Real-Time Daily Market Watch Metric Catalog

Version 1.2

VERSION HISTORY

Date	Version	Description	Author
9/09/2009	1.0	Creation of document	Yanni Chen
2/03/2011	1.1	Logo and address update	Market Performance Group
07/27/15	1.2	Update with FMM, EIM and new logo	Jennie Sage

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Introduction

The Market Quality and Renewable Integration division publishes a Day-Ahead and a Real-Time Daily Market Watch (DMW) for each trading day. These reports contain various graphs and tables pertinent to the trading day. The Real-Time DMW Metric Catalog provides a description of all the graphs published in the Real-Time DMW.

For any questions regarding the Real-Time DMW reports or the Real-Time DMW Metric Catalog please send an email to **Market_issues@caiso.com**.

RTD Default LAP LMPs

Figure 1 shows the Real-Time Dispatch (RTD) Locational Marginal Prices (LMPs) for default Load Aggregation Points (LAPs) - PGAE, SCE, SDGE and VEA- for each of the 5-minute intervals.

Figure 1: RTD Default LAP LMPs
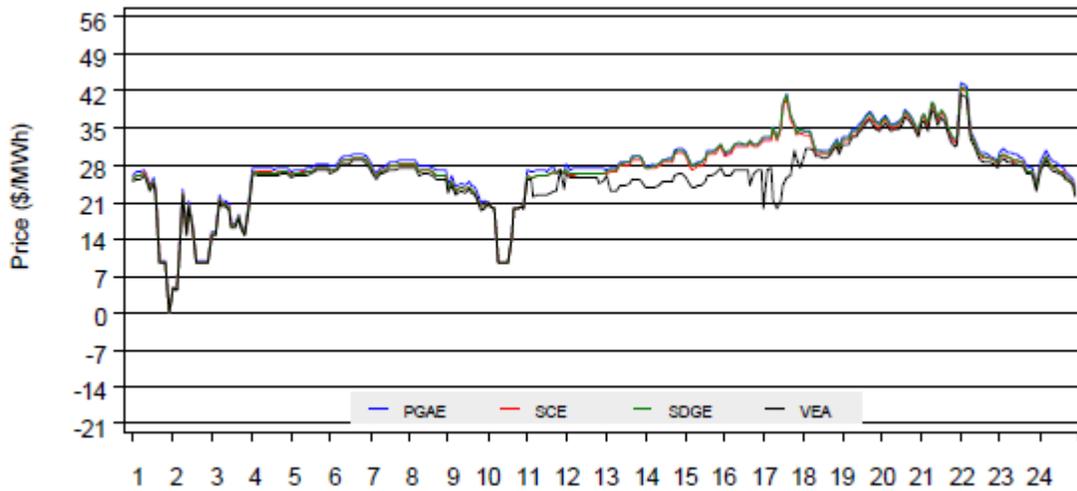
FMM Default LAP LMPs

Figure 2 shows the Fifteen-Minute (FMM) Locational Marginal Prices f or default Load Aggregation Points - PGAE, SCE, SDGE and VEA- for each of the 15-minute intervals.

Figure 2: FMM Default LAP LMPs
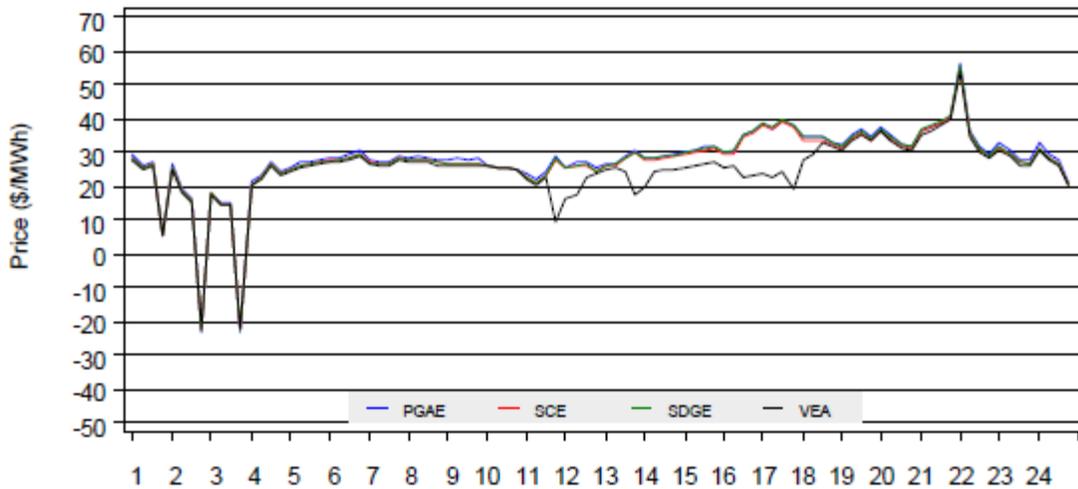
Selected RTD Nomogram Shadow Prices

Figure 3 shows the RTD shadow prices for nomograms for each of the 5-minute intervals. At most four nomograms are displayed in this graph based on the methodology explained in **Appendix I**.

