Commitment Cost Enhancements Phase 3

Straw Proposal

August 24, 2015

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1. Introduction

Commitment Cost Enhancements and *Commitment Cost Enhancements Phase 2* had proposed the calculation of opportunity costs for use-limited resources but there was insufficient time to vet the methodology and business rules. This follow-on stakeholder process, *Commitment Cost Enhancements Phase 3*, is narrowly scoped to continue that discussion.

This initiative will culminate in implementing a process which will determine an opportunity cost for use-limited resource's limitation(s). The opportunity cost(s) will be reflect in commitment cost bids and/or the resource's Default Energy Bid (DEB). Reflecting the opportunity costs in the resource's commitment cost(s) will facilitate a more efficient market solution while respecting the limitations of these resources that cannot be optimized by the appropriate market commitment process. Once opportunity costs are implemented for use-limited resources, the registered cost option will be eliminated, and all resources will be on the proxy cost option for commitment costs. Along with the termination of registered cost option, the manual process to address potential natural gas price spikes as described in a proposed tariff waiver filed on March 6, 2014 will no longer exist[1].

A technical workshop for *Commitment Cost Enhancements Phase 3* was held at the California ISO on July 20th, 2015. During the workshop, the ISO presented two potential prototype models that could be developed to calculate opportunity costs for use-limited resources along with preliminary test results. The ISO also discussed with stakeholders various issues that arose during the development of the models as well as additional processing and policy related questions that will be addressed during the policy development of this initiative.

2. Schedule for stakeholder policy engagement

The proposed schedule for the policy stakeholder process is listed below. We have omitted the issue paper since the issue was already discussed under Commitment Cost Enhancements Phase 1.

Date	*Event*
July 15, 2015	*Market Surveillance Committee Meeting*
July 20, 2015	*Technical Workshop*
July 30, 2015	*Stakeholder comments due*
August 24, 2015	*Straw proposal posted*
August 31, 2015	*Stakeholder call*

[1] *California Indep. Sys. Operator Corp.*,146 FERC 61,218 (2014).

September 8, 2015	*Stakeholder comments due on straw proposal*
September–October 2015	*Draft final proposal posted*
	Stakeholder call
	Stakeholder comments due on draft final proposal
Nov 5 – 6, 2015	*Board of Governors meeting*

3. Initiative scope

This initiative was created to allow additional time for development and vetting of the business rules to determine opportunity costs for use-limited resources. The discussion of use-limited resources and limitations uses the definition of a "use-limited capacity" developed under *Commitment Cost Enhancements Phase 2* (henceforth referred to as CCE2).

The remainder of this paper is divided into the following sections.

- Section 5 summarizes the definition of "use-limited capacity" as developed through CCE2.
- Section 6 summarizes changes to the Business Practice Manuals due to policy established through the *Reliability Services* initiative.
- Section 7 expands upon the use-limited registration process as it pertains to the opportunity cost determinations.
- Section 8 describes the modeling process and how the calculated opportunity costs will be incorporated into commitment cost bids and default energy bids.
- Section 9 describes the negotiated opportunity cost method for those limitations that cannot be modeled.
- Section 10 proposes modifications to how opportunity costs will be incorporated into commitment cost bids for MSG resources.
- Section 11 proposes modifications to the use-limited outage cards established through the Reliability Service initiative.
- Section 12 provides the next steps for this initiative.

4. Summary of stakeholder comments from Technical Workshop

Below is a summary of stakeholder comments received at the July 20 technical workshop and the ISO's response to those comments.

Almost all stakeholders that submitted comments agreed with using projected energy prices based on historical fifteen minute real-time market prices. NRG indicated it was not appropriate for the ISO to only consider fifteen minute prices, and PG&E noted they too were not convinced only using fifteen minute prices is appropriate. PG&E also suggested the ISO evaluate the use-limited resources to determine how many would be committed on another set of energy prices. The ISO reiterates that most use-limited resources are committed on fifteen minute prices; only three gas-fired use-limited resources have start-up times that would require them to be committed based on day-ahead prices. Day-ahead prices have been lower than fifteen minute prices by, on average, $1-$2/MWh; therefore the difference in commitment decisions between using slightly higher day-ahead prices would be minimal. In addition, the fifteen minute prices have tended to be more volatile than day-ahead prices; the volatility of prices is a driving factor in use-limited resources expending their limitations due to being cycled more frequently than if less volatile, day-ahead prices, were utilized. While the ISO cannot predict the pricing trends to continue given expected changes to the market and resource fleet, the ISO will continue to propose using estimated prices based on the fifteen-minute real-time market energy prices for all use-limited resources that are modeled in the opportunity cost model.

The ISO asked for feedback in regards to adjusting the estimated energy prices used in the model by an index based on future power prices. Future power prices will reflect anticipated market conditions and pricing trends that are not accounted for in the implied heat rate method proposed, such as known changes in hydro conditions one year to the next. This could potentially minimize error between the model estimated usage of the resource and its actual usage. NRG and SDG&E supported the use of future power prices while Wellhead and Six Cities were not supportive. The effectiveness of opportunity costs as an economic tool to better optimize use-limited resources are dependent on reflecting accurate market conditions. To improve upon the market conditions reflected in the estimated LMPs, the ISO is proposing to incorporate the inflator.

The frequency of scheduled re-runs, as well as potentially having impromptu re-runs, was discussed at the workshop. Most stakeholders were supportive of having more frequently scheduled updates. SCE, SDGE, and PG&E all suggested monthly re-runs. SCE, PG&E, Wellhead, and NRG also noted that the ISO should allow for unscheduled re-runs primarily when the resource is being dispatched differently from what the model estimated. Given the proposed frequency of monthly scheduled runs, the ISO is not at this time proposing impromptu re-runs. Monthly runs will require considerable amount of ISO resources, and to include unscheduled and unanticipated re-runs mid-month can become onerous and potentially cause the ISO to fall behind scheduled runs.

All stakeholders supported updating the limits used in the model for scheduled runs by the actual usage of the resource. The Market Surveillance Committee also supported this approach

and noted any potential gaming concern could be observed by DMM. The ISO agrees and proposes to update the limits in the model runs throughout the calendar year by actual usage of the resource.

The ISO will be able to model limitations on starts, run-hours, and output, but recognizes some limitations may be stated in terms of emissions or fuel usage. To model limitations based on fuel or emissions, the limitations will have to be translated into starts, run-hours, and/or output. SCE, Wellhead, and PG&E supported the ISO's option of having market participants be the entity that translates the permits into limits the ISO can model; SDGE did not support this option. Six Cities commented that the ISO should develop a model and calculation that will cover the broadest limitations and allow for future refinements. At this time, the ISO does not intend to directly model emissions or fuel usage in the model but notes that could be a future enhancement item. Given the market participants have the expertise and knowledge of how these resources efficiently operate under the limitations, the ISO proposes the market participants translate emission and fuel limits that can be translated, into starts, run-hours, and output during the registration process.

