Commitment Costs Enhancements

Revised straw proposal discussion

June 17, 2014

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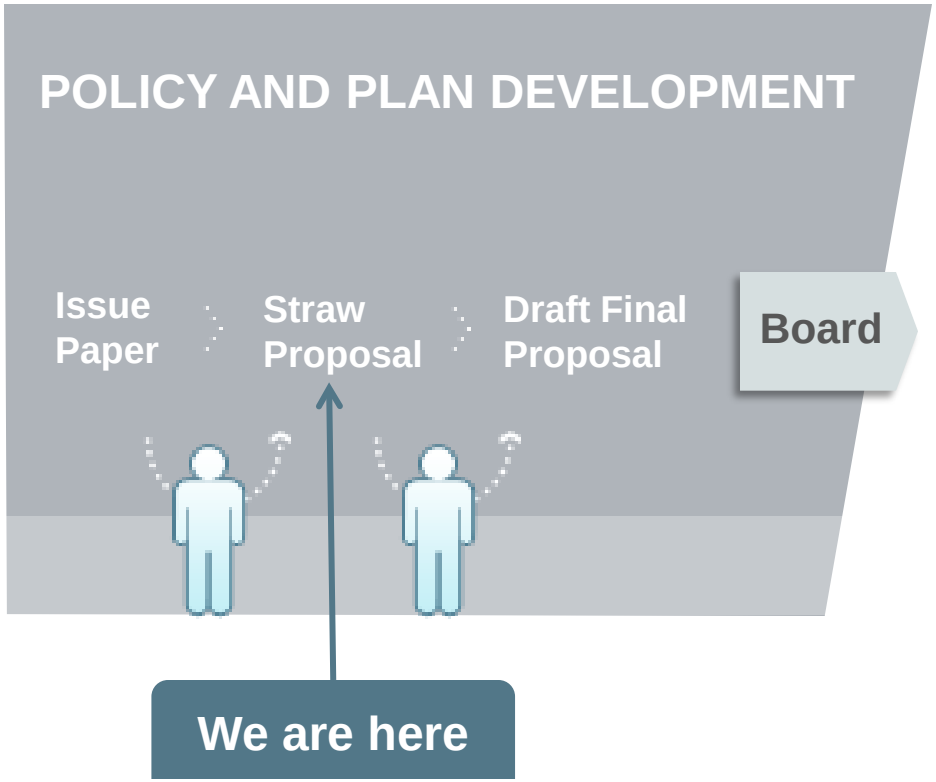
Agenda

Time	Topic	Presenter
10:00 – 10:05	Introduction	Kristina Osborne
10:05 – 11:45	Changes from issue paper/straw proposal and discussion	Delphine Hou
11:45 – 12:00	Next Steps	Kristina Osborne

ISO Policy Initiative Stakeholder Process



Changes from issue paper/straw proposal

- Additional clarification on the manual process
- Opportunity cost methodology from other initiatives
- Additional items for consideration
- Revised schedule

Manual process clarification

Day	Time	Process
Day 1	19:00 – 22:00	Update gas price index per current process
Day 2	Before 10:00	Monitor intra-day gas price for potential to exceed threshold
	Approximately 10:00	ICE index shows:

≤125% ⇩

No change

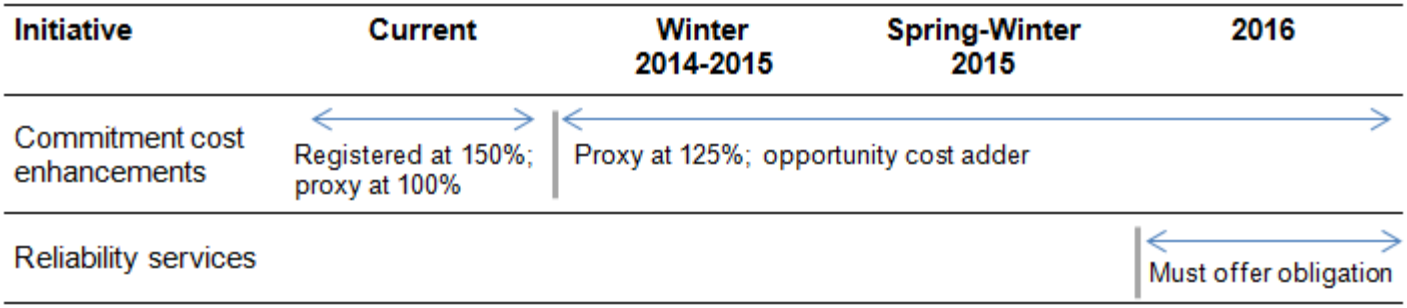
>125% ⇩

- Delay DAM close
- Update GPI, DEB, proxy calc, generated bids
- Allow rebidding
- Close DAM per usual

Opportunity cost methodology for dispatchable natural gas-fired use-limited resources

- Inclusion of opportunity cost discussed in *Commitment Cost Refinements 2012* initiative
- A methodology to calculate opportunity costs for dispatchable, natural gas-fired resources was originally discussed in FRACMOO (then RSI), to dovetail with a proposal to insert bids as part of the must offer obligation

Figure 4
Design elements impacting use-limited resources



Proposal: Opportunity cost scope

- Propose to incorporate by winter 2014
  - This may be possible because current methodology is largely offline (future improvement should migrate this into a tool)
- Propose to apply calculation to dispatchable, natural gas-fired use-limited resources
  - Use and refine methodology before there is must offer obligation
  - Expand to other use-limited resources at later stage
- Propose to calculate opportunity costs for monthly and annual: (1) start, (2) run hour, and (3) energy limitations based on verifiable information from use plans
- Allow resources to incorporate opportunity cost into start-up, minimum load, and default energy bids
  - For commitment costs, bid up to 125% proxy cost plus calculated opportunity

How will ISO calculate the opportunity cost?*

- For start and run hour limitations, opportunity cost is defined as the difference in gross margin (or profits) resulting from changes in dispatch due to each limitation
- Example:
  - Start limit per month = 10

Starts per month	Total revenues	Total costs	Profit
Limit to 10	$500	$480	$20
Limit to 9	$450	$435	$15
Difference in profit			$5

- For generation limitations, opportunity cost is the shadow price on the constraint

*See Market Surveillance Committee meeting documents for November 15, 2013 available at: http://www.caiso.com/Documents/Presentation-MSC-FRACMOO_OpportunityCost-Hobbs.pdf.

What model will the ISO use to calculate the opportunity costs?

- The ISO has developed an offline unit commitment and dispatch optimization model
  - Respect Master File and use-limitation plan constraints
  - Maximize gross margin (total revenues – total costs)
  - Optimally commit and dispatch against simulated real-time energy prices
  - A set of simulated prices will be generated for each resource-specific pricing node

- Improvements in progress
  - Monthly to full year analysis
  - 30 minute to 15 minute real-time price

How will the ISO simulate real-time energy prices?

$$\text{Im } pHR_{i,t-1} = \frac{LMP_{i,t-1}}{NatGasP_{l,t} + (GHGas_{t-1} * EmRate)}$$

Where:

$LMP_{i,t-1}$ is the real time energy price at pnode *i* from the previous year's period, *t-1.*

$GHGas_{t-1}$ is the greenhouse gas allowance price from the previous year's period, *t-1*.

$EmRate$ is the emissions rate per MMBtu of gas, which is $.053165 \text{mtCO}_2\text{e/MMBtu}$

$NatGasP_{l,t-1}$ is the daily natural gas price from the region *l* of pnode *i* and the previous year's period, t-1

$$LMPi,t = ImpHR_{i,t-1} * \left(NatGasF_{\ l,m} + (GHGasF_m * EmRate)\right) * 110\%$$

Where:

$LMP_{i,t}$ is the forecasted real time price at pnode *i* for interval *t*

$ImpHR_{i,t-1}$ is the calculated implied heat rate at pnode *i* from a base period, *t-1*

$NatGasF_{l,m}$ is the average natural gas price of the preceding month for region *l*

$GHGasF_{t,m}$ is the average greenhouse gas allowance price of the preceding month.

