

August 1, 2016

The Honorable Kimberly D. Bose  
Secretary  
Federal Energy Regulatory Commission  
888 First Street, NE  
Washington, DC 20426

**Re: California Independent System Operator Corporation  
Docket Nos. ER08-1178-000 and EL08-88-000  
April 2016 Exceptional Dispatch Report (Chart 2 Data)**

Dear Secretary Bose:

Pursuant to the orders issued in the above-referenced dockets on September 2, 2009 and May 4, 2010, the California Independent System Operator Corporation (CAISO) submits the attached report. The report provides Exceptional Dispatch information that the Commission directed be included in "Chart 2," which is set forth in Appendix A to the September 2, 2009 order, as modified by the May 4, 2010 order.

The attached report provides Chart 2 data for the month of April 2016. The report also includes the price impact analysis for April 2016 required by paragraph 44 of the September 2, 2009 order, as well as the degree of mitigation analysis required by CAISO tariff section 34.9.4 for April 2016.

Respectfully submitted,

**By: /s/ Sidney L. Mannheim**

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# **Exceptional Dispatch Report**

## **Table 2: April 2016**

Market Quality and Renewable Integration

July 29, 2016

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## Introduction

This report is filed pursuant to FERC's September 2, 2009, and May 4, 2010, orders in ER08-1178. These orders require two monthly Exceptional Dispatch reports—one issued on the 15<sup>th</sup> of each month and one issued on the 30<sup>th</sup> of each month. This report provides data on the frequency, reasons and costs for Exceptional Dispatches issued in April 2016.

This report contains a price impact analysis as prescribed by FERC in its September 2 order. The price impact analysis for the month of April is presented in Appendix B. This report also includes mitigation analysis for April 2016 required by section 34.9.4 of the CAISO tariff. This analysis compares those Exceptional Dispatches subject to bid mitigation ( i.e. Exceptional Dispatches to address noncompetitive constraints and Delta Dispatch), and determines the cost difference between the Exceptional Dispatch bid mitigation settlement rules and what the settlement amount would have been had the Exceptional Dispatches not been subject to bid mitigation. The Exceptional Dispatch bid mitigation analysis for April is presented in Appendix C.

## The Nature of Exceptional Dispatch

The CAISO can issue exceptional dispatch instructions for a resource as a pre-day-ahead unit commitment, a post day-ahead unit commitment or a real-time exceptional dispatch. A pre-day-ahead unit commitment is an exceptional dispatch instruction committing a resource at or above its physical minimum (Pmin) operating level in the day-ahead market. A post-day-ahead unit commitment is an exceptional dispatch instruction committing a resource at or above its (Pmin) operating level in the real-time market. A real-time exceptional dispatch instructs a resource to operate at or above its physical minimum operating point. A real-time exceptional dispatch above the resource's day-ahead award is an incremental exceptional dispatch instruction and a real-time exceptional dispatch below the day-ahead award is considered a decremental dispatch instruction. The CAISO issues exceptional dispatch instructions to maintain the reliability of the grid when the market software cannot do so. Whenever the CAISO issues an exceptional dispatch instruction, the operator logs the dispatch and the associated reason. Reliability requirements are calculated for both local area and the system wide needs, and are classified into various requirements including local generation, transmission management, non-modeled transmission outages, ramping and intertie emergency assistance. Whenever the CAISO issues an exceptional dispatch instruction, the operators log these instructions and the associated reason for each instruction.

Most of the generation procedures are internal to the CAISO and not available publicly on the CAISO website; however, all of the transmission procedures are available on the CAISO website.<sup>1</sup>

The following additional reason for exceptional dispatch instructions in 2016 includes Software Limitation. When an exceptional dispatch instruction was used to bridge schedules across days for resources with a minimum down time of 24 hours, as the CAISO software does not handle multi day commitment. For instance, a resource has a day-ahead schedule from 0600 till 2300, and then is shut down in 2400. If this resource had a minimum down time of 24 hours and it is required the following day, then the CAISO issues an exceptional dispatch to commit this resource in 2400 so it can be dispatched economically in the following day. Software limitation reason was also used for exceptional dispatches to manually issue shut down instructions to a resource because of a temporary Automatic Dispatch System (“ADS”) failure, or similar issues. There were a few other reasons used to explain exceptional dispatch instructions in February, which are self explanatory.

The data in Table 1 is based on a template specified in the September 2009 order.<sup>2</sup> This table contains all the information published in Table 1 of the first report for April 2016. In addition, it contains volume (MWh) and cost information. Each entry in Table 1 is a summary of exceptional dispatches classified by (1) the reason for the exceptional dispatch; (2) the location of the resource by Participating Transmission Owner (PTO) service area; (3) the Local Reliability Area (LRA) where applicable; (4) the market in which the exceptional dispatch occurred (day-ahead vs. real-time); and (5) the date of the exceptional dispatch. For each classification the following information is provided: (1) Megawatts (MW); (2) Commitment; (3) Inc or Dec; (4) Hours; (5) Begin Time; (6) End Time; (7) Total Volume (MWh); (8) Min Load Cost; (9) Start Up Cost; (10) CC6470; (11) ED Volume (MWh INC/DEC); (12) CC6470 INC; (13) CC6470 DEC; (14) CC6482; (15) CC6488; and (16) CC6620. Each column is defined :

- The MW column shows the range of exceptional dispatch instruction in MW for the classification.
- The Commitment column specifies if there was a unit commitment for the classification.
- The INC/DEC/NA column specifies if there was an incremental dispatch (INC), a decremental dispatch (DEC), or only a unit commitment (NA). The Begin Time and End Time columns show the start and end time of exceptional dispatch for the classification respectively.

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<sup>1</sup> A list of all of the CAISO’s Operating Procedures and all the publicly available Operating Procedures are available at the following link:

<http://www.caiso.com/thegrid/operations/opsdoc/index.html>

<sup>2</sup> The data in Table 1 is principally SLIC information supplemented with data from the Market Quality System (MQS) and Settlements database. The volume and cost information is based on t+51B Recalculation Statements.

- The Hours column is the time difference between begin time and end time rounded up to the next hour.
- The total volume column shows the total MWh dispatch quantity dispatched for that classification. This quantity includes the minimum load quantity, the imbalance energy quantity, and the exceptional dispatch quantity.
- The Min-Load Cost column shows eligible minimum load cost for the classification.
- The Start-Up Cost column shows the eligible start up cost for the classification. The CAISO does not explicitly pay resources for its start up and minimum load costs; however, it ensures that resources are compensated adequately through its bid cost recovery.<sup>3</sup>
- The CC6470 column shows the total imbalance energy costs for the classification. This cost contains the portion of exceptional dispatch instruction settled as optimal energy due to its bid price being less than the LMP in the relevant settlement interval.
- The ED Volume MWh (MWh INC/DEC) column shows the incremental or the decremental portion of the real-time exceptional dispatch MWh for the classification. The CC6470-INC shows that portion of incremental exceptional dispatch instruction settled at the resource LMP.
- The CC6470-DEC column shows that portion of decremental exceptional dispatch instruction settled at the resource specific LMP. Both these charge codes are portions of the real-time instructed imbalance energy charge code (6470).<sup>4</sup>
- The CC6482 column shows the real-time excess cost for the classification.<sup>5</sup>
- The CC6488 column shows the real-time exceptional dispatch uplift settlement for the classification.<sup>6</sup> The CC6620 shows the bid cost recovery payment for the classification. This cost is shown for all pre-day-ahead unit commitments only.

Charge codes 6470, 6470 INC, 6470 DEC, 6482 and 6488 are shown in Table 1 because all these charge codes pertain to real-time exceptional dispatch MWh quantities. The classification of data is further explained for example in Attachment A.

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<sup>3</sup> For further details regarding the Bid Cost Recovery process please refer to section 11.8 of the CAISO tariff.

<sup>4</sup> For further details please refer to the BPM configuration Guide: Real-Time Instructed Imbalance Energy Settlement published on the CAISO's website.

<sup>5</sup> For further details please refer to the BPM configuration Guide: Real Time Excess Cost for Instructed Energy Settlement published on the CAISO's website.

<sup>6</sup> For further details please refer to the BPM configuration Guide: Real Time Exceptional Dispatch Uplift Settlement published on the CAISO's website.

