



**California ISO**  
Shaping a Renewed Future

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**Second Supplement to  
Dynamic Transfers  
Revised Draft Final Proposal**

**Provided in Support of 2009-2011 Stakeholder Process to Consider  
Expansion of Dynamic Transfer Services in ISO Tariff**

**April 1, 2011**

# Second Supplement to Dynamic Transfers Revised Draft Final Proposal

This Second Supplement to the Revised Draft Final Proposal updates the February 18, 2011, Supplement to Revised Draft Final Proposal to reflect discussions at the stakeholder meeting on February 25, 2011, and subsequent stakeholder comments on March 11, 2011. Revisions to the Supplement to Revised Draft Final Proposal are provided in redlining, after a summary of additional stakeholder comments received on March 11, 2011, and ISO responses to those comments. The ISO will publish a “clean” (without redlining) version of the body of this Supplement as it completes its preparation for the May 2011 Board of Governors meeting.

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## Responses to March 11, 2011, Stakeholder Comments

The following table summarizes the comments submitted by stakeholders following the February 25, 2011, stakeholder meeting, and offers initial ISO responses. A number of comments support proposals that the ISO has offered in this stakeholder process, and these supporting comments are not included here. The full text of stakeholder comments is available at <http://www.caiso.com/27b9/27b980b1477b0.html>.

These issues will be discussed further during a stakeholder conference call on April 8, 2011.

Submitted by	Stakeholder Comment	ISO Response
8minutenergy, CEERT	<p>8minutenergy: The ISO should either conform its proposal to practices and procedures that it uses to manage congestion and other operational issues within the ISO, or explain why it must use different tools – most notably, different VER output forecasting and transmission reservations – for DTs.</p> <p>CEERT: it is not clear why the ISO has needs for the transmission reservation as a maximum delivery amount. There is no need for such a transmission reservation within the ISO BA, and it is not clear why such a mechanism would not also work at the interties. The addition of the transmission reservation may add a level of complexity to dynamically scheduling energy at the interties.</p>	<p>As the ISO has previously explained, the establishment of transmission reservations is a required part of scheduling across interties, as governed by NERC and WECC standards that the ISO is required to operate under. Specifically, WECC standards TOP-STD-007-0 and TOP-STD-007-1 both require that net schedules as well as actual power flows be within operating limits. The standards require net scheduled power flow as well as the actual power flow over an interconnection between transmission operators' areas to be maintained within Operating Transfer Capability (OTC) limits. The net schedule over an interconnection cannot exceed the OTC, regardless of the prevailing actual power flow on the interconnection. Within a transmission operator's area, the scheduling limits across interconnections do not apply.</p> <p>Today's ISO tariff establishes the transmission reservation as being equal to the energy schedule. The use of the transmission reservation ensures that the ISO complies with the applicable NERC and WECC standards requiring interchange schedules as well as energy flows to remain within the established OTC. The issue being considered in this stakeholder process is whether dynamic transfers should be allowed to establish a transmission reservation greater than their initially expected energy delivery. As the ISO has explained, the ISO does not propose to use the transmission reservation to limit a resource's maximum delivery. Whether or not a resource has a transmission reservation exceeding its average expected energy, the ISO will not limit its energy dispatch for 5-minute intervals to its pre-scheduled transmission reservation if the sum of all energy dispatches for the 5-minute interval do not exceed the OTC, and actual energy flows do not exceed the OTC.</p>

		<p>Concerning the ability of intermittent dynamic transfers to supply a forecast of their delivery, the ISO has explained that the ISO is making this capability available as an option, which can particularly be useful when the resource obtains balancing services from sources outside the ISO market to reduce the variability of its MW delivery to the ISO. As the ISO explained, this capability will enable the ISO's 5-minute real-time market to support intra-hour scheduling over longer scheduling intervals such as 15- or 30-minute intervals.</p>
<p>IID</p>	<p>The ISO should adopt the Dynamic Scheduling System (DSS) developed through the Joint Initiatives as the platform for its dynamic scheduling or, in the alternative, adopt a final dynamic transfer platform that will fully interface with DSS. This will ensure that dynamic scheduling between the ISO and other BAs in the West will be fully integrated.</p>	<p>The ISO recognizes benefits to supporting DSS and will consider use of DSS when implementing future dynamic transfer agreements. The requirements for supporting DSS may not require significant changes in the ISO's systems, and are being evaluated in further detail.</p>
<p>NextEra Energy</p>	<p>It is unclear how dynamic transfers will be considered for purposes of resource adequacy. Pursuant to the 2011 Net Qualifying Capacity list some existing dynamically transferred resources (e.g. APEX) and pseudo tie pilot projects (e.g. Sutter) receive the full nameplate value of the resource for purposes of resource adequacy. While existing dynamic transfer resources external to the ISO seem to have been given a NQC value, it is unclear what the process was for assessing deliverability and establishing the capacity value. Variable resources within the ISO have an additional protocol for establishing qualify capacity. Pursuant to CPUC decision D.09-06-028, qualifying capacity for wind and solar resources is based on an exceedance methodology. The CPUC establishes a qualifying capacity value and the ISO conducts a deliverability assessment to determine the Net Qualify Capacity value. With regard to dynamic transfer resources, it seems clear that the CPUC would consider the qualifying capacity value of the resource pursuant to the exceedance methodology since the resource is essentially treated as a resource within the ISO for purposes of the energy production assessment. It is not clear, however, how the ISO will conduct the deliverability assessment to come up with the Net Qualifying Capacity value for dynamically transferred resources. Further explanation about how the ISO will assess variable dynamic transfer resources for purposes of resource</p>	<p>The ISO has added an explanation of the process for allocation of import capacity for resource adequacy resources to section 2 of the Revised Draft Final Proposal. The ISO's existing resource adequacy process establishes an allocation of import capacity to load serving entities, which in turn can assign their capacity to specific import resources for purposes of meeting their resource adequacy requirements. The ISO does not anticipate a need to modify this process as additional resources participate in the market as dynamic transfers.</p>

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	adequacy would be helpful.	
NextEra Energy	While NextEra recognizes and supports the ISO's continual assessment of the dynamic transfer protocols into the future, resources that have an agreement should be able to maintain that arrangement through the life of any contractual commitment. Any reassessment of the eligibility for dynamic transfers should only be applicable to new dynamic transfers so that existing dynamic transfers can meet their commercial obligations.	The ISO's technical studies during the course of this stakeholder process concerning the potential for maximum dynamic transfer limits for intermittent resources have concluded that no limits need to be applied within the ISO's BAA at this time. If the ISO's ongoing monitoring of any operational issues that relate to dynamic transfers identifies such limitations in the future, the ISO will identify appropriate responses, including potentially limiting new dynamic transfers of intermittent resources, but would not limit dynamic transfers that would have already been established.
NextEra Energy	A dynamic variable energy generator importing energy into ISO to submit an import schedule with expected delivery matching the 'energy profile' in the e-tag, and maximum delivery matching the 'transmission profile'. In validating the import tags, will the ISO use the original tags submitted in OATI or will the import interface be modified for additional schedules?	All bid components, including both the expected energy schedule and any additional transmission reservation will be submitted through the ISO's existing market bidding mechanism. The pair of MW and price values for the transmission reservation will be added to the existing components of submitted bids. In the ISO's market processes, e-tags are a confirmation of market schedules, rather than being requests for transmission service.
NextEra Energy	The ISO proposes real-time scheduling options to manage intra hour variability and maximize transmission utilization, in which either (1) the ISO would use the most recent available telemetry of the resource's output as its real-time dispatch for the next dispatch interval, or (2) the resource would communicate its own forecast and availability during the operating hour, which the ISO would return as the resource's dispatch. Under both approaches, the ISO defines the instructed operating point for the next real-time dispatch interval based on available transmission capacity as well as their 'persistence' forecast. Is the ISO's dispatch order is being conducted for the next 5 minute interval or the period 2 intervals ahead, and for how many intervals forward will the ISO use the current persistence forecast?	In the option in which the ISO uses the most recent available telemetry of the resource's output as its real-time dispatch for the next dispatch interval, there is a two-interval lag between the telemetry time and the effective time of the dispatch, to allow for the ISO's real-time dispatch optimization, communication of the dispatch, and response by the resource. For example, the telemetry observed at 2.5 minutes into an operating hour would become an input to the real-time market dispatch optimization that issues dispatch instructions by 7.5 minutes into the operating hour, to instruct dispatchable resources to begin ramping to their dispatch operating targets for 12.5 minutes into the operating hour. As this applies to intermittent resources, the ISO uses the most recent telemetry for the horizon of the real-time dispatch process.  In the option in which the resource submits its own forecast for a rolling two-hour look-ahead period, the ISO uses the resource's forecast for the two-hour period as the ISO determines other time-sensitive unit commitment and economic dispatch decisions. However, only the first 5-minute interval's dispatch within the forecast period becomes a binding dispatch. The forecast is then updated on 5-minute intervals, in order to use a current value for the binding 5-minute interval.
PG&E	The ISO should establish an interim limit on the total MW capacity of dynamic transfer arrangements at each intertie equal to the maximum operating transmission capability. PG&E believes that this will help prevent cases of	The ISO's previous consideration of limits on the execution of dynamic transfer agreements with intermittent resources was based on reliability concerns, for example, that variations in their MW delivery may produce excessive voltage variations or produce

	<p>excessive and recurring curtailment of intermittent and firm schedules that cross the interties, therefore providing certainty for long term contracting with out-of-ISO intermittent resources. If or when such a limit is reached, the ISO should re-establish a stakeholder process to explore the appropriateness of allowing arrangements beyond such a limit.</p>	<p>regional oscillations. The ISO addressed these concerns through the dynamic transfer capability study done by GE Energy, which concluded that these reliability concerns do not limit dynamic transfers of intermittent resources. PG&amp;E’s request for a limit on dynamic transfers based on impacts of congestion does not appear to be supported by other stakeholders. In particular, NextEra supports the ISO’s approach of not limiting dynamic transfers, and SCE supports the allocation of resources through market means as opposed to an allocation.</p>
<p>PG&amp;E</p>	<p>The ISO’s economic analysis should include a sensitivity that assumes intermittent dynamic schedules will routinely self schedule their maximum hourly output (as opposed to the assumption that they will use the transmission reservation product for anything above their average output). Use of the transmission reservation during times of potential congestion may result in a significant risk for resources to be economically curtailed. PG&amp;E believes that self-scheduling of intermittent dynamic schedules above their expected average hourly delivery is likely to occur, leading to wasted intertie space at precisely the times when intertie space is most needed.</p>	<p>The ISO has presented analyses of potential market impacts of dynamic transfers of intermittent resources, including the use of transmission reservations in excess of average energy deliveries, in two previous stakeholder discussions, and concluded that the apparent impacts were not sufficient to warrant more extensive analysis and were not a basis for imposing limitations on dynamic transfers of intermittent resources. In Figures 1 to 4 following this table of stakeholder comments and ISO responses, the ISO adds an additional sensitivity analysis “C”, and reaches the same conclusion that potential market impacts are not a basis for imposing limitations on dynamic transfers of intermittent resources. Scenario C uses more extreme assumptions than the previous cases, and not surprisingly has greater impacts, but in this case an additional conclusion is that the ISO should allow intermittent dynamic transfers to use the transmission reservation mechanism rather than being forced to submit excessive energy self-schedules, in order to promote accurate energy scheduling in the ISO’s markets.</p> <p>The reader should refer to the ISO’s presentations for previous stakeholder meetings for the background of this analysis.</p> <p>Scenario C uses energy self-schedules in HASP based on the maximum delivery within the modeled hours, in contrast to scenario B’s use of economically-bid transmission reservations (as was discussed at the February 25 stakeholder meeting). Scenario C modifies B by including the transmission reservation capacity as energy self-schedules that can crowd-out conventional self-schedules. Figure 1 presents the resulting impacts on LAP prices within the ISO. In some hours, prices in case 4 (real-time dispatch) exceed case 2 (market scheduling in pre-scheduling time horizons). In these hours, forcing intermittent resources to self-schedule excess energy that will not appear in real-time, in order to obtain transmission capacity, has impacted LAP prices in RTD in a small number of hours.</p>

		<p>In Figure 2, scenario C (showing higher intermittent energy self-schedules to obtain transmission reservations) shows some impact of reduced transmission utilization at Palo Verde. This reduction in transmission usage occurs in case 4, compared to case 2, primarily on day # 4 (fall season). Figure 3 shows that a greater impact occurs at Four Corners, where the reduction in transmission usage occurs in case 4 on days 1 and 4 (winter and fall seasons), when actual self-schedules had filled the available capacity. In RTD, the lost static scheduled cannot be recovered at Four Corners due to limited real-time bids by dynamic transfers. In contrast, Figure 4 shows no impact on transmission utilization at Mead. Self-scheduled energy has not filled the transmission capacity at Mead, so excess energy self-schedules have not reduced transmission utilization in RTD.</p>
<p>PG&amp;E</p>	<p>The ISO has proposed to utilize dispatchable dynamic transfer resources to manage underutilization of transmission capacity. In concept, PG&amp;E agrees with this proposal. However, there may be cases where in practice the ISO's utilization of non-intermittent dynamic transfers to fill-in could lead to potential curtailment of intermittent dynamic resources. If the intermittent dynamic transfer has the ability to return to schedule but the dispatchable resource is not capable of backing down, the intermittent may be instructed by the ISO to curtail/remain at its current lower output. PG&amp;E would like clarification around how such situations might be avoided. Additionally, the ISO's expectation of other dynamic resources "filling in or backing off" in response to variations in intermittent dynamic transfers may be optimistic, given that these parties must participate on the same intertie in order to provide this service.</p>	<p>The ISO will offer a real-time scheduling option that allows intermittent resources to inform the ISO of their anticipated delivery during each 5-minute interval of a forward-looking 2-hour period. The ISO will use these updates to ensure that other dynamic resources are scheduled with the dispatchability needed to accommodate the dispatch of the intermittent resources. This would be an option available to intermittent resources in addition to the existing functionality of dispatching intermittent resources based on their most recently available telemetered output. The ISO continues to evaluate how it can improve its forecasting of intermittent resources' deliveries and how these forecasts can be integrated with the ISO's real-time dispatch processes. PG&amp;E is correct that filling-in transmission capacity that has been allocated through market bids to intermittent resources that are not delivering their full capacity in a particular dispatch interval depends on the presence of at least one dispatchable resource on the same intertie, as the ISO has stated in section 3.2 of its Revised Draft Final Proposal (and in previous documents). However, while the ISO is making the opportunity available for dispatchable resources to fill-in the available capacity, the ISO has not stated or relied on an expectation as to the availability of bids beyond what it already available in the real-time market. The ISO's analysis of potential market impacts has noted that this opportunity will be available, but its conclusions have not been based on additional bids being available.</p>
<p>PG&amp;E</p>	<p>PG&amp;E supports the ability for dynamic transfers to have the option to utilize a rolling persistence schedule as a method to provide 5-minute updates, as well as the option to self-provide forward-looking forecast data. However,</p>	<p>The default mechanism is to utilize the rolling persistence schedule to provide 5-minute updates, as the ISO does now for intermittent resources within the ISO's BAA. The ISO will establish the specific procedures that will be involved in a market participant's selection</p>

	<p>there may be certain times of the day, e.g. ramping hours, where a persistence schedule would be consistently inaccurate in a fairly predictable way, such that a self-provided schedule might be more efficient, whereas at other times the persistence schedule would likely be the most efficient predictor of future output. PG&amp;E requests that the ISO clarify or establish rules or protocols for how to switch between these practices, and to determine how often an entity can request this switch. Lastly, please clarify how much lead time the ISO would require for such a switching request to take effect.</p>	<p>of the option to self-provide forward-looking forecast data, but expects the lead time to be approximately one month. Once the ISO has implemented a market participant's selection of the option to self-provide forward-looking forecast data, the ISO will use the market participant's forecast whenever it is provided, but will revert to the rolling persistence schedule if the market participant does not provide a forecast. In addition, when the market participant has chosen the option to self-provide its forecast, it will determine how it will calculate its forecast, and could use different methods at different times. For example, the market participant could forecast its availability using a typical-day profile during ramping periods (e.g., a solar generator at sunrise and sunset), then use a persistence method to determine its forecast during times of day when changes from interval to interval do not follow a regular pattern, and develop its own method for transitioning from one approach to the other.</p>
<p>PG&amp;E</p>	<p>PG&amp;E supports deferring and potentially phasing-in the voluntary release of transmission reservations that have been awarded. However, before implementing this provision, the ISO should consider and discuss with stakeholders the rules for such release, if such release would receive compensation, and the implications on transmission reservation behavior.</p>	<p>As the ISO considers phasing in this option one year after implementation of the transmission reservations bid component, after observing market behavior, the ISO will discuss its observations with stakeholders and consider stakeholder input.</p>
<p>Powerex</p>	<p>Concerning the ISO's Preliminary Formulation of Software Function for Transmission Reservations for Dynamic Transfers, Powerex offers four clarifications: (1) the range of the economic bid for this commodity can be more than the range of the energy bid submitted for the dynamic resource but less than <u>or equal to</u> the registered physical capacity, (2) clarification is needed on how the transmission capacity will be accommodated on interties that are not modeled as ITC's, (3) the ISO should confirm that while the transmission capacity will not be subject to pro-rata processing, the energy flowing on the transmission capacity will be subject to economic dispatch and pro-rata processing, and that once pro-rata processing is required due to a de-rate, the dynamic energy flowing on the transmission capacity will be fixed at a static level for the duration of the de-rate for the current hour, and (4) in the formula for the Proposed Physical Inter-Tie Constraints, a new variable should be defined that represents only the total dynamic import energy scheduled on the total Import Transmission</p>	<p>The Preliminary Formulation of Software Function for Transmission Reservations for Dynamic Transfers is an initial description of the software that would be implemented by the ISO's vendor, from which the ISO will formulate its implementation. As stated in section 3.1 of the ISO's 2/18/2011 Revised Draft Final Proposal, the ISO will limit an intermittent resource's transmission reservation to no more than (i.e., less than or equal to) the maximum capacity stated in its dynamic transfer agreement, but limit the transmission reservation for a non-intermittent resource to no more than the highest offered capacity in its submitted bid.</p> <p>The transmission reservation applies to scheduling limits that are enforced as ITCs, rather than the flow limits that are currently the basis of other constraints, and the ISO is exploring how all intertie scheduling limitations can be modeled as ITCs.</p> <p>Any pro rata curtailments will be applied to transmission reservations and static intertie schedules, after all economic bids have been used that would be effective at mitigating congestion. Dynamic transfers would be able to vary at levels at or below their transmission reservations during the duration of the pro rata</p>

