Commitment Cost Enhancements Phase 2

Draft Final Proposal

February 9, 2015

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1. Changes from the revised straw proposal

Section 6 – In response to stakeholder comments, the ISO reiterates that the tariff only recognizes non-economic use limitations. This would mean that contracts signed to economically limit a resource's participation in the ISO markets is not a recognized use limitation. This is a long-standing rule in the ISO tariff and has not been changed in this initiative. To maintain reliability, the ISO expects resources with resource adequacy capacity to be available 24 hours, seven days a week but for non-economic limitations.

The ISO has incorporated discussion on the commitment processes relevant for use limitations.

Section 7 - In response to stakeholder feedback and to allow more time for discussion, development of opportunity costs will be moved to a new initiative, *Commitment Cost Enhancements Phase 3*. In the meantime, use-limited capacity may remain on the registered cost option and use a new "short-term use-limit reached" outage without penalty to manage use limitations.

Section 8 – In response to stakeholder requests, the ISO provides more detailed examples of the proposed calculation of transition costs. The ISO clarifies that the proposed changes will allow for bidding of transition costs consistent with the registered or proxy cost option.

Section 9 – The ISO agrees with stakeholders that there is too much regulatory uncertainty at this time to propose any policy changes to the ISO's current practices. The ISO will continue to monitor the situation and can discuss this issue again with stakeholders when the situation changes.

Section 10 - The ISO agrees with stakeholders that the energy price index and the methodology used to calculate auxiliary start-up costs is not clear. Therefore, the ISO will clarify the existing methodology in a business practice manual as soon as possible. Additionally, the ISO will discuss any proposed changes to the inputs and methodology (inclusive of policy and business practice manual changes) in a stakeholder process, to be determined at a later date.

Section 11 – The ISO agrees with stakeholders that there is currently no need to review the default variable operation and maintenance costs. While the ISO agrees with stakeholders that establishing default major maintenance adders may be beneficial, we will need more time to explore this option. This topic is also delayed to *Commitment Cost Enhancements Phase 3*.

Some stakeholders have suggested improvements in how the ISO accounts for start types and gas transportation costs. The ISO agrees that these issues may need to be reviewed will address them in *Commitment Cost Enhancements Phase 3.* Additionally, the ISO proposes to address the use of the daily start limit field more closely under the *Bidding Rules Enhancements* initiative.

2. Background

Commitment Cost Enhancements (henceforth referred to as Phase 1) 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 2*, is narrowly scoped to continue that discussion and provide additional policy clarifications.

During the winter season of 2013-2014, the ISO energy market experienced abnormally volatile and high natural gas price spikes. The ISO was not able to reflect these price spikes in its resource commitment decisions, which led to inefficient resource dispatch. To address the potential for additional natural gas price spikes for the duration of the winter season, on March 6, 2014 the ISO filed with the Federal Energy Regulatory Commission (FERC) a proposed tariff waiver until April 30, 2014 to take remedial action. In the tariff waiver filing, the ISO also committed to commence a stakeholder process in April to address the issues raised by gas market conditions and to more comprehensively develop an interim solution that can be implemented in fall 2014 if such solutions do not require substantial system changes. FERC granted the ISO's tariff waiver on March 21, 2014.[1]

The ISO started a stakeholder process in April 2014, *Commitment Cost Enhancements Phase 1*, to develop an interim solution to enhance the current options for reflecting resource commitment costs for starting a resource and running at minimum load. The ISO provides two options: 1) the "proxy cost," which updates natural gas prices daily and allows daily bidding up to 100 percent of the calculated proxy cost; and 2) the "registered cost," which updates natural gas prices every 30 days but allows for a fixed, 30-day bid up to 150 percent of the calculated proxy cost. The interim solution modified the current rules by increasing the proxy cost bid cap to 125 percent and eliminating the registered cost option for all resources except those categorized as use-limited resources. The interim solution was approved by the ISO Board of Governors in September 2014 and has been filed at the FERC.[2] Once opportunity costs are implemented for use-limited resources, the registered cost option will be eliminated for all resources.

As Table 1 shows, the *Commitment Cost Enhancements stakeholder* processes are also coordinated with the *Reliability Services* initiative for the development of a more stringent must offer obligation for certain use-limited resources by 2016.

The ISO has added a new initiative, *Commitment Cost Enhancements Phase 3*, to discuss development of an opportunity cost model and additional issues that were not addressed in phase 2. In the meantime, use-limited capacity may continue to use the registered cost option.

[1] *California Indep. Sys. Operator Corp.*,146 FERC 61,218 (2014).
[2] *California Indep. Sys. Operator Corp.*, FERC docket no. ER15-15, October 1, 2014.

The ISO will also address broader market changes related to bidding rules for energy and commitment costs in the *Bidding Rules Enhancements* initiative. These are longer-term market changes that will require significant market design, settlements, and system changes.

Table 1
Commitment cost-related initiatives

Initiative	Description	Policy start	Status
Commitment Cost Enhancements Phase 1	Interim solution to address natural gas price spikes. Proxy cap increased to 125% and only use-limited on registered.	Q2 2014	Implemented
Commitment Cost Enhancements Phase 2	Clarify definition, qualifications, and requirements for use-limited resources with additional commitment cost improvements.	Q4 2014	Policy, coordinate implementation with Reliability Services
Commitment Cost Enhancements Phase 3	Develop opportunity cost adders for use-limited resources with additional commitment cost improvements	Q1 2015	Policy, targeted Q4 2015 Board
Reliability Services	Phase 1 focuses on resource adequacy rules and will develop more stringent must offer obligations for use-limited resources.	Q1 2014	Policy, targeted Q1 2016 implementation
Bidding Rules Enhancements	Longer-term changes to energy and commitment cost bidding.	Q4 2014	Policy

There are two additional processes that deserve mention here:

- First, a separate stakeholder initiative, *Natural Gas Pipeline Penalty Recovery*, created to address potential ISO bid cost recovery of operational flow order penalties under specific limited circumstances, has been closed. The ISO was not able to gain unanimous support from natural gas pipeline companies for this policy due to concerns that ISO cost recovery would undermine natural gas reliability. Therefore, the ISO decided not to pursue this policy change. This decision was presented to stakeholders and the Board of Governors at the December 2014 meeting as an informational item.

- Second, on March 20, 2014, the FERC released a notice of proposed rulemaking (NOPR) to address coordination and scheduling practices of the interstate natural gas pipeline companies and the electricity industry.[3] The NOPR provides the natural gas and electricity industries six months to reach a consensus. While the NOPR is not directly related to commitment cost pricing in the ISO market, issues discussed there may overlap with the ISO's commitment cost-related stakeholder initiatives.

[3] http://www.ferc.gov/whats-new/comm-meet/2014/032014/M-1.pdf

3. Schedule for policy stakeholder 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
Wed 10/29/14	Straw proposal posted
Wed 11/12/14	Stakeholder call
Wed 11/19/14	Stakeholder comments due
Mon 12/22/14	Revised straw proposal posted
Tue 1/6/15	Stakeholder call
Tue 1/13/15	Stakeholder comments due on revised straw proposal
Fri 2/6/15	Joint call with *Reliability Services* initiative to announce move of opportunity cost modeling to *Commitment Cost Enhancements Phase 3*
~~Tue 2/3/15~~ Mon 2/9/15	Draft final proposal posted
~~Tue 2/10/15~~ Thu 2/12/15	Stakeholder call
~~Tue 2/24/15~~ Mon 3/2/15	Stakeholder comments due on draft final proposal
Thu/Fri 3/26-3/27/15	Board of Governors meeting

4. Initiative scope

This initiative was created to develop a methodology and the business rules to calculate opportunity costs for use-limited resources. In doing so, it is necessary to first clarify the current use-limited definition, the process for submitting documentation and qualifying for use-limited status, and modeling those use limitations as opportunity costs.

