



2017 to 2019 RS-1 Budget: Energy Forecast

Arthur Maniaci

*Supervisor, Load Forecasting & Energy Efficiency
New York Independent System Operator*

Budget & Priorities Working Group

September 12, 2016

KCC

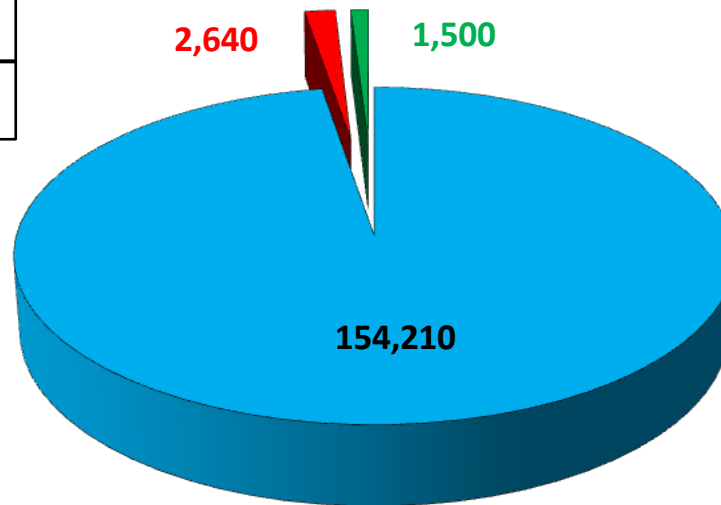
RS-1 Forecast Methodology

- ◆ **Net Energy** – Based on zonal econometric models, net of transmission losses, with adjustments.
 - **Energy Models:** Examined Moody's Analytics forecasts & reviewed current energy usage patterns. Budget forecast is based on 2016 Gold Book with modest adjustments for year-to-date tracking of forecast to weather-adjusted send-out.
 - **Energy Efficiency & Solar PV Impact:** The budget forecast includes the same energy efficiency impacts and Solar PV as the Gold Book forecast.
- ◆ **Exports**
 - Annual levels determined by judgment & statistical analysis of recent history. Through June 2016, actual is on par with budget. Exports for RS-1 are lower than in 2015 due to CTS.
- ◆ **Wheels**
 - Annual levels determined by judgment & statistical analysis of recent history. Through June, 2016 actual is ahead of budget.