**Table 1: Exceptional Dispatches in April 2016**

**California Independent System Operator Corporation  
Exceptional Dispatch Report  
July 29, 2016**

**Chart 2: Table of Exceptional Dispatches for Period 01/April/2016 - 30/April/2016**

Number	Market Type	Reason	Location	Local Reliability Area	Trade Date	MW	Commitment	INC_DEC	Hours	Begin Time	End Time	Total MWH	Min Load Cost	Start Up Cost	CC6470	ED MWH (INC/DEC)	CC6470 INC	CC6470 DEC	CC6482	CC6488	CC6620
1	RT	Fast Start Unit Management	PG&E	Bay Area	4/19/2016	0	No	INC	4	10:15	13:19	-13.23	5015.01	0.00	191.11	0.00	0.00	0.00	0.00	0.00	0.00
2	RT	Fast Start Unit Management	PG&E	Fresno	4/8/2016	83	No	INC	5	14:10	18:59	-64.85	19862.11	0.00	-615.15	0.00	0.00	0.00	0.00	0.00	0.00
3	RT	Fast Start Unit Management	PG&E	Sierra	4/8/2016	0	No	INC	1	18:20	19:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	RT	Fast Start Unit Management	SCE	Big Creek-Ventura	4/5/2016	0	No	INC	1	0:00	0:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	RT	Fast Start Unit Management	SCE	Big Creek-Ventura	4/9/2016	0	No	INC	1	11:15	12:14	4.82	636.49	0.00	-161.69	4.25	-149.12	0.00	0.00	0.00	0.00
6	RT	Fast Start Unit Management	SCE	LA Basin	4/1/2016	0	No	INC	1	2:30	3:29	0.00	1992.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	RT	Fast Start Unit Management	SCE	LA Basin	4/9/2016	0	No	INC	3	11:15	13:44	-20.39	994.00	136.80	-863.54	-23.10	0.00	220.90	0.00	0.00	0.00
8	RT	Fast Start Unit Management	SCE	LA Basin	4/13/2016	0	No	INC	1	11:20	12:19	-30.25	2822.00	0.00	-448.55	-30.25	0.00	-448.55	0.00	0.00	0.00
9	RT	Fast Start Unit Management	SCE	LA Basin	4/19/2016	0	No	INC	5	11:00	15:14	4.49	3471.84	0.00	-209.86	-7.48	-0.11	0.00	0.00	0.00	0.00
10	RT	Incomplete or Inaccurate Transmission	PG&E	Sierra	4/10/2016	120-145	No	INC	4	4:10	7:59	-0.80	0.00	0.00	-22.34	0.00	0.00	0.00	0.00	0.00	0.00
11	RT	Market Disruption	PG&E	Bay Area	4/12/2016	600	No	INC	1	1:30	1:59	65.39	0.00	0.00	-1050.35	0.00	0.00	0.00	0.00	0.00	0.00
12	RT	Market Disruption	PG&E	Fresno	4/4/2016	-317	No	INC	1	9:40	9:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	RT	Market Disruption	PG&E	N/A	4/4/2016	52	No	INC	2	9:40	10:44	-15.72	0.00	0.00	145.11	0.00	0.00	0.00	0.00	0.00	0.00
14	RT	Operating Procedure Number and Constraint (7110)	N/A	N/A	4/1/2016	30	No	INC	10	6:55	15:59	47.51	84.26	0.00	-1185.52	17.29	-601.87	0.00	0.00	0.00	0.00
15	RT	Operating Procedure Number and Constraint (7110)	N/A	N/A	4/2/2016	12	No	INC	9	10:50	18:59	-20.62	327.34	0.00	372.54	1.31	-26.79	0.00	0.00	0.00	0.00
16	RT	Operating Procedure Number and Constraint (7110)	N/A	N/A	4/4/2016	10-24	No	INC	16	7:20	22:59	-2.73	0.00	0.00	-2.46	0.93	-25.53	0.00	0.00	0.00	0.00
17	RT	Operating Procedure Number and Constraint (7110)	N/A	N/A	4/5/2016	12-30	No	INC	14	2:45	15:59	0.10	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00

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**Chart 2: Table of Exceptional Dispatches for Period 01/April/2016 - 30/April/2016**

Number	Market Type	Reason	Location	Local Reliability Area	Trade Date	MW	Commitment	INC_DEC	Hours	Begin Time	End Time	Total MWH	Min Load Cost	Start Up Cost	CC6470	ED MWH (INC/DEC)	CC6470 INC	CC6470 DEC	CC6482	CC6488	CC6620
18	RT	Operating Procedure Number and Constraint (7110)	N/A	N/A	4/10/2016	16	No	INC	5	9:10	13:59	2.66	0.00	0.00	-58.51	3.44	-72.18	0.00	0.00	0.00	0.00
19	RT	Operating Procedure Number and Constraint (7110)	N/A	N/A	4/13/2016	24	No	INC	11	9:00	19:59	1.82	3379.19	0.00	37.04	2.98	-15.49	0.00	0.00	0.00	0.00
20	RT	Operating Procedure Number and Constraint (7110)	N/A	N/A	4/14/2016	20	No	INC	2	22:30	23:59	2.52	380.06	0.00	-43.57	0.00	0.00	0.00	0.00	0.00	0.00
21	RT	Operating Procedure Number and Constraint (7110)	N/A	N/A	4/15/2016	24	No	INC	18	7:30	0:59	98.06	0.00	0.00	-1217.20	45.96	-1268.29	0.00	0.00	0.00	0.00
22	RT	Operating Procedure Number and Constraint (7110)	N/A	N/A	4/16/2016	15	No	INC	7	1:00	7:59	11.05	568.75	0.00	-163.37	3.00	-116.45	0.00	0.00	0.00	0.00
23	RT	Operating Procedure Number and Constraint (7110)	N/A	N/A	4/17/2016	10-30	No	INC	13	6:55	18:59	-0.26	0.00	0.00	-0.06	0.00	0.00	0.00	0.00	0.00	0.00
24	RT	Operating Procedure Number and Constraint (7110)	N/A	N/A	4/18/2016	13	No	INC	3	9:15	11:59	-7.90	0.00	0.00	116.77	0.00	0.00	0.00	0.00	0.00	0.00
25	RT	Operating Procedure Number and Constraint (7110)	N/A	N/A	4/21/2016	20	No	INC	11	10:15	20:59	-27.60	944.52	144.98	456.81	0.00	0.00	0.00	0.00	0.00	0.00
26	RT	Operating Procedure Number and Constraint (7110)	N/A	N/A	4/24/2016	24	No	INC	11	9:15	19:59	207.56	342.99	0.00	-3311.27	35.34	-1140.25	0.00	0.00	0.00	0.00
27	RT	Operating Procedure Number and Constraint (7110)	N/A	N/A	4/26/2016	10-25	No	INC	23	1:40	23:59	11.99	0.00	0.00	-103.55	0.00	0.00	0.00	0.00	0.00	0.00
28	RT	Operating Procedure Number and Constraint (7110)	N/A	N/A	4/28/2016	10-15	No	INC	16	8:45	23:59	4.56	0.00	0.00	-122.61	0.00	0.00	0.00	0.00	0.00	0.00
29	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/1/2016	12-28	No	INC	16	8:50	23:59	1.98	1348.12	0.00	-90.43	5.49	-144.94	0.00	0.00	0.00	0.00
30	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/2/2016	12-28	No	INC	13	0:00	12:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/3/2016	10	No	INC	15	10:10	0:29	-10.00	844.83	0.00	113.87	0.00	0.00	0.00	0.00	0.00	0.00
32	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/4/2016	10	No	INC	1	0:05	0:29	-1.84	0.00	0.00	31.68	0.00	0.00	0.00	0.00	0.00	0.00
33	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/5/2016	14	No	INC	6	6:40	11:59	2.67	0.00	0.00	-100.43	0.00	0.00	0.00	0.00	0.00	0.00
34	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/6/2016	20	No	INC	11	8:50	18:59	111.78	993.01	0.00	-4011.80	0.00	0.00	0.00	0.00	0.00	0.00
35	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/10/2016	10	No	INC	4	17:45	20:59	-4.00	0.00	0.00	82.57	0.00	-0.05	0.00	0.00	0.00	0.00



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**Chart 2: Table of Exceptional Dispatches for Period 01/April/2016 - 30/April/2016**