This initiative also clarifies additional commitment cost-related issues such as transition costs, greenhouse gas costs, and related business practice manual changes. Transition costs are costs incurred by multi-stage generators when transitioning from one configuration to another. They can also be thought of as start-up costs when "starting" a new configuration. *Commitment Cost Enhancements Phase 1* did not make any changes to transitions costs. In this initiative we reevaluate the current calculation of transition costs and how they are similar to start-up costs for non-multi-stage generators.

The *Commitment Cost Refinements, 2012* stakeholder process[4] incorporated greenhouse gas costs into commitment costs for those resources subject to California's greenhouse gas program. This initiative considers additional greenhouse gas compliance on natural gas suppliers.

[4] http://www.caiso.com/informed/Pages/StakeholderProcesses/CommitmentCostsRefinement2012.aspx

Business practice manual changes will be necessary to clarify the current policy as well as support new policy developed in this initiative. Though changes to the business practice manuals do not require FERC approval and have a separate change process, this revised straw proposal discusses those changes to help stakeholders track closely related issues.

The remainder of this paper is divided into the following sections. Section 5 summarizes all of the proposals. Section 6 clarifies the definition of and process for qualifying for use-limited status. Section 7 notes that the opportunity cost discussion will be addressed under *Commitment Cost Enhancements Phase 3*, targeting a later Board approval date. The remainder of the *Commitment Cost Enhancements Phase 2* initiative will be presented at the March Board meeting for approval. Section 8 aligns the treatment of multi-stage generator transition costs with start-up costs. Section 9 considers extending the greenhouse gas costs to thermal resources not subject to California's greenhouse gas program. Section 10 discusses the business practice manual changes in progress and references additional changes that need to be made pursuant to policy developed in this stakeholder initiative. Section 11 discusses a potential review of default variable operation and maintenance costs and default major maintenance adders. Section 12 discusses next steps.

5. Summary of proposals

Table 2 summarizes the changes by topic, and whether it is new policy or clarifications to the existing business practice manuals (BPMs).

Table 2
Summary of proposals

Topic	Change	Type of change*
Use-limited definition	Revised definition and new flag	Policy
	Application process for use-limited status including documentation	Existing BPM clarifications
Transition costs	Clarify calculation used in start-up costs	Existing BPM clarifications
	New methodology to calculate transition costs and allow bidding	Policy
Greenhouse gas costs	Given the regulatory uncertainty, ISO proposes no changes at this time. The ISO will continue to monitor and propose changes as necessary in another stakeholder initiative	None
Costs for non-thermal resources	Clarify that non-thermal resources may use the "fuel cost" field to reflect certain costs	Existing BPM clarifications and implementation changes
Major maintenance adder	Clarify the documentation required for and methodology to calculate major maintenance adders and responsible	Existing BPM clarifications

	parties.	

*The *type of change* category only reflects whether the topic is new policy or only requires clarification to an existing business practice manual section. It does not determine whether the policy changes will be detailed in the tariff or in a business practice manual. Consistent with the existing FERC-approved ISO tariff, the ultimate tariff language may mention the new policy and provide relevant details in a business practice manual.

6. Use-limited definition

Use-limited resources cannot operate continuously because of environmental, operational, or other non-economic limits. Consequently, the ISO provides for a separate treatment of these resources in accordance with their approved limitations. *Commitment Cost Enhancements Phase 1* clarified that use-limited status is separate from resource adequacy as shown in the first column of Table 3.[5] Therefore, non-resource adequacy resources can also apply for use-limited status. While some resources are deemed use-limited under the tariff, all others must apply for use-limited status.[6]

The ISO proposes to further modify the use-limited definition to what is presented in the second column.[7] These clarifications will greatly benefit the subsequent calculation of opportunity costs. In addition, the ISO will separately identify resource adequacy capacity that will be exempt from the requirement to bid their capacity.

Table 3
Existing and proposed use-limited capacity definition

Existing	Proposed
A resource that, due to design considerations, environmental restrictions on operations, cyclical requirements, such as the need to recharge or refill, or other non-economic reasons, is unable to operate continuously. This definition is not limited to Resource Adequacy Resources. A Use-Limited Resource that is a Resource Adequacy Resource must also meet the definition of a Resource Adequacy Resource.	Capacity with limitations or restrictions on its operation established by statute, regulation, ordinance, or court order that cannot be optimized by the appropriate ISO commitment process without allowance for opportunity costs.

[5] *California Indep. Sys. Operator Corp.*, FERC docket no. ER15-15, October 1, 2014.
[6] Based on tariff section 40.6.4.1, hydroelectric generating units, proxy demand resources, reliability demand response resources, and participating load, including pumping load, are deemed to be use-limited.
[7] Policy change.

First, the ISO proposes to refer to use-limited *capacity* rather than resources.[8] This more accurately reflects the fact that a single resource may have both use-limited and non-use-limited capacity or the resource may only be designated use-limited for certain parts of the year. For example, a combined heat and power resource may have use-limited capacity above its regulatory must-take capacity but not below it. Another resource may have an air permit limiting its capacity's run hours only during the summer months.

The limitations accepted by the ISO must be statutory, regulatory, based on an ordinance, due to a court order or operational in nature. They cannot be economic or contractual. The ISO cannot provide an exhaustive list of what the acceptable limitations are but Table 4 below provides illustrative examples.[9] The ISO is seeking feedback from stakeholders on whether the explanations below provide enough guidance.

Table 4
Sample of use limitation sources and examples

Acceptable?	Source	Non-exhaustive list of examples
Yes	Statutes, regulations, ordinances, or court order	• Such as from Air Quality Management Districts, California Energy Commission, Local Regulatory Authorities, etc. o This limitation is largely environmental and most commonly in the form of an air permit. For example, emissions limitations with an absolute limit (cannot pay to emit more and would incur a penalty), wildlife/natural resource management, noise restrictions, etc.
	Operational	• Limited due to the actual design of the resource. o This limitation is largely applicable to hydro, pumped storage, participating load, and combined heat and power. For example, limited reservoir storage capacity or interruption of host functions for combined heat and power capacity above the regulatory must-take capacity, etc.
No	Contractual	• Limitations based on a power purchasing or tolling agreements
	Economic	• To reduce wear and tear • Staffing constraints or lack of investment • Avoid purchasing more credits, allowances, etc. to manage emissions (*e.g.*, South Coast Air Quality Management District allows purchase of additional permits rather than a strict limit) • Did not procure fuel (potentially because it was expensive)
	Fuel intermittency	• Variable energy resource o Such as wind and solar without storage, geothermal

[8] Policy change.
[9] Business practice manual change supporting new policy.

The limitations may be statutory, regulatory, based on an ordinance or court order (such as an air permit from a local regulatory authority) or operational (such as supporting a thermal host for combined heat and power resources) but must be non-economic (*i.e.*, not based on contractual obligations or other economic decisions such as staffing requirements).

