



Item 6: Summer 2016 Operational and Market Review - Revised

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Board of Directors Meeting

ERCOT Public

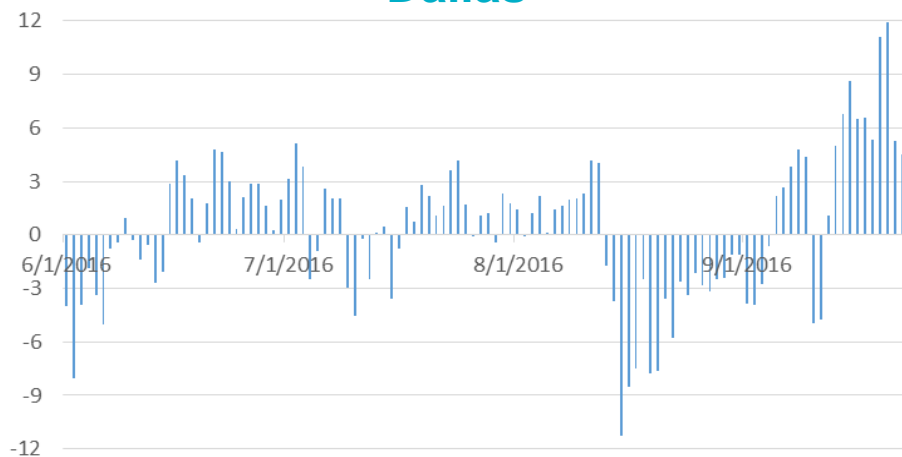
October 11, 2016

Summer 2016 Highlights

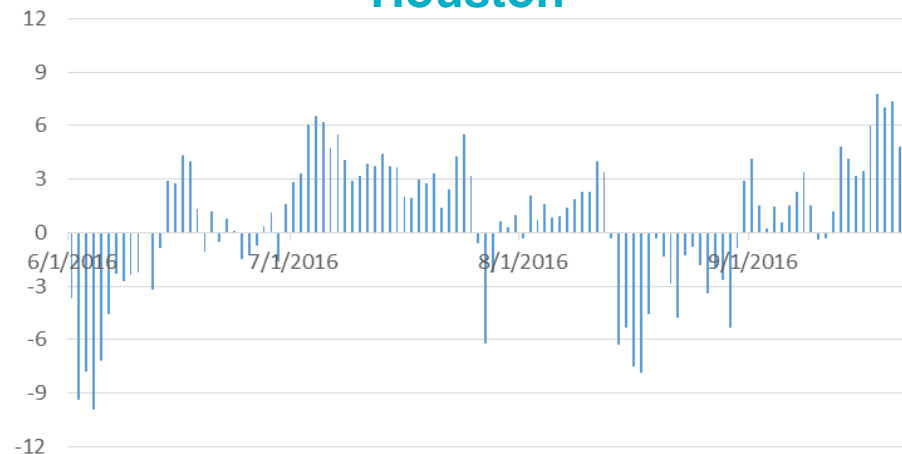
- Set peak demands for ERCOT System several times during week of August 8-12
 - New all-time peak of 71,093 MW on August 11
 - Annual peak forecast was 70,588 MW (0.7%)
- On-peak wind generation was generally higher, and generation outages similar, as compared to expectations from seasonal assessment (SARA)
- Pricing
 - Low Fuel Index Price - \$2.6/MMBtu average
 - Low average wholesale electricity prices
June: \$23.87, July: \$27.29, and Aug: \$32.36
- Change in generation self-commitment pattern
 - More resources staying offline
 - RUC Impacts