	Capacity as opposed to the total import energy which includes both static and dynamic import energy.	curtailment. The ISO will work with its vendor to ensure that all equations are clearly stated.
SCE	Since dynamic transfer is a scheduling arrangement, it is appropriate to require dynamically transferred resources to operate within a certain tolerance during normal operations and respond appropriately to intertie curtailments during operating orders. However, it is not necessary to require specific operational characteristics (e.g., to reduce output in 5 MW step-size increments, voltage control, or to have an automatic frequency control system) in order to participate in dynamic transfers. It may be impracticable to require dynamically transferred variable energy generators to meet the requirements as defined. Many in-state variable energy resources meet those requirements through interconnection process requirements, but out-of-state variable energy resources do not have the same interconnection requirements. Many out-of-state contracts are executed, approved, and will soon be delivering that do not require these attributes, and would be excluded as dynamic transfers to meet California's RPS requirements, thus making the market for tie capacity less liquid and more volatile. As an alternative, the ISO should require participants to operate within a reasonable tolerance from schedule and respond to operating orders, allowing participants to respond in their own manner. If conformance to operating orders is a criterion for ongoing participation in dynamic transfer, that must be clearly delineated.	SCE's comment refers to the listing of technical requirements that was stated in the ISO's proposals before FERC issued its decision on the ISO's interconnection requirements for intermittent resources within the ISO's BAA, which the 2/18/2011 Revised Draft Final Proposal prefaced with the clarification that they would apply "to the extent that they have been approved by FERC". Some of the ISO's proposed interconnection requirements were not approved by FERC, such as the step-size increments and automatic frequency control provisions that SCE cites in its comment. The ISO is updating the statement of these requirements in section 3.3 of the Revised Draft Final Proposal to focus on ability to communicate with the ISO and respond to the ISO's dispatch instructions.
SCE	SCE is skeptical of the ISO's ability to gather all of the data necessary for LMP calculations on a real time basis. On the intertie it may be that generators from outside the ISO's BA can judge their own dispatch and transmission potential more accurately than could be provided by a dispatch by the ISO based on its estimate of LMP. Furthermore, an error prone LMP could result in resource dispatch inferior to that which occurs using economic bids. Prior to implementation of a proxy LMP, SCE would expect the ISO to make a definitive demonstration of its ability to produce meaningful LMPs outside of its control area. Aside from data gathering and limited information, the modeling of more of the WECC would seem to add	First, it must be understood that the ISO's LMPs reflect only the impacts of supply and demand resources on the ISO's BAA, and in determining these impacts, the location of the resources is critical, particularly when the dynamically transferred resources are not physically adjacent to the contract-path scheduling point. It is the ISO that has the knowledge of conditions within the ISO's BAA that is necessary to determine the resources' impacts. The ISO's LMPs do not reflect resources' impacts on BAAs other than the ISO, which means that perfect knowledge by the ISO market of conditions in other BAAs is less critical than the ISO's knowledge of conditions within the ISO's BAA and the location of dynamic transfers in the external network. Second, the locational pricing of pseudo-ties has already been the ISO's existing practice (as of

	<p>complications to the substantial updates already in the queue for MRTU, including the disconnect between HASP and real-time pricing, intra-hour scheduling, and MSG. Finally, SCE is concerned that the use of LMP for dynamic transfer schedules while using intertie prices for static resources would make the intertie ripe for gaming.</p>	<p>MRTU implementation) since pseudo-ties are modeled as generators, and is also essentially in place for existing resource-specific dynamic schedules since they are located at or very close to the ISO’s scheduling points. No additional methodological development is needed to reflect the locational pricing of dynamic transfers. The ISO’s market already includes a fairly extensive model of the external areas that most affect the ISO. The ISO’s state estimator is solving accurately for the full WECC region, and is the source of starting conditions for the real-time market. To the extent that improved modeling of the remaining portions of the external network will improve the ISO’s market operations, these improvements are already in development. Among the key differences between dynamic transfers and static hourly intertie schedules is that the actual source location of static schedules is not known when the ISO runs its hourly markets, and the ISO’s real-time market adjusts its network analysis calculation of compensating injections to account for the difference between the actual source location and the ISO’s scheduling point along with other factors that contribute to flows at the ISO boundary, before making real-time dispatch decisions. In contrast, the ISO’s real-time dispatch requires the best possible knowledge of the location of the resources that are dispatched, and not modeling and pricing resource-specific dynamic transfers at their physical locations would lead to significant errors in market operation.</p>
<p>SCE</p>	<p>The statement that the ISO will “limit an intermittent resource’s transmission reservation to no more than the maximum capacity stated in its dynamic transfer agreement” and a non-intermittent resource to “the transmission reservation (i.e., the sum of the resource’s initial energy schedule and ancillary service awards, plus any additional capacity to allow for a real-time increase in output as sent in dispatches) to no more than its highest offered capacity in its submitted bid” implies that units need to accommodate dispatch beyond the economic bid.</p>	<p>The same paragraph that SCE quotes, in section 3.1 of the Revised Draft Final Proposal, states (in the context of dynamic transfers, and not accounting for must-offer obligations for resource adequacy): “the output of a dispatchable generator ... will not be dispatched above its self-schedule or the maximum capacity of its submitted economic bid”, and “a non-intermittent resource would not be dispatched above the maximum capacity offered in its economic bid.”</p>
<p>SCE</p>	<p>The ISO states that a resource may designate its expected delivery and maximum delivery in its day-ahead and real-time bids, and offers a scheduling option for dynamic transfers of Eligible Intermittent Resources allowing adjustment of dynamic schedules for varying availability within the operating hour. Will bidding be done close enough to the dispatch so that it can be adjusted to resource conditions.</p>	<p>Intermittent dynamic transfers who use this scheduling option would update their forecasted availability every five minutes.</p>

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SMUD	SMUD agrees with the proposal to transition the three existing pseudo-ties from pilots to tariff-based resources, along with providing tariff authorization for other pseudo-ties to be established, based on its understanding that such a transition will in no way diminish or adversely impact the existing rights and operational practices enjoyed by the parties under their existing pilots.	The ISO does not anticipate that the proposals resulting from this stakeholder process will change the operations of the current pseudo-tie pilots, as these resources transition to tariff-based arrangements.
ZGlobal Energy	At present, the pro-forma Dynamic Scheduling Agreement for Scheduling Coordinators is executed between the ISO and a certified SC. The ISO should allow generator owners to execute such agreements, which are assignable, in addition to SCs, or establish alternative means to address the needs of generator owners to be able to demonstrate RPS “deliverability” using dynamic scheduling, for Power Purchase Agreement (PPA) purposes. Certain LSEs require that a prospective PPA partner first demonstrate “deliverability” in the context of the California RPS Standard definition.	<p>The ISO tariff imposes no limits on the dynamic scheduling of imports from system resources external to the ISO balancing authority area into the ISO balancing authority area, provided that the dynamic scheduling is undertaken by an ISO-certified scheduling coordinator that has entered into a dynamic scheduling agreement with the ISO and the resource is located in a host balancing authority area whose balancing authority has entered into an agreement with the ISO to facilitate dynamic schedules from the resource. The ISO’s dynamic transfers initiative is not proposing to impose any additional limitations on this opportunity. Given this unfettered opportunity for resources to be eligible for dynamic scheduling under the ISO tariff, the ISO proposes that the ISO tariff serve as the evidence to be used by owners of system resources to demonstrate their ability to deliver power to the ISO balancing authority area by means of dynamic scheduling.</p> <p>Particularly with regard to the ISO’s pro forma dynamic scheduling agreement, the key element of the relationship of the ISO to the resource associated with a dynamic schedule is the ability of the ISO to establish requirements applicable to the scheduling coordinator with respect to the dynamic schedule. Consequently, the ISO considers it most appropriate for the dynamic scheduling agreement to be entered into between the ISO and the scheduling coordinator. The ISO has no need for a direct contractual relationship with the owner of the resource and would consider a dynamic scheduling agreement with the owner of the resource to be inappropriate to establish the requirements for dynamic scheduling from the resource if the resource owner were not certified to submit those schedules and meet the ISO’s requirements applicable to those schedules. Thus, the ISO proposes not to change the fundamental terms of the existing pro forma dynamic scheduling agreement as part of this initiative, and the ISO particularly proposes to continue to require that the party to a dynamic scheduling agreement be an ISO-certified scheduling coordinator.</p>

Figure 1: Scenario "C" Impact of Dynamic Transfer Transmission Capacity on LMPs for Load Aggregation Points

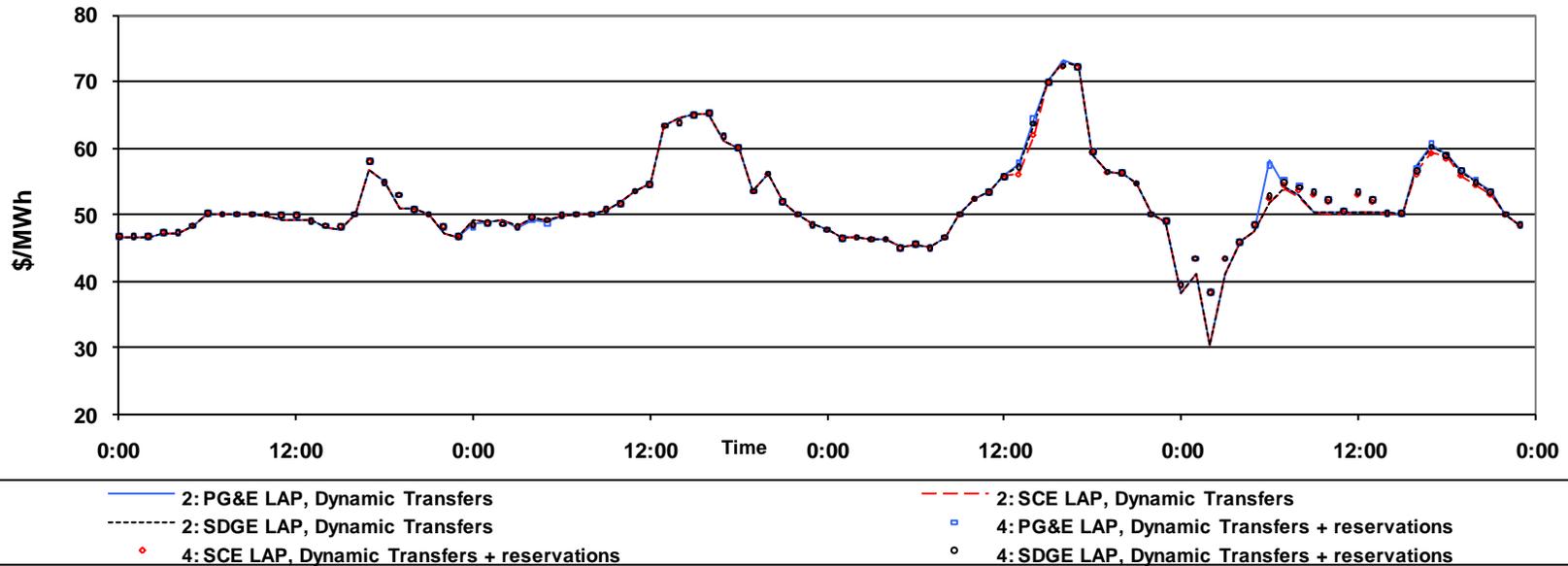


Figure 2: Scenario "C" Dynamic Transfer Impact on Palo Verde Transmission Utilization

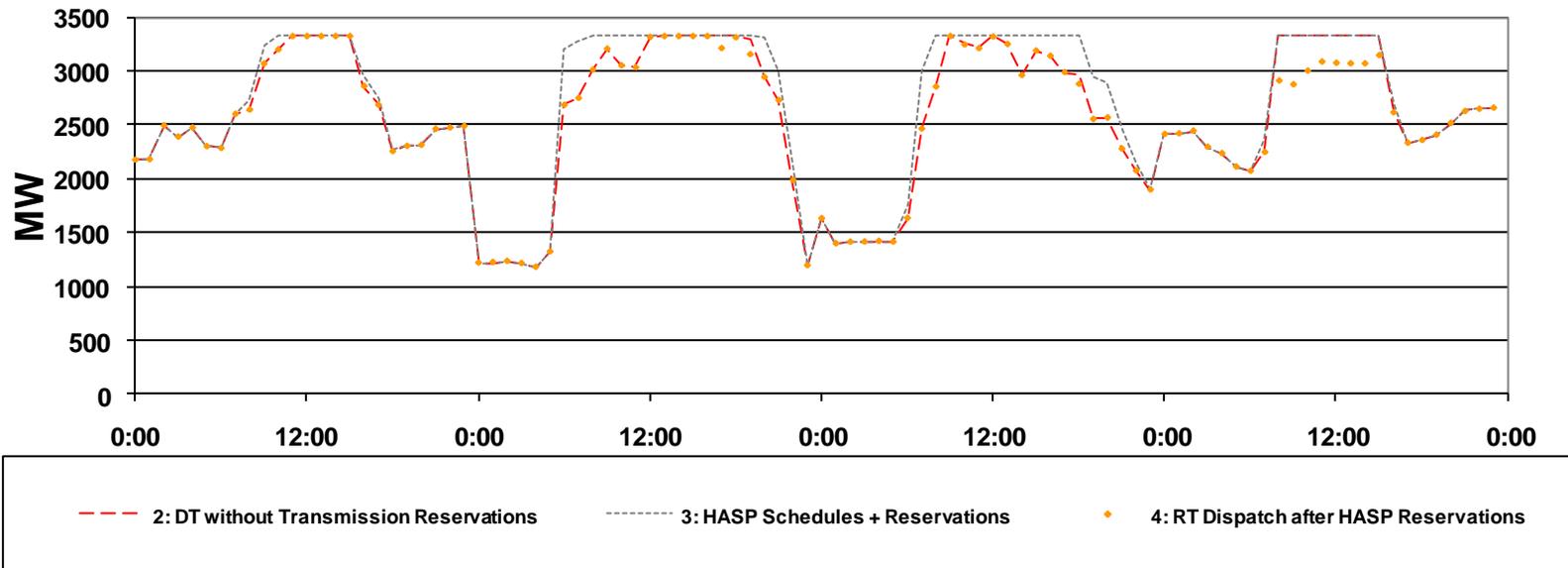


Figure 3: Scenario "C" Dynamic Transfer Impact on Four Corners Transmission Utilization

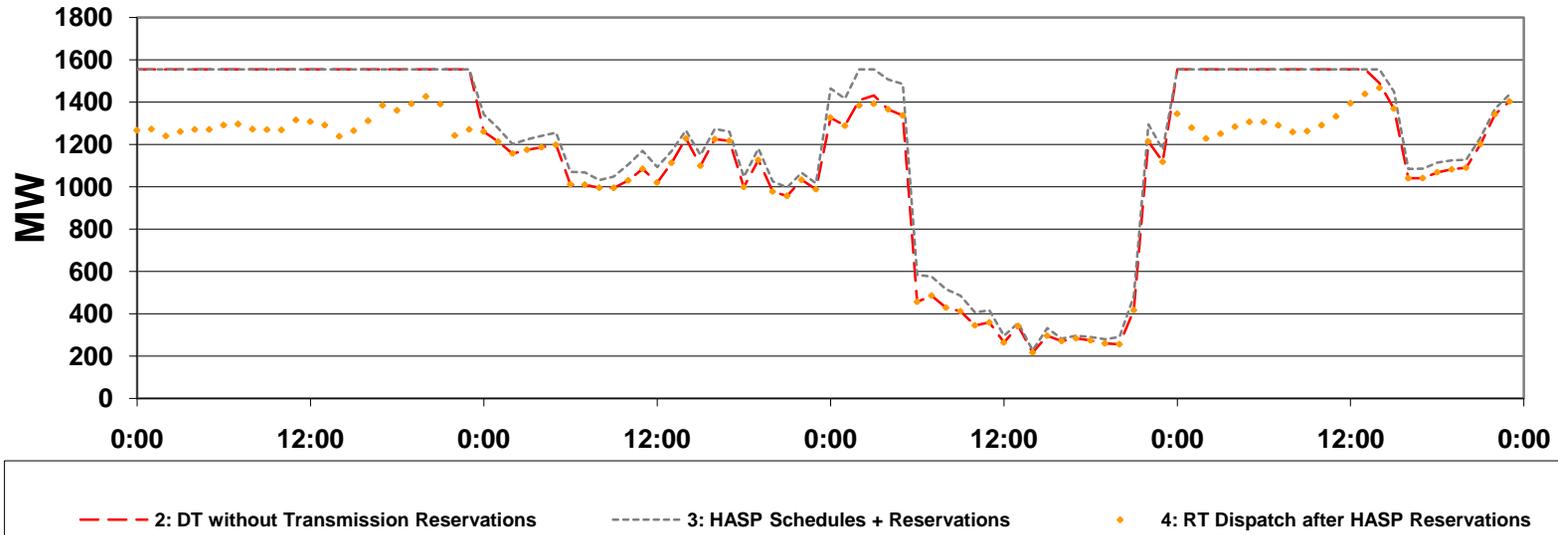
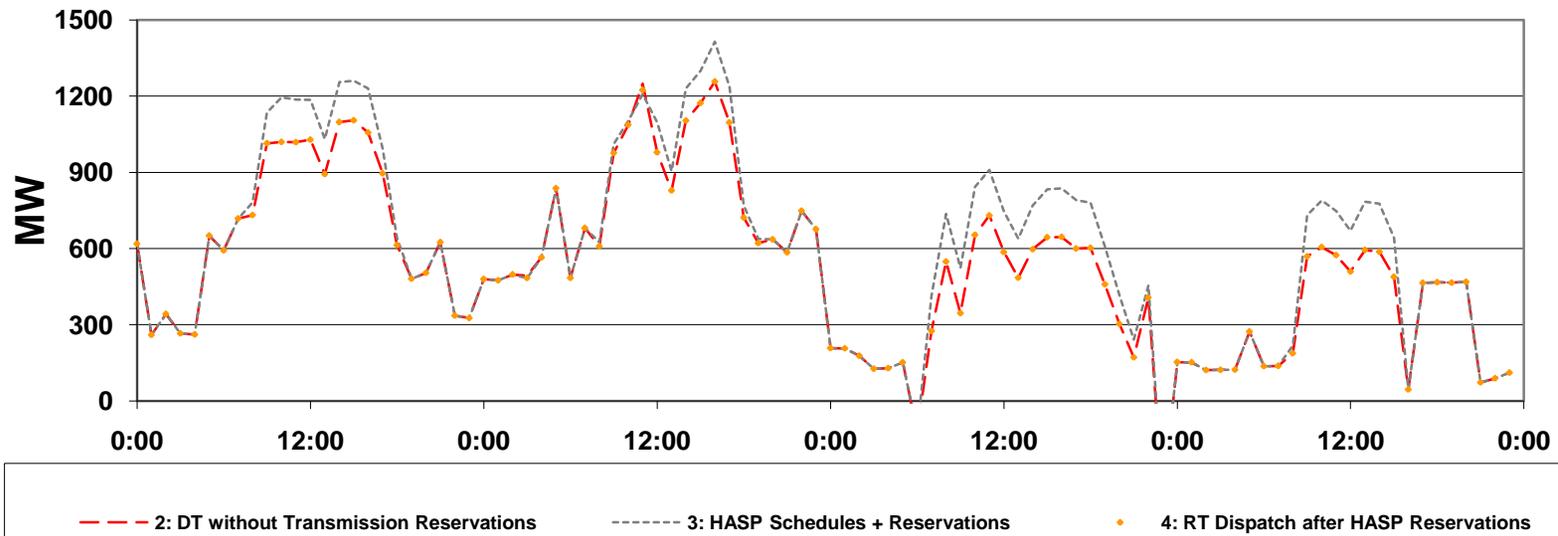


Figure 4: Scenario "C" Dynamic Transfer Impact on Mead Transmission Utilization



## **1. Background**

The objective of this Revised Draft Final Proposal is to propose solutions to issues affecting dynamic scheduling as presently offered in the California Independent System Operator (ISO) tariff, and to develop solutions for extending the ISO's dynamic scheduling policy into tariff provisions for pseudo-ties.<sup>1</sup>

The ISO published its Dynamic Transfers Straw Proposal in this stakeholder process on March 10, 2010 (available at <http://www.caiso.com/2755/2755e7b852d20.pdf>), and discussed it in a stakeholder meeting on March 17.<sup>2</sup> The objective of the Straw Proposal was to describe the functions of dynamic scheduling and pseudo-ties, propose solutions to issues affecting dynamic scheduling as presently offered in the ISO tariff, and develop solutions for extending the ISO's dynamic scheduling policy into tariff provisions for pseudo-ties. A Supplement to the Straw Proposal (available at <http://www.caiso.com/2787/2787c64b6e390.pdf>) provided additional discussion with stakeholders on selected issues prior to this Draft Final Proposal. The Draft Final Proposal (published on May 20 and available at <http://www.caiso.com/279c/279c8cae45e20.pdf>) stated the ISO management's conclusions, based on these stakeholder discussions, about the following policies to recommend to the ISO's Board of Governors to facilitate the use of the ISO's dynamic transfer services:

1. Clarifying tariff provisions for conventional resources,
2. Extending the existing use of dynamic scheduling for imports of conventional resources to include dynamic transfer of intermittent or "renewable" energy resources into the ISO from other Balancing Authority Areas (BAAs) and to dynamic exports, and
3. Incorporation of pseudo-tie service in the ISO tariff, including intermittent resources, predicated upon the successful culmination of the two present conventional resource pseudo tie pilots.