Commitment processes and use-limitations

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. As Table 5 shows, the ISO commits long-start resources in the day-ahead (integrated forward market or IFM) and medium- and short-start resources in the short-term unit commitment (STUC) and short- and fast-start resources in the real-time unit commitment (RTUC).[10] While all day-ahead awards are financially binding, only long-start resources have *operationally* binding commitments in the IFM. All other resources with shorter start-up times will have an operationally binding commitment in one of the real-time market processes. Short-start resources straddle both the STUC and RTUC processes but will be considered in RTUC for the purposes of analyzing use limitations.

Table 5
ISO commitment processes relevant for use limitations

Attribute	Fast-start	Short-start	Medium-start	Long-start	Extremely long-start
Start-up time	≤10 minutes	< 2 hours	2 to 5 hours	5 to 18 hours	>18 hours
Cycle time		≤ 270 minutes	≤ 270 minutes		
Day-ahead application					
IFM (24 hours)	Financial commitment	Financial commitment	Financial commitment	Financial and operationally binding commitment	No commitment
Real-time applications					
STUC (approx. 5 hours)	Advisory or operationally binding commitment	Advisory or operationally binding commitment	Operationally binding commitment	No commitment	No commitment
RTUC (~1 hour or 4 to 7 subsequent 15-min intervals)	Operationally binding commitment	Advisory or operationally binding commitment	No commitment	No commitment	No commitment

[10] Extremely long-start resources are committed separately in the Extremely Long-Start Commitment Process.

The ISO proposes to consider a use-limitation if the applicability[11] of the limitation is longer than the resource's appropriate commitment process. The appropriate commitment process for each type of resource's use-limitation consideration is highlighted in Table 5 above. Table 6 below provides examples of this proposal.

Resources A1 and A2 in Table 6 are both long-starts and therefore committed in the day-ahead, which currently has a time horizon of 24 hours. For resource A1, the permit has a daily start limitation that is applicable for 24 hours. Since this is equal or less than the commitment time horizon, A1 is not use-limited. On the other hand, A2 has an illustrative limit of 100 run hours per year. The limiting factor is the applicability of the permit, which is one year and is longer than the commitment process for this long-start. Notice that the 100 hour limitation is not relevant. A2 may be considered a use-limited resource in the ISO market.

Resources B1 and B2 are both medium-starts and therefore committed in STUC, which currently has a time horizon of approximately four hours. For both resources, the applicability of the limitation is longer than the commitment horizon. Therefore, both resources may be considered use-limited resources in the ISO market

Resources C1 and C2 are both short-starts and D1 and D2 are fast-starts and therefore committed in RTUC, which currently has a time horizon of approximately one hour. For all four of these illustrative resources, the applicability of the limitation is longer than the commitment horizon. Therefore, they may be considered use-limited resources in the ISO market

Table 6
Examples of ISO commitment processes and use limitations

	Resource type	Operationally binding commitment process	Commitment process time horizon	Limitation *(assume from air permit)*	Applicability of limitation	Is applicability > commitment process time?
A1	Long-start	IFM	24 hours	1 daily start	24 hours	No, not use-limited
A2				100 run hours per year	One year	Yes, use-limited
B1	Medium-start	STUC	4 hours	1 daily start	24 hours	Yes, use-limited
B2				100 run hours per year	One year	Yes, use-limited
C1	Short-start	RTUC	1 hour	1 daily start	24 hours	Yes, use-limited
C2				100 run hours per year	One year	Yes, use-limited
D1	Fast-start	RTUC	1 hour	1 daily start	24 hours	Yes, use-limited
D2				100 run hours per year	One year	Yes, use-limited

[11] 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.

This standard is applicable to Energy Imbalance Market (EIM) entities seeking use-limited status and intertie resources that are dynamic transfers. No other intertie resources can apply for use-limited status.

Intermittent resources

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). Since the ISO commitment software cannot optimize the resource over the month without opportunity cost adders, we currently do not automatically generate bids for the resource but instead allow scheduling coordinators to bid in accordance with a submitted use plan.[12] Similarly, hydro resources may be limited by a combination of storage capacity and fish and wildlife restrictions.

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 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.

Use limitation in other contexts

The ISO clarifies that designation of "use limited" in the ISO market is not a reflection on how this term is used in other forums (*e.g.*, California Public Utilities Commission) or a judgment on the actual statute, regulation, ordinance, court order, or operational characteristic. For example, if the California Public Utilities Commission uses its own definition of "use limited" to grant resource adequacy capacity, the ISO does not change this designation. The ISO respects the Commission's designation and then applies the ISO's rules applicable to resource adequacy capacity obligations (such as a must offer obligation) for participation in the ISO markets. The resource can additionally apply for use-limited status in the ISO market if it meets the criteria in the proposed definition. Therefore, the ISO can have the following four types of capacity: 1) resource adequacy and use-limited; 2) resource adequacy and not use-limited; 3) not resource adequacy and use-limited; and 4) not resource adequacy and not use-limited.

[12] Most resources with a resource adequacy designation have a must offer obligation to bid that capacity into the market or else the ISO automatically generates a bid. Use-limited resources are exempt from automatic bid insertion unless there is a residual unit commitment availability bid or residual unit commitment schedule for a resource without a corresponding economic bid or self-schedule. Changes under the *Reliability Services* initiative will address must offer obligations for use-limited resources. See: http://www.caiso.com/informed/Pages/StakeholderProcesses/ReliabilityServices.aspx

Similarly, if the resource has an air permit limiting its operation, the ISO does not question the premise or content of the air permit. However, the ISO will have requirements for providing documentation and validating that sufficient information is provided to the ISO. The ISO can deny use-limited status if the resource has not submitted the appropriate or complete documentation.

Table 7 below is partially reproduced from the *Reliability Requirements* business practice manual. Text copied from the manual is in black and bolded text in blue reflect changes to the use-limited categorization under the proposed definition. The table provides general non-binding guidelines regarding the scope of use-limited status.

The first two changes under **gas-fired resources** with limited fuel storage and environmental restrictions clarify that approval of use-limited status means the limitation cannot be modeled by the ISO optimization without opportunity cost adders because it runs over a single day.

Hydro resources and participating load (including pumping load) will all remain "deemed use-limited" capacity under the proposed definition.

As noted above, **wind and solar** generators will not be considered default use-limited capacity under the proposed definition. However, tariff section 40.6.4.3.4 exempts them from automatic bid insertion in the day-ahead and real-time markets. This section is currently in the use-limited discussion in the tariff. The ISO proposes to retain this exemption but move it to an appropriate section in the tariff so that it is not subsumed under the use-limited definition.[13] Impact on Resource Adequacy designation is discussed below in Section 6.1.

Qualifying facilities (QFs) with existing QF contracts (grandfathered Public Utility Regulatory Policies Act contracts) under the ISO tariff are categorized as regulatory must-take resources, a type of self-scheduling, and are exempt from the standard capacity product availability standard reporting requirements related to resource adequacy capacity. This largely negates the need for additional use-limited status. Since the resources are self-scheduled, there is no opportunity cost. Similarly, QFs that are 20 MW or less are also entitled to regulatory must-take status and would not qualify for use-limited status. QFs with amended QF contracts will be treated as non-use-limited capacity unless they qualify otherwise under the proposed definition. Qualifying facilities that have signed the Net Scheduled Participating Generator Agreement are discussed below in the combined heat and power description. Impact on resource adequacy designation is discussed below in Section 6.1 Regulatory must-take capacity that is also resource adequacy capacity will be exempt from the bidding obligation.

