

## 27.7 Constrained Output Generators

### 27.7.1 Election Of Constrained Output Generator Status

A Scheduling Coordinator on behalf of a Generating Unit eligible for COG status must make an election to have the resource treated as a COG before each calendar year by registering the resource's PMin in the Master File as equal to its PMax less 0.01 MW ( $P_{Min} = P_{Max} - 0.01 \text{ MW}$ ) within the timing requirements specified for Master File changes described in the applicable Business Practice Manual. Generating Units with COG status will be eligible to set LMPs in the IFM and RTM based on their Calculated Energy Bids.

As with all Generating Units that are not Use-Limited Resources, a Scheduling Coordinator on behalf of a COG that is not a Use-Limited Resource must ~~use~~elect either the Proxy Cost ~~methodology~~option or the Registered Cost option, as provided in Section 30.4, for determining its Start-Up Costs and Minimum Load Costs. A Scheduling Coordinator on behalf of a COG that is a Use-Limited Resource must elect to use either the Proxy Cost methodology or the Registered Cost methodology, as provided in Section 30.4, for determining its Start-Up Costs and Minimum Load Costs.

A ~~COG's~~ Calculated Energy Bid of a COG that is not a Use-Limited Resource will be calculated based on the Proxy Cost methodology~~this election~~. A Calculated Energy Bid of a COG that is a Use-Limited Resource will be calculated based on its election of the Proxy Cost methodology or the Registered Cost methodology. Whenever a Scheduling Coordinator for a COG submits an Energy Bid into the IFM or RTM, the CAISO will override that Bid and substitute the Calculated Energy Bid if the submitted Bid is different from the Calculated Energy Bid.

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## 30.4 Proxy Cost and Registered Cost Methodologies Election For Start-Up Costs And Minimum Load Costs

Scheduling Coordinators for Generating Units and Resource-Specific System Resources that are not Use-Limited Resources will~~may be subject to elect on a thirty (30)-day basis either of the two options provided below~~ (the Proxy Cost ~~methodology~~option or the Registered Cost option) for ~~specifying~~their Start-Up Costs and Minimum Load Costs, ~~to be used for these resources in the CAISO Markets Processes.~~

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Scheduling Coordinators for Generating Units and Resource-Specific System Resources that are Use-Limited Resources may elect on a thirty (30) day basis to use either the Proxy Cost methodology or the Registered Cost methodology for specifying their Start-Up Costs and Minimum Load Costs to be used for those resources in the CAISO Markets Processes. The elections are independent; that is, a Scheduling Coordinator for a Use-Limited Resource electing to use either the Proxy Cost ~~methodologyoption~~ or ~~the~~ Registered Cost ~~methodologyoption~~ for Start-Up Costs may make a different election for Minimum Load Costs. If a Scheduling Coordinator has not made an election, the CAISO will assume the Proxy Cost ~~methodologyoption~~ as the default ~~option~~.

Scheduling Coordinators for Multi-Stage Generating Resources may also register with the CAISO their Transition Costs on a thirty (30)-day basis.

**30.4.1 Start-Up and Minimum Load Costs**

**30.4.1.1 Proxy Cost ~~MethodologyOption~~**

**30.4.1.1.1 Natural Gas-Fired Resources**

For each natural gas-fired resource, the Proxy Cost ~~methodologyoption~~ uses formulas for Start-Up Costs and Minimum Load Costs based on the resource's actual unit-specific performance parameters. The Start-Up Cost and Minimum Load Cost values utilized for each such resource in the CAISO Markets Processes will be either (a) or (b) below:

- (a) Formulaic natural gas cost values adjusted for fuel-cost variation on a daily basis using the natural gas price as calculated pursuant to Section 39.7.1.1.1.3.a Business Practice Manual,

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Start-Up Costs also include: (i) the cost of auxiliary power calculated using the unit-specific MWh quantity of auxiliary power used for Start-Up multiplied by a resource-specific electricity price; (ii) a greenhouse gas cost adder for each resource registered with the California Air Resources Board as having a

greenhouse gas compliance obligation, which is calculated for each Start-Up as the product of the resource's fuel requirement per Start-Up, the greenhouse gas emissions rate authorized by the California Air Resources Board, and the applicable Greenhouse Gas Allowance Price; (iii) the rates for the Market Services Charge and System Operations Charge multiplied by the shortest Start-Up Time listed for the resource in the Master File, multiplied by the PMin of the resource, multiplied by 0.5; and (iv) a resource-specific adder, if applicable, for major maintenance expenses (\$ per Start-Up) determined by the CAISO or Independent Entity selected by the CAISO to determine such major maintenance expenses.