Figure 3: RTD Nomogram Shadow Prices
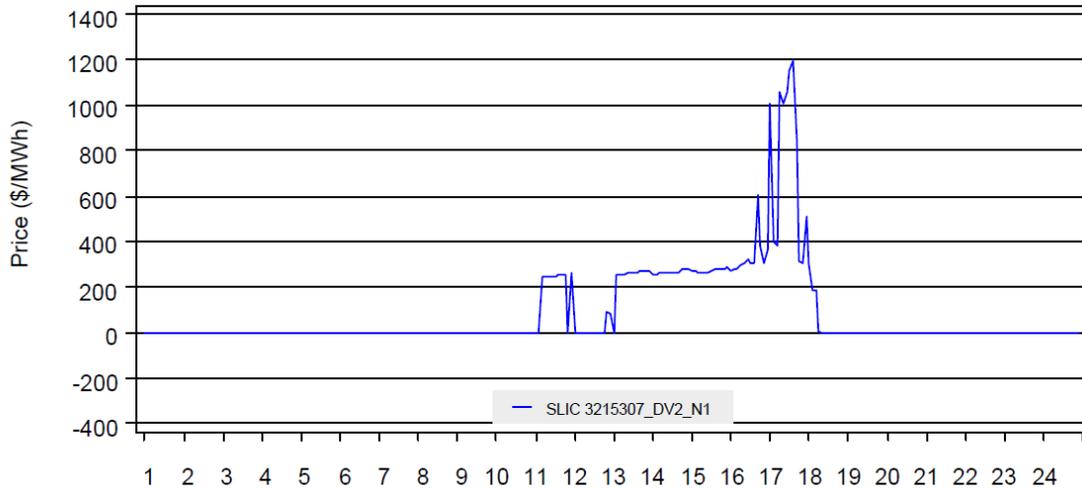
Selected FMM Nomogram Shadow Prices

Figure 4 shows the FMM shadow prices for nomograms for each of the 15-minute intervals. At most four nomograms are displayed in this graph based on the methodology explained in **Appendix I**.

Figure 4: FMM Nomogram Shadow Prices
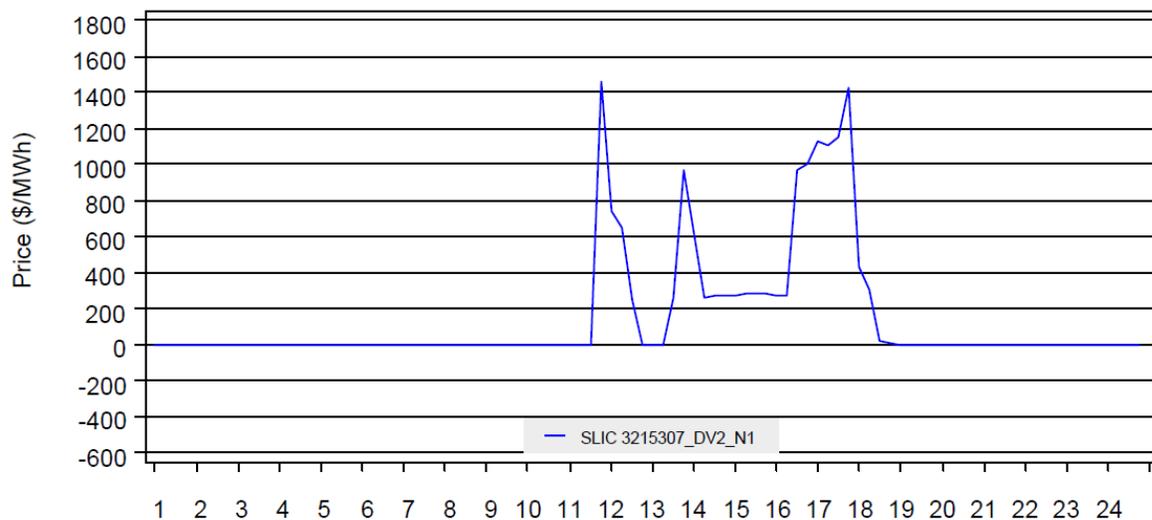
Selected RTD Transmission Line and Transformer Shadow Prices

Figure 5 shows the RTD shadow prices for transmission lines and transformers for each of the 5-minute intervals. At most four constraints are displayed in this graph based on the methodology explained in **Appendix I**.

Figure 5: RTD Transmission Line and Transformer Shadow Prices
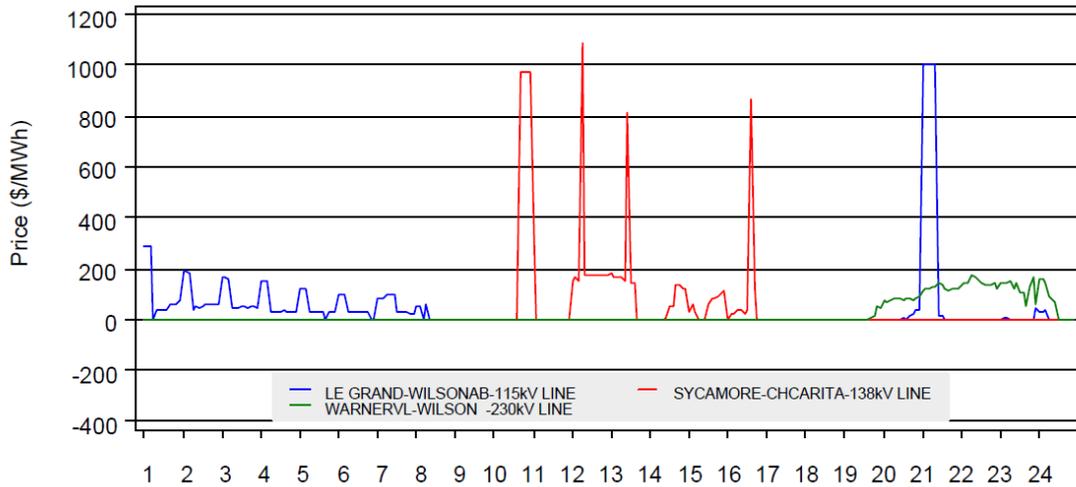
Selected FMM Transmission Line and Transformer Shadow Prices

Figure 6 shows the FMM shadow prices for transmission lines and transformers for each of the 15-minute intervals. At most four constraints are displayed in this graph based on the methodology explained in **Appendix I**.