There were several comments in regards to the negotiated opportunity cost. SCE supported the use of negotiated opportunity costs in general and Six Cities supported the use for MSG resources. Wellhead and PG&E suggested the ISO allow for re-negotiations; PG&E also requested additional clarification on documentation that would be required under the negotiated opportunity cost. The ISO does intend to allow negotiated opportunity costs to be updated on a monthly basis along with the scheduled runs of the market but is not proposing to have impromptu re-negotiations. Additional clarification on the requested documentation is also provided in Section 9.

WPTF commented that use-limited resources should still be able to submit use-limit reached outage cards, as developed through the *Reliability Services initiative*, after the opportunity cost is implemented. The ISO will continue to allow use-limited resources to submit the outage card when a limitation has been reached. A modification to the use of outage cards for use-limited resources is discussed in Section 11.

Stakeholder Comments not addressed in this straw proposal:

NRG prefers the opportunity cost be added to the proxy cost basis and then apply 125% to set the bid cap to reflect the risk of running the resource which is generally not priced by the ISO. At this time, the ISO does not believe this would be an appropriate approach. Generator risk of resulting in major catastrophic maintenance can be reflected in the MMA. Furthermore, FERC has recently required justification for headroom applied to costs used in the ISO markets. WPTF prefers there be no bid caps to commitment costs. At this time, the ISO continues to propose increasing the bid cap by the opportunity cost adder and does not intend to implement uncapped commitment cost bids.

WPTF suggested the ISO seek Board approval concurrently with the Bidding Rules initiative, which is targeted for approval in 2016. While the ISO understands the two initiatives are related, this initiative will be developed in such a way to feed directly into the commitment cost bidding

rules as developed through that initiative. Therefore, this initiative is still targeting Board approval in Q4 of 2015.

Questions posed by stakeholders

A few stakeholders posed questions to the ISO through submitted comments. The ISO has addressed the questions through additional information or clarification in the straw proposal.

Model development and testing

In response to stakeholder comments provided during the *Commitment Cost Enhancements Phase 2* initiative, the ISO delayed finalizing the opportunity cost methodology to this initiative. This was primarily done to allow additional time to develop and test prototype models to ensure such a model was feasible.

At the technical workshop on July 20th, the ISO presented two prototype models and preliminary results. One model was developed using an optimization based solver; the other model was created with a heuristic approach. Preliminary results indicated both prototype models generated similar results. While the platform used to implement policies is traditionally an implementation detail, the ISO presented the two model results at the workshop to:

- show an opportunity cost model is feasible to develop for use-limited resources,
- discuss policy related questions with stakeholders, such as frequency of model runs and modeled limitations, and
- gain insight to stakeholders priorities of policy questions as that will guide the software decision during implementation.

Based on discussion with stakeholders at the workshop, and through submitted comments, the frequency of model runs is a significant factor. For some stakeholders, increased frequency of model runs outweigh the potential additional modeling accuracy of an optimization based approach. Additional testing to ensure the two models continue to generate reasonable results was also suggested by a few stakeholders. The ISO continues to develop and test prototype models and will seek a modeling approach capable of frequent model runs that provides scheduling coordinators an effective tool to manage use-limited resources through the market while accurately reflecting opportunity costs.

5. Use-limited capacity definition

Use-limited resources are defined as resources that cannot operate continuously because of non-economic limitations set forth in regulations, statutes, ordinances, court orders, or due to design considerations. Consequently, the ISO provides for separate treatment of resources that meet the definition to accommodate their use limitations. *Commitment Cost Enhancements Phase 1* clarified that use-limited status is separate from a resource's resource adequacy status.

Therefore, non-resource adequacy resources can also have use-limited status if they meet the definition.

Commitment Cost Enhancements Phase 2 further modified the definition of use-limited to benefit the calculation of opportunity costs as developed through this initiative. The modifications refer to use-limited capacity rather than resources to reflect the fact that a single resource may have both use-limited and non-use-limited capacity or be deemed use-limited for certain parts of the year. There are three key elements of the revised definition, which are bolded below. The revised definition of use-limited is as follows:

> "Capacity with ***limitations or restrictions*** on its operation established by statue, regulation, ordinance, or court order that **cannot be optimized** by the appropriate ISO commitment process **without allowance for opportunity costs**."

First, the limitations accepted by the ISO must be statutory, regulatory, based on an ordinance, due to a court order, or due to the design of the resource. They cannot be contractual or based on economic decisions such as staffing requirements or maintenance cost tradeoffs (e.g. to avoid catastrophic maintenance events).

The next important change in the proposed definition explicitly points out the limitation in the ISO's commitment time horizon and why an opportunity cost should be calculated. The ISO proposed to consider a use-limitation if the applicability[2] of the limitation is longer than the resource's appropriate commitment process in the ISO market. For example, a long start resource with a daily limitation would not be considered use-limited because it is committed in the day-ahead market which optimizes over 24 hours; the applicability of the limitation is 24 hours which is not longer than the optimization horizon of the market which commits the resource. If the same resource has a monthly limitation, then it would be considered use-limited because the day-ahead market does not optimize over the month.[3]

Lastly, there must be an opportunity cost associated with the limitation. A use-limitation is different from an intermittent fuel source. For example, a gas-fired resource with an air permit limiting run hours to 200 per month could physically continue to run more than this limit. Since the run hours are restricted, it is most optimal to only run the resource during the most profitable 200 hours per month. The use-limited capacity has an opportunity cost if it is run in less profitable hours reflecting the foregone profits (*i.e.*, forgone greater benefit to the ISO system).

On the other hand, wind, solar, and geothermal resources (all without storage) run only when the fuel (*i.e.*, energy source) is available. While these generators may have some level of control (*e.g.,* feathering blades) and can submit decremental bids, the fuel supply cannot be optimized

[2] The ISO is using the term "applicability" to mean the time frame for which the limitation applies and not the run time limitation. For example, a long-start resource has an air permit that limits its operation to 200 hours per month. The applicability is the month whereas the run time limitation is 200 hours. Since a month is clearly greater than the 24 hours of the day-ahead commitment process, this resource may apply for use-limited status.

[3] See of Commitment Cost Enhancements Phase 2 Draft Final Proposal http://www.caiso.com/Documents/DraftFinalProposal_CommitmentCostEnhancementsPhase2.pdf for additional detail and more illustrative examples of what would qualify for use-limitation.

by the scheduling coordinator (*e.g.,* wait to use the fuel at a later time in order to maximize profits and system benefit). Therefore, these resources do not inherently have opportunity costs.