$EmRate$ is the emissions rate per MMBtu of gas, which is $.0530731\ mtCO_2e/MMBtu$

NOTE: The indices in the real-time price formula have been modified since the paper was posted to match the indices in the definitions.

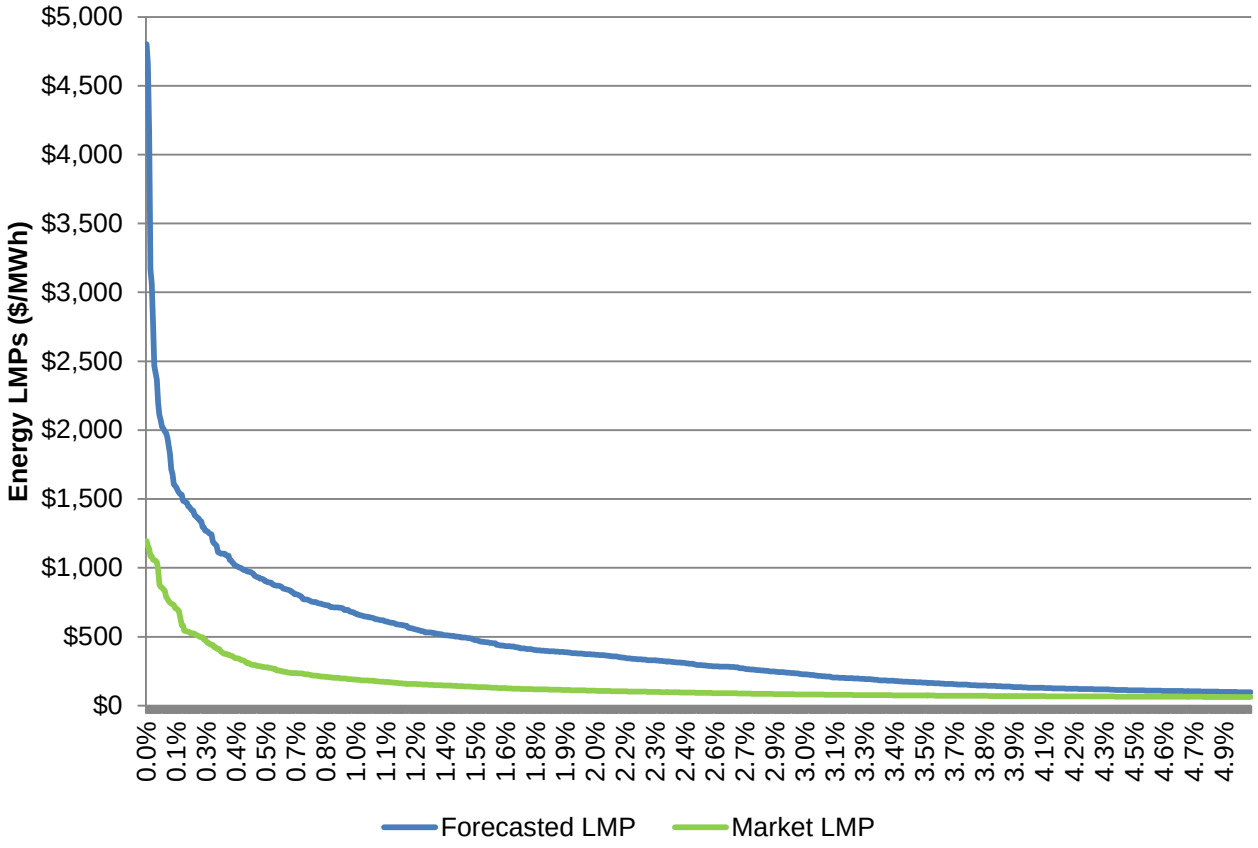
Model outputs and process

- The starts or run hour opportunity cost is an adder to the proposed 125% proxy cap for start-up and minimum load cost, respectively
    - Scheduling coordinators can then bid *up to* this total amount
- The generation opportunity cost will be included in the resource's default energy bid
- An opportunity cost will be calculated each month for each limitation a resource has in the use-limitation plan
  - Opportunity costs will be updated, at a minimum, monthly
  - More frequent updates may occur if gas prices or energy prices vary significantly (*i.e.,* decreases) from estimated prices

