Pricing and Price Signals: What is the problem we are trying to solve?

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TOPICS

Fixed Block Pricing

- Rationale for Fixed Block Pricing in New York
- COG Pricing in the MRTU Design

Prices and Unit Commitment

- IFM
- RUC Commitment
- Real-time Commitment

Possible Changes

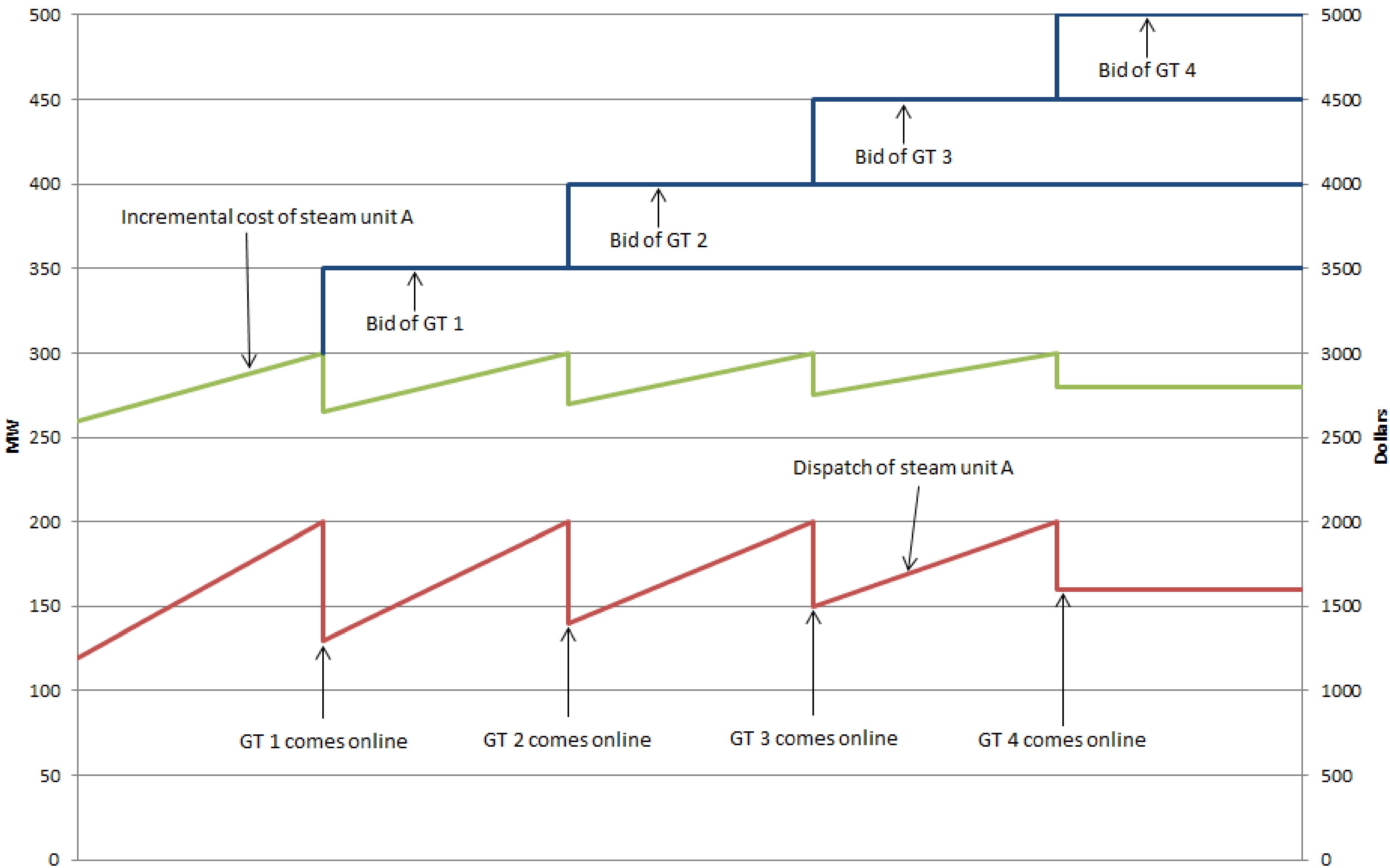
Uplift Impacts

FIXED BLOCK PRICING

The New York ISO implemented fixed block pricing on November 19, 1999, and the basic concept remains in place today.

- Changes were made in the software in July 2000 to correct the initial implementation of ramp constraints;
- Changes made in response to guidance from FERC in Docket EL00-70;
- Minor changes made with new real-time dispatch software in February, 2005;
- Changes made to accommodate changes in the modeling of dragging, March 2009.