Proxy demand and reliability demand response resources are deemed use-limited by the tariff and the ISO does not propose any changes to this status. Reliability demand response resources do not have non-zero start-up or minimum load costs and therefore do not have commitment cost-related opportunity costs. Proxy demand resources may have shut-down costs and minimum load costs that the ISO may consider. However, both can have energy-

[13] Policy change.

based opportunity costs. The ISO would only calculate these costs to include in a default energy bid if these resources were mitigated as part of the market power mitigation process. But since demand response is not subject to mitigation, there is no need for the ISO to calculate these costs. Proxy demand resources can directly reflect opportunity cost in the energy bids up to the offer cap and reliability demand response resources are already required to bid in near the offer cap.

Combined heat and power resources that are not subject to an existing QF contract (grandfathered Public Utility Regulatory Policies Act contract) but have signed a Net Scheduled Participating Generator Agreement can have the capacity used to support a thermal host designed as regulatory must-take, which will be exempt from the offer obligation. Tariff section 4.6.10 determines the maximum regulatory must-take capacity. Above this amount, the resource can apply to be treated as use-limited capacity if it can demonstrate that the ISO's co-optimize of non-regulatory must-take capacity would unduly interfere with the operation of the thermal host or undermine regulatory policy objectives concerning efficiency or greenhouse gas emissions.[14] Impact on resource adequacy designation is discussed below in Section 6.1.

Nuclear resources under the ISO tariff are also categorized as regulatory must-take resources. Similar to QFs, the ISO proposes to remove nuclear units from the use-limited designation. Impact on resource adequacy designation is discussed below in Section 6.1. These resources will also be exempt from the must offer obligation.

The last four rows have been added to the original table and assumes none of the generation types are QFs subject to existing QF contracts. As noted above, **geothermal** resources' fuel source is limited in the same way that wind and solar are and do not qualify for default use-limited status. As circumstances change, these resources may apply for use-limited capacity designation via the same process as other resources.

If **storage** resources can be fully optimized by the ISO within the optimization time horizon, then they do not qualify as use-limited. This does not apply to storage resources such as participating load or pumped storage (and are already deemed use-limited). The ISO understands from the California Energy Storage Alliance (CESA) that modern storage devices (*e.g.,* fly wheels) are not yet large enough to charge or discharge beyond the current ISO optimization time horizon of a single trade date in the day-ahead. If this should change in the future, these storage resources may apply for use-limited status like any other resource with an acceptable limitation. Impact on resource adequacy designation is discussed below in Section 6.1

We seek stakeholder feedback on how to address potential limitations for **biomass, landfill gas, and other resources** not discussed. Thus far, stakeholders have not objected to the ISO's classifications. These resources will not be default use-limited but may apply for such status based on the acceptable limitations.

[14] Addendum to Draft Final Proposal, Regulatory Must-Take Generation stakeholder initiative, April 30 2012, California ISO. http://www.caiso.com/Documents/Addendum_DraftFinalProposal-RegulatoryMust-TakeGeneration.pdf

Lastly, only **dynamic transfers** are allowed to apply for use-limited status. All other intertie resources cannot be considered use-limited.

Table 7
Use-limited categorization changes under proposed definition

Resource type	Use-limited (Yes/No)	Proposed changes
Gas-Fired (Steam)	No	**None**
Gas-Fired (Combined Cycle)	No	**None**
Gas-Fired (GT with limited fuel storage)	Yes	**Not use-limited if can be optimized by ISO**
Gas-Fired (GT without limited fuel storage)	No	**None**
Gas-Fired with environmental restrictions that constraint its operation	Yes	**Not use-limited if can be optimized by ISO**
Hydro-Large Storage	Yes/No - although Hydro with large amount of storage may have more flexibility to generate on demand and thus may not be use-limited in a manner similar to a run-of-the river, downstream water flow and water-release needs and other environmental conditions may dictate output so as to warrant Use-Limited status	**None. This category should also include participating load, including pumping load.**
Hydro-Small Storage/Small Conduit	Yes	**None**
Hydro-Run of the River	Yes	**None.**
Wind	Yes	**Not default use-limited. Do not have to bid in DAM (40.6.4.3.4). Assume same treatment in RTM.**
Solar	Yes	**Not default use-limited. Do not have to bid in DAM (40.6.4.3.4). Assume same treatment in RTM.**
Nuclear	Yes	**Not use-limited – regulatory must-take.**
QF	Yes	1. **With existing QF contract** – not use-limited. Is already considered regulatory must-take. 2. **Is 20 MW or less** - not use-limited. Is already considered regulatory must-take. 3. **With amended QF contract** – not default use-limited. May apply based on proposed definition.

Resource type	Use-limited (Yes/No)	Proposed changes
Resource with Contractual Limitation that Limits Availability	No	4. **With Net Scheduled Participating Generator Agreement –** see discussion below on combined heat and power **This is an overarching requirement, not just under QFs.**
Clarification: Proxy demand and reliability demand response resources	**Yes, per current tariff section 40.6.4.1**	**No commitment-related opportunity cost for RDRR. Both may have energy-related opportunity costs but ISO may not calculate because these resource types are not currently mitigated.**
New: Combined heat and power	**n/a**	**Not use-limited for regulatory must-take capacity; may apply for use-limited status for capacity above regulatory must-take.**
New: Geothermal	**n/a**	**Not default use-limited.**
New: Storage	**n/a**	**Not default use-limited.**
New: Biomass, landfill gas, others	**n/a**	**Not default use-limited.**
Intertie resources	**n/a**	**Only dynamic transfers may apply for use-limited status.**

This proposal does not change the definition or use of the terms "dispatchable" and "non-dispatchable." Under the current paradigm, non-dispatchable use-limited resources include regulatory must-take, regulatory must-run and fuel limited resources such as wind, solar, and some combined heat and power, biomass, hydro, and geothermal units. However, this proposal may eliminate or vastly decrease resources considered non-dispatchable *use-limited* and instead categorize them as non-dispatchable only. As a consequence, resources that have been previously exempt from the residual unit commitment process per tariff section 40.6.4.3.2 may now be subject to it if they have resource adequacy capacity.[15]

In summary, use-limited capacity:

- Is limited by operational limitations or restrictions established by statue, regulation, ordinance, or court order that is not 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.

[15] Policy change under the Reliability Services Initiative.

6.1. Use-limited designation and resource adequacy

As discussed in the tariff stakeholder process for *Commitment Cost Enhancements*, use-limited capacity need not be a resource adequacy resource. Consequently, the ISO proposes that two existing flags in the Master File be used as follows: 1) the use-limited flag may be used for use-limited capacity regardless of resource adequacy status and 2) the must-offer flag may be used more generically (and may be renamed) to indicate that the ISO does not insert a bid regardless of resource adequacy status.[16] The use-limited flag may be used to indicate that the resource has an opportunity cost (and may also be renamed to reflect this use). A single resource may have one, both or none of the flags selected. The *Reliability Services* initiative will establish the criteria for which the ISO uses the no bid insertion flag for both use-limited and non-use-limited resource adequacy capacity.[17]

The December 10, 2014 working group of the *Reliability Services* initiative has proposed the following changes to coordinate with the change in default use-limited status for certain resources.[18] Specifically:

- Continue to exempt use-limited resources, regulatory must-take, non-generator resources, and variable energy resources from generated bid rules;
- Continue to exempt hydro, pumping load, and non-dispatchable, use-limited resources, and qualifying facilities from residual unit commitment.
    - Wind and solar may need specific provisions that recognize that their residual unit commitment obligation is equal to their day-ahead schedule.

