NYCA Preliminary Weather Normalization and RLGF Modeling Discussion

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Agenda

- COVID-19 Implications for the NYCA Peak Forecast

- Year-to-Date NYCA Peak and Weather Conditions

- Year-to-Date NYCA Peak Weather Normalization – Preliminary Example

- 2021 NYCA Regional Load Growth Factor Projections – Preliminary Examples

- Discussion and Next Steps

COVID-19 Implications for the NYCA Peak Forecast

- COVID-19 and its associated economic impacts have generally reduced observed load levels since mid-March

- The IRM and ICAP weather normalization models often include binary and interaction variables to account for differences in the current year's load level and weather response. These variables can provide an estimate of the impact of COVID-19 on summer daily peak loads

- The NYISO develops three Criteria to evaluate Transmission Owner estimates of peak load growth for the following year. Two of the three Criteria project load growth via models incorporating economic and other variables. Any economic recovery forecasted for the summer of 2021 will be captured in the modeled load growth

- Either one of or a combination of these two methods will allow the LFTF, NYISO, and the Transmission Owners to accurately account for COVID-19 impacts on forecasted 2021 peak demand

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Year-to-Date NYCA Peak

- The Year-to-Date* NYCA Peak of 30,660 MW occurred on July 27, 2020 at Hour Beginning 17 (5 PM)

- The NYCA composite peak-producing CTHI on July 27 was 83.56, slightly below the 20-year average of 83.79

- The NYCA CTHI was on the 46th percentile relative to the 20-year history (2000 – 2019). The CTHI in individual transmission districts on July 27th ranged from 81.35 (RG&E) to 85.21 (Central Hudson), and from the 25th percentile (RG&E) to the 75th percentile (NYPA)

- Con Edison and O&R design their peak forecast at a 1-in-3 (67th percentile) criterion, while the remaining Transmission Owners design their peak forecasts at a 1-in-2 (50th percentile) criterion. The load-weighted NYCA peak forecast design condition is the 57th percentile (84.23 CTHI)

  *Through August 16

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Year-to-Date NYCA Peak Weather Conditions

Peak - Producing CTHI									
Statistic	**CE**	**CH**	**LI**	**N Grid**	**NYPA**	**NYSEG**	**OR**	**RGE**	**NYCA**
Max	90.73	89.63	89.71	86.42	87.72	87.44	89.60	87.75	88.06
20 Yr Avg	85.52	85.52	84.74	82.36	82.07	82.53	84.71	83.07	83.79
Min	80.76	81.18	79.12	77.35	77.13	77.94	81.17	77.80	78.87
StDev	2.56	2.42	2.91	2.46	3.16	2.52	2.53	2.55	2.52
50th	85.52	85.52	84.74	82.36	82.07	82.53	84.71	83.07	83.79
57th	85.97	85.95	85.25	82.79	82.63	82.97	85.16	83.52	84.23
67th	86.63	86.57	86.00	83.42	83.44	83.62	85.80	84.17	84.88
90th	88.80	88.62	88.47	85.51	86.12	85.76	87.95	86.34	87.02
7/27/2020	84.59	85.21	85.02	82.11	84.19	83.02	83.96	81.35	83.56
Percentile	36%	45%	54%	46%	75%	58%	38%	25%	46%
z (2020)	-0.36	-0.13	0.10	-0.10	0.67	0.19	-0.30	-0.67	-0.09
CTHI Delta	-0.93	-0.31	0.28	-0.25	2.12	0.49	-0.75	-1.72	-0.23

Notes: Cumulative Temperature & Humidity Index (CTHI) is a three-day weighted average of maximum temperature and humidity
The 20-year Peak-Producing CTHI distributions are calculated using 2000 – 2019 NYCA peak dates
The NYCA design condition of the 57th percentile is based upon a load-weighted average of the TD design conditions

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Preliminary Example - NYCA Peak Weather Normalization

- The NYISO performed a preliminary regression model analysis to weather-normalize the 2020 NYCA peak through July

