Attachment G

MAXIMUM START-UP AND MINIMUM LOAD VALUES UNDER THE REGISTERED AND PROXY COST OPTIONS

G   Registered and Proxy Cost Options

This attachment explains how Start-up and Minimum Load Costs are calculated under the Registered and Proxy Cost options and the maximum allowable values for each. Only ~~new~~ resources with fewer than 12 months of LMP data and approved use-limitations on register in the Master File Use Limit Plan Data Template ~~ed capacity~~ are eligible to ~~may~~ select the Registered Cost Option for up to 14 months after the resource is established in the market, pursuant to tariff section 30.4.1.2~~. The CAISO will make available an alternative to electing the Registered Cost Option for these resources.~~Once the CAISO has 12 months of LMP date, the CASIO will utilize a two month period to calculate the opportunity cost. If the CAISO can identify a comparable PNode or APNode to the new resource's node to use to determine forecasted prices needed in the calculation of opportunity costs, the C~~a~~AISO will offer an alternative transitional solution to the Scheduling Coordinator where the resource can elect the Proxy Cost option with an opportunity cost. The Scheduling Coordinator must elect the option it prefers through its Generator Resource Data Template. See Attachment N of the Market Instruments BPM for details on the methodology for establishing opportunity costs for ~~new~~ use-limited resources eligible for opportunity cost ~~adders~~ pursuant to tariff section 30.4.1.1.6.1.2. See Attachment H of the Market Instruments BPM for Transition Cost calculations for multi-stage generating resources.

In case market-based rate authority is suspended, the Scheduling Coordinator responsible for submitting the resource's Minimum Load and Start-Up Costs subject to Appendix II of the tariff will not be entitled to select the Registered Cost option available under Section 30.4.1.2 and can only select the Proxy Cost option as specified in Section 30.4.1.1 of the CAISO Tariff for their Minimum Load and Start-Up Costs. If the resource lacks a Start-Up or Minimum Load Cost in any market intervals, the CAISO will insert the Start-Up or Minimum Load Costs calculated based on the Proxy Cost option.

G.1   Registered Cost Option

Units selecting the Registered Cost Option in the Master File must also submit values for Start-up and Minimum Load Costs in the Master File, as described in Attachment B. Multi-Stage Generating units selecting the Register Cost Option in the Master File must also submit values for Transition Costs in the Master File, as described in Attachment B.

Before approving Start-up and Minimum Load Cost values submitted under the Registered Cost Option, the Master File analyst will review the values to determine if they are within the allowable levels.

- Start-Up, Minimum Load, and Transition Costs[1] under the Registered Cost Option may not exceed 150 percent of the unit's Projected Proxy Cost for Start-Up, Minimum Load, and Transition Costs.

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[1] See Attachment H for transition cost calculations.

The registered Start-up, Minimum Load, and Transition Cost values for units selecting the Registered Cost Option may not be modified for a period of 30 days after becoming effective. However, the SC may switch to the Proxy Cost Option during this period if fuel costs increase such that the unit's actual Start-up and Minimum Load Costs, as calculated under the Proxy Cost Option, exceed the unit's registered value under the Registered Cost Option in the Master File. Unit's switching from the Registered Cost Option to the Proxy Cost Option during this 30 day period must remain on the Proxy Cost Option for the remainder of this 30 day period. Transition Costs will not be evaluated for switching. However, if the Start-up Cost is switched from Registered to Proxy Cost, then the Transition Costs will also be switched from Registered to Proxy Cost at the same time.

If the Start-up, Minimum Load, or Transition costs exceed the maximum limit after the 30 day period expires, the costs will be lowered to the maximum limit currently in effect, as outlined in the following section.

Monthly Validation of Registered Costs

On a monthly basis, the CAISO will review the Master File Start-up, Minimum Load, and Transition Cost values for units that had selected the Registered Cost Option to identify resources that have registered cost values over the allowable cap.

- Within 3 business days following the first day of the month, CAISO will review the existing registered cost values that were in effect on the first of the month and identify those resources that have registered cost values over the allowable cap.
  NOTE: Resources that had a change to minimum load or startup costs within the previous 30 days will be excluded from this review.

- Within 5 business days following the first day of the month, CAISO will communicate a list of the affected resources to the Scheduling Coordinator (SC) requesting that registered cost values be revised to comply with the new limits.

- The SC will have until the 8th business day of the month to submit a valid revised RDT, with an effective date no later than the 15th business day of the month.

- If the SC has not submitted a valid revised RDT by the 8th business day of the month, the Master File analyst will apply the new registered cost cap using an effective date of the 15th business day of the month.

CAISO Validation of SC-requested Change to Registered Costs

A SC may submit a GRDT to change the Start-up, Minimum Load, and Transition Cost values for a resource where these values have not been modified within the previous 30 days.

- The SC submits a GRDT with change(s) to Start-up, Minimum Load, and/or Transition Costs.

- CAISO validates that the requested effective date is no greater than 15 business days from the date of submittal.

- CAISO validates that the costs do not exceed the applicable limit based on the gas price that was posted on the day the SC submitted their request.

- If the requested cost values exceed the cap, CAISO will decline the request.

- If the requested costs are within the applicable limit, and no other validation errors occur, the change will be approved and the affected resource will be excluded from the following monthly validation of registered costs.

Automatic Switching of Cost Basis from Registered to Proxy

As of beginning of the 14 month after a new use-limited resource with approved use-limitations on register in the Master File Use Limit Plan Data Template is established in the market, the resource is no longer eligible to select Registered Cost and must move to the Proxy Cost methodology. The CAISO will automatically switch the cost basis of such a resource to Proxy Cost methodology in the Master File at the end of the 14 month after the date the resource was established in the market.