Two supplements to the Draft Final Proposal (available at <http://www.caiso.com/27b2/27b2c77c63e0.pdf> and <http://www.caiso.com/27d3/27d383ed3e3f0.pdf>), and a previous Revised Draft Final Proposal

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<sup>1</sup> These documents apply to dynamic transfers as a category of market participation, and use the term "dynamic transfer" as a general term that applies to either dynamic schedules or pseudo-ties. ("Dynamic import" and "dynamic export" refer to dynamic transfers in a specific direction.) The term "dynamic schedule" refers to an interchange schedule in which the resource remains under the control of the native balancing authority (BA) where the source of transfer is electrically located, and the native BA includes the resource's output in its balancing of supply and demand. The term "pseudo-tie" refers to a transfer in which the source is accounted for in the attaining BA's balance. The attaining BA also performs other balancing area functions for pseudo-tie resources. Appendix A of the Straw Proposal explains these characteristics of dynamic transfers in greater detail. The ISO attempts to use these terms precisely to explain provisions of the proposal that apply to the respective terms.

The ISO also attempts to distinguish appropriately between the terms "balancing authority" (BA) and "balancing authority area" (BAA). A BA is an entity that manages a BAA. For example, the ISO as a company is a BA that maintains the balance of loads, interchange, and generation within the metered boundaries of its BAA.

<sup>2</sup> The stakeholder process began with the ISO's Issue Paper, which was published on November 30, 2009 (available at <http://www.caiso.com/2476/2476ecfa5f550.pdf>) and discussed in a stakeholder meeting on December 7, to identify the issues that should be considered in this stakeholder process.

(published on August 16, 2010, and available at <http://www.caiso.com/27f4/27f4b6ec14ef0.pdf>) have further explored the specific topic of managing requests for dynamic transfer agreements for intermittent resources, and the Market Surveillance Committee has adopted an opinion concerning this topic (available at <http://www.caiso.com/27e9/27e9d6297bf0.pdf>). Discussions of these documents showed that the ISO would not be able to resolve the underlying issues without an analysis of the ISO's dynamic transfer capability for intermittent resources, and the ISO completed a study, through a contract with GE Energy, and published the results in a Draft Final Report on December 10, 2010, and Final Report on Impact of Dynamic Schedules on Interfaces on January 6, 2011 (available at <http://www.caiso.com/2aff/2aff9e9150530.pdf>). A Revised Draft Final Proposal published on February 18, 2011 (available at <http://www.caiso.com/2b29/2b29c05056f10.pdf>) updated the ISO's conclusions to date on this topic, as well as adding clarifying discussions in response to the ISO's conclusions on other topics. The ISO reviewed document at a stakeholder meeting on February 25, and the Revised Draft Final Proposal that is now being published updates the document for the results of that discussion and subsequent stakeholder comments.

A fundamental present day issue is the import of intermittent, renewable energy on the interties (i.e., between BAAs). Extending the ISO dynamic transfer and pseudo-tie service to intermittent renewable resources raises issues the ISO has not encountered with dynamic transfer of conventional resources. While the ISO faces many of these issues with intermittent resources that are native to the ISO BAA, significant growth of intermittent resources could involve bringing intermittent power into the control and responsibility of the ISO through dynamic transfer arrangements. Neither the North American Electric Reliability Corporation (NERC) nor Western Electricity Coordinating Council (WECC) policies directly address the implementation of dynamic transfers associated with renewable or "intermittent" resources. Accordingly, various efforts are underway within the WECC to consider how to implement, operate and account for the coordinated interchange of intermittent energy from source to sink BAAs. The use of dynamic transfer functionality to establish pseudo-ties under a market construct is also a relatively new and currently rarely used concept in the West.

With the advent of the 20 and 33 percent renewable portfolio standards for California load, the frequency of requests to the ISO for dynamic scheduling based import services has increased dramatically. Over the past year, multiple independent power project developers of external conventional and intermittent generation resources have inquired to the ISO about participation in various ISO markets and renewable energy programs, including the Participating Intermittent Resource Program (PIRP). In comments on the ISO's Issue Paper, PG&E states that dynamic transfer is essential for incorporating out-of-ISO renewable resources into PG&E's resource portfolio, and "Six Cities" (Anaheim, Azusa, Banning, Colton, Pasadena & Riverside) state they have already contracted outside the ISO and cannot get power to their cities due to the current ISO tariff and procedures.

Developers representing both conventional and renewable energy projects seek operating and scheduling services that face hurdles due to concerns for the potential grid reliability impacts and increased balancing energy burden. Their ISO service requests include the ability to dynamically schedule renewable energy imports into the ISO, dynamic imports from "single generator" BAAs, and the implementation of additional pseudo-ties for both conventional and renewable external resources. A particular concern in considering these requests is the ability of an external intermittent resource to be immediately responsive to interchange schedule (electronic tag, or "e-Tag") curtailment and decremental dispatch instructions in the event of real time intertie derate or contingency event.

To further address these issues, the ISO will discuss this Revised Draft Final Proposal in a stakeholder conference call on April 8, 2011, after which the ISO will receive stakeholder

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comments and prepare its final recommendations to its Board of Governors. The key dates in the schedule of the dynamic transfer tariff initiative are as follows:

November 30, 2009	Issue Paper published
December 7, 2009	Stakeholder meeting on Issue Paper
December 14, 2009	Stakeholder comments received on Issue Paper
March 10, 2010	Straw Proposal published
March 17, 2010	Stakeholder meeting on Straw Proposal
March 31, 2010	Stakeholder comments received on Straw Proposal
April 29, 2010	Supplement to Straw Proposal published
May 6, 2010	Stakeholder meeting on Supplement to Straw Proposal
May 13, 2010	Stakeholder comments received on Supplement to Straw Proposal
May 20, 2010	Draft Final Proposal published
May 27, 2010	Stakeholder meeting on Draft Final Proposal
June 10, 2010	Stakeholder comments received on Draft Final Proposal
June 11, 2010	Supplement to Draft Final Proposal published
June 18, 2010	Stakeholder conference call on Supplement to Draft Final Proposal
June 30, 2010	Stakeholder comments received on Supplement to Draft Final Proposal
July 14, 2010	Second Supplement to Draft Final Proposal published
July 21, 2010	Stakeholder conference call on Second Supplement to Draft Final Proposal
July 28, 2010	Stakeholder comments received on Second Supplement to Draft Final Proposal
August 5, 2010	Market Surveillance Committee Opinion adopted (MSC conference call)
August 16, 2010	Revised Draft Final Proposal published
August 23, 2010	Stakeholder conference call on Revised Draft Final Proposal
September 7, 2010	Stakeholder comments received on Revised Draft Final Proposal
October 6, 2010	Stakeholder conference call on Dynamic Transfer Study
October 13, 2010	Stakeholder comments received on Dynamic Transfer Study
November 12, 2010	Summary of October 2010 Stakeholder Comments and ISO Responses on Intermittent Dynamic Transfer Capability Study published
November 19, 2010	Stakeholder conference call on Impact of Dynamic Schedules on California-Oregon Intertie and West-Of-River
December 3, 2010	Stakeholder comments received on Intermittent Dynamic Transfer Capability Study
December 10, 2010	Draft Final Report on Impact of Dynamic Schedules on Interfaces published

December 17, 2010	Stakeholder conference call on Draft Final Report on Impact of Dynamic Schedules on Interfaces
December 27, 2010	Stakeholder comments received on Draft Final Report on Impact of Dynamic Schedules on Interfaces
January 7, 2011	Final Report on Impact of Dynamic Schedules on Interfaces published
January 27, 2011	Discussion Paper for February 1, 2011, Conference Call in Dynamic Transfer Stakeholder Process published
February 1, 2011	Stakeholder conference call on Status Update in Dynamic Transfer Stakeholder Process
February 8, 2011	Stakeholder comments received on Dynamic Transfers Discussion Paper
February 18, 2011	Supplement to Revised Draft Final Proposal published
February 25, 2011	Stakeholder meeting on Supplement to Revised Draft Final Proposal
March 11, 2011	Stakeholder comments received on Supplement to Revised Draft Final Proposal
April 1, 2011	Second Supplement to Revised Draft Final Proposal published
April 8, 2011	Stakeholder meeting on Second Supplement to Revised Draft Final Proposal
April 15, 2011	Stakeholder comments due on Second Supplement to Revised Draft Final Proposal, to <a href="mailto:dynamictransfer@caiso.com">dynamictransfer@caiso.com</a> .
May 18-19, 2011	Target Board of Governors decision on Dynamic Transfer initiative
June 2011	Target Tariff filing submitted to FERC for approval of Dynamic Transfer tariff changes.

The ISO has benefited from the comments that stakeholders submitted on the series of documents throughout the course of this stakeholder process, and thanks the commenters. The ISO now invites final inputs on this Supplement to Revised Draft Final Proposal's definition of the terms and conditions for dynamic transfer services.

## **2. Summary of Proposal**

To address the needs described above, this Draft Final Proposal addresses the expansion of dynamic transfer tariff service to incorporate these additional uses of dynamic transfer functionality, considering both the potential benefits and maintenance of grid reliability. Proposals cover the following topics:

- **Transmission reservations:** To account for the variation in renewable resources' output, allow dynamic transfers to specify maximum deliveries exceeding their expected average delivery. Given that the ISO provides hourly firm transmission and requires external transmission to be procured only for each operating hour, discourage excess transmission scheduling through settlement of congestion charges and the Grid Management Charge for the greater of scheduled and actual delivery.<sup>3</sup>

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<sup>3</sup> A stakeholder comment on the Straw Proposal questioned why the ISO treats resources connecting to Palo Verde substation as imports that are subject to intertie scheduling constraints, which differs from resources that might connect to Eldorado substation being considered to be within the ISO BAA.

- Congestion management: To efficiently dispatch all ISO resources over the real-time operating horizon, offer a scheduling option to intermittent resources to update their expected energy profile availability by 5-minute intervals, for a forward-looking two-hour period, to manage variability within operating hours and maintain high transmission utilization by dispatching other resources.
- Dispatchability requirements and curtailment rules: Ensure that dynamically transferred resources can immediately respond to interchange schedule (e-Tag) curtailment and decremental dispatch instructions and orders in the event of real time intertie derate or contingency event. Develop operating procedures to reflect characteristics of new resources, and use operating orders to facilitate compliance with reliability needs.
- Locational pricing: Model and price dynamic resource-specific system resources (including pseudo-ties) at their actual locations, as the ISO does currently for the Sutter pseudo-tie (using the same mechanism that determines prices at scheduling points, such as Four Corners, that are not at the ISO boundary).
- Pro rata allocation of deviations among BAAs: Update tariff provisions to incorporate pro rata allocation of uninstructed deviations into the ISO tariff as an upper limit on the ISO's allocation of deviations.
- Limits of dynamic imports: As part of the ISO's overall operational response to increasing levels of generation by intermittent resources, monitor any operational issues that relate to dynamic transfers, and coordinate with other affected BAAs to study regional issues affecting dynamic transfer capability. The ISO's technical studies during the course of this stakeholder process concerning the potential for maximum dynamic transfer limits for intermittent resources have concluded that no limits need to be applied within the ISO's BAA at this time. If such limitations become apparent in the future, the ISO will identify appropriate responses, including potentially limiting new dynamic transfers of intermittent resources, but would not limit dynamic transfers that would have already been established.

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This comment suggests that resources at Palo Verde should not be subject to intertie limits and other provisions that apply to pseudo-ties, since SCE owns the Palo Verde-Devers line and is part owner of Palo Verde substation, which it claims is similar to ownership at Eldorado. The difference between these locations is that even though both substations have multiple owners, the intertie point and associated metering at Eldorado substation establishing the boundary between the ISO BAA and its neighboring BAAs effectively place this substation inside the ISO BAA boundary, while the intertie points and associated metering at Palo Verde substation establishing the boundary between the ISO BAA and its neighboring BAAs effectively place this substation outside the ISO BAA boundary. Neither the Palo Verde nor Hassayampa substation has been placed under ISO operational control as either ISO BAA or ISO Controlled Grid, which requires that schedules from the Palo Verde Hub are subject to the same requirements as other imports, even when they are dynamic transfers. On the Merchant to Eldorado 230 kV intertie, the point of interconnection is at a transmission tower on the Merchant side of Eldorado substation. On the Palo Verde to Devers and Hassayampa to North Gila 500 kV intertie lines, the points of interconnection are at the boundaries of the 500 kV switchyards, not at the buses that terminate the 500 kV lines. Thus, a pseudo-tie resource that connects through generation ties to buses at Palo Verde or Hassayampa must first schedule as an export from the boundary of the pseudo-tie, and then import back to the ISO at these points of interconnection, where the resource is scheduled as an import to the ISO. The functions of dynamic schedules and pseudo-ties are described in NERC's Dynamic Transfer Reference Document, which is available at <http://www.nerc.com/filez/rfwg.html>, which states (among other provisions) that a pseudo-tie is used as a tie line flow in the AGC/ACE equation, and that pseudo-ties are accounted for as "actual interchange" while dynamic schedules are counted for as "scheduled interchange" (i.e., both are interchange calculations).

- Management of requests for dynamic transfers: To allow market participants who are developing or contracting for new dynamically transferred resources to self-manage risks that their projects, combined with existing dynamic transfers, do not exceed the available transfer capability, determine procedures for sharing data regarding dynamic transfer agreements that have been registered and/or are operational at specific interties.
- Aggregation of conventional and/or renewable resources: Support aggregation of resources that are electrically close together.
- Generator-only BAAs: As with any resource seeking to dynamically import into the ISO, the ISO will approve dynamic scheduling agreements in which performance terms and conditions, supported by successful management of inadvertent energy and sufficient contingency reserves, indicate that the resource will reliably perform as a dynamic schedule.
- Dynamic exports: Allow dynamic exports of supply resources that are geographically within the ISO's BAA.
- Layoffs from pseudo-ties: Continue to support exports to native BAAs from pseudo-tie generators, as the ISO has done in the pilot implementation.
- Multiple dynamic schedules: Allow an external generator to be split in fixed shares as dynamic schedules (not pseudo-ties) that would be scheduled on different interties in order to obtain transmission through external BAAs.
- Non-firm transmission: Allow dynamic schedules for energy to use non-firm transmission through external BAAs.
- Documentation for AS certification: Modify requirements to align certification processes.
- Coordination with neighboring BAAs: Coordinate development of similar market initiatives.

In most of these areas, the ISO's proposals in this Draft Final Proposal and Revised Draft Final Proposal are the same as in the Straw Proposal, as modified in the Supplement to the Straw Proposal, and differences in the original and this Revised Draft Final Proposal mostly seek to clarify the explanation of the proposals if needed, as well to refine their details. The Draft Final Proposal added detail concerning the ISO's technical studies of limits on dynamic imports of intermittent resources, and the studies have been completed. The ISO's technical studies have concluded that no dynamic transfer capability limits need to be applied to intermittent resources at this time within the ISO's BAA. As part of the ISO's overall operational response to increasing levels of generation by intermittent resources, the ISO will monitor any operational issues that relate to dynamic transfers, and will coordinate with other affected BAAs to study regional issues affecting dynamic transfer capability. If such limitations become apparent in the future, the ISO will identify appropriate responses, including potentially limiting new dynamic transfers of intermittent resources, but would not limit dynamic transfers that would have already been established. The resolution of these issues will be formalized in the final proposal that will be recommended to the ISO Board of Governors, and as needed in revisions to the ISO tariff as approved by the ISO Board of Governors as they pertain to dynamic scheduling, and as an addition of standard contract terms for pseudo-tie imports and dynamic exports.

The overall scope of issues that affect dynamically transferred resources extends beyond the topics that are addressed in this Revised Draft Final Proposal. The ISO maintains coordination among the staff teams that work on related projects, but it is necessary to divide topics among projects in order to keep each project's work manageable, rather than undertaking a global effort that would consider all issues, and thereby risk not achieving outcomes on the critical topics. After considering the alternatives on each issue as to whether to recommend a change

in the ISO tariff in this stakeholder process, consider issues in a related stakeholder process, or establish business processes to improve the ISO's operations within its existing tariff provisions, the ISO has focused this stakeholder process on topics that are specific to dynamic transfers. More general issues that apply to both internal and external resources are being addressed through other stakeholder processes. By applying this guideline, the ISO has been able to manage the scope of this stakeholder process, so that it can come to conclusions on the critical topics that it needs to address.

Therefore, as discussed in the Straw Proposal and subsequent documents, the ISO is not proposing changes in this document concerning the following issues:

- Management of increased load following and regulation requirements: Important consequences of receiving imports supported by intermittent resources, using dynamic transfers, are the variability of the energy delivered by intermittent resources, the difficulty of dispatching or anticipating the amount of delivered energy from intermittent resources, and the potential for increased responsibilities for regulation and load following. These impacts occur with increases in dynamic imports of intermittent resources, as well as with increases in intermittent resources within the ISO BAA. The ISO has concluded that it should maintain comparable charges to internal and external intermittent resources for their contributions to regulation and load following requirements, and has initiated the "Renewables Integration Market and Product Review" stakeholder process that will be a more general review of requirements for intermittent resources, including cost allocation and cost-sharing mechanisms for regulation and load following responsibility. Any charges resulting from that stakeholder process will apply to dynamic schedules and pseudo-ties that begin operation prior to its completion, with no grandfathering exemptions. Information on this stakeholder process is available at <http://www.aiso.com/27be/27beb7931d800.html>.
- Extension or modification of PIRP: Similarly, the "Renewables Integration Market and Product Review" stakeholder process, which is addressing a wide range of market issues concerning intermittent resources in general, will review the PIRP program as a whole, including questions of whether the ISO should expand PIRP to include external resources. Inclusion of dynamic imports in PIRP will be considered in that process rather than in this one.<sup>4</sup>

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<sup>4</sup> Generators outside the ISO are not currently eligible to participate in PIRP. The current limitation of PIRP eligibility to not include external resources is stated in Appendix Q (Eligible Intermittent Resources Protocol) of the ISO tariff, in which section 2.2.1 requires execution of a Participating Generator Agreement, whereas pseudo-ties execute Pseudo-PGAs instead, and section 2.2.2 requires that a PIRP resource must be connected to the ISO Controlled Grid, which does not include the connections to pseudo-ties.

A broader category of resources in the ISO tariff is Eligible Intermittent Resources. The current tariff definition of Eligible Intermittent Resource refers to Generating Units (which by the tariff definitions are within the ISO) that are powered by wind or solar energy (with an allowance for a de minimis amount of energy from other sources). The ISO will extend the definition of Eligible Intermittent Resources to include similar generation sources that participate in the ISO's markets through dynamic transfers. On April 30, 2010, FERC conditionally accepted the ISO's proposed tariff revisions, subject to further compliance filings (FERC docket ER10-319-000), to improve its ability to forecast the production from Eligible Intermittent Resources, and to mitigate the operational impacts of variability and uncertainty by receiving specified forecasting and telemetry data and reporting of forced outages. Receiving the same information for dynamic transfers of intermittent resources will be important for maximizing the utilization of inertia capacity and maintaining sufficient unit commitment of dispatchable generation to manage variations in external as well as internal intermittent resources.