- The approximate weather-normalized 2020 NYCA YTD peak using this method is 30,950 MW. This includes the generally load-reducing impacts of COVID-19

- The preliminary weather-normalized peak value of 30,950 MW does not include the addback of Demand Response impacts

- The year 2020 binary, which reflects the difference in 2020 base load levels relative to prior years at cool temperatures, is approximately -1,100 MW

- Through various analyses, the NYISO has observed that the load response to weather has been larger this summer relative to prior summers. Thus, the observed difference in load levels decreases at higher temperatures

- The approximate difference in 2020 load levels relative to prior years at summer peak temperatures is significantly smaller, at approximately -550 MW

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NYCA Load Response to Weather – Simple Polynomial Fits

June and July NYCA Weekday Peaks (MW vs CTHI)
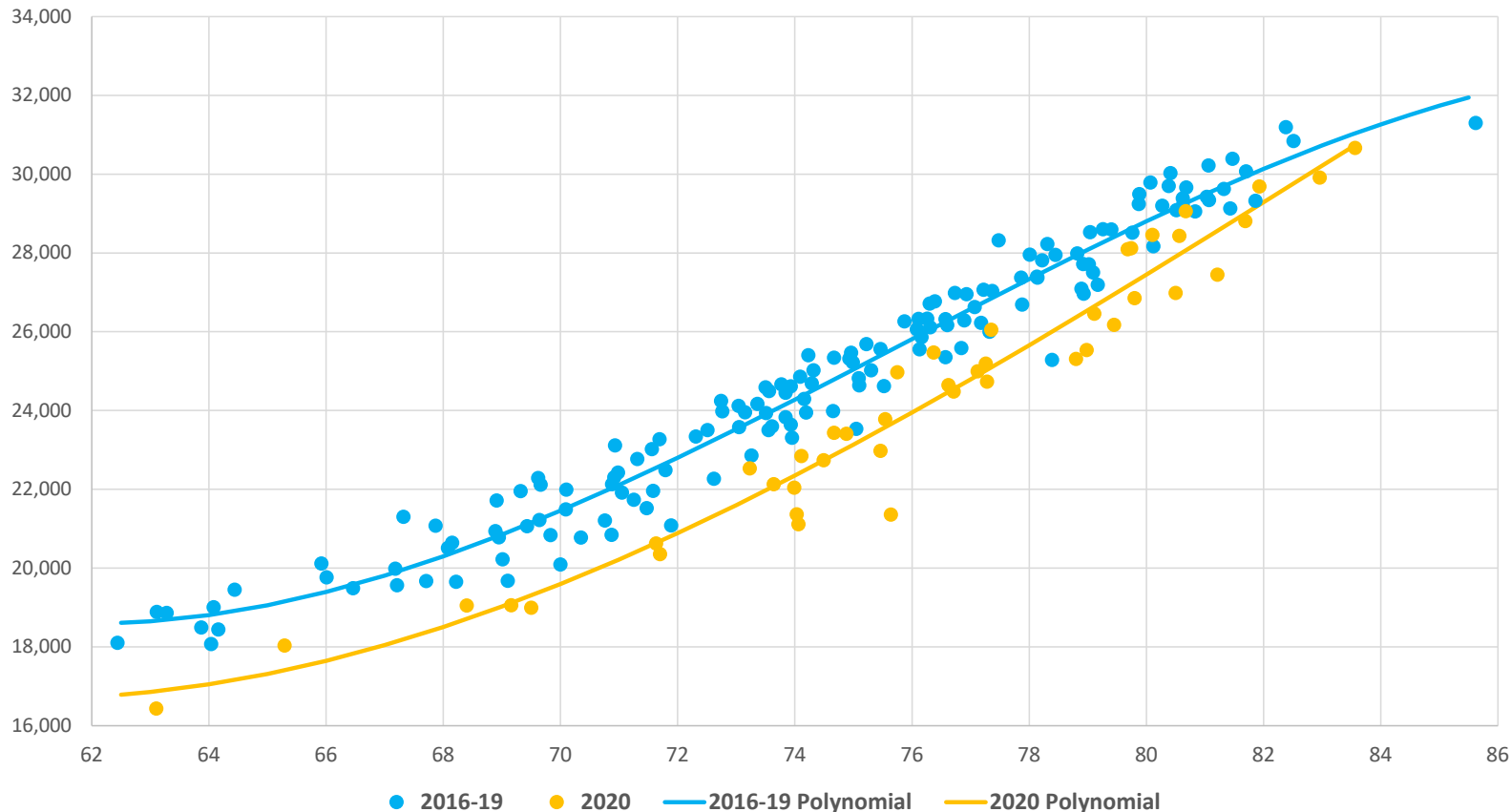
Note: These regression lines show simple 3rd order polynomial fits for illustrative purposes. They do not reflect the full model fit used for the preliminary NYCA weather-normalization analysis.