In summary, use-limited capacity:

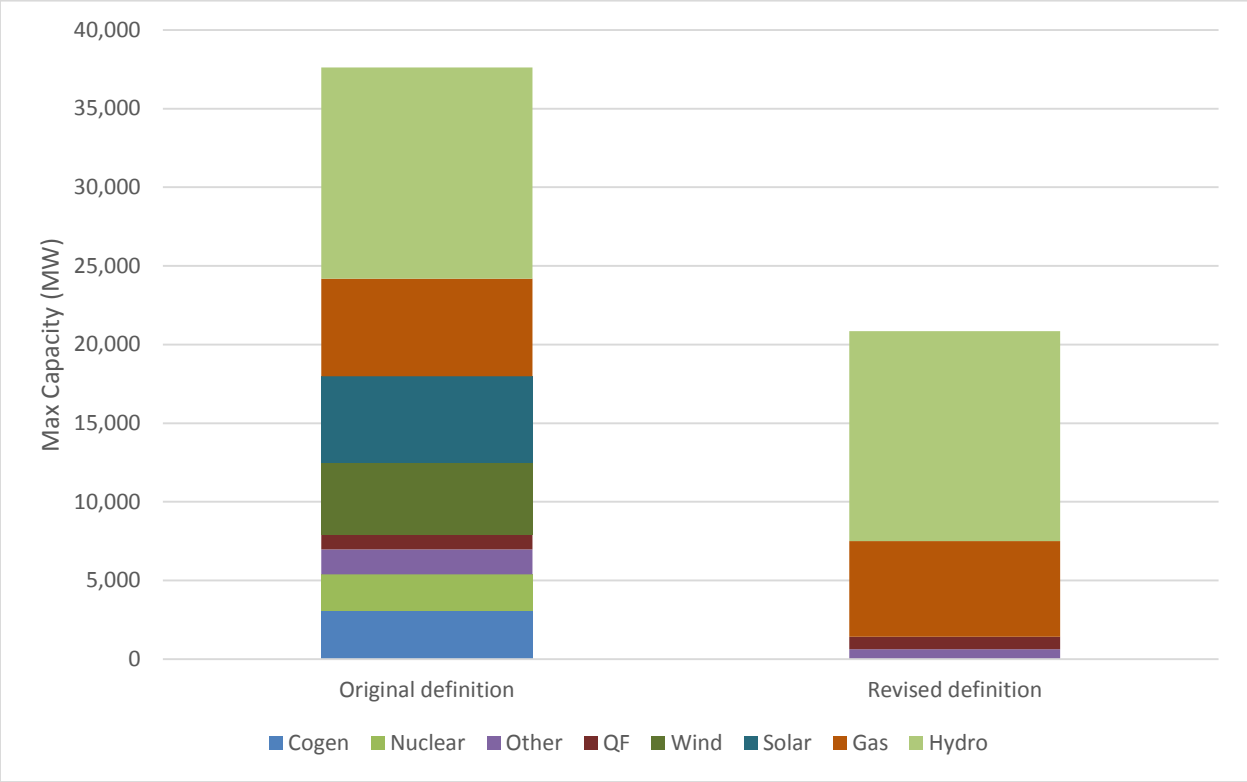
- Is limited by restrictions set forth by statues, regulations, ordinances, court orders, or due to design elements. Limitations cannot be due to economic, contractual, or fuel limitations;
- Cannot be optimized per their limitations because of the ISO's commitment horizon as appropriate for the resource without an opportunity cost adder; and
- Has an opportunity cost.

The discussion in this initiative is based on the proposed modifications made to the definition of use-limited as developed through *Commitment Cost Enhancements Phase 2* initiative[4]. Figure 1 below is provided to gain perspective of the quantity of current use-limited capacity that will likely remain use-limited per the proposed definition. There are currently 659 resources with use-limited status, accounting for almost 38,000 MW. Under the proposed definition the expected use-limited capacity would decrease to almost 21,000 MW, represented by 323 resources[5]. This quantity may increase due to 1) capacity from resource types that are not default use-limited, i.e. biomass, biogas, approved for use-limited status, and 2) resources that do not currently have use-limited status that may apply and qualify for such status under the revised definition.

[4] See Commitment Cost Enhancements Phase 2 Draft Final Proposal for a summary of use-limited categorization changes under the proposed definition of use-limited. http://www.caiso.com/Documents/RevisedStrawProposal-CommitmentCostEnhancementsPhase2.pdf

[5] The determination for which resources will remain use-limited is based on the default status under the proposed definition. Page 13 and 14 of Commitment Cost Enhancements Phase 2 Draft Final Proposal (see link above) contains a table with the default status.

Figure 1 Estimated Use-limited capacity under revised definition



Most of the use-limited capacity under the proposed definition is from hydro resources. Hydro resources are deemed use-limited by the tariff. The ISO expects the majority of these resources to have primarily energy related opportunity costs, which the ISO anticipates will be negotiated. Gas fired resources will likely represent the majority of resources with limitations for which the ISO can model. Regulatory must take capacity from co-generation resources will no longer be considered use-limited; however, there may be additional capacity from co-generation resources above the regulatory must take capacity that could have use-limited status.

6. Recent business practice manual changes to use-limited application process

The ISO has made corresponding business practice manual changes to clarify the current application process for use-limited resources[6] and clarify that a use-limited resource will be considered available 24 hours a day, 7 days a week unless the ISO receives a valid annual or monthly plan.

[6] Existing business practice manual clarifications. See PRR 787 available at: http://bpmcm.caiso.com/pages/default.aspx

Additional changes will be made to the business practice manual for the application process of use-limited resources to reflect refinements made through the *Reliability Services* initiative. During the registration process, scheduling coordinators will:

- Identify resources seeking use-limited status,
- Provide the limitations in terms of starts, run-hours, output, or other,
- Indicate the applicability of those limitations, i.e. monthly, quarterly, annual, and
- Upload required documentation which defines the limitations.

This initiative will expand upon the required documentation for purposes of determining the opportunity cost.

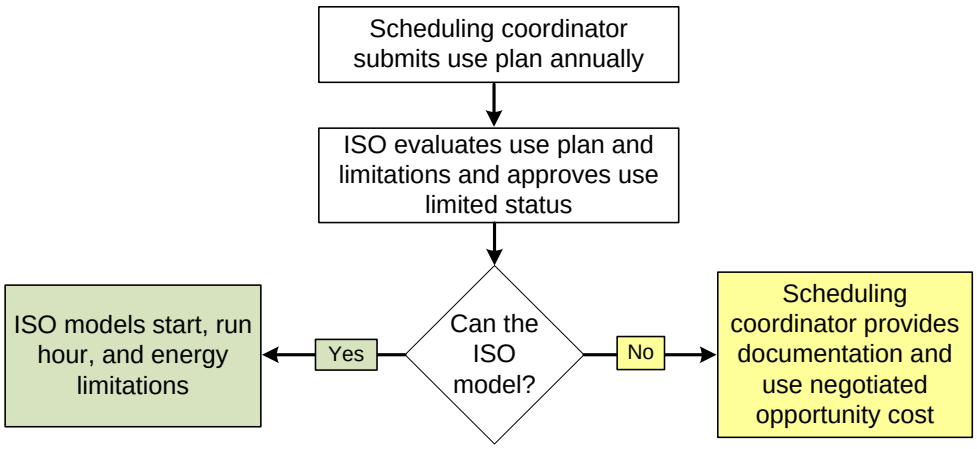
7. Opportunity cost and application process

Evaluating submitted limitations

All use-limited resources will be evaluated to determine if their limitation results in a non-zero opportunity cost. The ISO will not be able to model every type of limitation but will determine if modeling is possible based on reviews of documents submitted as part of the normal use-limited application process. Figure 2 below shows that the ISO will either calculate opportunity costs or work with market participants to develop negotiated opportunity costs after the ISO has received the documentation needed to evaluate use limitations and has approved the resource's use limited status.

