

2014 Summer Capacity Assessment

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Load Forecasting Task Force

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Rensselaer, NY

Overview

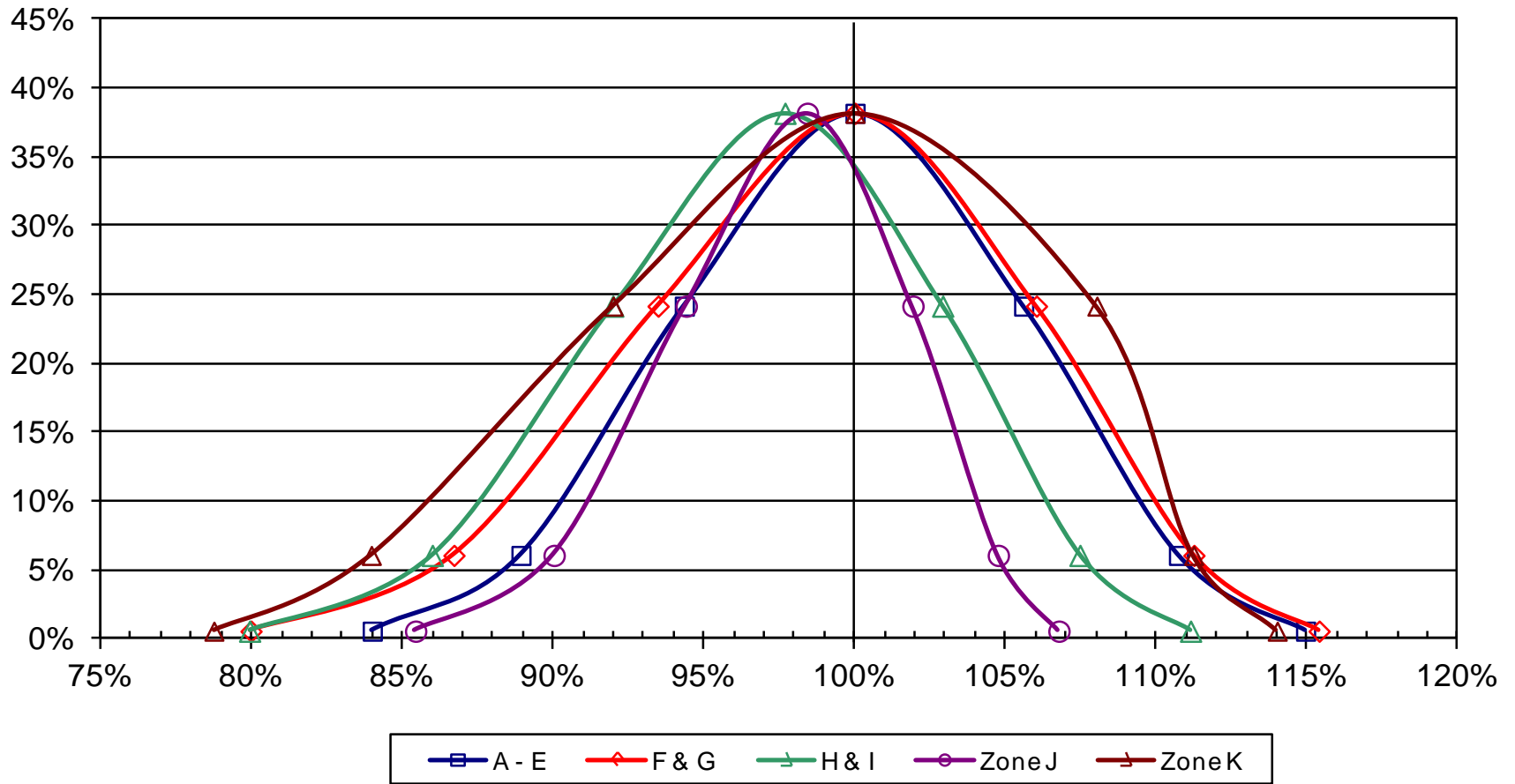
- 1. Summary of 2015 Load Forecast Uncertainty Models**
- 2. NYISO LFU Model for Zones A to E**
- 3. NYISO LFU Model for Zones F & G**
- 4. NYISO LFU Models for Zones H-I and J**
- 5. NYISO LFU Model for Zone K**

(1) Summary of 2015 Load Forecast Uncertainty Models

Recommended 2015 LFU Models

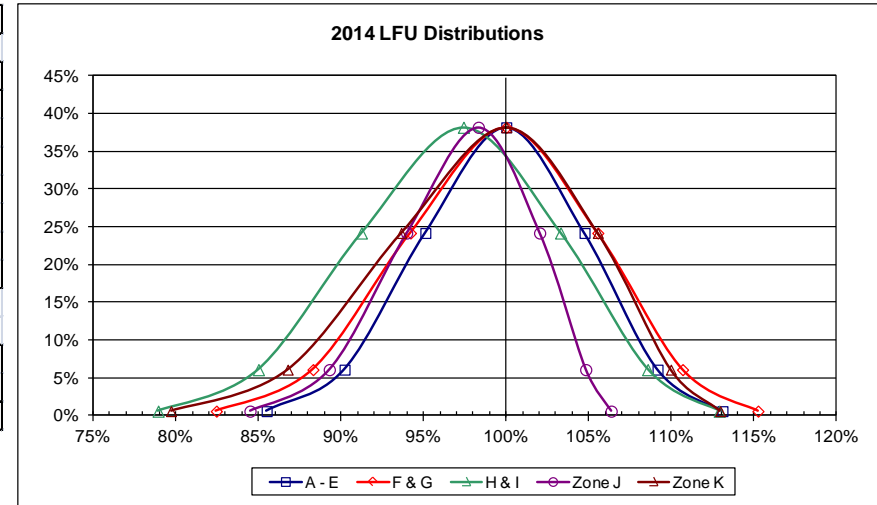
2015 Load Forecast Uncertainty Models						
Bin No.	Probability	A - E	F&G	H & I	Zone J	Zone K
1	0.62%	83.99%	79.97%	79.92%	85.43%	78.74%
2	6.06%	88.92%	86.70%	85.98%	90.02%	83.96%
3	24.17%	94.34%	93.47%	91.97%	94.40%	91.98%
4	38.30%	100.00%	100.00%	97.68%	98.42%	100.00%
5	24.17%	105.59%	106.02%	102.91%	101.92%	108.02%
6	6.06%	110.73%	111.24%	107.46%	104.75%	111.23%
7	0.62%	114.94%	115.39%	111.13%	106.76%	114.00%
2015	Low - Med	16.0%	20.0%	17.752%	13.0%	21.3%
	Hi-Med	14.9%	15.4%	13.450%	8.3%	14.0%
	Delta	30.9%	35.4%	31.202%	21.3%	35.3%

2015 LFU Distributions



2014 LFU Models for Comparison

2014 Load Forecast Uncertainty Models						
Bin No.	Probability	A - E	F&G	H & I	Zone J	Zone K
1	0.62%	85.50%	82.45%	78.93%	84.49%	79.71%
2	6.06%	90.21%	88.30%	85.00%	89.29%	86.77%
3	24.17%	95.10%	94.20%	91.23%	93.97%	93.64%
4	38.30%	100.00%	100.00%	97.41%	98.31%	100.00%
5	24.17%	104.74%	105.54%	103.29%	102.02%	105.54%
6	6.06%	109.16%	110.67%	108.56%	104.81%	109.96%
7	0.62%	113.09%	115.24%	112.89%	106.35%	112.95%
2014	Low - Med	14.5%	17.5%	18.5%	13.8%	20.3%
	Hi-Med	13.1%	15.2%	15.5%	8.0%	12.9%
	Delta	27.6%	32.8%	34.0%	21.9%	33.2%



