

PDR-DERP-NGR Summary Comparison Matrix

Proxy Demand Response (PDR), Distributed Energy Resource Provider (DERP) and Non Generator Resource (NGR) Program Elements

Market Participation Model	Proxy Demand Resource (PDR)	Distributed Energy Resource (DER) Provider	Non-Generating Resource (NGR)
Description	<p>1. Proxy Demand Response (PDR) is a market participation model that enables 3rd parties to bid demand response into the CAISO market independent of the Load Serving Entity for load <i>curtailment</i> in wholesale Energy and Ancillary Services markets</p> <p>2. PDR – Load Shift Resource (PDR-LSR) is a market participation model recently developed; allows for a <i>bidirectional</i> dispatch product that rewards PDRs for increasing consumption during negative pricing (i.e., oversupply events). Available Fall 2019.</p> <p>3. Reliability Demand Response Resource (RDRR) is a market participation model for reliability-based load <i>curtailment</i>, triggered only under emergency conditions. RDRRs have different requirements and limitations, as participation is limited to CPUC jurisdictional DR program integration, with a cap on</p>	<p>DER Provider (DERP) is a market participation model that allows for an aggregation of Distributed Energy Resources (DERs) allowed within limitations to meet minimum capacity requirements and act as one ‘virtual’ resource (see also the DERP Agreement template).</p> <ul style="list-style-type: none"> • [Review the Distributed Energy Resources Provider webpage for more information] 	<p>Non-Generating Resource (NGR) is a <i>resource-type</i> market participation model (i.e., such as a conventional generator), created to account for the positive-negative range of a storage resource. It may either act as a storage resource—or, if providing generation-only, as a conventional generator.</p> <p style="color: red;"><i>*Note* A resource-type participation model, distinguished from non-resource-type participation models like PDR and DERP, may bid into markets directly under its own model <u>or</u> through other participation models (i.e., NGR resources may bid through the NGR model, or it may be used within the PDR or DERP models).</i></p> <p>(3) NGR subtypes:</p> <ul style="list-style-type: none"> • Limited Energy Storage Resources (LESRs) have a continuous positive to negative operating range according to discharge and charge limits, respectively, and are constrained by their State of Charge (SOC). Batteries and flywheels qualify as LESRs.

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	<p>the amount of MWs that count for Resource Adequacy based on a CPUC settlement agreement.</p> <p>4. Unique rules apply to the Participating Load model, which includes <i>Pumped Hydro Storage</i>. These resources act as load while using energy to pump water to higher elevation reservoirs; then act like generators by creating energy when releasing water back to lower reservoirs.</p> <ul style="list-style-type: none"> [Review Section 2.1.6 of the Market Operations BPM and the Storage webpage for more information on <i>Participating Load</i>] <p><i>*Note*</i> DR resources are not eligible to provide Regulation Energy Management (REM).</p> <ul style="list-style-type: none"> [Review the material on the Demand Response and Load webpage for more information] 		<ul style="list-style-type: none"> Dispatchable Demand Response (DDR) resources have a non-positive operating range (i.e. cannot generate electricity), and they are constrained by their Curtailable Energy Limit. Generic NGRs, like LESRs, have a continuous positive-to-negative operating range, but they are not constrained by an SOC. <p><i>*Note*</i> LESRs and DDRs may provide Regulation Energy Management (REM) or act as non-REM resources, while Generic NGRs may <i>only</i> provide REM—this distinction determines which market products are accessible to the resource and how capacity is calculated.</p> <ul style="list-style-type: none"> [See the Storage webpage for more information]
<p><i>Market Participation Options</i></p>	<ul style="list-style-type: none"> Day-Ahead & Real-Time energy Day-Ahead & Real-Time Spinning and Non-Spinning reserves 	<ul style="list-style-type: none"> Day-Ahead & Real-Time energy Day-Ahead & Real-Time Spinning and Non-Spinning reserves 	<p>LESR and DDR:</p> <ul style="list-style-type: none"> Day-Ahead & Real-Time energy Day-Ahead & Real-Time Spinning Reserves, Non-Spinning reserves, and Regulation Up & Down