Number	Market Type	Reason	Location	Local Reliability Area	Trade Date	MW	Commitment	INC_DEC	Hours	Begin Time	End Time	Total MWH	Min Load Cost	Start Up Cost	CC6470	ED MWH (INC/DEC)	CC6470 INC	CC6470 DEC	CC6482	CC6488	CC6620
36	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/11/2016	10	No	INC	15	9:00	23:59	4.54	2342.00	0.00	-243.99	0.00	0.00	0.00	0.00	0.00	0.00
37	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/12/2016	10-15	No	INC	23	1:20	23:59	41.78	552.05	0.00	-796.44	0.00	0.00	0.00	0.00	0.00	0.00
38	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/18/2016	13	No	INC	7	8:00	14:59	-2.19	0.00	0.00	40.45	0.00	0.00	0.00	0.00	0.00	0.00
39	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/20/2016	20	No	INC	2	22:35	23:59	0.78	303.18	0.00	-13.10	0.00	0.00	0.00	0.00	0.00	0.00
40	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/21/2016	10	No	INC	10	10:10	19:59	-18.24	900.52	0.00	276.58	0.00	0.00	0.00	0.00	0.00	0.00
41	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/22/2016	24	No	INC	7	13:25	19:59	-2.54	820.31	0.00	-324.15	1.59	-48.16	0.00	0.00	0.00	0.00
42	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/23/2016	32	No	INC	3	21:55	23:59	-0.76	342.97	0.00	24.65	3.00	-43.84	0.00	0.00	0.00	0.00
43	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/25/2016	15	No	INC	6	8:50	13:59	-11.85	1077.08	0.00	181.75	0.00	0.00	0.00	0.00	0.00	0.00
44	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/26/2016	30	No	INC	13	7:15	19:59	191.41	610.98	0.00	-5029.76	46.18	-1375.99	0.00	0.00	0.00	0.00
45	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/27/2016	20-28	No	INC	12	8:50	19:59	90.49	545.10	0.00	-2035.18	24.00	-805.11	0.00	0.00	0.00	0.00
46	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/28/2016	20	No	INC	16	8:40	23:59	137.80	2583.75	0.00	-2497.39	0.00	0.00	0.00	0.00	0.00	0.00
47	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/29/2016	24	No	INC	13	8:00	20:59	212.04	0.00	0.00	-1446.86	38.44	-1042.53	0.00	0.00	0.00	0.00
48	RT	Operating Procedure Number and Constraint (7110)	PG&E	Humboldt	4/30/2016	20	No	INC	1	23:15	23:59	3.95	726.74	0.00	-90.48	0.00	0.00	0.00	0.00	0.00	0.00
49	RT	Operating Procedure Number and Constraint (7430)	PG&E	Fresno	4/7/2016	83	No	INC	2	23:00	0:29	-0.78	0.00	0.00	39.91	0.00	0.00	0.00	0.00	0.00	0.00
50	RT	Operating Procedure Number and Constraint (7430)	PG&E	Fresno	4/8/2016	83	Yes	INC	1	0:00	0:29	6.17	0.00	0.00	-106.85	0.00	0.00	0.00	0.00	0.00	0.00
51	RT	Operating Procedure Number and Constraint (7430)	PG&E	Fresno	4/16/2016	60	No	INC	15	5:50	19:59	-6.04	0.00	0.00	14.74	-2.12	0.00	-539.92	0.00	0.00	0.00
52	RT	Operating Procedure Number and Constraint (7430)	PG&E	Fresno	4/17/2016	60	No	INC	1	4:25	4:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
53	RT	Operating Procedure Number and Constraint (7430)	PG&E	Fresno	4/18/2016	70	No	INC	4	6:30	9:59	1.60	0.00	0.00	22.41	0.00	0.00	0.00	0.00	0.00	0.00

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**Chart 2: Table of Exceptional Dispatches for Period 01/April/2016 - 30/April/2016**

Number	Market Type	Reason	Location	Local Reliability Area	Trade Date	MW	Commitment	INC_DEC	Hours	Begin Time	End Time	Total MWH	Min Load Cost	Start Up Cost	CC6470	ED MWH (INC/DEC)	CC6470 INC	CC6470 DEC	CC6482	CC6488	CC6620
54	RT	Operating Procedure Number and Constraint (7820)	SDG&E	San Diego-IV	4/18/2016	489-496	No	INC	2	16:15	17:44	0.00	531.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55	RT	Other Reliability Requirement	N/A	N/A	4/23/2016	28-30	No	INC	5	13:15	17:44	0.49	0.00	0.00	5.94	0.00	0.00	0.00	0.00	0.00	0.00
56	RT	Other Reliability Requirement	PG&E	Fresno	4/20/2016	95	No	INC	2	7:10	8:59	-36.69	0.00	0.00	627.41	-41.14	0.00	833.87	0.00	0.00	0.00
57	RT	Other Reliability Requirement	PG&E	Kern	4/5/2016	64	No	INC	3	19:40	22:14	0.00	265.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
58	RT	Over Generation	PG&E	Bay Area	4/24/2016	330	No	INC	1	22:32	22:44	35.93	0.00	0.00	-3903.46	0.00	0.00	0.00	0.00	0.00	0.00
59	RT	Planned Transmission Outage and Constraint	N/A	N/A	4/14/2016	15-30	No	INC	14	6:20	19:59	5.89	84.67	0.00	-165.05	0.00	0.00	0.00	0.00	0.00	0.00
60	RT	Planned Transmission Outage and Constraint	N/A	N/A	4/18/2016	22-39	No	INC	3	22:50	0:59	-4.36	0.00	0.00	93.62	0.83	-10.31	0.00	0.00	0.00	-6.05
61	RT	Planned Transmission Outage and Constraint	N/A	N/A	4/19/2016	15-32	No	INC	18	1:00	18:59	2.75	-331.39	0.00	-37.63	0.50	-6.80	0.00	0.00	0.00	0.00
62	RT	Planned Transmission Outage and Constraint	N/A	N/A	4/21/2016	35	No	INC	2	22:45	0:29	-265.04	7022.35	434.93	5010.84	0.00	0.00	0.00	0.00	0.00	0.00
63	RT	Planned Transmission Outage and Constraint	N/A	N/A	4/22/2016	20	No	INC	3	6:15	9:14	11.02	450.01	0.00	-591.57	0.00	0.00	0.00	0.00	0.00	0.00
64	RT	Planned Transmission Outage and Constraint	PG&E	Bay Area	4/10/2016	40	Yes	INC	9	9:15	17:59	-0.72	0.00	0.00	10.32	0.00	0.00	0.00	0.00	0.00	-2540.17
65	RT	Planned Transmission Outage and Constraint	PG&E	Fresno	4/18/2016	83	No	INC	2	23:10	0:29	89.11	5428.15	0.00	-2807.40	0.00	0.00	0.00	0.00	0.00	0.00
66	RT	Planned Transmission Outage and Constraint	PG&E	Fresno	4/19/2016	46-184	Yes	INC	10	0:00	9:34	5.31	701.30	66.34	-752.16	0.00	0.00	0.00	0.00	0.00	0.00
67	RT	Planned Transmission Outage and Constraint	PG&E	Humboldt	4/19/2016	32-57	No	INC	19	6:30	0:54	2.52	0.00	0.00	-329.31	0.00	0.00	0.00	0.00	0.00	0.00
68	RT	Planned Transmission Outage and Constraint	PG&E	Humboldt	4/20/2016	38	No	INC	16	1:15	16:59	154.24	0.00	0.00	-2092.24	0.00	0.00	0.00	0.00	0.00	0.00
69	RT	Planned Transmission Outage and Constraint	PG&E	Humboldt	4/30/2016	15	No	INC	6	1:45	6:59	-2.29	84.95	0.00	9.79	0.00	0.00	0.00	0.00	0.00	-8.13
70	RT	Planned Transmission Outage and Constraint	PG&E	NCNB	4/15/2016	119-200	No	INC	8	9:27	16:44	-2.55	0.00	0.00	-53.92	-2.55	0.00	-53.92	0.00	0.00	-42.73
71	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/1/2016	50-280	No	INC	21	3:50	23:59	-42.64	0.00	0.00	-68.34	-12.32	0.00	147.19	0.00	0.00	0.00