2014 vs 2015

Area	2014		2015	
	Low	High	Low	High
A - E	85.50%	113.09%	83.99%	114.94%
F - G	82.45%	115.24%	79.97%	115.39%
H - I	78.93%	112.89%	79.92%	111.13%
J	84.49%	106.35%	85.43%	106.76%
K	79.71%	112.95%	78.67%	116.77%

(2) Model Specifications for Zones A-E

- ◆ **Per-unit MW data & load-weighted CTHI from NYISO archives, including DR impacts**
- ◆ **Years: 2011, 2012, 2013**
- ◆ **Months – May to September**
- ◆ **CTHI – Greater than or equal to 60**
- ◆ **Days – Monday-Friday, no Holidays**
- ◆ **4th order polynomial**
- ◆ **Total observations - 244**

2015 LFU Model – Zones A-E

	Wtd CTHI
20-Year Mean	82.345031
20-Year Std. Dev	2.3528259

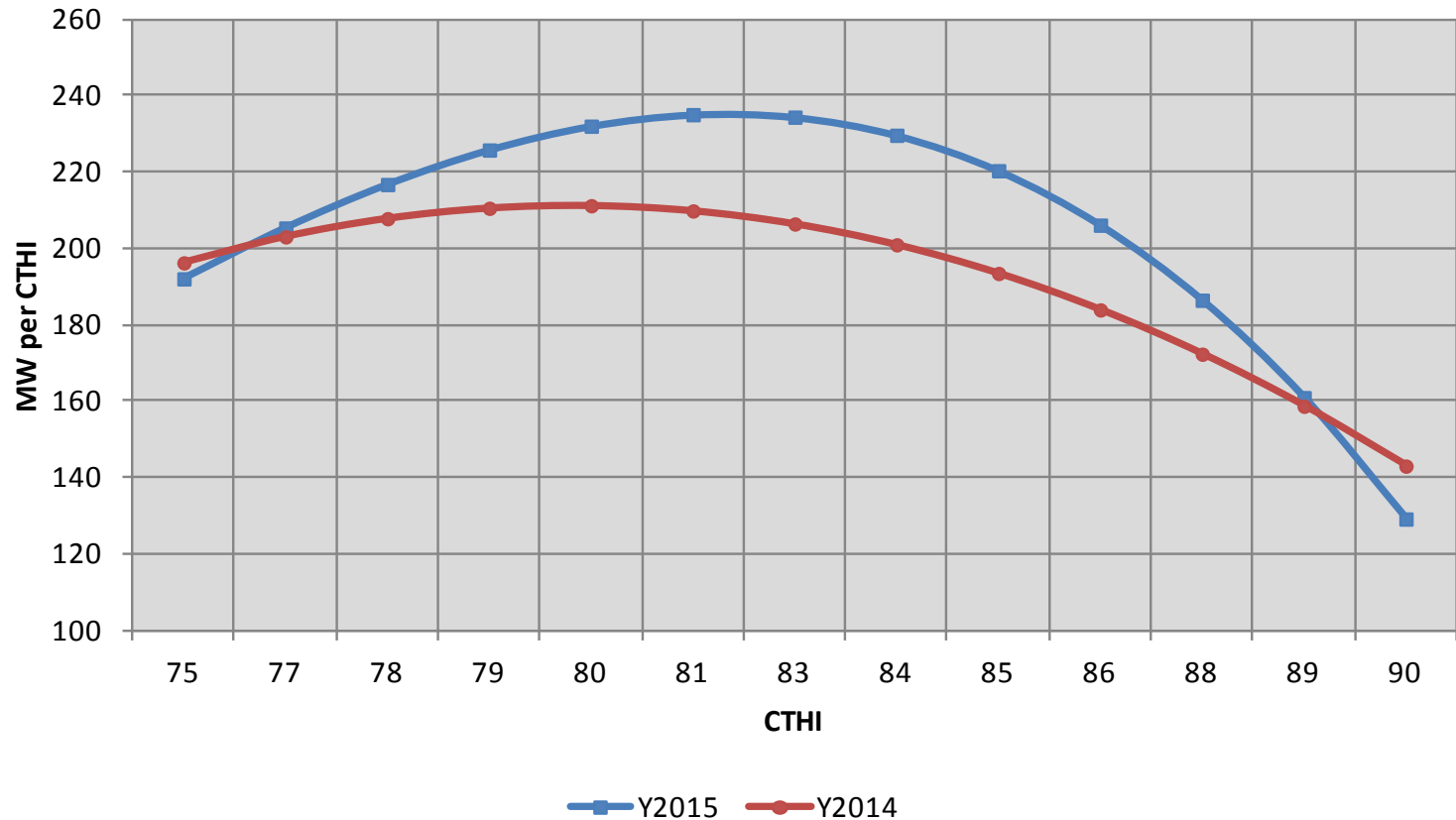
	Load Model	
A0	-25.7701601	
A1	1.5627425	
A2	-0.0341911	
A3	0.0003278	
A4	-0.0000012	
2015 MW	9820.0	at 50th pct

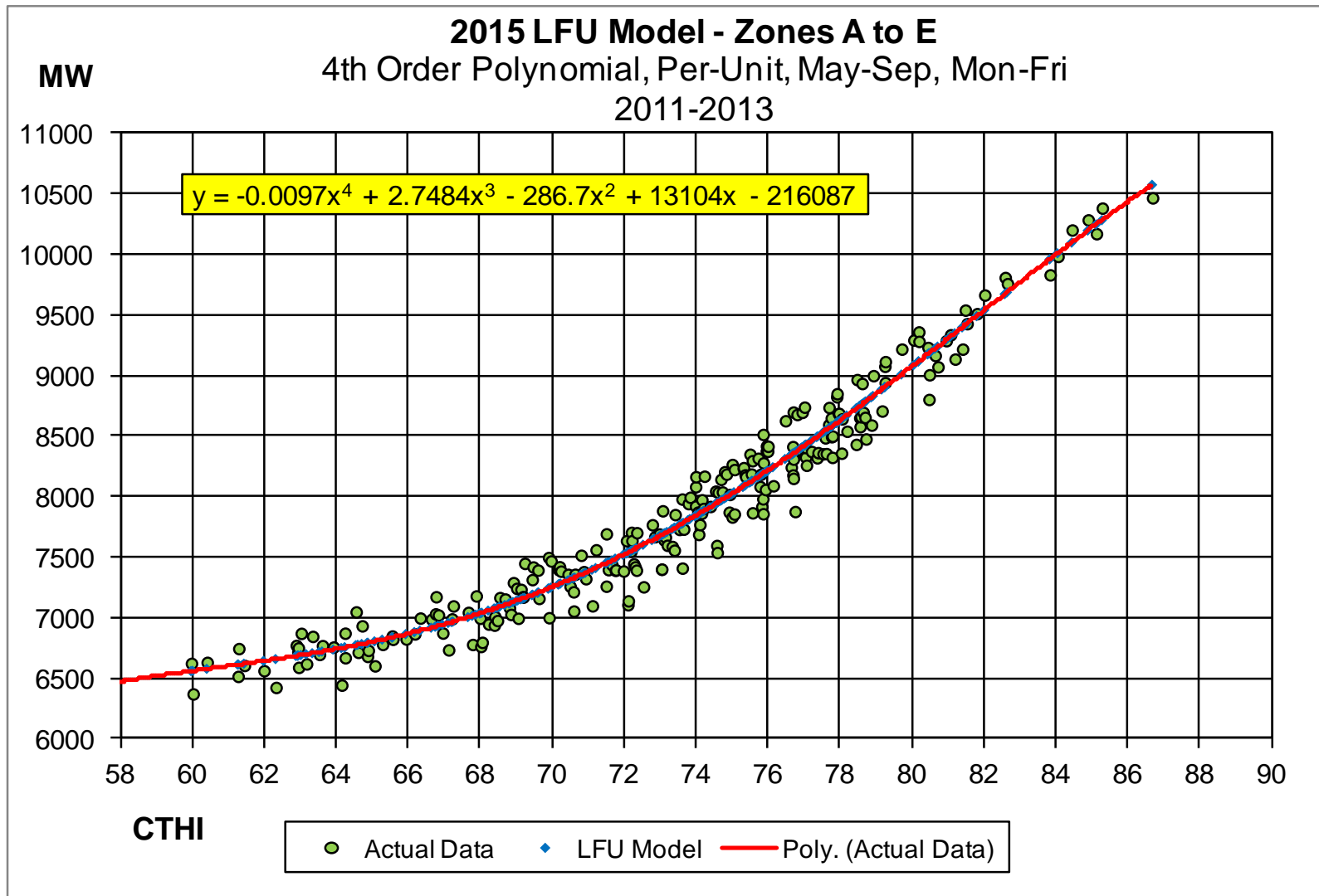
Derivative
1.56E+00
-6.84E-02
9.83E-04
-4.61E-06