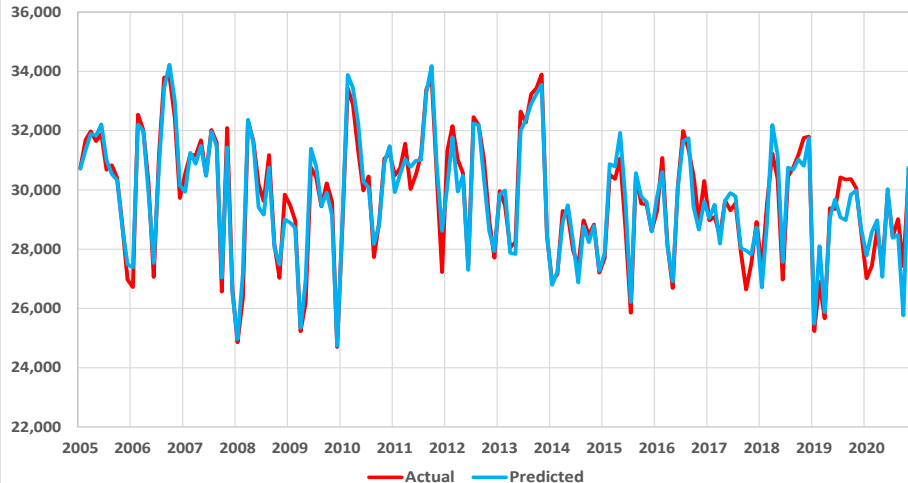# NYCA RLGF Analysis – Preliminary Criterion 2 Example

- The NYISO performed preliminary Criterion 2 peak load growth modelling on a statewide level

- Criterion 2 is a projection of peak load growth relative to predicted economic growth and other variables. The NYISO used statewide economic indices provided in the April 2020 Moody's forecast delivery. Economic variables considered include Population, Households, Real Income, Employment and GDP

- The Criterion 2 models assessed using the various economic variables allow for statewide peak growth ranging from approximately -2.5% to +2.5% for 2021 relative to 2020

- The Moody's forecasts used show a slight economic recovery for July 2021 relative to July 2020. For example, GDP grows by 3% and Employment grows by 1%, while Real Income falls by 2%

- Criterion 2 models load behavior during hot summer days. These models estimate the impact of COVID-19 and the economy on load levels during peak-type scenarios. The approximate impact on peak load levels is estimated to be -550 MW

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NYCA RLGF Analysis – Preliminary Criterion 2 Example

Variable	Coefficient	StdErr	T-Stat	P-Value
Constant	-39422.202	10564.96	-3.731	0.03%
CTHI60	1872.956	319.943	5.854	0.00%
CTHI60 Squared	-27.089	7.186	-3.77	0.02%
Energy Efficiency Trend	-194.028	53.883	-3.601	0.04%
Coincident Peak	247.534	158.694	1.56	12.09%
Daily Trend	18.519	3.737	4.955	0.00%
Weekday / Holiday	-3087.783	100.861	-30.614	0.00%
Friday	-338.389	133.304	-2.538	1.22%
Year 2020	-159.123	281.887	-0.564	57.33%
Real Income	0.007	0.003	2.324	2.15%
Population	1.862	0.416	4.478	0.00%