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<p>See the Market Operations BPM for additional information</p>	<ul style="list-style-type: none"> [See also Section 3.2 of the Market Instruments BPM for additional information] 		<p>Generic NGR:</p> <ul style="list-style-type: none"> Day-Ahead & Real-Time Regulation Up & Down <p><i>*Note* Energy and Ancillary Service Awards are co-optimized throughout the optimization horizon</i></p>
<p style="text-align: center;"><i>Capacity & Aggregation Requirements</i></p>	<p>Energy markets only: 100 kW minimum curtailment—must be sustainable for duration of bid.</p> <p>Ancillary Services: 500 kW minimum curtailment—must be sustainable for 60 minutes for Day-Ahead Regulation awards, 30 minutes for Real-Time Regulation awards, and 30 minutes for Spin/Non-Spin awards.</p> <p>Additionally, smaller loads may be aggregated to achieve the minimum; aggregations are not required to be served by a single LSE that is located within the same Sub-LAP.</p> <ul style="list-style-type: none"> [See DR/RDRR Overview presentation located on the Demand Response and Load webpage; Tariff section 8.4] 	<p>Aggregation must be 0.5 MW minimum capacity.</p> <p>Aggregation must be <20 MW in total when spanning multiple P-Nodes.</p> <p>Individual resources within the aggregation must be <1 MW in size and must be located within the same Sub-Lap.</p> <ul style="list-style-type: none"> [See the DERP Participation Guide and Checklist for additional information] 	<p>500 kW minimum capacity (PMax counts towards this minimum, not just for the qualifying regulation capacity)</p> <p>Non-REM: 60-min continuous energy requirement</p> <p>REM: 15-min continuous energy requirement</p> <p><i>*Note* All subtypes may be aggregated</i></p> <ul style="list-style-type: none"> [See the REM-NGR BRS and REM-NGR Overview for qualifying regulation capacity for DA Awards, as well as for additional information]
<p><i>*Note*</i> As noted in the NGR section above (pg. 1), individual resources may be of different types (battery/storage, EV-managed charging, conventional gen, etc.)</p>			