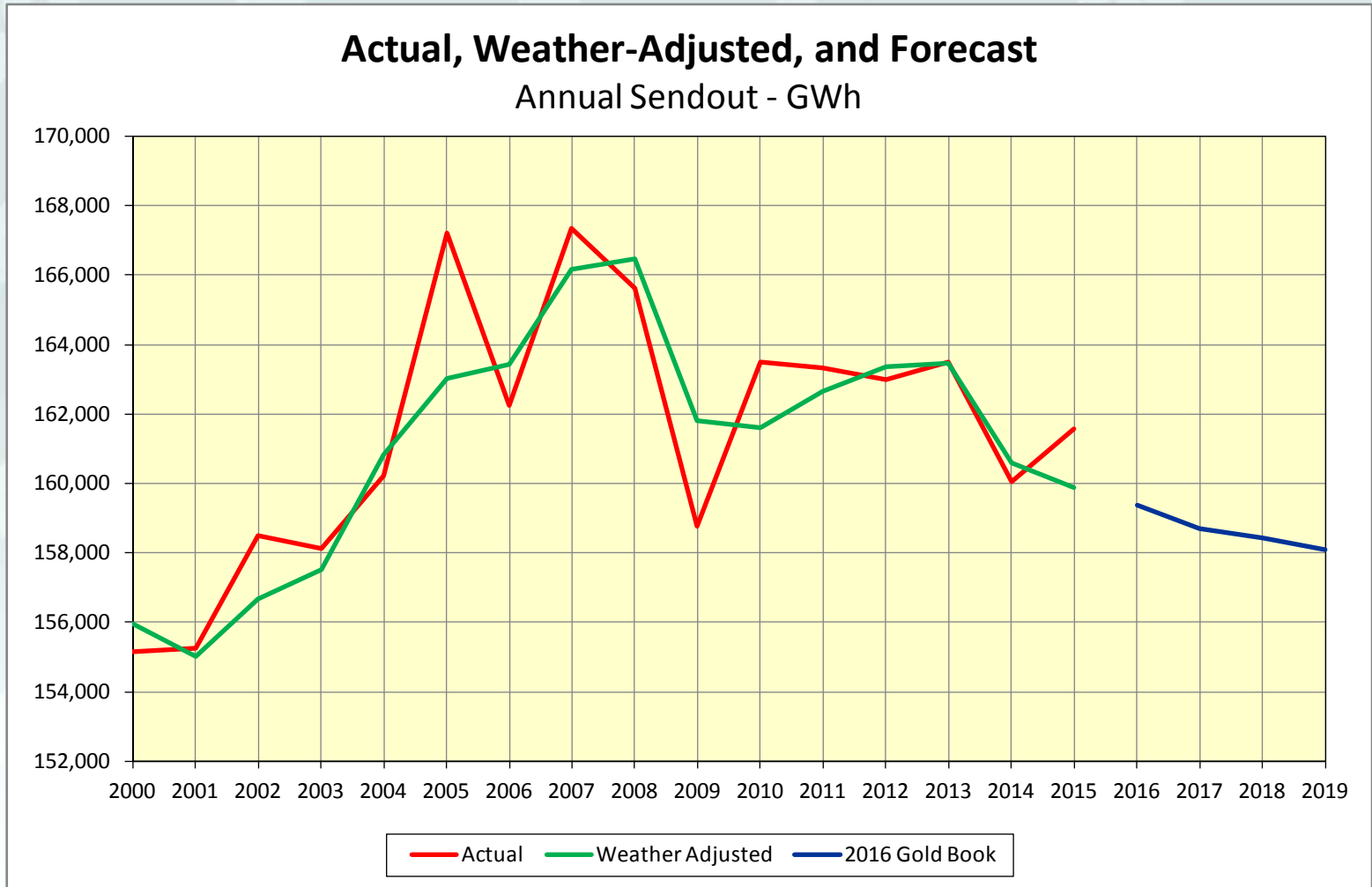
Three Components of Forecast

2017 RS-1 Forecast (GWh)

| |
|----------------------------|
| ■ Net Energy - 154,210 GWh |
| ■ Exports - 2,640 GWh |
| ■ Wheels - 1,500 GWh |
| TOTAL - 158,350 GWh |