FIXED BLOCK PRICING



FIXED BLOCK PRICING

The New York ISO's fixed block or hybrid pricing design was motivated by a desire to send an efficient price signal when non-dispatchable gas turbines are committed to meet load.

- Prices set by a steam unit that is dispatched up and down to balance load between gas turbine commitments would not send an efficient price signal for the scheduling of interchange.
- Fixed block units that are only on-line because of their minimum run time do not set price, as their offers would not send an efficient signal for scheduling interchange.

COG PRICING IN THE MRTU DESIGN

The California ISO MRTU design provides gas turbines and other quick start resources where minimum load is nearly equal to maximum operating level (constrained output generation) to be treated as flexible for the purpose of setting real-time prices when their output was needed to meet load.[1]

- The resources would not set prices, however, if they were only on-line as a result of a minimum run-time or minimum down-time constraint.
- This COG pricing design was accepted by FERC in its June 17, 2004 order, ¶ 121.
- The LECG February 23, 2005 report endorsed this design, but pointed out that the modeling of upper limits of non-COG units in the dispatch in which COG units were treated as flexible needed to be carefully specified.[2]

1) California ISO, Comprehensive Market Design Proposal, July 21, 2003 items 61, 106 and 116; an d Cal ifornia ISO May 11, 2004 technical conference comments, Att A III.3d,e

2) See Scott Harvey, William Hogan and Susan Pope, "Comments on the California ISO MRTU LMP Market Design," February 23, 2005 "p. 60-62

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COG PRICING IN THE MRTU DESIGN

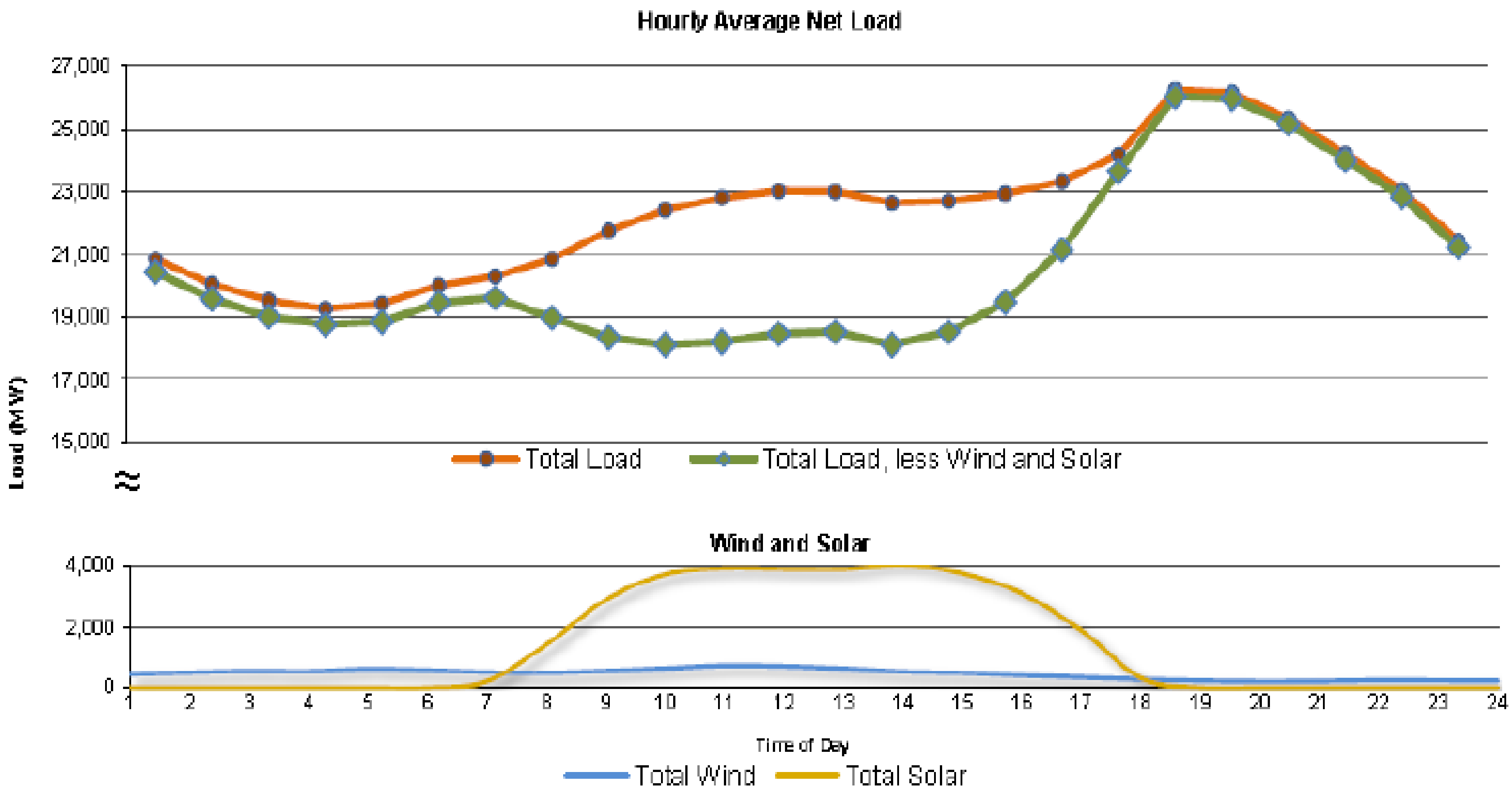
I understand that the California ISO ultimately implemented of COG pricing for resources that meet the following criteria and elect COG pricing treatment:

- (Pmax – Pmin) is not greater than the higher of three (3) MW or five percent (5%) of their actual Pmax.
- One could review the implementation of COG pricing and assess whether there is anything in the implementation that is causing the design to not operate as intended.
- But, it is my understanding that very few resources either meet the criteria or have elected COG treatment and are registered as COG in the Master-File.

If most gas turbines in the California ISO today are in fact dispatchable over a reasonable range, what problem would any improvements fixed block pricing address?

COG PRICING IN THE MRTU DESIGN

The duck – March 8



Source: California ISO, Market Performance and Planning Forum, March 13, 2014, p.21.

COG PRICING IN THE MRTU DESIGN

What signal would be sent by higher prices during HB 10-14 (the duck's belly)?

- Higher prices due to a change in the pricing rule would mean lower exports, and even lower net load during the these hours;
- This would require that generation internal to the California ISO be dispatched down even further, so the real dispatch price would fall.

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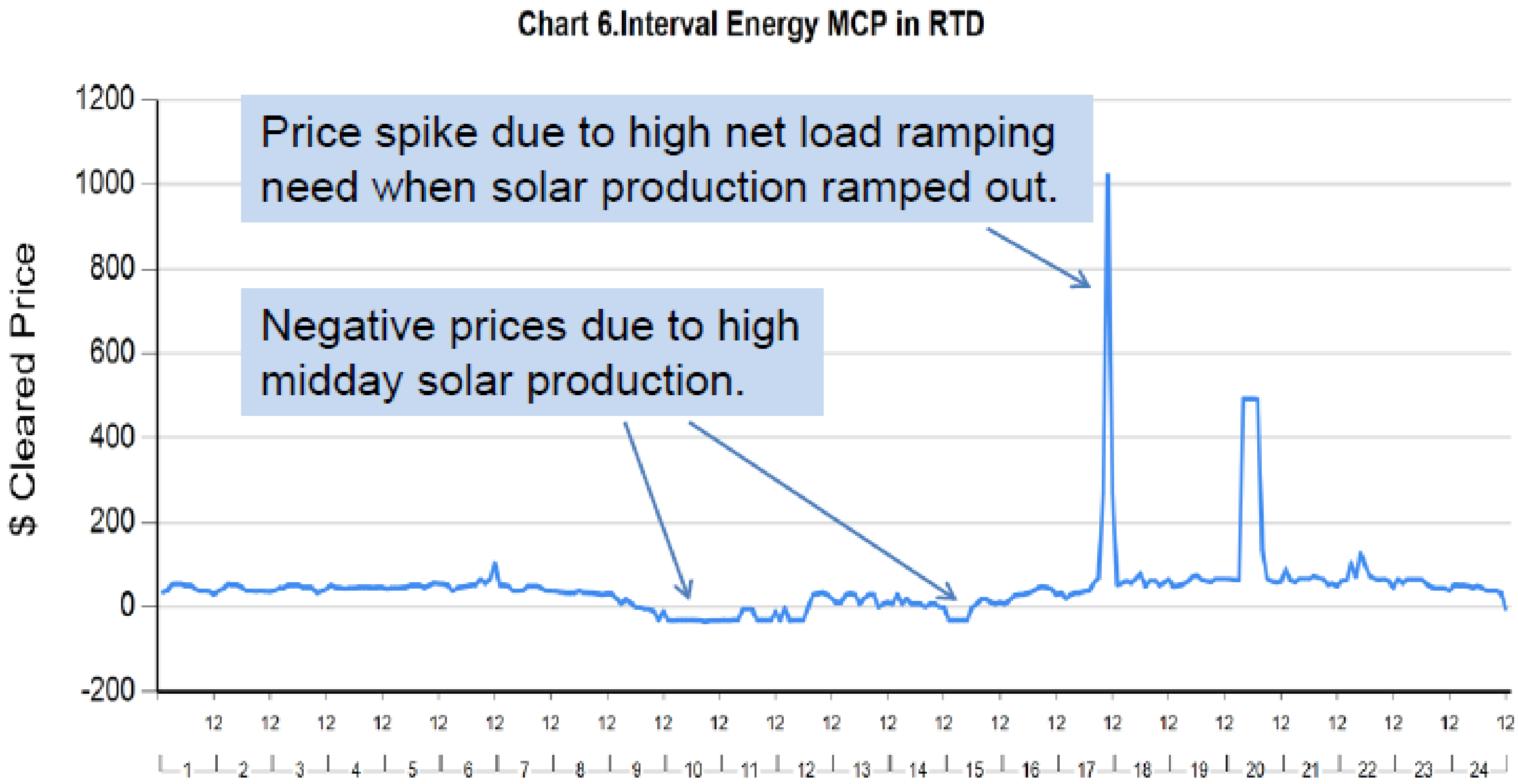
COG PRICING IN THE MRTU DESIGN

