



Recreating Mosaic Requirement

With Data Available in OASIS

Short-term Forecasting

shorttermforecasting@caiso.com

Rev: 1/31/2023

The information contained in these materials is provided for general information only and does not constitute legal or regulatory advice. The ultimate responsibility for complying with the ISO FERC Tariff and other applicable laws, rules or regulations lies with you. In no event shall the ISO or its employees be liable to you or anyone else for any decision made or action taken in reliance on the information in these materials.

Outline

- How to recreate mosaic requirement with data available in OASIS
 - This will have a companion Excel spreadsheet
- Recreating requirement for
 - Trade Date: 1/24/23
 - HE 15
 - Interval 1
 - ‘RTPD’
- Ways to gather information as to what your requirement will be, prior to t-75 minutes.

3 Steps to Recreate Mosaic Requirement

- Gather Relevant Information from OASIS
- Perform two stages of calculations in line with the BPM
- Validate 15 min calculation in OASIS

GRAB INPUT FORECASTS

Run Type = 'Advisory'

Interval = 1

Date From: 01/24/2023 Market/Process: RTPD BAA ID: CISO

Flexible Ramp Forecasts

1 - 12 of ???

Market	Opr Date	Balancing Authority Area ID	Run Type	Data Type	Interval	HE01	HE02	HE03	HE04	HE05	HE06	HE07	HE08	HE09	HE10	HE11	HE12	HE13	HE14	HE15	HE16	HE17
RTPD	01/24/2023	CISO	Advisory	Demand	1	22,276.48	21,506.78	21,077.52	20,938.34	21,318.87	22,529.08	24,741.45	26,882.20	26,765.90	24,488.46	22,088.85	20,490.41	19,568.97	19,308.8	19,541.61		
RTPD	01/24/2023	CISO	Advisory	Solar	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	584.45	5,945.94	10,334.24	11,044.97	11,214.88	11,026.97	11,036.5	10,866.74		
RTPD	01/24/2023	CISO	Advisory	Wind	1	1,591.56	1,355.83	1,008.52	748.68	627.43	629.81	707.63	902.21	1,109.63	1,177.47	1,238.27	1,307.13	1,222.15	1,286.4	1,267.39		
RTPD	01/24/2023	CISO	Advisory	Demand	2	21,830.27	21,236.20	20,977.00	21,005.12	21,450.76	23,414.65	26,065.71	26,895.64	25,995.93	23,297.81	21,607.79	19,987.40	19,347.62	19,137.8	20,061.34		
RTPD	01/24/2023	CISO	Advisory	Solar	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,439.22	7,380.66	10,602.34	11,048.22	11,130.01	11,114.70	10,984.68	10,736.97		
RTPD	01/24/2023	CISO	Advisory	Wind	2	1,518.45	1,284.34	993.92	679.53	602.30	656.28	690.97	954.05	1,100.02	1,247.35	1,247.06	1,266.62	1,253.96	1,198.73	1,296.38		
RTPD	01/24/2023	CISO	Advisory	Demand	3	21,814.82	21,308.85	20,949.12	21,017.24	21,758.87	23,544.04	25,948.38	27,160.26	25,911.56	23,183.36	21,324.03	19,935.62	19,308.20	19,215.43			
RTPD	01/24/2023	CISO	Advisory	Solar	3	0.00	0.00	0.00	0.00	0.00	0.00	9.65	2,681.45	8,609.30	10,692.87	11,177.44	11,090.18	11,074.49	10,930.10			
RTPD	01/24/2023	CISO	Advisory	Wind	3	1,524.58	1,216.44	929.18	684.35	607.90	691.62	731.41	1,043.60	1,104.94	1,262.85	1,290.02	1,253.27	1,195.56	1,227.55			
RTPD	01/24/2023	CISO	Advisory	Demand	4	21,061.20	20,492.47	20,255.65	20,472.02	21,483.51	23,470.25	25,705.43	25,922.87	24,656.86	21,955.04	20,432.98	19,292.09	18,588.58	18,725.82			
RTPD	01/24/2023	CISO	Advisory	Solar	4	0.00	0.00	0.00	0.00	0.00	0.00	135.46	4,203.86	9,571.30	10,892.78	11,208.02	10,996.96	11,059.85	10,788.12			
RTPD	01/24/2023	CISO	Advisory	Wind	4	1,549.74	1,112.50	884.56	694.38	602.96	715.39	832.47	1,110.67	1,124.93	1,258.05	1,313.52	1,235.84	1,240.49	1,169.70			

Report Generated: 01/24/2023 21:41:48

GRAB INPUT POLYNOMIALS

Ignore Percentile Column, Group data by Ramp Type

Date: Market/Process: BAA Group:

Flexible Ramp Requirement Input Polynomials

1 - 8 of ???