The ISO will evaluate each submission on a case-by-case basis and determine whether the ISO can model the opportunity costs. The ISO expects that its calculated methodology will largely be used by gas-fired resources with clearly defined limitations based on starts, run hours, and energy use, as shown in the green box.

Figure 2 Opportunity costs modeled



There may be some resources for which the ISO can model some limitations but not others. The ISO proposes to consider these resources under the negotiated option where the final opportunity cost is a combination of ISO calculated and scheduling coordinator provided data.

Modeled limitations

The proposed opportunity cost model will be able to model limitations on the number of starts, run hours, and/or output. Limitations may be applicable for a day (assuming the resource's commitment process is not the IFM), month, quarter, or year. A resource with more than one limitation which can be modeled will have a calculated opportunity cost for each limitation. For purposes of this initiative, each modeled limitation has two components:

- Operating characteristic: this refers to the operating component which is limited, i.e. starts, run-hours, or output.

- Applicability: this refers to the time frame for which the limitation is applied, i.e. monthly, annual, etc.

Some limitations may not explicitly be a limit on the quantity of starts, run-hours, and/or output but rather in terms of emissions, fuel usage, etc. It is the ISOs understanding that some of these limitations can be translated into a limit on starts, run-hours, and/or output, but may not be a simple translation. For example, emissions may differ at start-up and vary across the operating range of the resource. Scheduling coordinators of these resources have the expertise and knowledge on how they operate most efficiently within their current limitations. Therefore the ISO proposes that market participants translate such limitations into a limit on starts, run-hours, and/or output if possible, and submit the translated limitations to the ISO during the application process. When a limitation is translated into a limit on starts, run-hours, and/or output, the market participant will also provide the ISO documentation summarizing the methodology used to translate the limitations. This documentation will be submitted along with the other required documentation during the use-limitation application process.

Negotiated limitations

Limitations that the ISO determines cannot be modeled will have a negotiated opportunity cost. Based on conversations with scheduling coordinators, many hydro, participating load, and pumped storage resources develop costs based on sophisticated models that synthesize the impact of current and projected hydrology data, including snowpack levels, watershed topology and size, and various fish and wildlife restrictions. The ISO will not be able to replicate such a model. Instead, the ISO expects the scheduling coordinator to provide the opportunity cost(s) and documentation of the modeling methodology for calculating the opportunity cost(s). The resource will then use negotiated opportunity cost adders as approved by the ISO based on the submitted methodology. The ISO expects that thermal host needs for combined heat and power and more complicated environmental permits (*e.g.,* Delta Dispatch), as well as multi-stage generators with use limitations, may also require negotiated opportunity costs.

As discussed below, market participants will be required to provide documentation describing the methodology used to determine the submitted opportunity cost for each negotiated limitation. The methodology will be subject to ISO review. The ISO will allow negotiated opportunity costs to be updated as described in Section 9 below.

Multi-stage generating resources

Use-limited multi-stage generating resources (MSGs) may be use-limited if they meet the criteria set forth in the modified definition of use-limited and are approved such status through the registration process. Based on conversations with scheduling coordinators some limitations on MSG resources apply to the resource in its entirety, i.e. at the parent resource level, while others apply to the configurations and transitions between configurations. The ISO intends to calculate opportunity costs for limitations for which the model can accurately reflect. Therefore, the ISO will determine through the use-limited application process MSG limitations it can model and calculate an opportunity cost, and those it cannot model and would submit a negotiated opportunity cost. Currently, there are nine gas-fired MSG resources with use-limited status that are likely to remain use-limited under the proposed definition.

In some cases, transition costs for MSG resources with limitations on the configuration level become another commitment type cost. Therefore additional consideration as to which commitment costs for MSG resources is warranted and is discussed in Section 10.

Supporting documentation

Through the application process, the market participants will identify the restriction(s) or limitation(s) of the resource. For the resource to be approved as use-limited by the ISO, required supporting documents will be submitted during the registration process.

For each resource applying for use-limited status, the market participant will submit to the ISO original documentation stating the resources' limitations or restrictions due to statutes, regulation, ordinances, and/or court orders. Resources seeking use-limited status due to design considerations will have to submit documentation proving to the ISO why the design of the resource limits the resource in such a way to qualify for an opportunity cost. The ISO will reserve the right to verify and validate the submitted limitations and supporting documents.

In some instances, the market participant may translate the limitation as stated in the original documentation to a limit which can be modeled by the ISO, which is described below. If the limitation has been translated, a document showing the methodology used to translate the limitations as stated in the original documentation to what was submitted in the registration process will be required. The ISO will reserve the right to verify and accept the methodology used to translate such limits.

For limitations that ISO cannot model, they will be eligible for a negotiated opportunity cost as described below. During the registration process, the market participants will provide an opportunity cost for such limitations along with a document describing the methodology used to determine the opportunity cost. The ISO will reserve the right to verify and accept both the methodology used and the submitted opportunity costs during the registration process.

In summary, market participants will identify resources and the limitations of each resource seeking use-limited status during the registration process. In addition, market participates will also need to provide to the ISO for each resource:

- Original documentation, such as environmental permits, statutes, or court orders, citing the limitations of each resource.

- Documents showing the translation of limits as cited in the original documentation into limitations on starts, run-hours, or output for any limitations translated to limitations on starts, run-hours, or output during the registration process.

- For resources with negotiated opportunity costs, an opportunity cost for each limitation.

- A document explaining the methodology used to determine the submitted negotiated opportunity cost for each limitation.

8. Opportunity Cost Model

The Market Surveillance Committee opinion on the *Commitment Cost Refinements 2012* initiative noted committee members' concern that relying on use plans (*i.e.*, limiting the hours a resource is bid into the market to avoid over-use) could result in inefficient use of a unit's limited starts, run-hours, and energy output.[7] Traditionally, the highest prices and need predictably occurred during on-peak hours. With increasing renewable penetration and the need for flexibility and ramping capability, high prices may occur more frequently during off-peak periods that cannot be anticipated by a use plan.

The Committee concluded that it would be more efficient to allow high start-up and minimum load bids that reflect opportunity costs of operation, which then gives flexibility to the market software to determine if the resource is economic. The ISO will seek a modeling approach capable of frequent model runs that provides market participants an effective tool to manage use-limited resources through the market while accurately reflecting opportunity costs. The model will use an algorithm to estimate commitment and dispatch of a resource and the foregone profits of having one less start, run-hour, or MWh to generate. The opportunity costs for each limitation will then be determined by the estimated foregone profits.

8.1. Opportunity cost methodology overview

Table 1 below provides an overview of the major components needed to calculate and utilize the opportunity cost estimates, including the inputs, calculation procedures, outputs, and the usage of the outputs. Under the "inputs" column, the optimization model will rely on limitations provided

[7] http://www.caiso.com/Documents/MSCFinalOpinion-BidCostRecoveryMitigationMeasures_CommitmentCostsRefinement.pdf

to the ISO through the registration process, Master File characteristics,[8] and applicable commitment and variable energy costs to provide a resource- and limitation-specific opportunity cost. This cost is based on calculating the profit (or gross margin) that is foregone in some future interval if one less start, one less operating hour, and/or one less MWh is available, as appropriate. In order for the model to calculate the profit, we will use historical implied heat rates, natural gas future prices, recent gas transportation and greenhouse gas prices, and an inflator based on future power prices to simulate a distribution of the node-specific locational marginal prices for the resource. As noted under the "outputs" column, the model will provide for each resource a specific opportunity cost for each limitation it has over a specific period of time (*e.g.*, month or year). Lastly, the opportunity cost will be reflected in commitment cost bids or added to the resource's DEB.

