California ISO
Shaping a Renewed Future

MSG Enhancements

PG&E Comments

Short to Medium Term (No obvious Policy or Tariff updates required)

#	Enhancement/Change	Business Impact	Tariff/Policy	Priority (H,M,L)	Stakeholder Comments
1	Include transition ramp time when considering minimum up time constraint of the from configuration (Day-ahead and Real-Time)	This will allow the MSG unit to better model their inter-temporal constraints. Due to the fact that transition ramp time is variant based on transition, current behavior makes it hard for them to choose a MUT.	None identified	L	Conceptually, allows market participants to separate considerations of running sub-units from time to start.
2	RTPD needs to consider telemetry – Currently RTPD does not take the telemetry into consideration for MSG resources. RTD does recognize the telemetry.	This allows RTPD to be able to make a better decision in case of non compliance, early startup/shutdown or transition.	None identified	H	This helps the CAISO to better assess the true state of the supply/demand balance in the system during RTPD, and should achieve better consistency between the inputs used in RTPD and those used in RTD.
3	MSG DA schedule consistency across day boundries. Currently as an interim solution, we require market participants to bid in the configuration for HE1 of next trade day if that configuration is committed at HE24 for the prior trade day. This enhancment is to make IFM able to transit to the HE1 bid-in configuration from a different configuration based on initial condition if it is physically possible based on registered transition matrix. MPs do not have to bid in the same configuration in HE1 once this is done.	This will eliminate the need for market participant to bid in the configuration for the first tradin ghour of next day IF it is committed at that configuration at HE24 the previous day.	None identified	L	An acceptable though inconvenient workaround exists.
4	Extension of the terminal condition to consider configuration level minimum down time when making transition decisions.	This will allow the MSG resources with long transition notification time to be able to move to the configuration committed in day-ahead without being moved to another configuration that makes the transition no longer feasible.	None identified	H	This change will help to address one of the issues that results in self scheduling and self commitment of MSG resources, and should reduce self scheduling in the off peak hours.

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Short to Medium Term Horizon - Policy/Tariff change required					
#	Enhancement/Change	Business Impact	Tariff/Policy	Priority (H,M,L)	Stakeholder Comments
5	1). Bids for non-RA resources in RTM with DA award. SIBR shall enforce the bids to be available for all configurations below the DA schedule even the DA scheduled configuration is startup-able. 2). SIBR rule changes to tighten real-time bid submission including support of DA awarded AS or sufficient bids to allow transition across trading hours. Similarly to item B, SIBR shall enforce the lower configurations to be bid in. 3). Whenver a capacity is offered, the MSG resource shall offer the entire capacity range underneath that capacity.	This will solve a lot of operation problems for RTPD/RTD. Having the full capacity range bid-in (lower configurations) is important to be able to move the unit arouns economically.	Tariff/Policy	L	Market participants should be concerned about any backdoor introduction of a downward RA requirement. In addition, this increases the inconsistency of the MSG and non-MSG models.
6	Requested by Market Participants, Transition Cost registration – Formula needs to be revised (Policy change required)	This will allow market participants to able to encapture their true cost of transition. Currently, the formula is too limited.	Policy	H	It should be possible to validate non-fuel costs using a third party consultant such as Potomac or the ISO's own market monoitoring group, and correct modeling of such costs is essential to true system optimization and cost recovery by participants.
7	Requested by Market Participants, Extension of the Real-time limit on maximum number of configurations (Tariff change required) -- Change to "Max of 5 configurations - regardless of DA or RUC awards"? -- Or, consider eliminating limit, but enforcing new limit on the transition matrix. Max number of transition paths from a config. This change is important to allow market participants to bid in their RA configurations instead of having SIBR inserting the default energy bids.	This will further help the MSG resources with bigger number of configurations. It also helps CAISO since there are more choices to move in case of under-gen or over-gen.	Tariff Only	**M**	So far, large numbers of configurations are not seen as a major obstacle to RTPD/RTD consistency and provide little additional value in making the resource model more operationally realistic. Guidance is needed as to how additional configurations could be used to the benefit of both CAISO and generation owners. We may be interested in up to five configurations always being available in RTPD.

