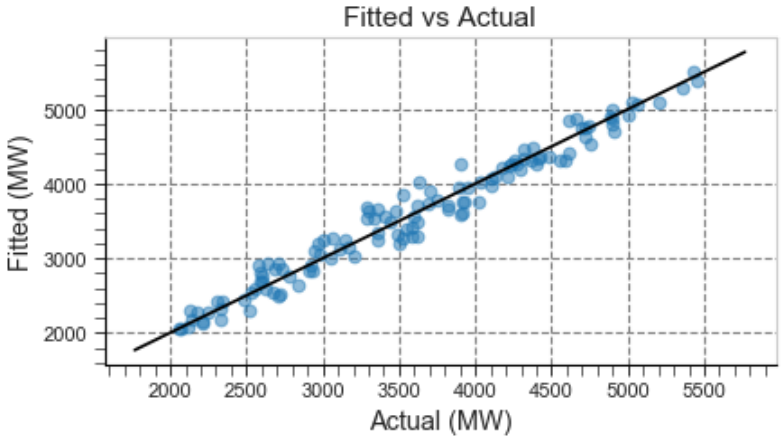
	LFU		
Bin	2020 Model	Pooled Model	Current
Design	100.0%	100.0%	100.0%
Bin_1	111.69%	110.79%	110.73%
Bin_2	107.65%	107.23%	107.33%
Bin_3	102.92%	102.82%	102.89%
Bin_4	97.69%	97.75%	97.67%
Bin_5	92.12%	92.22%	91.91%
Bin_6	86.36%	86.43%	85.86%
Bin_7	80.60%	80.57%	79.79%

New York ISO

2020 Model – Zone K

	Coef.	Std.Err.	t	P>|t|
Intercept	123127.98	27024.88	4.56	0.0000
wthr	-4895.78	1099.91	-4.45	0.0000
wthr2	64.64	14.87	4.35	0.0000
wthr3	-0.27	0.07	-4.11	0.0001
May	-288.50	61.37	-4.70	0.0000
Jun	-139.01	39.20	-3.55	0.0006
Fri	-121.14	47.43	-2.55	0.0120
WkEnd	-211.15	36.18	-5.84	0.0000



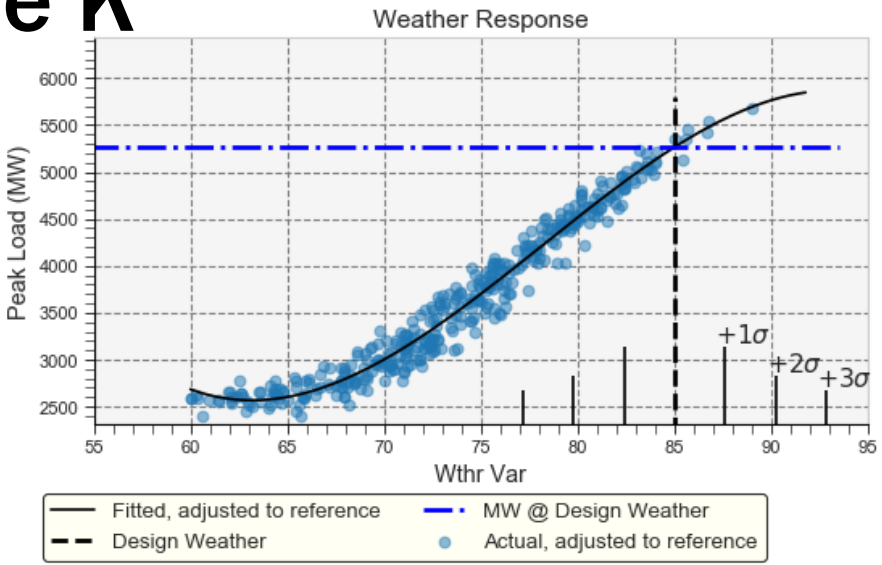


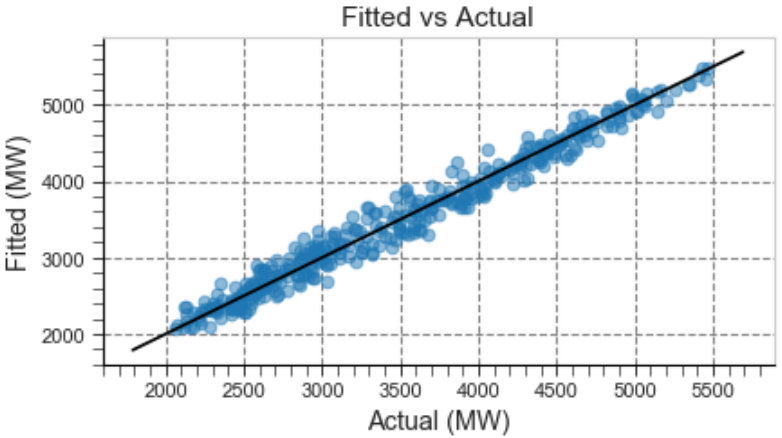
N	121
DF Model	7
R-Sq (%)	96.6
Adj. R-Sq (%)	96.4