Currently two use-limited resources that do not individually meet the definition of a flexible resource can be combined to meet the flexible resource criteria (Section 40.10.3.2(b)(2)). The ISO does not propose to change this policy.

Lastly, the business practice manual discussion for use-limited resources will be moved out of the Reliability Requirements manual to the Market Operations manual.[19] The separately published Use-Limited Resource Guidebook will be subsumed into the use-limited discussion in the Market Operations manual.[20]

6.2. Current application process

The ISO has made corresponding business practice manual changes to clarify the current application process for use-limited resources. The ISO submitted changes to require an

[16] Policy change.
[17] See http://www.caiso.com/informed/Pages/StakeholderProcesses/ReliabilityServices.aspx
[18] Presentation available at: http://www.caiso.com/Documents/AgendaPresentation-ReliabilityServices-WorkingGroupDec122014.pdf
[19] Business practice manual change pursuant to policy change.
[20] The guidebook is currently available at: http://www.caiso.com/Documents/Use-LimitedResourceGuideBook.pdf

affidavit verifying that each resource categorized as use-limited continues to qualify as such the next calendar year.[21] In addition, the ISO clarifies 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.

Additional changes will be made in the Reliability Service Initiative to further refine the current application process.

7. Opportunity costs

In response to stakeholder feedback and to allow for more time for discussion, the ISO will not implement a model for calculating opportunity costs for use-limited resources by Fall 2015. While the remainder of this proposal will move to March Board, the opportunity cost model discussion will be split off into a new initiative, *Commitment Cost Enhancements Phase 3*, along with minor commitment cost items not addressed in this initiative. The ISO will target a later Board date for phase 3, likely in Q4 2015. The ISO still commits to work with stakeholders to provide a prototype and hold technical workshops as necessary. In the meantime, use-limited resources may continue to use the registered cost option to reflect opportunity costs and take advantage of a new "short-term use-limit reached" outage without penalty to manage use limitations. These changes were discussed at a joint call with the *Reliability Services* initiative on February 6, 2015. Stakeholders can also refer to the addendum to the draft final proposal for the *Reliability Services* initiative.[22]

8. Transition costs

This topic only applies to multi-stage generators.

Transition costs are a type of start-up cost specific to multi-stage generators. Transitions costs can be thought of as the costs to "start" a configuration (or conversely the cost savings to "shut down" a configuration). The ISO maintains the separate terminology to differentiate between changes in configuration when the resource is already on versus plant-level start-up, which turns the resource "On" or "Off" per the ISO tariff definitions. A plant-level start reflects an operational need to validate a physical start and adherence to certain physical parameters such as inter-temporal constraints for the plant, versus the configuration. Otherwise, they are the same.

8.1. Transition cost current business practice manual changes

The ISO currently does not allow scheduling coordinators to submit a major maintenance adder for non-start-upable configurations. However, the ISO has clarified that for resources with an

[21] Existing business practice manual clarifications. See PRR 787 available at: http://bpmcm.caiso.com/pages/default.aspx
[22] See http://www.caiso.com/informed/Pages/StakeholderProcesses/ReliabilityServices.aspx

approved major maintenance adder in a start-able configuration, the adder from the highest start-able configuration below the non-start-upable configuration, will be added to the non-start-up-able configuration for the purposes of calculating the transition cost. This process is needed to prevent negative calculations from missing data. The ISO has made this clarification in Attachment L of the Market Instruments business practice manual.[23] This can be accomplished without any policy changes and will largely preserve the current calculation of transition costs.

8.2. Transition cost policy changes

The ISO proposes to simplify the transition cost calculation by clarifying its definition and providing guidelines on how it will be calculated. As a consequence of these changes, scheduling coordinators will be able to bid transition costs under the proxy or registered cost options.

8.2.1. Transition cost current calculation

Table 8 below is reproduced from the sample transition cost calculation spreadsheet posted on the ISO website.[24] The figure shows a four configuration resource that can start directly into configurations 1 and 3 but not into 2 or 4. The fields in yellow are based on information provided by the scheduling coordinators (or otherwise stored in the Master File). The ISO expects the data provided for the heat input, configuration Pmin and configuration start-up time to reflect the resource's actual unit-specific performance parameters and may be different for each configuration. On the other hand, the monthly GPI (gas price index), GHG (greenhouse gas) price and emission rate and the GMC (grid management charge) are the same for all configurations. The 10 percent cost adder in the last column is a calculation embedded in the spreadsheet. Lastly, the major maintenance adder column should be populated based on costs submitted to and approved by the ISO pursuant to the processes and rules in Appendix L of the Market Instruments business practice manual (incorporating the recent changes to be made as discussed in Section 10). Once the major maintenance adders have been approved, they will be stored in the Master File.

[23] Existing business practice manual clarifications (completed). See PRR 782 available at: http://bpmcm.caiso.com/pages/default.aspx

[24] "See Multi Stage Generating Resource Transition Cost Validation Sample Spreadsheet v2" available at: http://www.caiso.com/market/Pages/NetworkandResourceModeling/Default.aspx

Table 8
Current sample start-up cost calculation for multi-stage generator

STEP 1:	Calculate proxy start-up values for each configuration, and apply a 10% adder											
	The values in cells highlighted in yellow are supplied by the SC.											
		Configuration Proxy Start-Up Costs – For validation of rule 1 ONLY										
	Enter Configuration IDs	Configuration	Start-able	Heat Input (MMBtu)	Monthly GPI ($/MMBtu)	Monthly GHG Price	GHG Emission Rate	Major Maint. Adder	Configuration Pmin	Config Startup Time	GMC	Cost + 10%
	Config 1	1 - Startable	Y								0.3626	$ -
	Config 2	2	N		$0.00	$0.00	0				0.3626	$ -
	Config 3	3 - Startable	Y		$0.00	$0.00	0				0.3626	$ -
	Config 4	4	N		$0.00	$0.00	0				0.3626	$ -

Eliminate cost boundary rules

Currently the ISO relies on two separate rules to bound transition costs:

> Rule 1: Constrains the transition costs along each feasible path from offline to each configuration such that their sum is between 100 percent and 125 percent of the cost (plus 10 percent) associated with starting up directly to that configuration.
>
> Rule 2: Limits transition costs between configurations such that the sum of nested transition costs is between 100 percent and 125 percent of the direct transition.

The ISO proposes to eliminate both rules and change how transition costs are calculated.[25]

8.2.2. Transition cost proposal

A transition cost is a type of start-up cost

The ISO will clarify that the transition cost is the cost to transition between multi-stage generator configurations when the resource is already "On." It is the ISO's understanding that the transition cost reflects the fuel input and major maintenance costs, as appropriate, to transition from one configuration to another. The fuel input is based on the resource's actual unit-specific performance parameters, as required in tariff section 30.4.1.1.1. Since the transition is a start-up, there is no transition cost when transitioning to a lower configuration just like there is no start-up cost when shutting down.[26]

[25] Policy change.
[26] However, there are resources that have explicit shut-down costs.