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Number	Market Type	Reason	Location	Local Reliability Area	Trade Date	MW	Commitment	INC_DEC	Hours	Begin Time	End Time	Total MWH	Min Load Cost	Start Up Cost	CC6470	ED MWH (INC/DEC)	CC6470 INC	CC6470 DEC	CC6482	CC6488	CC6620
72	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/2/2016	20-225	No	INC	20	0:00	19:59	-1.43	0.00	0.00	24.01	0.00	0.00	0.00	0.00	0.00	0.00
73	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/5/2016	200	No	INC	3	21:50	23:59	-15.64	0.00	0.00	351.44	-3.28	0.00	81.60	0.00	-13.86	0.00
74	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/10/2016	130-150	No	INC	2	1:15	2:59	-6.41	0.00	0.00	246.54	-5.83	0.00	101.91	0.00	-8.11	0.00
75	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/12/2016	90-110	No	INC	6	13:35	18:59	-4.47	0.00	0.00	50.45	0.00	0.00	0.00	0.00	0.00	0.00
76	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/13/2016	100-140	No	INC	21	1:00	21:59	-17.39	0.00	0.00	274.03	-4.88	0.00	34.30	0.00	0.00	0.00
77	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/14/2016	100-140	No	INC	23	1:15	23:59	9.31	0.00	0.00	-3.98	-8.51	0.00	119.81	0.00	-2.48	0.00
78	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/15/2016	60-120	No	INC	23	2:20	0:59	-82.55	0.00	0.00	-596.71	-20.60	0.00	-241.56	0.00	-2.17	0.00
79	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/16/2016	90-100	No	INC	21	1:00	21:59	-83.86	0.00	0.00	-29.53	-78.63	0.00	66.45	0.00	-1102.62	0.00
80	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/17/2016	90-110	No	INC	18	1:00	18:29	-53.12	0.00	0.00	756.46	-50.00	0.00	751.67	0.00	-903.58	0.00
81	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/18/2016	110-150	No	INC	18	6:30	0:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-878.37	0.00
82	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/19/2016	130-135	No	INC	7	0:15	6:59	-58.52	0.00	0.00	-435.53	0.00	0.00	0.00	0.00	0.00	0.00
83	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/20/2016	155-160	No	INC	15	5:25	19:59	-14.61	0.00	0.00	30.77	0.00	0.00	0.00	0.00	0.00	0.00
84	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/21/2016	15-155	No	INC	17	6:15	22:29	-2.40	0.00	0.00	83.45	0.00	0.00	0.00	0.00	0.00	0.00
85	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/22/2016	110-120	No	INC	17	3:30	19:59	-4.60	0.00	0.00	89.06	0.00	0.00	0.00	0.00	0.00	0.00
86	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/23/2016	110-115	No	INC	3	17:25	19:59	-27.32	0.00	0.00	-265.97	-25.86	0.00	-182.43	0.00	0.00	0.00
87	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/24/2016	100-140	No	INC	14	6:10	19:59	20.90	0.00	0.00	-41.58	-12.25	0.00	-106.87	0.00	0.00	0.00
88	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/25/2016	155-165	No	INC	17	6:50	23:19	52.97	0.00	0.00	955.12	0.00	0.00	0.00	0.00	0.00	0.00
89	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/26/2016	110-140	No	INC	17	5:30	21:59	-5.44	0.00	0.00	152.06	0.00	0.00	0.00	0.00	0.00	0.00

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Number	Market Type	Reason	Location	Local Reliability Area	Trade Date	MW	Commitment	INC_DEC	Hours	Begin Time	End Time	Total MWH	Min Load Cost	Start Up Cost	CC6470	ED MWH (INC/DEC)	CC6470 INC	CC6470 DEC	CC6482	CC6488	CC6620
90	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/27/2016	110-150	No	INC	15	5:30	19:59	-11.87	0.00	0.00	246.89	-0.17	0.00	5.89	0.00	-0.93	0.00
91	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/28/2016	110	No	INC	8	1:55	9:44	-56.73	0.00	0.00	967.29	0.00	0.00	0.00	0.00	-1617.15	0.00
92	RT	Planned Transmission Outage and Constraint	PG&E	Sierra	4/29/2016	140	No	INC	3	14:35	16:59	-11.53	0.00	0.00	-77.71	-9.17	0.00	-58.99	0.00	0.00	0.00
93	RT	Planned Transmission Outage and Constraint	PG&E	Stockton	4/5/2016	45-60	No	INC	11	8:21	18:58	-16.42	0.00	0.00	-687.37	0.00	0.00	0.00	0.00	0.00	0.00
94	RT	Planned Transmission Outage and Constraint	PG&E	Stockton	4/5/2016	45	No	INC	5	18:59	23:58	-116.17	0.00	0.00	2389.39	0.00	0.00	0.00	0.00	0.00	0.00
95	RT	Planned Transmission Outage and Constraint	PG&E	Stockton	4/6/2016	43	No	INC	16	1:59	17:52	-267.71	0.00	0.00	3217.56	-248.04	0.00	3490.12	0.00	-3487.58	0.00
96	RT	Planned Transmission Outage and Constraint	PG&E	Stockton	4/8/2016	65	No	INC	21	3:00	23:58	-119.97	0.00	0.00	5978.07	-13.00	0.00	3557.80	0.00	-2694.15	0.00
97	RT	Planned Transmission Outage and Constraint	PG&E	Stockton	4/18/2016	63	No	INC	12	12:38	23:58	-106.36	0.00	0.00	1421.52	0.00	0.00	0.00	0.00	0.00	0.00
98	RT	Planned Transmission Outage and Constraint	PG&E	Stockton	4/29/2016	67	No	INC	15	9:06	23:58	-24.15	0.00	0.00	-3233.25	0.00	0.00	0.00	0.00	0.00	0.00
99	RT	Planned Transmission Outage and Constraint	SDG&E	San Diego-IV	4/1/2016	155	No	INC	19	2:00	20:59	-41.85	89568.43	0.00	1634.06	0.00	0.00	0.00	0.00	0.00	0.00
100	RT	Planned Transmission Outage and Constraint	SDG&E	San Diego-IV	4/4/2016	30	No	INC	3	20:15	22:59	5.00	1095.66	201.27	-68.35	0.00	-0.04	0.00	0.00	-1.18	0.00
101	RT	Planned Transmission Outage and Constraint	SDG&E	San Diego-IV	4/5/2016	30	No	INC	3	19:55	21:59	2.50	1460.88	0.00	-76.19	0.00	0.00	0.00	0.00	0.00	0.00
102	RT	Planned Transmission Outage and Constraint	SDG&E	San Diego-IV	4/6/2016	30	No	INC	4	19:30	22:59	15.00	2921.76	0.00	-365.22	0.00	-0.12	0.00	0.00	-11.55	0.00
103	RT	Planned Transmission Outage and Constraint	SDG&E	San Diego-IV	4/7/2016	25-33	No	INC	9	11:20	19:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
104	RT	Planned Transmission Outage and Constraint	SDG&E	San Diego-IV	4/12/2016	20-126	No	INC	15	6:30	20:59	-226.28	45939.42	26442.23	9943.35	0.00	-0.05	0.00	0.00	-0.82	0.00
105	RT	Planned Transmission Outage and Constraint	SDG&E	San Diego-IV	4/13/2016	185	No	INC	20	2:00	21:59	-331.90	91382.59	0.00	6271.87	0.00	0.00	0.00	0.00	-2.42	0.00
106	RT	Planned Transmission Outage and Constraint	SDG&E	San Diego-IV	4/14/2016	150	No	INC	7	9:00	15:59	-83.07	0.00	0.00	1133.53	0.00	0.00	0.00	0.00	-0.73	0.00
107	RT	Planned Transmission Outage and Constraint	SDG&E	San Diego-IV	4/15/2016	160-325	No	INC	6	10:56	15:59	34.13	0.00	0.00	-97.95	28.74	444.83	0.00	0.00	-147.64	0.00