Summer Weather

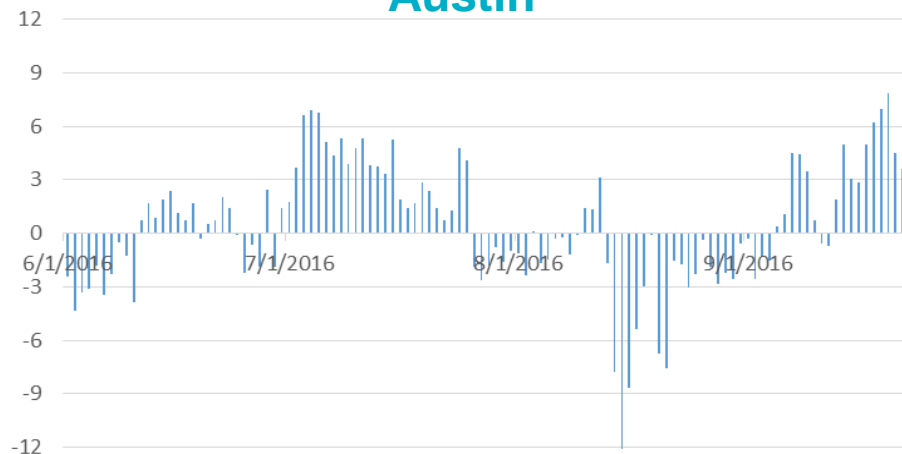
Dallas



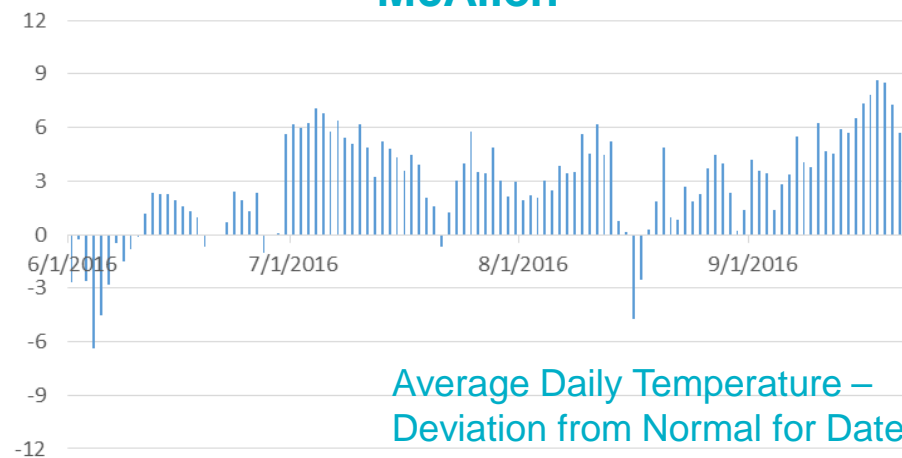
Houston



Austin



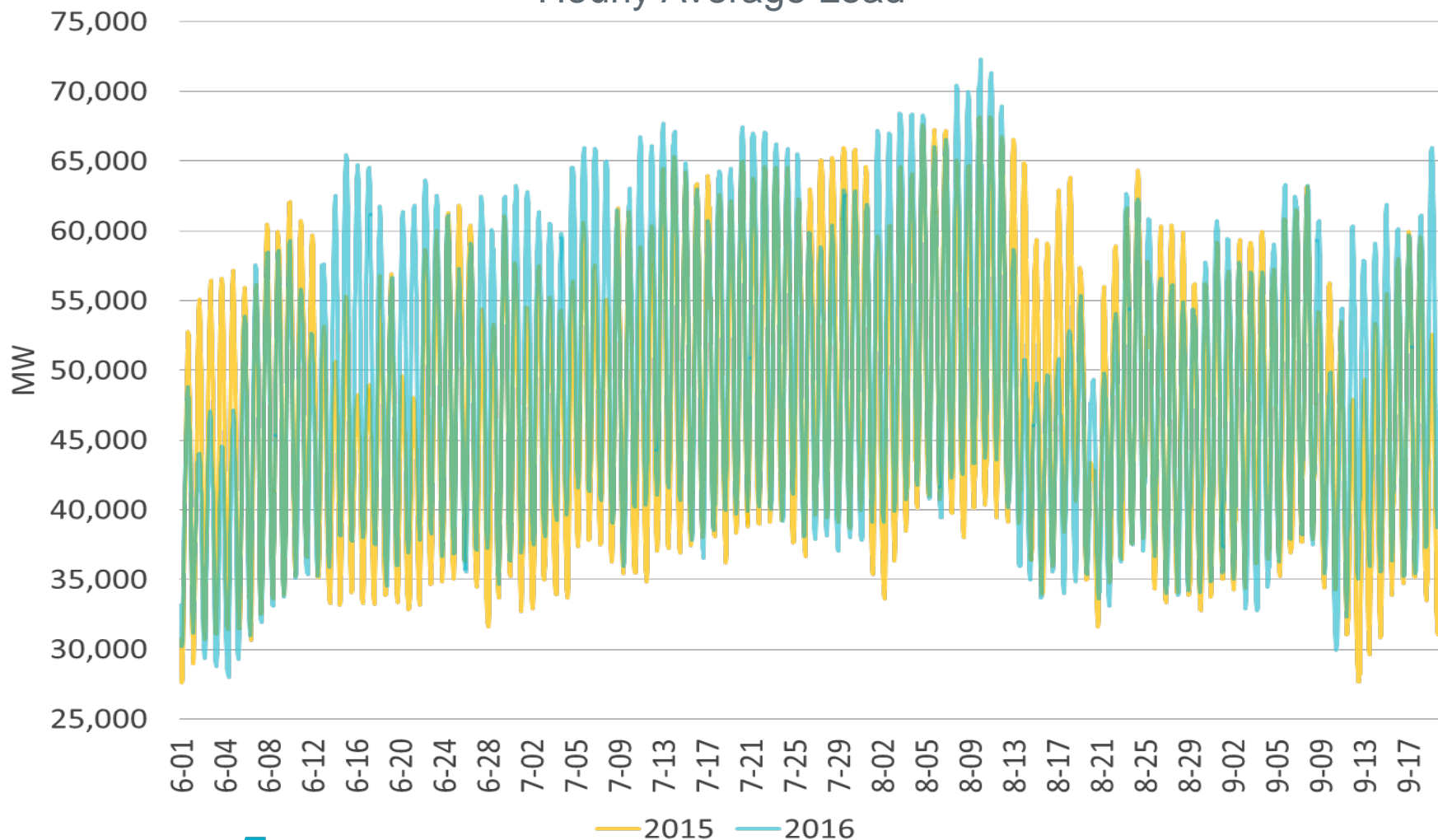
McAllen



Average Daily Temperature –
Deviation from Normal for Date

ERCOT Load

Hourly Average Load

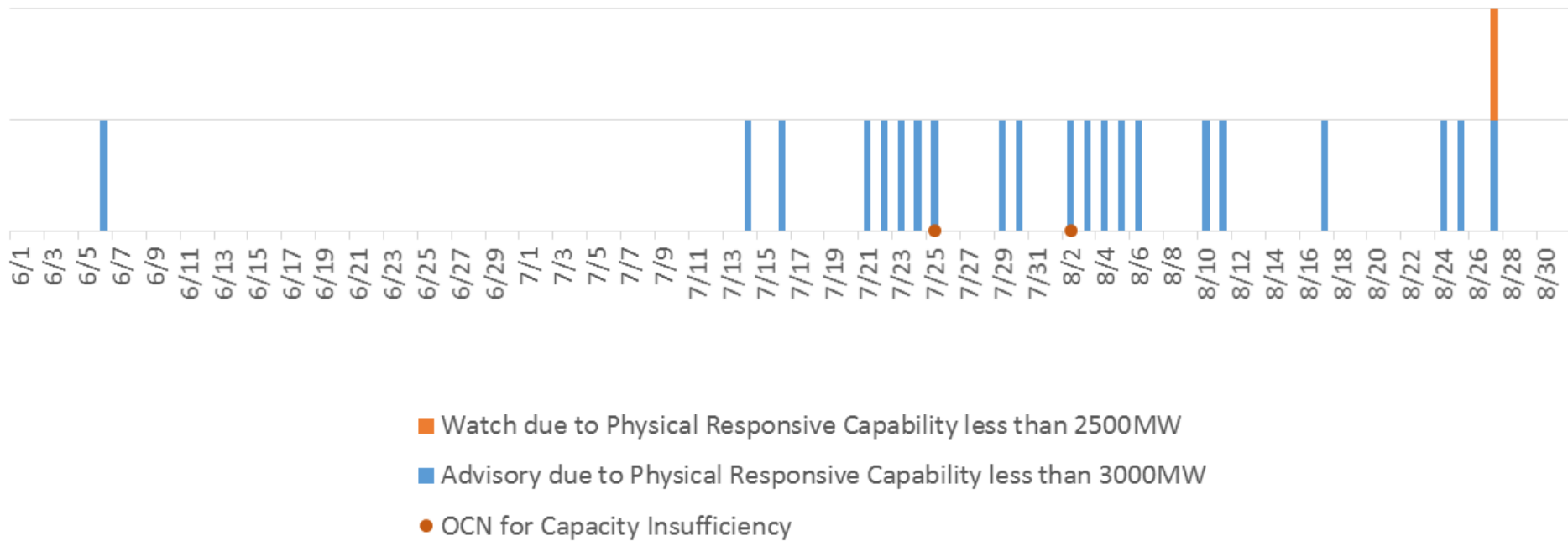


ERCOT Load

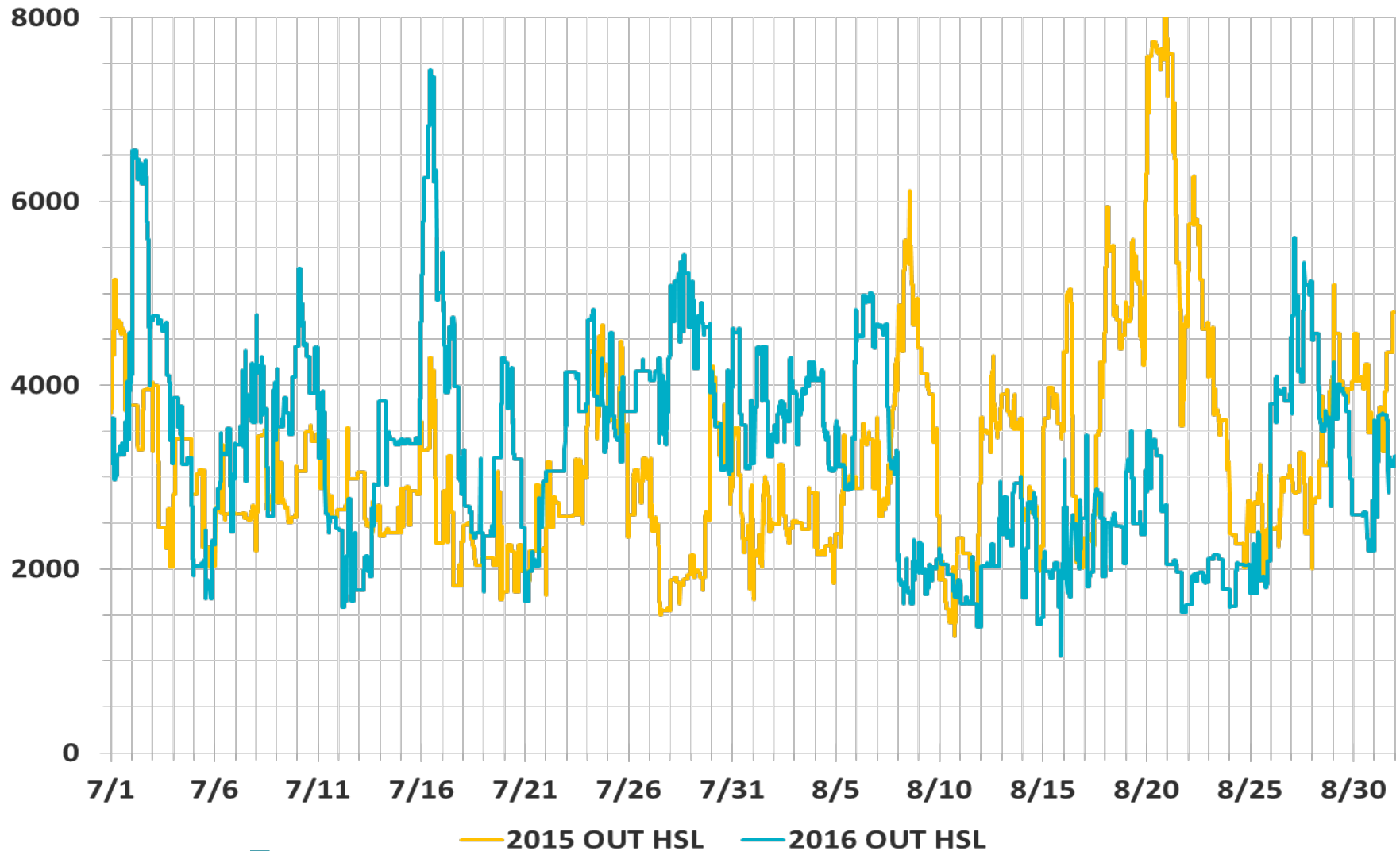