Minimum Load Costs also include: (i) operation and maintenance costs as provided in Section 39.7.1.1.2; (ii) a greenhouse gas cost adder for each resource registered with the California Air Resources Board as having a greenhouse gas compliance obligation, which is calculated for each Start-Up as the product of the resource's fuel requirement at Minimum Load, the greenhouse gas emissions rate authorized by the California Air Resources Board, and the applicable Greenhouse Gas Allowance Price; (iii) the rates for the Market Services Charge and System Operations Charge multiplied by the PMin of the resource; (iv) the Bid Segment Fee; and (v) a resource-specific adder, if applicable, for major maintenance expenses (\$ per operating hour) determined pursuant to Section 30.4.1.1.4.

- (b) Values specified by Scheduling Coordinators pursuant to Sections 30.7.9 and 30.7.10.

In the event that the Scheduling Coordinator for a unit does not provide sufficient data for the CAISO to determine the unit's base Proxy Costs or one or more of the additional components of the unit's Proxy Costs, the CAISO will assume that the unit's base Start-Up Costs and Minimum

Load Costs, or the indeterminable additional component(s) of the unit's Start-Up Costs or Minimum Load Costs, are zero.

#### **30.4.1.1.2 Non-Natural Gas-Fired Resources**

For each non-natural gas-fired resource, Start-Up Cost and Minimum Load Cost values under the Proxy Cost methodologyoption shall be based on either (a) or (b) below:

- (a) The relevant cost information of the particular resource, including fuel or other energy input costs, which will be provided to the CAISO by the Scheduling Coordinator and maintained in the Master File.

Start-Up Costs will also include: (i) greenhouse gas allowance costs for each resource registered with the California Air Resources Board as having a greenhouse gas compliance obligation, as provided to the CAISO by the Scheduling Coordinator; (ii) the rates for the Market Services Charge and System Operations Charge multiplied by the shortest Start-Up Time listed for the resource in the Master File, multiplied by the PMin of the resource, multiplied by 0.5; and (iii) a resource-specific adder, if applicable, for major maintenance expenses (\$ per Start-Up) determined by the CAISO or Independent Entity selected by the CAISO to determine such major maintenance expenses.

Minimum Load Costs also include: (i) operation and maintenance costs as provided in Section 39.7.1.1.2; (ii) greenhouse gas allowance costs for each resource registered with the California Air Resources Board as having a greenhouse gas compliance obligation, as provided to the CAISO by the Scheduling Coordinator; (iii) the rates for the Market Services Charge and System Operations Charge multiplied by the PMin of the resource; (iv) the Bid Segment Fee; and (v) a resource-specific adder, if applicable, for major maintenance expenses (\$ per operating hour) determined by the CAISO or an Independent Entity selected by the CAISO.

For each resource registered with the California Air Resources Board as having a greenhouse gas compliance obligation, the information provided to the CAISO by the Scheduling Coordinator must be consistent with information submitted to the California Air Resources Board. Adders for major maintenance expenses will be determined pursuant to Section 30.4.1.1.4.

- (b) Values specified by Scheduling Coordinators pursuant to Sections 30.7.9 and 30.7.10.

In the event that the Scheduling Coordinator for a unit does not provide sufficient data for the CAISO to determine one or more components of the unit's Proxy Costs, the CAISO will assume that the indeterminable component(s) of the unit's Start-Up Costs or Minimum Load Costs are zero.

#### 30.4.1.1.3 Multi-Stage Generating Resources

~~If a Multi-Stage Generating Resource elects t~~The Proxy Cost methodology for calculating Start-Up Costs and Minimum Load Cost~~option, that election~~ will apply to all the MSG Configurations for a Multi-Stage Generating Resource that is not a Use-Limited Resource and for a Multi-Stage Generating Resource that is a Use-Limited Resource and elects to use the Proxy Cost methodology. The Proxy Cost values for Multi-Stage Generating Resources will be calculated for each specific MSG Configuration.