Table 1 Opportunity cost methodology overview

Model inputs	Opportunity cost calculation	Model outputs
• Use plan limitations • Unit characteristics • Historical commitment costs • Historical implied heat rate • Natural gas futures • Greenhouse gas prices • Gas transportation costs • Future power price conversion factor	Unit commitment model over future time period (*e.g.*, month) based on simulated node-specific LMPs.	Separate resource specific opportunity costs for start-up, minimum load, and energy, as appropriate. Can be reflected in commitment cost bids or resource's DEB.

The subsections below discuss each of the columns in Table 1 in greater detail.

8.1.1. Model inputs

This section discusses resource characteristics and market inputs to the optimization model.

The ISO will rely on submitted use plans to determine the resource's limitation(s). The ISO will also use Master File characteristics such as the minimum load and maximum capacity of the resource. The variable energy cost will be based on the megawatt weighted average heat rate, forward gas prices, recent gas transportation and greenhouse gas costs, and the O&M adder. For commitment costs, the ISO will calculate proxy start-up and minimum load costs based on the recent heat rates, gas transportation and greenhouse gas costs, O&M and major maintenance adders, GMC, and forward gas prices.

Scheduling coordinators will need to know their resource-specific opportunity costs for the month or year prior to the start of that period in order to reflect the costs in their bidding. Therefore the

[8] The model accounts for each resource's minimum run time and minimum down time. It does not consider maximum daily starts in Master File.

opportunity cost of each limitation will have to be calculated in advance of the time period based on simulated future prices.

Most use-limited resources are committed and de-committed based on the 15-minute real time prices; there are three gas-fired long-start use-limited resources that are committed and de-committed based on day-ahead prices. On average, 15-minute real-time prices have been slightly lower than day-ahead prices by $1-$2/MWh, but are more volatile. Price volatility in the real-time market can result in use-limited resources cycling through starts and run hours, thus more likely to expend the limitations. The ISO recognized these pricing trends may not persist as the resource fleet and system conditions evolve. However, based on stakeholder feedback and discussion at a recent Market Surveillance Committee meeting, the ISO proposes to estimate 15-minute real-time prices to use in the opportunity cost model.

The ISO will simulate real-time prices by calculating an implied marginal heat rate at each use-limited resource's pricing node (Pnode) based on fifteen minute real-time energy prices from the same time period the previous year. Each interval's and location's LMP is assumed to reflect the heat rate of a marginal unit, and that heat rate can be inferred from the prices of gas and emissions allowances at that time and place. This procedure will allow the implied heat rate to inherently capture real-time price volatility which will then be used to forecast prices for the current time period. For example, if the ISO is estimating November 2016 prices, we will use November 2015 15-minute real-time energy prices, greenhouse gas costs, daily gas prices, and gas transportation costs. This will generate an implied heat rate for every 15-minute real-time interval, which will then be used to forecast November 2016 real-time energy prices for a given resource.

Implied heat rate, $ImpHR_{i,t-1}$, will be determined as follows:

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

Where

$\text{LMP}_{\text{i,t-1}}$	is the real time energy price at pnode *i* from the previous year's period, *t-1.*
$\text{GHG}_{\text{t-1}}$	is the greenhouse gas allowance price from the previous year's period, *t-1*.
EmRate	is the greenhouse gas content of natural gas, which is *.0531148mtCO2e/MMBtu*[9]
$\text{NatGasP}_{\text{l,t-1}}$	is the daily natural gas price and transportation costs from the region *l* of pnode *i* of the previous year's period, t-1

[9] Per EPA

The ISO previously proposed to simulate the energy prices by multiplying the implied heat rate by the sum of: (1) the most recent natural gas future prices of the applicable month; (2) the most recent gas transportation costs; and (3) the most recent greenhouse gas costs multiplied by the standard emissions rate. Using an implied heat rate from the previous time period to simulate energy prices assumes (1) real time volatility and congestion patterns from the previous year will materialize in the modeled year, and (2) the average nodal LMPs will remain consistent year over year. Changes in market conditions, both anticipated and unanticipated, may result in the estimated energy prices diverging from market energy prices.

Based on discussions with the Market Surveillance Committee and stakeholder feedback, incorporating anticipated changes in market conditions, such as changes in hydro conditions one year to the next, into the simulated energy prices may minimize the need for more frequent model runs. Therefore the ISO proposes to simulate the energy prices as previously proposed, using the implied heat rate methodology described above, but scaling the implied heat rate by a conversion factor based on future power prices. The conversion factor will have a minimum of 1, only increasing estimated LMPs if future power prices indicate higher anticipated energy prices relative to the previous year.

The conversion factor will be generated as follows:

$$PPConv_{h,m} = Max(1, \frac{ImpHRF_{h,m,tou}}{ImpHRH_{h,m-12,tou}})$$

Where:

$ImpHRF_{h,m,tou}$ is the implied heat rate based on the future power price at hub *h* for the analysis month *m* and interval time of use *tou*, calculated as:

$$ImpHRF_{h,m,tou} = \frac{PPF_{h,m,tou}}{NatGasF_{m,l} + (GHGas_{m-1} * EmRate)}$$

where:

$PPF_{h,m,tou}$ is the future power price at hub *h* of pnode *i,* for the analysis month *m* and interval time of use *tou.* Future power prices at NP15 hub will be applied to resources in PGE1 and PGE2 fuel regions; SP15 hub will be applied to resources in SCE1 and SCE2 fuel regions; resources in CISO fuel region will use the maximum future power prices of NP15 and SP15.

$NatGasF_{m,l}$ is the natural gas future price for the analysis month *m* , from region *l* of hub *h*

$GHGas_{m-1}$ is the monthly average greenhouse gas allowance price from the previous month, *m-1*

EmRate is the greenhouse gas emissions rate per MMBtu of natural gas, which is $.0531148 mtCO2e/MMBtu$

And where:

$ImpHRH_{h,m-12,tou}$ is the implied heat rate based on average monthly power price at hub *h* from the same month the previous year, *m-12*, and interval time of use, *tou*, calculated as:

$$ImpHRH_{h,m-12,tou} = \frac{PP_{h,m-12,tou}}{NatGas_{m-12,l} + (GHGas_{m-12} * EmRate)}$$

Where:

$PP_{h,m-12,tou}$ is the monthly average power price at hub *h* of pnode *i* from the previous time period *m-12,* and interval time of use *tou.* Power prices at NP15 hub will be applied to resources in PGE1 and PGE2 fuel regions; SP15 hub will be applied to resources in SCE1 and SCE2 fuel regions; resources in CISO fuel region will use the maximum future power prices of NP15 and SP15.