Hourly Average Load



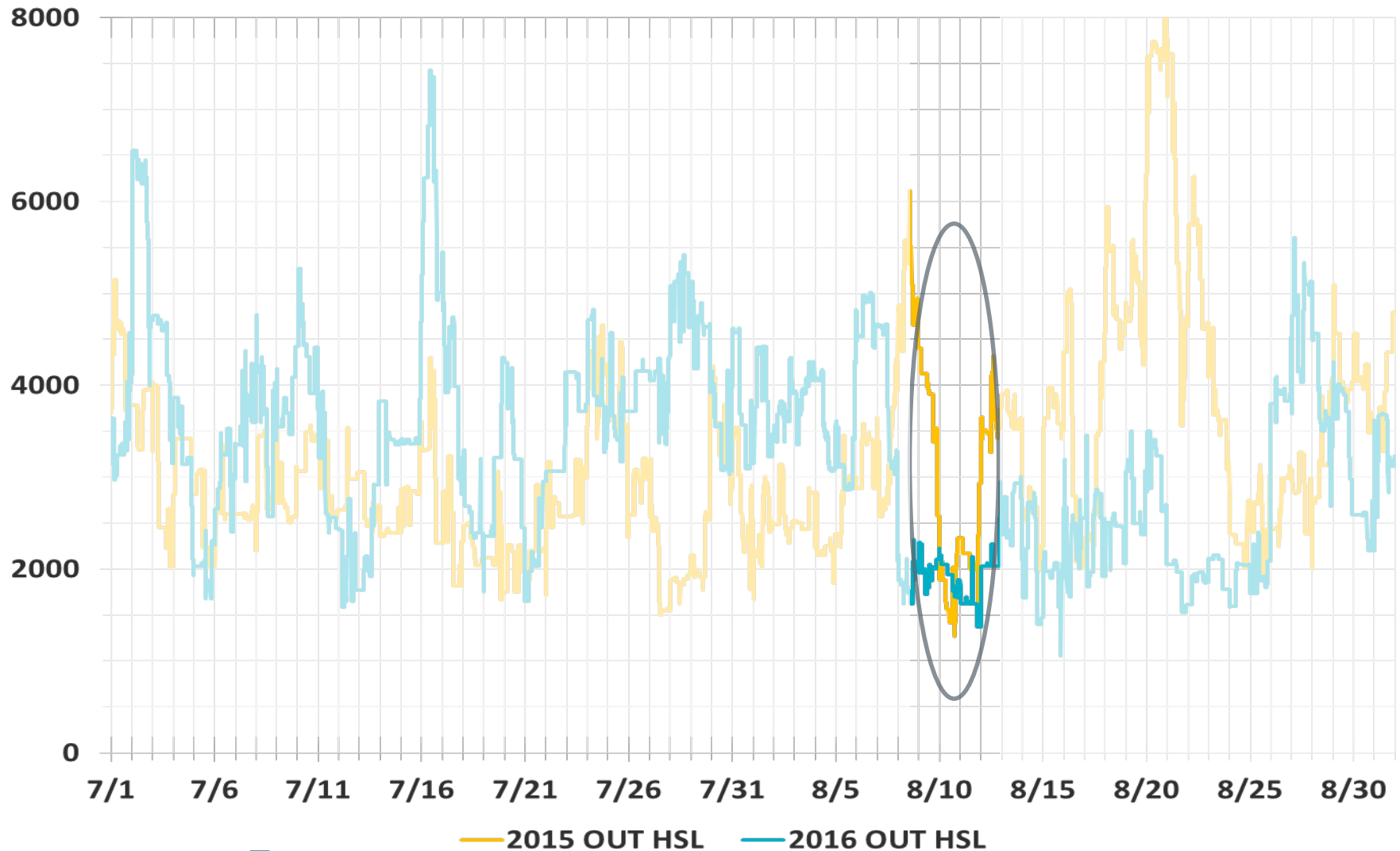
Operating Notices



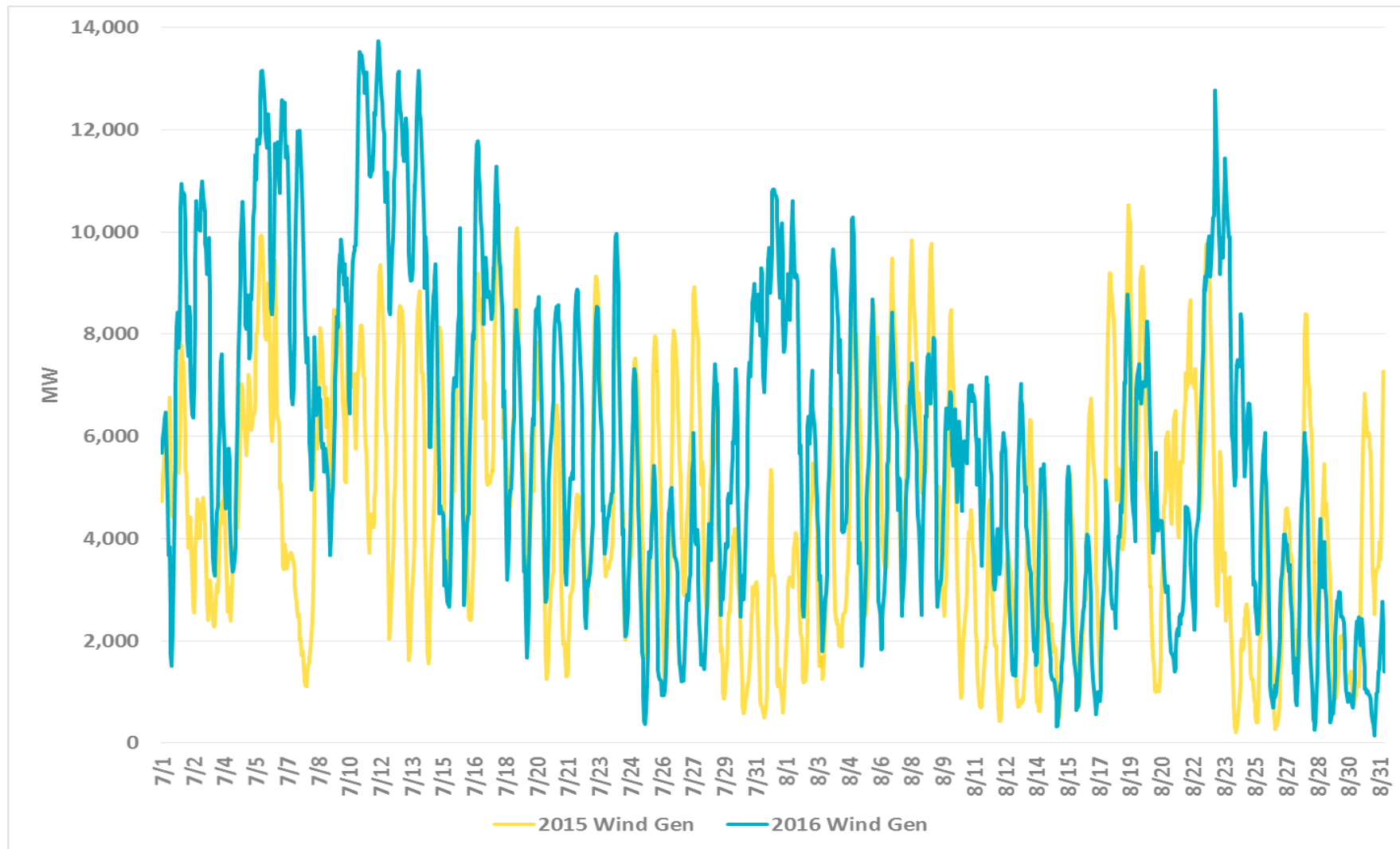
2016 Vs 2015 HSL of Outaged Resources



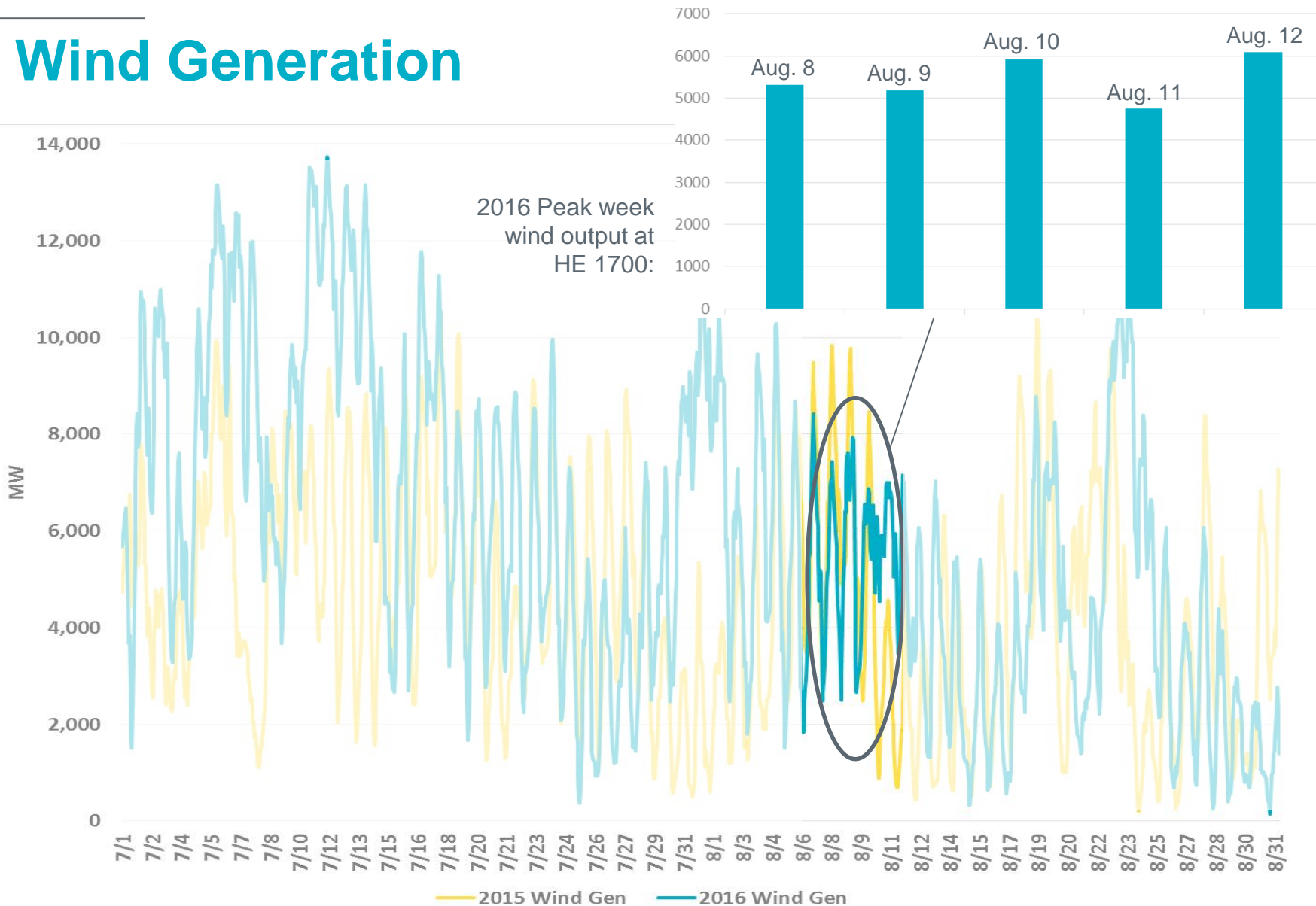
2016 Vs 2015 HSL of Outaged Resources



Wind Generation

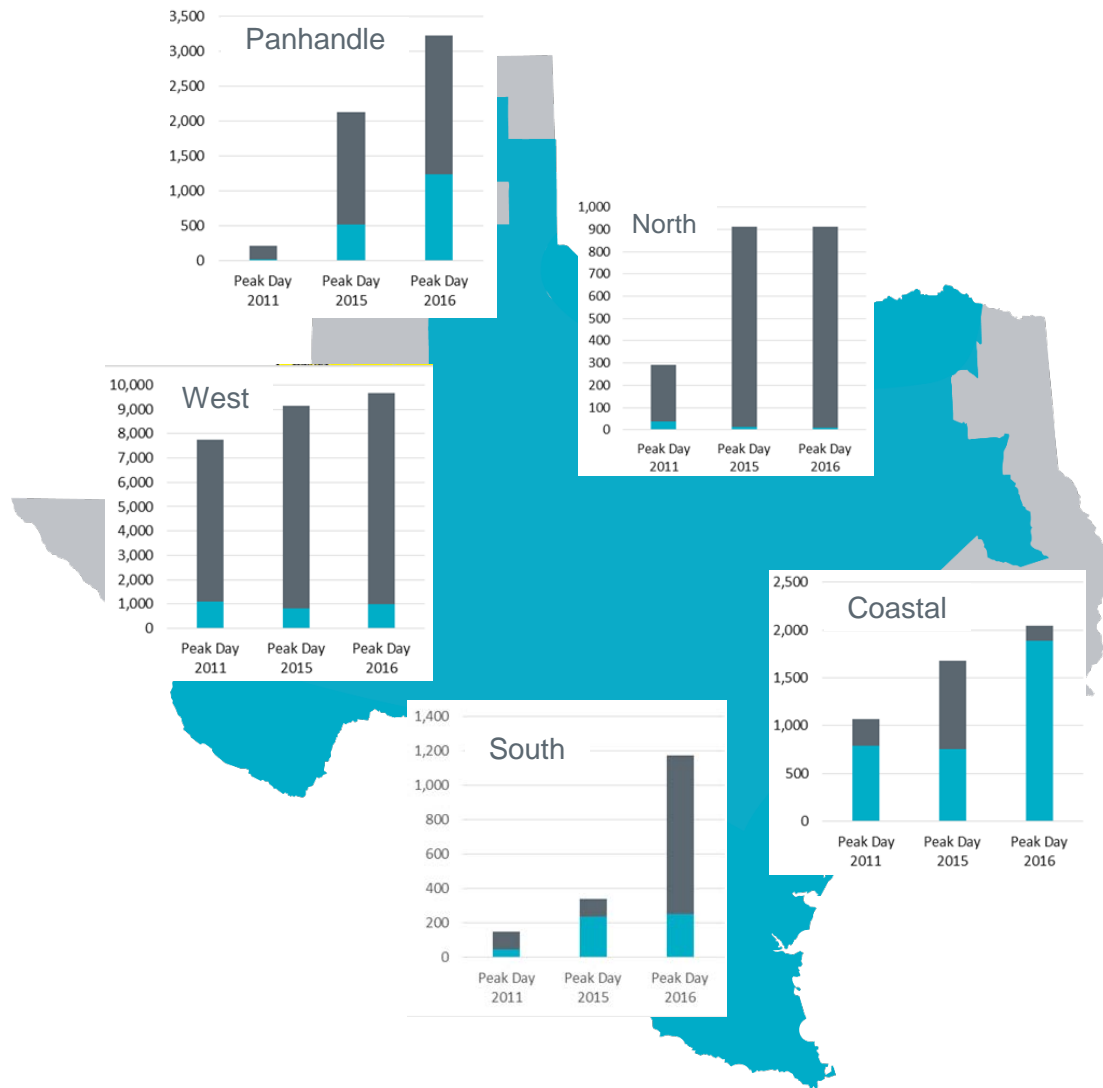
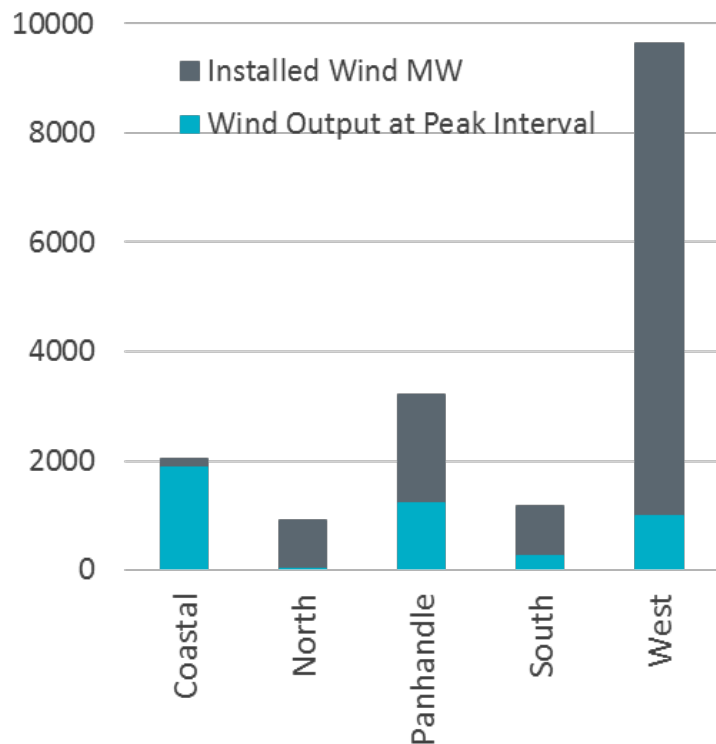