- Interconnection standards and transmission planning. The ISO has recently completed stakeholder processes on interconnection standards for renewable resources, and on a revised transmission planning processes, both of which have been presented to the Board of Governors at its May 2010 meeting. Operational issues that the ISO faces as intermittent resources become more prevalent, such as ensuring that it has enough inertia through synchronized capacity to arrest frequency decline following losses of generation, and that apply to both internal and external resources, will similarly be considered in other forums. This stakeholder process on dynamic transfers excludes issues that overlap with the other stakeholder processes.
- Ancillary services and uninstructed deviations: The ISO will maintain its existing tariff provisions concerning responsibility for operating reserves,<sup>5</sup> certification of ancillary services, and financial settlement of uninstructed deviations.
- Dynamic transfers of load: The ISO maintains a willingness to develop pilot agreements for dynamic transfers of load, but has not had operational experience with dynamic transfers of load that would enable identification of appropriate tariff provisions.

In addition, questions arose during the stakeholder process seeking explanations of whether the status of a resource affects a market participant's resource adequacy (RA) portfolio, and whether pseudo-ties might be eligible for being deemed deliverable into the ISO for qualification as RA resources. While the qualification of generation resources within the ISO's BAA includes an assessment of deliverability and a Net Qualifying Capacity (NQC) value, and dynamic system resources are treated the same as generators in many ways, under ISO tariff section 40.8.1.12.1 except that these deliverability assessments do not apply to imports. Rather, eligibility as a RA resource is contingent upon a showing by the scheduling coordinator (SC) that the dynamic system resource has secured transmission through any intervening BAAs for the applicable operating hours that cannot be curtailed for economic reasons or bumped by higher priority transmission, and that the load serving entity (LSE) has an allocation of import capacity at the import scheduling point under ISO tariff section 40.4.6.2 that is not less than the resource adequacy capacity provided by the dynamic system resource. Variable resources within the ISO have an additional protocol for establishing Qualifying Capacity, in which CPUC decision D.09-06-028 established an exceedance methodology to determine qualifying capacity for wind and solar resources. The ISO proposes to apply the same exceedance methodology used for establishing Qualifying Capacity for Variable resources within the ISO to resources importing to the ISO including dynamic transfers of variable resources.

The ISO's deliverability assessment for dynamic transfers does not differ from other imports, and the ISO believes it would be undesirable to carve out intertie capacity as a reservation for dynamic transfers (including pseudo-ties), for reasons including the following:

- First, economic inefficiency and possibly harmful shifts in competitive pricing could occur if the ISO were to reserve intertie capacity specifically to serve dynamic transfers. Reserving such capacity would be a fundamental shift in RA policy by assigning the import capacity value to the generator versus the current method of assigning the limited amount of import transmission capacity to the LSEs. Over time LSEs would have much reduced competitive options in making their procurement decisions for RA capacity as potentially more of the import capacity was shift to be assigned to external generators using dynamic transfers. The import transmission capacity is a limited resource, but

<sup>5</sup> Under Section 6.4 of the ISO tariff's Appendix X, the ISO treats firm dynamically scheduled energy as a resource contingent import, and procures (or allows for self-provision of) operating reserves. ISO tariff section 11.10.4.2 states the unit-contingent imports' obligation for operating reserves.

allocation of such capacity to LSE's allows access to all resources in the WECC region. Assigning a portion of any intertie to a single resource would seem to underutilize the limited import capacity, without the pseudo-tie generator having gone through the ISO interconnection process. Looking into the future, the ISO expects to receive more and more pseudo-tie requests, and allocating capacity to them, away from the LSEs who have the obligation to procure RA capacity, could severely impact the LSEs' choices of RA import capacity.

- Second, the consumers of California may experience a decrease in overall system reliability. The current RA framework for imports allows for energy-based contracts to count towards the capacity-based RA program. This allows California consumers and the ISO to benefit from the full capacity in the WECC to "back" the energy that is expected to flow across the intertie when the RA is called upon. This is true regardless of which generators are online at a particular time. Moving to a designated generator paradigm would cause a reliability reduction because the RA import capacity would not provide service when the RA physical resource experiences a scheduled or forced outage.

Even without a direct deliverability assignment, a pseudo-tie can still become a RA resource since its Qualifying Capacity is calculated based on the Local Regulatory Agency rules that are applicable to the procuring LSE. This occurs through the existing process in which the procuring LSE assigns its allocation of RA import capacity to the pseudo-tie.

Section 3 of this document describes the proposals offered in this Draft Final Proposal in further detail. The impact of most issues is quite similar for both dynamic schedules and pseudo-ties, and this discussion will distinguish between these scheduling options only if needed, with the proposals applying to both forms of dynamic transfers. For clarity, section 4 summarizes the applicability of the proposals to dynamic schedules versus pseudo-ties. Section 5 highlights areas in which the ISO will need to implement changes to its market and operations systems before the full functionality described herein is available, and identifies the functionality that will be available in the interim. Appendix A of the Straw Proposal described the overall characteristics of dynamic transfers, and will be incorporated into the ISO's Business Practice Manuals after the conclusion of this stakeholder process. Appendix B of the Straw Proposal contained the standard terms of service for pseudo-ties, which the ISO proposes to include in the ISO tariff as a pro forma Pseudo Participating Generator Agreement.<sup>6</sup>

<sup>6</sup> Both the Sutter and New Melones pseudo-tie pilots have participated successfully in the ISO's markets. This experience has revealed limitations in market functionality, which have not deterred the success of the pilots and are now being resolved. The ISO has developed the Pseudo PGA for Copper Mountain by refining the terms of the initial pilots, and now proposes the terms of the Copper Mountain pilot as the basis for pro forma language to go into the ISO tariff to support pseudo-tie imports. The key part of the pro forma Pseudo PGA is the statement of terms of service, which the ISO has adapted from the Copper Mountain Pseudo PGA by simply removing resource-specific references, and is Appendix B of the Straw Proposal as the ISO's proposed pro forma contract terms. An area where a refinement is currently being implemented is in the enforcement of intertie scheduling constraints. Congestion management includes enforcing both (1) flow-based constraints within the ISO BAA, to ensure that flows remain within thermal limits of transmission facilities, adequate voltage support is available throughout the grid, and inter-regional flows do not undermine regional stability, and (2) scheduling constraints that limit the volume of schedules that adjacent BAAs agree can be scheduled on a particular intertie, based on either thermal capacity or contractual limits, regardless of how the resulting energy flows through the grid. Intertie scheduling is limited by both what the ISO calls "market scheduling limits", which place boundaries around scheduling points or sets of scheduling points that can be defined flexibly, but only limit energy schedules, and "intertie"

### **3. Enhancements for Dynamic Transfers**

ISO tariff section 4.5.4.3 (Dynamic Scheduling) allows imports of energy and ancillary services from Dynamic System Resources, provided that: (a) such dynamic scheduling is technically feasible and consistent with NERC and WECC reliability standards, including any requirements of the NRC, (b) all operating, technical, and business requirements for dynamic scheduling functionality, as set forth in the Dynamic Scheduling Protocol in Appendix X or posted in standards on the ISO website, are satisfied, (c) the SC for the Dynamic System Resource executes a dynamic scheduling agreement as provided in Appendix B.5 with the ISO, and (d) all affected native Balancing Authorities and intermediary Balancing Authorities each execute with the ISO an Interconnected Balancing Authority Area Operating Agreement or other operating agreement related to the operation of dynamic functionality.<sup>7</sup>

These requirements do not inherently limit dynamic scheduling to certain generation technologies (e.g., conventional vs. intermittent). Given the recent level of interest in dynamic scheduling of renewable resources, what needs to be addressed is to define the ISO's operating, technical, and business requirements, to ensure that dynamic scheduling is technically feasible and consistent with NERC and WECC reliability standards. Like conventional resources, intermittent resources will need to comply with the provisions of the ISO tariff's Dynamic Scheduling Protocol and all other applicable requirements that conventional resources must meet before they can establish a dynamic transfer with the ISO. The tariff provisions that apply to Eligible Intermittent Resources that do not participate in PIRP will also be applicable to dynamic transfers of intermittent resources, including communication, telemetry, and forecasting requirements and the provisions of the Eligible Intermittent Resources Protocol (ISO tariff Appendix Q). The ISO's Issue Paper and Straw Proposal identified several additional areas in which operating, technical, and business requirements need to be defined, which are addressed in the following subsections.

#### **3.1. Transmission reservations**

As dynamic transfers begin to include intermittent resources, a concern is how to maintain full transmission utilization, while recognizing the variability of intermittent resources' output. A fundamental difference between scheduling generation within the ISO BAA and scheduling dynamic transfers is that dynamic transfers must cross interties, which (1) are subject to specific

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constraints that maintain the sum of energy and ancillary service schedules within the defined limits but have a restriction that a resource can be subject to only one intertie constraint, due to current software functionality. The Sutter pseudo-tie uses network transmission service to support its scheduling through the SMUD BAA, which allows delivery to the ISO at multiple alternative scheduling points. Until recently, the ISO was unable to define an intertie constraint that applies to Sutter, because the intertie constraint allows mapping of a resource to only a single intertie. In Sutter's case, this had not been an issue because sufficient transmission has been available across the SMUD to ISO boundary. The possibility of an alternative delivery point for Copper Mountain in the event of an outage of its normal delivery point led the ISO to identify a solution through a market setup script. This is a manually initiated work-around for use in the event of intertie outages, using either network or point-to-point transmission service through other BAAs, but does not support alternative intertie mappings as a routine market function. This is an implementation issue that does not affect the definition of terms of service in the Pseudo PGA.

<sup>7</sup> Tariff changes to implement the policies resulting from this stakeholder process may include renaming the Dynamic Scheduling Protocol to "Dynamic Transfers Protocol", and similar renaming of other documents. Except for obvious changes such as reference to a Pseudo Participating Generator Agreement rather than a Dynamic Scheduling Agreement, the requirements set forth in the existing Dynamic Scheduling Protocol appear to be applicable to pseudo-ties as well as dynamic schedules.

scheduling constraints that are not necessarily directly the same as constraints of the thermal capacity of the transmission lines and are not determined only by conditions within the ISO BAA, and (2) are subject to NERC and WECC standards that do not apply to schedules within the ISO BAA. Electronic tags (e-Tags) for dynamic scheduling contain capacity values for both expected delivery and maximum delivery. Issues of allocating transmission capacity using e-Tags apply to all interties but do not affect scheduling within the ISO BAA, and thus intertie schedules face requirements that do not apply to resources within the ISO. The ISO's market software manages dynamic schedules using only the value for expected delivery, and this represents the transmission reservation for purposes of the ISO market.<sup>8</sup> However, if (1) a dynamically scheduled intermittent resource were to schedule its average, expected delivery, (2) its reserved transmission matches its energy schedule, and (3) other interchange schedules were accepted up to its intertie's full capacity, the intermittent resource may be unable to deliver more than its initial expected energy schedule. A contrasting concern is that Scheduling Coordinators (SCs) could submit excessive self-schedules to obtain flexibility for exceeding their actual expected, but intermittent, deliveries to the ISO. In this event, the ISO's market systems could expect that it would receive more energy from the intermittent resources than they would actually be expected to produce, and may fail to commit sufficient dispatchable capacity to maintain the required energy balance. Excessive scheduling for the purpose of obtaining flexibility for intermittent deliveries could also result in unused transmission capacity that could be used by other market participants. As the use of dynamic transfers grows, the ISO needs to avoid reducing the utilization of the ISO's import capacity.

To resolve these concerns, the ISO will treat the capacity values for expected delivery and maximum delivery, which are separate values in e-Tags for dynamic scheduling ("energy profile" and "transmission profile"), as separate values in market bids and schedules for dynamically transferred resources. In the day-ahead market and hour-ahead scheduling process, both the maximum delivery and expected delivery are subject to the intertie scheduling constraint. If the maximum delivery exceeds the expected delivery, the difference is similar to a capacity reservation for imports of ancillary services.<sup>9</sup> As such, the market bid component for maximum

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<sup>8</sup> Section 6.1 of Appendix X (Dynamic Scheduling Protocol) of the ISO tariff states: "For any Operating Hour for which Energy and/or Ancillary Services (and associated Energy) is scheduled dynamically to the CAISO from the System Resource, a firm (or non-interruptible for that hour) matching transmission service must be reserved across the entire Dynamic Schedule transmission path external to the CAISO Balancing Authority Area." The intent that the requirement for firm transmission along the external scheduling path does not extend beyond the operating hour is stated on page 10 of the cover letter for Amendment 59: "The ISO's proposed dynamic scheduling policy requires that the Scheduling Coordinator make arrangements for firm, or non-interruptible for the operating hour, transmission service from the host Control Area and through all intermediary Control Areas, if applicable, to the ISO." Section 6.11 of Appendix X further states: "In Real-Time the Dynamic Schedule may not exceed the maximum value established by the sum of the Day-Ahead Market and HASP/RTM accepted Energy and Ancillary Services Bids plus any response to the CAISO's Real-Time Dispatch Instructions. The composite value of the Dynamic Schedule derived from the Day-Ahead and HASP/RTM accepted Bids plus any Dispatch Instruction response represents not only the estimated Dynamic System Resource's Energy but also the transmission reservation on the associated CAISO Scheduling Point." Requiring dynamic transfers to be supported by firm transmission only for each operating hour avoids a concern that requiring long-term transmission contracts outside the ISO could limit the availability of transmission to get to the ISO boundary. The dynamic schedule remains subject to the scheduling practices of other BAAs between the ISO, and the value for maximum delivery may have other significance to other BAAs.

<sup>9</sup> An energy schedule or ancillary service award on an intertie automatically carries a transmission reservation in the existing ISO markets. Both must be confirmed using an e-Tag. There is currently no ability to acquire transmission across an intertie in the ISO market separately from the energy and

delivery will be supported in both the day-ahead and real-time markets, with a single bid segment, with the same bid cap as energy bids, and a bid floor of \$0. An example of the use of separate bid and schedule components for expected delivery and maximum delivery is a solar photovoltaic generator during morning hours. In a particular hour, the generator's output is expected to be 30 MW at the start of the hour and 50 MW at the end of the hour, with the average delivery being 40 MW. This generator may choose to submit a self-schedule for an expected energy delivery of 40 MW and a bid for a maximum delivery of 50 MW, thereby assuring that it will have a transmission reservation sufficient to support its 50 MW delivery at the end of the hour.<sup>10</sup>

Depending on environmental conditions (e.g., wind speed or cloud cover), an intermittent resource's potential delivery may vary as high as its installed capacity. However, the output of a dispatchable generator is controllable, and will not be dispatched above its self-schedule or the maximum capacity of its submitted economic bid. Thus, the ISO will limit an intermittent resource's transmission reservation to no more than the maximum capacity stated in its dynamic transfer agreement. In addition, the ISO recognizes that a non-intermittent resource would not be dispatched above the maximum capacity offered in its economic bid. Thus, for non-intermittent resources, the ISO proposes to limit the transmission reservation (i.e., the sum of the resource's initial energy schedule and ancillary service awards, plus any additional capacity to allow for a real-time increase in output as sent in dispatches) to no more than the highest offered capacity in its submitted bid.

To discourage submission of self-schedules for intermittent resources that exceed their actual expected delivery, the ISO will base settlements of dynamic transfers for the congestion component of LMPs and the Grid Management Charge on the greater of scheduled transmission reservations and actual delivery.<sup>11</sup> Schedules for dynamic transfers are not

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AS schedules, for which the transmission reservation in the ISO market exactly equals the energy and AS schedule. It would not be meaningful for a static energy schedule to reserve additional transmission capacity, because the static energy schedule cannot be increased during the operating hour (except for the defined inter-hour ramping). The questions of establishing additional transmission reservations apply only to dynamic transfers, which receive dispatches within the operating hour to follow the ISO's system conditions or an intermittent resource's availability.

<sup>10</sup> The ISO will continue to support self-scheduling of energy, but does not propose to add self-scheduling of transmission reservations.

<sup>11</sup> Specifically, the congestion charge for a transmission reservation in excess of the energy schedule will be set by the shadow price of the intertie scheduling constraint ("ITC") that applies to the dynamically transferred resource, in the market where the transmission reservation is awarded (day-ahead market or hour-ahead scheduling process). To avoid double-charging for congestion, the settlement price for the resource's real-time energy delivery up to its transmission reservation will exclude the real-time market's shadow price for that intertie scheduling constraint. The full congestion charge would apply to deliveries above the transmission reservation.

For example, consider a dynamically transferred resource that schedules 90 MW of energy and establishes a 100 MW transmission reservation in the day-ahead market, and then delivers 120 MW in real-time, using the Palo Verde scheduling point. This resource would be paid the day-ahead LMP at Palo Verde for its 90 MW energy schedule, and charged the day-ahead shadow price of the Palo Verde ITC when it establishes its additional 10 MW transmission reservation. Path 26 may also be congested in the day-ahead market, and the Path 26 shadow price affects the Palo Verde LMP for its 90 MW day-ahead energy schedule but would not be included in the resource's day-ahead congestion price for the transmission reservation. This is because the transmission reservation affects scheduling on the Palo Verde intertie, but does not directly affect the flow on Path 26.

If the Palo Verde ITC is then congested in the real-time market, the resource's settlement would not include the real-time Palo Verde ITC's shadow price for its first 100 MW of energy delivery because

required to submit transmission reservations that exceed their expected actual delivery. However, in recognition that an intermittent dynamic resource's maximum delivery can exceed its average delivery, the ISO is offering the flexibility to schedule the additional transmission capacity that the intermittent dynamic resource chooses to reserve. When an intermittent dynamic resource does schedule additional capacity beyond its expected average delivery, doing so reduces the transmission capacity that is available to other market participants, and it is appropriate to pay for the transmission reservation. In considering whether to reserve capacity beyond its expected average delivery, a dynamic resource would consider that its real-time dispatch (including the scheduling options discussed in section 3.2) may exceed its maximum transmission reservation, as recallable transmission, if non-recallable scheduled use and other recallable scheduled use of transmission have not filled the available capacity.<sup>12</sup>

The existing tariff section 11.10.1.1.1 and 11.10.9.1 establish the congestion charges and credits, respectively, assessed for a dynamic system resource that is providing ancillary services becoming undeliverable due to a transmission derate. The ISO will clarify these sections to be applicable to all dynamic transfers including pseudo-ties that are providing ancillary services. Furthermore, similar provisions will apply for credits for release of transmission reservation that occur prior to the hour-ahead scheduling process (HASP) due to a transmission derate.

### **3.2. Congestion management**

The previous section has addressed a portion of the ISO's concern for maintaining full transmission utilization while recognizing the variability of intermittent resources' output, by allowing intermittent resources to reserve sufficient transmission to accommodate their realistic levels of variable deliveries, while informing the ISO of their actual expected delivery, and while discouraging excessive requests for transmission reservations. However, there is a remaining concern that transmission usage at any particular time could be just a fraction of the available capacity, at the same time that the market awards for maximum delivery have fully reserved the available transmission (i.e., appearing to be congestion). If the example in the previous section, in which a solar generator has an expected energy delivery of 40 MW and a maximum delivery of 50 MW, is extrapolated into hundreds of MW of dynamically scheduled intermittent resources whose average delivery is a small fraction of their maximum capacity, the concern becomes significant.