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Number	Market Type	Reason	Location	Local Reliability Area	Trade Date	MW	Commitment	INC_DEC	Hours	Begin Time	End Time	Total MWH	Min Load Cost	Start Up Cost	CC6470	ED MWH (INC/DEC)	CC6470 INC	CC6470 DEC	CC6482	CC6488	CC6620
108	RT	Planned Transmission Outage and Constraint	SDG&E	San Diego-IV	4/16/2016	160	No	INC	15	1:00	15:59	14.51	63727.37	0.00	-1106.64	0.00	0.00	0.00	0.00	-0.91	0.00
109	RT	Planned Transmission Outage and Constraint	SDG&E	San Diego-IV	4/18/2016	39-115	Yes	INC	11	12:34	22:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
110	RT	Planned Transmission Outage and Constraint	SDG&E	San Diego-IV	4/19/2016	37	No	INC	8	12:30	19:59	21.15	8041.58	449.56	-1939.45	0.00	0.00	0.00	0.00	0.00	0.00
111	RT	Planned Transmission Outage and Constraint	SDG&E	San Diego-IV	4/22/2016	20-126	No	INC	19	5:00	23:59	-579.72	58779.04	26549.66	10623.96	0.00	-0.04	0.00	0.00	-0.50	0.00
112	RT	Planned Transmission Outage and Constraint	SDG&E	San Diego-IV	4/26/2016	20	Yes	INC	12	5:00	16:59	-47.79	18107.65	17090.00	1105.15	0.00	0.00	0.00	0.00	-3.14	0.00
113	RT	Software Limitation	PG&E	Bay Area	4/2/2016	0	No	INC	4	8:00	11:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
114	RT	Software Limitation	PG&E	Bay Area	4/5/2016	0	No	INC	2	0:00	1:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
115	RT	Software Limitation	PG&E	Bay Area	4/24/2016	0	No	INC	1	18:55	19:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
116	RT	Software Limitation	PG&E	Fresno	4/4/2016	0	No	INC	8	16:40	23:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
117	RT	Software Limitation	PG&E	Fresno	4/5/2016	0	No	INC	1	9:45	10:44	-20.75	986.94	0.00	-324.25	-20.75	0.00	-324.25	0.00	0.00	0.00
118	RT	Software Limitation	PG&E	Fresno	4/10/2016	0	No	INC	1	17:45	18:44	-13.29	0.00	0.00	294.92	0.00	0.00	0.00	0.00	0.00	0.00
119	RT	Software Limitation	PG&E	Fresno	4/14/2016	0	No	INC	1	23:35	23:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
120	RT	Software Limitation	PG&E	Fresno	4/15/2016	0	No	INC	20	0:00	19:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
121	RT	Software Limitation	PG&E	Fresno	4/24/2016	0	No	INC	1	19:05	19:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
122	RT	Software Limitation	PG&E	N/A	4/5/2016	0	No	INC	1	0:05	1:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
123	RT	Software Limitation	PG&E	N/A	4/25/2016	0	No	INC	4	1:00	4:59	-198.94	5238.30	0.00	3120.48	-62.00	0.00	-203.64	0.00	0.00	0.00
124	RT	Software Limitation	PG&E	Sierra	4/5/2016	0	No	INC	2	0:00	1:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
125	RT	Software Limitation	PG&E	Stockton	4/12/2016	0	No	INC	2	3:00	4:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Number	Market Type	Reason	Location	Local Reliability Area	Trade Date	MW	Commitment	INC_DEC	Hours	Begin Time	End Time	Total MWH	Min Load Cost	Start Up Cost	CC6470	ED MWH (INC/DEC)	CC6470 INC	CC6470 DEC	CC6482	CC6488	CC6620
126	RT	Software Limitation	SCE	Big Creek-Ventura	4/4/2016	0	No	INC	1	23:55	0:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
127	RT	Software Limitation	SCE	Big Creek-Ventura	4/5/2016	0	No	INC	2	0:00	1:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
128	RT	Software Limitation	SCE	Big Creek-Ventura	4/9/2016	245	No	INC	1	4:50	4:59	9.89	0.00	0.00	-143.78	0.00	0.00	0.00	0.00	0.00	0.00
129	RT	Software Limitation	SCE	Big Creek-Ventura	4/15/2016	0	No	INC	1	18:30	19:29	8.40	536.13	0.00	-96.76	0.00	0.00	0.00	0.00	0.00	0.00
130	RT	Software Limitation	SCE	LA Basin	4/5/2016	0	No	INC	1	0:00	0:59	-0.43	890.41	0.00	8.85	0.00	0.00	0.00	0.00	0.00	0.00
131	RT	Software Limitation	SCE	LA Basin	4/19/2016	0	No	INC	1	9:25	9:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
132	RT	Software Limitation	SCE	LA Basin	4/25/2016	0	No	INC	3	21:00	23:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
133	RT	Software Limitation	SCE	N/A	4/13/2016	0	No	INC	6	18:55	0:09	-1117.04	0.00	0.00	1138.90	-900.33	0.00	0.00	0.00	0.00	0.00
134	RT	Software Limitation	SDG&E	San Diego-IV	4/19/2016	0	No	INC	2	8:45	10:09	-9.50	0.00	0.00	8.65	-9.59	0.00	0.00	0.00	0.00	0.00
135	RT	Start-Up Instructions	PG&E	Humboldt	4/9/2016	10-20	No	INC	3	20:45	22:59	-4.80	0.00	0.00	96.64	0.00	0.00	0.00	0.00	0.00	0.00
136	RT	Unit Testing	N/A	N/A	4/14/2016	299	No	INC	1	11:25	11:29	0.00	22.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
137	RT	Unit Testing	PG&E	Bay Area	4/19/2016	120-294	No	INC	4	8:50	11:59	-12.17	35105.07	0.00	131.32	0.00	0.00	0.00	0.00	0.00	0.00
138	RT	Unit Testing	PG&E	Fresno	4/20/2016	21	No	INC	2	7:00	8:59	23.09	1878.80	566.19	-809.73	0.00	0.00	0.00	0.00	0.00	0.00
139	RT	Unit Testing	PG&E	N/A	4/18/2016	146	No	INC	1	10:15	10:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
140	RT	Unit Testing	PG&E	N/A	4/18/2016	146	No	INC	1	10:07	10:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
141	RT	Unit Testing	PG&E	Sierra	4/18/2016	13	No	INC	1	9:40	9:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
142	RT	Unit Testing	PG&E	Sierra	4/18/2016	13	No	INC	1	9:29	9:40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
143	RT	Unit Testing	SCE	Big Creek-Ventura	4/9/2016	16-48	No	INC	1	9:50	10:49	5.33	106.08	0.00	-139.55	0.36	-12.57	0.00	0.00	0.00	0.00

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Number	Market Type	Reason	Location	Local Reliability Area	Trade Date	MW	Commitment	INC_DEC	Hours	Begin Time	End Time	Total MWH	Min Load Cost	Start Up Cost	CC6470	ED MWH (INC/DEC)	CC6470 INC	CC6470 DEC	CC6482	CC6488	CC6620
144	RT	Unit Testing	SCE	Big Creek-Ventura	4/9/2016	48	No	INC	1	9:35	10:22	6.41	265.20	0.00	-168.39	0.46	-15.97	0.00	0.00	0.00	0.00
145	RT	Unit Testing	SCE	LA Basin	4/1/2016	48	No	INC	9	5:35	13:44	-7.88	0.00	0.00	-19.56	0.00	0.00	0.00	0.00	0.00	0.00
146	RT	Unit Testing	SCE	LA Basin	4/9/2016	46-96	No	INC	3	9:35	12:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
147	RT	Unit Testing	SCE	LA Basin	4/9/2016	90-96	No	INC	3	9:23	11:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
148	RT	Unit Testing	SCE	LA Basin	4/14/2016	114	No	INC	1	9:30	9:34	-4.65	0.00	0.00	94.03	0.00	0.00	0.00	0.00	0.00	0.00
149	RT	Unit Testing	SCE	LA Basin	4/18/2016	47-238	No	INC	2	14:30	15:59	-1.66	0.00	0.00	34.33	0.00	0.00	0.00	0.00	0.00	0.00
150	RT	Unit Testing	SCE	LA Basin	4/18/2016	191	No	INC	1	14:03	14:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
151	RT	Unit Testing	SCE	LA Basin	4/19/2016	45-192	No	INC	5	9:40	14:14	11.97	3471.84	0.00	-209.86	0.00	-0.11	0.00	0.00	0.00	0.00
152	RT	Unit Testing	SCE	LA Basin	4/19/2016	43-90	No	INC	4	9:32	13:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
153	RT	Unit Testing	SCE	LA Basin	4/26/2016	5	No	INC	2	11:33	12:34	-0.92	126.02	0.00	-8.17	0.00	0.00	0.00	0.00	0.00	0.00
154	RT	Voltage Support	PG&E	Fresno	4/3/2016	-318	No	INC	1	16:50	17:29	-2.65	0.00	0.00	141.61	0.00	0.00	0.00	0.00	0.00	0.00
155	RT	Voltage Support	PG&E	Fresno	4/9/2016	-319	No	INC	6	6:05	11:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
156	RT	Voltage Support	PG&E	Fresno	4/16/2016	-310	No	INC	1	6:00	6:59	-12.92	0.00	0.00	495.63	0.00	0.00	0.00	0.00	0.00	0.00
157	RT	Voltage Support	PG&E	Fresno	4/18/2016	-310	No	INC	3	5:15	7:59	-245.42	0.00	0.00	4786.20	0.00	0.00	0.00	0.00	0.00	0.00
158	RT	Voltage Support	PG&E	Fresno	4/19/2016	-310	No	INC	2	4:50	5:59	-12.92	0.00	0.00	1765.81	0.00	0.00	0.00	0.00	0.00	0.00
159	RT	Voltage Support	SCE	N/A	4/29/2016	172	No	INC	10	5:00	14:59	9.56	38819.34	18741.78	-111.24	0.00	0.00	0.00	0.00	0.00	0.00

## Appendix A: Explanation by Example

All examples listed below are based on fictitious data. Many simplified assumptions are made to explain settlement charge codes, and not all assumptions are explicitly stated in these examples.

