PJM Additional Bias Metrics

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MIC Special Session
Five Minute Dispatch and Pricing
August 25, 2020

Review Current SCED Inputs/Forecast

- Forecast as inputs to SCED
  - Load (Neural Net)
  - Wind Forecast (for constraint control)
  - Interchange (RTSCED uses actual interchange)
  - Solar (Solar forecast is not used in SCED)
- Other Major Inputs to SCED
  - Generator Operating Parameters
  - Constraint Data
  - EMS Data

Bias Summary

Bias is a tool needed to manage the inherent uncertainty of an oscillating power system as well as unforeseen system failures

Operators are focused on the amount of MWs SCED solution is generating and pricing is an outcome of operator actions that are used to control the system frequency and maintain reliability in PJM region

Spin Event Unpredictability and Volatility

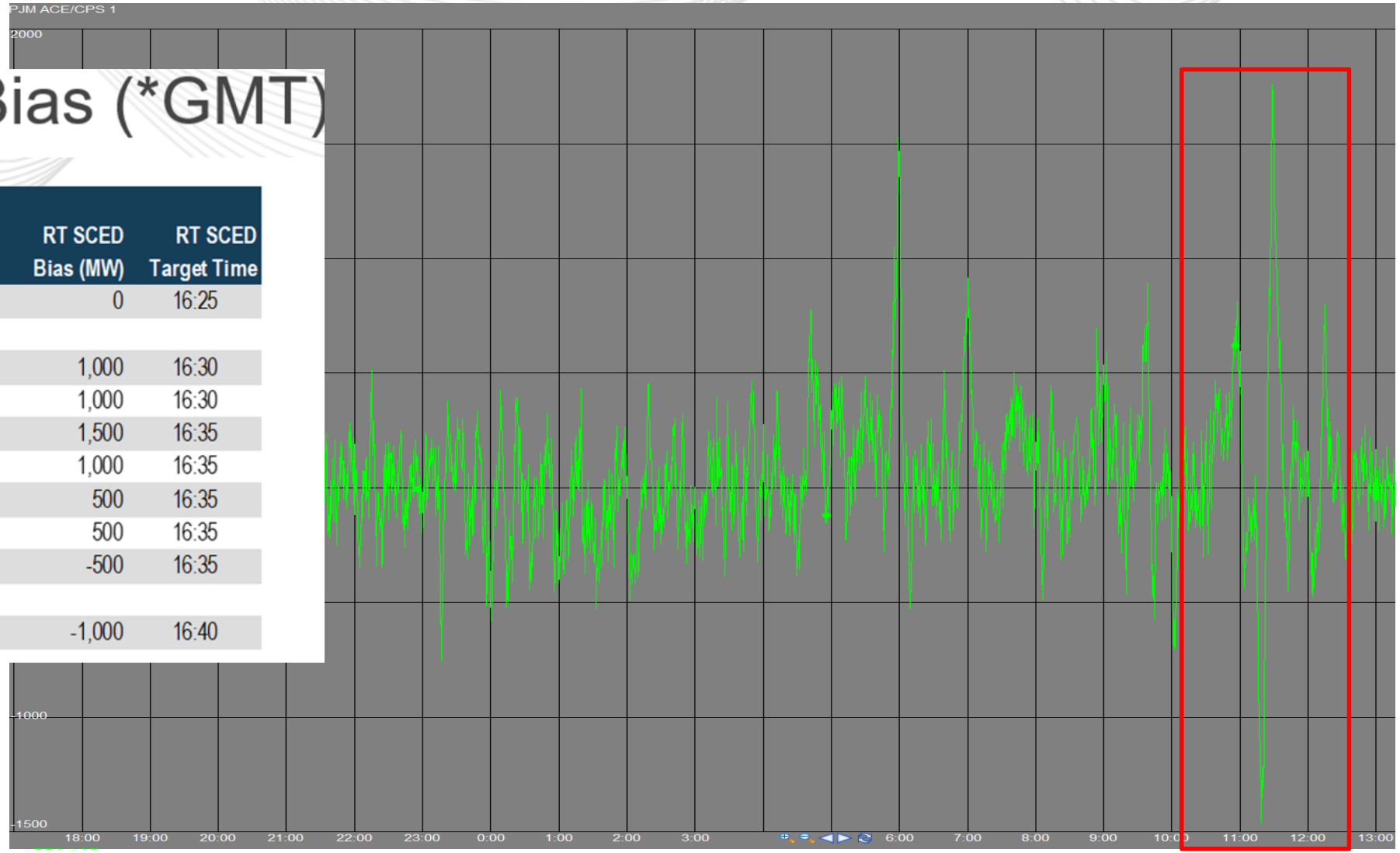
- Response to Spin Events is unpredictable therefore, Dispatchers continue to rely on Load Bias to control ACE