If the ISO has knowledge of how a dynamically scheduled resource's output will vary within the operating hour for which the market bid has been submitted, the ISO can minimize the

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[this capacity was already purchased in the day-ahead market, but would be subject to the real-time Palo Verde ITC shadow price for the delivery above 100 MW. If Path 26 remains congested in the real-time market, the resource's real-time energy settlement would include the impact of Path 26 congestion for the full amount of its increase from 90 to 120 MW.](#)

<sup>12</sup> The capability for a resource's real-time dispatch to exceed its day-ahead or hour-ahead transmission reservation can be useful for a dispatchable dynamic transfer as well as for an intermittent dynamic transfer, by allowing the resource to be dispatched for peaking capacity when needed by the ISO's system conditions, when transmission capacity is available in real-time. A fast-start peaker may choose to submit an economic bid without establishing a day-ahead or hour-ahead transmission reservation, and be available for real-time dispatch on a similar basis as a peaker within the ISO's BAA. To accommodate this, the ISO will clarify Section 6.8 of Appendix X of the ISO tariff (which now states: "If there is no Dynamic Schedule in the CAISO's Day-Ahead Market, or HASP/RTM the dynamic signal must be at "zero" ("0") except when in response to CAISO's Dispatch Instructions associated with accepted Ancillary Services Bids") to be applicable to imbalance energy as well as ancillary services.

underutilization of transmission capacity. For resources that are dispatchable through price-responsive bids or as regulation reserve, the ISO can manage the variation of the resource's output. The ISO proposes to offer a scheduling option for dynamic transfers of Eligible Intermittent Resources, which will allow these resources to adjust their dynamic schedules for variations in their availability within the operating hour, for reasons other than price-responsive dispatches or response as regulation reserve.<sup>13</sup> The proposed scheduling option will leverage the market functionality that was initially developed to support Metered Subsystems (MSS).<sup>14</sup> The dynamic schedule would not become an MSS. Rather, the dynamic resource would be recognized in some ISO software systems as having a variable self-schedule, which in this case would be reported to the ISO as its expected output during 5-minute time intervals during a two-hour look-ahead period. The ISO sends the value to the resource as the ISO's dispatch (assuming no reduction due to congestion), in somewhat the same manner that a MSS informs the ISO where its load-following resources will be operating, after which the ISO echoes back the operating point as a dispatch. SCs representing intermittent dynamically transferred resources would initially submit hourly self-schedules and/or economic bids for their forecast of expected delivery, concurrently with the ISO receiving bids for static interchange schedules in the Hour-Ahead Scheduling Process, allowing the ISO to optimize transmission reservations for static and dynamic schedules before using the updated forecasts of expected delivery during real-time interval dispatch. In the real-time market, the resources' availability as reported to the ISO (or as observed from telemetry, if an SC has not reported its availability) becomes an upper limit on the ISO's dispatch instructions. If an SC has submitted an economic bid for reductions in delivery below its resource's availability, the ISO's real-time economic dispatch will schedule the resource at or below its availability. The ability of resources to submit economic bids for decremental dispatch below their availability allows market participants to limit their exposure to negative LMPs that can result from congestion, over-supply, or other system conditions, and provides the ISO with increased flexibility for managing these system conditions.<sup>15</sup>

By adding this capability, the ISO allows Eligible Intermittent Resources that are dynamically transferred into the ISO to choose between two scheduling options:<sup>16</sup>

<sup>13</sup> Non-intermittent resources already have the ability to report reductions in their availability through SLIC. Intermittent resources are also expected to report reductions in their availability that are due to equipment outages or derates, but SLIC is not designed to be able to handle the very frequent changes in meteorological conditions that affect wind and solar generators.

<sup>14</sup> An MSS is an electric utility system located within the ISO, which has operated before the ISO's formation as a municipal utility, water district, irrigation district, state agency or federal power marketing authority.

<sup>15</sup> The real-time dispatch operating target sent by the ISO, combined with the day-ahead schedule, defines the instructed imbalance energy for financial settlements. Because reductions from day-ahead schedules to maximum availability are determined by resource limitations rather than the ISO's real-time dispatch, these reductions are not subject to bid cost recovery. The ISO's Renewables Integration Market and Product Review stakeholder process may determine additional settlement principles that would apply to intermittent resources in general.

<sup>16</sup> By default, the ISO will utilize the rolling persistence schedule to provide 5-minute updates, as it does now for intermittent resources within the ISO's BAA. Once the ISO has implemented a market participant's selection of the option to self-provide forward-looking forecast data, the ISO will use the market participant's forecast whenever it is provided, but will revert to dispatching based on telemetry if the market participant does not provide a forecast. In addition, when the market participant has chosen the option to self-provide its forecast, it will determine how it will calculate its forecast, and could use different methods at different times. For example, the market participant could forecast its availability using a typical-day profile during ramping periods (e.g., a solar generator at sunrise and sunset), then base its forecast on its most recent telemetry during times of day when changes from

1. The resource may designate its expected delivery and maximum delivery in its day-ahead and real-time bid submission. During the operating hour, the ISO will use its internal systems to forecast the resource's delivery, for use in its overall unit commitment and dispatch for the ISO BAA as a whole.<sup>17</sup> Initially, the ISO will use the most recent available telemetry reporting of the resource's output as its expected deliverability and real-time dispatch for the next dispatch interval (adjusted downward if necessary due to congestion), and will continue its efforts to improve its forecasting capability for intermittent resources. This option uses existing ISO market software functionality.<sup>18</sup>
2. Using the new functionality, the resource may designate its expected delivery and maximum delivery in its day-ahead and real-time bids, and then submit its own forecast of its availability during the operating hour. Its reported availability would perhaps be based on its own forecast or other arrangements such as firming and shaping services that it receives outside the ISO markets. The ISO will return the reported availability during the next 5-minute dispatch interval as the resource's dispatch, adjusted downward if necessary due to congestion. The ISO will monitor the submitted forecasts of availability, compared to actual deliveries and the ISO's own forecasts of availability, and will expect the submitted forecasts to reflect the then-current capability of forecasting technology.

Using either option, the ISO's dispatch defines the instructed operating point for the resource during the next real-time dispatch interval, which is the basis for financial settlements of instructed and uninstructed energy. Such a mechanism will allow a dynamic resource to manage its real-time schedule, which affects its energy settlement. This mechanism also allows the ISO to maintain efficient operation of its interties and internal transmission by dispatching other resources that can respond to the availability of transmission, in two ways: (1) the ISO will be aware of upcoming changes in delivery from the dynamic transfers, and efficiently dispatch other resources to meet system requirements, and (2) if there is at least one separate, dispatchable dynamic transfer using the same intertie, the ISO can dispatch the other dynamic resource to use the available intertie capacity. The following examples illustrate these interactions:

- If a dynamic intermittent resource with an initial schedule of 100 MW uses an intertie with 400 MW of capacity, and other schedules using the same intertie have not used all of the remaining intertie capacity, the intermittent resource will provide its forecasted delivery to the ISO, which will return the forecast to the resource as its dispatch. If the intermittent resource's forecast were for a decrease to 80 MW, the ISO would return a dispatch instruction of 80 MW. If the intermittent resource's forecast increases to 120 MW and there is available intertie capacity, the ISO's dispatch would be 120 MW.
- If static hourly schedules using the same intertie have been awarded schedules in the day-ahead market or HASP that fully utilize the remaining 300 MW of available capacity, and no

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[interval to interval do not follow a regular pattern, and develop its own method for transitioning from one approach to the other.](#)

<sup>17</sup> The ISO requires Eligible Intermittent Resources to provide meteorological data to enable the ISO to forecast the intermittent resource's output, comparable to data required under PIRP. The ISO will extend the definition of Eligible Intermittent Resources to include dynamically transferred resources with the same characteristics as for internal resources.

<sup>18</sup> Internally, the ISO's market systems flag the resource as being "non-compliant" in the sense that the resource is not expected to follow an economic dispatch. Instead, the ISO issues dispatch instructions to remain at its current output, or in the case of real-time congestion or over-generation, instructions to reduce output. The term "non-compliant" in this context has no implication for other compliance monitoring, such as the ISO's rules of conduct.

other dynamic resources can be dispatched, the intermittent resource would not be able to increase its schedule. If the intermittent resource were to submit a forecast to the ISO that its delivery would increase to 120 MW, the ISO would return a dispatch instruction to remain at 100 MW.

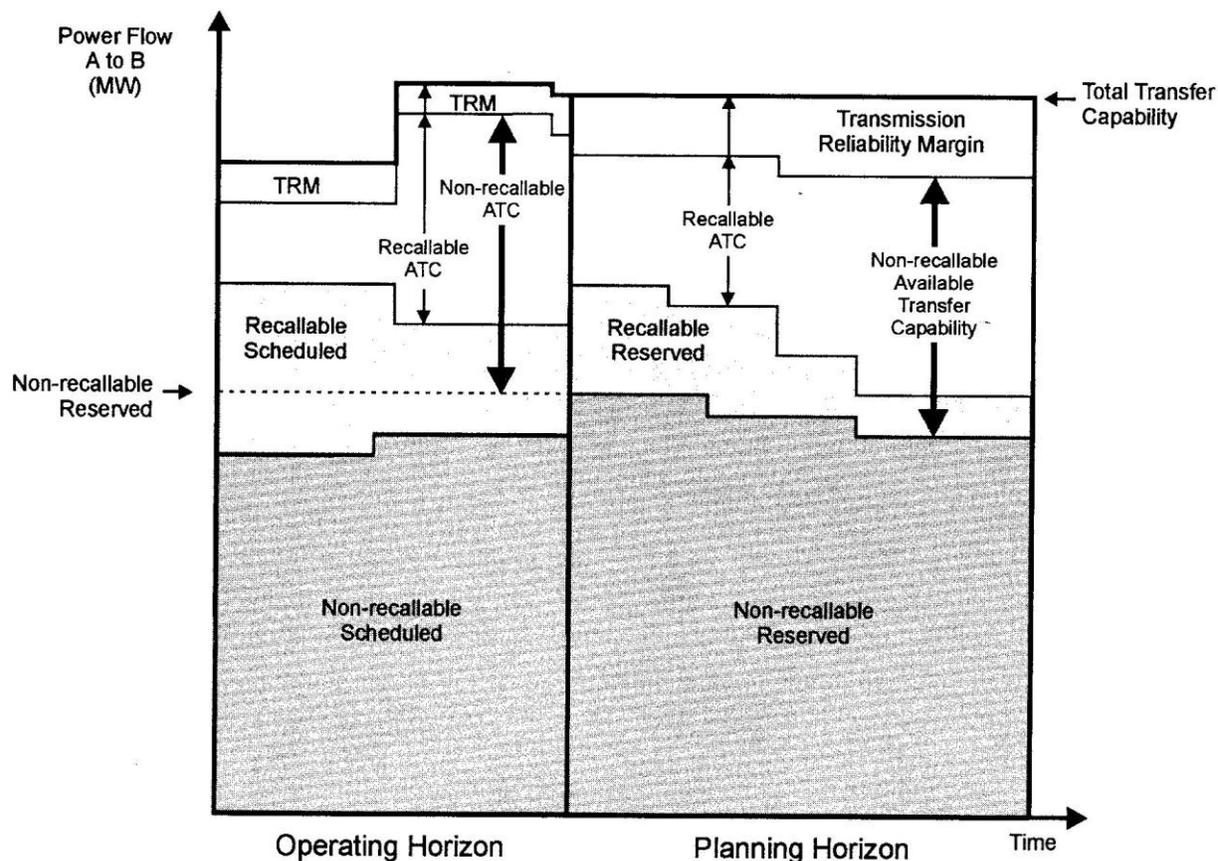
- If there is a second dynamic transfer using the same intertie, which is dispatchable (for example, had submitted an economic bid with a \$50/MWh bid price, and is not subject to operational constraints such as minimum run time that limit the economic bid's availability), the ISO would dispatch the second dynamic transfer to decrease its output to accommodate the intermittent resource's increase in delivery to 120 MW (assuming the intermittent resource has submitted a self-schedule or a bid price less than \$50/MWh). This flexibility allows the ISO to maximize its utilization of intertie capacity.
- Extending the forecast of delivery by the intermittent resource beyond the current dispatch period allows the ISO to dispatch resources based on an understanding of future conditions. If the intermittent resource has a temporary decrease in a self-schedule to 80 MW, which is expected to return to its original level after a few dispatch intervals, the ISO will be able to avoid dispatching other resources that would be sub-optimal later, after considering their operating constraints. If (1) the intermittent resource's output were to decrease to 80 MW without providing a forecast that its delivery would return to 100 MW after 15 minutes, (2) the ISO were to dispatch the start-up of a second dynamic resource that has a 30-minute minimum run time and that uses the 20 MW of capacity represented by the intermittent resource's reduction in delivery, and (3) the intertie capacity has been fully utilized, the ISO would be unable to allow the intermittent resource to return to its 100 MW schedule.

The concepts of dispatching economic bids of separate, dispatchable dynamic transfers to maximize transmission utilization can be understood through the framework for determining available transfer capabilities of interconnected transmission networks for a commercially viable electricity market, that is stated in NERC's "Available Transfer Capability Definitions and Determination" report.<sup>19</sup> NERC distinguishes among reserved versus scheduled, and recallable versus non-recallable, uses of transmission as shown in the following diagram.

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<sup>19</sup> NERC's "Available Transfer Capability Definitions and Determination" report is available at <http://www.nerc.com/docs/docs/pubs/atcfinal.pdf>

### TTC, ATC, and Related Terms in the Transmission Service Reservation System



Using the concepts of the NERC framework, the day-ahead market and hour-ahead scheduling process are within the planning horizon, when intertie capacity is reserved but dynamic resources are not yet scheduled. Recallability is defined in the NERC report as the right of a transmission provider to interrupt all or part of a transmission service for any reason, including economic, that is consistent with FERC policy and the transmission provider's transmission service tariff or contract provisions. In the above diagram, in the operating horizon "recallable scheduled" transmission uses a portion of "non-recallable reserved" transmission when the "non-recallable scheduled" transmission is less than the "non-recallable reserved" transmission. The NERC report explains that the combination of "non-recallable reserved" and "recallable reserved" can exceed the total transfer capability, to more fully utilize transmission assets, subject to constraints and priorities including:

- The sum of "non-recallable scheduled" plus "recallable scheduled" transmission cannot exceed the total transfer capability,
- "Non-recallable reserved" itself cannot exceed the total transfer capability,
- Non-recallable service has priority over recallable service, and
- Reserved transfer capability may be used by recallable scheduled transfers.

In terms of the ISO's markets, awarded self-schedules can be considered "non-recallable scheduled" transmission, while dispatches of economic bids above self-schedules can be

considered "recallable scheduled" transmission since they can be rescinded based on economics. "Non-recallable reserved" transmission is the maximum reservation, which will be subject to the intertie scheduling constraint in the day-ahead and HASP market runs, and then go in the transmission profile of e-Tags to the extent it is awarded. When the ISO issues a dispatch for an interval in the real-time market, the dispatch represents "recallable scheduled" transmission, for which the ISO has reserved "recallable reserved" transmission for that real-time dispatch interval. This framework supports the dispatch of dynamic transfers that have submitted economic bids, to make use of transmission that is within the e-Tag transmission profiles of intermittent resources but that is not used in that five-minute dispatch interval.

Based on the mechanisms described above, the series of steps for congestion management affecting dynamic transfers is as follows:

- In the ISO's markets, congestion is managed first by dispatches of economic bids. Over the time horizon during which the ISO economically dispatches resources' bids, the ISO will be able to use the available forecasts of intermittent resources' availability to award "recallable scheduled" transmission and "recallable reserved" transmission (maximum reservation, in the terms used above), within the available capacity.
- When economic bids that are effective in relieving congestion on transmission constraints are exhausted (i.e., fully dispatched for the next dispatch interval), the ISO's market software will adjust self-schedules of dispatchable resources to further manage congestion.
- In the event that real-time flows exceed transmission limits, time is more limited, and the ISO may need to (1) instruct resources whose outputs exceed their maximum transmission reservation to return to their schedules and dispatch points, and then (2) use economic bids that are available to the ISO's operators to manage congestion more quickly than the market software would normally resolve, before (3) initiating pro rata curtailments of self-schedules that are the most effective at relieving the real-time congestion.<sup>20</sup>

This sequence reflects that, first, the schedules and dispatch points represent reserved transmission, and second, that economic dispatches represent recallable transmission with lower priority than self-schedules, which represent non-recallable transmission.

### **3.3. Dispatchability requirements and curtailment rules**

In most instances, the market prices resulting from the ISO's congestion management may be adequate to ensure compliance with dispatches. When the ISO's market software determines schedules, it considers known transmission constraints, but sometimes conditions change after the market runs and changes to schedules must occur in order to maintain reliable operations. In the event of a real time derate on the designated intertie or other transmission contingency event in close proximity, it is imperative that the dynamic resource, either conventional resource or intermittent, be "dispatchable" so as to be able to respond immediately to the dynamic

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<sup>20</sup> An issue in the ISO's market software has been obtaining pro rata adjustments of equally situated resources' self-schedules. For the day-ahead market, there is much similarity between the schedules of dynamic and static resources, and the ISO is working to ensure equitable schedule adjustments. In the real-time market, dynamic and static resources are less similar due to scheduling of static resources at fixed amounts during operating hours (except for inter-hour ramping), while dynamic resources are dispatched using five-minute intervals, and further analysis will be needed before the ISO can commit to pro rata adjustments of self-schedules.

interchange schedule (e-Tag) curtailment.<sup>21</sup> Experience with the existing dynamic schedules has shown that critical real-time operational issues can arise very quickly, and that rapid response is required to maintain reliability, but the response by some market participants has not always occurred as needed. If a market participant causes the ISO to incur a penalty for non-compliance with standards, existing tariff provisions allow the ISO to charge the market participant for the penalty, but these provisions only cover fairly extreme departures from reliable operation and may not be sufficient.

A key issue with the expansion of dynamic import services to renewable resources will be the ability of the resource to be “dispatchable” and to drop load in defined increments, to be immediately responsive to curtailment orders by the native or attaining BA. In addition to tariff provisions, this ability may require the use of special operating procedures that would be developed to reflect individual resources’ individual characteristics, equipment that facilitates immediate response to such dispatch instructions, and the decisive reduction of output in pre-defined blocks of MWs. This agreement and unit ability will be particularly critical in the event of an overload condition at the associated pre-existing physical Intertie for grid reliability and NERC Interchange Standard compliance.

The market software currently has some provisions for performing contingency dispatch to respond to events including outages or unexpected derates of interties, although at times manual intervention by operators is necessary to reduce energy flows. Manual intervention may also be necessary if dynamic resources do not respond to dispatches, even if derates are foreseeable or allow response times that would otherwise accommodate normal ramping. Dynamic scheduling allows the ISO to respond to changing congestion conditions within operating hours more than its very limited ability to adjust static hourly intertie schedules, and the Dynamic Scheduling Agreement for Scheduling Coordinators requires compliance with the ISO’s dispatches.<sup>22</sup> In addition, inadequate compliance with dispatches can result in issuing operating orders (as defined in tariff section 37.2.1.1) to dynamic resources, to reduce flows to within operating limits. The ISO will determine how it can most efficiently distinguish operating orders from routine dispatches, and communicate operating orders to the affected resources. One potential mechanism for communicating operating orders may be by using a comment field in communications that would be distributed through the Automated Dispatch System (ADS).

Recognizing these concerns, the Straw Proposal noted the existence in the current ISO tariff of Section 5.1 of the pro forma Dynamic Scheduling Agreement for Scheduling Coordinators (Appendix B.5 of the ISO tariff), which provides that except for operating emergency situations, real-time energy transfers may not vary from the day-ahead schedule as adjusted by any dispatch instructions by more than the greater of five MW or three percent of the net

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<sup>21</sup> E-Tagging of dynamic transfers is necessary for compliance with scheduling standards. The ISO is refining our administration of e-Tags for pseudo-ties within the market systems, based on our experience with the pseudo-tie pilots.

<sup>22</sup> Although the ISO will be modifying the terms of Section 5.1 of the Dynamic Scheduling Agreement for Scheduling Coordinators, which currently states a tolerance band for uninstructed deviations, sections 4.1 and 5.2 of the agreement are general requirements for compliance with the ISO tariff. Also, Section 8.3 of the Dynamic Scheduling Protocol (ISO Tariff Appendix X) states: “All Day-Ahead Market and HASP/RTM submitted Dynamic Schedules shall be subject to CAISO Congestion Management and as such may not exceed their transmission reservations in Real-Time (with the exception of intra-hour Dispatch Instructions of the Energy associated with accepted Ancillary Services Bids).” The ISO will determine the disposition of the current language in section 5.1 while developing the tariff amendment to implement the Board of Governors’ upcoming Dynamic Transfers decision, but section 5.1’s content may be limited to its existing reference to the ISO tariff’s overall provisions for uninstructed deviations.