Market	Opr Date	Balancing Authority Area Group	Ramp Type	Percentile	Data Type	HE01			HE02			A		
						A Value	B Value	C Value	A Value	B Value	C Value			
RTPD	01/24/2023	CISO	DOWN	HIGH	SOLAR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00002	-0.52934	3,829.60409
RTPD	01/24/2023	CISO	DOWN	HIGH	WIND	-0.00002	0.23402	-29.51617	0.00000	0.05495	175.06654	-0.00008	0.45010	126.39481
RTPD	01/24/2023	CISO	DOWN	LOW	DEMAND	0.00000	0.05489	-841.84794	0.00000	0.00061	-130.49446	0.00000	-0.07629	599.32797
RTPD	01/24/2023	CISO	DOWN	LOW	MOSAIC	0.00179	2.37403	172.03185	0.00726	5.95540	793.92691	0.00051	1.16012	-356.92844
RTPD	01/24/2023	CISO	UP	HIGH	DEMAND	0.00000	-0.05151	778.22094	0.00000	-0.06000	827.06427	0.00000	-0.03831	1,114.27918
RTPD	01/24/2023	CISO	UP	HIGH	MOSAIC	-0.00122	2.43381	-400.37546	-0.00209	3.47676	-683.36965	-0.00026	1.32051	367.37244
RTPD	01/24/2023	CISO	UP	LOW	SOLAR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	-0.06700	-1,792.46039
RTPD	01/24/2023	CISO	UP	LOW	WIND	0.00006	-0.34086	-128.63992	0.00002	-0.20994	-226.42682	0.00000	-0.14924	-148.71694

HE15		
A Value	B Value	C Value
0.00002	-0.52934	3,829.60409

Report Generated: 01/24/2023 21:44:09

GRAB HISTOGRAM VALUES

Ignore Percentile Column, Group data by Ramp Type

Date: 01/24/2023 31 Market/Process: RTPD v BAA Group: CISO v Apply Reset

Download XML Download CSV

Flexible Ramp Requirements Input Uncertainty Histograms

1 - 8 of ???

Market Opr Date	Balancing Authority Area Group	Ramp Type	Percentile	Data Type	HE01	HE02	HE03	HE04	HE05	HE06	HE07	HE08	HE09	HE10	HE11	HE12	HE13	HE14	HE15
RTPD 01/24/2023	CISO	DOWN	HIGH	SOLAR	0.00	0.00	0.00	0.00	0.00	0.09	112.35	700.13	941.75	1,046.32	1,107.51	1,093.54	824.77	536.9	672.61
RTPD 01/24/2023	CISO	DOWN	HIGH	WIND	434.20	322.75	428.32	355.64	320.98	287.62	240.58	263.44	218.09	304.46	341.53	283.28	364.47	425.5	605.70
RTPD 01/24/2023	CISO	DOWN	LOW	DEMAND	-237.72	-188.17	-226.32	-199.76	-210.02	-303.00	-420.32	-306.09	-539.60	-596.74	-577.68	-593.75	-448.33	-593.2	-693.91
RTPD 01/24/2023	CISO	DOWN	LOW	NET-DEMAND	-493.70	-374.31	-505.64	-439.42	-359.12	-403.48	-431.60	-468.86	-1,028.89	-1,378.65	-1,542.55	-1,217.70	-882.41	-837.0	-887.10
RTPD 01/24/2023	CISO	UP	HIGH	DEMAND	288.83	244.43	182.67	146.39	204.25	340.74	377.26	531.32	495.29	545.09	484.14	336.22	467.59	451.1	524.35
RTPD 01/24/2023	CISO	UP	HIGH	NET-DEMAND	660.14	654.06	581.90	572.58	634.30	656.40	924.50	2,291.01	2,196.28	1,503.61	1,026.35	1,051.09	1,258.22	1,343.1	1,626.98
RTPD 01/24/2023	CISO	UP	LOW	SOLAR	0.00	0.00	0.00	0.00	0.00	-0.05	-600.22	-1,938.98	-1,873.35	-1,260.40	-863.38	-914.86	-1,075.53	-1,290.0	-1,479.77
RTPD 01/24/2023	CISO	UP	LOW	WIND	-544.27	-572.65	-614.10	-561.28	-577.77	-544.42	-576.95	-671.17	-593.49	-514.66	-507.98	-423.00	-480.01	-474.7	-531.69

Report Generated: 01/24/2023 21:43:02

(Stage 1)

Calculate “q” variable for load, solar and wind, using input forecasts and polynomial coefficients