MW at Ref CTHI	8385.1
Ref MW at 50th	9614.4
2015 CP	9820.0

Z'	Cum Prob	CTHI	Per Unit Model	2014 PU	dPU	dCTHI	MW/CTHI from Bins	MW/CTHI	PU @ 50th
-3.00	0.00135	75.29	0.9630	8248		1.18		193	0.8399
-2.50	0.00621	76.46	0.9905	8483	235	1.18	200	206	0.8638
-2.00	0.02275	77.64	1.0196	8732	249	1.18	212	217	0.8892
-1.50	0.06681	78.82	1.0501	8994	261	1.18	222	226	0.9158
-1.00	0.15866	79.99	1.0817	9264	271	1.18	230	233	0.9434
-0.50	0.30854	81.17	1.1140	9541	277	1.18	235	237	0.9716
0.00	0.50000	82.35	1.1466	9820	279	1.18	237	237	1.0000
0.50	0.69146	83.52	1.1790	10098	278	1.18	236	234	1.0283
1.00	0.84134	84.70	1.2107	10369	271	1.18	231	227	1.0559
1.50	0.93319	85.87	1.2411	10629	260	1.18	221	215	1.0824
2.00	0.97725	87.05	1.2696	10873	244	1.18	207	199	1.1073
2.50	0.99379	88.23	1.2954	11095	221	1.18	188	177	1.1298
3.00	0.99865	89.40	1.3179	11287	193	1.18	164	150	1.1494

A to E Weather Response: 2015 vs 2014





Comparison of 2014 & 2015 A-E Models

2015 Load Forecast Uncertainty Distribution

			Zones A-E
LFU Bin	Cum Prob	Bin Prob	PU MW @ 50th
1	0.62%	0.62%	0.8399
2	6.68%	6.06%	0.8892
3	30.85%	24.17%	0.9434
4	69.15%	38.30%	1.0000
5	93.32%	24.17%	1.0559
6	99.38%	6.06%	1.1073
7	100.00%	0.62%	1.1494

2014 Load Forecast Uncertainty Distribution

			Zones A-E
LFU Bin	Cum Prob	Bin Prob	PU MW @ 50th
1	0.62%	0.62%	0.8550
2	6.68%	6.06%	0.9021
3	30.85%	24.17%	0.9510
4	69.15%	38.30%	1.0000
5	93.32%	24.17%	1.0474
6	99.38%	6.06%	1.0916
7	100.00%	0.62%	1.1309

(3) Model Specifications for Zones F-G

- ◆ **Per-unit MW data & Load-weighted CTHI from NYISO archives, including DR impacts**
- ◆ **Years: 2011, 2012, 2013**
- ◆ **Months – June to August**
- ◆ **CTHI – Greater than or equal to 60**
- ◆ **Days – Monday-Friday, no Holidays**
- ◆ **3rd order polynomial**
- ◆ **Total observations - 183**

2015 LFU Model – Zones F&G

	Wtd CTHI
20-Year Mean	85.611959
20-Year Std. Dev	2.6316638

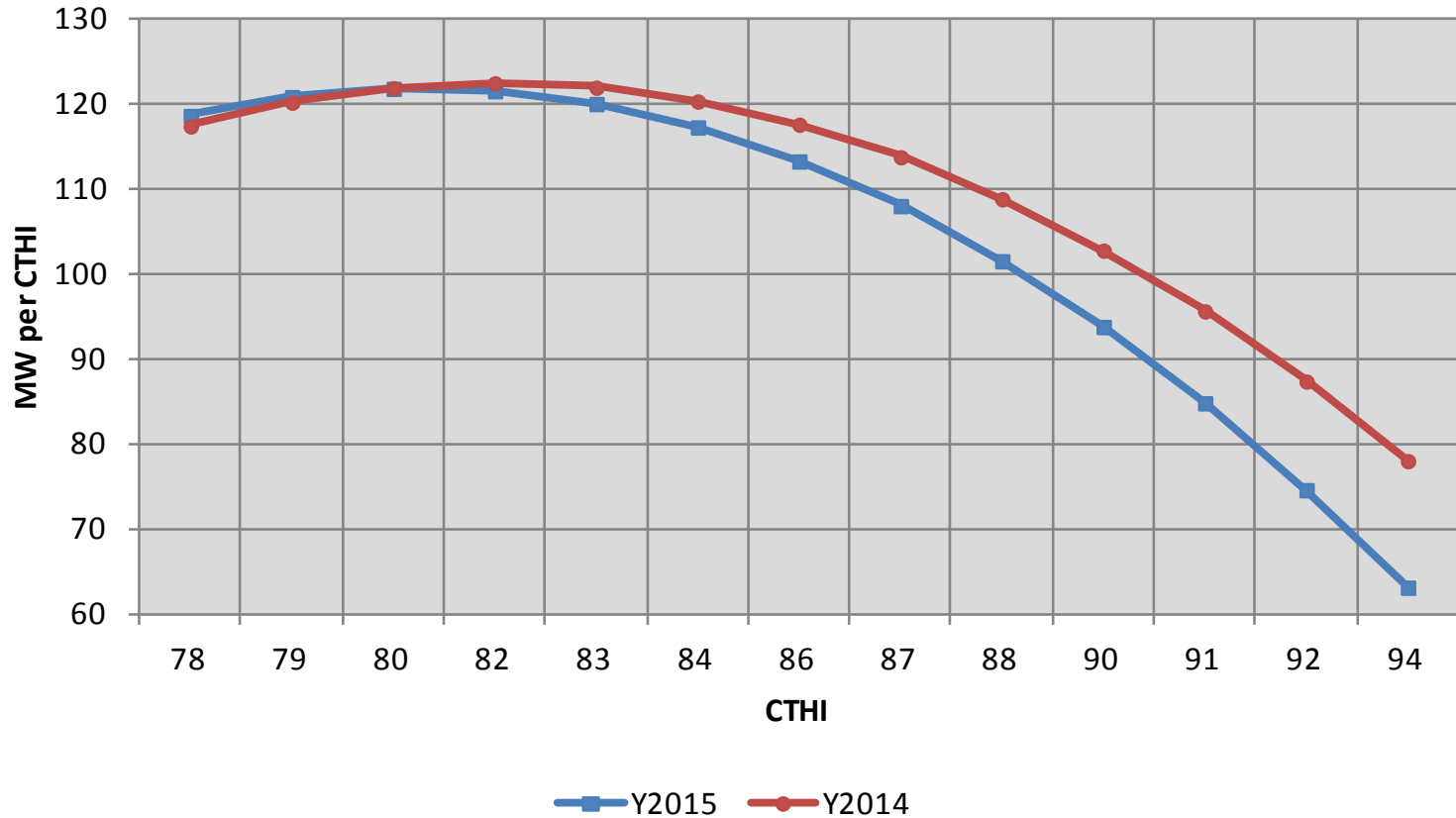
	Load Model	
A0	15.8690613	
A1	-0.6147458	
A2	0.0080344	
A3	-0.0000332	
A4		
2015 MW	4714.0	at 50th pct