Negative prices in midday – March 8



Source: California ISO, Market Performance and Planning Forum, March 13, 2014, p.22.

COG PRICING IN THE MRTU DESIGN

The offers of units such as gas turbines that are dispatched to their maximum (during the duck neck period of the day) should place a floor on the clearing price, with the clearing price potentially set by a higher cost resource.

- Is something in the pricing algorithm believed to be inefficiently depressing prices during the duck neck period or are the duck neck period prices consistent with the dispatch?
- Are non-convexities in incremental heat rate curves causing gas fired generators to self-schedule during the duck belly, to avoid being dispatched up and down?
- Or are the issues not with pricing in RTD, but with the unit commitment?

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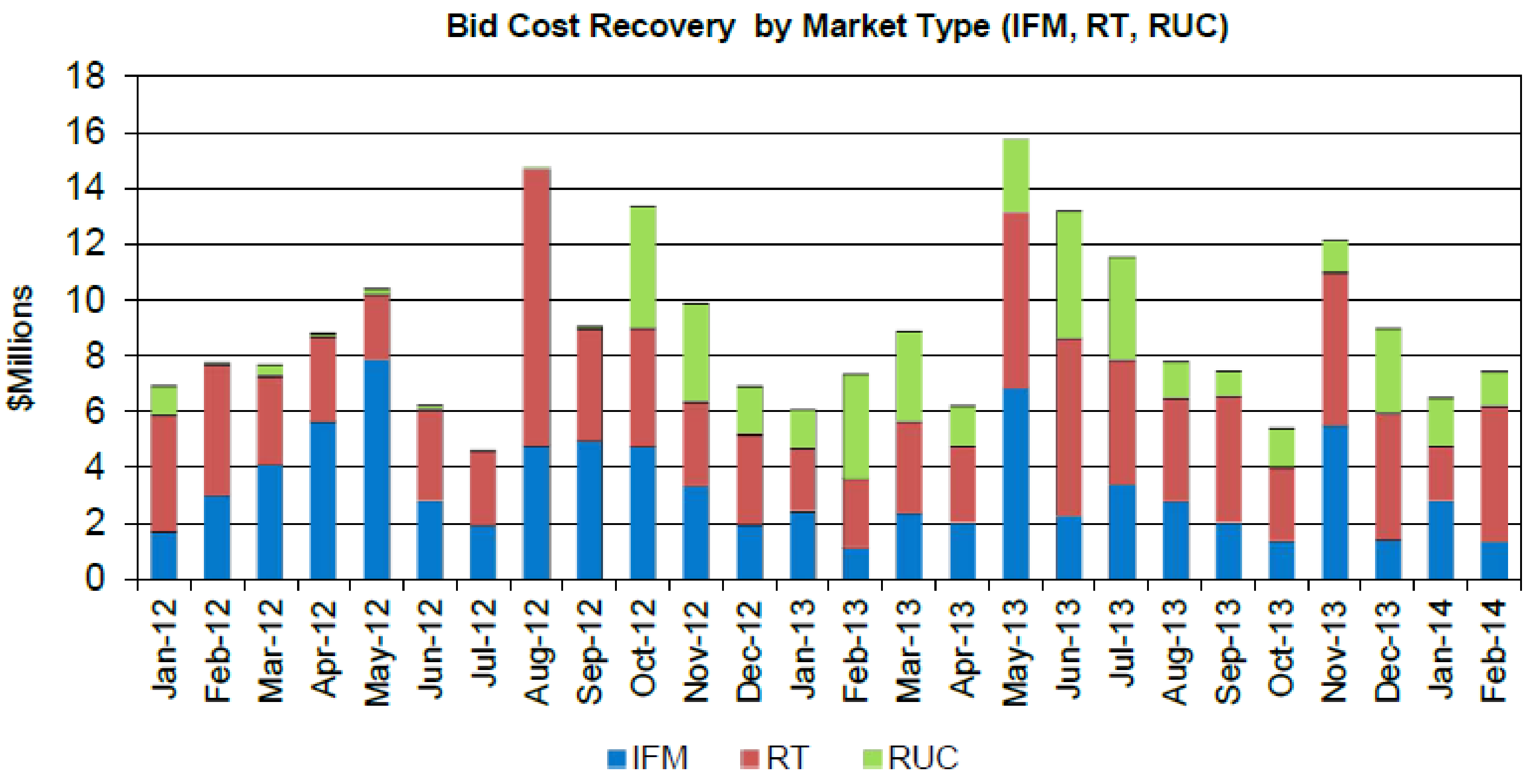
PRICES AND UNIT COMMITMENT