Wind Generation

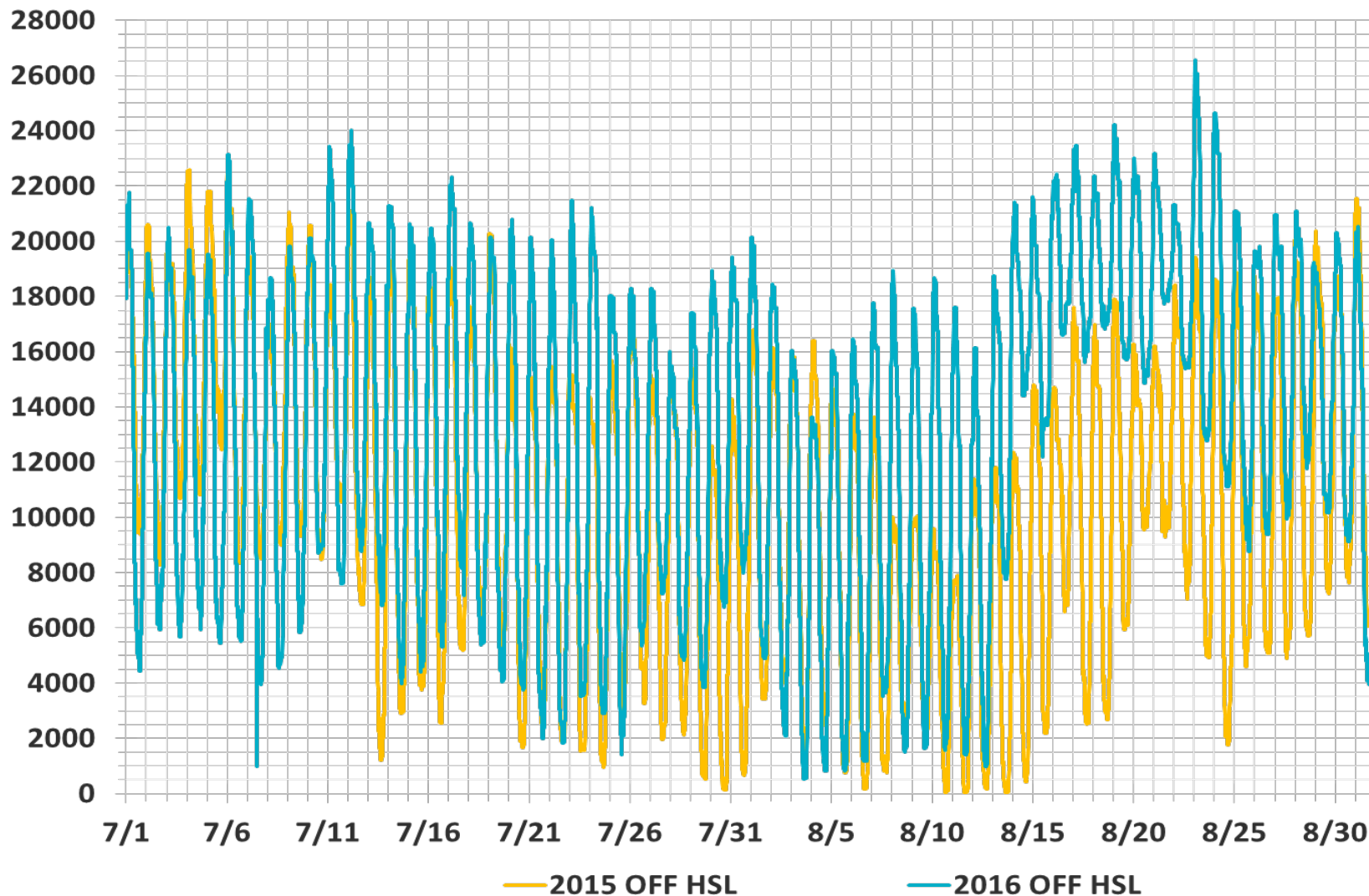


Wind Production at Peak Load Vs Installed Capacity

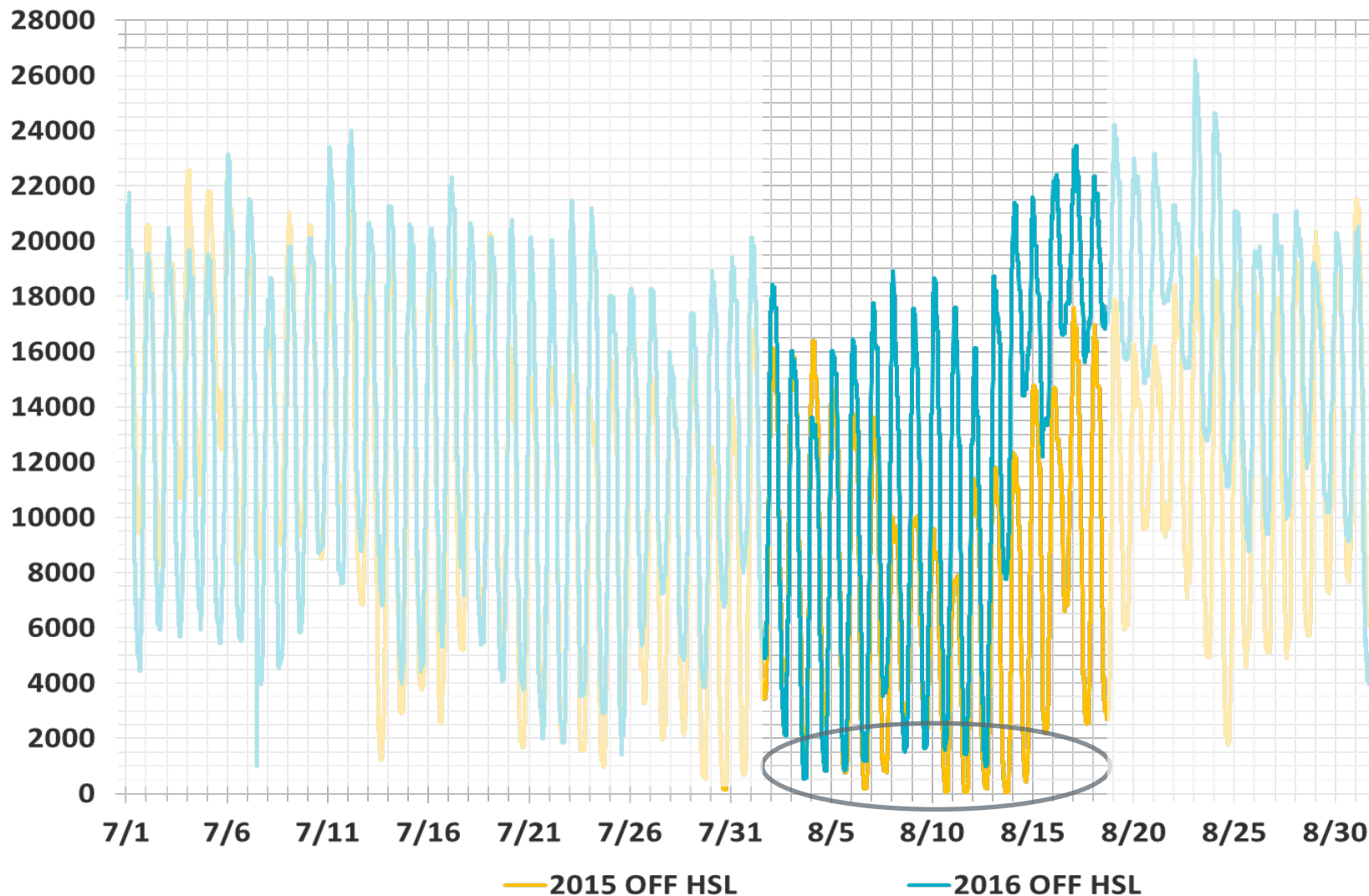
2016 Installed Wind Capacity and its Output at peak load interval – 8/11 15:55