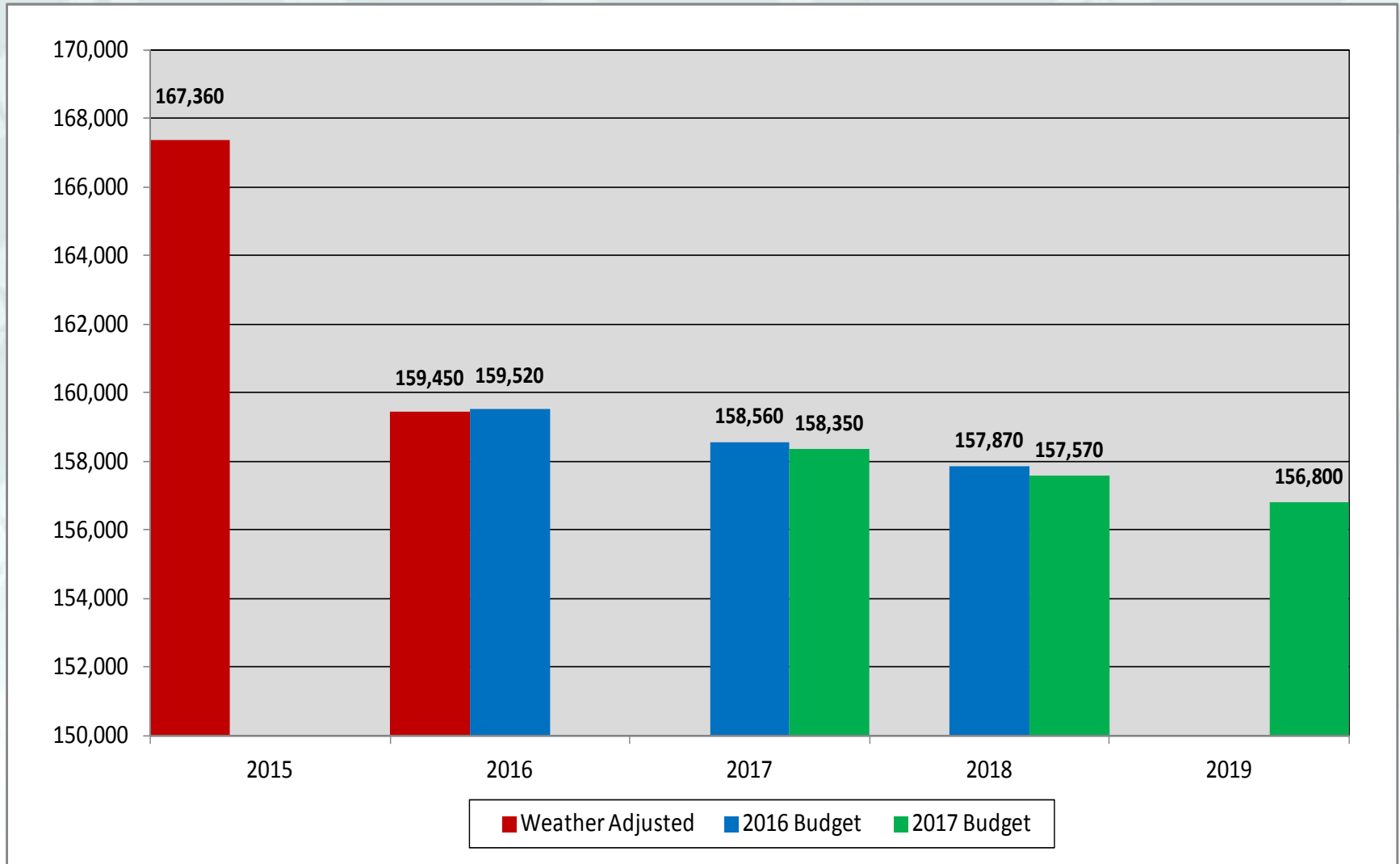


Annual Energy Send-out Forecast

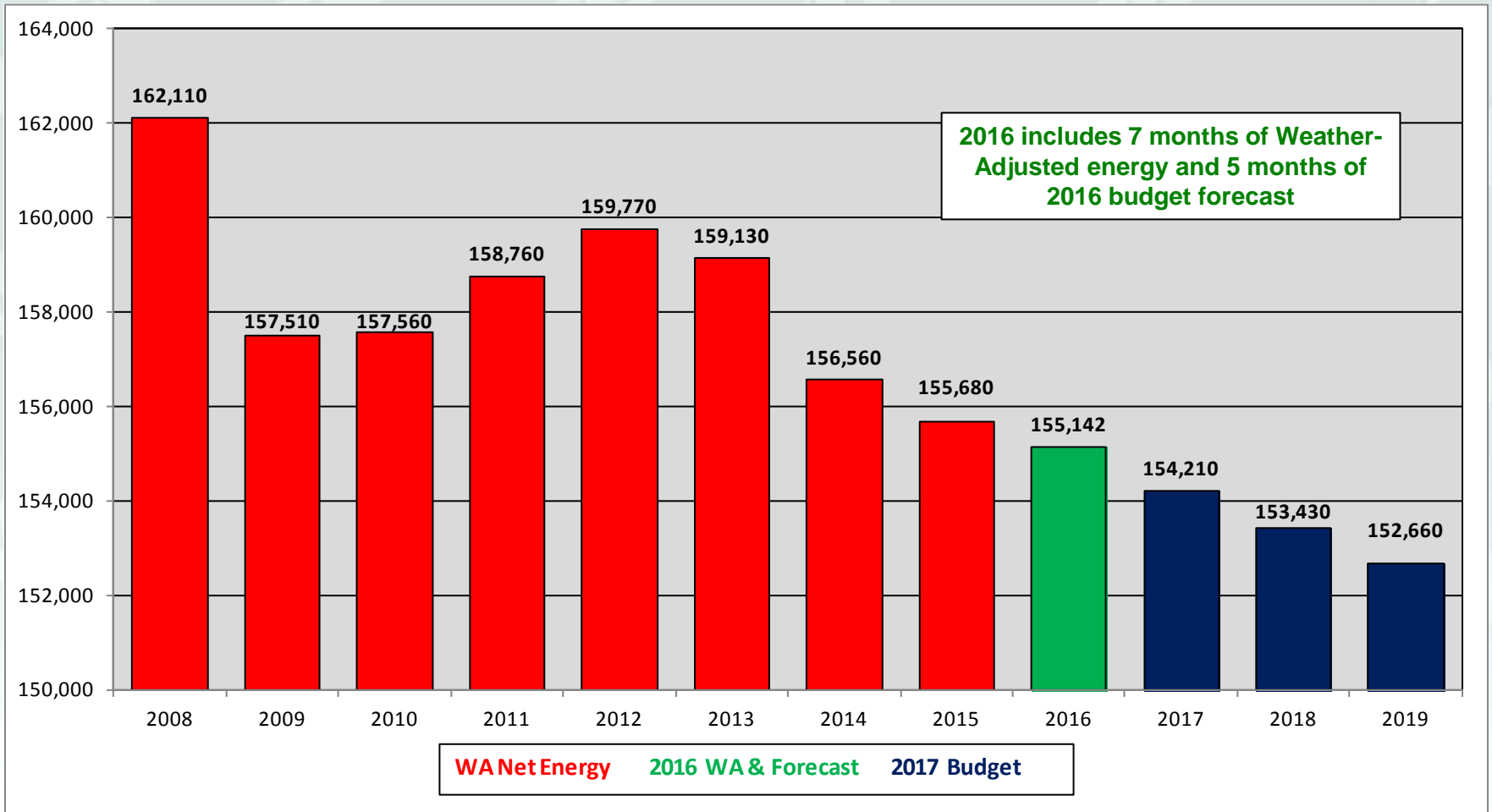


Note: Sendout includes bulk power system transmission losses; these are excluded from the net energy used in the RS-1 budget.