Are day-ahead and/or real-time prices artificially low due to uneconomic unit commitments by the California ISO?

- IFM
- RUC
- Real-time (STUC and RTPD)

PRICES AND UNIT COMMITMENT



Source: California ISO, Market Performance and Planning Forum, March 13, 2014, p.26.

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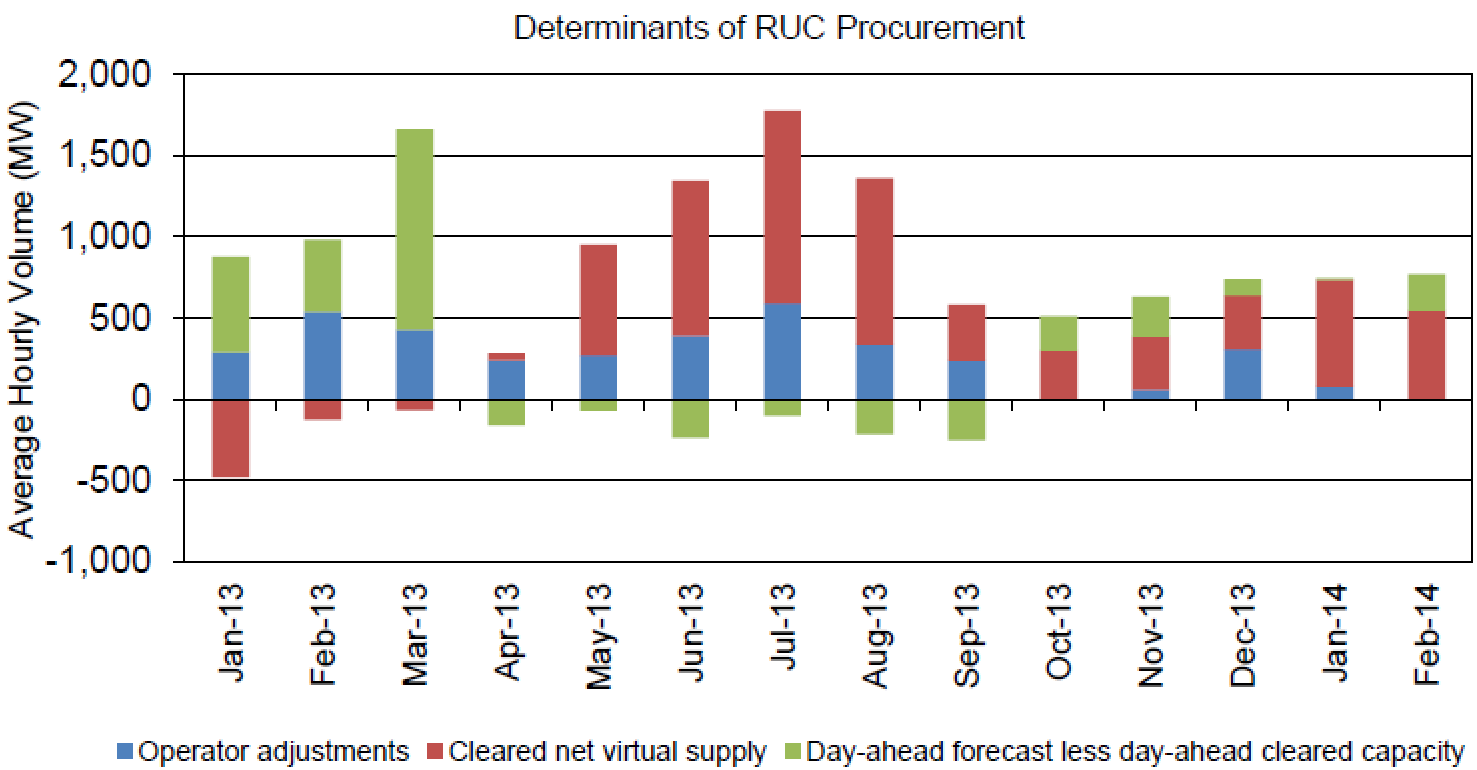
DAY-AHEAD MARKET