Model Statistics	
Adjusted Observations	160
Deg. of Freedom for Error	149
R-Squared	0.937
Adjusted R-Squared	0.933
F-Statistic	222.199
Prob (F-Statistic)	0
Std. Error of Regression	524.08
Mean Abs. Dev. (MAD)	386.45
Mean Abs. % Err. (MAPE)	1.31%

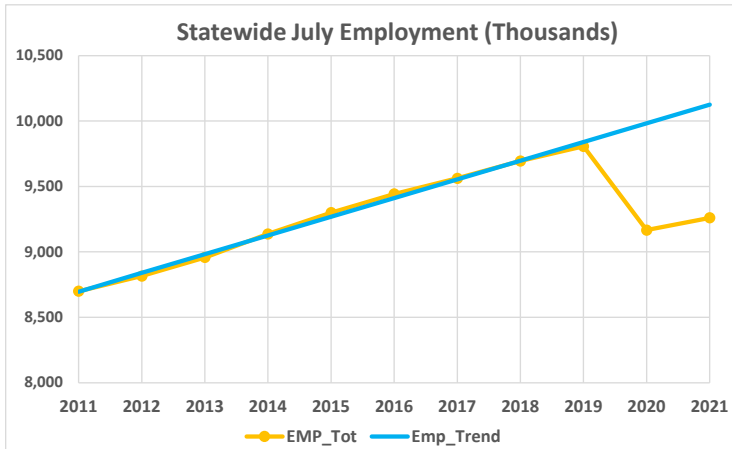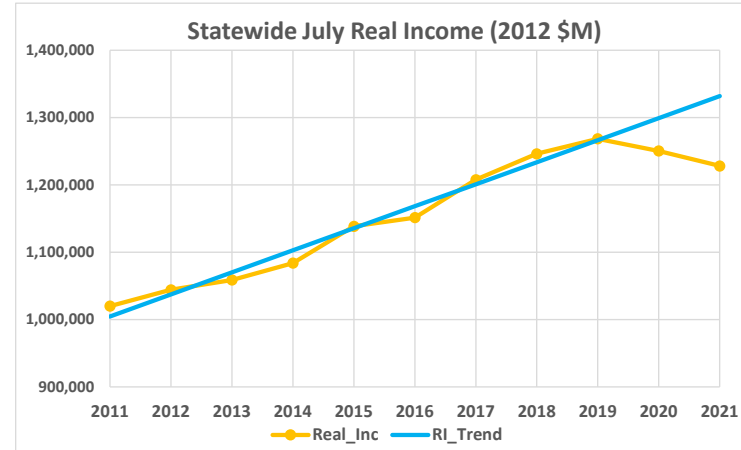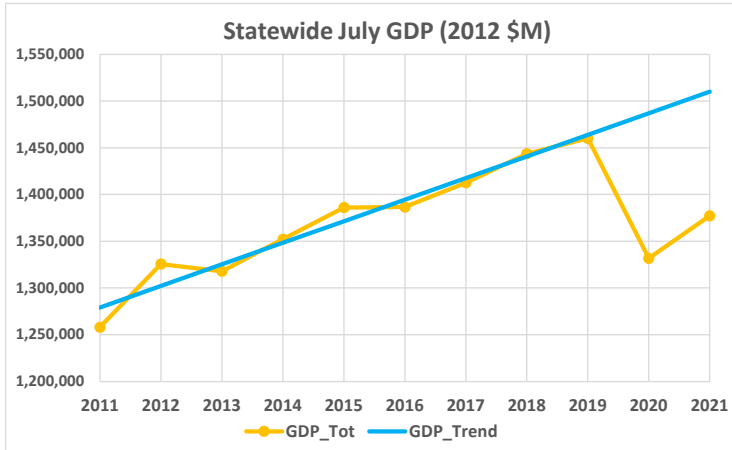NYCA Daily Peaks (MW) - Actual vs Criterion 2 Predicted