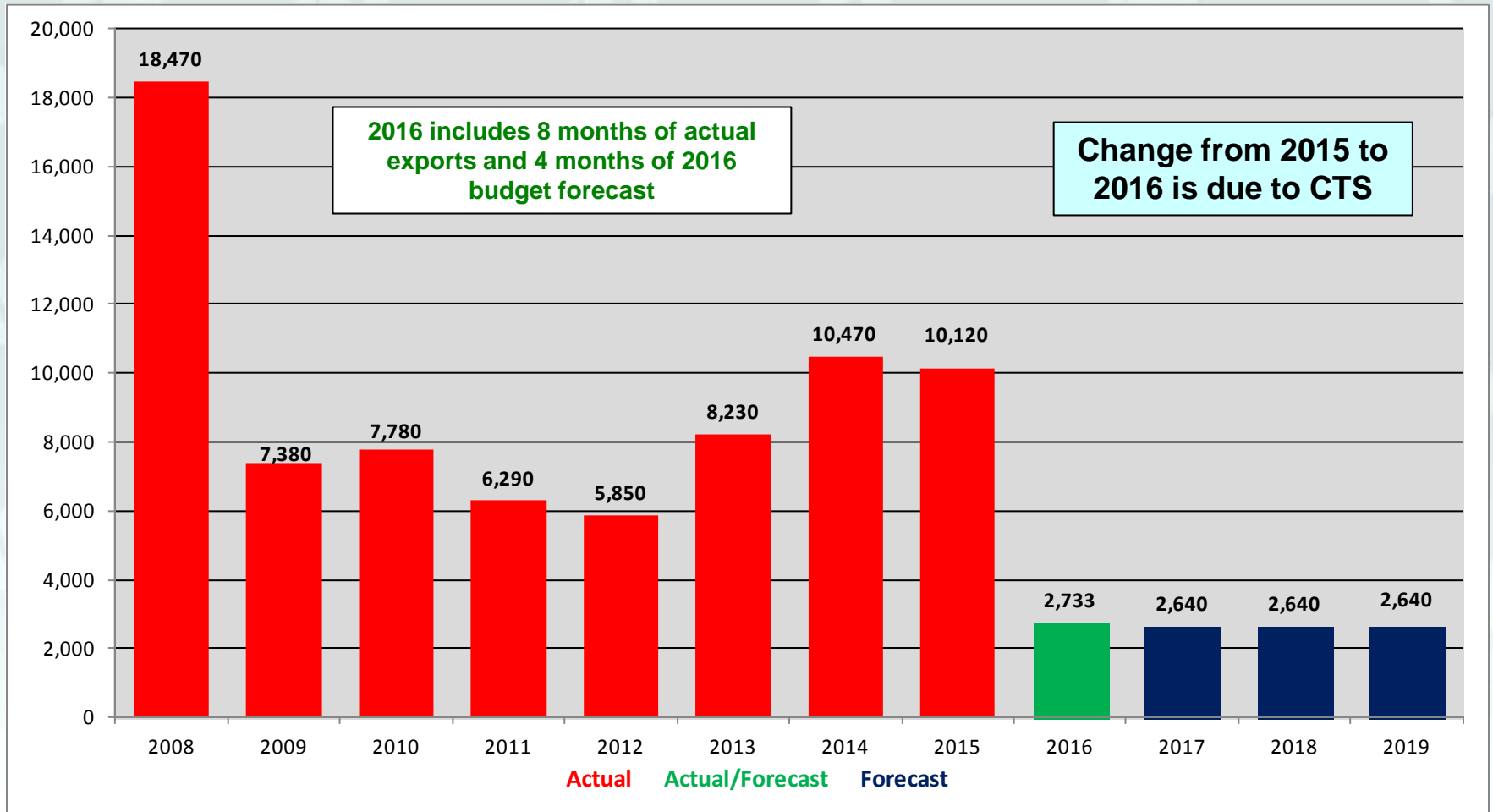
RS-1 Budget Forecast - GWh



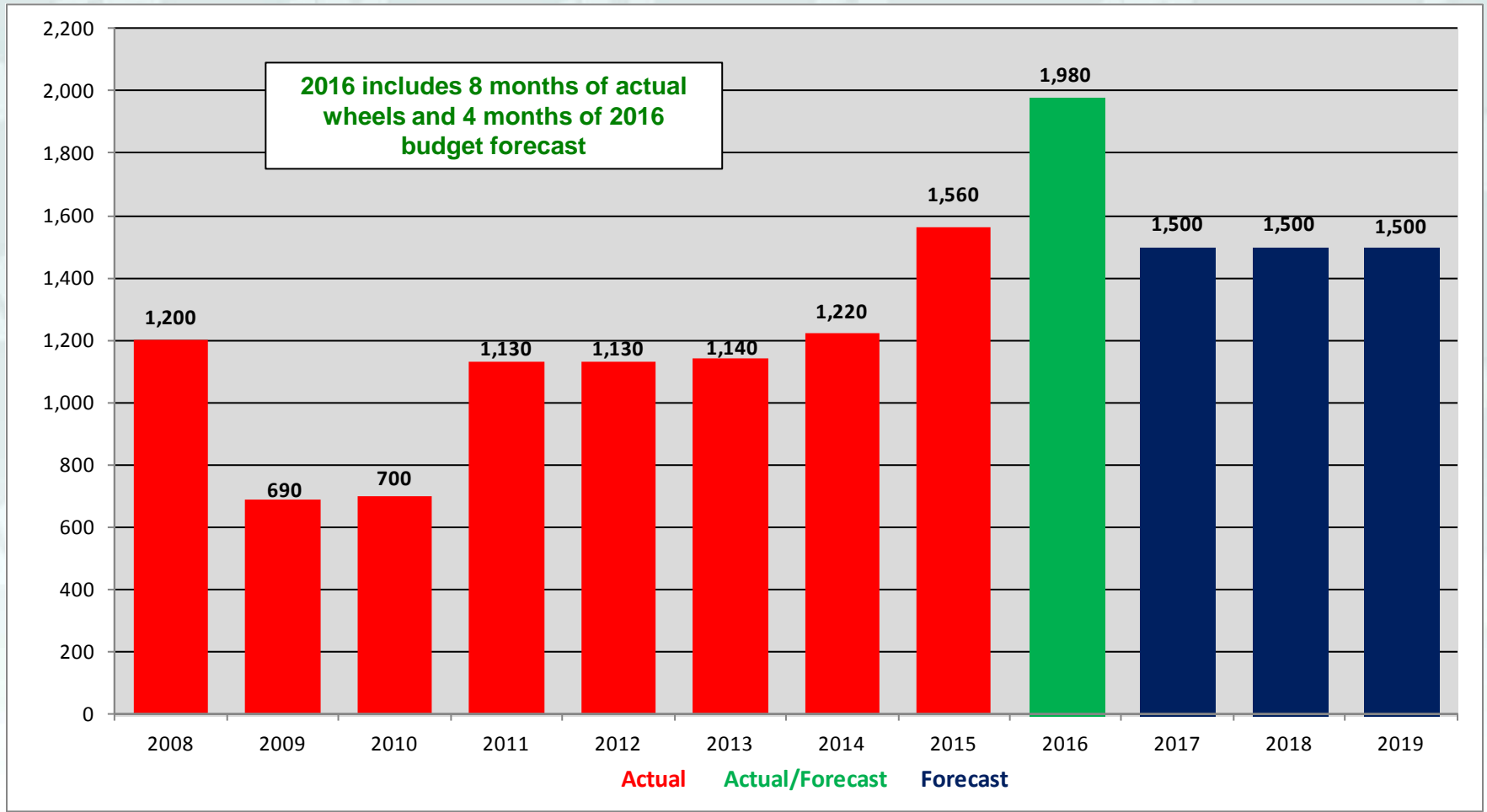
2017-2019 Net Energy - GWh



2017–2019 Exports - GWh



2017–2019 Wheels - GWh



RS-1 Budget Summary - GWh

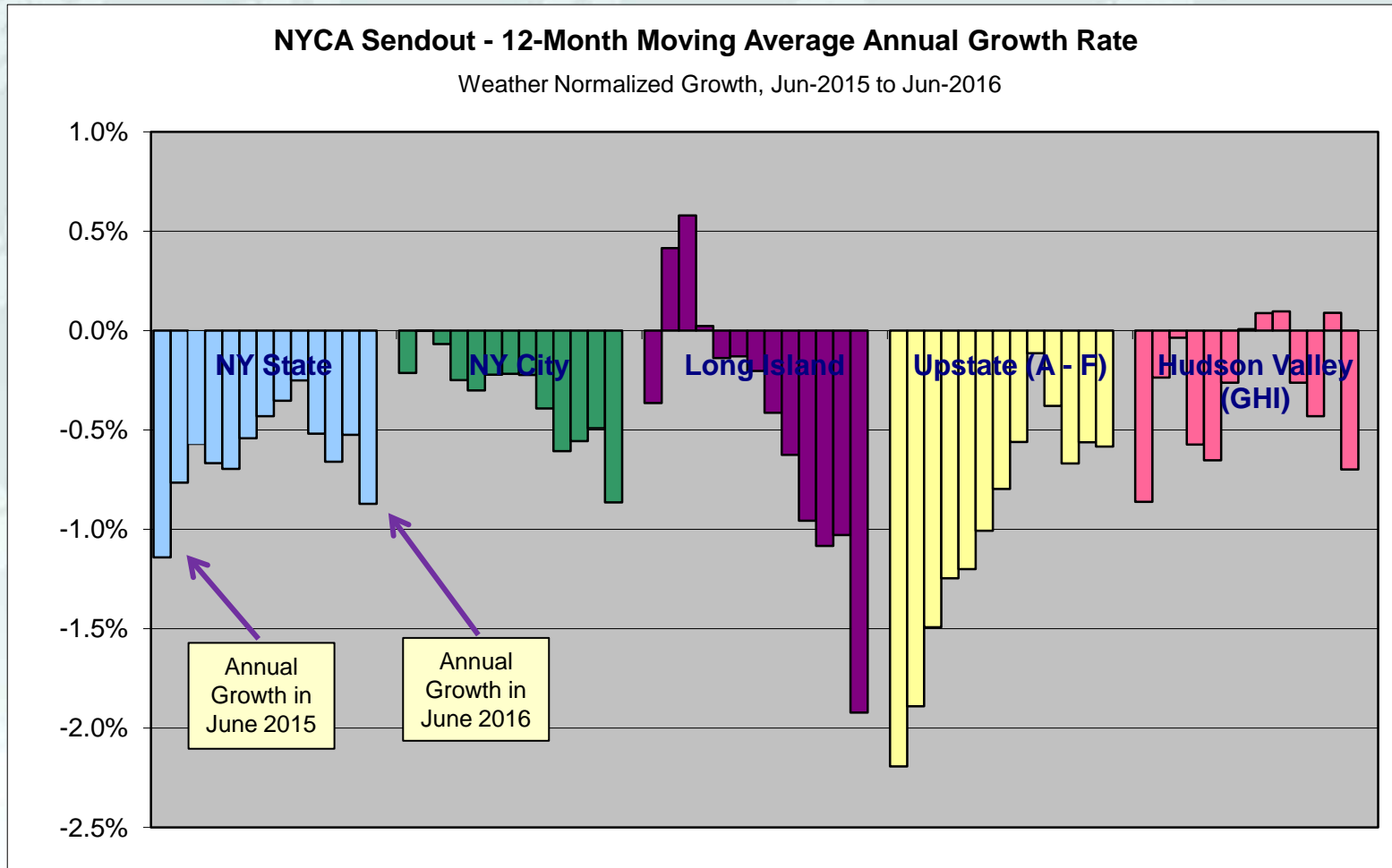
| Actual & Forecast Energy - GWh | | | | | | Pct Growth | |
|--------------------------------|------------|---------|--------|------------|----------|------------|----------|
| Year | Net Energy | Exports | Wheels | RS-1 Total | Forecast | Net Energy | RS-1 Tot |
| 2008 | 161,271 | 18,473 | 1,196 | 180,940 | | | |
| 2009 | 154,450 | 7,380 | 685 | 162,515 | | | |
| 2010 | 159,496 | 5,630 | 701 | 165,827 | | | |
| 2011 | 159,454 | 6,291 | 1,125 | 166,870 | | | |
| 2012 | 159,170 | 5,848 | 1,125 | 166,143 | | | |
| 2013 | 159,132 | 8,229 | 1,136 | 168,497 | | | |
| 2014 | 156,035 | 10,470 | 1,220 | 167,725 | | | |
| 2015 | 157,307 | 10,121 | 1,559 | 168,987 | | | |
| 2016 (1) | 156,565 | 2,733 | 1,980 | 161,278 | 159,520 | -0.47% | -5.60% |
| 2017 | 154,210 | 2,640 | 1,500 | | 158,350 | -1.50% | -0.73% |
| 2018 | 153,430 | 2,640 | 1,500 | | 157,570 | -0.51% | -0.49% |
| 2019 | 152,660 | 2,640 | 1,500 | | 156,800 | -0.50% | -0.49% |