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<p><i>Operating & Bidding Characteristics</i></p> <p>See the Market Operations BPM, for additional information</p>	<p>Resource bids in as a supply resource; bid segments may be as granular as 0.01 MW</p> <p>Resource owner defines one start-up and one ramp rate</p> <p><i>*Note* All bids must lie above the Net Benefits Test (NBT) threshold</i></p> <ul style="list-style-type: none"> [See also the ESDER Phase 2 BRS and the most current User Guide on the Demand Response and Load Participation webpage for additional information] 	<p>Pnode resource movement must be “in the same direction as dispatch” (e.g., if the resource is asked to “increase supply,” individual sub-resources can move in opposite directions—i.e., discharging by some while others are charging—but the aggregated response at a Pnode must result in an increase in supply at each Pnode).</p> <p>Default Distribution Factors (DFs) are statically set within the Masterfile for the resource but can be dynamically reset as part of the resource’s schedule or bid. Resources must respond according to these DFs, which apply to both load and generation response collectively (ISO is currently investigating separate DFs for load and generation).</p> <p>Market resource is evaluated, dispatched, and controlled at the aggregation level. Resource control system is required to manage sub-resource response to a single ISO instruction.</p>	<p>There are two segments of ramp rates</p> <p>Currently, NGRs are modelled with no start-up time and no start-up costs; as such, they are also ineligible for commitment cost recovery.</p> <p>Energy losses are considered during the charging process, not the discharging process.</p> <p>Non-REM: DAM and RTM observe State of Charge (SOC) limitations in the energy and ancillary service optimizations. Further, DAM calculates SOC according to prior day’s day-ahead schedule if SOC is not included in the DA bids.</p> <p>REM: SOC limitations are observed in real-time economic dispatch only. ISO manages SOC. Real-time energy offsets.</p> <p><i>*Note* Other than the Generic NGR subtype, currently, NGRs are not subject to Market Power Mitigation (MPM)</i></p> <ul style="list-style-type: none"> [See also the REM-NGR BRS Section 4.1, for additional information]
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<p style="text-align: center;">Telemetry</p> <p style="text-align: center;">See the Direct Telemetry BPM for additional information</p>	<p>Energy Market:</p> <ul style="list-style-type: none"> ○ Telemetry not required unless resource is >10 MW ○ Provision of status every 4 seconds ○ Update of status every 360 seconds (maximum); 5-minute scan rate (as defined in the Direct Telemetry BPM) <p>Ancillary Services (Spinning & Non-Spinning):</p> <ul style="list-style-type: none"> ○ Required (at any capacity) ○ Provision of status every 4 seconds ○ Update of status every 60 seconds (maximum) ○ 1-minute scan rate (as defined in the Direct Telemetry BPM) 	<p>Energy Market:</p> <ul style="list-style-type: none"> ○ Telemetry not required unless resource is >10 MW <p>Ancillary Services (Spinning & Non-Spinning):</p> <ul style="list-style-type: none"> ○ Required (regardless of capacity) ○ Provision of status every 4 seconds <p><i>*Note* A DER must securely convey telemetry to the ISO's EMS over the Energy Communication Network (ECN) using one of the ISO approved protocol methods</i></p>	<p>Energy Market:</p> <ul style="list-style-type: none"> ○ Telemetry not required unless capacity is >10 MW ○ Provision of status every 4 seconds ○ Update of status every 360 seconds (maximum); 5-minute scan rate <p>Ancillary Services (Regulation Up/Down, Spinning & Non-Spinning):</p> <ul style="list-style-type: none"> ○ Provision of status every 4 seconds ○ Update of status every 4 seconds <ul style="list-style-type: none"> ▪ 8-second round trip response <p><i>*Note* State of Charge (SOC) optimization requires telemetry, but an SC may choose to self-manage SOC (i.e., an SC may choose not to use energy limits and SOC optimization and may instead manage SOC and risk of non-performance in Real Time)</i></p>
<p style="text-align: center;">Metering</p> <p style="text-align: center;">See the Metering BPM for additional information; See the Direct Telemetry</p>	<p>Metered by Scheduling Coordinator (SC)</p> <ul style="list-style-type: none"> ○ LRA-approved meters permitted (thus, UDC meters ok) ○ SC submits Settlement Quality Meter Data (SQMD) to ISO 	<p>Metered by SC</p> <ul style="list-style-type: none"> ○ LRA-approved meters permitted (thus, UDC meters ok) ○ In the absence of LRA requirements, ISO has developed default requirements 	<p>Metered by ISO or SC</p> <p>If ISO-metered:</p> <ul style="list-style-type: none"> ○ ISO-metered entities require an ISO meter and polling (ISO-metered, polled and processed), or an ISO-approved SC-metered entity approach <p>If SC-metered:</p>

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<p>BPM for specific requirements</p>			<ul style="list-style-type: none"> ○ LRA-approved meters permitted (thus, UDC meters ok) ○ In the absence of LRA requirements, ISO has developed default requirements
<p>Performance Metrics for Settlement</p>	<p>SQMD is used to develop baselines and measure PDR performance—submit SQMD to ISO by applying Distribution-Loss Factors to revenue quality meter data.</p> <p>Performance is measured as curtailment from <i>expected</i> load; settlements uses baseline methodologies to assess PDR performance—refer to the most current User Guide on the Demand Response and Load Participation webpage for all methodology options]</p> <p><i>*Note*</i></p> <ul style="list-style-type: none"> ○ <i>DA energy can be settled on hourly meter data</i> ○ <i>RT and A/S is settled on 5 minute data, which can be estimated from 15 minute meter data</i> ○ <i>For Ancillary Services, a No-Pay Charge is evaluated for Spinning and Non-Spinning Reserve Settlement based on meter readings before and after—this rescinds Day-Ahead and Real-Time Reserve Capacity Awards</i> 	<p>Submit SQMD to ISO by applying Distribution-Loss Factors to revenue quality meter data.</p> <p><i>*Note* SQMD is required to be submitted from the SC on a daily basis for all market intervals 24/7—i.e., not just when scheduled or received pursuant to an ISO dispatch</i></p>	<p>NGR Real-Time bids utilize State of Charge (SOC) values from 4-second cycle Telemetry signals.</p> <p>ISO Energy Management System (EMS) passes SOC values to the ISO Real Time Market every 1 minute.</p> <p><i>*Note* 24/7 resource availability required—i.e., metered and settled 24/7 on metered quantity, thus, must always schedule or bid into the market when operating or will incur an Uninstructed Deviation Energy payment/charge when operating and not bidding/scheduling</i></p>