- IMM Dates:
  - Jan 23rd 2020
  - February 10th 2020
  - February 18th 2020

Jan 23rd 2020 11:17

Spin Event Bias (*GMT)

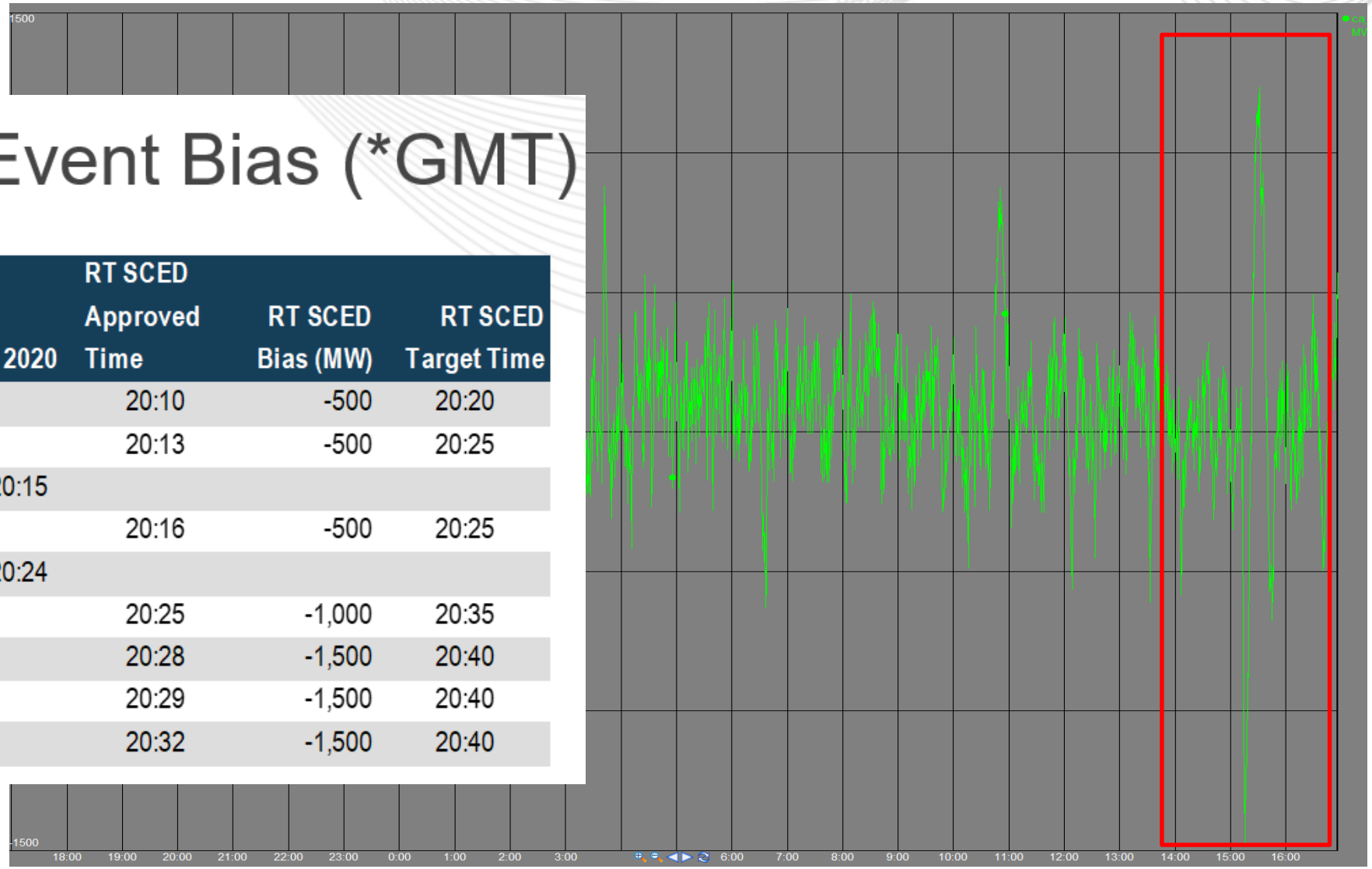
January 23, 2020		RT SCED Approved Time	RT SCED Bias (MW)	RT SCED Target Time
		16:16	0	16:25
Spin Start	16:17			
		16:18	1,000	16:30
		16:19	1,000	16:30
		16:22	1,500	16:35
		16:24	1,000	16:35
		16:24	500	16:35
		16:26	500	16:35
		16:26	-500	16:35
Spin End	16:26			
		16:28	-1,000	16:40