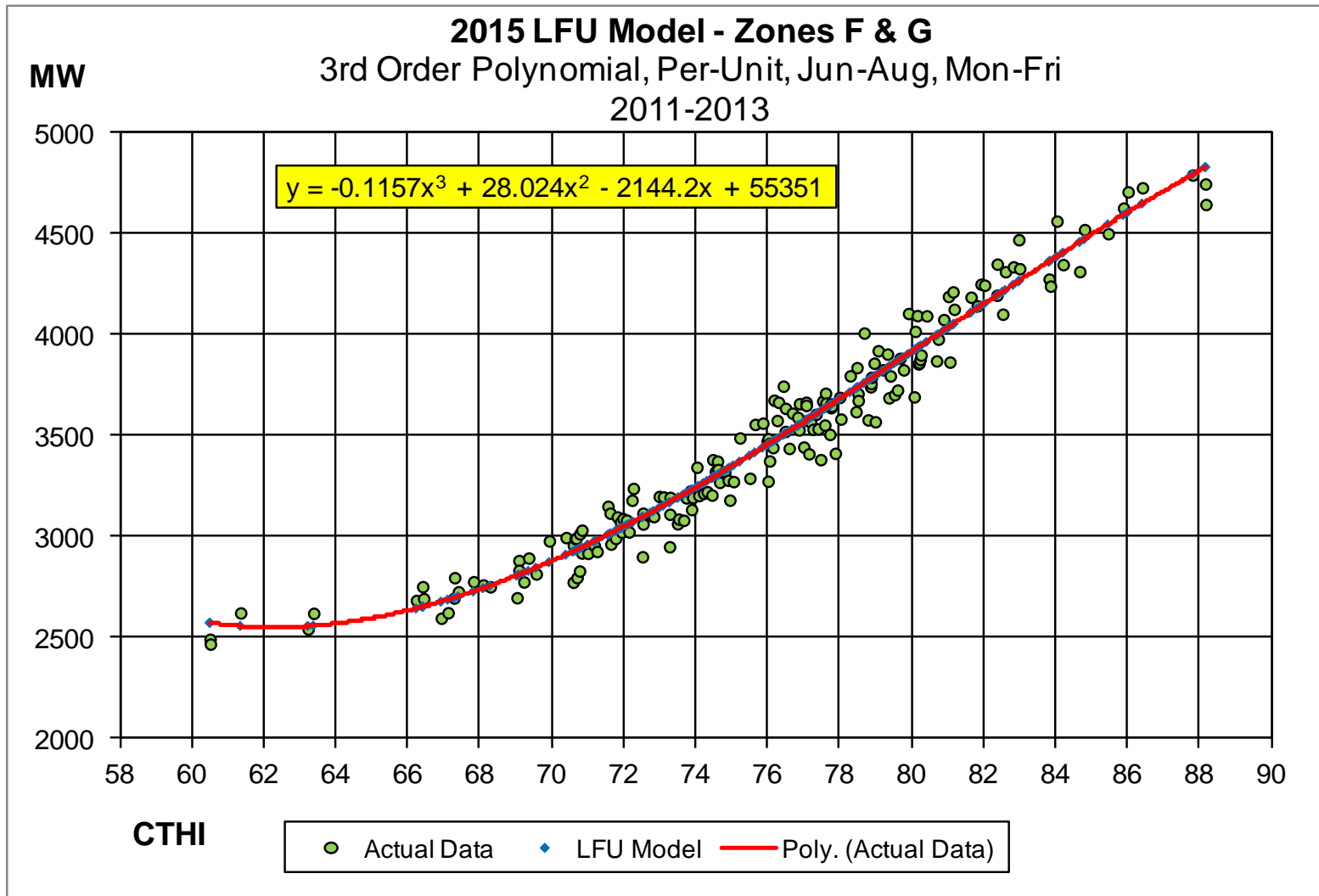
Derivative
-6.15E-01
1.61E-02
-9.95E-05

MW at Ref CTHI	3488.0
Ref MW at 50th	4563.4
2015 CP	4714.0

Z'	Cum Prob	CTHI	Per Unit Model	2014 PU	dPU	dCTHI	MW/CTHI from Bins	MW/CTHI	PU @ 50th
-3.00	0.00135	77.72	1.0463	3770		1.32		119	0.7997
-2.50	0.00621	79.03	1.0900	3927	158	1.32	120	121	0.8331
-2.00	0.02275	80.35	1.1343	4087	160	1.32	121	122	0.8670
-1.50	0.06681	81.66	1.1788	4247	160	1.32	122	121	0.9010
-1.00	0.15866	82.98	1.2229	4406	159	1.32	121	120	0.9347
-0.50	0.30854	84.30	1.2662	4562	156	1.32	119	117	0.9678
0.00	0.50000	85.61	1.3083	4714	152	1.32	115	113	1.0000
0.50	0.69146	86.93	1.3487	4860	146	1.32	111	108	1.0309
1.00	0.84134	88.24	1.3870	4998	138	1.32	105	101	1.0602
1.50	0.93319	89.56	1.4227	5126	129	1.32	98	94	1.0874
2.00	0.97725	90.88	1.4554	5244	118	1.32	89	85	1.1124
2.50	0.99379	92.19	1.4845	5349	105	1.32	80	75	1.1347
3.00	0.99865	93.51	1.5097	5440	91	1.32	69	63	1.1539

F & G Weather Response: 2015 vs 2014





Comparison of 2014 & 2015 Models

2015 Load Forecast Uncertainty Distribution

			Zones F-G
LFU Bin	Cum Prob	Bin Prob	PU MW @ 50th
1	0.62%	0.62%	0.7997
2	6.68%	6.06%	0.8670
3	30.85%	24.17%	0.9347
4	69.15%	38.30%	1.0000
5	93.32%	24.17%	1.0602
6	99.38%	6.06%	1.1124
7	100.00%	0.62%	1.1539