Figure 6: FMM Transmission Line and Transformer Shadow Prices
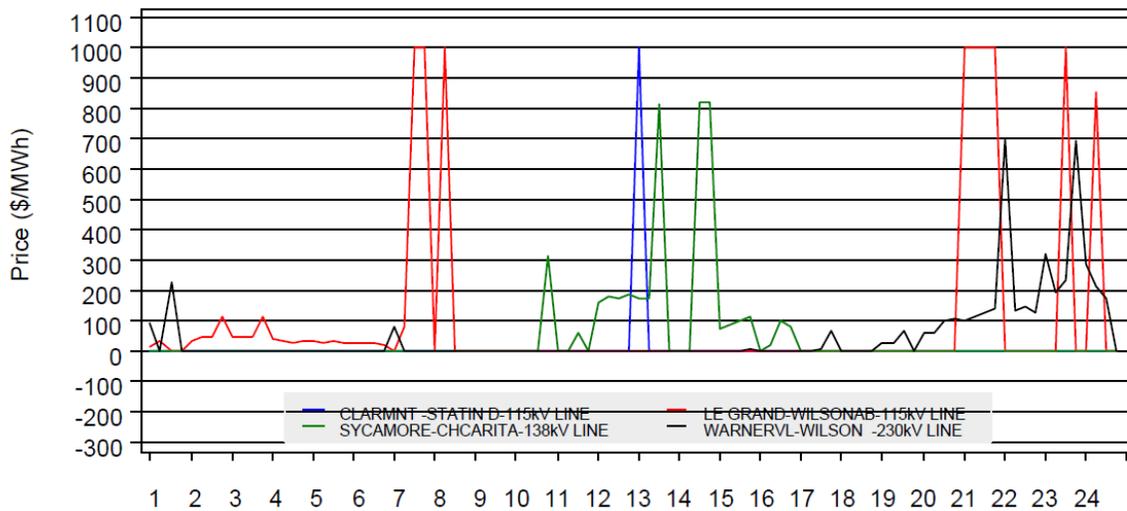
Selected RTD Transmission Corridor Shadow Prices

Figure 7 shows the RTD shadow prices for transmission corridors for each of the 5-minute intervals. At most four constraints are displayed in this graph based on the methodology explained in **Appendix I**.

Figure 7: RTD Transmission Corridor Shadow Prices
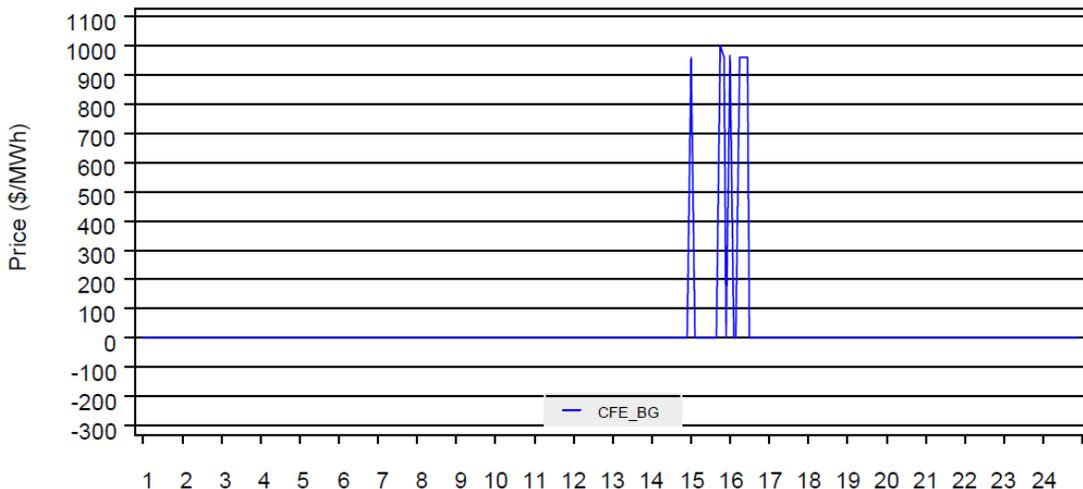
Selected FMM Transmission Corridor Shadow Prices

Figure 8 shows the FMM shadow prices for transmission corridors for each of the 15-minute intervals. At most four constraints are displayed in this graph based on the methodology explained in **Appendix I**.

Figure 8: FMM Transmission Corridor Shadow Prices
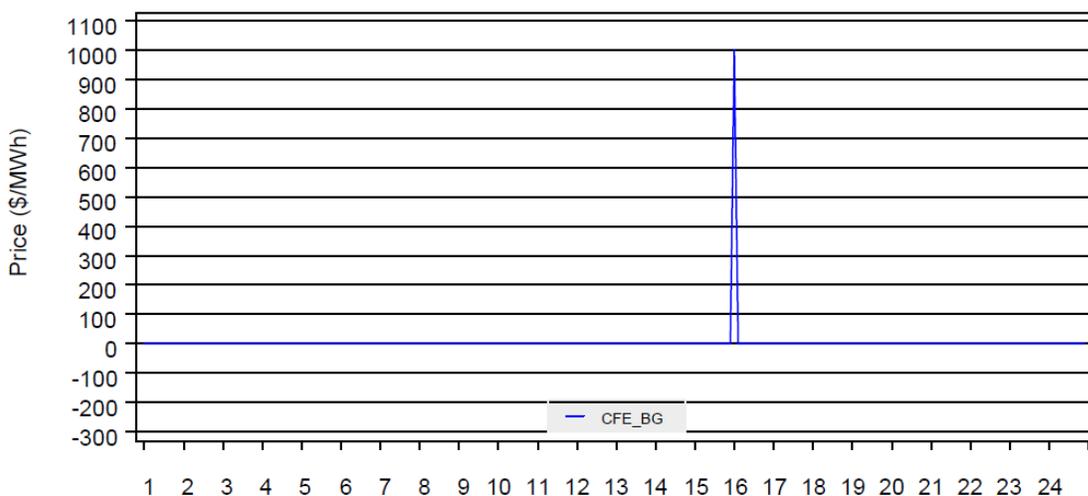
FMM Tie LMPs