New York ISO

Pooled Model – Zone K

	Coef.	Std.Err.	t	P>|t|
Intercept	107605.55	9556.72	11.26	0.0000
wthr	-4295.76	393.88	-10.91	0.0000
wthr2	57.04	5.39	10.59	0.0000
wthr3	-0.24	0.02	-9.94	0.0000
Y2018	49.95	16.44	3.04	0.0025
May	-278.77	27.39	-10.18	0.0000
Sep	-150.21	21.40	-7.02	0.0000
Jun_2020	-200.95	30.88	-6.51	0.0000
WkEnd	-213.20	16.66	-12.79	0.0000

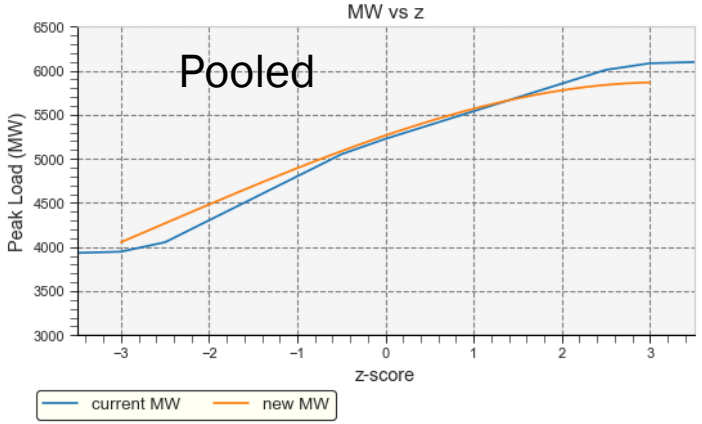


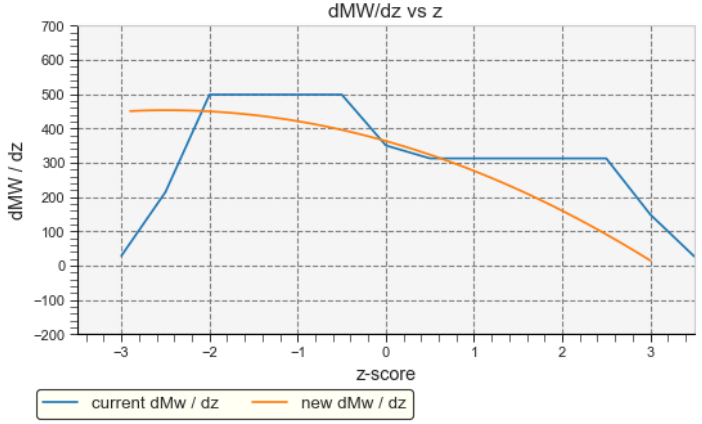


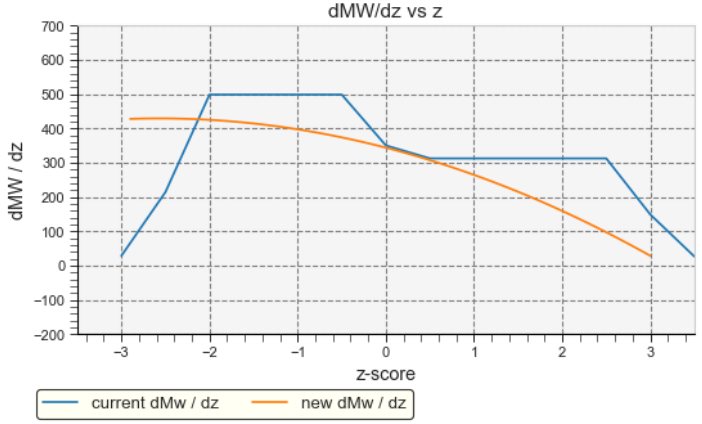
N	380
DF Model	8
R-Sq (%)	97.2
Adj. R-Sq (%)	97.2

New York ISO

Weather Response – Zone K







New York ISO

LFU Model Results – Zone K

	LFU		
Bin	2020 Model	Pooled Model	Current
Design	100.0%	100.0%	100.0%
Bin_1	111.62%	111.42%	116.38%
Bin_2	110.06%	109.72%	111.97%
Bin_3	106.00%	105.75%	105.98%
Bin_4	100.00%	100.00%	100.00%
Bin_5	92.60%	92.97%	91.88%
Bin_6	84.36%	85.14%	82.34%
Bin_7	75.83%	77.01%	75.52%

New York ISO