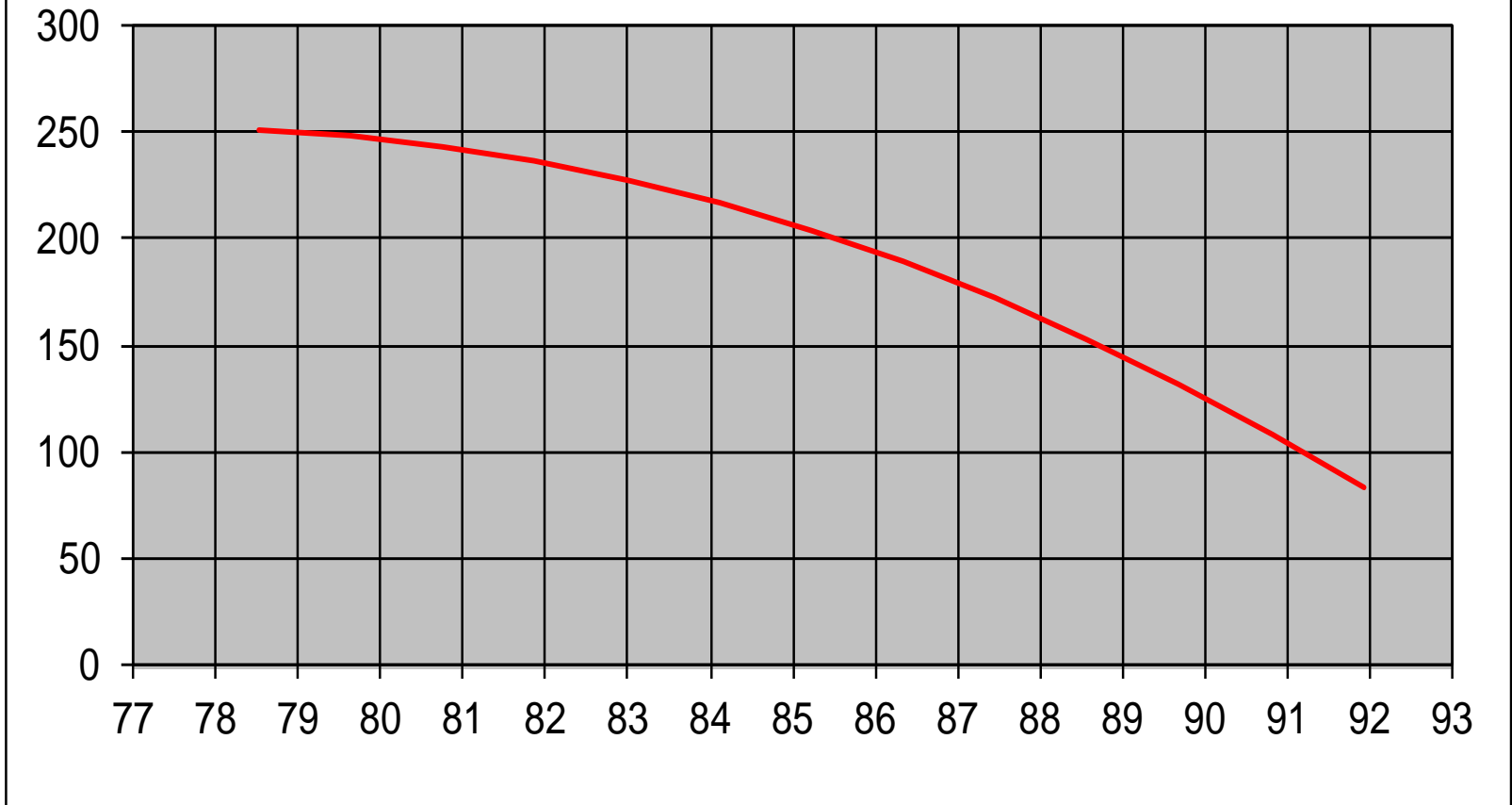
2014 Load Forecast Uncertainty Distribution

			Zones F-G
LFU Bin	Cum Prob	Bin Prob	PU MW @ 50th
1	0.62%	0.62%	0.8245
2	6.68%	6.06%	0.8830
3	30.85%	24.17%	0.9420
4	69.15%	38.30%	1.0000
5	93.32%	24.17%	1.0554
6	99.38%	6.06%	1.1067
7	100.00%	0.62%	1.1524

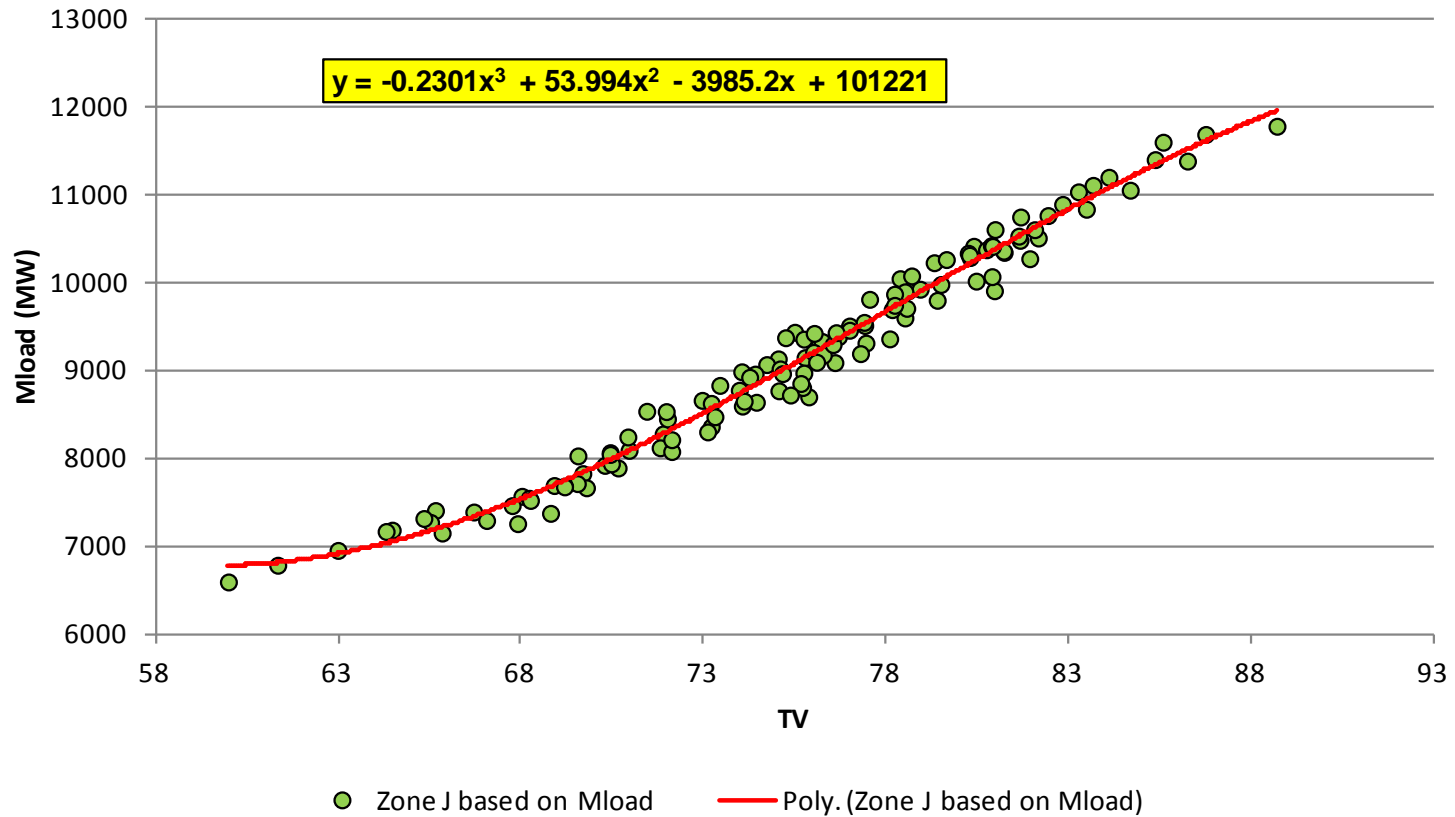
(4) Model Specifications for H-I and J

- ◆ **Provided by Con-Ed**
- ◆ **Per-unit MW data & TV data, including DR impacts**
- ◆ **Years: 2011, 2012, 2013**
- ◆ **Months – June 1 through August 15, each year**
- ◆ **Days – Mon-Thurs, no Fridays, Holidays**
- ◆ **3rd order polynomial**
- ◆ **Total observations - 129**