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#### 30.4.1.2 Registered Cost Methodology~~Option~~

- (a) Under the Registered Cost methodology~~option~~, the Scheduling Coordinator for a Use-Limited Resource may register values of its choosing for Start-Up Costs and/or Minimum Load Costs in the Master File subject to the maximum limit specified in Section 39.6.1.6. For a Use-Limited Resource to be eligible for the Registered Cost methodology~~option~~ there must be sufficient information in the Master File to calculate the value pursuant to the Proxy Cost methodology~~option~~ to be used to validate for the specific value registered using the Registered Cost methodology~~option~~-value. Any such values will be fixed for a

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minimum of 30 days in the Master File unless: (a) the resource's costs for any such value, as calculated pursuant to the Proxy Cost ~~methodologyoption~~, exceed the value registered using the Registered Cost ~~methodologyoption~~, in which case the Scheduling Coordinator may elect to switch to the Proxy Cost ~~methodologyoption~~ for the balance of any 30-day period, except as set forth in Section 30.4.1.2(b); or (b) any cost registered in the Master File exceeds the maximum limit specified in Section 39.6.1.6 after this minimum 30-day period, in which case the value will be lowered to the maximum limit specified in Section 39.6.1.6. If a Multi-Stage Generating Resource elects to use the Registered Cost ~~methodologyoption~~, that election will apply to all the MSG Configurations for that resource. The cap for the Registered Cost values for each MSG Configuration will be based on the Proxy Cost values calculated for each MSG Configuration, which are also subject to the maximum limit specified in Section 39.6.1.6.

(b) If the alternative natural gas price set forth in Section 39.7.1.1.3(b) is triggered, and a Use-Limited Resource's Start-Up Costs or Minimum Load Costs calculated pursuant to the Proxy Cost methodology using the alternative gas price exceeds the value registered in the Master File, then the CAISO will switch the Use-Limited Resource to the Proxy Cost methodology. Any Use-Limited Resource switched to the Proxy Cost methodology pursuant to this Section 30.4.1.2(b) will revert to the Registered Cost methodology as of the next day that the Use-Limited Resource's costs for the value registered in the Master File, as calculated pursuant to the Proxy Cost methodology, no longer exceed the value registered using the Registered Cost methodology. These determinations will be made separately for both Start-Up Costs and Minimum Load Costs.

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#### 30.5.2.4 Supply Bids for System Resources

In addition to the common elements listed in Section 30.5.2.1, Supply Bids for System Resources shall also contain: the relevant Ramp Rate; Start-Up Costs; and Minimum Load Costs.

Resource-Specific System Resources ~~are subject to may elect~~ the Proxy Cost ~~methodologyoption~~ or the Registered Cost ~~methodologyoption~~ for Start-Up Costs and Minimum Load Costs as

provided in Section 30.4, and Transaction ID as created by the CAISO. Other System Resources are not eligible to recover Start-Up Costs and Minimum Load Costs. Resource-Specific System Resources are eligible to participate in the Day-Ahead Market on an equivalent basis as Generating Units and are not obligated to participate in RUC or the RTM if the resource did not receive a Day-Ahead Schedule unless the resource is a Resource Adequacy Resource. If the Resource-Specific System Resource is a Resource Adequacy Resource, the Scheduling Coordinator for the resource is obligated to make it available to the CAISO Market as prescribed by Section 40.6. Dynamic Resource-Specific System Resources are also eligible to participate in the HASP and RTM on an equivalent basis as Generating Units. The quantity (in MWh) of Energy categorized as Interruptible Imports (non-firm imports) can only be submitted through Self-Schedules in the Day-Ahead Market and cannot be incrementally increased in the HASP or RTM. Bids submitted to the Day-Ahead Market for ELS Resources will be applicable for two days after they have been submitted and cannot be changed the day after they have been submitted.

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### **30.7.9 Format And Validation Of Start-Up Costs And Shut-Down Costs**

For a Generating Unit or a Resource-Specific System Resource, the submitted Start-Up Cost expressed in dollars (\$) as a function of down time expressed in minutes must be a staircase function with up to three (3) segments defined by a set of 1 to 4 down time and Start-Up Cost pairs. The Start-Up Cost is the cost incurred to start the resource if it is offline longer than the corresponding down time. The last segment will represent the cost to start the resource from cold Start-Up and will extend to infinity. The submitted Start-Up Cost function shall be validated as follows:

- (a) The first down time must be zero (0) min.
- (b) The down time entries must match exactly (in number, sequence, and value) the corresponding down time breakpoints of the Start-Up Cost function, as registered in the Master File for the relevant resource as either the Proxy Cost or Registered Cost.

- (c) The Start-Up Cost for each segment must not be negative and must be equal to the Start-Up Cost of the corresponding segment of the Start-Up Cost function, as registered in the Master File for the relevant resource. In addition, if the Proxy Cost ~~methodologyoption~~ pursuant to Section 30.4 applies to the resource, the Scheduling Coordinator for that resource may submit a daily Bid for the Start-Up Cost that must not be negative but may be less than or equal to one hundred twenty-five (125) percent of the Proxy Cost. For a resource that is eligible and has elected to use the Registered Cost ~~methodologyoption~~ pursuant to Section 30.4, if a value is submitted in a Bid for the Start-Up Cost, it will be overwritten by the Registered Cost reflected in the Master File. If no value for Start-Up Cost is submitted in a Bid, the CAISO will insert the Master File value, as either the Proxy Cost or Registered Cost based on the ~~methodologyoption~~ elected pursuant to Section 30.4.
- (d) The Start-Up Cost function must be strictly monotonically increasing, i.e., the Start-Up Cost must increase as down time increases.