Simulating real-time prices: Preliminary comparisons

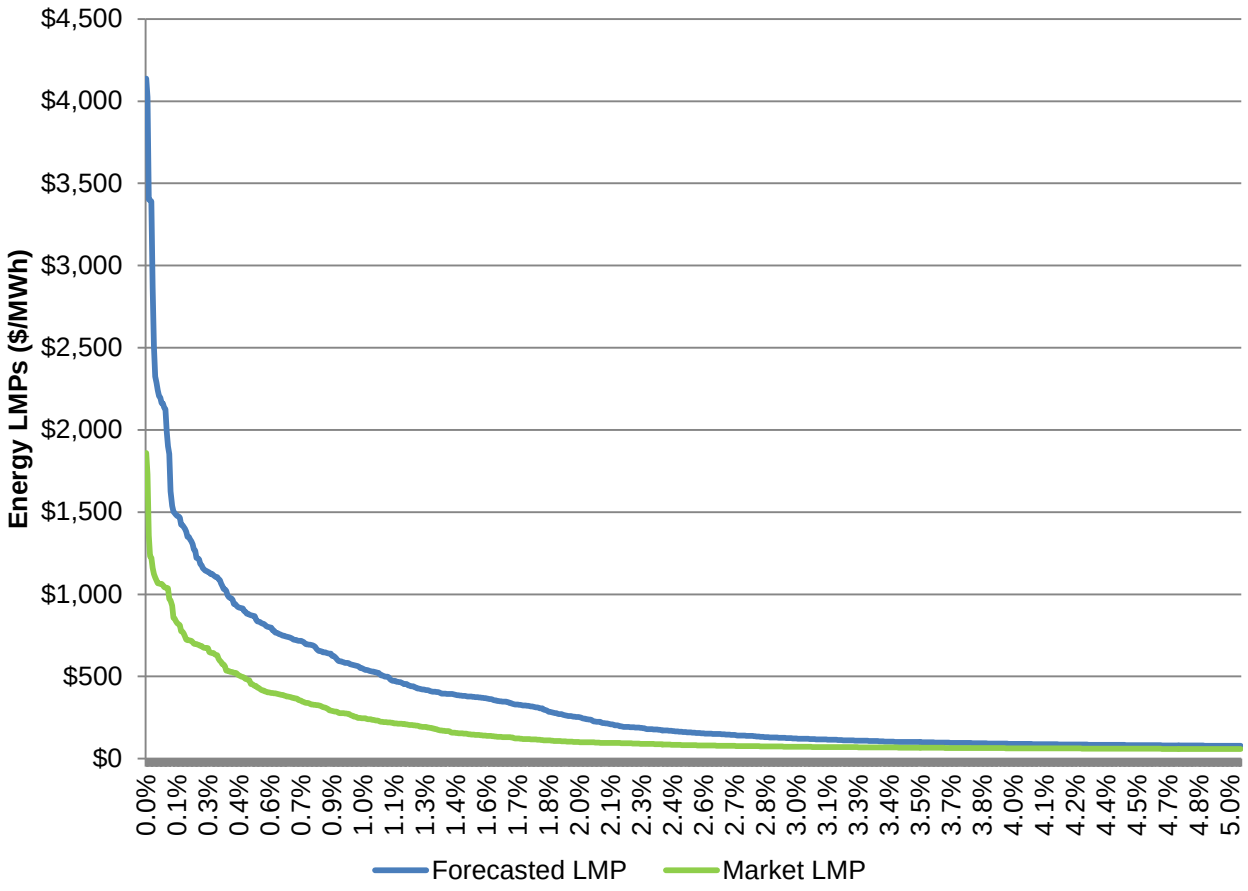
- ISO estimated 2013 energy LMPs
  - Two pricing nodes, one in the north one in the south
- Estimated 5 minute real time LMPs and then aggregated up to 30 minute prices
- Compared distribution of actual energy LMPs to simulated LMPs