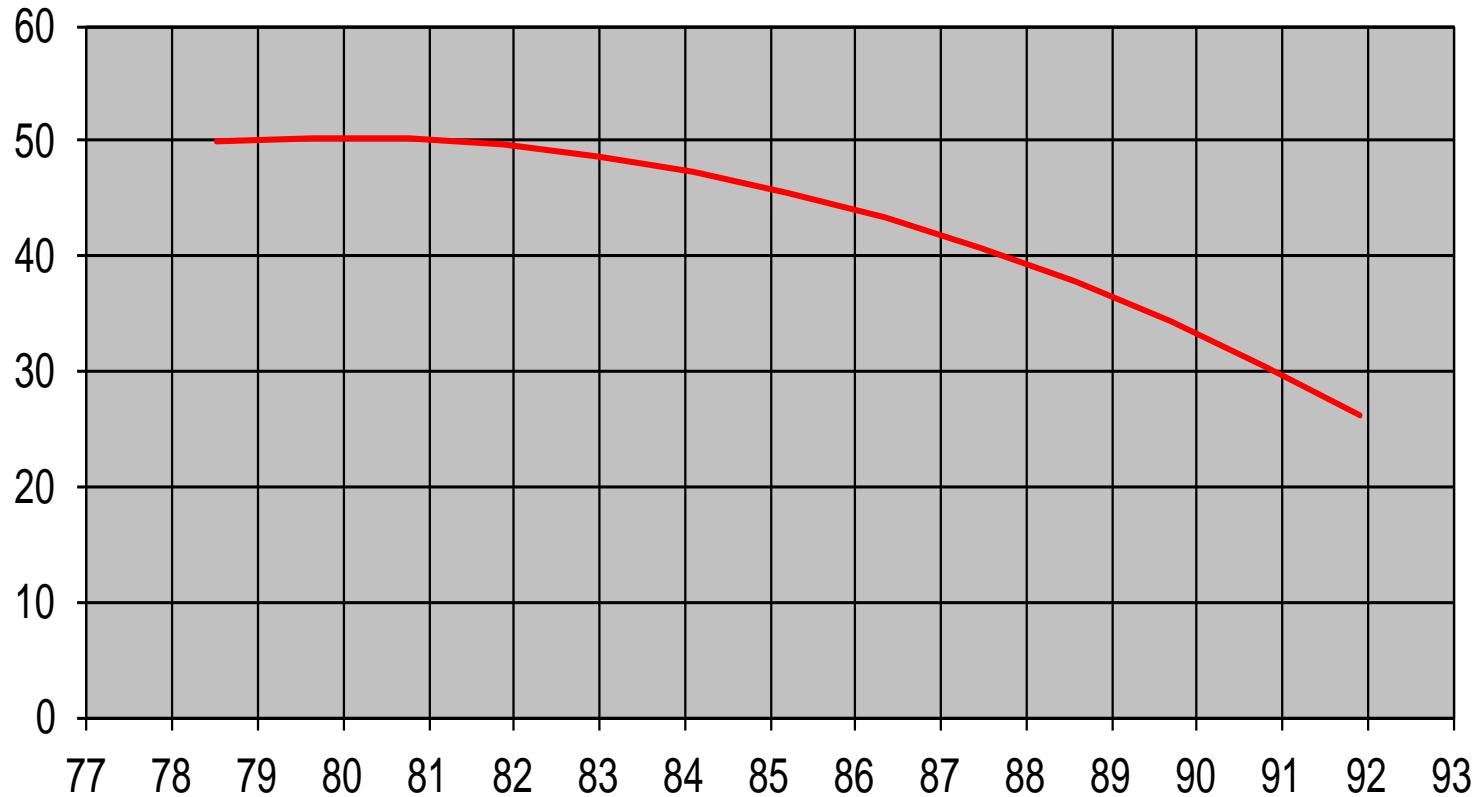
Weather Response Function for Con-Ed System (Zone J) MW per TV



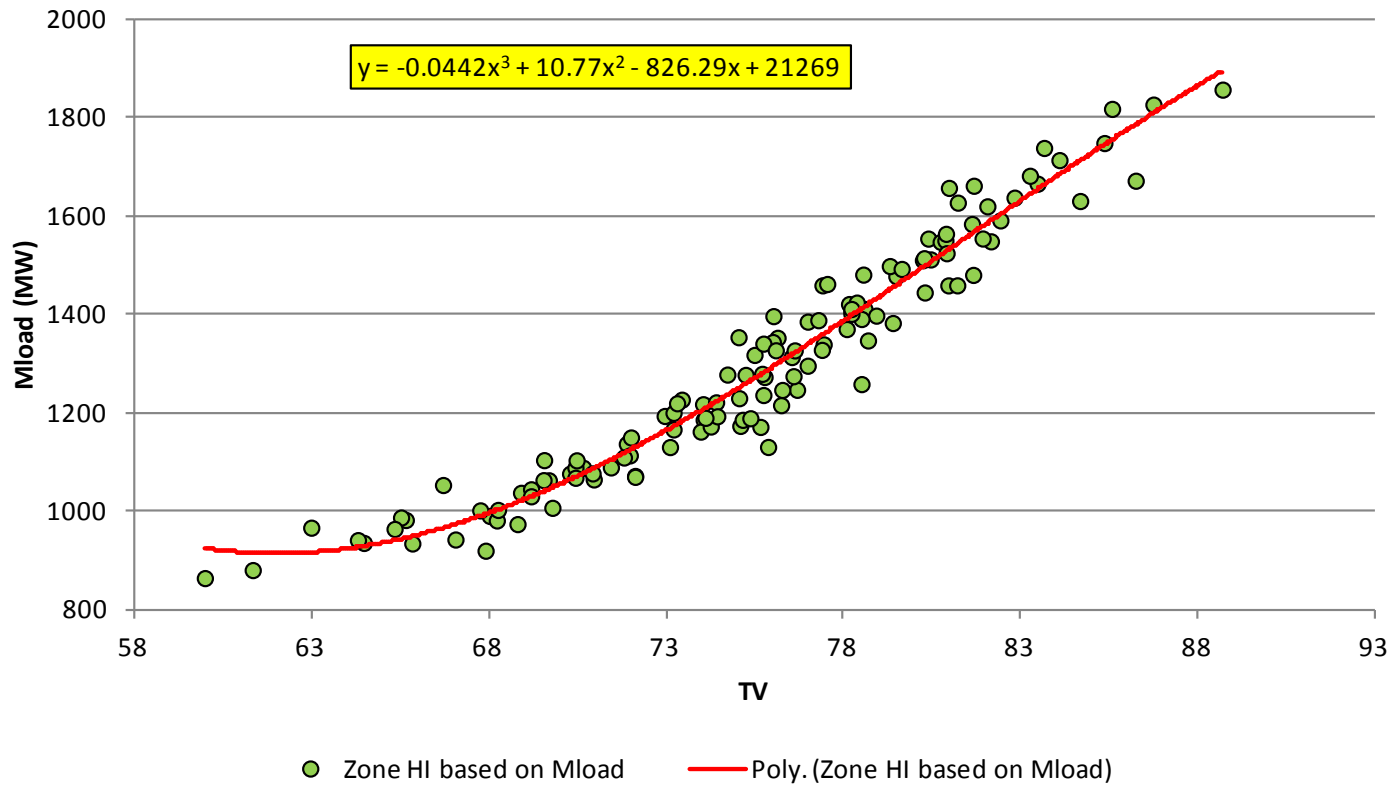
Zone J based on Mload 3rd Order, Jun. 1 - Aug. 15, 2011-13



Weather Response Function for Con-Ed System (Zones H & I) MW per TV



Zones H & I based on Mload 3rd Order, Jun. 1 - Aug. 15, 2011-13



Comparison of 2014 & 2015 Models

2015 Load Forecast Uncertainty Distribution

LFU Bin	Cum Prob	Bin Prob	Zone J	Zones H&I
			PU MW @ 67th	PU MW @ 67th
1	0.62%	0.62%	0.8543	0.7992
2	6.68%	6.06%	0.9002	0.8598
3	30.85%	24.17%	0.9440	0.9197
4	69.15%	38.30%	0.9842	0.9768
5	93.32%	24.17%	1.0192	1.0291
6	99.38%	6.06%	1.0475	1.0746
7	100.00%	0.62%	1.0676	1.1113

2014 Load Forecast Uncertainty Distribution

LFU Bin	Cum Prob	Bin Prob	Zone J	Zones H&I
			PU MW @ 67th	PU MW @ 67th
1	0.62%	0.62%	0.8449	0.7893
2	6.68%	6.06%	0.8929	0.8500
3	30.85%	24.17%	0.9397	0.9123
4	69.15%	38.30%	0.9831	0.9741
5	93.32%	24.17%	1.0202	1.0329
6	99.38%	6.06%	1.0481	1.0856
7	100.00%	0.62%	1.0635	1.1289