Figure 9 shows the FMM LMPs for three tie points: Malin, Palo-Verde and Sylmar DC which highlight the LMPs at the PACI, Palo Verde and NOB interties, respectively. These tie-points are chosen for this graph because on average more than 50% of imports into the CAISO area are scheduled on them. Please note that Pnode names in the Full Network Model (FNM) for Malin and Sylmar DC scheduling points are MALIN_5_N101 and SYLMARDC_2_N501, respectively. The APnode name for the Palo Verde intertie is PALOVRDE_ASR-ANDE.

Figure 9: FMM Tie LMPS
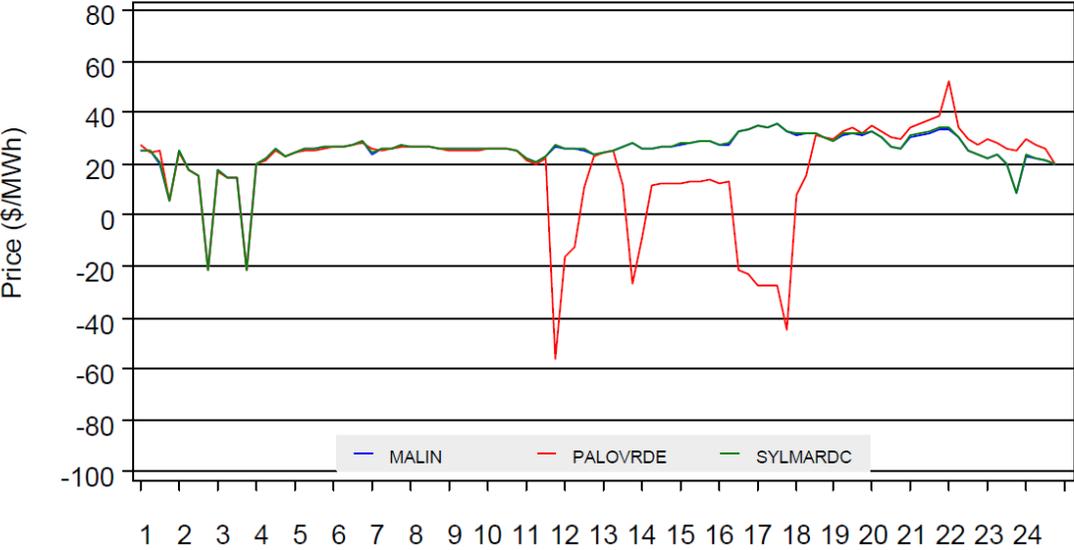
Selected FMM Tie Point Shadow Prices

Figure 10 shows the FMM shadow prices by interties for each of the 15-minute intervals. At most four Interties are displayed in this graph based on the methodology explained in **Appendix I**.

Figure 10: Selected FMM Intertie Shadow Prices
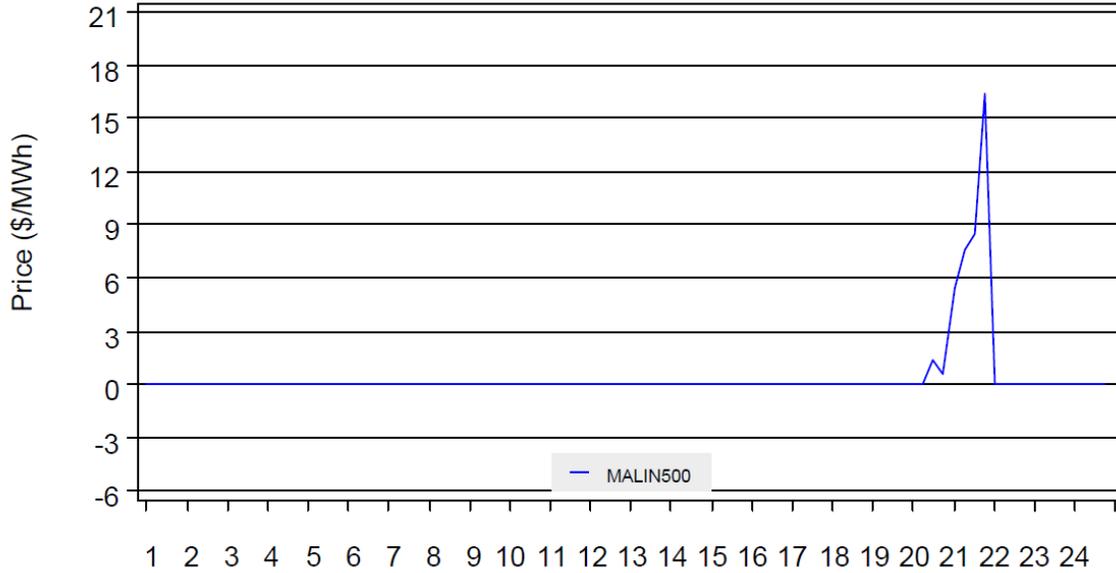
RTD Trading Hub LMPs

Figure 11 shows the RTD LMPs for three Trading Hubs – NP15, SP15 and ZP26- for each of the 5-minute intervals.