Formula bar: $=E6+B4*E5+(B4^2)*E4$

A	B	C	D	E	F	G	H	I	J	K
INPUTS										
SOURCE	OASIS		OASIS					CALCULATED		
	ADVISORY FORECAST		Down Coefficients	Up Coefficients				DOWN q variables	UP q variables	
LOAD	19541.61	A_LOAD		0	0	LOAD		-891.5014569	365.6401009	
SOLAR	10866.74	B_LOAD		-0.07629	-0.03831	SOLAR		439.124703	-1339.671588	
WIND	1267.39	C_LOAD		599.32797	1114.27918	WIND		568.344856	-337.8622236	
		A_SOLAR		0.00002	0.00001					
HE	15	B_SOLAR		-0.52934	-0.067					
INT	1	C_SOLAR		3829.60409	-1792.46039					
	2:15	A_WIND		-0.00008	0					
		B_WIND		0.4501	-0.14924					
		C_WIND		126.39481	-148.71694					

(Stage 2)

Calculate “m” variable for net load, using histograms and “q” variables

Clipboard Font Alignment

A19 fx =M4-(M5-M6-M7)+(I4-I5-I6)

	A	B
1	INPUTS	
2	SOURCE	OASIS
3		ADVISORY FORECAST
4	LOAD	19541.61
5	SOLAR	10866.74
6	WIND	1267.39
7		
8	HE	15
9	INT	1
10		2:15
11		
12		
13		
14		
15	Model the calculation of m variable like presented in BPM...	
16	$M5 P97.5 (nd, d, s, w) \equiv ND5 H97.5 - (D5 H97.5 - S5 H2.5 - W5 H2.5) + (D5 F$	
17		
18	DOWN MOSAIC VARIABLE	UP MOSAIC VARIABLE
19	-813.8510159	1134.343912
20		
21	~600	
22		
23		

H	I	J	K	L	M	N	O
	CALCULATED				OASIS		
	DOWN q variables		UP q variables		DOWN histogram	Up histogram	
LOAD	-891.5014569	365.6401009		NET LOAD	-887.1	1626.98	
SOLAR	439.124703	-1339.671588		LOAD	-693.91	524.35	
WIND	568.344856	-337.8622236		SOLAR	672.61	-1479.77	
				WIND	605.7	-531.69	

Confirm calculation of RTPD requirement within OASIS

Data Type = 'Net-Load Uncertainty'
 Test Indicator = 1 (Interval = 1)
 (IF Ramp Type = 'DOWN'), Multiply value by -1

Date From:		01/24/2023		To:		01/24/2023		Market/Process:		RTM		BAA ID:		CISO		Snapshot Indicator:		T55MIN		Apply		Reset		
Download XML		Download CSV		Flexible Ramp Requirements Inputs and Outputs (WEIM RSE Flexible Ramping Tests)																				
Market	Opr Date	Balancing Authority Area ID	Base Schedule Snapshot Indicator	Ramp Type	Test Indicator	Data Type	HE01	HE02	HE03	HE04	HE05	HE06	HE07	HE08	HE09	HE10	HE11	HE12	HE13	HE14	HE15	HE16		
RTM	01/24/2023	CISO	T55MIN	DOWN	1	Net-Load Uncertainty	40.83	312.65	510.37	349.52	334.82	444.75	418.58	468.05	991.86	1,118.40	1,248.90							
RTM	01/24/2023	CISO	T55MIN	DOWN	1	Change in Load Forecast	21.99	144.67	81.74	-31.32	-227.42	-553.07	-933.14	-449.59	295.96	501.79	416.50							
RTM	01/24/2023	CISO	T55MIN	DOWN	1	Ramping Capacity	12,110.35	8,919.74	8,828.02	9,191.21	9,572.13	9,694.36	10,964.57	10,501.56	11,784.57	12,848.39	12,553.66							
RTM	01/24/2023	CISO	T55MIN	DOWN	1	Credit	20.18	0.00	301.53	310.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
RTM	01/24/2023	CISO	T55MIN	DOWN	1	Net Import Capability	2,699,952.80	2,700,064.20	2,699,671.50	2,699,662.20	2,700,016.00	2,700,402.20	2,700,919.20	2,700,360.00	2,700,490.20	2,700,846.80	2,701,533.50							
RTM	01/24/2023	CISO	T55MIN	DOWN	1	Net Export Capability	2,599,994.20	2,599,882.80	2,600,275.50	2,600,284.80	2,599,931.00	2,599,544.80	2,599,027.80	2,599,587.00	2,599,456.80	2,599,100.20	2,598,413.50							
RTM	01/24/2023	CISO	T55MIN	DOWN	1	Diversity Benefit	271.86	204.12	343.14	228.44	223.24	259.01	220.53	333.18	585.16	526.40	591.76							
RTM	01/24/2023	CISO	T55MIN	DOWN	1	Requirement Amount	329.77	253.20	-52.56	-221.07	-115.84	-367.34	-735.09	-314.71	702.66	1,093.79	1,073.63							
RTM	01/24/2023	CISO	T55MIN	DOWN	2	Test Status	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS							
RTM	01/24/2023	CISO	T55MIN	DOWN	2	Net-Load Uncertainty	401.05	309.24	510.39	350.38	335.26	443.02	417.18	452.00	998.31	1,114.98	1,262.90							
RTM	01/24/2023	CISO	T55MIN	DOWN	2	Change in Load Forecast	445.58	299.69	153.63	-42.25	-416.07	-985.04	-1,614.57	-569.51	674.11	1,001.13	841.21							
RTM	01/24/2023	CISO	T55MIN	DOWN	2	Ramping Capacity	13,231.59	10,320.07	10,151.53	10,503.22	10,932.57	11,172.16	13,092.78	12,551.33	13,114.29	13,430.49	13,081.96							
RTM	01/24/2023	CISO	T55MIN	DOWN	2	Credit	20.18	0.00	301.53	310.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
RTM	01/24/2023	CISO	T55MIN	DOWN	2	Net Import Capability	2,699,952.80	2,700,064.20	2,699,671.50	2,699,662.20	2,700,016.00	2,700,402.20	2,700,919.20	2,700,360.00	2,700,490.20	2,700,846.80	2,701,533.50							
RTM	01/24/2023	CISO	T55MIN	DOWN	2	Net Export Capability	2,599,994.20	2,599,882.80	2,600,275.50	2,600,284.80	2,599,931.00	2,599,544.80	2,599,027.80	2,599,587.00	2,599,456.80	2,599,100.20	2,598,413.50							
RTM	01/24/2023	CISO	T55MIN	DOWN	2	Diversity Benefit	267.58	201.83	342.40	229.07	220.49	252.27	211.85	327.21	576.54	523.41	598.73							
RTM	01/24/2023	CISO	T55MIN	DOWN	2	Requirement Amount	558.87	407.10	20.09	-231.77	-301.30	-794.29	-1,409.25	-444.71	1,095.88	1,592.70	1,505.38							
RTM	01/24/2023	CISO	T55MIN	DOWN	3	Test Status	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS							
RTM	01/24/2023	CISO	T55MIN	DOWN	3	Net-Load Uncertainty	397.42	305.83	510.44	352.13	335.71	441.25	418.34	452.77	956.39	1,144.32	1,272.43							