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	<p style="color: red;"><i>payments for the service to the extent that the resource that was awarded the Reserve Capacity does not fulfill the requirements associated with that payment</i></p> <ul style="list-style-type: none"> ○ <i>Positive changes in load will be set to 'zero' for settlement purposes</i> 		
<i>ISO Contract Requirements</i>	<p>Demand Response Provider Agreement (DRPA)</p>	DERP Agreement (DERPA) if aggregating to meet .5 MW minimum size requirement	<ul style="list-style-type: none"> ● Participating Load Agreement (PLA) ● Participating Generator Agreement (PGA)
<p><i>Interconnection Requirements</i></p> <p>See the Resource Interconnection Guide webpage for additional information</p>	<p>ISO: None; registration process.</p> <p>UDC: None, unless a behind-the-meter device is providing DR, then refer to Rule 21.</p> <ul style="list-style-type: none"> ● [Refer to the most current User Guide on the Demand Response and Load Participation webpage for additional information] 	<p>ISO:</p> <ul style="list-style-type: none"> ○ ISO Interconnection Process ○ ISO New Resource Implementation (NRI) Process <p>UDC:</p> <ul style="list-style-type: none"> ○ Must abide by UDC interconnection application process for the purposes of ISO wholesale participation ○ Once UDC Interconnection approval is granted, resource enters ISO New Resource Implementation (NRI) process <p style="color: red;"><i>*Note* Requires alignment between distribution-level interconnection and the ISO NRI process</i></p>	<p>ISO:</p> <ul style="list-style-type: none"> ○ ISO Interconnection Process ○ ISO New Resource Implementation (NRI) Process <p>UDC:</p> <ul style="list-style-type: none"> ○ Must abide by UDC interconnection application process for the purposes of ISO wholesale participation ○ Once UDC Interconnection approval is granted, resource enters ISO NRI process

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Summary of Bidding Requirements for Resources Providing RA Capacity¹

- **Note* The DERP participation model is ineligible to provide RA*
- Must-Offer Obligation (MOO):
 - 24 Hours a Day
 - IFM, RUC and RTM for all hours for all RA MW
 - Can be given non-binding RUC commitments if it is short start
- 3 consecutive days of dispatch
- 24 hours per month of dispatch
 - A PDR must bid under the MOO whenever the PDR has demand reduction availability. If the PDR is capable of reducing load 24 hours/day is must bid 24 hours/day. If is only capable 14 hours/day (i.e. the business is only open 14 hours/day), then it must bid those 14 hours/day.
- 4 hours per dispatch
- Bid economically – PDR is not subject to local market power mitigation; therefore, highly priced bids will not be mitigated by the ISO.

Resource Type	Summary of Generic (System) RA Bidding Requirements			
	IFM	RUC	RTM	ISO Inserts Required Bids
Distributed Energy Resources (Single resource Type)	Economic Bids or Self-Schedules are to be submitted for all RA Capacity for all hours of the month the resource is physically available.	\$0/MW RUC Availability Bids are to be submitted for all RA Capacity for all hours of the month the resource is physically available.	Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity from resources scheduled in IFM or RUC. Economic	Yes ²

¹ For additional information, please refer to the Reliability Requirements BPM, located on the [BPM landing page](#)

² ISO will insert Economic Bids and RUC Availability Bids into DAM and RTM if required amounts of RA Capacity are not offered into these markets
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			Bids or Self-Schedules are to be submitted for all RA Capacity from Short-Start Units not scheduled in IFM.	
Distributed Energy Resources	Same as resources type for grid connected resource	Same as resources type for grid connected resource	Same as resources type for grid connected resource	Same as resource type for grid connected resource
Non-generator resource (Non-REM)	Economic Bids or Self-Schedules are to be submitted for all RA Capacity for all hours of the month the resource is physically available.	\$0/MW RUC Availability Bids are to be submitted for all RA Capacity for all hours of the month the resource is physically available.	Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity from resources scheduled in IFM or RUC. Economic Bids or Self-Schedules are to be submitted for all RA Capacity not scheduled in IFM.	Yes ³
Non-generator resource (REM)	Economic Bids or Self-Schedules are to be submitted for all RA Capacity for regulation for all hours of the month the	\$0/MW RUC Availability Bids are to be submitted for all RA Capacity for all hours of the month the	Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity from resources scheduled	Yes ⁴