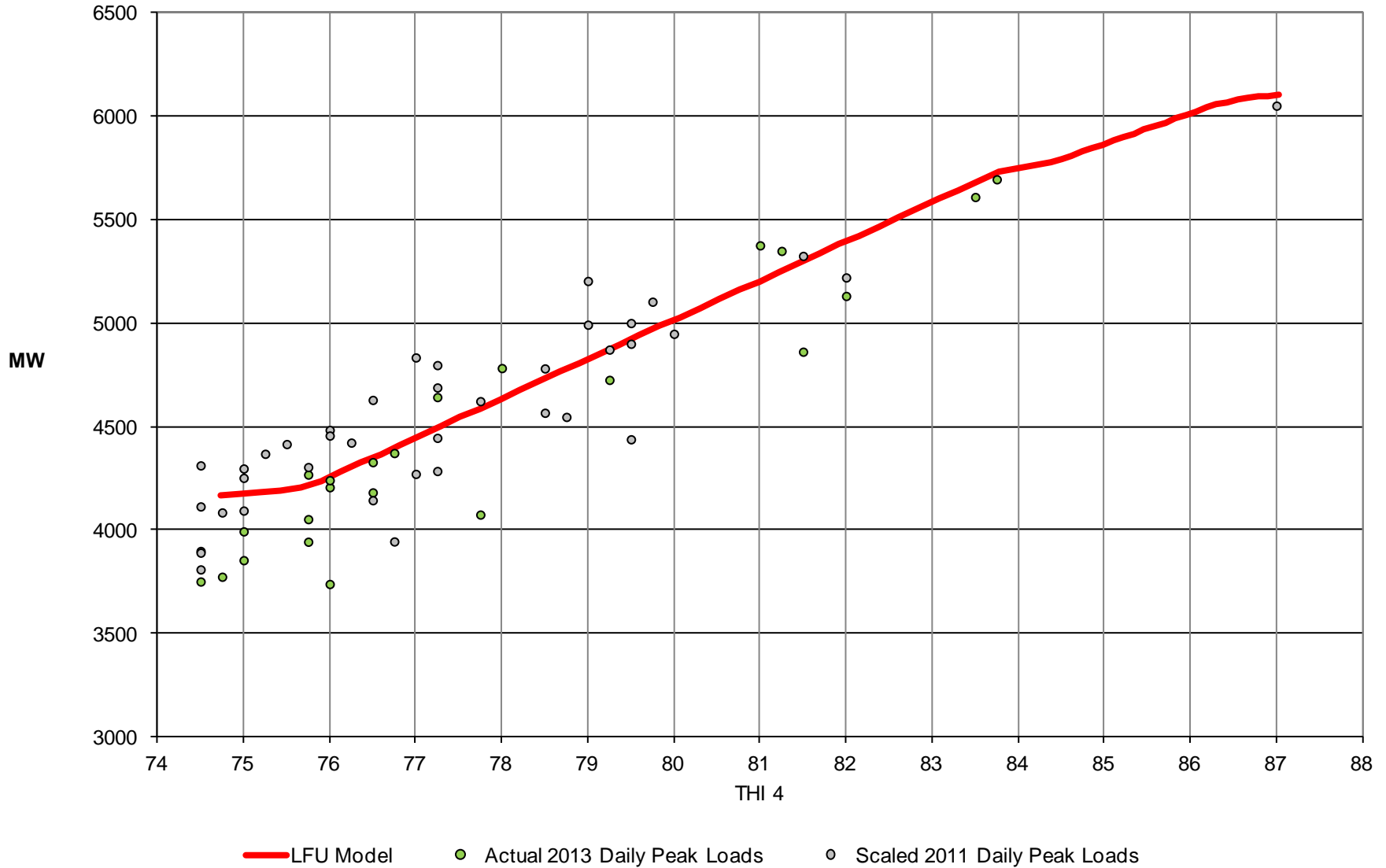
(5) Model Specifications for Zone K

- ◆ **Provided by LIPA-PSEG**

2015 LFU Model - Zone K

Z	Cum Prob	THI 4	MW	Δ MW	Δ THI 4	Δ MW / Δ THI 4	MW / $MW_{CP=50\%}$
-3.0	0.13%	74.7	4,343				0.7874
-2.5	0.62%	75.9	4,410	67	1.2	58	0.7995
-2.0	2.28%	77.1	4,631	221	1.2	191	0.8396
-1.5	6.68%	78.2	4,852	221	1.2	191	0.8797
-1.0	15.87%	79.4	5,074	221	1.2	191	0.9198
-0.5	30.85%	80.5	5,295	221	1.2	191	0.9599
0.0	50.00%	81.7	5,516	221	1.2	191	1.0000
0.5	69.15%	82.8	5,737	221	1.2	191	1.0401
1.0	84.13%	84.4	5,958	221	1.5	147	1.0802
1.5	93.32%	85.0	6,047	89	0.6	147	1.0963
2.0	97.72%	85.6	6,135	89	0.6	147	1.1123
2.5	99.38%	86.2	6,224	89	0.6	147	1.1284
3.0	99.87%	86.8	6,277	53	0.6	88	1.1380

2015 LFU Model - Zone K (LIPA ICAP Only)



2015 LFU Model – Zone K

06/02/2014

Zone K peak load for Locational ICAP

Mean	2014	± 1 SD		± 2 SD		± 3 SD	
		MW	PU	MW	PU	MW	PU
	5,516	5,958	1.0802	6,135	1.1123	6,288	1.1400
		5,074	0.9198	4,631	0.8396	4,343	0.7874

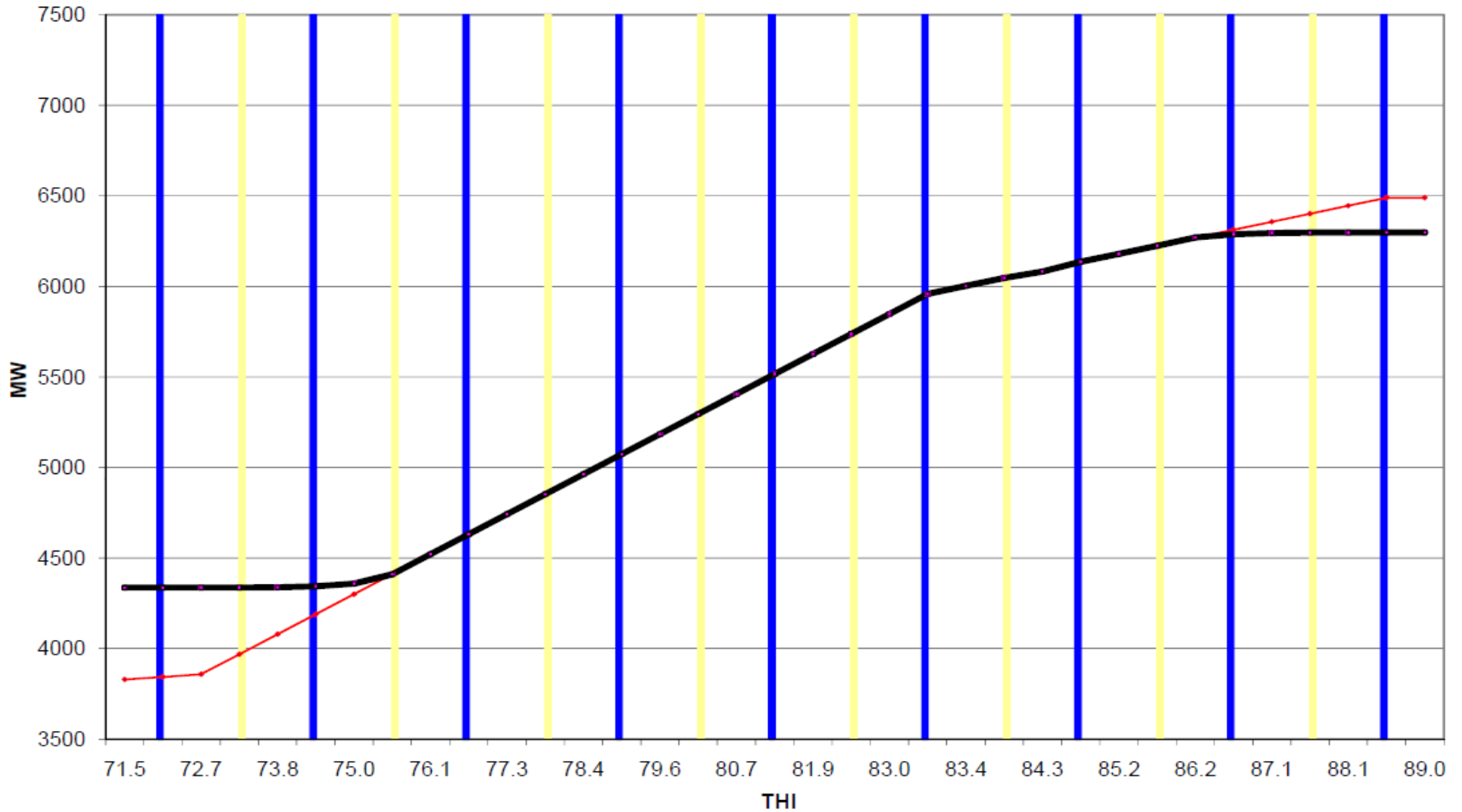
		x SD	probability	probability bands
High	6,297	3.5	0.9998	
Low	6,224	2.5	0.9938	0.0060
High	6,224	2.5	0.9938	
Low	6,047	1.5	0.9332	0.0606
High	6,047	1.5	0.9332	
Low	5,737	0.5	0.6915	0.2417
High	5,737	0.5	0.6915	
Low	5,295	-0.5	0.3085	0.3830
High	5,295	-0.5	0.3085	
Low	4,852	-1.5	0.0668	0.2417
High	4,852	-1.5	0.0668	
Low	4,410	-2.5	0.0062	0.0606
High	4,410	-2.5	0.0062	
Low	4,337	-3.5	0.0002	0.0060