2016 Vs 2015 – HSL of Offline Resources

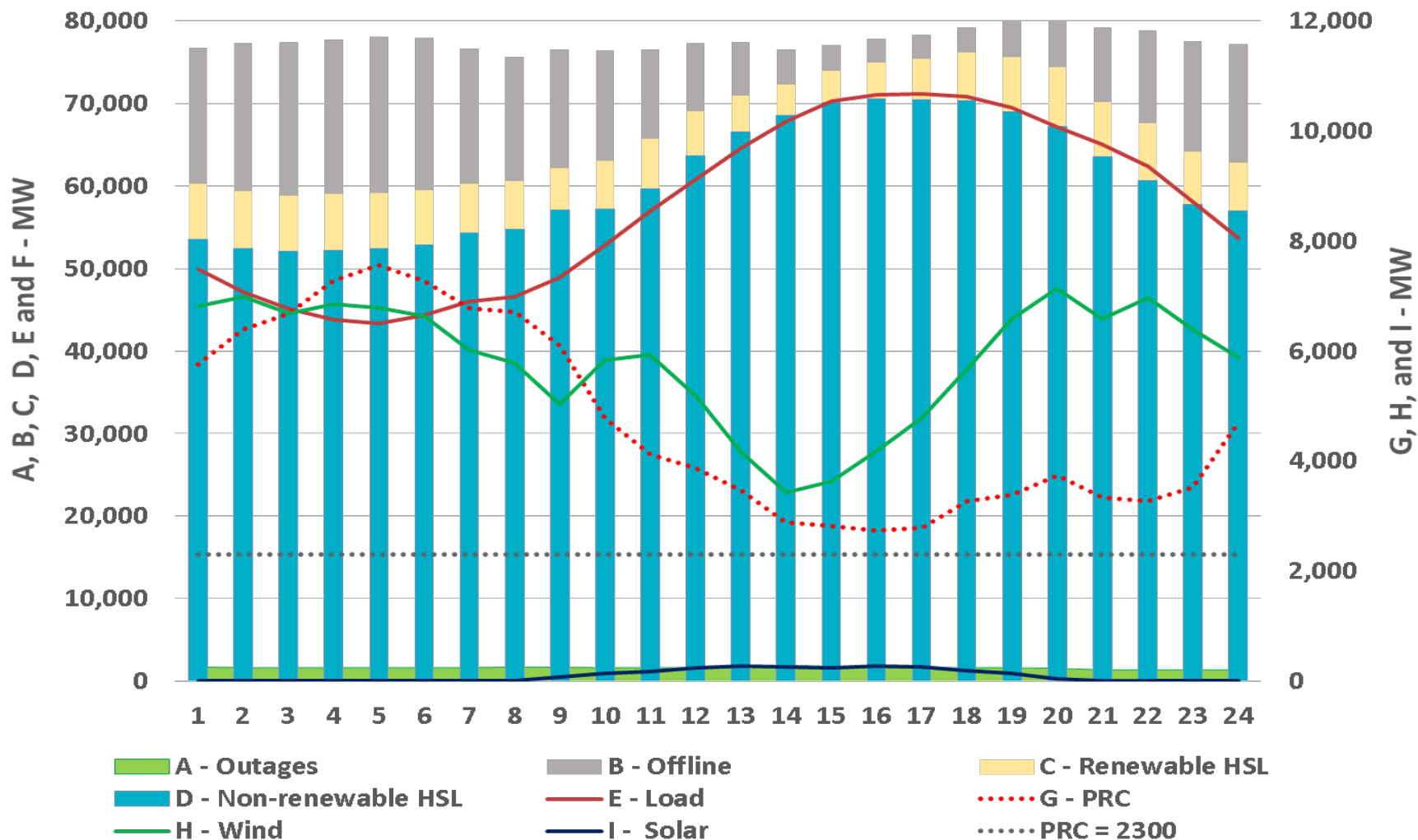


2016 Vs 2015 – HSL of Offline Resources



Peak Day – August 11, 2016 (Thursday)

Hourly Average Values



Transmission

- No issues in Valley
 - New 345kV line in service and Frontera still available
- One Transmission Emergency Notice issued for a post-contingency overload in the Laredo-Hamilton Road area on 6/13 due to DC Tie export
- Congestion into Houston due to offline units and in north Texas due to transmission outages

Summer 2016 RUCs

RUC Design Changes

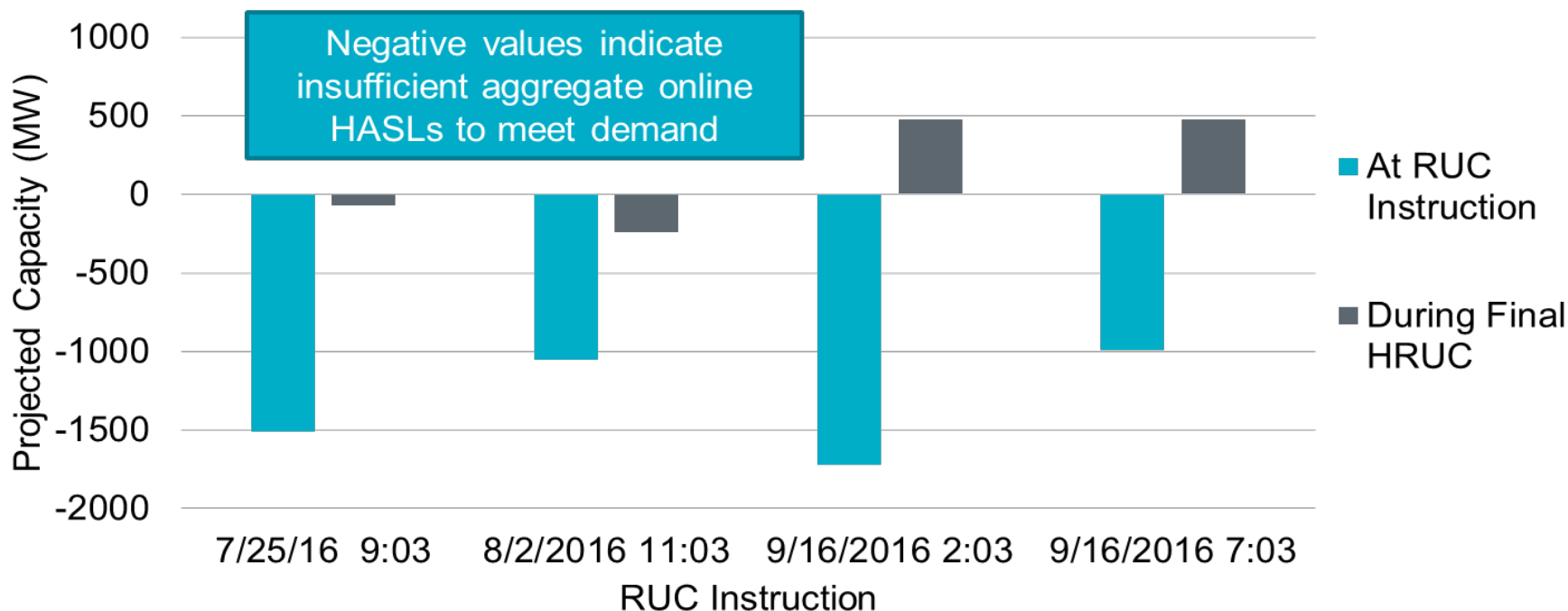
- Market Design Changes which had impact on RUC
 - **NPRR416:** Allowing QSEs to buy back RUC commitment and operate those resources as self committed Resources
 - **NPRR435:** Setting \$1500/MWh as the offer floor for RUC
 - **NPRR575:** Allowing QSEs to carry Ancillary Services on RUC buy-back Resources
 - **NPRR626:** Mitigate the price reversal/suppression associated with the deployment of Load Resources and/or other out-of-market reliability deployments
 - **NPRR679:** Allowing buy back using telemetered status adjustment for Resources committed after end of adjustment period

Change in Self-Commitment Pattern- RUC Impacts

- QSEs made self commitment decisions closer to real time
 - Near Real Time commitment lead to efficient market operation
- Current Operating Plan not always in synch with Real Time
 - With less self commitment, the HRUC recommended more commitments to resolve transmission constraints or meet forecasted load plus reserve capacity
- Operations philosophy on RUC decisions
 - Use RMR Resource as a last resort
 - Deselecting RUC-recommended shorter lead time Resources to allow time for market-based self-commitments

RUCs for Insufficient Capacity to meet Demand

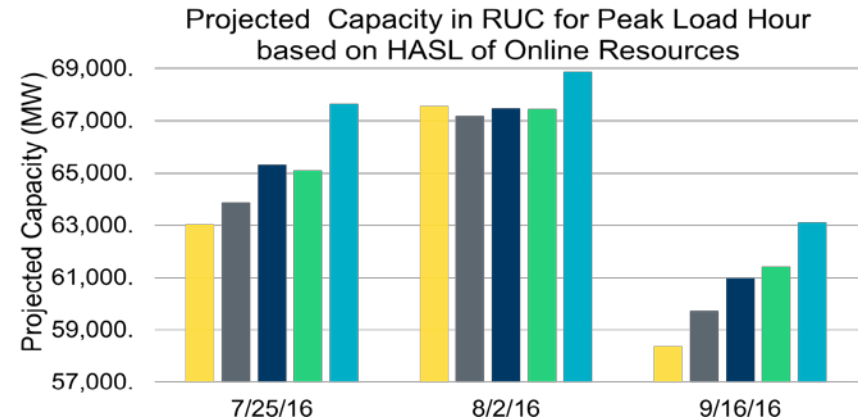
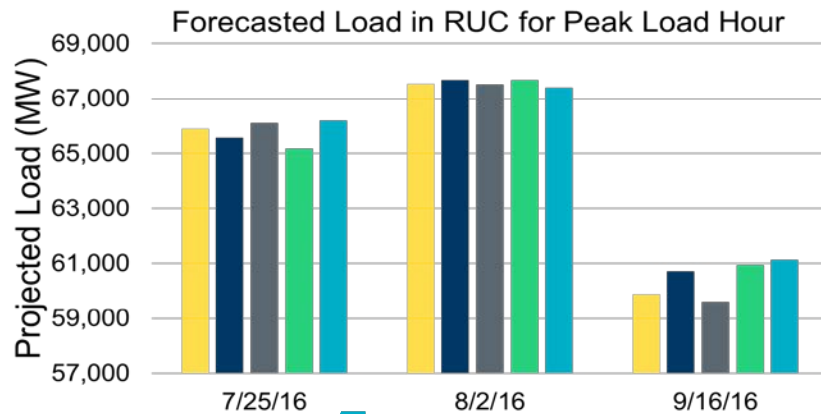
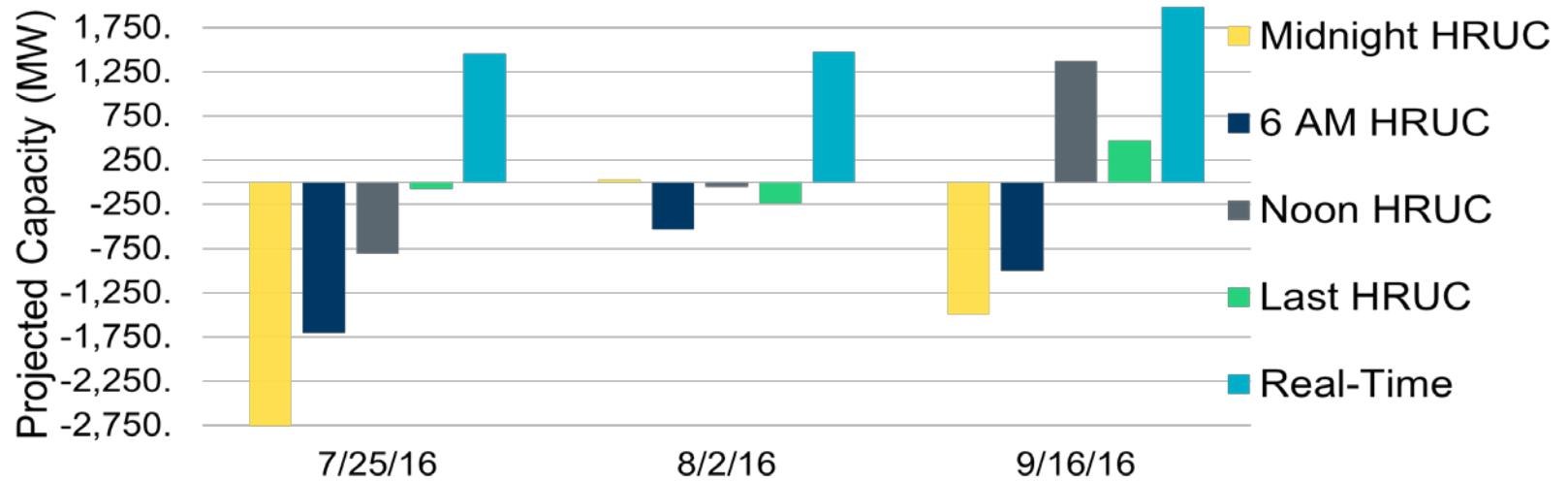
Projected Additional Capacity for Peak Load Hour in RUC
based on HASL of Online Resources and the Forecasted Load