Figure 11: RTD Trading Hub LMPs
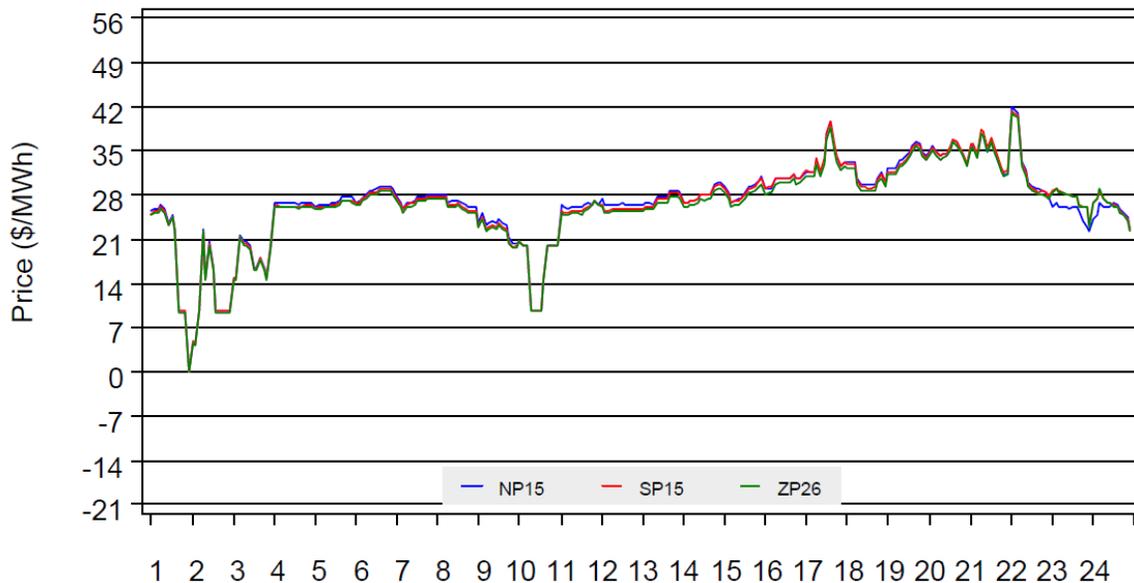
FMM A/S System Requirement

Figure 12 shows the FMM Ancillary Service requirements for Regulation Up, Regulation Down, Spin and Non-Spin for the CAISO expanded region.

Figure 12: A/S System Requirement
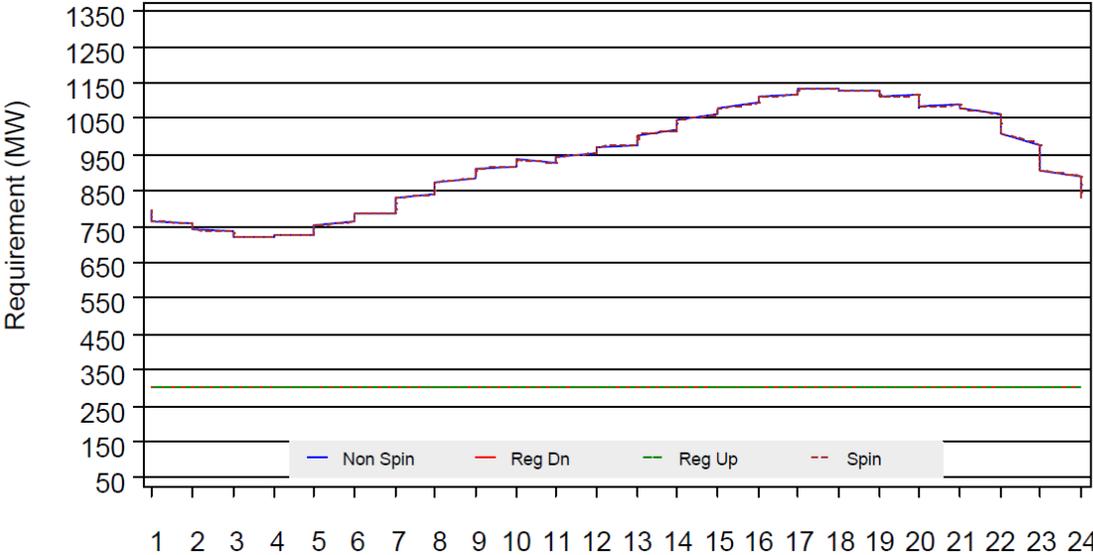
FMM A/S Average Price

Figure 13 shows the average price from the FMM for all four types of Ancillary Services for each of the 15-minute intervals. The average price for a particular type of Ancillary Service is the ratio of total cost of procuring non-self scheduled Ancillary Service to the total non-self scheduled procured quantity. Note that all the day-ahead Ancillary Service awards are taken as the self-scheduled quantities in FMM.