February 10th 2020 15:15

Spin Event Bias (*GMT)

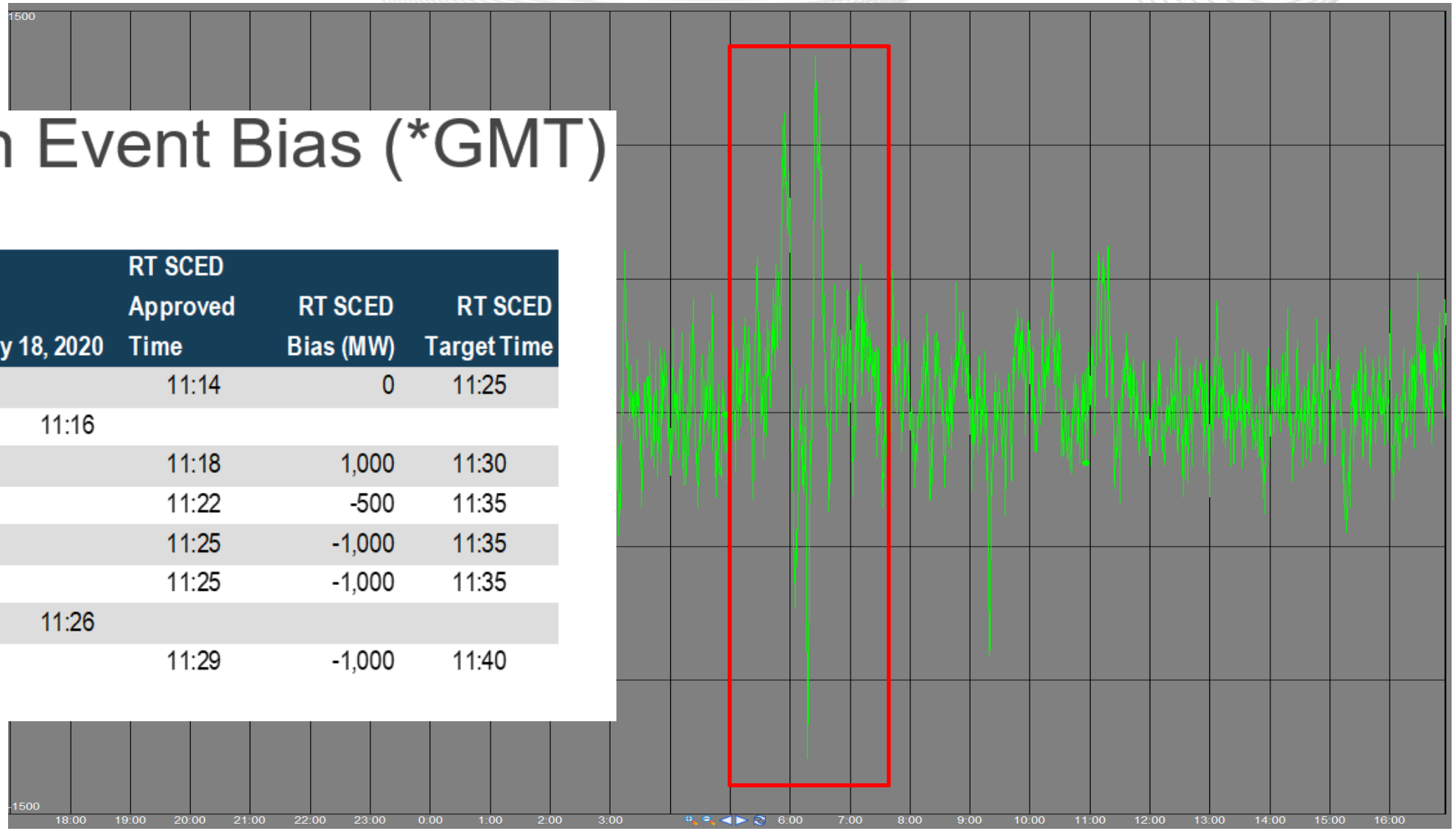
February 10, 2020		RT SCED Approved Time	RT SCED Bias (MW)	RT SCED Target Time
		20:10	-500	20:20
		20:13	-500	20:25
Spin Start	20:15			
		20:16	-500	20:25
Spin End	20:24			
		20:25	-1,000	20:35
		20:28	-1,500	20:40
		20:29	-1,500	20:40
		20:32	-1,500	20:40