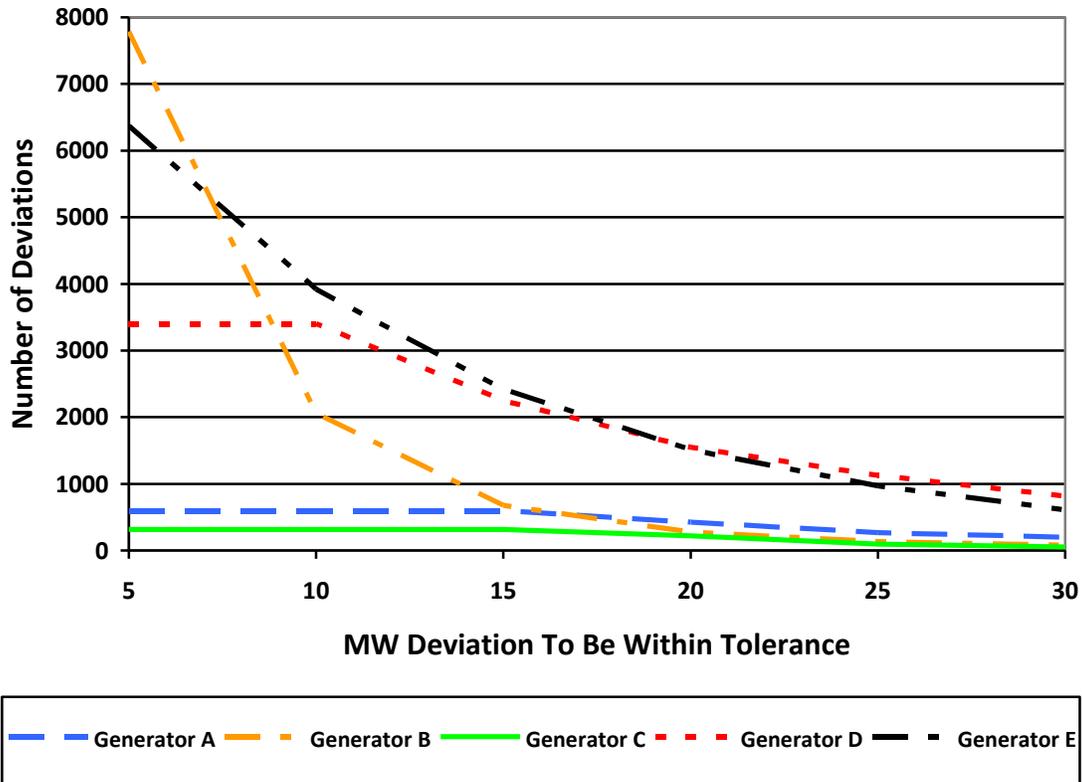
dependable capacity (PMax) of the System Resource, integrated across a ten-minute interval. If such defined performance band is exceeded by any amount in more than five percent of the ten-minute intervals on three successive days, then such deviations constitute one event of non-compliance with the Dynamic Scheduling Protocol. Section 3.2.2 of the Dynamic Scheduling Agreement allows the ISO to terminate the agreement after three instances of non-compliance with the Dynamic Scheduling Protocol (ISO tariff Appendix X).

The ISO proposed the scheduling option discussed in section 3.2 with the initial intent of allowing intermittent resources to manage their schedules within this tolerance band. This option would allow an intermittent resource to update its availability every five minutes within the operating hour, by reporting its expected delivery to the ISO by 5-minute time intervals for a forward-looking 2 hour period, which the ISO would return to the resource as the ISO's dispatch unless it is limited by congestion or other conditions. There does not appear to be any alternative that could allow more accurate updates for the ISO's dispatch, given that the ISO's real-time dispatch interval is five minutes in duration.

Nevertheless, discussion at the March 17, 2010, stakeholder meeting concerning the Straw Proposal questioned whether the existing tolerance band is achievable, even with the proposed ability to update the ISO dispatch level. To analyze whether the tolerance band that now exists in the ISO tariff is appropriate, the ISO subsequently analyzed the performance for the 2009 calendar year of the ten then-existing dynamic transfers (nine dynamic schedules plus one pseudo-tie import) and of existing intermittent generators within the ISO. The purpose of this analysis is to determine whether the ISO should consider changes to the existing tolerance band and/or to the provisions concerning non-compliance, given that the ISO has operated successfully with these resources in operation.

In the analysis of existing intermittent resources, the ISO was not able to use five-minute updates of forecasted output because the ISO had not forecasted at that granularity. During discussion at the March 17 stakeholder meeting, some participants suggested that they would not be able to forecast more accurately than to assume that current output would be the expected output during the subsequent interval. Therefore, this analysis assumes that for the forecasted output that would be sent during one five-minute interval would use the average output during the previous five minutes as the forecast for the following five minutes, and that this method would be performed regularly during each five-minute update during the year. The analysis then averaged the difference between the "forecasted" and actual delivery across ten-minute intervals, as currently stated in the tariff. The following graph shows the number of 10-minute intervals during the year in which this difference exceeds the tolerance band, out of the 52,560 ten-minute intervals during the year (8760 hours times six intervals per hour), versus the MW of deviation that defines the tolerance band (the current tariff definition being 5 MW), for five intermittent resources (wind and solar). (The comparison for intermittent resources is relative to the MW part of the threshold definition because most existing intermittent resources are less than 300 to 400 MW, so the MW part of the definition generally exceeds the percentage part of the definition. The five intermittent resources shown here are among the larger ones, although they are not necessarily the largest five resources because variability of weather at the generator's site can cause as much MW variability as simply being the largest resource.)

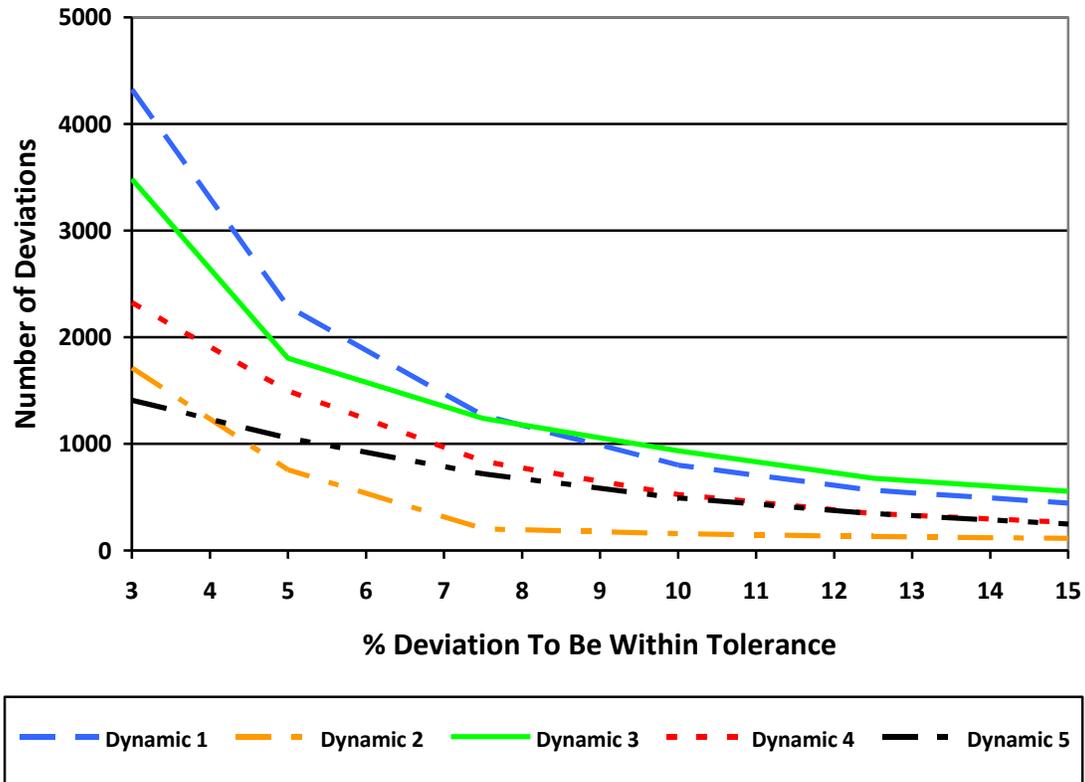
### Intermittent Resources: Deviations Outside Tolerance Band



Note that it is not necessary to be within the tolerance band in all intervals to meet the existing tariff requirement, which counts the number of intervals with deviations outside the tolerance band during three-day periods. However, an examination of the events of non-compliance using the assumptions of this analysis, it would appear to be necessary to widen the tolerance band's percentage to at least 25 MW to avoid termination of dynamic scheduling agreements with intermittent resources similar to generation within the ISO.

For existing dynamic transfers, the ISO determined the difference between delivered output and the real-time dispatch point, as adjusted for regulation energy, by 10-minute interval. The following graph shows the number of 10-minute intervals during the year in which this difference exceeds the tolerance band, versus the percentage of deviation that defines the tolerance band (the current tariff definition being 3% of PMax), for five of the ten existing transfers. (The comparison for existing dynamic transfers is relative to the percentage of PMax because most existing dynamic transfers are at least 300 to 400 MW, so the percentage part of the threshold definition exceeds the MW part of the definition.)

### Existing Dynamic Transfers: Deviations Outside Tolerance Band



As noted above, it is not necessary to be within the tolerance band in all intervals, but it is more difficult to meaningfully show the number of events of non-compliance as defined by the tariff. However, an examination of the events of non-compliance, after accounting for instances of reported outages and derates (including not counting reasonable extensions of time near the reported outages and derates as events of non-compliance), suggests that it would be appropriate to widen the tolerance band's percentage to at least 10% of PMax to reduce the exposure to potential termination for parties to dynamic scheduling agreements in the future.

In summary, if the ISO were to retain the tolerance band approach to measuring compliance, and attempt to make it workable under the existing tariff approach of exposure to potential contract termination after three events of "non-compliance," it appears that it would be appropriate to widen the tolerance band to at least the greater of 25 MW or 10% of PMax. Expecting new dynamic transfers to be able to routinely perform within this level of tolerance may be appropriate as a criterion for acceptance of new resources, but this would not be adequate performance for reliability purposes at times when the ISO experiences real-time congestion on its interties and resources' deliveries exceed their schedules. When there is no congestion, uninstructed deviations by dynamically transferred resources would be no more of a concern than they are for resources within the ISO. A more appropriate criterion for continued operation of a dynamic transfer agreement would be compliance with operating orders, including the existing provisions of section 37.2 of the ISO tariff ("Comply with Operating Orders"). The term "operating order" in section 37.2 can be presumed to be different from a routine dispatch instruction, and to be more focused on conditions when reliability requires a specific response to the ISO operator's instructions. Section 37.2.1.1 of the ISO tariff states a

definition of the term “operating order”: “For purposes of enforcement under this Section 37.2, an operating order shall be an order(s) from the CAISO directing a Market Participant to undertake a single, clearly specified action (e.g., the operation of a specific device, or change in status of a particular Generating Unit) that is feasible and intended to resolve a specific operating condition.”

The following examples illustrate the relative roles of dispatches and operating orders, in terms of the order of actions stated in Section 3.2 of this Draft Final Proposal that may be taken in the event that real-time flows exceed transmission limits, with limited time available for response.<sup>23</sup> Normally, the ISO’s real-time market software will have dispatched economic bids to account for transmission constraints, including anticipated changes in constraints, and forecasts of intermittent resources’ output. To manage operating constraints when time does not allow control using only dispatches of economic bids, the ISO would first instruct resources whose outputs exceed their maximum transmission reservation to return to their schedules and dispatch points, and then use any remaining economic bids to manage congestion, before initiating pro rata curtailments of self-schedules that are the most effective at relieving the real-time congestion.

- First, assume that the available transfer capability (ATC) is 1000 MW, and the market schedules resulting from HASP include 600 MW of static hourly firm schedules. (All scenarios in these examples assume the 1000 MW of ATC and 600 MW of static schedules.) In addition, dynamic schedules with expected average energy of 300 MW and maximum transmission reservation of 300 MW. In actual real-time operations, the dynamic resources deviate by +10 MW. There is no required ISO curtailment action in this first scenario because the 910 MW of actual flow does not exceed the 1000 MW flow limit.
- In a second scenario, the dynamic schedules have an expected average energy of 400 MW and maximum transmission reservation of 400 MW. If the dynamic schedules deviate by +10 MW in actual real-time operations, the actual flow becomes 1010 MW, which exceeds the flow limit of 1000 MW. The ISO would have the right to issue an operating order for the dynamic schedules to return to the 400 MW of transmission reservation. If further mitigation were needed, the ISO would dispatch economic bids, if effective bids were available from dynamic transfers or resources within the ISO BAA.
- In a third scenario, the dynamic schedules’ maximum transmission reservation is 400 MW, but the dynamic schedules have an expected average energy of only 300 MW. In actual real-time operations, the dynamic schedules deviate by +110 MW above the scheduled energy, producing an actual flow of 1010 MW (exceeding the flow limit of 1000 MW). The ISO would be able to first use operating orders for the dynamic schedules to curtail by 10 MW, to produce a return to their transmission reservation of 400 MW. If further mitigation were needed, the ISO would dispatch economic bids, if bids were available.

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<sup>23</sup> When adequate time is available for response, changes in transmission constraints’ capacity or in intermittent resources’ output would be accounted for through the ISO’s normal economic dispatch, assuming that dispatchable resources comply with dispatch instructions. The real-time market software includes unit commitment with a forecast period of nearly five hours, and known changes in transmission capacity would be considered in unit commitment and dispatch. Similarly, observed changes in intermittent resources’ outputs and forecasts of output in future dispatch intervals would be considered in the real-time market’s normal functions. The scenarios illustrated here apply to more immediate needs for response, as well as to instances when the ISO has dispatched resources to maintain their outputs at certain levels but the resources have not complied.

- In a fourth scenario, both the average energy and maximum transmission reservation of the dynamic schedules' are 300 MW. In actual real-time operations, the dynamic schedules do not deviate above their scheduled energy, but unscheduled flow from other sources produces an actual flow of 1010 MW. In this scenario, the ISO will not issue an operating order to curtail the dynamic schedules as the first response, because they are within their transmission reservations. To restore the actual flow to the flow limit, the ISO would dispatch economic bids as the first curtailment action. If economic bids were not available or were not sufficient to return the flow to the flow limit, the ISO would order pro rata curtailments across all schedules using the affected inertia to obtain the needed 10 MW flow reduction, as operating orders.
- A fifth scenario is similar to the third, with the addition of unscheduled flow as in the fourth scenario: the dynamic schedules' maximum transmission reservation is 400 MW, but the dynamic schedules have an expected average energy of only 300 MW. In actual real-time operations, the dynamic schedules deviate by +110 MW above the scheduled energy, which, in combination with uninstructed flows, producing an actual flow of 1100 MW. The ISO would have the right to initially issue operating orders to the dynamic schedules to curtail by 10 MW, to produce a return to their transmission reservation of 400 MW. To accomplish the remaining 100 MW of flow reduction, the ISO would dispatch economic bids, if bids were available, before issuing operating orders for pro rata reductions.

Tariff Section 37.2 provides financial penalties for non-compliance with operating orders issued by the ISO (\$5,000 for the first instance, and \$10,000 for subsequent instances), but ironically does not appear to provide contract termination as a result of non-compliance. Based on the analysis presented above, the ISO now proposes to eliminate contract termination as a penalty resulting from section 5.1 of the Dynamic Scheduling Agreement for Scheduling Coordinators. Instead, upon a third instance of non-compliance with an operating order, the ISO proposes to require the resource owner to install additional equipment or institute other measures to ensure compliance, potentially including direct equipment control, and consider contract suspension if these measures do not secure the necessary compliance.<sup>24</sup> The ISO will also determine how it can most efficiently distinguish operating orders from routine dispatches, and communicate operating orders to the affected resources, such as a distinguishing indicator in communications that would be distributed through the Automated Dispatch System (ADS).

In addition to being able to demonstrate response to operating orders, intermittent resources that use dynamic transfer should also satisfy ~~the following~~ requirements that the ISO Board of Governors approved on May 18, 2010, to apply to ~~internal~~ variable energy generators to the extent that they have been approved by FERC.<sup>25</sup> The applicable requirements focus in particular on resource operators' ability to communicate with the ISO and respond to the ISO's dispatch instructions, including:

<sup>24</sup> Section 3.2.1 of the Dynamic Scheduling Agreement for Scheduling Coordinators states other grounds for contract termination, while section 3.2.2 addresses non-compliance provisions such as the tolerance band in section 5.1. A stakeholder comment that addressed the context of sections 3.2.2 and 5.1 suggests that contract suspension is more appropriate than contract termination. If the resource operator does not implement the necessary actions to ensure future compliance, the ISO will release any capacity assigned to the resource in queues that may exist for inertia capacity.

<sup>25</sup> These requirements are stated in the ISO management's recommendation to the Board, which is available at <http://www.caiso.com/2793/2793abee1a0a8.pdf>. The term "variable energy generators" should be considered synonymous with Eligible Intermittent Resource for purposes of this Draft Final Proposal.

1. Variable energy generators must have the ability to limit their active power output in response to a dispatch instruction or operating order from the ISO. This ability should apply to the resource's full range of potential output so that the resource's reduction in output can range from incremental to full curtailment.
- ~~2. The capability must be able to reduce active power output on step-sizes in no greater than 5 MW increments, which also should not result in voltage steps greater than 2% under normal system conditions.~~
- ~~3. The variable energy generator is expected to interface with the ISO in a manner similar to any other generating facility. As such, the resource must be able to receive and respond to automated dispatch system instructions and any other form of communication authorized by the tariff and in conformance with the time periods prescribed by the tariff.~~
- ~~4. If a variable energy generator is ordered off-line or curtailed, the plant operator must not reconnect the plant to the grid or increase output without prior approval from ISO operating personnel similar to other generating resources.~~
- ~~5. Variable energy generators must be able to limit and control their ramp rates at the request of the ISO, except for downward ramps resulting from the loss of wind or sun to fuel the generating facility. The ramp rate limiter should have the ability to set their ramp rate between a range of 5% and 20% of rated capacity/minute with a default setting of 10%.~~
- ~~6.2. Variable energy generators must have an over frequency control system that continuously monitors the frequency of the transmission system and automatically reduces the real power output of the generator in the event of over frequency. An intentional dead band of up to 0.036 Hz can be designed for the over frequency control system. The over frequency response design requires a droop setting of 5%, which means that a generator will change its output 100% for a 5% (3 Hz) change in system frequency.~~

### **3.4. Locational pricing**

Although most of the ISO's dynamically scheduled resources began operation prior to April 2009, as of April 2009 the ISO's market models generation within the ISO at its physical location in the transmission network, and prices generation output at the point where it is metered. Similarly, the ISO includes significant transmission facilities outside the ISO BAA in its full network model to the extent that is practicable, and models and prices pseudo-tie generation at its actual location in the full network model. For dynamic resource-specific system resources, the ISO's dynamic scheduling agreements establish the actual location of the generation, and the ISO will model and price dynamic resource-specific system resources at these locations.<sup>26</sup>

Modeling dynamic resource-specific system resources at their actual locations allows the ISO to establish feasible interchange schedules and thereby maintain the reliable operation of the ISO's transmission system, by modeling the resulting flows as accurately as possible. A lack of modeling resources at their actual locations, when their locations are known, could cause consumers to pay inappropriate costs resulting from inaccurate real time re-dispatch costs, as the ISO would need to mitigate congestion that results from using inaccurate modeling. After establishing the scheduling and dispatch of dynamic resource-specific system resources based on their actual locations, it is then necessary to use the corresponding locational marginal prices (LMPs) to avoid disparities between the prices that are used for scheduling and dispatch and the prices that are paid in financial settlements.

<sup>26</sup> This is not a significant change for existing dynamic resource-specific system resources, because they schedule into the ISO markets at scheduling points that are close to their physical locations.