(1) 2016 Includes 8 months actual & 4 months projection

RS-1 Budget by Month Actual and Forecast - GWh

| Month | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1 | 15,290 | 14,430 | 14,460 | 14,020 | 14,680 | 15,800 | 15,330 | 13,715 | 13,675 | 13,605 | 13,535 |
| 2 | 12,800 | 12,880 | 12,730 | 12,670 | 13,470 | 14,140 | 14,660 | 12,750 | 12,405 | 12,345 | 12,285 |
| 3 | 13,250 | 12,970 | 13,430 | 12,710 | 13,750 | 14,540 | 14,670 | 12,395 | 12,795 | 12,735 | 12,675 |
| 4 | 12,290 | 11,800 | 12,240 | 12,110 | 12,450 | 12,190 | 12,190 | 11,685 | 11,695 | 11,635 | 11,575 |
| 5 | 12,600 | 13,160 | 13,020 | 13,310 | 12,970 | 12,510 | 12,960 | 12,415 | 12,205 | 12,145 | 12,085 |
| 6 | 13,040 | 15,020 | 14,590 | 14,360 | 14,220 | 14,180 | 13,750 | 13,730 | 13,615 | 13,545 | 13,475 |
| 7 | 14,700 | 17,800 | 17,540 | 17,350 | 17,710 | 15,690 | 16,120 | 16,583 | 15,735 | 15,655 | 15,575 |
| 8 | 16,150 | 16,460 | 15,850 | 16,630 | 15,190 | 14,800 | 16,140 | 17,105 | 15,395 | 15,315 | 15,245 |
| 9 | 12,950 | 13,120 | 13,850 | 13,550 | 13,280 | 13,650 | 14,730 | 13,210 | 13,275 | 13,215 | 13,155 |
| 10 | 12,650 | 12,920 | 13,070 | 12,590 | 12,740 | 12,710 | 12,960 | 12,210 | 12,275 | 12,215 | 12,155 |
| 11 | 12,290 | 12,110 | 12,440 | 12,850 | 13,130 | 13,210 | 12,680 | 12,060 | 12,015 | 11,955 | 11,895 |
| 12 | 14,500 | 13,990 | 13,630 | 13,990 | 14,900 | 14,300 | 12,810 | 13,420 | 13,265 | 13,205 | 13,145 |
| Annual | 162,510 | 166,660 | 166,850 | 166,140 | 168,490 | 167,720 | 169,000 | 161,278 | 158,350 | 157,570 | 156,800 |