- **OCNs** for projected reserve shortage were issued on **7/25, 8/2, and 9/16**
- ERCOT RUCed for capacity on those three days due to insufficient capacity to meet demand based on COP even after OCN was issued

RUC Vs Real-Time Capacity – Capacity Change

Projected Additional Capacity in RUC for Peak Load Hour based on HASL of Online Resources and the Forecasted Load



RUCs for Congestion - Revised*

- With less self commitment this summer, the HRUC recommended significantly increased commitments this year to resolve transmission constraints when compared to 2015
- The change in self commitment behavior was mainly observed for fast start resources which could be committed much closer to Real Time
- Operators issued RUC instruction to only those Resources that were in their last hour to notify in order to be started for the required hour and thus maintained reliability with much smaller % of units committed from the RUC recommendations this year

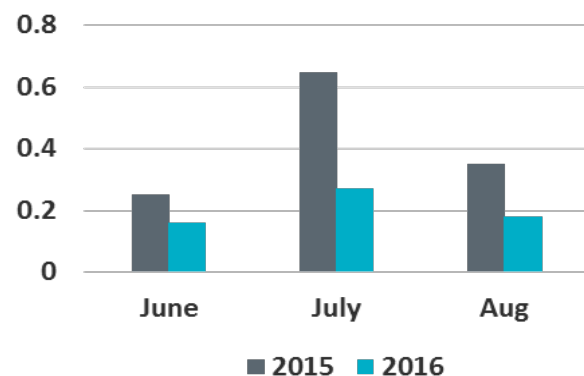
% Selected from RUC Recommendations - Added*

RUC Unit Hours

2015	June	July	Aug
RUC Suggested	222	17	46
Units Selected	56	11	16
Units ONRUC	8	7	10
% Selected	25%	65%	35%

2016	June	July	Aug
RUC Suggested	1937	1187	768
Units Selected	309	324	142
Units ONRUC	92	188	80
% Selected	16%	27%	18%

% of Units Hours Committed from the RUC Recommendation

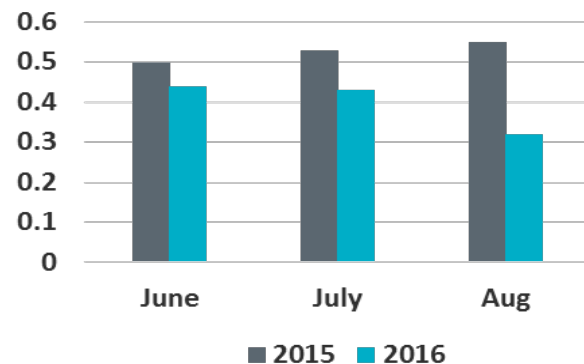


RUC MWh

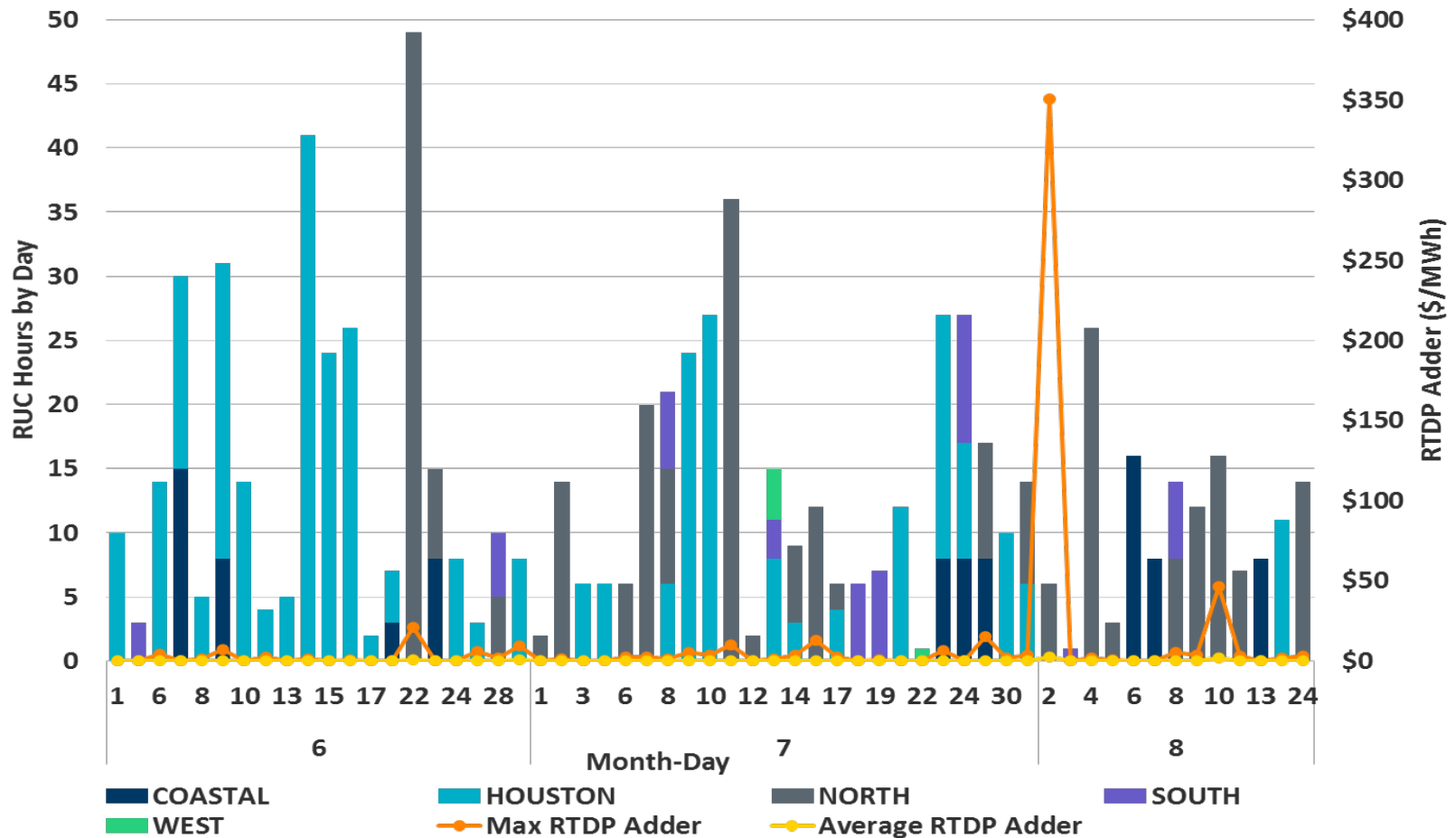
2015	June	July	Aug
RUC Suggested	35,201	828	3,731
Units Selected	17,772	441	2,041
% Selected	50%	53%	55%

