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Inter-interval Ramping Rules for the MRTU Integrated Forward Market and Real Time Market

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1. Introduction

Recent ISO white papers issued on February 10 and 13 of this year[1] described how the market optimization software would take into account a resource's ramping capability for the purpose of co-optimizing energy scheduling and ancillary services procurement over multiple market intervals. The approach described in those papers utilized a pair of constraints to limit the "sharing" of a resource's ramping capability between inter-interval energy schedule changes and ancillary service awards, in order to retain the resource's ability to deliver the procured ancillary services during the inter-interval ramping period. Subsequent to the release of those white papers, the ISO determined that the software functionality to implement the ramp-sharing constraints cannot be in place for MRTU launch on March 31. The ISO is planning to implement the ramp-sharing constraints at a later time, but for purposes of MRTU launch the ISO will utilize the original rules for managing resource inter-interval ramping capability in the markets as described in this technical bulletin.

2. Rules for the Integrated Forward Market

The integrated forward market distinguishes between fast-ramping and slow-ramping resources and treats each type differently in the co-optimization of energy and ancillary services procurement. Fast-ramping resources are those resources that are able to ramp from their Pmin to their Pmax within twenty (20) minutes utilizing their operational ramp rate. Slow-ramping resources are all other resources; i.e., resources that require more than 20 minutes to ramp from PMin to PMax at their operational ramp rate.

Fast-ramping resources will be scheduled by the integrated forward market optimization to provide both ancillary services and inter-hour energy schedule changes without any restrictions on the sharing of their ramping capability between these uses. The ramp rate used to schedule a fast-ramping resource's inter-hour energy schedule change will differ, however, based on whether the resource has been scheduled to provide regulation service in one or both of the hours. Table 1 indicates the ramp rate that will be utilized for inter-hour energy schedule changes in each of these cases. If the resource is not providing regulation service in either of two consecutive hours, the operational ramp rate will be used in determining the energy schedule change between the two hours. If the resource is providing regulation service in either or both of two consecutive hours, the regulating ramp rate will be used in determining the energy schedule change between the two hours.

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[1] See "Supplementary Discussion of MRTU Market Parameters," dated February 10, 2009 (available at http://www.caiso.com/2351/2351f3c016020.pdf) and "Market Parameter Settings for MRTU Market Launch," dated February 13, 2009 (available at http://www.caiso.com/2354/2354107423420.pdf).

In addition, certain ramping rules will apply to the start-up and shut-down processes. A fast-ramping resource that is starting up in a given hour will ramp up from its Pmin to its scheduled operating level within 30 minutes after start-up, i.e., within 30 minutes of the start of the first hour in which it is scheduled to be on. Similarly, a fast-ramping resource that is shutting down will ramp down from its scheduled operating level to its Pmin within 30 minutes.

A slow-ramping resource may or may not be scheduled by the integrated forward market to provide ancillary services depending on the magnitude of its inter-hour energy schedule change. Specifically, if a slow-ramping resource would take more than 20 minutes to ramp up from one hour's energy schedule to the next hour's energy schedule, it will be ineligible to provide Regulation Up, Spinning Reserve, or Non-Spinning Reserve in either of the two hours. Conversely, a slow-ramping resource that self-provides Regulation Up, Spinning Reserve, or Non-Spinning Reserve in a given hour will have its inter-hour energy schedule changes, both prior and subsequent to the given hour, limited to changes that can be achieved within 20 minutes. If necessary such a resource's energy self-schedules (except for RMR resources) may be adjusted in the integrated forward market so that this rule is not violated.

Similarly, a slow-ramping resource that would take longer than 20 minutes to ramp down from one hour's energy schedule to the next hour's energy schedule will be ineligible to provide Regulation Down in either of the two hours. Conversely, a slow-ramping resource that self-provides Regulation Down in a given hour will have its inter-hour energy schedule changes limited to changes that can be achieved within 20 minutes, and if necessary its energy self-schedules (except for RMR resources) may be adjusted so that this rule is not violated.

Depending on whether a slow-ramping resource is awarded regulation service in a given hour, the resource will use the applicable regulating or operational ramp rate for its inter-hour energy schedule changes as indicated in Table 1 below. If the resource is not providing regulation service in either of two consecutive hours, the operational ramp rate will be used in determining the energy schedule change between the two hours. If the resource is providing regulation service in either or both of two consecutive hours, the regulating ramp rate will be used in determining the energy schedule change between the two hours.

The ramping rules for the start-up and shut-down processes for slow-ramping resources will differ depending on whether the resource is providing ancillary services during the start-up or shut-down hour. If a slow-ramping resource is providing ancillary services during the start-up process, it will be required to ramp from its Pmin up to its scheduled operating level within 10 minutes after start-up, i.e., within the first 10 minutes of the start of the first hour in which it is scheduled to be on. Similarly, if it is providing ancillary services during the shut-down process, it will be required to ramp down from its scheduled operating level to its Pmin within 10 minutes. If the slow-ramping resource is not providing ancillary services during the start-up or shut-down hours it will have up to 30 minutes to complete these ramps.

If a resource's regulation ramp-rate is greater than its operational ramp-rate, the market solution may result in a very small quantity regulation award in order to access the higher regulation ramp-rate available when the resource is providing regulation.

Table 1: Integrated Forward Market Ramp-rate Scenarios

Fast-ramping resource scenario 1	Hour T-1	Up to -30 min	Up to +30 min	Hour T	Up to -30 min	Up to +30 min	Hour T+1
	Reg award	Reg Ramp Rate	Reg Ramp Rate	No Reg award	Op Ramp Rate	Op Ramp Rate	No Reg award
Fast-ramping resource scenario 2	Hour T-1	Up to -30 min	Up to +30 min	Hour T	Up to -30 min	Up to +30 min	Hour T+1
	No Reg award	Reg Ramp Rate	Reg Ramp Rate	Reg award	Reg Ramp Rate	Reg Ramp Rate	No Reg award
Slow-ramping resource with spin or non-spin award	Hour T-1	-10 min	+10 min	Hour T	-10 min	+10 min	Hour T+1
	Reg award	Reg Ramp Rate	Reg Ramp Rate	No Reg award	Op Ramp Rate	Op Ramp Rate	No Reg award
Slow-ramping resource with no spin or non-spin award	Hour T-1	-10 min	+10 min	Hour T	-30 min	+30 min	Hour T+1
	Reg award	Reg Ramp Rate	Reg Ramp Rate	No Reg award	Op Ramp Rate	Op Ramp Rate	No Reg award

3. Rules for the Real Time Market

In the real time market the above distinction between fast-ramping and slow-ramping resources is not used. In particular, in the real time market – including the real-time pre-dispatch (RTUC and HASP), the real-time five-minute interval dispatch (RTD) and the real-time contingency dispatch (RTCD) – there are no ramping-related restrictions that link the inter-interval energy dispatch and the award of ancillary services. This means that all resources have their full ramping capability available for energy dispatch in the real time market processes.

The applicable ramp rate that will be used for dispatching energy in the real time market will depend on whether the resource is providing regulation service. The operational ramp rate is used to dispatch a resource across two consecutive intervals (from the middle of one interval to the middle of the next interval) if the resource is not providing regulation service in either of the two intervals. If the resource is providing regulation service in either of two consecutive intervals, the regulating ramp rate is used in determining the energy dispatch between the two intervals.