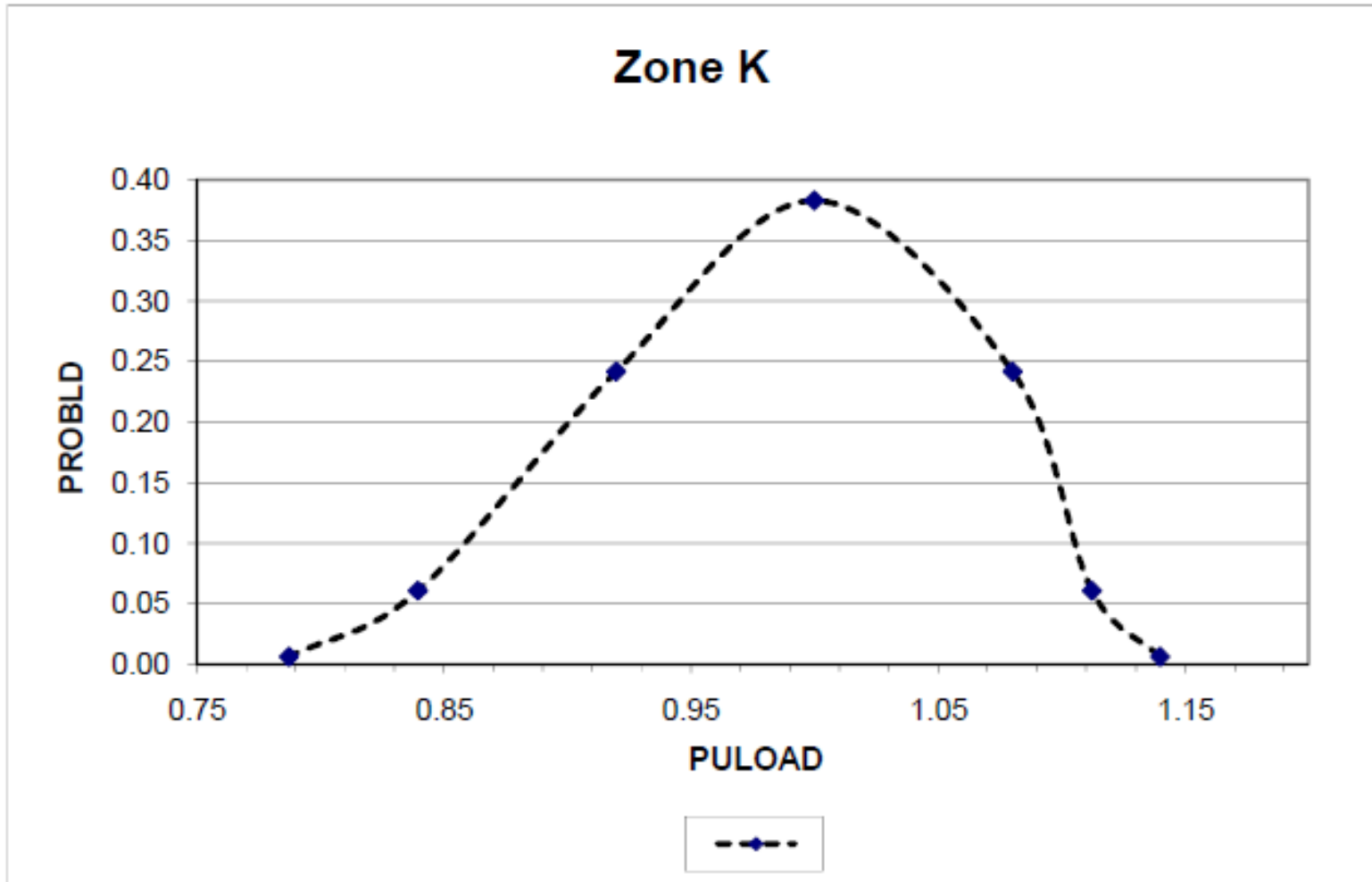
Sigma	MW
-4.0	4,336
-3.5	4,337
-3.0	4,343
-2.5	4,410
-2.0	4,631
-1.5	4,852
-1.0	5,074
-0.5	5,295
0.0	5,516
0.5	5,737
1.0	5,958
1.5	6,047
2.0	6,135
2.5	6,224
3.0	6,288
3.5	6,297
4.0	6,298

LIPA PULOAD	1.1400	1.1123	1.0802	1.0000	0.9198	0.8396	0.7874
PROBLD	0.0060	0.0606	0.2417	0.3830	0.2417	0.0606	0.0060

0.9963
0.9996

Zone K - MW versus THI





Comparison of 2014 & 2015 Models

2015 Load Forecast Uncertainty Distribution

			Zone K
LFU Bin	Cum Prob	Bin Prob	PU MW @ 67th
1	0.62%	0.62%	0.7867
2	6.68%	6.06%	0.8396
3	30.85%	24.17%	0.9198
4	69.15%	38.30%	1.0000
5	93.32%	24.17%	1.0802
6	99.38%	6.06%	1.1308
7	100.00%	0.62%	1.1677

2014 Load Forecast Uncertainty Distribution

			Zone K
LFU Bin	Cum Prob	Bin Prob	PU MW @ 67th
1	0.62%	0.62%	0.7970
2	6.68%	6.06%	0.8677
3	30.85%	24.17%	0.9364
4	69.15%	38.30%	1.0000
5	93.32%	24.17%	1.0554
6	99.38%	6.06%	1.0996
7	100.00%	0.62%	1.1295

The New York Independent System Operator (NYISO) is a not-for-profit corporation responsible for operating the state's bulk electricity grid, administering New York's competitive wholesale electricity markets, conducting comprehensive long-term planning for the state's electric power system, and advancing the technological infrastructure of the electric system serving the Empire State.



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