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Long Termer Horizon

#	Enhancement/Change	Business Impact	Tariff/Policy	Priority (H,M,L)	Stakeholder Comments
8	Requested By Market Participants: Submission of the Actual Configuration in Real-time from ADS or EMS As in the first go-live of MSG implementation, real-time application uses the state estimator or telemetry values to guess which actual configuration the plant is operating on. This is problematic when the MSG resource has multiple configurations overlapping each other. This problem will need to be addressed before we extend the MSG model to other areas including the aggregated pumps and aggregated pump storages. CAISO will need to work with market participants to develop a way either through telemetry or ADS for market participants to communicate the actual configuration in real-time to CAISO. This communication will need to happen no less than 5 minute frequency to facilitate the No Bid and Compliance functions in RTM	This will allow accurate configuration to be used in dispatch. Especially important when configurations are overlapping.	Tariff	L	Mechanics of submission of configuration in real time will require substantial systems work and the costs may exceed the potential benefits.
9	Requested By Market Participants, New Inter-Temporal Constraints (Tariff change needed) As in the first go-live of MSG implementation, we observe the minimum up time and down time on configuration level and the maximum daily transition per directional transitions. During the late stake holder implementation workshop, market participants have indicated that, the actual constraints they are facing is the physical unit level minimum up time. This is due to the manufacturer's warranty. This will be better described by a 3X1 combined cycle plant. In this example, each Gas Turbine has a minimum up time of 8 hours. So it is fine to move the MSG resource from offline to 1X1 configuration, then to 2X1 and then to 3X1. But it will be problematic to transit from 2X1 to 1X1 too soon since it will imply that one of the GTs has to be shutdown. CAISO has reached agreements with market participants that, for the first go-live, the minimum up time and down time on configuration level and the maximum daily transition per directional transitions will be used to model the physical constraints to a large extent. However, this will not complete the solution. A complete solution will be needed to operate the MSG resource correctly and is also important when we extend MSG to other areas including aggregated pumps and pump storages.	Allows the physical unit level constraint to be modeled 100% for the combined cycle unit.	Policy	H	Although the details of this implementation are not well understood, it seems to point toward a drastic change of the MSG model to something more physically based, which would probably yield better schedules and allow generation owners to better and more simply represent their costs and constraints.

Market Participant Requests

#	Enhancement/Change	CAISO Initial Response	Tariff/Policy	Priority (H,M,L)	Stakeholder Comments
10	Improve Market Simulation effectiveness, especially for potential new MSG	CAISO recognizes the need to better facilitate the market simulation to help the resource parameter tuning. Needs further plan in this area.	N	M	Costs of such improvement need to be compared to potential benefits in evaluationg possible enhancements.
11	Ability to self-schedule into real-time for different configurations that has day-ahead energy or AS awards	It was evalauted. Current rule is over-limiting the self schedule function. Will address this in MSG enhancement project.	N	H	Need for this would be reduced by more basic improvements such as multiple ramp rates or changes CAISO has suggested which would reduce the need for self scheduling in the first place. This is a second best solution if the former aren't feasible.

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12	Allow at least two ramp rates within configuration in IFM/RTD (or at least RTD). This is also related to the need to be able to provide more spin service when it can move from a configuration into duct firing in 10 minutes inclusive of ramp and transition.		N	H	Such a representation would allow combination of nx1 and nx1 duct firing states in a single configuration, and improve CAISO's assessment of reserve availability and real time ramping capability.
13	Allow ambient re-rating of pmin only, in SLIC and subject to consistency rules	CAISO recognizes the need to allow ambient re-rating of Pmin for the higher configuration to be lower than the original registered value and will evaluate impacts to the markets.	Y	L	CAISO suggested re-rating pmin down on units and configurations as an alternative solution. Though this adversely impacts our ability to recover minimum load costs, it should probably be tried prior to more fundamental changes to the resource model.
14	STUC/RTPD lookahead (5 hours) inconsistent with transition times (6 hours +), resulting in ISO violations of IFM schedules		N	H	The benefits of this improvement, when computationally feasible, may far outweigh the costs, though that depends on how many additional operating constraints are caught by STUC versus the present horizon.
15	Because all state transitions occur in RTPD rather than RTD, MSG is inherently unresponsive to RT interval price spikes (except as load following capability is maintained through uneconomic marginal pricing) and state transitions are inherently untransparent to SCs and resource operators		Y	H	This is however not just an MSG issue.
16	Day-ahead transition time versus RT transition time rounding time. This rounding difference will cause day-ahead awarded ancillary service to be disqualified in real-time. Suggest to look into this for refinement.		N	H	Transitions should be no less capable of maintaining ancillary services than the FOR model. If less capable, the enhancement should be mandatory.
17	The method of setting a day-ahead schedule in the middle of non-overlapping region can cause real-time exposure for real-time energy; Similarly, in real-time, it is also brought up that, the current method of setting dispatch at the boundary of the from configuration can cause more UIE in settlement.		Y	L	Is there an example that would show the magnitude of the adverse exposure?
18	Market transparency in allowing RTPD prices visible to market participants. This issue does not only apply to MSG resources. However, since RTPD makes decisions for MSG transitions, this issue does get amplified in MSG.		Y	H	Essential for transparency of the MSG and fast start commitment priocesses.
19	Penalty prices of day-ahead awarded ancillary service versus energy in real-time. This is not just MSG issue. However, since MSG disqualifies the ancillary service during the transition period, the high penalty prices to protect day-ahead ancilllary service does limit MSG unit to move.		Y	M	Not an MSG issue as such.

Send completed comments template to Li Zhou at lzhou@caiso.com.