The Start-Up cost for a Reliability Demand Response Resource shall be zero (0). For Participating Loads and Proxy Demand Resources, a single Shut-Down Cost in dollars (\$) is the cost incurred to Shut-Down the resource after receiving a Dispatch Instruction. The submitted Shut-Down Cost must not be negative. For Multi-Stage Generating Resources, the Scheduling Coordinator must provide Start-Up Costs for each MSG Configuration into which the resource can be started.

#### **30.7.10 Format And Validation Of Minimum Load Costs**

For a Generating Unit or a Resource-Specific System Resource, the submitted Minimum Load Cost expressed in dollars per hour (\$/hr) is the cost incurred for operating the unit at Minimum Load. The submitted Minimum Load Cost must not be negative. In addition, if the Proxy Cost ~~methodologyoption~~ pursuant to Section 30.4 applies to the resource, the Scheduling Coordinator for that resource may submit a daily Bid for the Minimum Load Cost that must not be negative but



may be less than or equal to one hundred twenty-five (125) percent of the Proxy Cost value. For a resource that is eligible and has elected to use the Registered Cost methodology option pursuant to Section 30.4, any submitted Minimum Load Cost must be equal to the Minimum Load Cost as registered in the Master File.

For Participating Loads, the submitted Minimum Load Cost (\$/hr) is the cost incurred while operating the resource at reduced consumption after receiving a Dispatch Instruction. The submitted Minimum Load Cost must not be negative.

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#### **31.6.1 Criteria For Temporary Waiver Of Timing Requirements**

The CAISO may at its sole discretion implement any temporary variation or waiver of the timing requirements of this Section 31 and Section 6.5.3 (including the omission of any step) if any of the following criteria are met:

- (i) such waiver or variation of timing requirements is reasonably necessary to preserve System Reliability, prevent an imminent or threatened System Emergency or to retain Operational Control over the CAISO Controlled Grid during an actual System Emergency.
- (ii) because of error or delay, the CAISO requires additional time to fulfill its responsibilities;
- (iii) problems with data or the processing of data cause a delay in receiving or issuing Bids or publishing information on the CAISO's secure communication system;
- (iv) problems with telecommunications or computing infrastructure cause a delay in receiving or issuing Day-Ahead Schedules or publishing information on the CAISO's secure communication system;
- (v) the alternative natural gas price set forth in Section 39.7.1.1.3(b) is triggered.

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#### **39.6.1.6 Maximum Start-Up Cost and Minimum Load Cost Registered Cost Values**

The maximum Start-Up Cost and Minimum Load Cost values registered in the Master File by Scheduling Coordinators for resources that [are eligible and elect to use](#) the Registered Cost ~~methodologyoption~~ in accordance with Section 30.4 will be limited to 150% of the Projected Proxy Cost. The Projected Proxy Cost [for natural gas-fired resources](#) will include a gas price component, a major maintenance expense component, [if available](#), a volumetric Grid Management Charge component, and, if eligible, a projected Greenhouse Gas Allowance Price component calculated as set forth in this Section 39.6.1.6. [The Projected Proxy Cost for non-natural gas-fired resources will be based on costs provided to the CAISO pursuant to Section 30.4.1.1.2, a major maintenance expense component, if available, a volumetric Grid Management Charge component, and, if eligible, a projected Greenhouse Gas Allowance Price component calculated as set forth in this Section 39.6.1.6.](#)

#### **39.6.1.6.1 Gas Price Component of Projected Proxy Cost**

For natural gas-fired resources, the CAISO will calculate a gas price to be used in establishing maximum Start-Up Costs and Minimum Load Costs after the twenty-first day of each month and post it on the CAISO Website by the end of each calendar month. The price will be applicable for Scheduling Coordinators [for natural gas-fired Use-Limited Resources](#) electing [to use](#) the Registered Cost ~~methodologyoption~~ until a new gas price is calculated and posted on the CAISO Website. The gas price will be calculated as follows:

- (1) Daily closing prices for monthly natural gas futures contracts at Henry Hub for the next calendar month are averaged over the first twenty-one (21) days of the month, resulting in a single average for the next calendar month.
- (2) Daily prices for futures contracts for basis swaps at identified California delivery points, are averaged over the first twenty-one (21) days of the month for the identified California delivery points as set forth in the Business Practice Manual.
- (3) For each of the California delivery points, the average Henry Hub and basis swap prices are combined and will be used as the baseline gas price applicable for calculating the caps for Start-Up and Minimum Load costs for [Use-Limited Resources](#) electing [to use](#) the Registered Cost ~~methodologyoption~~. The most

geographically appropriate will apply to a particular resource.