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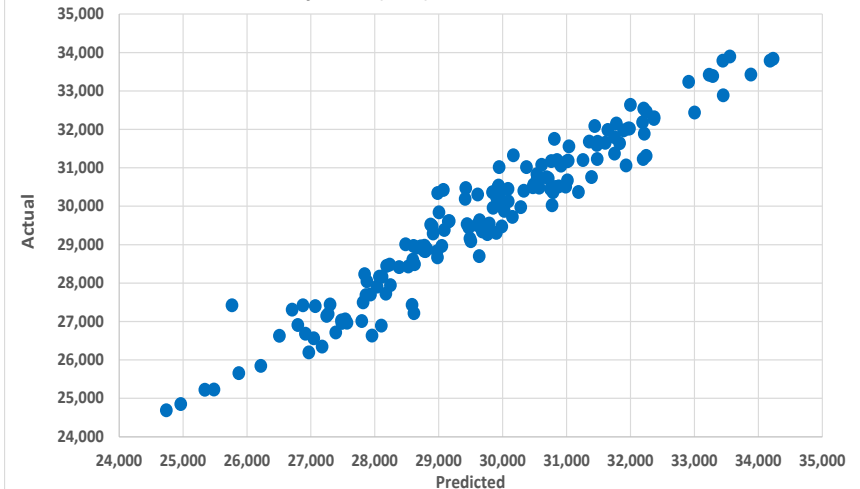
NYCA RLGF Analysis – Preliminary Criterion 3 Example

- Criterion 3 is an independent projection of load growth performed by the NYISO. Summer energy growth is regressed against economic and other variables

- The NYISO performed preliminary Criterion 3 load growth modelling on a statewide level. Economic variables considered include Population, Households, Real Income, Employment and GDP

- The Criterion 3 models assessed using the various economic variables allow for statewide peak growth ranging from approximately -1.5% to +4% for 2021 relative to 2020

- The Moody's forecasts used show a slight economic recovery for July 2021 relative to July 2020. For example, GDP grows by 3% and Employment grows by 1%, while Real Income falls by 2%

- Criterion 3 models load behavior across the summer, including both base load and peak load type days. The preliminary Criterion 3 models assess June and July days. The final Criterion 3 models will assess July and August days

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NYCA Economic Summary – Moody's Analytics (April 2020 Delivery)

Statewide July GDP (2012 $M)

Statewide July Real Income (2012 $M)

Statewide July Employment (Thousands)

July Economic Variables - NYCA Year Over Year Percent Change

Year	Real Income	Employment	GDP
2012	2.4%	1.3%	5.4%
2013	1.4%	1.6%	-0.6%
2014	2.4%	2.0%	2.6%
2015	5.1%	1.8%	2.5%
2016	1.1%	1.5%	0.0%
2017	4.9%	1.3%	1.9%
2018	3.2%	1.4%	2.2%
2019	1.8%	1.2%	1.1%
2020*	-1.4%	-6.5%	-8.8%
2021*	-1.8%	1.0%	3.4%
* Forecast			
Trend	2.8%	1.5%	1.9%

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Discussion and Next Steps

- These preliminary models are examples that show how the estimated impacts of COVID-19 can be accounted for within the IRM and ICAP forecast process. All models will be updated using the most recent economic, load and weather data as part of the standard procedures for preparing the IRM and ICAP Market forecasts

- This weather-normalization and Regional Load Growth Factor modelling will be performed at the Transmission District level with updated data through August. Updated Moody's economic forecasts will be included in the Criteria modelling when available

- The NYISO will discuss and assess similar modeling work and resulting values from the Transmission Owners. TO results will be assessed against the criteria set forth in the Load Forecasting Manual

- Best practices for estimating the COVID-19 impact on summer peak loads will continue to be discussed at LFTF. Preliminary and final IRM and ICAP modelling work and forecasts will be reviewed during future LFTF meetings

- The NYISO will continue to track and estimate the load impacts of COVID-19 via various modelling techniques

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Questions?

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- 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

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