Figure 13: A/S Average Price
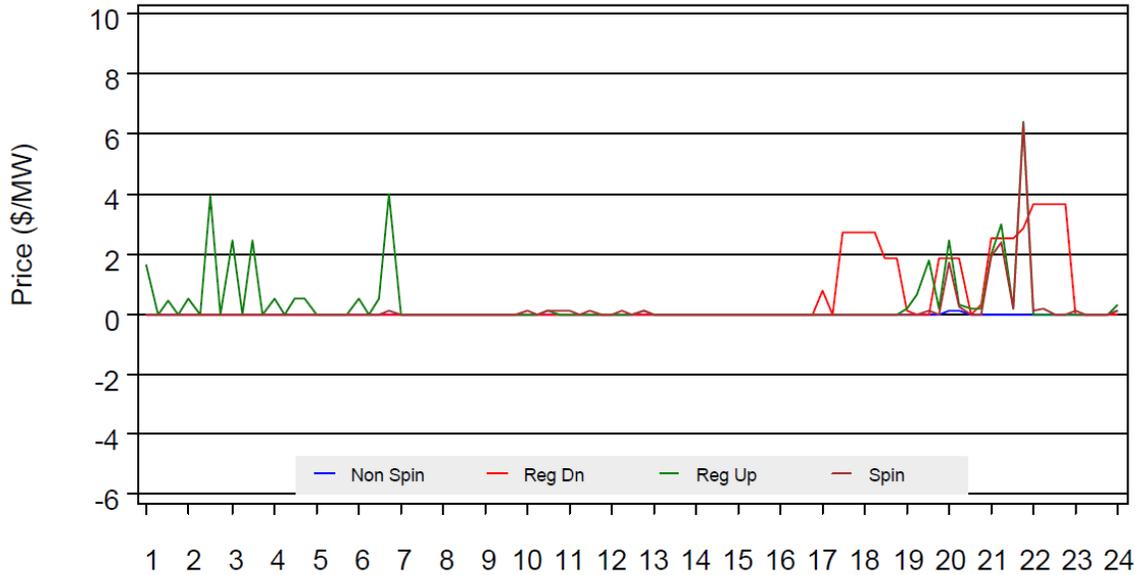
LMP Statistics for On and Off-Peak Hours ($/MWh)

Table 1 shows the maximum, mean and minimum of the RTD LMPs for four default LAPs and three Trading Hubs by on-peak and off-peak hours. Peak hours are defined as Monday through Saturday, excluding North American Electric Reliability Council (NERC) holidays, from HE 7 to HE 22 (6:00 AM to 10:00 PM). All other hours are off-peak hours.

Table 1: LMP Statistics for On and Off-Peak hours ($/MWh)

	NP15			SP15			ZP26			PGAE			SCE			SDGE			VEA		
	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min
OFF	29.38	22.71	0.00	29.13	22.84	0.00	28.99	22.65	0.00	31.11	23.91	0.00	29.87	23.24	0.00	30.04	23.20	0.00	29.22	22.74	0.00
ON	41.88	28.89	9.71	41.36	28.64	9.71	40.99	28.17	9.71	43.53	29.93	9.71	42.41	29.26	9.71	42.91	29.59	9.71	41.55	27.10	9.71

RTD PAC ELAP LMPs and System MCE

Figure 14 shows the RTD LMPs for two ELAPs participating in the Energy Imbalance Market (EIM) – PACE and PACW – for each of the 5-minute intervals and the system Marginal Component for Energy.

Figure 14: RTD PAC ELAP LMPs and System MCE
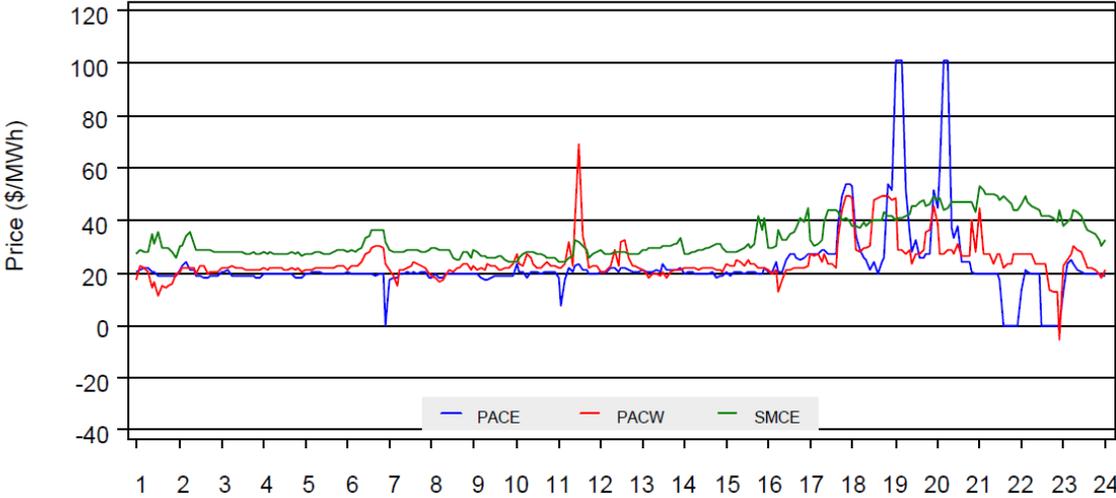
FMM PAC ELAP LMPs and System MCE

Figure 15 shows the FMM LMPs for two ELAPs participating in the Energy Imbalance Market (EIM) – PACE and PACW – for each of the 15-minute intervals and the system Marginal Component for Energy.