³ ISO will insert Economic Bids and RUC Availability Bids into DAM and RTM if required amounts of RA Capacity are not offered into these markets

⁴ ISO will insert Economic Bids and RUC Availability Bids into DAM and RTM if required amounts of RA Capacity are not offered into these markets

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	resource is physically available.	resource is physically available.	in IFM or RUC. Economic Bids or Self-Schedules are to be submitted for all RA Capacity not scheduled in IFM.	
Proxy Demand Resource	Economic Bids or Self-Schedules are to be submitted for RA Capacity that the market participant expects to be available per supply plan.	\$0/MW RUC Availability Bids are to be submitted for all short and medium start RA Capacity for all hours of the month the resource is physically available. No RUC Availability Bids required for long-start RA Capacity.	Economic Bids or Self-Schedules are to be submitted for any remaining RA Capacity from resources scheduled in IFM or RUC. Economic Bids or Self-Schedules are to be submitted for all RA Capacity from Short-Start Units not scheduled in IFM.	No ⁵

⁵ ISO will not insert bids for these resources in the event that required amounts of RA capacity are not offered into the respective markets—an exception is that the ISO will insert Economic bids into the IFM and/or RTM in the event that there is a RUC Availability Bid or RUC Schedule for a resource without a corresponding Economic Bid or Self-Schedule.

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Summary of Bidding Requirements for Resources Providing Flexible RA Capacity⁶

There are three different types of Flexible RA Capacity, Base Ramping, Peak Ramping, and Super-Peak Ramping. A resource qualifies to provide Flexible RA Capacity in each Flexible Capacity Category for which it meets the qualifications set forth in ISO Tariff Sections 40.10.3.2, 40.10.3.3, and 40.10.3.4.

	Base Ramping ⁷	Peak Ramping ⁸	Super-Peak Ramping ⁹
Capable of DAM and RTM Economic Bidding	5:00 a.m. – 10 p.m.	Five hour block determined seasonally ¹⁰	Five hour block determined seasonally ¹¹
Energy Requirement	Minimum 6 hours at EFC	Minimum 3 hours at EFC	Minimum 3 hours at EFC
Daily Availability	7 days per week, all days per month	7 days per week, all days per month	All non-holiday weekdays per month
Daily Start-Up Capability	Resource must be able to provide the minimum of (i) two Start-Ups per day each day of the month or sixty Start-Ups per month, or (ii) the number of Start-Ups allowed by its operational limits, including minimum up and minimum down time	At least one start per day	At least one start per day
Other Limitations	No monthly or annual limitations on number of starts or energy limits that	No monthly or annual limitations on number of starts or energy limits that translate to less	Must be capable of responding to at least 5 dispatches per month during the five-hour

⁶ For additional information, please refer to the Reliability Requirements BPM, located on the [BPM landing page](#)

⁷ For a complete list of Base Ramping qualifications, please refer to ISO Tariff Section 40.10.3.2

⁸ For a complete list of Peak Ramping qualifications, please refer to ISO Tariff Section 40.10.3.3

⁹ For a complete list of Super-Peak Ramping qualifications, please refer to ISO Tariff Section 40.10.3.4