February 18th 06:16

Spin Event Bias (*GMT)

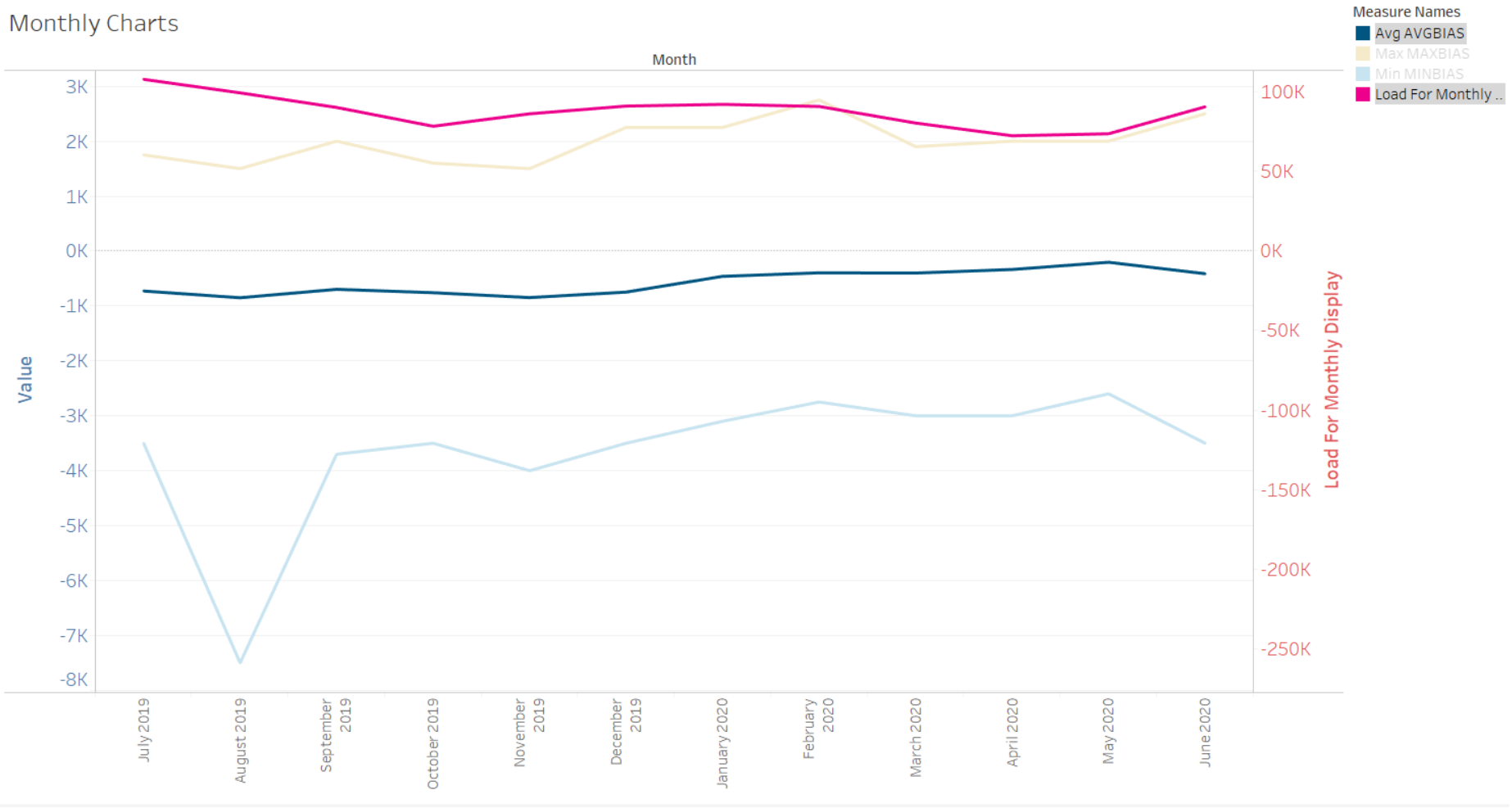
February 18, 2020		RT SCED Approved Time	RT SCED Bias (MW)	RT SCED Target Time
		11:14	0	11:25
Spin Start	11:16			
		11:18	1,000	11:30
		11:22	-500	11:35
		11:25	-1,000	11:35
		11:25	-1,000	11:35
Spin End	11:26			
		11:29	-1,000	11:40