Node A – top 5% of distribution



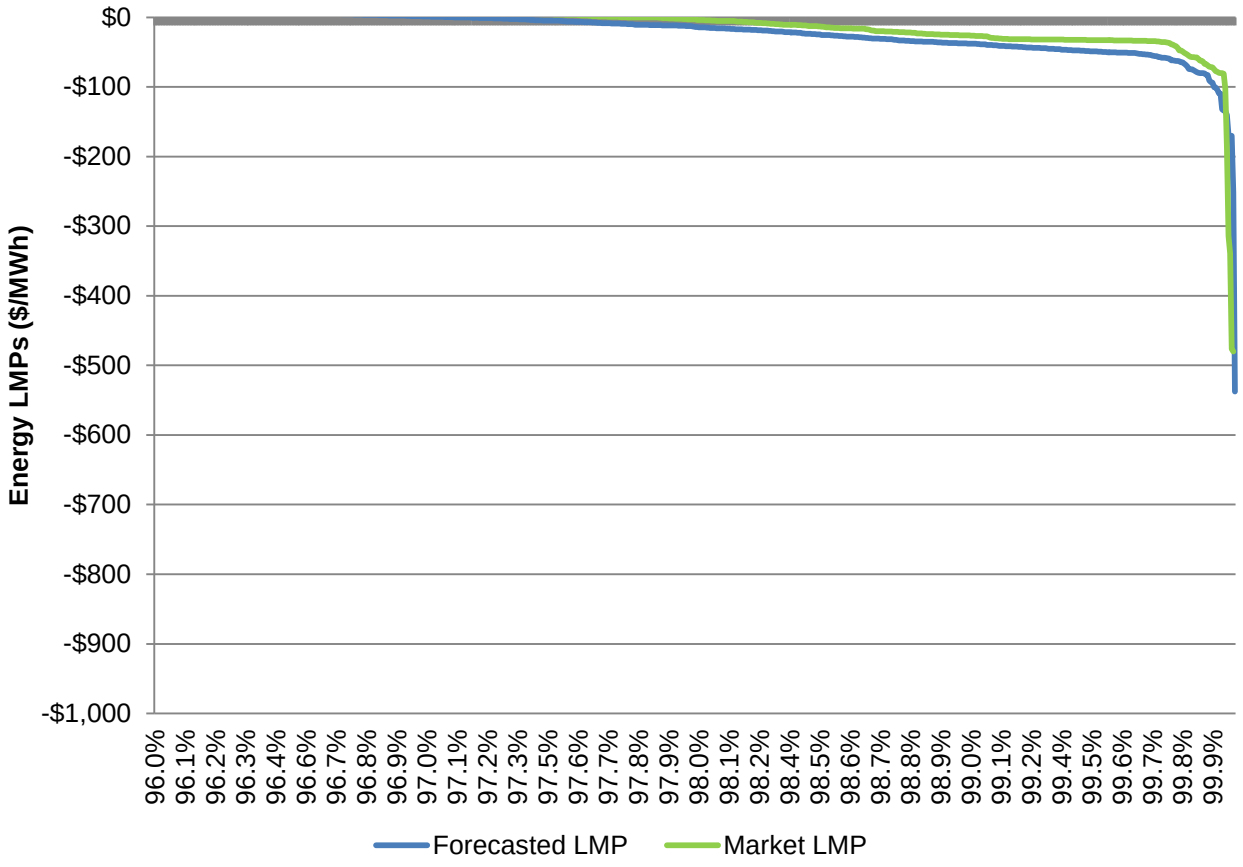
- 2013 forecasted energy LMPs are higher than actual LMPs in the top 4% of the distribution
- Congestion in 2012 that does not materialize in 2013 can create an inconsistency between forecasted and actual energy LMPs