Weather Adjusted Energy Growth Rates June 2015 to June 2016



2016 Budget Forecast Update

Actual Through August, 2016 Budget for Balance of Year

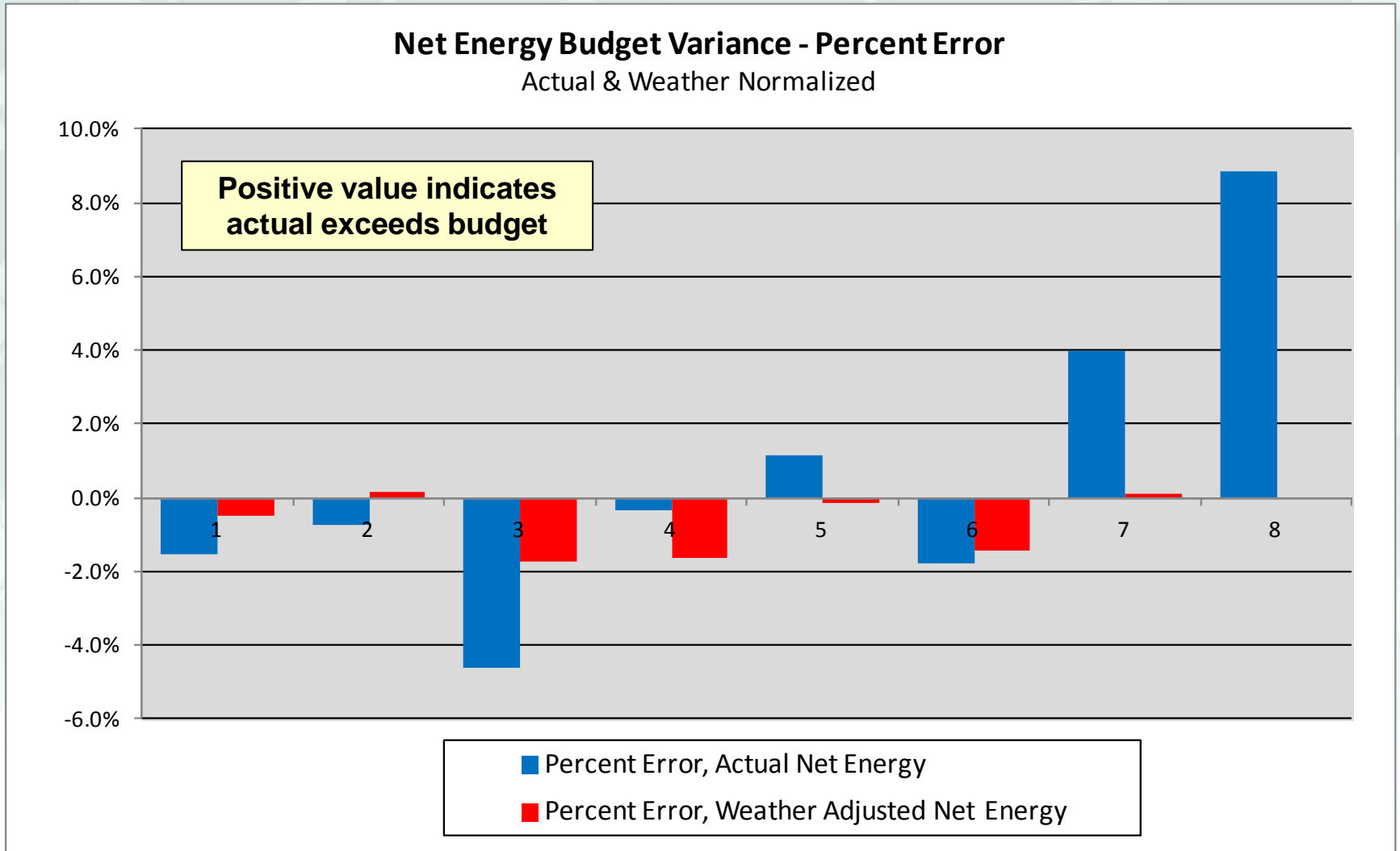
| 2016 Actual GWh | | | | | | | 2016 Long Term Forecast - GWh | | | | | |
|-------------------|-------|------|----------------|--------------|--------------|----------------|-------------------------------|--------------|--------------|----------------|--------------------|----------------|
| Actual / Forecast | Month | Days | Net GWh | Exports GWh | Wheels GWh | Total GWh | Net Load | Exports | Wheels | Budget GWh | Monthly Over/Under | Cum Over/Under |
| Actual | 1 | 31 | 13,280 | 245 | 190 | 13,715 | 13,490 | 220 | 90 | 13,800 | -85 | -85 |
| Actual | 2 | 29 | 12,339 | 230 | 180 | 12,749 | 12,430 | 220 | 90 | 12,740 | 9 | -76 |
| Actual | 3 | 31 | 12,001 | 215 | 180 | 12,396 | 12,580 | 220 | 90 | 12,890 | -494 | -570 |
| Actual | 4 | 30 | 11,261 | 250 | 175 | 11,686 | 11,300 | 220 | 90 | 11,610 | 76 | -494 |
| Actual | 5 | 31 | 12,005 | 205 | 200 | 12,410 | 11,870 | 220 | 90 | 12,180 | 230 | -264 |
| Actual | 6 | 30 | 13,327 | 185 | 215 | 13,727 | 13,570 | 220 | 90 | 13,880 | -153 | -417 |
| Actual | 7 | 31 | 16,087 | 255 | 241 | 16,583 | 15,470 | 220 | 90 | 15,780 | 803 | 386 |
| Actual | 8 | 31 | 16,598 | 268 | 239 | 17,105 | 15,250 | 220 | 90 | 15,560 | 1,545 | 1,931 |
| Forecast | 9 | 30 | 12,870 | 220 | 90 | 13,180 | 12,870 | 220 | 90 | 13,180 | 0 | 1,931 |
| Forecast | 10 | 31 | 11,870 | 220 | 90 | 12,180 | 11,870 | 220 | 90 | 12,180 | 0 | 1,931 |
| Forecast | 11 | 30 | 11,720 | 220 | 90 | 12,030 | 11,720 | 220 | 90 | 12,030 | 0 | 1,931 |
| Forecast | 12 | 31 | 13,070 | 220 | 90 | 13,380 | 13,070 | 220 | 90 | 13,380 | 0 | 1,931 |
| Annual | | | 156,428 | 2,733 | 1,980 | 161,141 | 155,490 | 2,640 | 1,080 | 159,210 | 1,931 | |