Summary

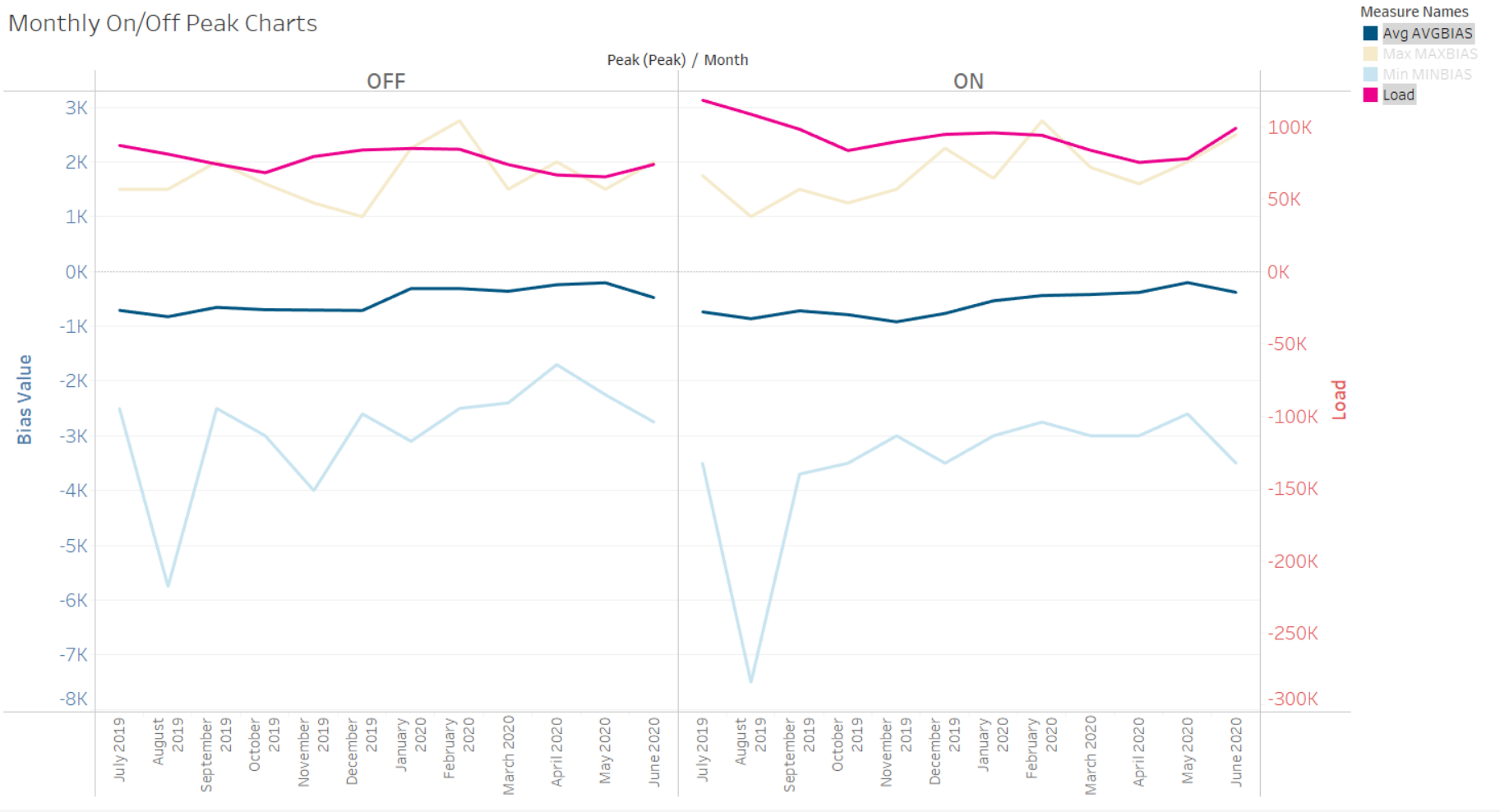
- Average Monthly Bias is around -570 July 2019 – June 2020
- The Average Monthly Bias is less than 1% of the forecasted load
- Any outliers are generally related to forecast or input errors or unforeseen system issues/defects.
- Response to Spin Events is unpredictable therefore, Dispatchers continue to rely on Load Bias to control ACE