Start-up costs can reflect major maintenance adders

The ISO will allow major maintenance costs for each configuration to be reflected in the start-up cost for each configuration. The ISO can calculate a start-up cost for each configuration regardless if the resource can start directly into that configuration or not. However, the ISO expects scheduling coordinators to provide major maintenance costs for each configuration as part of the existing process to provide such costs as described in Attachment H of the Market Instruments business practice manual.[27] If the ISO does not receive or cannot calculate major maintenance costs for non-start-upable configurations, then the last the adder from the highest start-able configuration below the non-start-able configuration will be added to the non-start-able configuration for the purposes of calculating the transition cost. This clarification is needed to prevent negative calculations from missing data.

Transition cost calculation proposal

Transition and start-up costs will be calculated and treated as follows:[28]

- A start-up cost is incurred when a resource is turned "On." If a resource is already On but incrementing between configurations, it may incur a transition cost.
- The ISO will calculate a start-up or indicative start-up cost for each configuration based on quantifiable and verifiable costs, related to physical parameters of the resource. The start-up cost is the cost incurred when a resource is turned On and is for a configuration that the resource can directly start into. An *indicative* start-up cost[29] is only calculated for the purpose of calculating transition costs and will not be used when a resource is turned On (and is not a biddable parameter). Both the start-up cost and indicative start-up cost may include a major maintenance adder per configuration. If the scheduling coordinators cannot provide such information for a particular configuration, then that configuration will have the same costs and/or parameters as the next lowest configuration with the missing data.
- The ISO clarifies that even configurations that cannot be directly started (referred to as "non-start-upable" configurations) can have verifiable physical parameters and/or costs that are used to calculate the start-up or indicative start-up cost. Again, should the scheduling coordinator not (or cannot) provide such information, the parameters of the next lowest configuration with the data will be used.
- The ISO will calculate start-up or indicative start-up costs without considering any headroom.
- Transition costs will be calculated as the difference between the calculated "To" and "From" configuration start-up or indicative start-up costs when the resource is increasing

[27] Business practice manual change pursuant to policy change.
[28] Policy change.
[29] New term. This is a proposed term to distinguish these calculated costs from the current definition of start-up costs. The ISO may ultimately use a different term but the concept remains.

in configurations. Transition costs will only be calculated for possible transition paths. The ISO does not recognize a downward transition cost. At this point, the calculation of the transition cost does not consider any headroom. Transition costs must be either a zero or positive number and will default to zero if negative.

- Scheduling coordinators may bid start-up costs and transition costs according to the rules of the proxy or registered cost option. Under the proxy cost option, scheduling coordinators may bid up to 125 percent of the start-up or transition cost on a daily basis for each configuration. Under the registered cost option, scheduling coordinators may bid up to 150 percent of the start-up and transition cost every 30 days for each configuration. These changes will require new bidding and verification functionality for both registered and proxy cost options. The ISO will automate these processes.

8.2.3. Transition costs for natural gas-fired resources

The ISO reviewed a sample of multi-stage generator transition costs for natural gas-fired resources. The tables below reflect the two most common variations. Table 9 shows the proposed calculation for a resource with distinct peakers or steam turbines and Table 11 shows a resource with duct firing and distinct peakers or turbines. For both tables, the costs are calculated as such:

(Heat input x Gas price) + (Heat input x GHG price x GHG emission rate) + Major maintenance adder + (Config startup time / 2 x Config startup time /60 x GMC) + (Start-up energy x EPI)

Unit A in Table 9 has four configurations. Only configurations 1 and 3 are directly startable and all transition paths are possible except from 2 to 4. In this example, a new configuration entails starting a new peaker or steam turbine. Therefore, most of the costs and physical parameters approximately double as the configurations increase. The ISO expects that all the columns in yellow are verifiable costs and/or verifiable physical parameters of the resource. For example, the ISO should be able to verify the heat input, start-up energy, configuration Pmin, and start-up time for each configuration. The ISO clarifies that the heat input is the amount to reach the Pmin of the peaker or steam turbine. This is different than the transition heat input which is the difference in heat input between the configurations.[30]

Additionally through its existing process, the ISO expects to verify the major maintenance adder for each configuration. The non-highlighted columns are costs that remain the same for all configurations and are provided by the ISO, such as the daily gas price index. The last column in blue calculates the total start-up or indicative start-up cost.

[30] Business practice manual change supporting new policy.

Table 9
Proposed start-up and indicative start-up cost calculation: peaker or steam turbine

Config IDs	Configuration	Heat Input (MMBtu)	Gas price ($/MMBtu)	GHG Price	GHG Emission Rate	Major Maint. Adder	Config Pmin	Config Startup Time	GMC	Start-up energy (MWh)	Energy Price Index ($/MWh)	Cost
UnitA_1	1 - Startable	80	$4.00	$12.00	0.053963	$250	50	20	$0.38	20	$1.00	$645
UnitA_2	2 - NOT startable	160	$4.00	$12.00	0.053963	$550	100	20	$0.38	20	$1.00	$1,320
UnitA_3	3 - Startable	240	$4.00	$12.00	0.053963	$1,000	150	20	$0.38	20	$1.00	$2,145
UnitA_4	4 - NOT startable	320	$4.00	$12.00	0.053963	$1,500	200	20	$0.38	20	$1.00	$3,020

Table 10 shows the calculated transition costs based on the start-up and indicative start-up costs shown in Table 9. The calculated transition costs do not include headroom. All of the transition costs are calculated as the difference between the "To" configuration and "From" configuration start-up and indicative start-up costs. For example, the start-up cost for configuration 1 is $645 and for configuration 2 is $1,320 as shown in the last column of Table 9. If the resource transitions from configuration 1 to 2, it would incur an additional $675 in transition costs shown in the first row, second column of Table 10, which is the difference between the two configuration start-up costs.

Scheduling coordinators can bid up to 125 percent or 150 percent of the transition cost under proxy or registered cost, respectively. As noted above, the unit cannot transition from configuration 2 to 4 so that transition cost is not calculated. When the resource stays in configuration 1 it incurs only the start-up for configuration 1. After it transitions, it would only incrementally incur the transition cost to configuration 2. There are no transition costs from a higher to a lower configuration or if the resource stays in the same configuration.

Table 10
Proposed transition cost calculation: peaker or steam turbine

		"To" configuration			
		UnitA_1	UnitA_2	UnitA_3	UnitA_4
"From" configuration	UnitA_1		$675	$1,500	$2,375
	UnitA_2			$825	n/a
	UnitA_3				$875
	UnitA_4				

As part of this new policy, if information is not provided for each configuration (even if the configuration is not start-upable), then the ISO will use data from the last available configuration. Table 11 below provides an illustrative example where the non-start-upable configuration data is missing and highlighted in orange. For data missing for configuration 2, the ISO will use data from configuration 1 and for data missing for configuration 4 the ISO will use data from configuration 3.