2016	June	July	Aug
RUC Suggested	306,792	164,100	127,810
Units Selected	135,730	70,454	41,432
% Selected	44%	43%	32%

% of MW Hours Committed from the RUC Recommendation

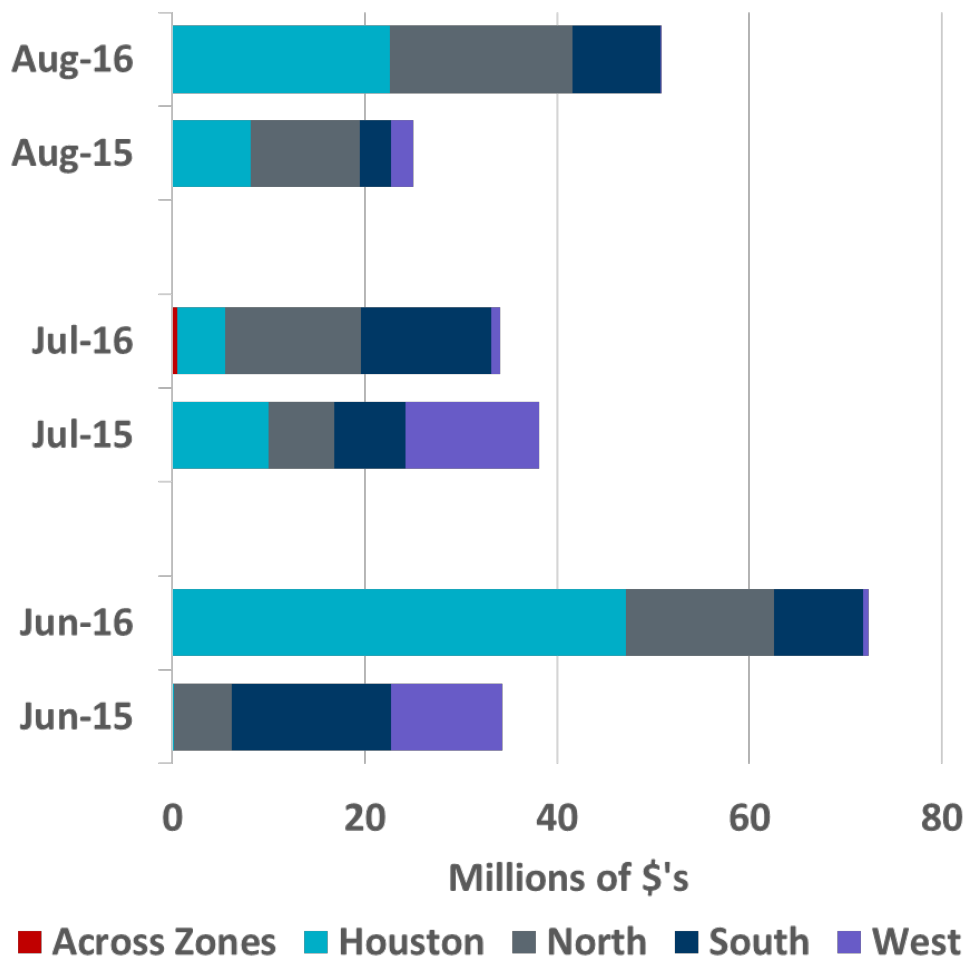


HRUC Hours by Day by Forecast Zone July and August 2016

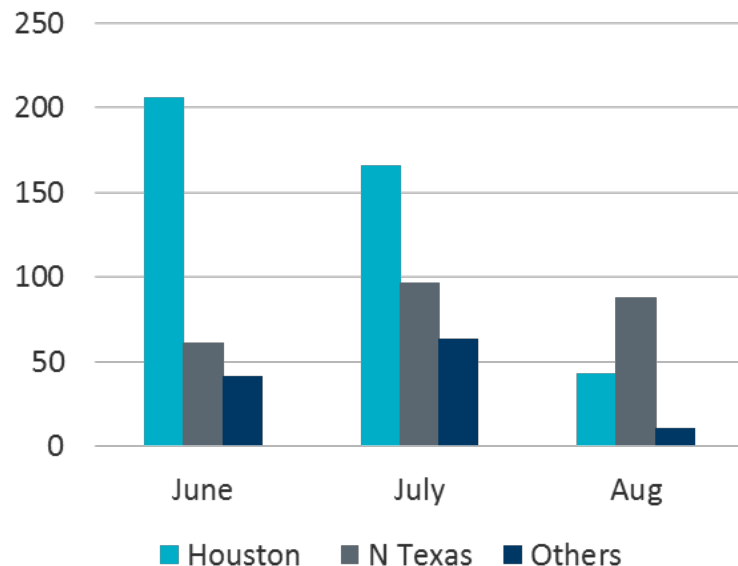


The Reliability Deployment Price Adder (RTDPA) is an adder to the energy price to mitigate the impact of price taker energy injected by RUC commitments.

More Congestion to Manage in 2016

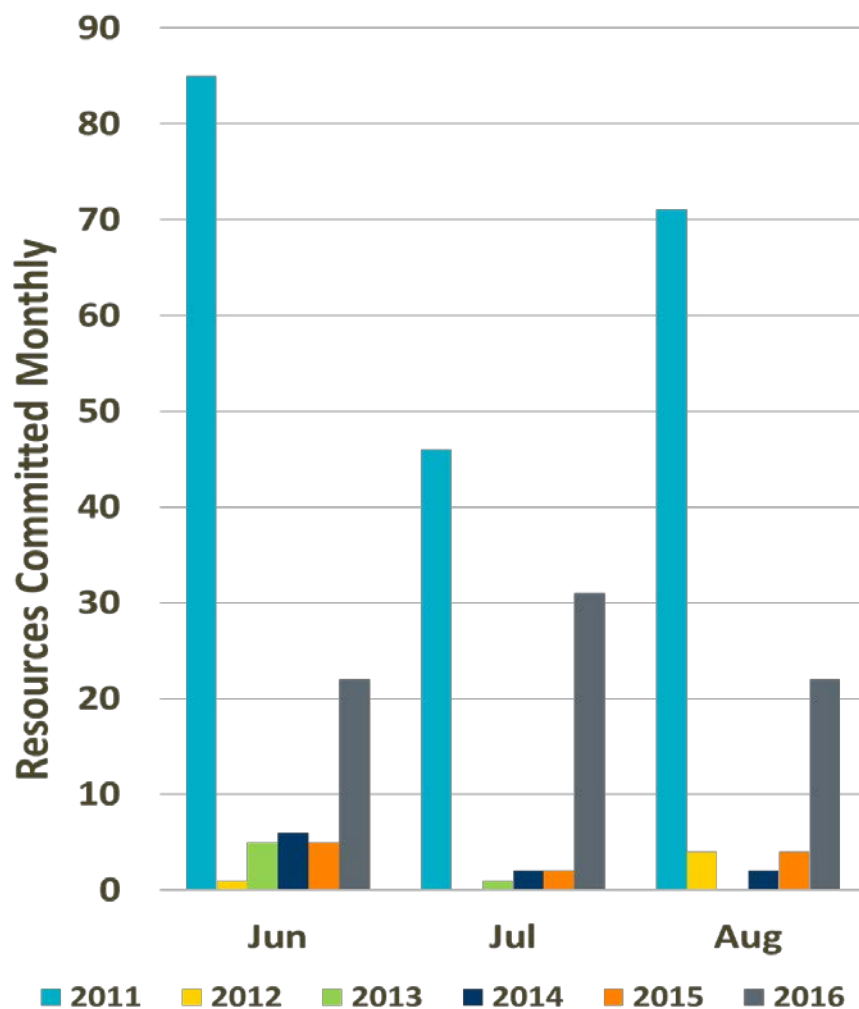


RUC hours by Congestion Area in 2016



RUC commitments this summer correlate with the increased congestion in Houston and North Texas areas.

RUC Summer Commitments from 2011 to 2016



- Changes in Operator procedure to defer the decision for committing shorter lead time Resources has helped reduce the number of RUC commitments after 2011.
- Changes in self commitment pattern, forced outage extensions, and delay in planned transmission upgrades contributed to the increase in RUC.

Summer 2016 Summary

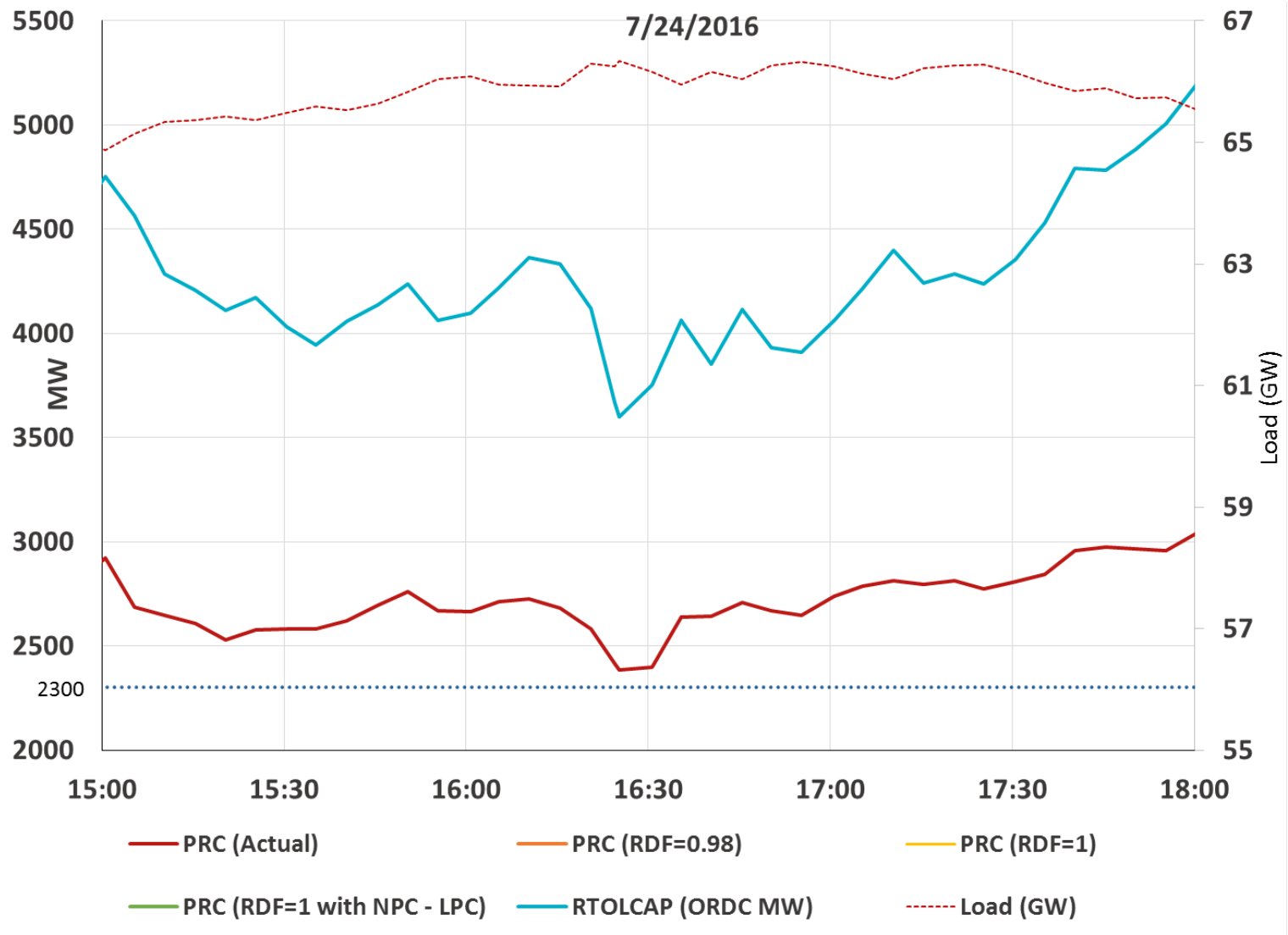
- Even with setting the highest peak load record, greater wind production helped keep reserves high. The combination of higher wind and lower natural gas prices resulted in lower clearing prices.
- QSEs made self commitment decisions closer to RT resulting in
 - More resources staying offline
 - More efficient commitment
 - COP showing lower capacity online than in RT
 - ERCOT needing to RUC resources even after issuing OCN or sending out congestion price signals
- RUC commitments were reasonable given the tight transmission conditions and the markets desire to self commit closer to real-time.