RTSCED Monthly Comparison Bias Vs. Load July 2019- June 2020



RTSCED On/Off Peak Comparison to Load

*HE 8-23 is defined as on-peak, HE 1-7 & 24 off-Peak



Suggesting Data Miner Additions in 90 days

- For Each Approved Case in Real-Time:
  - RT BIAS
  - IT BIAS
  - LPC BIAS

Contact

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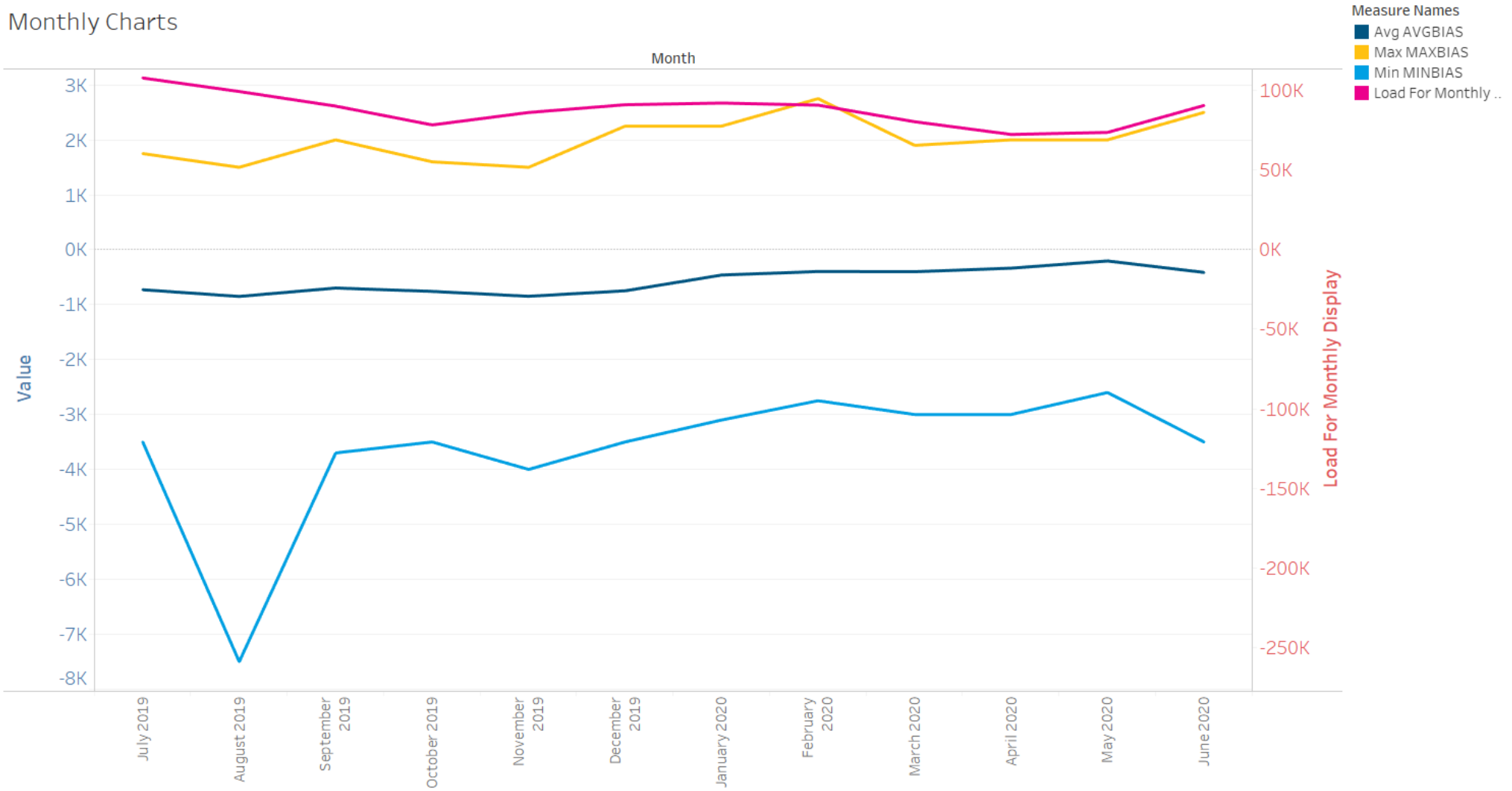
Appendix