There will inevitably be some uneconomic unit commitment in the day-ahead market as a result of lumpy units and reserve constraints, including any MOC type constraints enforced in the IFM.

- One expects IFM uplift costs due to the scheduling of reserves to be highest during low load, high hydro months when fewer units need to be on-line to meet load and reserve requirements are more likely to cause uneconomic commitments.
- This sort of appears to be the case for the California ISO.
- The Department of Market Monitoring has estimated that a little less than a third of the uplift in IFM is due to modeling of MOC constraints.
- The uplift would be even higher if the MOC constraints were not modeled in the IFM and were only enforced in real-time.
- What is the cause of high uplift costs in the IFM in summer months?

RUC COMMITMENT



Source: California ISO, Market Performance and Planning Forum, March 13, 2014, p.16.

RUC COMMITMENT

Units committed in RUC can inefficiently depress real-time prices relative to prices in the IFM and give rise to uplift costs if their operation is not needed to meet load in real-time.

- This may be the case, on average, for generation committed in RUC to compensate for the uncertain output of intermittent resources (or for virtual supply reflecting the expected output of such resources) because the additional capacity will often not be needed.
- Are virtual supply offers causing RUC to commit additional long-start capacity in RUC or can the variations in intermittent output be covered by RUC procurement on quick start units and the long-start capacity is being committed in RUC for other reasons, e.g. "operator adjustments"?

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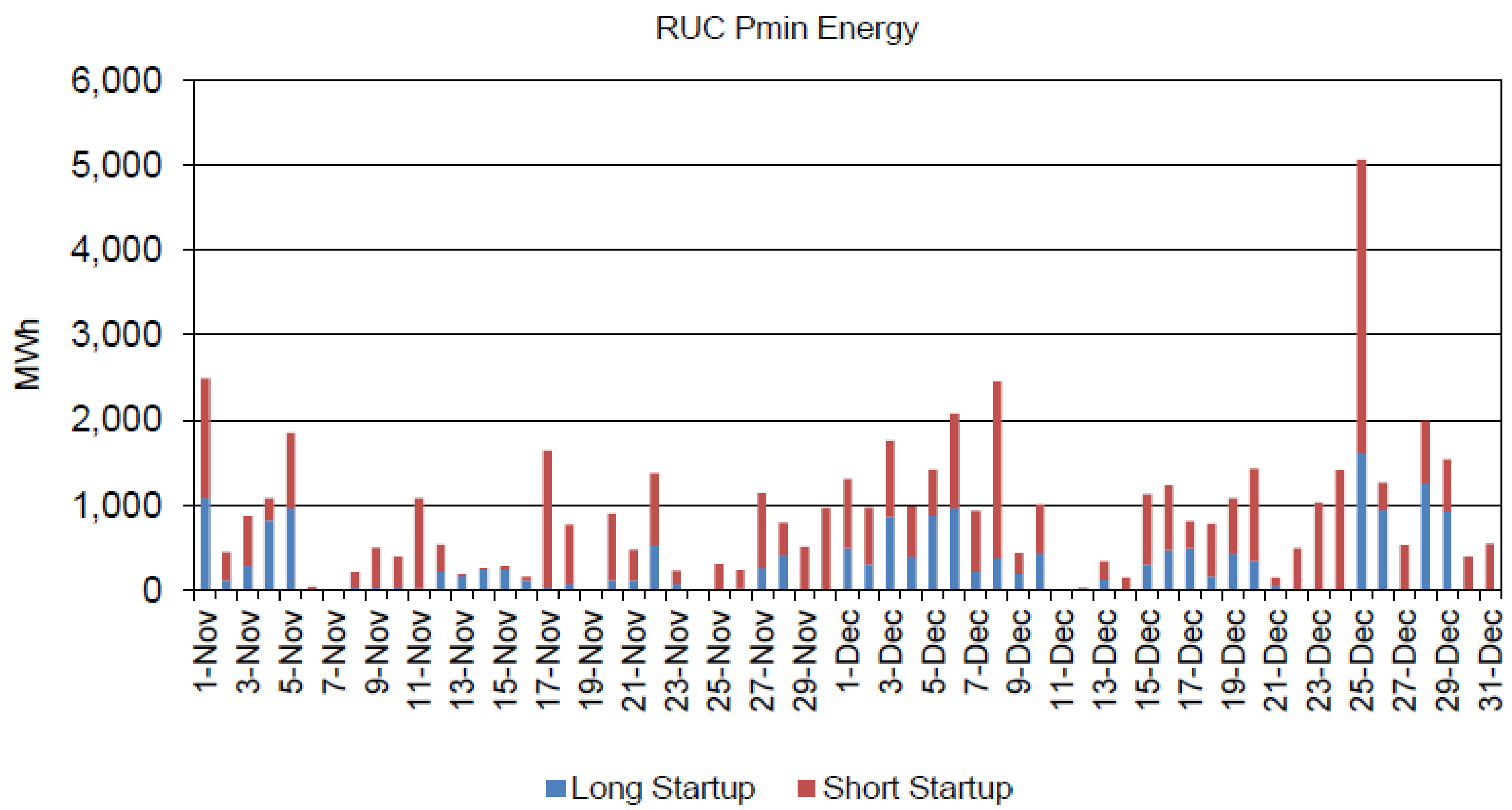
RUC COMMITMENT