An important attribute of the locational marginal prices (LMPs) that the ISO uses to schedule, dispatch, and settle resources at these locations outside the ISO is that they reflect only costs that occur within the ISO market. The calculation of the ISO's LMPs is described in detail in Section 27.1 and Appendix C of the ISO tariff, and is an established practice in the ISO's markets. The ISO enforces congestion only for transmission constraints that are within the ISO's BAA and scheduling capacity rights that are available as ISO controlled grid outside the ISO BAA, and the ISO excludes losses on transmission facilities that are outside the ISO BAA. Transmission constraints that are within an external BAA are enforced and priced under the terms of the external BA's tariff, and are not enforced or priced in the ISO's markets. Similarly, losses between resource locations and the ISO boundary are calculated and settled under the terms of the external BA's tariff, or under its transmission contracts, and are not included in the ISO's LMPs. In some cases, the external BA's charges for losses are settled by the external BA charging the ISO, which in turn passes these charges on to the scheduling coordinators whose schedules have used the affected transmission, but this existing practice does not affect the ISO's LMPs and is not changed by this proposal.

Information for modeling dynamic resource-specific system resources consists of data concerning both the dynamically transferred resource and the transmission system that supports it. For a generation resource, most of the required data would be obtained from the resource operator and/or scheduling coordinator, for implementation of the Dynamic Scheduling Agreement for Scheduling Coordinators (Appendix B.5 of the ISO tariff), Pseudo Participating Generator Agreement (which will be added to the tariff), or similar agreement. The ISO currently bases its modeling of external transmission systems on base cases that are available on the WECC web site. If (1) a BA acts only in the role of a transmission operator and is not involved in the scheduling of a dynamic transfer, and (2) the WECC base cases contain adequate representations of the transmission systems that support delivery of the resource to the ISO boundary, at the level of detail that would normally be contained in a WECC base case, the ISO does not anticipate needing additional information about the transmission system. In most cases, the host BA for the dynamically transferred resource and any intermediary BAs will need process e-Tags and to receive data concerning the dynamic resource, such as telemetry, which it may need to relay to the ISO. These requirements are described in the Dynamic Scheduling Host Balancing Authority Operating Agreement (Appendix B.9 of the ISO tariff) or similar agreement.

### **3.5. Pro rata allocation of deviations among BAAs**

Prior to 2007, the ISO assumed real-time balancing service for some dynamic resources that scheduled less than 100% of the resource output into the ISO, as the dynamic transfer equaled the actual plant output minus static schedules. For example, if an external resource was actually generating 490 MW in real-time but had a dynamic import schedule of 100 MW to the ISO and a static schedule of 400 MW with another BAA, the actual dynamic transfer into the ISO would have been 90 MW (490 – 400), which meant that the ISO assumed the entire 10 MW of deviation.

Recognizing that this methodology could result in excessive costs to the ISO's market participants, the ISO has subsequently incorporated pro rata allocation of deviations into agreements for individual dynamic schedules, producing a sharing of the real-time balancing burden from an external resource that is dynamically scheduled to the ISO (proportionate to the percentage of the resource that sinks to the ISO dynamically). Example: assuming an external resource is actually generating 490 MW in real-time but has a dynamic schedule of 100 MW import to the ISO and a static schedule of 400 MW with another BAA. The ISO would incur 2

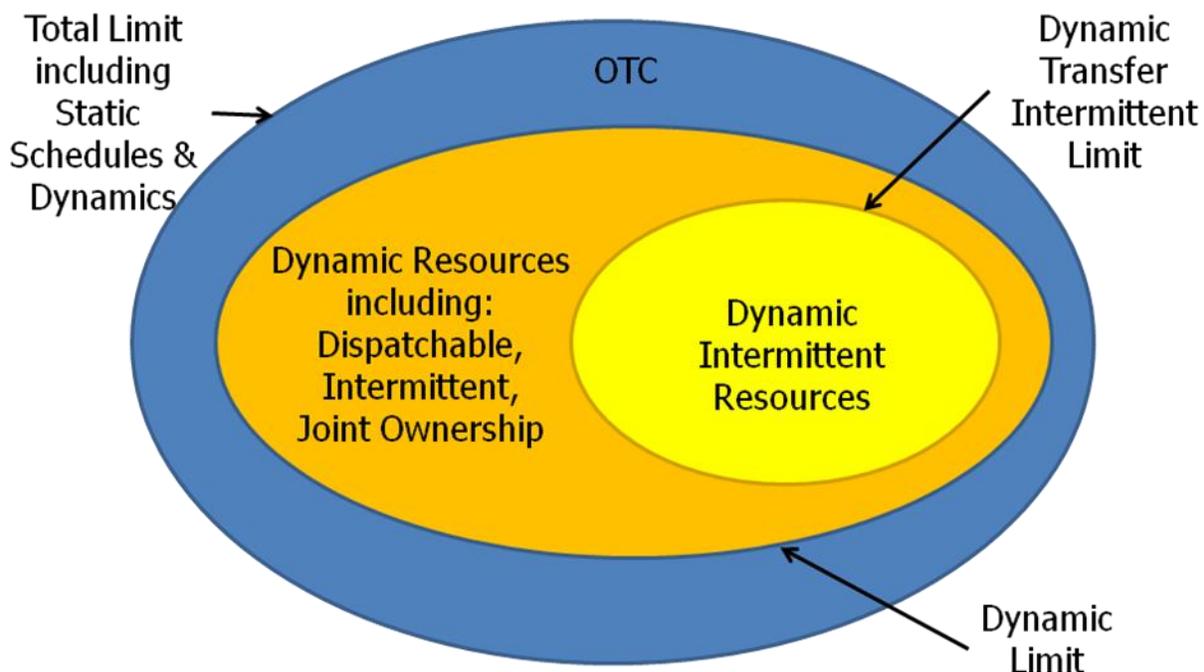
MW of the 10 MW deviation ( $100/500 * 10$ ). The native BAA maintains responsibility for the other 8 MW of deviation burden.

Stakeholder comments support the ability of dynamically scheduled resources to schedule only a portion of their output into the ISO's markets. The ISO will incorporate this treatment in its tariff as an upper limit on its allocation of deviations, rather than needing to use a contract-by-contract provision. The implementation of the pro rata allocation of deviations among BAAs may include tariff provisions that the ISO will not execute new Dynamic Scheduling Agreements for resources in BAAs that do not provide this limit to the ISO's exposure to deviations.

### **3.6. Limits of dynamic imports**

Section 5.1 of the Dynamic Scheduling Protocol (Appendix X of the ISO tariff) establishes the right for the ISO to establish limits applicable to the amount of any ancillary services and/or energy imported into the ISO BAA, whether delivered dynamically or statically. The following figure illustrates the applicability of the limits addressed in this section: within the total Operational Transfer Capability (OTC) of an intertie, in theory there could be a limit on overall dynamic transfers including both conventional and intermittent resources, and within that, there could be a limit on dynamic transfers of intermittent resources. The innermost part of this diagram is the subject of technical studies that the ISO has performed during the course of this stakeholder process, through a contract with GE Energy.

**Illustration of Dynamic Transfer Limit as Part of Overall OTC**



During the course of its study, the ISO has coordinated with other affected BAAs within the WECC area (Western Interconnection) concerning the potential for maximum transfer limits between BAAs, including one-to-one discussions with other balancing authorities, presentations

to WECC's Seams Issues Subcommittee and Variable Generation Subcommittee, and participation in the Dynamic Transfer Capability Task Force in the Pacific Northwest.<sup>27</sup> The ISO has also discussed the details and results of these studies with its market participants through publication of reports and conference calls, from August to December 2010.

The ISO's studies have addressed the potential for operational impacts and limitations on control, stability and response of the transmission system. The studies to support the dynamic transfer policy are not general studies of limitations related to intermittent resources in general, but need to evaluate the effects that the level of variability of dynamic transfers has on operational reliability. In other words, the studies are specific to dynamic transfer limits and not replace, but rather be informed by, general studies addressing the system needs to accommodate all intermittent resources.

The ISO studied whether there are any limitations as a result of supporting dynamic transfer of variable resources located outside of the ISO BAA while shaping and firming energy to support the variable delivery with resources within the ISO BAA, to answer the following technical questions:

- a. Do variable dynamic transfers pose any impacts to existing path limits that are established based on static interchange models with an accommodation of planned hourly variation ramped over a 20 minute period?
- b. Do variable dynamic transfers create any voltage control issues?
- c. Does the level and nature of variability and dynamic transfers of variable resources pose any risk to stability or excitation of low frequency modes of oscillation? In order to answer this question, the ISO may have to gather more granular actual output data from some technology types.

The ISO published GE Energy's Final Report on Impact of Dynamic Schedules on Interfaces on January 6, 2011 (available at <http://www.caiso.com/2aff/2aff9e9150530.pdf>). The conclusion is that the frequency and magnitude of voltage variations due to intermittent dynamic transfers are expected to be within the normal capability of the transmission system, system stability is maintained, and therefore no limits need to be applied within the ISO's BAA at this time. (The ISO's study has not examined whether limitations exist in other BAAs, which may determine that such limitations exist within their systems.) As part of the ISO's overall operational response to increasing levels of generation by intermittent resources, the ISO will monitor any operational issues that relate to dynamic transfers, and continue to coordinate with other affected BAAs to study regional issues affecting dynamic transfer capability. If such limitations become apparent in the future, the ISO will identify appropriate responses, including potentially limiting new dynamic transfers of intermittent resources, but would not limit dynamic transfers that would have already been established

### **3.7. Management of requests for dynamic transfers**

Due to the possibility that the studies discussed above may have established limits on dynamic imports of intermittent resources, the ISO discussed a series of alternatives for management of requests for dynamic transfers. Even when dynamic transfers of intermittent resources are not limited to less than the maximum inertia capacity, the ISO must decide how to allocate the available capacity for supporting dynamic transfers. This can be done by limiting the amount of dynamic transfer schedules accepted by the ISO markets in any given hour (the "congestion

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<sup>27</sup> For example, Bonneville Power Administration has conducted a study whose results are available at [http://www.transmission.bpa.gov/wind/dynamic\\_transfer/default.cfm](http://www.transmission.bpa.gov/wind/dynamic_transfer/default.cfm)

management approach”), by limiting the amount of supply capacity that is approved via dynamic transfer agreements to utilize the available dynamic transfer capacity (the “administrative approach”, involving queuing or other procedures), or a combination of both approaches. The evolution of proposals in this area was documented in the Supplement to the Draft Final Proposal, Second Supplement to the Draft Final Proposal, and Revised Draft Final Proposal, and in a Market Surveillance Committee opinion, which are available at <http://www.caiso.com/2476/24768d0a2efd0.html>.

As noted above, the conclusion of the ISO’s study of intermittent dynamic transfer capability is that no limits need to be applied within the ISO’s BAA at this time.<sup>28</sup> Thus, there would be little need for a separate process for management of requests for intermittent dynamic transfers, beyond processes that would otherwise apply to enrollment of conventional dynamic transfers. Like conventional dynamic transfers, intermittent dynamic transfers will be subject to the same congestion management processes that otherwise apply during operation of the ISO’s markets. In previous documents and stakeholder meetings discussing the alternative enrollment management approaches, the ISO recognized that the congestion management approach has risks to market participants about whether newly developed resources will be deliverable to the ISO market, and whether they will be able to market energy that does not clear the ISO’s congestion management process. Thus, to allow market participants who are developing or contracting for new dynamically transferred resources to self-manage risks that their projects, combined with existing dynamic transfers, do not exceed the dynamic available transfer capability, the ISO will determine procedures for sharing data regarding dynamic transfer agreements that have been registered and/or are operational at specific inerties.

### **3.8. Aggregation of conventional and/or renewable resources**

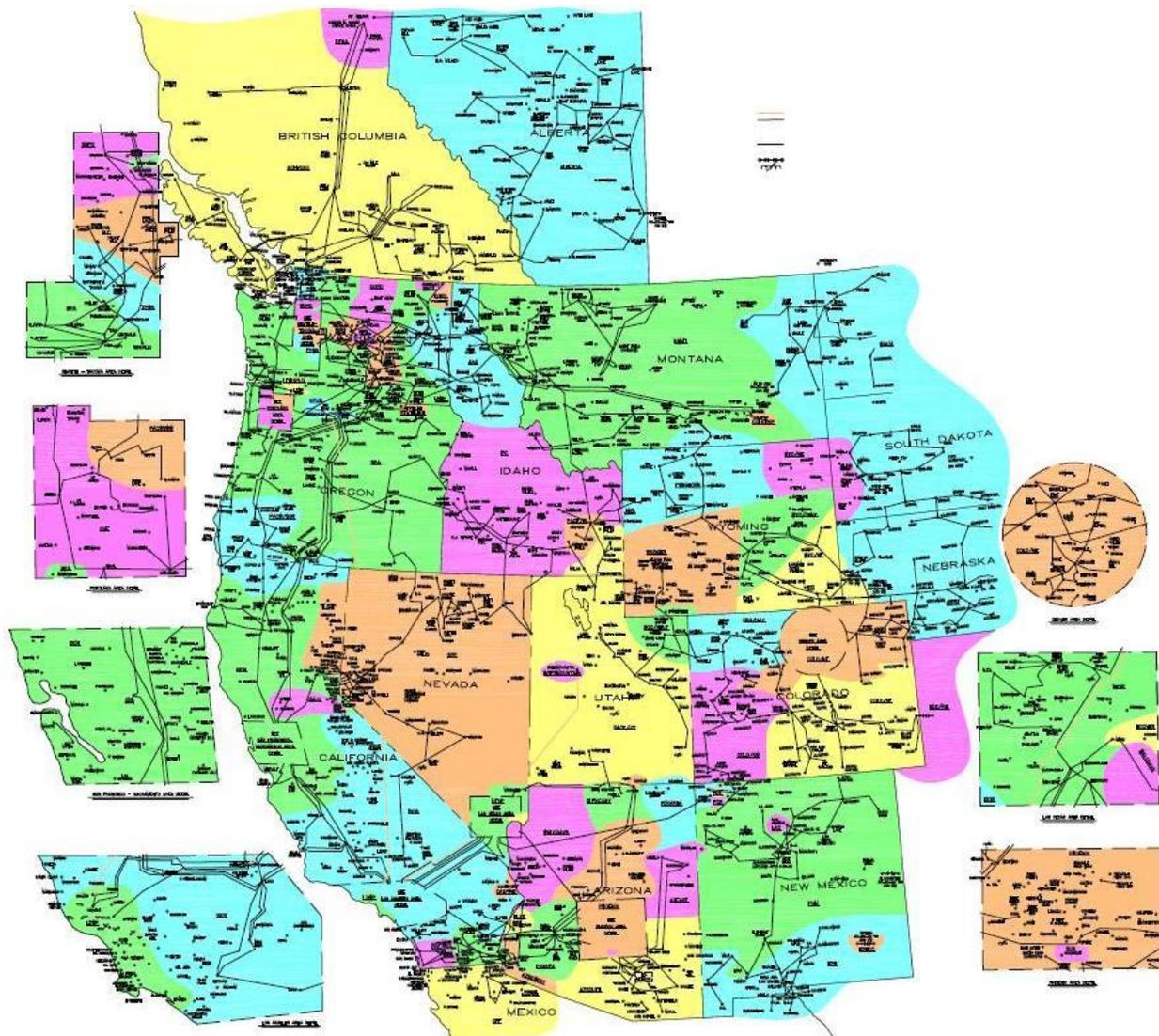
Some external intermittent resources are contemplating aggregating resources to take advantage of geographic diversity in order to reduce real-time deviations. In some cases a conventional resource could be aggregated with an intermittent resource. Advantages of aggregation include the ability of the dynamically transferred resources to combine resources together in a way that lessens the overall ISO regulation and load following burden. For example, if an intermittent resource wants to aggregate with a gas-fired generator, it would schedule the units as a package to use its dispatchable generator to “firm” or shape the intermittent resource’s output. Scheduling these resources together obviates the need for the ISO to dispatch resources within our BAA to regulate or shape that dynamic transfer. Calpine’s comments on the Issue Paper suggest a more elaborate approach, involving a “virtual control area” where several resources could be aggregated together into a pseudo-BAA and then scheduled into the ISO as a single resource. The ISO supports aggregation as a concept but sees limitations if sites were aggregated that are not “electrically close” to each other, since the impact on the ISO and LMPs at the scheduling points would vary among the resources’ actual locations. Market initiatives that are developing elsewhere in WECC may affect the effectiveness of aggregation, which may create regional congestion management on more than the current Qualified Paths of the WECC Unscheduled Flow Mitigation Procedure and a regional energy imbalance energy market.

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<sup>28</sup> While the ISO study did not identify any need for limit of intermittent dynamic resources on COI or West of River based on condition internal to the ISO, other balancing authorities may limit the quantity of dynamic transfers on an intertie based on conditions in their area.

The ISO can support aggregation of resource sites that are electrically close together, subject to agreement by both the native BAA and attaining BAA, to provide certainty that aggregations will not conflict with other policies that are still being developed. Criteria for being “electrically close” are likely to vary between the perspectives of the ISO and the balancing authority in whose area aggregated resources are located, and both the native balancing authority and attaining balancing authority have legitimate interests in defining acceptable resource aggregations. To provide clarity in what the ISO would require, the ISO notes that the WECC’s current Unscheduled Flow Mitigation Plan (UFMP) uses an identification of a number of unscheduled flow (USF) zones within the WECC region, in which resources have very similar impact on the qualified paths that are managed through the UFMP. The qualified paths include the California-Oregon Intertie (COI) (Path 66), for which the ISO is the path operator, as well as interfaces in the Southwest such as Path 22, Four Corners-Central Arizona, and Path 23, Four Corners 345/500-kV Transformer. These zones are shown in the following map, which is available at <http://www.wecc.biz/committees/StandingCommittees/OC/UFAS/Shared%20Documents/USF%20Zone%20Map.pdf>. These zones define areas within which generators would have sufficiently similar impacts on the ISO to serve as boundaries of acceptable resource aggregations, from the ISO’s perspective. In addition, the ISO notes that a variety of functions that balancing authorities must perform to support dynamic transfers, such as exchange of telemetry on four-second intervals, would be difficult to perform if a resource aggregation were to span multiple balancing authorities.

## WECC Unscheduled Flow Zones



As noted above, the acceptability of a resource aggregation needs to be determined by both the native balancing authority and the attaining balancing authority. Since a dynamic import to the ISO is a dynamic export for the native balancing authority, the determination of aggregation qualifications will partly fall on the native balancing authority where the resources are interconnected to the grid. The native balancing authority must determine the “electrical closeness” of a potential aggregation based upon the impact to the source balancing authority’s system. In cases where the ISO would be the native balancing authority rather than the attaining balancing authority, the ISO would generally require that resources be at the same substation and voltage level to approve an aggregation for dynamic export. The ISO assumes native balancing authorities may establish similar requirements for dynamic transfers to the ISO.

### **3.9. Generator-only Balancing Authority Areas**

Among the requests for dynamic transfers into the ISO are ones from single generator Balancing Authority Areas. Currently, single generators providing their own reserves and service are tagged and denoted as “unit-contingent” resources and transactions, which is a type of standard transaction that is recognized by the Western Systems Power Pool (WSPP). As discussed in the Straw Proposal, the challenges of dynamic transfers from these BAAs include (1) increased potential for increased requirements for the ISO to firm, shape and load follow for a single resource, particularly an intermittent resource, (2) proper accounting and compensation for inadvertent flows, (3) whether aggregation as described above offers a better solution than participation as a generator-only BAA, (4) whether NERC and WECC reliability criteria are met, and (5) impacts pertaining to intermittency. To the extent that the single generator BAA cannot self regulate, it imposes inadvertent interchange on the balance of the WECC.