For instance settlement charge codes are calculated based on metered quantities, whereas, in these examples the dispatch quantities are assumed to be equal to metered quantities. These assumptions have been made to simplify the understanding of settlements calculations.

### Example 1: Exceptional Dispatch Instructions Prior to DAM

In this fictitious example, the CAISO issued an exceptional dispatch instruction for resource A to be committed at its Pmin of 50 MW from hours ending 5 through 10 for a generation procedure 7630. Similarly, the CAISO issued additional instructions to resources B and C for the same reason in Table 2. Exceptional dispatches prior to the day-ahead market are commitments to minimum load. Here the dispatch levels are all at minimum load. Table 2 below also shows the commitment costs and the total volume (MWh) of exceptional dispatch instruction for each resource. The minimum load costs and start up costs, shown in Table 2 are the eligible minimum load and start up costs different from the bid-in minimum load and start up costs<sup>7</sup>. Only those quantities which relate to pre-day-ahead unit commitments are shown in this table.

**Table 2: Instructions Prior to Day-Ahead Market**

Date	Market	Resource	Location	Local Reliability Area (LRA)	Begin Time	End Time	Dispatch level (MW)	Reason	Total Volume (MWh)	Min-Load Cost	Start- Up Cost	CC6620 (BCR)
01-Jul-09	DA	A	SCE	LA BASIN	05:00	10:00	50	7630	300	\$5000	\$0	0
01-Jul-09	DA	B	SCE	LA BASIN	08:00	20:00	30	7630	390	\$6000	\$500	\$4000
01-Jul-09	DA	C	SCE	LA BASIN	09:00	23:00	20	7630	300	\$400	\$1000	\$1000

This data is summarized as shown in Table 3, which is the prescribed format specified in the FERC order on September 02, 2009. This summary classifies the data by reason, resource location, local reliability area, and trade date. The MW column in Table 3 is the range of MW; in this case the minimum instruction MW is 20 MW for resource C which occurs from hours ending 21 through 23. The maximum instruction occurs in hour ending 10. In this hour resource A is committed at 50 MW, resource B is committed at 30 MW and resource C is committed at 20 MW. This adds up to 100 MW. The MW column shows the minimum and maximum of the overlaps of all the exceptional dispatch instructions. The Commitment column shows whether a resource was committed between the begin time and end time. Commitments are broken out separately from energy dispatches. In the day-ahead however, the exceptional dispatches are nearly always just commitments, as in this example. The Begin Time column shows hour ending 5 as this was the hour ending for first dispatch of the day, and the End Time column shows hour ending 23, as this was the hour with last dispatch. It is also possible there might be hours between the begin time and the end time where there might not be exceptional dispatch instructions for the reason, meaning that the range between the begin time and end time can include null hours with no dispatch. The total volume (MWh) is the MWh quantity for each resource, which adds up to 990 MWh. Similarly, all cost information is sum of individual resource costs. Some resources bid-in zero start-up cost; as seen in this example, resource A bid in zero for its start up cost. Since the CAISO does not explicitly pay a resource for bid-in minimum load costs and start-up costs; these costs are recovered through the charge code CC6620 (Bid Cost Recovery), this table shows the summary of CC6620 for the classification. Here, it is the CC6620 for all three resources which adds up to \$5000. This column shows the impact of exceptional dispatch on bid cost recovery for all pre-day-ahead exceptional dispatch commitments.

**Table 3: FERC Summary of Instructions Prior to DAM**

Number	Market Type	Reason	Location	Local Reliability Area (LRA)	Trade Date	MW	Commitment	INC/DEC	Hour	Begin Time	End Time	Total Volume (MWh)	Min-Load Cost	Start-Up Cost	CC6620
1	DA	7630	SCE	LA Basin	1-Jul-09	20-100	Yes	N/A	19	05:00	23:00	990	\$11,400	\$1,500	\$5000

### Example 2: Incremental Exceptional Dispatch Instructions in RTM

In this fictitious example the CAISO issued an exceptional dispatch instruction to resource A to be committed at its Pmin of 30 MW from hours 6:00 through 11:00 after completion of the day-ahead market for the transmission procedure 7110. This resource had no day-ahead award in those hours. The CAISO issued another exceptional dispatch instruction to resource B, to be dispatched at 40 MW from hours 7:00 through

<sup>7</sup> Please refer to the BPM configuration Guide: Bid Cost Recovery Settlements published on the CAISO's website for details about eligible minimum load and start up costs.



9:00 in real-time for the transmission procedure 7110. This resource had a day-ahead schedule of 20 MW from the day-ahead market, which implies this exceptional dispatch instruction was an incremental instruction and the exceptional dispatch MW was 20 MW. Similarly, the details of exceptional dispatch (ED) instruction for resource C are shown in Table 4. This table also shows volume (MWh) and various real-time charge codes associated with the exceptional dispatch instructions. The total MWh column for each resource shows all types of imbalance energy quantities for this resource between the begin time and end time which includes both the exceptional dispatch energy quantities and optimal energy quantities.

Resource A was committed at its Pmin so its total volume (MWh) is equal to its Pmin times the number of hours, which is calculated as 30 MW times 6 hours and is equal to 180 MWh. The resource Minimum load costs and the start up costs are its eligible commitment costs for that period. LMP at this resource is \$10/MWh, so the charge code CC6470 is calculated at (180 MWh \* \$10/MWh) and is equal to \$1,800. Since this resource is not dispatched above its Pmin, it has a zero volume (MWh) of exceptional dispatch. All charge codes associated with the exceptional dispatch increment or decrement quantities are zero.

Resource B is dispatched 20 MW above its day-ahead schedule, so its total volume (MWh) is calculated as 20 MW times 3 hours which is equal to 60 MWh. Since the resource was committed in the Day-Ahead Market there are no minimum load quantity and start up costs associated with this resource. The resource had a bid price of \$100/MWh and the LMP at that resource was \$10/MWh. All of 60 MWh is considered as exceptional dispatch incremental quantity shown in ED Volume (MWH INC/DEC) column. The charge code CC6470 INC is calculated as 60 MWh \* resource LMP (\$10/MWh) which is equal to \$600. Since the only imbalance energy in this timeframe was the exceptional dispatch volume, the charge code CC6470 is equal to CC6470 INC. The charge code CC6488 is calculated as MWH quantity \*(bid price – LMP), which is equal to \$5400 (60 MWh \*(\$100/MWh-\$10/MWh)). Similarly, volumes and real-time charge codes are calculated for resource C.

**Table 4: Incremental Exceptional Dispatch Instructions in RTM**

Date	Market	Resource	Location	Local Reliability Area (LRA)	Begin Time	End Time	Dispatch level (MW)	Day-Ahead Award (MW)	Commitment	INC/DEC	ED (MW)	Reason	Total MWH	Min Load Cost	Start Up Cost	CC6470	ED MWH (INC/DEC)	CC6470 INC	CC6470 DEC	CC6482	CC6488
1-Jul-09	RT	A	PG&E	Humboldt	6:00	11:00	30	0	Yes	INC	30	7110	180	1000	50	1800	0	0	0	0	0
1-Jul-09	RT	B	PG&E	Humboldt	7:00	9:00	40	20	No	INC	20	7110	60	0	0	600	60	600	0	0	5400
1-Jul-09	RT	C	PG&E	Humboldt	12:00	15:00	50	50	No	INC	0	7110	0	0	0	0	0	0	0	0	0
1-Jul-09	RT	C	PG&E	Humboldt	16:00	20:00	50	40	No	INC	10	7110	50	0	0	300	20	300	0	0	200

This data is summarized as shown in Table 5 and is classified by reason, resource location, local reliability area, and trade date. The MW column in Table 5 is the range of MW; in this case the minimum instruction MW is 0 MW for resource C which occurs from hours ending 13 through 15. The maximum instruction occurs in hours ending 8 & 9, as during these two hours both resources A and B have an ED MW of 30MW and 20MW, respectively. This adds up to 50 MW. The MW column shows the minimum and maximum of the overlaps of all the exceptional dispatch instructions. The Commitment column shows whether a resource was committed between the begin time and end time. This column shows a commitment if there was a single commitment in the entire interval of exceptional dispatch. The Begin Time column shows the time of the first dispatch of the day. This is a time not a range. Similarly, the End Time column shows a time and not a range. Exceptional dispatches occurred between these two times. Since there was a commitment between the begin time and end time then the Commitment column displays yes for the summary. Similarly, the INC/DEC column shows an INC as there was an incremental dispatch between the begin time and end time. As mentioned in the previous example it is possible there might be hours between the begin time and end time where there were no exceptional dispatch instructions for the reason. Both volume and cost information columns are the summation for all the respective columns for resource A, B and C. For instance the Total volume (MWh) column is calculated as summation of 180,60,0 and 50 which are the individual volumes (MWh) for resources A, B and C for time periods shown in Table 4.