Source: California ISO, Market Performance and Planning Forum, January, 2014, p.20.

RUC COMMITMENT

In assessing the impact of RUC on real-time prices, it is critical to recognize that only RUC commitments, not RUC procurement, impact real-time prices.

- It is my understanding that only the procurement of RUC capacity on long-start units committed in RUC result in the commitment of capacity based on the RUC procurement.
- The commitment decisions for short-start capacity procured in RUC are not made in RUC but in STUC or RTPD.
- Moreover, my understanding is that the Department of Market Monitoring estimates that of the $23 million of uplift on off-line units with capacity procured in the RUC pass, only around $8 million was for long-start units actually committed by RUC.

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RUC COMMITMENT

Although commitment of long-start units in RUC accounts for a smaller proportion of uplift than suggested by the figures for uplift on units with capacity procured in RUC, it is still desirable to assess whether the RUC commitment process is operating as intended. Some questions are:

- What is the reason for higher levels of commitments of long start units in RUC at the end of the day?
- Why is long-start capacity being committed in RUC when short-start capacity appears to be available?

RUC COMMITMENT

Average hourly difference in supply between the real-time and day-ahead markets in 2013.

Hour	HASP Net Imports	Wind	Solar	Exceptional Dispatch Commitment	Exceptional Dispatch OOS	RUC Long-Start Unit Commitment	RUC Capacity RT Must-Take	RUC Capacity Economic RT Dispatch	Net Virtual Supply	Total Additional RT Supply
1	69	593	4	28	1	4	76	81	(678)	178
2	90	588	4	29	1	3	56	74	(770)	74
3	107	564	4	31	1	3	55	67	(781)	50
4	42	529	4	31	1	2	46	51	(812)	(107)
5	134	504	4	34	1	3	49	66	(758)	36
6	364	488	(4)	36	1	4	63	91	(588)	455
7	312	466	(47)	41	1	5	61	68	(320)	586
8	223	419	(56)	45	1	7	78	75	(345)	447
9	246	388	74	48	1	8	80	80	(384)	541
10	153	386	213	52	1	8	74	85	(388)	585
11	1	384	333	58	1	9	63	82	(383)	548
12	(82)	382	400	59	1	12	69	83	(324)	600
13	(129)	381	429	60	1	14	61	65	(258)	623
14	(155)	400	442	63	1	14	67	62	(291)	604
15	(142)	427	447	67	1	16	78	74	(298)	670
16	(141)	469	416	66	1	17	83	85	(274)	722
17	(183)	534	337	65	1	17	77	77	(138)	788
18	(136)	572	251	64	1	17	94	86	109	1,058
19	(78)	582	125	63	2	20	133	102	24	973
20	(19)	580	14	64	2	20	121	81	41	903
21	85	580	(0)	64	2	21	143	99	(28)	966
22	84	579	4	62	1	25	158	92	(319)	685
23	(50)	577	4	56	1	32	168	92	(493)	388
24	(16)	591	4	57	1	35	210	98	(676)	303
Average	32	498	142	52	1	13	90	80	(381)	528

Source: California ISO, Market Performance and Planning Forum, March 2014, p.44.