2016 Budget Forecast Update

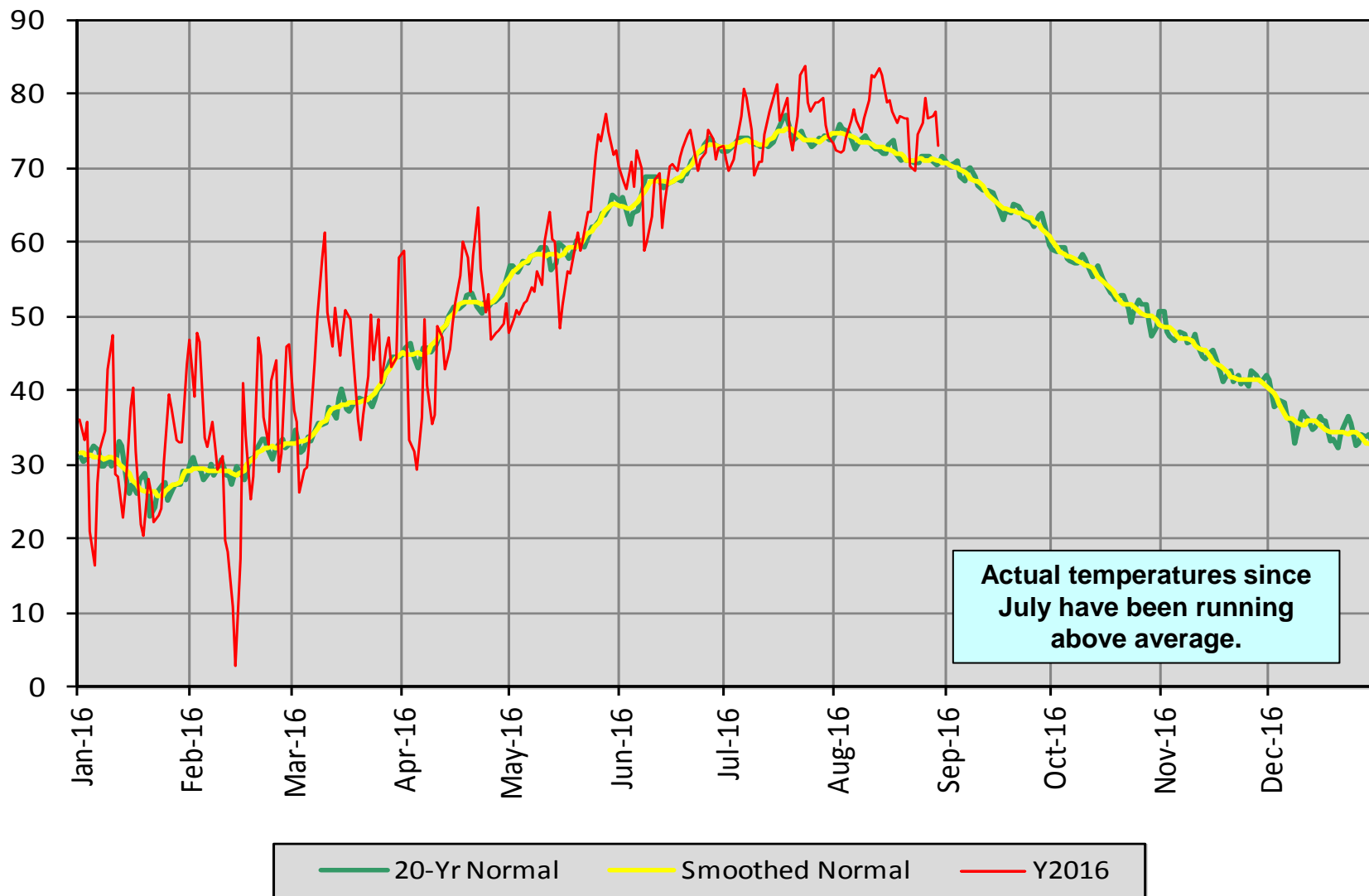
Weather-Adjusted Through July, 2016 Budget for Balance of Year

| 2016 Weather-Adjusted GWh through July | | | | | | | 2016 Budget Forecast - GWh | | | | | |
|--|-------|------|---------------------|----------------|---------------|----------------|----------------------------|--------------|--------------|----------------|---------------------------|-----------------------|
| Adjusted/ Forecast | Month | Days | Net Wthr Adj GWh | Exports GWh | Wheels GWh | Total GWh | Net Load | Exports | Wheels | Budget GWh | Monthly Over/ Under | Cum Over/ Under |
| Adjusted | 1 | 31 | 13,425 | 245 | 190 | 13,860 | 13,490 | 220 | 90 | 13,800 | 60 | 60 |
| Adjusted | 2 | 29 | 12,448 | 230 | 180 | 12,858 | 12,430 | 220 | 90 | 12,740 | 118 | 178 |
| Adjusted | 3 | 31 | 12,361 | 215 | 180 | 12,756 | 12,580 | 220 | 90 | 12,890 | -134 | 44 |
| Adjusted | 4 | 30 | 11,143 | 250 | 175 | 11,568 | 11,330 | 220 | 90 | 11,640 | -72 | -28 |
| Adjusted | 5 | 31 | 11,881 | 205 | 200 | 12,286 | 11,900 | 220 | 90 | 12,210 | 76 | 48 |
| Adjusted | 6 | 30 | 13,412 | 185 | 215 | 13,812 | 13,610 | 220 | 90 | 13,920 | -108 | -60 |
| Adjusted | 7 | 31 | 15,522 | 255 | 241 | 16,018 | 15,510 | 220 | 90 | 15,820 | 198 | 138 |
| Forecast | 8 | 31 | 15290 | 220 | 90 | 15,600 | 15,290 | 220 | 90 | 15,600 | 0 | 138 |
| Forecast | 9 | 30 | 12900 | 220 | 90 | 13,210 | 12,900 | 220 | 90 | 13,210 | 0 | 138 |
| Forecast | 10 | 31 | 11900 | 220 | 90 | 12,210 | 11,900 | 220 | 90 | 12,210 | 0 | 138 |
| Forecast | 11 | 30 | 11750 | 220 | 90 | 12,060 | 11,750 | 220 | 90 | 12,060 | 0 | 138 |
| Forecast | 12 | 31 | 13,110 | 220 | 90 | 13,420 | 13,110 | 220 | 90 | 13,420 | 0 | 138 |
| Annual | | | 155,142 | 2,685 | 1,831 | 159,658 | 155,800 | 2,640 | 1,080 | 159,520 | 138 | |

2016 Net Energy Budget Forecast Accuracy - Percent Over/Under



NYCA Composite Daily Average Temperature 2016 & Normal



Actual temperatures since July have been running above average.

— 20-Yr Normal — Smoothed Normal — Y2016

The mission of the New York Independent System Operator, in collaboration with its 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 policy makers, stakeholders and investors in the power system*

www.nyiso.com