RTSCED Monthly Comparison Bias Vs. Load July 2019- June 2020



RTSCED On/Off Peak Comparison to Load

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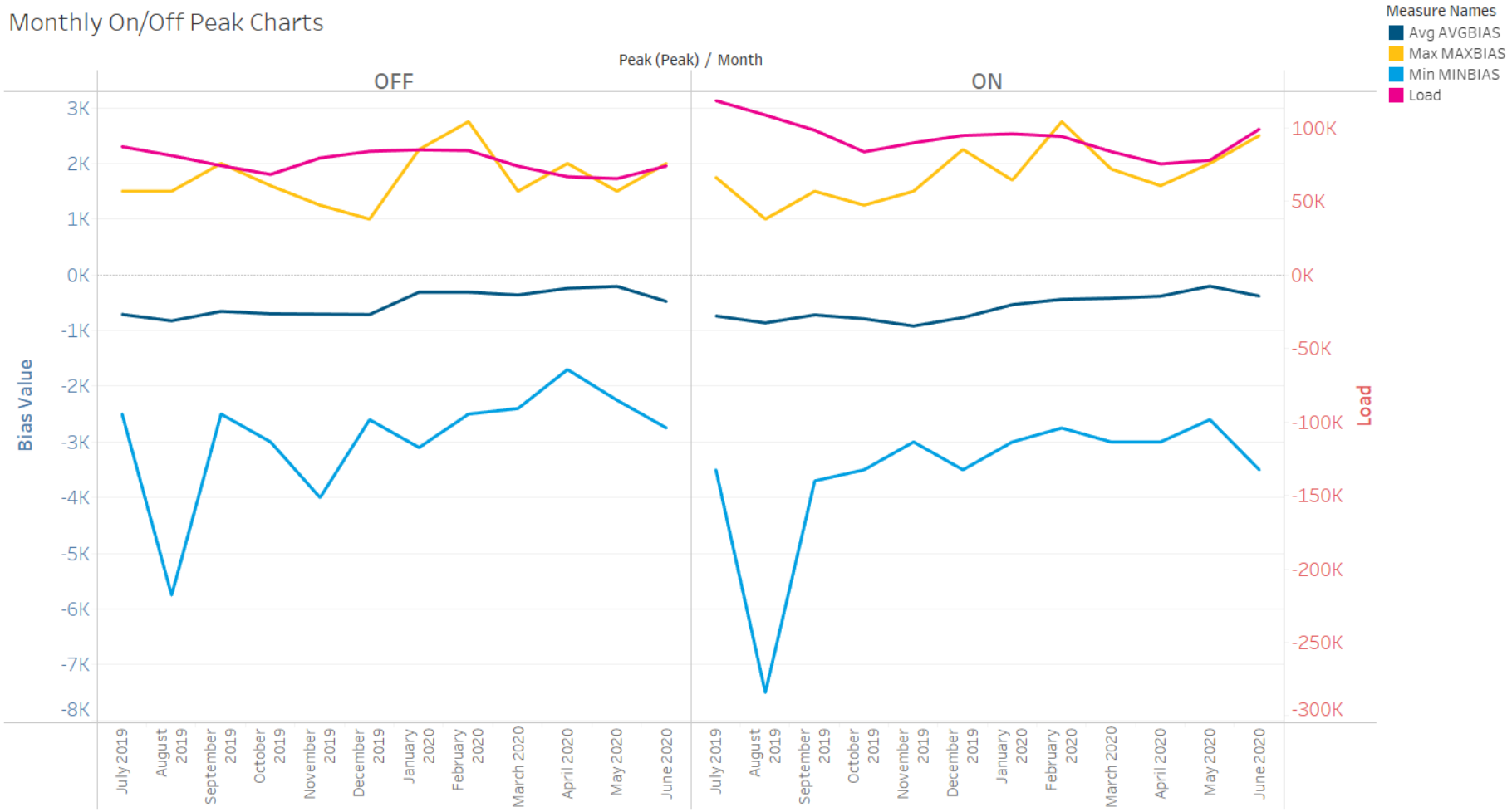