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RUC COMMITMENT

Real-time price taking output identified as "RUC Capacity RT Must-Take" averaged 90 megawatts an hour in 2013, with an average ranging from 121 to 210 megawatts an hour over hours ending 19-24.

- Based on my discussions with the California ISO, these commitments have little to do with RUC procurement.
- The classification of capacity as "RUC Capacity RT Must-Take" in the Market and Planning Performance Forum reports is based on whether the unit was procured as RUC capacity. It does not mean the unit was committed as a result of RUC procurement.
- My understanding that some of this capacity was self-scheduled by market participants and the rest committed by STUC or RTPD, either to meet load or to satisfy the flexi-ramp constraint.

Perhaps we should be analyzing STUC and RTPD commitments, not RUC procurement?

REAL-TIME COMMITMENT

Are the STUC and RTPD unit commitment decisions efficient or are they contributing to the duck belly?

- Is the California ISO committing the wrong units in RTPD during the morning ramp, committing units able to meet the morning ramp but units with too little downward ramp for the duck belly hours.
- Is the unit commitment for the duck belly period in RTPD not optimal because the RTPD runs that commit generation for the morning ramp do not look out far enough into the duck's belly to take into account the need for downward ramp?

Alternatively, is the problem that the RTPD runs in the duck belly period that schedule net interchange have a upward flexible ramp constraint but no downward flexible ramp constraint, with the result that RTPD fails to schedule exports that would provide more downward ramp at low cost.

REAL-TIME COMMITMENT

Questions to help us understand what is happening in real-time:

- How much of the capacity on line in real-time that was not scheduled in the IFM, was:
  - Committed as a result of a market participant self-schedule?
  - Committed in STUC to meet load at least cost?
  - Committed in RTPD, either to meet load at least cost or to meet the flexi-ramp constraint?
- Of the capacity committed by STUC and RTPD,
  - What proportion of the capacity operated profitably over its commitment period?
  - What was the aggregate profitability of the capacity over its commitment period?

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REAL-TIME COMMITMENT

More questions:

- How much of the capacity included in the historical exceptional dispatch commitments would be accounted for in the market with implementation of the contingency modeling enhancements?
    - What factors account for the rest of the exceptional dispatch commitments?

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REAL-TIME COMMITMENT

- Why are STUC and/or RTPD committing/not-decommitting an average of at least 60- 80 megawatts per hour of minimum load block capacity during the duck belly period?
  - It is "at least" because "RUC capacity RT Must-Take" does not include all capacity committed by in these hours, only the part that was also procured as RUC capacity.
  - Is this capacity kept on line due to minimum down time or start limitations?
  - Is this capacity self-scheduled by the unit operator to stay on line?
- Why is exceptional dispatch capacity on average growing during the duck belly period?

POSSIBLE CHANGES

What if any changes in STUC or RTPD might be desirable depends on the answers to the questions posed in the preceding discussion. Some possibilities are:

- Make real-time unit commitment decisions using a tool that looks out further in time so it considers the duck belly period when committing units for the morning ramp.
- Include a downward flexible ramp constraint in RTPD that would schedule more exports during the duck belly period.
- Correct any logic flaws or data inconsistencies with RTD that are causing STUC or RTPD to commit capacity that is not needed during the duck belly period.

Or perhaps the commitments are driven by the flexiramp constraint and meaningful improvement will only come after implementation of the flexiramp product and adjustments in the amount of procurement.

POSSIBLE CHANGES

Changes in IFM and RUC:

- Account for constraints causing exceptional dispatch commitments in the IFM.
- Correct any logic flaws that are causing RUC to commit long-start capacity when enough short start capacity is available to meet the need.
- Remove inappropriate uplift allocations that are reducing virtual supply offers during the duck belly period.

UPLIFT IMPACTS

Should we care about the relative level of uplift payments and energy market revenues in the California ISO market?

- While assuring resources that they will recover the cost of following ISO dispatch and unit commitment instructions improves reliability, uplift adversely impacts other incentives.

Resources receiving uplift payments in many hours over the year:

- Have reduced incentives to make investments to reduce their incremental operating costs, as the cost reductions will result in lower uplift revenues;
- Have reduced incentives to make investments to improve their performance (such as raising their ramp rate) as increases in energy revenues will be offset by lower uplift revenues;
- Have reduced incentives to bid their actual costs, as higher offer prices will raise uplift revenues if the unit remains economic.