Node B – top 5% of distribution



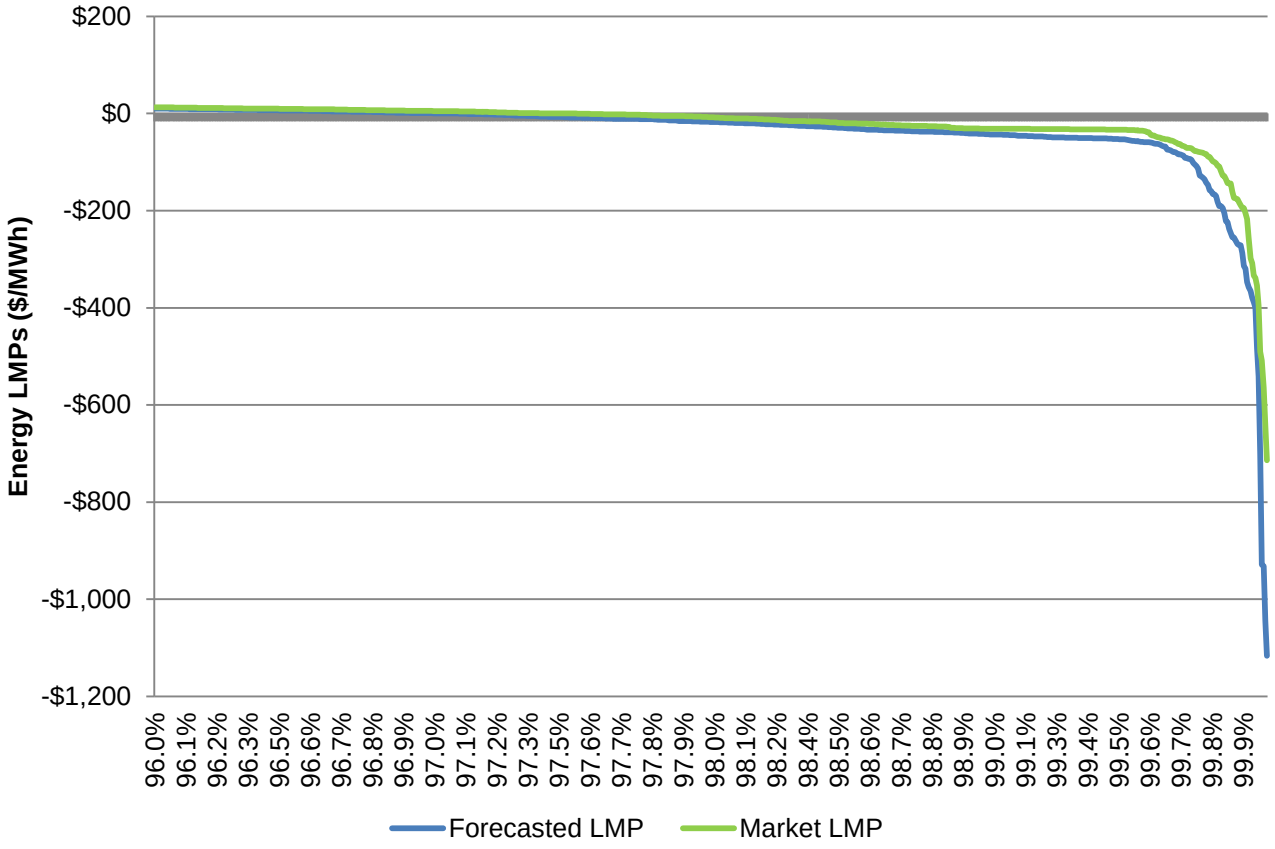
- 2013 Forecasted energy LMPs are higher than actual LMPs for approximately 3% of the distribution

Node A – bottom 5% of distribution



- Forecasted and actual LMPs from 5% to 100% of the distribution are extremely similar.