RTSCED Monthly and Monthly On/Off Peak July 2019-June 2020

Meaures	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20
Load	108,002	99,490	90,316	78,484	86,320	91,184	92,261	90,931	80,502	72,506	73,763	90,723
Min BIAS	-3,500	-7,500	-3,700	-3,500	-4,000	-3,500	-3,100	-2,750	-3,000	-3,000	-2,600	-3,500
Max BIAS	1,750	1,500	2,000	1,600	1,500	2,250	2,250	2,750	1,900	2,000	2,000	2,500
Avg BIAS	-729	-851	-698	-759	-848	-748	-461	-397	-401	-336	-205	-413
Avg Percentage of Load	**0.67%**	**0.86%**	**0.77%**	**0.97%**	**0.98%**	**0.82%**	**0.50%**	**0.44%**	**0.50%**	**0.46%**	**0.28%**	**0.46%**

Period	Meaures	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20
OFFPEAK	Load	87,140	81,101	74,255	68,259	79,471	83,980	85,031	84,503	73,902	66,722	65,428	74,006
OFFPEAK	Min BIAS	-2,500	-5,750	-2,500	-3,000	-4,000	-2,600	-3,100	-2,500	-2,400	-1,700	-2,250	-2,750
OFFPEAK	Max BIAS	1,500	1,500	2,000	1,600	1,250	1,000	2,250	2,750	1,500	2,000	1,500	2,000
OFFPEAK	Avg BIAS	-710	-826	-655	-698	-705	-712	-312	-312	-362	-243	-207	-478
Off-Peak Percentage of Load		**0.82%**	**1.02%**	**0.88%**	**1.02%**	**0.89%**	**0.85%**	**0.37%**	**0.37%**	**0.49%**	**0.36%**	**0.32%**	**0.65%**
ONPEAK	Load	118,433	108,684	98,346	83,596	89,759	94,787	95,876	94,145	83,788	75,399	77,931	99,099
ONPEAK	Min BIAS	-3,500	-7,500	-3,700	-3,500	-3,000	-3,500	-3,000	-2,750	-3,000	-3,000	-2,600	-3,500
ONPEAK	Max BIAS	1,750	1,000	1,500	1,250	1,500	2,250	1,700	2,750	1,900	1,600	2,000	2,500
ONPEAK	Avg BIAS	-738	-863	-719	-789	-920	-766	-536	-440	-421	-383	-204	-381
On-Peak Percentage of Load		**0.62%**	**0.79%**	**0.73%**	**0.94%**	**1.02%**	**0.81%**	**0.56%**	**0.47%**	**0.50%**	**0.51%**	**0.26%**	**0.38%**