HE15	HE16
PASS	
832.00	
-146.13	
9,550.74	
0.00	
2,701,330.50	
2,598,616.50	
447.18	
238.69	
PASS	
842.51	
-376.42	
9,917.21	
0.00	
2,701,330.50	
2,598,616.50	
456.57	
9.52	
PASS	
861.91	

Coming Enhancement for OASIS

- Test number doesn't replicate when using OASIS information
 - 963 \neq 832
- This is because OASIS only reports 5 decimal place precision for the polynomial coefficients , an enhancement will replace this with much greater precision
 - This is important for the A coefficients because the forecast is squared before multiplying by A coefficient
- An example of the change when providing the full precision is shown in a second tab in the companion spreadsheet

Agreement with full precision of inputs, in Stage environment

Calculated	
Down Final Uncertainty Requirement	UP Final
-831.3739735	
RTBS	
Down Final Uncertainty Requirement	UP Final
-832	

Planning for Requirement Prior to t-75

- 1) Utilize thresholds provided in OASIS **Flexible Ramp Requirement Thresholds**, there are now two thresholds. **The requirement will never exceed the minimum of these two thresholds.**
 - a. Quarterly thresholds (labeled Data Type = Mosaic in OASIS) – will be static ~ quarterly, any change to this number is typically communicated out a week prior to any change
 - b. Daily thresholds (labeled Data Type = Histogram in OASIS) – like the current requirement, this value is resolved hourly and is available day prior. The major difference is that it's based off of 1% and 99%.

- 2) Unlike the thresholds – the remaining options **are not guaranteed to replicate your requirement**
 - a. With published polynomial coefficients (**Flexible Ramp Requirements Input Polynomials**) and histogram values (**Flexible Ramp Requirements Uncertainty Thresholds**) in OASIS – replicate the requirement outlined in the BPM with self-supplied wind, solar and demand forecasts (15 minute granularity for RTPD; 5 minute granularity for RTD) – (e.g., scale-up the companion spreadsheet with self-supplied forecasts for tomorrow's trade date)
 - b. To analyze requirements for a similar weather day and day type –the history of the 15 minute (RTPD) requirement will be available in **Flexible Ramp Requirements Inputs and Outputs** Data Type = 'Net-Load Uncertainty'
 - c. The Net-Demand histogram (2.5% and 97.5%) will be available and can provide reasonable guidance at an hourly level, it is located **Flexible Ramp Requirements Uncertainty Histograms** Data Type = 'NET-DEMAND'