Node B – bottom 5% of distribution



- Forecasted and actual LMPs from 5% to 100% of the distribution are extremely similar.
- 2013 forecasted LMPs go more negative than actual LMPs for 0.01% of the distribution at the southern node.

Opportunity cost model: back-casting initial results

- Calculated start-up and minimum load opportunity costs for two resources for each month in 2013.
- Re-ran the model using actual 2013 real-time LMPs in two scenarios
  - Scenario 1: 100% proxy cost
  - Scenario 2: 100% proxy cost + 100% opportunity cost
- 100% proxy cost was used to produce conservative results
- Analyzed the percentage of each resources' limitations that were used each month under both scenarios

Opportunity cost impact sample: Resource 1

	100% Proxy cost only		100% Proxy cost with opportunity cost	
	Percent of start-up limitation used	Percent of run hour limitation used	Percent of start-up limitation used	Percent of run hour limitation used
	[1A]	[1B]	[1C]	[1D]
Jan	188%	24%	63%	11%
Feb	338%	50%	100%	26%
March	225%	31%	25%	4%
April	325%	53%	13%	3%
May	250%	47%	38%	23%
June	100%	17%	0%	0%
July	138%	19%	0%	0%
August	275%	61%	25%	7%
September	150%	21%	0%	0%
October	313%	51%	63%	29%
November	150%	29%	13%	1%
December	225%	43%	25%	6%

- Non zero start-up opportunity cost every month
- Only two non-zero run hour opportunity costs
- Resource exceeds monthly start-up use limitation each month without opportunity cost.
- Resource does not exceed any limitations with 100% of opportunity cost

Opportunity cost impact sample: Resource 2

	100% Proxy cost only		100% Proxy cost with opportunity cost	
	Percent of start-up limitation used	Percent of run hour limitation used	Percent of start-up limitation used	Percent of run hour limitation used
	[2A]	[2B]	[2C]	[2D]
Jan	150%	50%	105%	47%
Feb	110%	41%	105%	40%
March	155%	55%	110%	58%
April	115%	35%	40%	25%
May	85%	46%	35%	19%
June	55%	37%	40%	23%
July	105%	50%	30%	27%
August	105%	87%	80%	67%
September	110%	46%	85%	45%
October	125%	58%	90%	50%
November	85%	41%	45%	26%
December	105%	63%	30%	72%

- Non zero start-up opportunity cost every month
- Six non-zero run hour opportunity costs
- Does not exceed run hour limitations in either scenario
- Resource exceeds monthly start-up limitation 9 months without opportunity cost and 3 months with opportunity cost.
- Mostly attributable to estimated LMPs being lower than actual LMPs

Opportunity cost model testing: Next steps

- Simulate prices for 2011 and 2012
- Re-run model with actual 2013 LMPs using 125% of proxy plus 100% opportunity costs
- Compare 2013 actual market activity for the two resources against the re-run results using opportunity costs.

Additional items for consideration

- The ISO seeks to improve dispatch of resources and ensure on the whole that resources are appropriately compensated for their costs
- Section 6 in revised straw requests additional information specific stakeholder requests to consider:
  - Intra-day gas costs
  - After-the-fact cost reimbursement

Next steps

Date	Event
Wed 4/30/14	Issue paper/straw proposal posted
Wed 5/7/14	Stakeholder call
Wed 5/21/14	Stakeholder comments due
Tue 6/10/14	Revised straw proposal posted
Tue 6/17/14	Stakeholder call
Tue 7/1/14	Stakeholder comments due on revised straw proposal
Tue 7/15/14	Second revised straw proposal posted
Tue 7/22/14	Stakeholder call
Tue 7/29/14	Stakeholder comments due on second revised straw proposal posted
Tue 8/12/14	Draft final proposal posted
Tue 8/19/14	Stakeholder call
Tue 8/26/14	Stakeholder comments due on draft final proposal
Thu/Fri 9/18-9/19/14	Board of Governors meeting

Please submit comments to ComCosts2@caiso.com