**Table 5: FERC Summary of ED Instructions in RTM**

Number	Market Type	Reason	Location	Local Reliability Area (LRA)	Trade Date	MW	Commitment	INC/DEC	Hour	Begin Time	End Time	Total MWH	Min Load Cost	Start Up Cost	CC6470	ED MWH (INC/DEC)	CC6470 INC	CC6470 DEC	CC6482	CC6488
1	RT	7110	PG&E	Humboldt	1-Jul-09	0-50	Yes	INC	15	6:00	20:00	290	1000	50	1700	140	1500	0	0	11000

It is possible that the CAISO would dispatch a particular resource for instance at 10 MW from hours ending 1 through 4, and all or part of its energy might settle as optimal energy. This situation occurs when the LMP at the resource pricing node is above the resource bid price. This cost will only be captured in charge code 6470. It is also possible that CAISO issues an exceptional dispatch for the resource to operate at a minimum of 10 MW which is its Pmin; however the market application might dispatch this resource above Pmin because the resource is economical. When this occurs, the charge code CC6470 and the total MWh quantity might overstate the actual exceptional dispatch MWh quantities. So, to best estimate the cost and volume (MWh) of exceptional dispatch it is appropriate to consider only the following columns: ED MWh (INC/DEC), CC6470 INC, CC6470 DEC, CC6482, CC6488.

**Example 3: Decremental Exceptional Dispatch Instructions in RTM**

This example highlights decremental exceptional dispatch instructions in the real-time market. In this fictitious example the CAISO issued an exceptional dispatch instruction to resource A to be committed at its Pmin of 20 MW from hours ending 15 through 20 after completion of the day-ahead market for the transmission procedure 7430. The CAISO issued additional exceptional dispatch instructions for resources B and C; details of those instructions are shown in Table 6. This table also includes volume (MWh) and cost information.

Resource A is committed in real-time at its Pmin, its total volume (MWh) is 20MW \*6 hours which is equal to 120 MWh. This resource has a zero MW of incremental dispatch in all hours, so all other relevant cost and volume columns result in zeros. Resource B has a decremental MW of 20 MW in 3 hours, which results in 60 MWh of decremental volume. Since this resource is not committed in real-time, both the minimum load cost and start up costs are zero. This resource had a bid price of \$50/MWh and LMP at the resource pricing node is \$10/ MWh. Based on this information CC6470-Dec is calculated as 60 MWh \*\$10/MWh which is equal to \$600. Since this resource has its ED volume (MWh) equal to its Total volume, CC6470 is equal to CC6470- DEC. The CC6488 is calculated as (60 MWh \* (\$50/MWh - \$10/MWh)) which is equal to \$2400. Resource C had a bid price of \$10/MWh and the LMP at its pricing node is \$50/MWh. Based on this information, volume and cost information is calculated for resource C.

**Table 6: Decremental Exceptional Dispatch Instructions in RTM**

Date	Market Type	Resource	Location	Local Reliability Area (LRA)	Begin Time	End Time	Dispatch level (MW)	Day-Ahead Award (MW)	Commitment	INC/DEC	ED (MW)	Reason	Total MWH	Min Load Cost	Start Up Cost	CC6470	ED MWH (INC/DEC)	CC6470 INC	CC6470 DEC	CC6482	CC6488
1-Jul-09	RT	A	PG&E	Fresno	15:00	20:00	20	0	Yes	INC	20	7430	120	\$ 120	\$ 100	\$ -	0	\$ -	\$ -	\$ -	\$ -
1-Jul-09	RT	B	PG&E	Fresno	7:00	9:00	40	60	No	DEC	20	7430	(60)	\$ -	\$ -	\$ 600	-60	\$ -	\$ 600	\$ -	\$2,400
1-Jul-09	RT	C	PG&E	Fresno	10:00	14:00	40	50	No	DEC	10	7430	(50)	\$ -	\$ -	\$ 500	-50	\$ -	\$ 500	\$ -	\$2,000

This data is summarized according to FERC convention in Table 7. This summary classifies the data by reason, resource location, local reliability area, and trade date. Incs and decs are broken out separately. The inc entry is self-explanatory and similar to the previous example. Regarding the dec entry the MW column is the range of MW; in this case the minimum dec instruction is 10 MW (actually -10MW as it is a dec) for resource C which occurs from hours ending 10 through 14. The maximum instruction occurs from hours ending 7 through 9, when resource B was issued a dec instruction of 20 MW. The MW column shows the minimum and maximum of the overlaps of all the exceptional dispatch instructions. The Commitment column shows whether a resource was committed between the begin time and end time. The volume and cost information are summarized by INC and DEC classification.

**Table 7: FERC Summary of Decremental ED Instructions in RTM**

Number	Market Type	Reason	Location	Local Reliability Area (LRA)	Trade Date	MW	Commitment	INC/DEC	Hour	Begin Time	End Time	Total MWH	Min Load Cost	Start Up Cost	CC6470	ED MWH (INC/DEC)	CC6470 INC	CC6470 DEC	CC6482	CC6488
1	RT	7430	PG&E	Fresno	1-Jul-09	20	Yes	INC	6	15:00	20:00	120	\$ 120	\$ 100	\$ -	0	\$ -	\$ -	\$ -	\$ -
2	RT	7430	PG&E	Fresno	1-Jul-09	10-20	Yes	DEC	8	7:00	14:00	(110)	\$ -	\$ -	\$ (1,100)	\$ (110)	\$ -	\$ (1,100)	\$ -	\$ (4,400)

## Appendix B: Price Impact Analysis

In the September 2 FERC order, FERC requested the CAISO to perform price impact analysis on two distinct pricing nodes for the entire reporting period. The order also mentioned that the CAISO must pick two pricing nodes for the entire reporting period that are most affected by the exceptional dispatch instructions, and the two pricing nodes must belong to two load aggregation points (LAPs).

Based on this requirement the CAISO implemented a methodology to perform price impact analysis. First, the CAISO identified a heavily affected pricing node from each of the Pacific Gas & Electric (PG&E) LAP and Southern California Edison (SCE) LAP. These two pricing nodes had the maximum amount of exceptional dispatch volume (MWh) in their respective LAP. Point A is in PG&E LAP and point B is in SCE LAP. Please note these two points correspond to an actual pricing node in the CAISO system. Only one resource was connected to each of these pricing nodes. For each resource the following input parameters were obtained to perform the analysis:

Exceptional dispatch information: constrained level, constraint type, start of exceptional dispatch instruction and end of exceptional dispatch instruction.  
 Real-Time LMPs for each of the five minute intervals for the month.  
 Real-Time hourly bid set for each trade hour.  
 Day-Ahead award for the resources.

The exceptional dispatch intervals have a begin time and an end time which can span as small as one minute to as large as 24 hours. Since the market application dispatches resources on five-minute basis, the exceptional dispatch instructions for each of these resources were broken down into five-minute intervals. If the begin time or end time for an instruction was in the middle of the five-minute interval, that instruction was rounded up to the next five-minute interval. These five-minute intervals were then coupled with resource five-minute LMPs calculated by the real-time market application. Also, the hourly bid information and the hourly day-ahead schedule were put together to create a dataset that had all the information to perform price impact analysis.