Figure 15: FMM PAC ELAP LMPs and System MCE
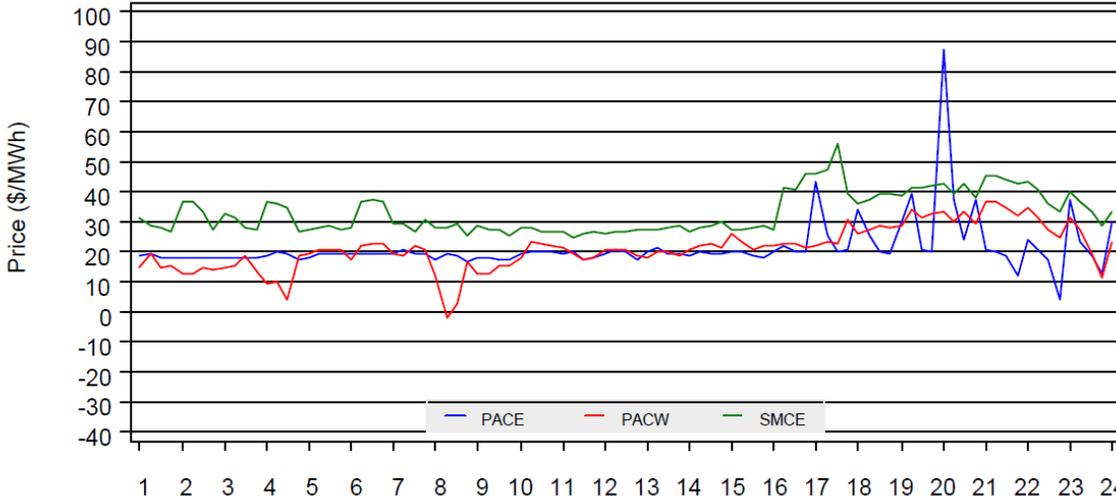
RTD EIM Transfer Limit Shadow Price

Figure 16 shows the shadow price for the Energy Imbalance Market transfer limits – CISO, PACE and PACE_PACW – for each of the 5-minute intervals.

Figure 16: RTD EIM Transfer Limit Shadow Price
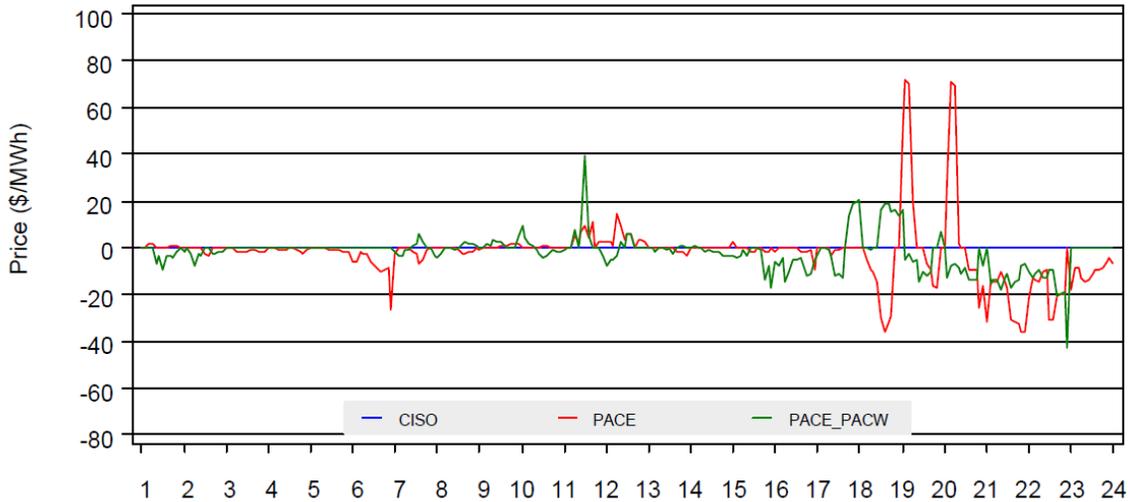
FMM EIM Transfer Limit Shadow Price

Figure 17 shows the shadow price for the Energy Imbalance Market transfer limits – CISO, PACE and PACE_PACW – for each of the 15-minute intervals.

Figure 17: FMM EIM Transfer Limit Shadow Price
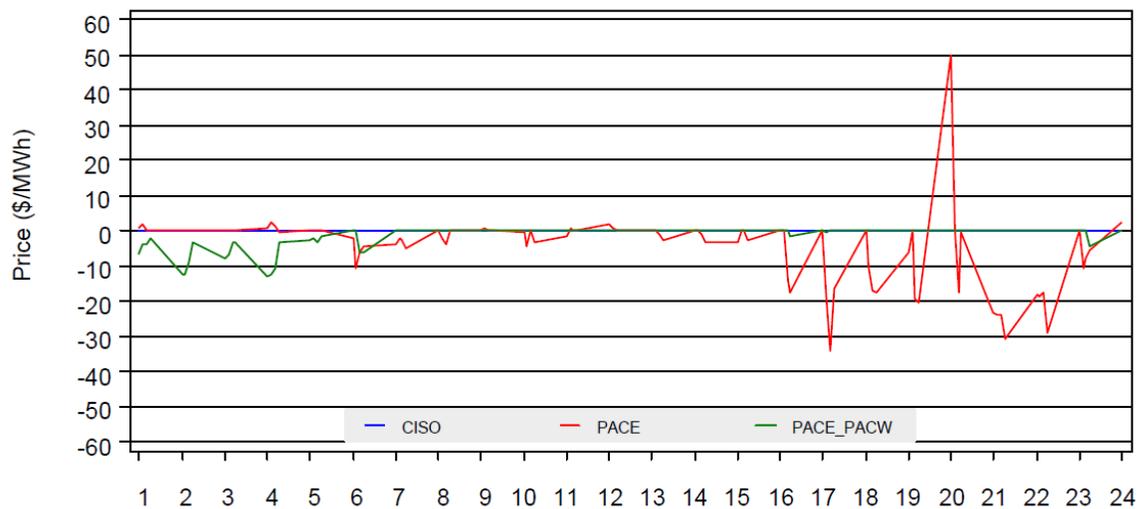
RTD EIM Transfer Flow

Figure 18 shows the transfer flow amounts in MW for the Energy Imbalance Market transfer limits – CISO, PACE and PACE_PACW – for each of the 5-minute intervals.