$NatGas_{m-12,l}$ is the monthly average of daily natural gas price from the region *l* of the previous year's period, *m-12*

$GHGas_{m-12}$ is the average greenhouse gas allowance price from the previous year's period, *m-12*.

EmRate is the greenhouse gas content of natural gas, which is $.0531148 mtCO2e/MMBtu$

Simulated 15-minute real-time energy prices will be generated as follows:

$$LMPi,t = ImpHR_{i,t-1} * PPConv_{h,m,tou} * \left(NatGasF_{\ l,t} + GasTrans_{l,m-1} + (GHGas_{m-1} * EmRate)\right)$$

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 the previous year's period, *t-1*

$NatGasF_{l,m}$ is the natural gas futures for the analysis month for region *l*

$GasTrans_{l,m-1}$ is the average gas transportation cost for region *l* from the previous month

$GHGas_{t,m-1}$ is the average greenhouse gas allowance price from the previous month.

$EmRate$ is the greenhouse gas content of natural gas, which is $.0531148 mtCO2e/MMBtu$

$PPConv_{h,m,tou}$ is the conversion factor based on future power prices at a given hub *h* for the analysis interval *m* and time of use*, tou*

The end result is a set of node specific forecasted 15-minute real-time energy prices for each use-limited resource with a limitation that can be modeled. These forecasted prices will be used in the opportunity cost model, along with the estimated resource costs and characteristics, to estimate the dispatch of the resource over the modeled time period.

8.1.2. Calculating opportunity costs

The ISO will develop a model which estimates a resource's 15 minute interval dispatch, over a given time period, using estimated resource specific costs and characteristics against the forecasted 15-minute real-time energy prices. The ISO will have to run the model, and calculate opportunity costs, prior to the time period for which the limitations are applicable. An opportunity cost will be calculated for each limitation a use-limited resource has that can be modeled.

Start-up limitations: The calculated opportunity cost for a limitation on the number of start-ups will be determined by the estimated profits foregone if the resource had one less start. This will be a $/start-up value.

Run-hour limitations: The calculated opportunity cost for a limitation on the number of run-hours will be determined by the estimated profits foregone if the resource had one less run hour. This will be a $/hour value.

Energy limitations: The calculated opportunity cost for a limitation on the output of the resource will be determined by the estimated profits foregone if the resource had MWh to generate. This will be a $/MWh value.

As previously noted, another element of a resource's limitation is applicability: the time period for which the limitation is applied. The ISO anticipates these to be daily, monthly, quarterly, calendar year, or rolling 12-month limitations. All opportunity costs will be calculated prior to the start of the applicable day, month, quarter, year, or 12-month period. In addition to the initial model run for the upcoming applicable time period, the ISO intends to run the model and update opportunity costs throughout the time period. More detailed information on scheduled runs, and how the opportunity costs are updated, is provided in Section 8.1.2.2. The following describes how opportunity costs for different applicable time horizons will be determined.

Calendar year limitations will have an opportunity cost valid for that calendar year, subject to updated values as a result of scheduled runs within the calendar year.

Rolling 12-month limitations (or other rolling limitations) will have an opportunity cost valid for that 12-month period, subject to updated values as a result of scheduled runs that contain months within the previously modeled time horizon.

Quarterly limitations will have an opportunity cost valid for each quarter, subject to updated values as a result of scheduled runs within, or before, the quarter.

Monthly limitations will have an opportunity cost for each month, subject to updated values as a result of scheduled runs before the month.

Daily limitations will have an opportunity cost for each month, subject to updated values as a result of scheduled runs before the month. The opportunity cost associated with daily limitations for a given month will be determined by the maximum daily opportunity cost from all days within the given month.

8.1.2.1. Nested limitations

A resource may have more than one limitation of the same type, i.e. limitation on starts, with different applicability, i.e. monthly and annual. The model will calculate an opportunity cost for each limitation, monthly starts and annual starts. If the model estimates both the monthly and annual limitations to be binding, i.e. calculates a non-zero opportunity cost, the two opportunity costs can be reflected in the start-up cost bids. However, these two estimated opportunity costs are not additive.

For example, assume a resource has a monthly limitation of 20 starts per month and 140 starts per year. Take the following estimated starts and total profits by month for the calendar year shown in Table 2. Note the total annual starts is 140, therefore the annual start limitation is binding and has a non-zero opportunity cost. The profits from the 140th most profitable start-up would be the opportunity cost for the annual start limitation; assume that occurs in February with an estimated profit of $100/start. The monthly limitation is also binding in two months, June and August. Assume the 20th most profitable start in June was $500/start and $800/start in August. These become the estimated opportunity costs for the monthly limitation for June and August respectively.

Table 2 Example model results

Month	Total Starts	Total Profit
January	10	$1,000
Feb	10	$1,000
March	10	$1,000
April	10	$1,200

May	10	$1,200
June	20	$4,000
July	10	$1,500
August	20	$6,000
Sept	10	$1,500
Oct	10	$1,200
Nov	10	$1,200
Dev	10	$1,200
Total	**140**	**$22,000**

The opportunity cost for start-up costs are those associated with a limitation on starts. In this instance, it would be the opportunity cost due to both the monthly and annual limitations. Table 3 below shows three possible options on how to combine the opportunity cost for the same operating characteristic, i.e. starts, but differing applicability periods, i.e. monthly and annual. The first column sums all the non-zero start-up opportunity costs and provides the same number each month; the second column applies the annual opportunity cost for each month and then adds the corresponding monthly opportunity costs for the binding months, i.e. June and August; the last column takes the maximum non-zero opportunity cost valid for that month. For example, the opportunity cost in June is the maximum of the annual ($100) and monthly opportunity cost for June ($500), while the opportunity cost in August is the maximum of the annual ($100) and monthly opportunity cost for July ($0).

Table 3 Options for combining opportunity costs from nested limitations

Final Opportunity Cost for Starts	Sum all OC	Sum annual with monthly	Max (annual, monthly)
Jan	$ 1,400	$ 100	$ 100
Feb	$ 1,400	$ 100	$ 100
March	$ 1,400	$ 100	$ 100
April	$ 1,400	$ 100	$ 100
May	$ 1,400	$ 100	$ 100
June	$ 1,400	$ 600	$ 500
July	$ 1,400	$ 100	$ 100
August	$ 1,400	$ 900	$ 800
Sept	$ 1,400	$ 100	$ 100
Oct	$ 1,400	$ 100	$ 100
Nov	$ 1,400	$ 100	$ 100
Dec	$ 1,400	$ 100	$ 100

The purpose of the opportunity cost adder is to be high enough such that the resource would not exceed its limitation if included in its commitment cost bids. However, summing all the non-zero opportunity costs of the same type significantly over-estimates the necessary adder. Furthermore, it provides an opportunity cost from the monthly limitations during time periods the limitation was not applicable. The second option, while significantly lower than the first, still over states the opportunity cost in the months for which the monthly limitation is binding as well. For example, if the monthly limit was not binding, a $100 start-up cost adder would be sufficient to optimize the 140 starts over the calendar year. If the annual limitation was not binding, $500 adder would be sufficient to optimize the 20 starts per month in June. Therefore summing the two non-zero opportunity costs during time periods they are both applicable over-states the necessary adder. The ISO is proposing to use the third option, which sets the opportunity cost to the maximum opportunity cost of each limitation which is applicable for that month.