Table 11
Proposed start-up and indicative start-up cost calculation for missing data: peaker or steam turbine

Config IDs	Configuration	Heat Input (MMBtu)	Gas price ($/MMBtu)	GHG Price	GHG Emission Rate	Major Maint. Adder	Config Pmin	Config Startup Time	GMC	Start-up energy (MWh)	Energy Price Index ($/MWh)	Cost
UnitA_1	1 - Startable	80	$4.00	$12.00	0.053963	$250	50	20	$0.38	20	$1.00	$645
UnitA_2	2 - NOT startable	80	$4.00	$12.00	0.053963	$250	50	20	$0.38	20	$1.00	$645
UnitA_3	3 - Startable	240	$4.00	$12.00	0.053963	$1,000	150	20	$0.38	20	$1.00	$2,145
UnitA_4	4 - NOT startable	240	$4.00	$12.00	0.053963	$1,000	150	20	$0.38	20	$1.00	$2,145

The consequence of not providing data for configurations 2 and 4 (and the ISO using information from configurations 1 and 3, respectively), is a zero transition cost calculated for transition paths C1 to C2 and C3 to C4, reduced transition cost from C1 to C4, and an increase in transition cost from C2 to C3 because the C2 cost is now lower. Transitioning from C2 to C4 is not possible for this resource.

Table 12
Proposed transition cost calculation for missing data: peaker or steam turbine

		"To" configuration			
		UnitA_1	UnitA_2	UnitA_3	UnitA_4
"From" configuration	UnitA_1		$0	$1,500	$1,500
	UnitA_2			$1,500	n/a
	UnitA_3				$0
	UnitA_4				

Unit B in Table 13 has four configurations and only the first and the third can be directly started. In this example, configurations 2 and 4 reflect duct firing. Therefore, the costs do not double from configuration 1 to 2 or from 3 to 4. Instead, there is an increase in fuel input to access the duct firing at the top of the combustion turbine configuration (*i.e.*, when the combustion turbine is operating at 85 percent of capacity) and small incremental increases in the costs due to the change in the configuration Pmin.[31] Unlike starting a new piece of equipment, it is the ISO's understanding that in order to access the duct firing capability, the resource needs to increase its energy output from the Pmin of configuration 1 (200 MW) through to the Pmin of configuration 2 (250 MW) and would be paid for the energy produced in the dispatchable portion

[31] Business practice manual change supporting new policy.

of configuration 1 (between 200 and 249 MW). In this way, there is a small amount of additional fuel input for reaching duct firing that has not been accounted for in the energy to ramp into the duct firing configuration. The ISO appreciates feedback provided by stakeholders in clarifying this point.

The ISO expects that all the columns in yellow are verifiable costs and/or verifiable physical parameters of the resource. For example, the ISO should be able to verify the heat input, start-up energy, configuration Pmin, and start-up time for each configuration. The ISO clarifies that the heat input is the amount to reach the Pmin of the combustion turbine or duct firing (assuming the combustion turbine supporting the duct firing is near maximum capacity). This is different than the transition heat input which is the difference in heat input between the configurations.[32]

Additionally through its existing process, the ISO expects to verify the major maintenance adder for each configuration. The non-highlighted columns are costs that remain the same for all configurations and are provided by the ISO such as the daily gas price index. The last column in blue calculates the total start-up or indicative start-up cost.

Table 13
Proposed start-up cost calculation: duct firing

Config IDs	Configuration	Heat Input (MMBtu)	Gas price ($/MMBtu)	GHG Price	GHG Emission Rate	Major Maint. Adder	Config Pmin	Config Startup Time	GMC	Start-up energy (MWh)	Energy Price Index ($/MWh)	Cost
UnitB_1X1	1 - Startable	1,500	$4.00	$12.00	0.053072	$11,590	200	60	$0.38	20	$1.00	$18,604
UnitB_1X1DF	2 - NOT startable	1,550	$4.00	$12.00	0.053072	$11,590	250	60	$0.38	20	$1.00	$18,845
UnitB_2X1	3 - Startable	2,500	$4.00	$12.00	0.053072	$23,180	400	60	$0.38	20	$1.00	$34,869
UnitB_2X1DF	4 - NOT startable	2,550	$4.00	$12.00	0.053072	$23,180	450	60	$0.38	20	$1.00	$35,110

Table 14 shows the calculated transition costs based on the start-up and indicative start-up costs shown in Table 13. The calculated transition costs do not include headroom. All of the transition costs are calculated as the difference between the "To" configuration and "From" configuration start-up and indicative start-up costs. For example, the start-up cost for configuration 1 is $18,604 and for configuration 2 is $18,845 as shown in the last column of Table 13. If the resource transitions from configuration 1 to 2, it would incur an additional $241 in transition costs shown in the first row, second column of Table 14, which is the difference between the two configuration start-up costs.

Scheduling coordinators can bid up to 125 percent or 150 percent of the transition cost under proxy or registered cost, respectively. The resource also cannot transition from configuration 2 to 4 so that transition cost is not calculated. When the resource stays in configuration 1 it incurs only the start-up for configuration 1. After it transitions, it would only incrementally incur the

[32] Business practice manual change supporting new policy.

transition cost to configuration 2. There are no transition costs from a higher to a lower configuration or if the resource stays in the same configuration.

Table 14
Proposed transition cost calculation: duct firing

		"To" configuration			
		UnitA_1	UnitA_2	UnitA_3	UnitA_4
"From" configuration	UnitA_1		$241	$16,265	$16,507
	UnitA_2			$16,024	n/a
	UnitA_3				$241
	UnitA_4				

8.2.4. Transition costs for non-natural gas-fired resources

For non-natural gas-fired resources (thermal and non-thermal), the ISO system currently uses a single cost amount (in dollars) or a single cost amount per configuration (in dollars) in start-up costs instead of a heat input multiplied by the gas price index. Other cost items remain largely the same except for different inputs used between the proxy and registered cost options.

Formula for non-natural gas thermal resource with greenhouse gas obligation under proxy cost option

(Non-natural gas start cost) + (Heat input x GHG price x GHG emission rate) + Major maintenance adder + (Config startup time / 2 x Config startup time /60 x GMC) + (Start-up energy x EPI)

Table 15
Proposed start-up cost calculation: non-natural gas thermal

Config IDs	Configuration	Non-nat gas start cost ($)	Heat Input (MMBtu)	GHG Price	GHG Emission Rate	Major Maint. Adder	Config Pmin	Config Startup Time	GMC	Start-up energy (MWh)	Energy Price Index ($/MWh)	Cost
UnitC_1	1 - Startable	$1,000	1,500	$12.00	0.053072	$10,000	200	60	$0.38	20	$1.00	$12,014
UnitC_2	2 - NOT startable	$2,000	2,300	$12.00	0.053072	$20,000	250	60	$0.38	20	$1.00	$23,533
UnitC_3	3 - NOT startable	$3,000	3,400	$12.00	0.053072	$35,000	400	60	$0.38	20	$1.00	$40,262
UnitC_4	4 - NOT startable	$4,000	4,400	$12.00	0.053072	$42,000	450	60	$0.38	20	$1.00	$48,908

The formula for a non-thermal resource is shown below. The only difference is the elimination of the greenhouse gas cost calculation. The formula would be the same for a non-natural gas thermal resource without a greenhouse gas obligation.

Formula for non-natural gas thermal resource with greenhouse gas obligation under proxy cost option

(Non-natural gas start cost) + Major maintenance adder + (Config startup time / 2 x Config startup time /60 x GMC) + (Start-up energy x EPI)

At this time the ISO cannot directly reflect multiple fuels for the same resource. Stakeholders should comment on whether this should be a future enhancement.