Figure 18: RTD EIM Transfer Flow
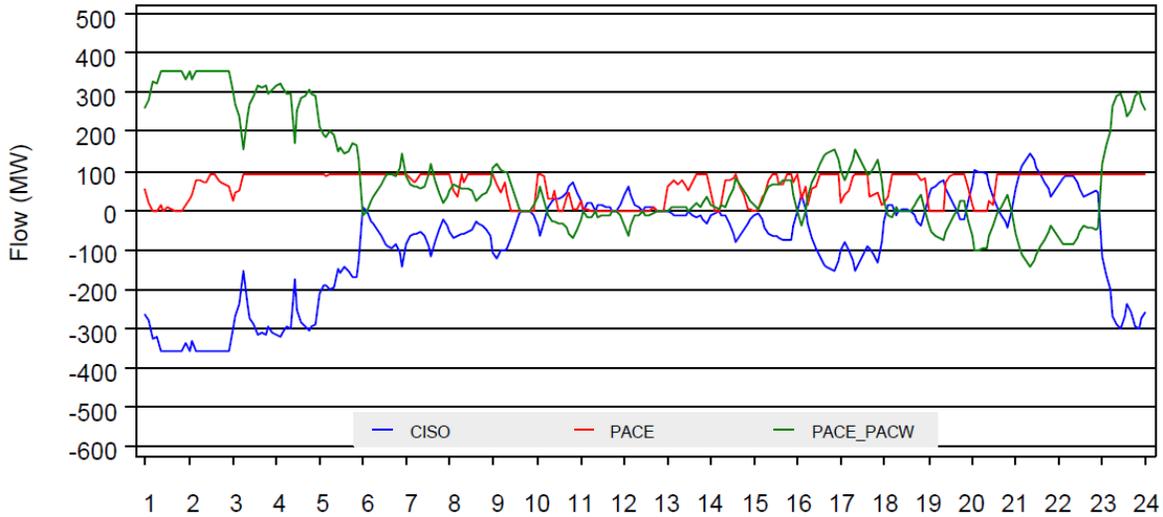
FMM EIM Transfer Flow

Figure 19 shows the transfer flow amounts in MW for the Energy Imbalance Market transfer limits – CISO, PACE and PACE_PACW – for each of the 15-minute intervals.

Figure 19: FMM EIM Transfer Flow
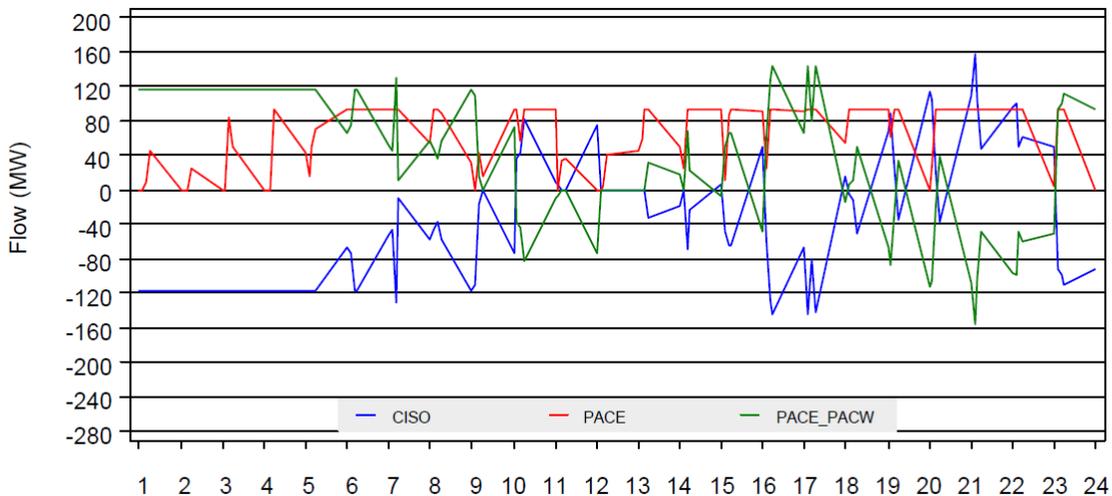
Appendix I

Figures 3-8 and 10 display the shadow prices of binding constraints. On any given day, there could be anywhere between no binding constraints to more than 10 binding constraints. This report highlights only important market events; as a result, this graph shows at most four binding constraints. The top four binding constraints are selected based on their congestion rents as explained below.

$$C_{ijk} = \left(shadow\_\mathrm{Pr}ice_{ijk} * Flow\mathrm{limit}_{ijk} \right)$$

C_{ijk} is the congestion rent for binding constraint i at interval j of hour k

i = 1 to M, where M is the total number of binding constraints for a particular trade date.

$$D_i = \sum_{k=1}^{H} \sum_{j=1}^{12} C_{ijk}$$

Where D_i = Daily total congestion rent for binding constraint i.

H = Total number of trading hours for a particular trade date

$$T = \sum_{i=1}^{M} D_i$$

Where T = Total congestion rent for all binding constraints on interties.

$$P_i = \frac{D_i}{T}$$

Where P_i is the percentage of congestion rent for binding constraint i.

Figures 3-8 and 10 show the top four binding constraints based on the rank of percentages.