8.1.2.2. Scheduled model runs

The opportunity cost model will be run prior to the time period for which the limitation is applicable. Most limitations are based on a calendar year, therefore the model will need to be initially run in Q4 of the year prior, to calculate opportunity costs for the year the limitation is applicable. As the year progresses, any re-runs of the model will model the months remaining in the calendar year and update previously calculated opportunity costs. Table 4 illustrates how scheduled runs throughout the year will update previously calculated opportunity costs.

Rolling 12-month limitations include the current month and either the preceding or upcoming 11 months. Theoretically, the opportunity cost today is based on energy prices in infinitely continuous 12-month rolling periods. For such limitations, the ISO will always model a single rolling 12-month period; if the limitation is based on the preceding months, the limit used in the model will be adjusted for actual usage during those months. Based on stakeholder discussion and input from the Market Surveillance Committee, this is a reasonable way to approximate opportunity costs for rolling 12-month limitations.

Frequency of scheduled model runs

The closer the model is run to the actual time period for which the limitation is applied, the more accurate the opportunity costs, and more effective the tool is for the market to optimize the use of these resources. Therefore the frequency of scheduled runs is a significant factor in developing opportunity costs through this initiative. At the recent technical workshop, and through submitted comments, stakeholders have encouraged the ISO to update opportunity costs throughout the year as frequently as possible; the effectiveness of the model as a tool is strongly related to the frequency of updates. Some stakeholders mentioned their willingness to forego model accuracy that would not enable more frequent updates, for a model that would enable frequent updates.

Given stakeholder comments, at this time, the ISO proposes to run the model and update opportunity costs monthly[10]. Table 4 below illustrates 1) when the model will be run, 2) what calculated opportunity costs are generated in each model run, and 3) how previously calculated opportunity costs are updated during subsequent model runs.

Table 4 Schedule for calculating opportunity costs

Limit applicability	Current year Dec	Calendar year limitations are applicable							
		Jan	Feb	Mar	Apr	May . . .Sept	Oct	Nov	Dec
Daily and Monthly	Model Jan - Dec	Model Feb - Dec	Model Mar - Dec						
Quarterly	Model Jan - Dec	Model Feb - Dec	Model Mar - Dec						
Annual	Model Jan -Dec	Model Feb - Dec	Model Mar - Dec						
Rolling 12-months	Model Jan -Dec	Model Feb - Jan	Model Mar - Feb						

Where: Binding; Binding, subject to updates; Advisory

Daily and monthly limitations: The December model run will model January through December and generate monthly opportunity costs for daily and monthly limitations. January opportunity costs will be binding; opportunity costs generated for February through December are advisory. The model run in January will model February through December, and produce binding opportunity costs for February and advisory opportunity costs for March through December. This will continue for each month through November where the November run will only model December and produce the final binding opportunity cost for that calendar year; the December run will then model January through December of the next year.

Quarterly limitations: The December model run will model January through December and generate an opportunity cost for each quarter. The opportunity cost for Q1 will be binding for January; the Q1 opportunity cost will also be binding for February and March but may be updated in the January and February model runs. The model run in January will model February through December and update the previously binding Q1 opportunity cost for February and March, and produce advisory opportunity costs for Q2 through Q4. The model run in March will model April through December and produce a binding opportunity cost for Q2, which will be binding for April through June but with May and June values subject to updated model runs. This will continue for each month through November where the November model run will update the previously calculated Q4 opportunity cost for December; the December run will then model January through December of the next year

[10] The software platform that will be used to develop the model and calculate opportunity costs will be determined in implementation. Processing speeding of the software and required CAISO resource time will both determine how frequently the model can be run.

Annual limitations: The December model run will generate one opportunity cost for January through December. That cost will be binding for January but subject to updates from the monthly model runs for the opportunity costs used February through December. Each monthly model run will model the remaining months of the year.

Rolling 12-month limitations: These limitations will be modeled each month as well but always include a 12 month modeled period. The table above assumes a rolling 12-month limitation based on the current month and forward 11 months as opposed to the preceding 11 months. A model run for a rolling 12-month limitation based on the preceding 11 months will only generate one opportunity cost: a binding opportunity cost for the upcoming month.

Model runs that update a previously calculated opportunity cost, whether it was binding subject to updates or advisory, will supersede any prior value. Model updates are intended to more accurately capture changes in gas price futures and how the resource has been used in the market, both of which impact opportunity costs. If those changes result in the limitations being less/more binding due to either lower/higher future gas prices or being committed less/more in the market than anticipated, the opportunity costs need to reflect the changes. Therefore opportunity costs can increase and decrease month to month.

Impromptu re-runs were discussed at the technical workshop as well as through submitted comments. Most stakeholders felt that some method of impromptu re-runs be made available to scheduling coordinators. Given the ISO current proposed monthly scheduled model runs, along with incorporating a conversion factor based on future power prices, the need to have impromptu re-runs has diminished. Therefore, the ISO is not proposing to have impromptu re-runs within a month. As discussed in Section 11, market participants will have outage cards to exempt the resource from RAAIM in the event a resource reaches a limitation and is no longer available.

Updating limitations in model

As the year progresses and the model is run to update opportunity costs, the limits used in the model also need to be updated. The ISO presented three options at both the August Market Surveillance Committee Meeting and the recent technical workshop on this initiative. During both discussions, and through stakeholder comments, one option was preferred by all whom commented on the issue. Therefore the ISO proposes to update the limits used in the model runs throughout the calendar year based on actual commitment and dispatch of the resource in the market. For example, the model run for March through December will reduce an annual limitation on starts by the number of starts the resource incurred in January and February. This will enable the opportunity cost model to accurately reflect unanticipated pricing events that resulted in a resource using more of its limitation than initially estimated by the model by generating a higher opportunity cost for the remaining months.

Based on discussion with stakeholders, there are some instances where a resource may incur a start or run hour that counts towards its limitation but that the ISO market data does not reflect. The ISO considers a resource start when it reaches minimum load. These are primarily failed starts or testing. When a resource has a failed start, testing, or any other even that leads to a reduction in remaining starts, run hours, and/or output that is not reflected in the ISO market data,

the scheduling coordinator will communicate that to the ISO such that it can be reflected in the remaining model runs for that calendar year.

8.1.3. Outputs

Each model run will produce a calculated opportunity cost adder for each limitation type. For purposes of this discussion, an opportunity cost adder is the final opportunity cost associated with either a start, run-hour, or output; it is the value after combining the non-zero opportunity costs of the same type, i.e. start, but varying applicability, i.e. monthly and annual, as described in the previous section.

Start limits will be reflected in an opportunity cost adder for start-up costs; run hour limits will be reflected in an opportunity cost adder for minimum load costs; energy limits will be reflected in an opportunity cost adder for DEBs and generated bids.