¹⁰ Five-hour block defined in Section 7

¹¹ Five-hour block defined in Section 7

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	translate to less than the daily requirements	than the daily requirements	period of the must offer obligation
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Resource Type	Summary of Flexible RA Bidding Requirements			
	IFM	RUC	RTM	ISO Inserts Required Bids
<p>Use-Limited Resources</p> <p><i>*Note* DR is a Use-Limited Resource</i></p>	<p>Consistent with its use-limitations:</p> <ul style="list-style-type: none"> ▪ Submit Economic Bids for Energy for the full Flexible RA Capacity MW. ▪ Submit Economic Bids for Ancillary Services that are not flagged as Contingency only for the full Flexible RA Capacity MW certified to provide Ancillary Services. ▪ Where Economic Bids are required, resource must submit in at least the required hours for the resource’s committed Flexible RA Capacity categories. <p><i>ISO Tariff Sections 40.10.6.1(a) & 40.10.6.1(f)(1)</i></p> <p><i>ISO Tariff Section 40.10.6.1(e)</i></p>	<p>Consistent with its use-limitations:</p> <ul style="list-style-type: none"> ▪ Participation of all available flexible RA capacity resources is required. ▪ ISO will optimize using \$0/MW-hour RUC Availability Bids for all Flexible RA Capacity that is not reflected in an IFM Schedule in only the required hours for the resource’s committed Flexible RA Capacity categories. <p><i>ISO Tariff Sections 40.10.6.1(a) & 40.10.6.1(f)(1)</i></p> <p><i>ISO Tariff Section 40.10.6.1(e)</i></p>	<p>Consistent with its use limitations:</p> <ul style="list-style-type: none"> ▪ Submit Economic Bids for Energy for the full Flexible RA Capacity MW. ▪ Where Economic Bids are required, resource must submit bids for the Trading Hours that it is capable of being economically dispatched. <p><i>ISO Tariff Sections 40.10.6.1(e)</i></p>	<p>IFM: No</p> <p>RUC: Optimized at \$0/MW-hour</p> <p>RTM: No</p>

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<p>Non-Generator Resources</p>	<p>For resources not flagged as regulation energy management:</p> <ul style="list-style-type: none"> ▪ Submit Economic Bids for Energy (includes positive and negative generation) for the full Flexible RA Capacity MW. ▪ Submit Economic Bids for Ancillary Services that are not flagged as Contingency only for the full Flexible RA Capacity MW certified to provide Ancillary Services. ▪ Where Economic Bids are required, resource must submit in at least the required hours for the resource’s committed Flexible RA Capacity categories. <p>For resources flagged as regulation energy management:</p> <ul style="list-style-type: none"> ▪ Submit Economic Bids for regulation up and down that are not flagged as Contingency Only for the full Flexible RA Capacity MW certified to provide Ancillary Services. 	<p>ISO will optimize using \$0/MW-hour RUC Availability Bids for all Flexible RA Capacity that is not reflected in an IFM Schedule in only the required hours for the resource’s committed Flexible RA Capacity categories.</p> <p><i>ISO Tariff Sections 40.10.6.1(a) & 40.10.6.1(f)(1)</i></p>	<ul style="list-style-type: none"> ▪ Must submit Bids for Regulation Up and Regulation Down from 05:00 to 22:00 seven days a week. ▪ Shall not submit Bids for Energy or other Ancillary Services. 	<p>IFM: No RUC: Optimized using \$0/MW-hour RTM: No</p>
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2019 Flexible Resource Adequacy Availability Assessment Hours and must offer obligation hours

Flexible RA Capacity Type	Category Designation	Required Bidding Hours	Required Bidding Days
January – April			
October – December			
Base Ramping	Category 1	05:00am to 10:00pm (HE6-HE22)	All days
Peak Ramping	Category 2	2:00pm to 7:00pm (HE15-HE19)	All days
Super-Peak Ramping	Category 3	2:00pm to 7:00pm (HE15-HE19)	Non-Holiday Weekdays*
May – September			
Base Ramping	Category 1	05:00am to 10:00pm (HE6-HE22)	All days
Peak Ramping	Category 2	3:00pm to 8:00pm (HE16-HE20)	All days

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Super-Peak Ramping	Category 3	3:00pm to 8:00pm (HE16-HE20)	Non-Holiday Weekdays*
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*Non-Holiday Weekdays are any day of the week from Monday through Friday that is not a FERC holiday

- **Note* DR is best suited to be a “Use-Limited – Super Peak Ramping resource” which requires:*
 - MOO:
 - Jan - April – 2:00 pm -7:00 pm
 - May - September – 3:00 pm – 8:00 pm
 - Non-holiday weekdays
 - Minimum 3 hours at our Effective Flexible Capacity (EFC)
 - At least one start per day
 - At least 5 dispatches per month during the 5 hour MOO window
 - Bid economically – PDR is not subject to local market power mitigation; therefore, highly priced bids will not be mitigated by ISO.