An exceptional dispatch instruction can be classified as a start up instruction, an instruction to be dispatched at or above the constrained level, an instruction to be dispatched at or below a constrained level, an instruction to be dispatched at a fixed constrained level, or a shut down instruction. The Locational Marginal Price (LMP) is set by a resource which can provide the next incremental MW of energy. Based on this definition of LMP and the classification of exceptional dispatches based on constraint type, a resource may set the LMP in only those intervals in which the resource is eligible to move either up or down from its constrained level. Hence, in those intervals in which the resource was constrained up at its Pmax or the resource was exceptionally dispatched to its Pmax and forced to generate at that level, the resource was ineligible to set the price as it had no room to move up. Similarly, if the resource was constrained down at its Pmin, then the resource was not eligible to set the price. All those intervals in which the resource was ineligible to set the price were dropped from the dataset under consideration. From this dataset of only eligible intervals, for both pricing nodes A and B, LMPs were calculated for all intervals based on the resource dispatch level and the its bid set. The calculated LMP is equal to that bid price corresponding to the constrained MW segment.

Table 8 shows the price impact analysis information for node A, which is in the PG&E area. This table shows all the five minute intervals in which the resource at PNode A was issued an exceptional dispatch instruction. Out of the 8,064 five-minute intervals in April, this resource was issued exceptional dispatch instructions in 28 five-minute intervals. This resource was eligible to set the LMP in 16 intervals. Out of the 16 intervals, resource calculated LMP was larger than the market LMP in 16 intervals. In the 16 intervals, the average increase in five minute LMP was \$5.87/MWh. Out of the 16 intervals, resource calculated LMP was less than the market LMP in 0 intervals. This implies that if the CAISO could model the constraint for this exceptional dispatch, then this resource and all other pricing nodes associated with that constraint would observe an average increase of \$5.87/MWh

Table 9 shows the price impact analysis information for node B, which is in the SCE area. This table shows all the five minute intervals in which the resource at PNode B was issued an exceptional dispatch instruction. Out of the 8,064 five-minute intervals in April, this resource was issued exceptional dispatch instructions in 46 five-minute intervals. This resource was eligible to set the LMP in 12 intervals. Out of the 12 intervals, resource calculated LMP was larger than the market LMP in 10 intervals. In the 10 intervals, the average increase in five minute LMP was \$8.02/MWh. Out of the 12 intervals, resource calculated LMP was less than the market LMP in 2 intervals. In the 2 intervals, the average decrease in five minute LMP was \$17.60/MWh. This implies that if the CAISO could model the constraint for this exceptional dispatch, then this resource and all other pricing nodes associated with that constraint would observe an average decrease of \$9.58/MWh

**Table 8: Price Impact Analysis Information for Pricing Node A in PG&E LAP**

Number	Trade Date	Trade Hour	Interval	Market LMP	Eligible Flag	Calculated LMP	Change in LMP
1	4/19/2016	11	1	16.89	Yes	19.95	3.06
2	4/19/2016	11	2	18.61	Yes	19.95	1.34
3	4/19/2016	11	11	13.74	Yes	19.95	6.21
4	4/19/2016	11	12	12.22	Yes	19.95	7.73
5	4/19/2016	12	1	11.36	Yes	19.95	8.59
6	4/19/2016	12	2	11.92	Yes	19.95	8.03
7	4/19/2016	12	3	12.39	Yes	19.95	7.56
8	4/19/2016	12	4	11.82	Yes	19.95	8.13
9	4/19/2016	12	5	15.56	Yes	19.95	4.39
10	4/19/2016	12	6	15.56	Yes	19.95	4.39
11	4/19/2016	12	7	15.40	Yes	19.95	4.55
12	4/19/2016	12	8	15.43	Yes	19.95	4.52
13	4/19/2016	12	9	14.90	Yes	19.95	5.05
14	4/19/2016	12	10	15.43	Yes	19.95	4.52
15	4/19/2016	12	11	13.41	Yes	19.95	6.54
16	4/19/2016	12	12	10.64	Yes	19.95	9.31
17	4/19/2016	13	1	12.30	No	19.95	7.65
18	4/19/2016	13	2	12.61	No	19.95	7.34
19	4/19/2016	13	3	12.78	No	19.95	7.17
20	4/19/2016	13	4	17.06	No	19.95	2.89
21	4/19/2016	13	5	16.16	No	19.95	3.79
22	4/19/2016	13	6	15.79	No	19.95	4.16
23	4/19/2016	13	7	16.06	No	19.95	3.89
24	4/19/2016	13	8	15.10	No	19.95	4.85
25	4/19/2016	13	9	15.77	No	19.95	4.18
26	4/19/2016	13	10	15.99	No	19.95	3.96
27	4/19/2016	13	11	18.43	No	19.95	1.52
28	4/19/2016	13	12	19.16	No	19.95	0.79

**Table 9: Price Impact Analysis Information for Pricing Node B in SCE LAP**

Number	Trade Date	Trade Hour	Interval	Market LMP	Eligible Flag	Calculated LMP	Change in LMP
1	4/5/2016	1	1	0.00	No	24.98	24.98
2	4/5/2016	1	2	0.03	No	24.98	24.95
3	4/5/2016	1	3	0.03	No	24.98	24.95
4	4/5/2016	1	4	-15.59	No	24.98	40.57
5	4/5/2016	1	5	0.00	No	24.98	24.98
6	4/5/2016	1	6	0.03	No	24.98	24.95
7	4/5/2016	1	7	10.22	No	24.98	14.76
8	4/5/2016	1	8	0.00	No	24.98	24.98
9	4/5/2016	1	9	-16.87	No	24.98	41.85
10	4/5/2016	1	10	-16.87	No	24.98	41.85
11	4/5/2016	1	11	-21.82	No	24.98	46.80
12	4/5/2016	1	12	-16.63	No	24.98	41.61
13	4/9/2016	10	1	52.88	Yes	29.54	-23.34
14	4/9/2016	10	2	41.40	Yes	29.54	-11.86
15	4/9/2016	10	8	25.85	No	29.54	3.69
16	4/9/2016	10	9	26.89	No	29.54	2.65
17	4/9/2016	10	10	20.61	No	29.54	8.93
18	4/9/2016	10	11	20.61	No	29.54	8.93
19	4/9/2016	10	11	20.61	Yes	29.54	8.93
20	4/9/2016	10	12	20.49	No	29.54	9.05
21	4/9/2016	10	12	20.49	Yes	29.54	9.05
22	4/9/2016	11	1	26.69	No	29.54	2.85
23	4/9/2016	11	2	23.22	No	29.54	6.32
24	4/9/2016	11	3	23.22	No	29.54	6.32
25	4/9/2016	11	3	23.22	Yes	29.54	6.32
26	4/9/2016	11	4	24.66	No	29.54	4.88
27	4/9/2016	11	4	24.66	Yes	29.54	4.88
28	4/9/2016	11	5	23.23	No	29.54	6.31
29	4/9/2016	11	5	23.23	Yes	29.54	6.31
30	4/9/2016	11	6	21.30	Yes	29.54	8.24
31	4/9/2016	11	7	20.42	Yes	29.54	9.12
32	4/9/2016	11	8	20.42	Yes	29.54	9.12
33	4/9/2016	11	9	20.42	Yes	29.54	9.12
34	4/9/2016	11	10	20.38	Yes	29.54	9.16
35	4/9/2016	12	1	23.03	No	25.26	2.23
36	4/9/2016	12	2	21.22	No	25.26	4.04

Department of Market Quality and Renewable Integration – California ISO

Number	Trade Date	Trade Hour	Interval	Market LMP	Eligible Flag	Calculated LMP	Change in LMP
37	4/9/2016	12	3	23.53	No	25.26	1.73
38	4/9/2016	12	4	24.31	No	25.26	0.95
39	4/9/2016	12	5	37.54	No	25.26	-12.28
40	4/9/2016	12	6	23.38	No	25.26	1.88
41	4/9/2016	12	7	44.38	No	25.26	-19.12
42	4/9/2016	12	8	41.46	No	25.26	-16.20
43	4/9/2016	12	9	509.28	No	25.26	-484.02
44	4/9/2016	12	10	507.71	No	25.26	-482.45
45	4/9/2016	12	11	75.41	No	25.26	-50.15
46	4/9/2016	12	12	44.34	No	25.26	-19.08

## **Appendix C: Exceptional Dispatch Bid Mitigation Analysis**

ISO did not have any cost savings for the exceptional dispatch bid mitigation for April 2016.



## CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon the parties listed on the official service lists in the above-referenced proceedings, in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010).

Dated at Folsom, California this 1<sup>st</sup> day of August 2016.

*/s/ Grace Clark*

Grace Clark