The Supplement to the Straw Proposal provided further discussion about the criteria the ISO would use to evaluate dynamic transfers from generation-only BAAs. Given that a dynamic transfer requires approval of a Dynamic Scheduling Agreement, by default all dynamic transfers are approved on a case-by-case basis. For pre-existing BAAs or other resources that wish to dynamically schedule with the ISO, the ISO would be able to review their historical performance in order to be assured that the ISO can maintain reliability after entering the Dynamic Scheduling Agreement. For BAAs that would be created with the intent to use dynamic scheduling, the ISO would review the expected performance of their dynamic schedules regardless of their resource portfolios. To add clarity in this area, the ISO does not believe it is necessary to explicitly distinguish generation-only balancing authorities for unique designation. As with any resource seeking to dynamically import into the ISO, the ISO and the native balancing authority will approve the dynamic scheduling agreement in which performance terms and conditions are defined. Since generation-only balancing authorities are approved by WECC, the ISO will not duplicate WECC’s qualifications, but will validate data to support that the source balancing authority is successfully managing its inadvertent energy and providing sufficient contingency reserves, as indicators of reliable performance as a dynamic schedule.

### **3.10. Expansion of dynamic transfer based services – dynamic export schedules and pseudo-ties**

Stakeholder comments on the Issue Paper have asked the ISO to consider expanding its dynamic transfer tariff provisions to include dynamic scheduling of exports and pseudo-ties of load. In the 2003-2004 timeframe when the ISO developed and filed Amendment 59 to its tariff to formalize its current provisions for dynamic scheduling, the ISO had received informal inquiries from market participants regarding the possible development of a formal dynamic scheduling program for exports from the ISO BAA to other BAAs. The 2004 filing of tariff amendment 59 did not establish a broader dynamic scheduling policy that would apply to exports because the short timeframe for preparing this filing required the ISO to focus on developing a comprehensive policy for imports. The ISO observed that a dynamic scheduling policy for exports would require different standards than those required for dynamically scheduled imports due to the different operational and business relationship of the ISO to resources within the ISO BAA, in contrast to imports from other BAAs. Moreover, unlike dynamically scheduled imports, the ISO had far more limited experience with the dynamic scheduling of exports, which would be instrumental in assessing potential future success of such a program. Nevertheless, the ISO offered in its filing of Amendment 59 to meet with parties who were interested in the dynamic scheduling of exports to discuss possible implementation of dynamic scheduling functionality for exports on an exploratory, pilot basis.

The ISO believed that it was reasonable and prudent to consider implementing an exploratory or pilot program for dynamically scheduled exports so that the ISO could gain necessary experience that could serve as the basis for developing more formal standards for dynamic exports in the future. The ISO has followed a similar approach both in (1) implementing the standards for dynamic scheduling of imports, where the combined experience from operating pre-existing dynamic schedules and from operating three pilots filed with FERC on January 9, 2004, provided enough operational confidence that the filing of standards for dynamic scheduling of imports became possible in Amendment 59, and (2) developing and implementing pilot agreements for pseudo-tie imports of both conventional and intermittent resources before developing tariff language through the current stakeholder process.

The pseudo-tie pilot for New Melones has proved successful as an export of hydroelectric generation, as demonstrated under both the prior and the present new market designs, and has provided the operating experience that the ISO lacked in 2004. The experience with the New Melones export and Sutter import pseudo-ties has allowed the ISO to identify needs for “dispatchability” to be immediately responsive to both e-Tag curtailments on their pre-determined interties and to operational dispatch orders in the event of over-generation or a real time intertie overload condition, competition on intertie scheduling constraints, and minor refinements to the ISO master file, interchange meter data processing, interchange transaction systems, and settlements, to more efficiently manage both market bids and interchange (e-Tag) schedules in ISO systems. The identified ISO system refinements are currently being implemented in support of the present pseudo-tie pilots, including the Copper Mountain Solar pilot project, which will serve as the prototype for future pseudo-tie services. In addition, stakeholders recognize the need for and assurance that pseudo-ties and dynamic schedules compete for transmission capacity on their designated intertie with static import schedules, to assure equal access to limited intertie Available Transfer Capability (ATC). Based on this operational experience, the ISO concludes that it can support dynamic export services for both conventional and renewable resources, as requested in stakeholder comments.

Although there will undoubtedly be differences between New Melones’ use of existing transmission contract capacity and resources that obtain transmission service through the ISO’s markets, and between pseudo ties and dynamic schedules, the Pilot Pseudo Tie Implementation Agreement for New Melones (available at <http://www.caiso.com/186a/186ad4f757710.pdf>) appears to be a useful prototype for dynamic transfer export agreements in general. One issue to be resolved when establishing agreements for dynamic exports is the allocation of uninstructed deviations between the native and attaining BAAs, for comparability with the practice that the ISO as the attaining BAA is responsible for 100% of the deviations of pseudo-tie generators but will limit its responsibility for dynamic schedules to a pro rata allocation of deviations. To ensure comparability, the ISO may require an export that is explicitly tied to a specific intermittent generator must be a dynamic transfer. Resource-specific requirements for both intertie curtailment and dispatch instruction responsiveness will be incorporated into dynamic and pseudo-tie contracts. All dynamic transfers must adhere to the applicable WECC and NERC reliability standards for dynamic interchange, and must compete for limited transmission access on the designated intertie.

To support dynamic exports, the ISO will need to enhance its current market software. The implementation of the new dynamic export functionality will be subject to the timeline for development and implementation of the necessary market design and bidding modifications, which will be identified as the ISO receives specific project proposals. The discussion of specific details with the involved market participants will ensure that the ISO appropriately identifies the needed software changes.

To date, no entities have offered specific proposals for pilot implementation of pseudo-ties serving load. Rather than attempting to develop tariff language without the benefit of actual operational experience with pseudo-ties of load, the ISO maintains its willingness to develop pilots for these scheduling arrangements. A pilot approach will allow the ISO, neighboring BAA and requesting participants to learn and revise if necessary rules that may generally be applied in the future, and for the ISO to identify and implement appropriate enhancements to its current market software.

### **3.11. Layoffs**

Under the ISO's existing pseudo-tie pilots, layoffs (energy transfers of a portion of a pseudo-tie generator's output back to the native BAA) are allowed but the layoffs are treated as firm static exports from the ISO. For a conventional dynamic schedule, the portion of the generator's schedule that is not scheduled into the ISO is an external schedule that the ISO does not see. In the case of layoffs from pseudo-ties, the ISO assesses all export charges except wheeling charges to the layoffs since the layoffs do not actually flow through the ISO's transmission system. The ISO will continue to support layoffs from pseudo-ties as it does in the pilots.

One potential concern about the use of layoffs is that a resource could schedule into the ISO as a pseudo-tie generator, and then export its output as a layoff of firm energy, simply to market what would otherwise be a unit contingent energy sale and thus achieve a better energy price in the regional markets. The ISO's existing tariff provisions assess the costs of operating reserves to firm exports, but this marketing practice could increase the ISO's ancillary service market clearing prices. The ISO will develop provisions to address such operational and market conditions if they are found to be significant.

Another potential form of uneconomic bidding behavior would occur if a pseudo-tie generator were to receive a higher LMP at its physical location than the LMP that it would pay to export layoff energy at a "contract path" scheduling point. The ISO will address this issue by charging for layoff exports from a pseudo-tie at the same location (i.e., the same LMP) that the pseudo-tie generator is paid for its generation output.

### **3.12. Division of physical generators into multiple dynamic schedules**

At the March 17 stakeholder meeting, one topic of discussion was whether a physical generator could be split into separate dynamically scheduled resources on different inerties, to facilitate situations where a resource owner cannot obtain transmission on a single external transmission path for the resource's full capacity. The discussion did not ask to divide the physical generation according to market conditions, but rather to establish resources with fixed capacities for each share of a generator. The ISO observes that there is a precedent for supporting this arrangement, which is that when the ISO filed letter agreements for three dynamic schedules, prior to the filing of Amendment 59 to the ISO tariff, two of the agreements were for shares of ownership in the Merchant power plant.

With certain qualifications, the ISO is prepared to support other instances in which a generator outside the ISO's BAA is divided into separate dynamically scheduled resources. First, the resource owner would need to describe a clear business need for this arrangement. In addition to establishing a fixed proportion of the total capacity that would comprise each resource, the resource owner would need to establish a clear mechanism for allocating the generator's output between the separate dynamically-scheduled resources. The resource owner would need to separate the dynamic interchange communications into separate data streams that appear to the ISO as if the resources are actually separate.

The ISO's business systems (particularly metering, since the generator's physical metering would see the plant as a whole when it is a pseudo-tie) would not be able to support separate pseudo-tie resources based on a single generator, just as the ISO cannot divide generators within the ISO BAA between multiple resources. (This is due to data relationships between meters and business systems, and does not prevent multiple separately-metered generators at the same geographic site from being separate pseudo-tie resources.) However, in the ISO's understanding at this time, the resource owner's business needs could be satisfied through dynamic scheduling, rather than necessarily requiring a pseudo-tie. When market participants identify clear business needs that could not be satisfied through regular dynamic scheduling arrangements, the ISO will consider such needs as they arise and determine appropriate solutions. For example, a stakeholder comment asks whether a physical generator can be split into multiple dynamic schedules at the same intertie, and the ISO's consideration of the specific instance would need to consider whether the existing inter-SC trade mechanism would meet the business needs.

### **3.13. Firmness of transmission**

Currently, ISO tariff provisions including section 6.1 of Appendix X (Dynamic Scheduling Protocol) require dynamic transfers to be supported by firm transmission reservations in each operating hour, although this is not a requirement for long term firm transmission. Stakeholder comments on the Straw Proposal pointed out that for practical purposes, the requirement for firm transmission can create a requirement for day-ahead scheduling that the Straw Proposal does not otherwise require. The basis for this conclusion is that intertie capacity may not be available after the day-ahead timeframe, which can occur because either (1) available intertie capacity into the ISO is fully scheduled in the day-ahead market, or (2) a market participant can only obtain non-firm transmission through other BAs to get to the ISO's scheduling points, after the day-ahead timeframe. In the first case, the unavailability of transmission into the ISO after the day-ahead market is the result of market competition for limited intertie capacity, and the ISO cannot favor one class of market participants over others in awarding capacity (other than for contractual requirements such as pre-existing transmission encumbrances).

Concerning the possibility that a market participant can only obtain non-firm transmission through other BAs after the day-ahead timeframe, the ISO has examined what its actual needs are for the use of firm transmission. In the case of pseudo-ties, the resource essentially becomes part of the ISO BAA, and the ISO relies on the pseudo-tie resource just as it relies on generation within the ISO's geographic boundary, so the ISO will continue to require firm transmission.<sup>29</sup> For dynamic schedules providing ancillary services, the ISO counts the awards to dynamic resources in meeting its reliability obligations, so the ISO must also require firm transmission. However, dynamic schedules of energy contribute to the ISO's balance of supply and demand similarly to the contributions of static interchange schedules, some of which use non-firm transmission to get to the ISO's scheduling points. Thus, the ISO proposes to not

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<sup>29</sup> LS Power's June 10, 2010, comments on the Draft Final Proposal describe the interconnection provisions for resources that connect to the Palo Verde Common Bus, which it describes a requirement for funding network upgrades and a resulting allocation of ATC across the common bus. The Palo Verde Common Bus does not become part of the ISO BAA or controlled grid through this process, but the described arrangement satisfies the requirement for firm transmission through the external transmission system.

require firm transmission through external BAAs for dynamic schedules of energy (i.e., not including pseudo-ties and ancillary services, which require firm transmission).<sup>30</sup>

### **3.14. Documentation for ancillary service certification**

In its prior efforts to implement dynamic schedules, the ISO has encountered concerns with the forms of documentation required by the Dynamic Scheduling Protocol in Appendix X of the ISO tariff, particularly some of the documentation required of affected BAAs in conjunction with certification of the ability to provide ancillary services from a Dynamic System Resource. The ISO proposes to modify these documentation requirements to address some of the concerns previously encountered.<sup>31</sup>

### **3.15. Coordination with neighboring BAAs, to avoid creating seams issues**

The final area to be noted in relation to market design options is that neighboring BAAs are currently facing similar issues with regard to integrating large amounts of intermittent resources. They face similar issues as those discussed in this document and are developing their own solutions to these issues, which the ISO continues to examine to identify potential common solutions. The current initiatives of other BAAs on which the ISO is examining as part of its coordination with neighboring areas include:

- Joint Initiatives efforts: In mid-2008, representatives from Columbia Grid, Northern Tier Transmission Group, and WestConnect joined forces to pursue a number of projects that would benefit from a broader level of participation and geographic economies of scale. Current initiatives sponsored by the collaborative include facilitation of intra-hour energy and transmission transactions, dynamic scheduling protocols, and sharing of ACE diversity. These mechanisms would allow a sharing of the regulation and operational burden beyond simply shifting the burden to the sending or receiving balancing authorities. Information is available at <http://www.columbiagrid.org/ji-nttg-wc-overview.cfm>. The ISO's implementation of future dynamic transfer agreements will consider use of the Dynamic Scheduling System (DSS), and the ISO sees its implementation of dynamic transfers as supporting the needs of intra-hour scheduling. In the January 27, 2011, Discussion Paper for February 1 Conference Call, and in the February 1 call, the ISO described a pilot program that it has initiated with Bonneville

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<sup>30</sup> Allowing dynamic schedules of energy to use non-firm transmission does not change other tariff provisions related to the use of non-firm transmission, such as settlements of obligations for operating reserves. Schedules within the ISO continue to represent firm transmission.

<sup>31</sup> The ISO has an existing certification process for dynamically scheduled ancillary services, including regulation, and balancing authorities from which such imports are to be scheduled. Applicable tariff provisions include but are not limited to section 8.3.4 (Certification and Testing Requirements), section 8.4 (Technical Requirements for Providing Ancillary Services), and Appendix K (Ancillary Service Requirements Protocol). These provisions apply to both generating units and System Resources that provide ancillary services across interties. In addition, dynamically scheduled resources are subject to Appendix X (Dynamic Scheduling Protocol), and dynamically scheduled resources that provide regulation are subject to the ISO's Standards for Imports of Regulation. This certification includes a requirement that the sending balancing authority and the SC representing the System Resource demonstrate that they have made appropriate arrangements and have put in place the equipment and services necessary to deliver the ancillary services to the point of interchange with the ISO BAA. In addition, the ISO requires the balancing authority from which the ancillary services are to be scheduled to enter into an agreement with the ISO for interconnected BAA operations. Minor modifications will clarify the documentation required for the certification process.

Power Administration for implementation of intra-hour scheduling using the mechanisms of dynamic scheduling.

- The Bonneville Power Administration (BPA) has developed a set of Wind Integration Charges that are applicable to intermittent resources in its BAA. There may be merit in implementing similar charges for similar functions in BAAs such as the ISO that have significant amounts of interchange schedules with BPA, when a future ISO stakeholder process considers cost allocation issues. Further information is available at [http://www.transmission.bpa.gov/wind/dynamic\\_transfer/default.cfm](http://www.transmission.bpa.gov/wind/dynamic_transfer/default.cfm). As noted in section 2 of this document, a separate stakeholder process will include issues of cost allocation and cost sharing mechanisms for the ISO's regulation and load following requirements.
- WECC's Seams Issues Subcommittee has initiated the conceptual development of improved methods of regional congestion management, including creation of a real-time energy imbalance service covering areas where organized markets do not currently exist. The ISO is active in this effort, which is currently in early stages of its market design.

The ISO believes that the proposals contained in this document do not conflict with coordinating with these efforts, so that the ISO can proceed with this Draft Final Proposal while its coordination is ongoing.

#### **4. Applicability of Proposals to Dynamic Schedules and Pseudo-Ties**

As stated in section 1, most proposals in this document apply to both dynamic schedules and pseudo-ties. Stakeholder comments have asked the ISO to specify which proposals apply to one or both of these forms of dynamic transfers, and the following table summarizes their applicability.

Topic	Applies to:	
	Dynamic Schedules	Pseudo-Ties
Transmission reservations	Yes	Yes
Congestion management	Yes	Yes
Dispatchability requirements and curtailment rules	Yes	Yes
Locational pricing	Yes	Yes
Pro rata allocation of deviations among BAAs	<b>Yes</b>	<b>No</b>
Limits of dynamic imports	Yes	Yes
Management of requests for dynamic transfers	Yes	Yes
Aggregation of conventional and/or renewable resources	Yes	Yes
Generator-only BAAs	<b>Yes</b>	<b>No</b>
Dynamic exports	Yes	Yes
Layoffs from pseudo-ties	<b>No</b>	<b>Yes</b>
Multiple dynamic schedules	<b>Yes</b>	<b>No</b>
Non-firm transmission	<b>Yes</b>	<b>No</b>
Documentation for AS certification	Yes	Yes
Coordination with neighboring BAAs	Yes	Yes

## 5. Interim functionality

As noted in previous sections, the ISO currently supports both dynamic schedules and pseudo-ties in its daily operations.<sup>32</sup> To the extent that new dynamic transfers use the same functionality that supports the existing dynamic transfers, the ISO will be able to support the new dynamic transfers under the existing tariff or once tariff amendments are approved by FERC. In instances where the ISO will need to modify its existing market or operations systems, the ISO will need to determine its implementation schedule. Until needed system enhancements can be implemented, the ISO will use interim functionality, as follows:

- **Transmission reservations:** The ISO will need to implement software changes to allow dynamic transfers to specify maximum deliveries exceeding their expected average delivery, and to settle congestion charges and the Grid Management Charge for the greater of scheduled and actual delivery, as discussed in section 3.1 of this Revised Draft Final Proposal. Until these software changes can be implemented, the ISO will continue its

<sup>32</sup> In instances where the previous sections note that the ISO is currently refining its support for existing dynamic transfers, the enhancements have been assumed to be in place prior to the filing of the tariff amendment resulting from the proposals described in this Draft Final Proposal, so they are considered to be existing functionality for purposes of this section. This section does not discuss needs for interim functionality in instances where the ISO can implement tariff changes without substantial changes to its market or operations systems. Changes to business processes do not necessarily require significant software changes.

existing market scheduling and settlement of transmission usage, including section 6.11 of ISO Tariff's Appendix X (Dynamic Scheduling Protocol).<sup>33</sup>

- Congestion management: Implementing the scheduling option discussed in section 3.2 of this Draft Final Proposal, to allow intermittent resources to update their expected energy profile availability by 5-minute intervals for a forward-looking two-hour period, will require changes in the ISO's market software and communication of dispatches. Until these software changes can be implemented, the ISO will dispatch intermittent resources using the first scheduling option described in section 3.2, in which the ISO will use the most recent available telemetry reporting of the resource's output as its expected deliverability and real-time dispatch for the next dispatch interval (adjusted downward if necessary due to congestion), and will continue its efforts to improve its forecasting capability for intermittent resources.
- Dynamic exports: As discussed in section 3.10 of this Draft Final Proposal, the specific market software design and bidding modifications to allow dynamic exports of supply resources that are geographically within the ISO's BAA will be identified as the ISO receives specific project proposals.
- Non-firm transmission: The ISO will need to document its tagging procedures and related systems and processes to identify dynamic schedules for energy that use non-firm transmission through external BAAs as allowed in section 3.13 of this Draft Final Proposal.
- Coordination with neighboring BAAs: As discussed in section 3.15 of this Draft Final Proposal, the ISO coordinates development of similar market initiatives, and recognizes benefits to supporting the Dynamic Scheduling System (DSS) that has been developed through the Joint Initiatives project. The requirements for supporting DSS may not require significant changes in the ISO's systems, but are being evaluated in further detail.

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<sup>33</sup> Section 6.11 of Appendix X provides: "In Real-Time the Dynamic Schedule may not exceed the maximum value established by the sum of the Day-Ahead Market and HASP/RTM accepted Energy and Ancillary Services Bids plus any response to the CAISO's Real-Time Dispatch Instructions. The composite value of the Dynamic Schedule derived from the Day-Ahead and HASP/RTM accepted Bids plus any Dispatch Instruction response represents not only the estimated Dynamic System Resource's Energy but also the transmission reservation on the associated CAISO Scheduling Point."