9. Greenhouse gas costs

In response to Assembly Bill 32, California's Air Resources Board established the state's market-based cap-and-trade program to reduce greenhouse gas emissions. "Covered entities," such as thermal generators, emitting more than 25,000 metric tons of carbon dioxide equivalents (MTCO2e) per year are required to comply. The program began on January 1, 2013 with phased compliance obligations for different parts of the economy. Thermal electric generating sources have already begun compliance.

Starting January 1, 2015, natural gas suppliers will also be considered covered entities for the amount of gas delivered to California end-users, net of the amount delivered to existing covered entities.[33]

The ISO currently allows covered entities to reflect greenhouse gas costs in commitment costs. Thermal resources that have not reached the 25,000 MTCO2e threshold cannot include a greenhouse gas cost or will have to voluntarily enroll in the cap-and-trade program. Depending on how the regulations are changed, the ISO has two main options in the future:

1) When natural gas suppliers become covered entities, the greenhouse gas costs incurred may be passed on to natural gas-fired generators that do not meet the emission threshold. Therefore, all natural gas-fired resources will have greenhouse gas costs. Correspondingly, the ISO proposes to allow all natural gas-fired resources to reflect greenhouse gas costs in commitment costs. This assumes that greenhouse gas costs are *not* reflected in the gas price indices used.[34]
2) On the other hand, if the cost of greenhouse gas is already reflected in the gas price indices, no generators will need an explicit adder for these costs. Instead, the ISO will simply reflect the natural gas costs.

[33] California Public Utilities Commission, *Scoping Memo and Ruling of the Assigned Commissioner and Administrative Law Judge*, Rulemaking 14-03-003, July 7, 2014, p. 3.
[34] Policy change.

The California Public Utilities Commission is currently assessing the impact of greenhouse gas compliance on natural gas suppliers.[35] On November 18, 2014 the Commission released a non-binding proposed decision that defers several key issues from the current Phase 1 process to Phase 2 of the proceeding.[36] The schedule for Phase 2 has not been released. It is also unclear whether the gas price indices in future will reflect greenhouse gas costs.

The outcome of this proposal will impact commitment cost and opportunity cost calculations and will need careful consideration of energy imbalance market resources. However, given the current regulatory uncertainty, the ISO proposes no policy changes until there is clearer direction from the Commission. The ISO needs more regulatory clarity in order to propose market design changes that will be acceptable to the Federal Energy Regulatory Commission.

10. Additional business practice manual clarifications

Costs for non-natural gas-fired resources

The FERC has approved the ISO's tariff amendment to allow reflection of fuel or fuel-equivalent costs for non-natural gas-fired resources.[37] The ISO will make a corresponding clarification in the Market Instruments manual that non-thermal resources will be allowed to use the "fuel cost" fields in the Master File to reflect non-fuel costs, such as pumping costs for pumped storage resources.[38] The ISO recognizes that much of the ISO's systems were created with natural gas-fired resources in mind and that some categories do not specifically meet non-gas or non-thermal resources' needs.

Specifically for start-up costs, non-natural gas-fired resources may include a single cost amount (in dollars) to reflect a fuel or fuel-equivalent cost. As discussed above in section 8.2.3, this can also be a per configuration cost for each start-up or indicative start-up.

Specifically for minimum load costs, non-natural gas-fired resources may include a single cost amount (in dollars) to reflect a fuel or fuel-equivalent cost. For resources selecting the multi-stage generator modeling, a single cost amount may be provided for each configuration.

For both start-up and minimum load costs, the ISO clarifies that these costs do not vary automatically (*e.g.,* based on an index or changing conditions). These costs are submitted by the scheduling coordinator and kept in the ISO's system. The ISO seeks stakeholder feedback on whether this is a sustainable solution for non-natural gas-fired resources and how stakeholders should submit supporting documentation for these costs.

[35] See California Public Utilities Commission, Rulemaking 14-03-003, filed March 13, 2014.
[36] California Public Utilities Commission, Proposed Decision, Decision Resolving Phase 1 Issues and Addressing the Motion for Adoption of Settlement Agreement, Rulemaking 14-03-003, November 18, 2014.
[37] *California Indep. Sys. Operator Corp.*, FERC docket no. ER15-15, October 1, 2014. Section 30.4.1.1.2 Non-Natural Gas-Fired Resources. FERC approved on December 31, 2014.
[38] Business practice manual change pursuant to tariff approved under ER15-15.

Major maintenance adders

The ISO has made a clarification in Appendix L of the Market Instruments manual outlining the documentation required and the methodology used to calculate major maintenance adders.[39]

Energy price index and auxiliary start-up cost calculation

The ISO agrees with stakeholders that the energy price index and the methodology used to calculate auxiliary start-up costs is not clear. Therefore, the ISO will clarify the existing methodology in a business practice manual as soon as possible.[40] As part of this documentation, the ISO may require the posting of certain information to stakeholders such as the specific and confidential energy price index used per resource. However, posting of information will need to follow the ISO's current implementation schedules and priority.

In addition to documenting the current process, the ISO will work with stakeholders to consider proposed changes, improvements, and clarifications to the inputs and methodology (inclusive of policy and business practice manual changes) in a stakeholder process. At this time the ISO is evaluating which stakeholder process will be the most appropriate venue (*i.e.*, *Commitment Cost Enhancements Phase 3* or *Bidding Rules*). The ISO will announce the final determination to stakeholders at a later date.

11. Other issues

Default variable operation and maintenance costs

The ISO is approaching the three year review period for default variable operation and maintenance costs, which became effective on April 1, 2012. We agree with stakeholders that current costs used are sufficient and there is currently no need for a review.

Default major maintenance adders

The ISO is contemplating ways to reduce the administrative burden on ISO and stakeholder resources by proposing to establish default values for major maintenance adders. Many scheduling coordinators only have access to contracts such as power purchase agreements as supporting documentation when applying for these adders. These costs may not necessarily reflect actual operational costs but rather a negotiated price. The ISO proposes to use default values when the scheduling coordinator cannot or does not provide supporting documentation for alternative values. The ISO would apply this to both non- and multi-stage generating

[39] Existing business practice manual clarifications (completed). See PRR 782 available at: http://bpmcm.caiso.com/pages/default.aspx
[40] Existing business practice manual change.

resources. While the ISO agrees with stakeholders that establishing default major maintenance adders may be beneficial, we will need more time to explore this option. This topic is also delayed to *Commitment Cost Enhancements Phase 3*.

Clarification on major maintenance adders

The ISO reiterates that if scheduling coordinators submit power purchase agreements, service agreements or other contractual arrangements as documentation for major maintenance adders, they must be based on estimates of reasonable actual major maintenance costs. This is already detailed in the tariff in section 30.4.1.1.4.

Future improvements to consider

Some stakeholders have suggested improvements in how the ISO accounts for start types and gas transportation costs. The ISO agrees that these issues may need to be reviewed will address them in *Commitment Cost Enhancements Phase 3.* Additionally, the ISO proposes to address the use of the daily start limit field more closely under the *Bidding Rules Enhancements* initiative.

12. Next Steps

The ISO will discuss this draft final proposal with stakeholders on a conference call on February 12, 2015. Stakeholders should submit written comments by March 2, 2015 to initiativecomments@caiso.com.