- (4) The applicable intra-state gas transportation charge as set forth in the Business Practice Manual will be added to the baseline gas price for each Use-Limited Resource that elects to use the Registered Cost methodologyoption to create a final gas price for calculating the caps for Start-Up and Minimum Load Costs for each such resource.

For non-natural gas-fired resources, the Projected Proxy Costs for Start-Up Costs and Minimum Load Costs will be calculated using the information contained in the Master File used for calculating the Proxy Cost, as set forth in the Business Practice Manual.

#### **39.6.1.6.2 Projected Greenhouse Gas Allowance Price**

For resources that are registered with the California Air Resources Board as having a greenhouse gas compliance obligation, the CAISO will calculate a projected Greenhouse Gas Allowance Price component to be used in establishing maximum Start-Up Costs and Minimum Load Costs after the twenty-first day of each month and will post it on the CAISO Website by the end of that month. The projected Greenhouse Gas Allowance Price component will be applicable for Scheduling Coordinators on behalf of eligible Use-Limited Resources electing to use the Registered Cost methodologyoption until a new projected Greenhouse Gas Allowance Price component is calculated and posted on the CAISO Website. The projected Greenhouse Gas Allowance Price component will be calculated by averaging the applicable daily Greenhouse Gas Allowance Prices calculated over the first twenty (20) days of the month using the methodology set forth in Section 39.7.1.1.1.4.

#### **39.6.1.6.3 Major Maintenance Expense Component**

The major maintenance expense component is determined based on the process set forth in Section 30.4.1.1.4.

#### **39.6.1.6.4 Volumetric Grid Management Charge Component**

The volumetric Grid Management Charge component is set forth in Sections 39.7.1.1.1.1 and 39.7.1.1.1.2.

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**39.7.1.1.1.3 Calculation of Natural Gas Price**

(a) ~~Except as set forth in Section 39.7.1.1.1.3(b) To calculate the natural gas price, the~~ CAISO will use different gas price indices for the Day-Ahead Market and the Real-Time Market and ~~each~~ gas price index will be calculated using at least two prices from two or more of the following publications: Natural Gas Intelligence, SNL Energy/BTU's Daily Gas Wire, Platt's Gas Daily, and the Intercontinental Exchange. If a gas price index is unavailable for any reason, the CAISO will use the most recent available gas price index. For the Day-Ahead Market, the CAISO will update the gas price ~~indices~~ between 19:00 and 22:00 Pacific Time using natural gas prices published on the day that is two (2) days prior to the applicable Trading Day, unless gas prices are not published on that day, in which case the CAISO will use the most recently published prices that are available. For the Real-Time Market, the CAISO will update gas price indices between the hours of 19:00 and 22:00 Pacific Time using natural gas prices published one (1) day prior to the applicable Trading Day, unless gas prices are not published on that day, in which case the CAISO will use the most recently published prices that are available.

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(b) ~~If a daily gas price reported by the Intercontinental Exchange on the morning of the Day-Ahead Market run exceeds one hundred twenty-five (125) percent of any natural gas price index calculated for the Day-Ahead Market between 19:00 and 22:00 Pacific Time on the preceding day, the CAISO will utilize the gas price reported by the Intercontinental Exchange in all CAISO cost formulas and market processes for that day's Day Ahead Market that would normally utilize the natural gas price index calculated pursuant to this Section 39.7.1.1.1.3.~~

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**Appendix A**

**Master Definition Supplement**

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**- Projected Proxy Cost**

A calculation of a resource's Start-Up Costs and Minimum Load Costs for a prospective period

used to determine the maximum Registered Cost for the resource, {as set forth in Section 39.6.1.6 for a 30-day period ~~pursuant to as set forth in~~ Section 30.4.}

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**- Proxy Cost**

The cost basis of a generating resource for which the operating cost is calculated as an approximation of the actual operating cost pursuant to Section 30.4.1.(1).

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**- Registered Cost**

The cost basis of a generating resource for which the operating cost is determined from registered values pursuant to Section 30.4.1.(2).