Presently, the bid cap for start-up and minimum load costs is determined by 125% of the daily calculated proxy cost. How the opportunity costs are determined to be reflected in commitment cost bids through this initiative will flow directly into the Bidding Rules Initiative. The ISO is proposing commitment cost bids can reflect up to 100% of the opportunity cost for the corresponding commitment cost. For example, if a resource has a $100/start opportunity cost, and the maximum start-up cost bid as determined by the Bidding Rules initiative, excluding the opportunity cost component, is $5,000, the scheduling coordinator can submit a start-up cost bid up to $5,100. Opportunity costs associated with output limitations will be added to the resource's DEB. Therefore:

- Start-up cost bids can reflect up to 100% of the opportunity cost due to a limitation on starts.
- Minimum load cost bids can reflect up to 100% of the opportunity cost due to a limitation on run hours.
- Opportunity costs due to a limitation on output will be added to the resource's Default Energy Bid.

Upon completion of each model run, the ISO will provide each scheduling coordinator a summary of the model outputs for each use-limited resource modeled. The summary will include:

- Estimated usage of each limitation, i.e. starts, run-hours, and/or output, by applicability, i.e. month, quarter, etc.
- Calculated binding and advisory opportunity cost for each limitation.
- Final binding and advisory opportunity cost adder for each limitation type, i.e. start, run hour, and/or output.

This will enable scheduling coordinators to track actual usage to how the model estimated the resource to be committed and dispatched. This will be significantly useful in the first year or so of implementation to aid in identifying any modeling enhancements that may increase the effectiveness of the tool. Furthermore, it will provide some transparency to how the final opportunity cost adders are determined.

9. Negotiated opportunity cost

The ISO anticipates it will not be able to model and calculate opportunity costs for complex limitations, (i.e. Delta Dispatch, run-of-river hydro), that cannot be translated into a limit on the number of starts, run-hours, and/or output. These limitations will have a negotiated opportunity cost. As discussed in Section 7, resources with negotiated opportunity costs will provide additional documentation to the ISO. The documentation will include an opportunity cost for each limitation that cannot be modeled by the ISO along with methodology showing how the submitted opportunity cost was determined.

All required documentation for use-limited registration is due to the ISO by the last day in October. At that time, the ISO will review the limitations and, if necessary, request additional information and documentation from scheduling coordinators with limitations that cannot be modeled. The ISO will then review the submitted negotiated opportunity costs and methodology. If any follow-up is required for missing information or clarification on submitted methodology and/or opportunity cost, the ISO will contact the scheduling coordinators.

As discussed at the technical workshop, and reiterated through submitted comments, stakeholders requested resources with negotiated opportunity costs to also be eligible for updated values throughout the calendar year. The ISO agrees that these resources, while not modeled by the ISO, may encounter unanticipated events that result in running through their limitations faster, or slower, than initially estimated. Therefore the ISO proposes to allow resources with negotiated opportunity costs to submit updated values for the ISO to consider on a monthly basis along with documentation describing what factors have changed which warrant an updated opportunity cost.

Finally, the ISO will be reviewing negotiated default energy bids, many of which include an opportunity cost that may no longer be appropriate once the policies in this straw proposal are implemented. The ISO will be amending section 39.7.1.3 of the ISO tariff to allow the ISO to review and propose modifications to existing negotiated default energy bids and to require the scheduling coordinator to provide updated supporting information and cost justification.

10. Multi-stage generating resources

This section only applies to Multi-stage generating resources.

It is the ISO's understanding that limitations on MSG resources may apply to either the collective resource, i.e. parent level, or on the individual configurations. In cases where transitions between configurations is considered a start to which the limitation applies, transition costs can be

considered another commitment type cost analogous to a start-up cost for that configuration. Essentially the configuration may be started by either 1) being started directly, if a startable configuration, or 2) being transitioned into that configuration. Upon implementation of *Commitment Cost Enhancements Phase 2*, transition costs will also be a biddable commitment cost. Therefore, additional consideration to determine which commitment cost bids may reflect opportunity costs is warranted. The following discussion pertains to all opportunity costs for MSG resources, independent of if the opportunity cost was calculated by the ISO or negotiated. The overall methodology used to determine which commitment costs may reflect the opportunity costs is based on the concept that any commitment type decision, i.e. transition or direct start, made by the market should reflect the appropriate opportunity cost.

For limitations on starts that apply to the collective resource, there will be one opportunity cost. Up to 100% of that opportunity cost may be reflected in the start-up bid for each startable configuration. This ensures that when the market commits the resource from being "off" to "on", the start-up cost incurred can reflect the opportunity cost associated with a limitation on starting the collective resource.

If a start-up limitation considers transitions between configurations as a "start", then the transition costs will also need to reflect the opportunity cost of that limitation. Therefore, in cases where the limitation on starts is applied to the configuration level (i.e. transitions between configurations are considered a start), an opportunity cost will be determined for each configuration. Up to 100% of the opportunity cost can be reflected in start-up cost bid for that configuration as well as the transition costs transitioning into that configuration.

Limitations on run-hours that apply to the collective resource will have one opportunity cost, and up to 100% of that opportunity cost may be reflected in the minimum load cost bids for each configuration of the MSG resource.

Limitations on run-hours that apply to each configuration will have an opportunity cost for each configuration Up to 100% of the configuration opportunity cost may be reflected in the minimum load cost for that configuration.

Limitations on output that apply to the collective resource will have one opportunity cost which will be included in the DEB for each configuration of the MSG resource.

Limitations on output that apply to each configuration will have an opportunity cost for each configuration. The configuration level opportunity cost will be reflected in the DEB for that configuration.

11. Resource adequacy availability incentive mechanism

The Reliability Service initiative modified the must offer obligation for Resource Adequacy resources. Along with the modified must offer obligations, the initiative also implemented the Resource Adequacy Availability Incentive Mechanism (RAAIM) intended to incentivize RA resource to adhere to their must offer obligations.

Use-limited resources may or may not also be RA resources, subject to must offer obligations and RAAIM. For the use-limited RA resources, the Reliability Service initiative also established the following outage card categories specific for use-limited RA resources:

Use-limited reached: When a use-limited resource expends its limitations it can stop bidding into the market, submit this outage card, and be exempt from RAAIM.

Short-term use-limited reached: This card may be submitted for use-limited resources as a tool to manage the resource until the ISO implements opportunity costs. The resource can then stop bidding into the market and be exempt from RAAIM.

The short-term use-limited reached outage card was developed as an interim solution between when RAAIM becomes effective and the ISO implements an economic tool, i.e. the opportunity cost, and can optimize the resource through the market. Once the opportunity cost method is implemented, the outage card can no longer be utilized.

At this time, the ISO proposes to retain the short-term use-limited reached outage card for a transition period. The transition period will allow time for the ISO and scheduling coordinators to become effective in using the opportunity costs in commitment cost bids and address any potential unforeseen issues that may arise. Having the outage card as a safety net for scheduling coordinators during this transition period will aid in a smooth transition away from the outage cards and towards an economic tool to optimize use-limited resources.

12. Next Steps

The ISO will discuss this straw proposal with stakeholders on a conference call on August 31st, 2015. Stakeholders should submit written comments by September 8, 2015 to initiativecomments@caiso.com.