Impacts of Physical Responsive Capacity (PRC) Calculation Changes

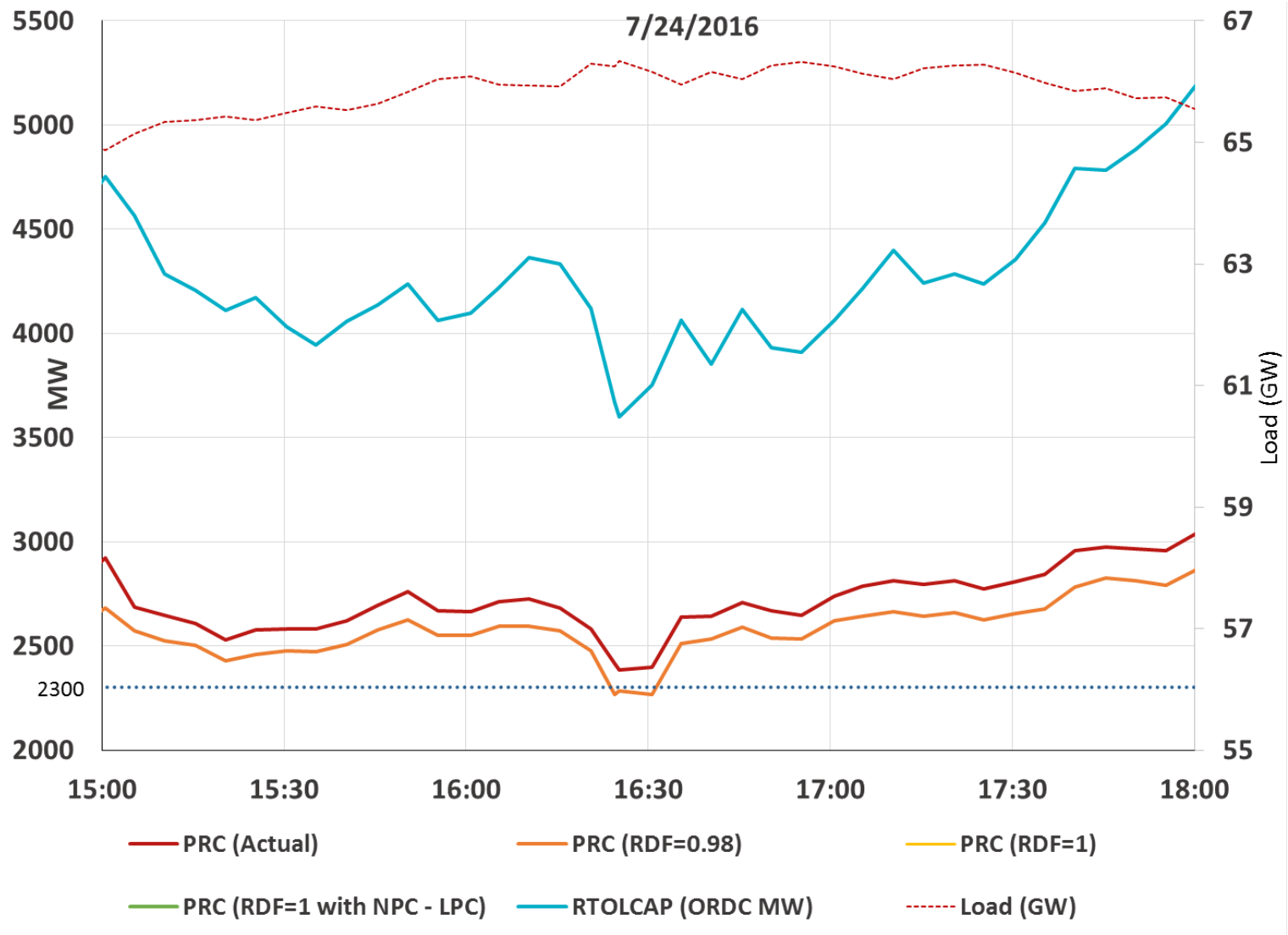
PRC and ORDC Convergence

- Changing of Reserve Discount Factor (RDF) to better reflect actual generator performance facilitated convergence of PRC and ORDC this summer.
- The proposed change for next year to make $RDF = 1$ and add extra capacity from non-controllable resources to PRC will further the convergence of ORDC to PRC as we approach scarcity.

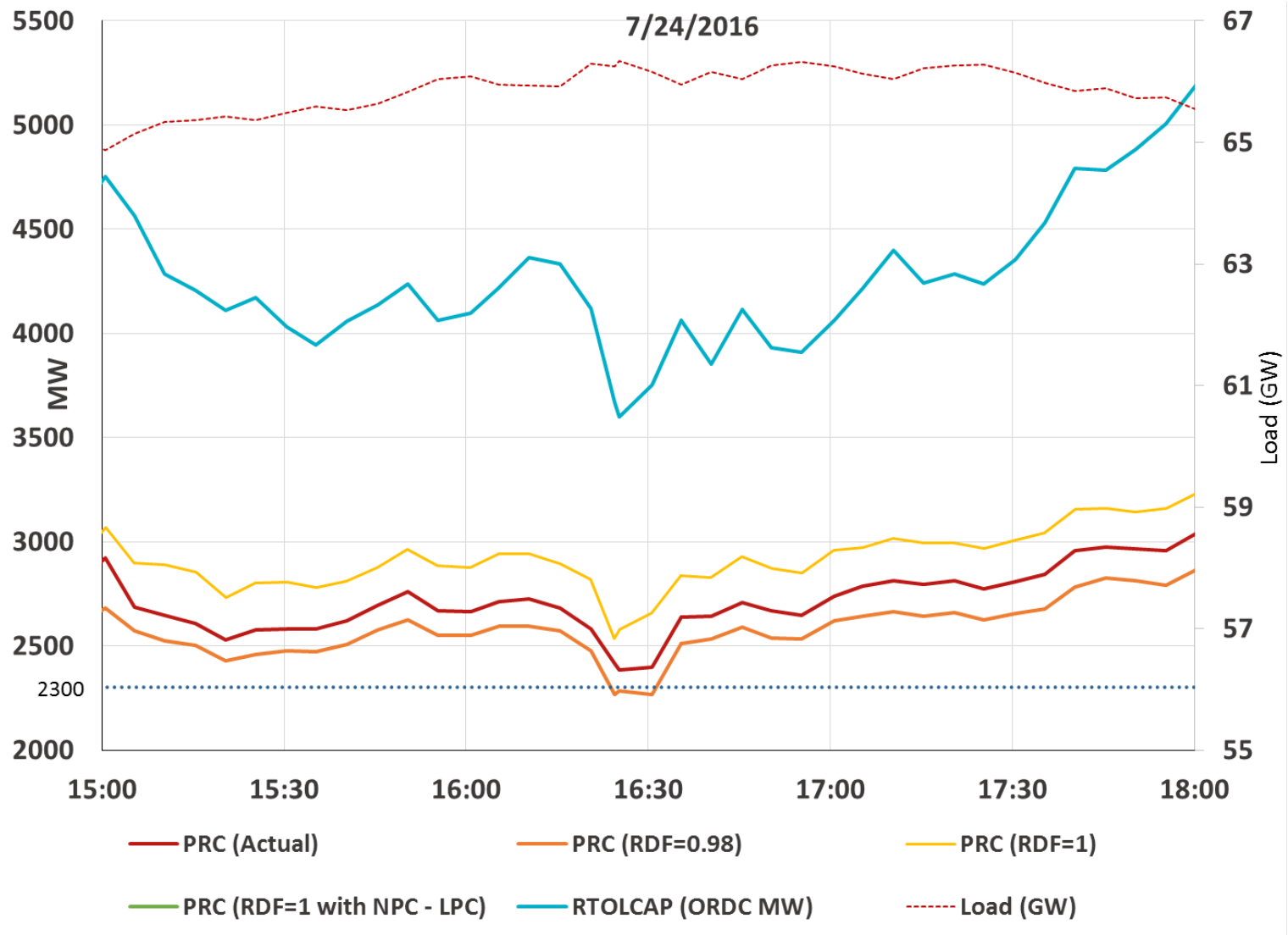
Impact of RDF Changes and NPRR801



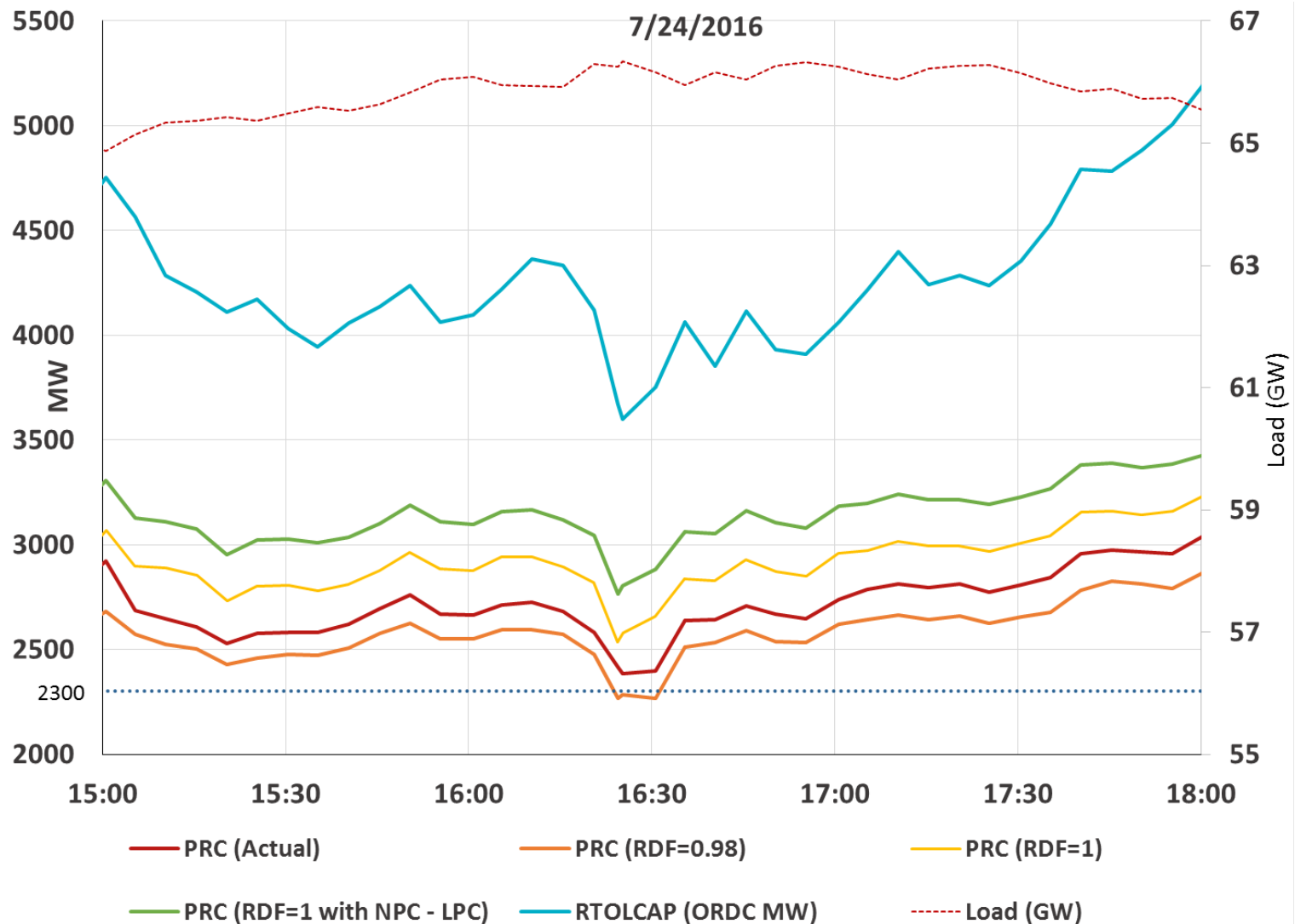
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Impact of RDF Changes and NPRR801



Questions?