G.1.1 Natural Gas Units

G.1.1.1 Maximum Registered Start-up Costs

The maximum Start-up costs that may be approved for gas-fired units under the Registered Cost Option are based on the resource's actual unit-specific performance parameters in the Master File. The projected Start-up costs will be calculated by combining the unit's Startup fuel curve and the projected gas price index, and the cost of any auxiliary power needed for start-up (as indicated in the STARTUP_ENERGY field in the Master File) will be calculated by multiplying the MWh energy input with the Electricity Price Index[2] the electrical energy consumption curve and the resource-specific electricity price, plus a Grid Management Charge (GMC) adder representing the Market Services Charge and System Operations Charge components. If the resource is subject to a greenhouse gas compliance obligation (as indicated by a 'Y' in the GHG_COMPLIANCE_OBLIG field in Master File), the CAISO will add to the projected Start-up costs the greenhouse gas allowance start-up cost. The cost will be calculated per Attachment K,

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[2] See Attachment M of the Market Instruments BPM for details.

using the projected Greenhouse Gas Allowance Price described in section G.3. In addition, if the resource has established a major maintenance adder with the CAISO or its designated agent, the CAISO or its designated agent will add a major maintenance cost adder (MMA). See Attachment L for details.

For purposes of this calculation, the cost of any auxiliary power needed for start-up (as indicated in the STARTUP_ENERGY field in the Master File) will be calculated by multiplying the MWh energy input with the Electricity Price Index. See Attachment M for details

Example: Registered Start-up Cost Calculation and Bid Cap for Gas-Fired Resource

An example of this calculation based on a gas price of $8.50/MMBtu is provided in the following table.

For purposes of the GMC adder, assume a PMin of 20 MW, a Start-Up Time Period of 600 minutes, and a GMC adder of $0.50/MWh (made up of a $0.15/MWh Market Services Charge and a $0.35/MWh System Operations Charge). Note that the fastest Start-Up Time Period registered in the Master File is used in this calculation, regardless of segment. In other words, even for warm starts or cold starts, the fastest start-up time will be used. For MSG resources this applies to the configuration, *i.e.*, use the fastest time period registered for the segment, not the entire resource.

Start-Up Cost = (Start-Up Fuel x Gas Price) + (Start-Up Energy x Electricity Price) + (PMin x Start-Up Time Period in min / 60 min/hour x GMC adder / 2)

Gas Price = 8.50/MMBtu
Gas Price Multiplier = 10

Electricity Price $_{Wholesale}$ = Gas Price x Gas Price Multiplier
Electricity Price $_{Retail}$ = Electricity Price

Example of start-up cost calculation using a wholesale EPI (first Start-Up segment):
Start-Up Cost = (1,083 MMBtu x $8.50/MMBtu) + (20MWh x $8.50 MMBtu x 10) + (20 MW x (600 minutes/(60 minutes/hour)) x $0.50/MWh / 2)
= (9,205.5) + (1,700) + (50)
= 10,955.50
= 10,956 (rounded)

Start-Up Costs including a GHG Compliance Obligation:

Start-Up Cost = (Start-Up Fuel x Gas Price) + (Start-Up Energy x Electricity Price) + (PMin x Start-Up Time Period in min / 60 min/hour x GMC adder / 2) + (Start-Up Fuel x GHG Emission Rate x GHG Allowance Price)

GHG Allowance Price = $15.34/mtCO$_2$e
GHG Emission Rate = 0.053165 mtCO$_2$e /MMBtu

Example of start-up:
Start-Up Cost = (1,083 MMBtu x $8.50/MMBtu) + (20MWh x $8.50 MMBtu x 10) + (20 MW x (600 minutes / (60minutes/hour)) x $0.50/MWh / 2) + (1,083 MMBtu x 0.053165 mtCO$_2$e /MMBtu x $15.34)
$$= (9,205.5) + (1,700) + (50) + (883.24)$$
$$= 11,838.74$$
$$= 11,839 \text{ (rounded)}$$

Start-Up Costs including a major maintenance cost adder:

The major maintenance cost adder is a single line item that is added to the Start-Up Cost. Continuing the example above:

Assume major maintenance cost adder calculated by the CAISO is $800.98 (same value applied to all segments).
Start-Up Cost = $11,838.74 + major maintenance cost adder
$$= \$11,838.74 + 800.98$$
$$= \$12,639.72$$
$$= \$12,640 \text{ (rounded)}$$

Table G1. Example of Projected Start-up Cost and Maximum Registered Cost Bid Calculation (Gas Price = $8.50/MMBtu)

	Cooling Time (minutes)	Start-Up Time (minutes)	Start-Up Fuel (MMBtu)	Start-Up Energy (MWh)	Start-Up Cost w/o GHG/MMA ($)	Start-Up Cost with GHG & MMA ($)	Max Start-Up Bid w/o GHG/MMA ($)	Max Start-Up Bid with GHG & MMA ($)
Hot	0	600	1,083	20	$10,956	$12,640	$16,433	$18,960
Warm	240	1390	1,633	40	$17,396	$19,529	$26,059	$29,294
Cold	480	1400	2,000	60	$22,217	$24,649	$33,325	$36,973

G.1.1.2 Maximum Registered ~~Cost~~ Minimum Load Costs

For purposes of determining maximum Minimum Load Cost that may be approved for gas-fired units under the Registered Cost Option, the projected Minimum Load Cost will be calculated using the unit's Minimum Load Heat Rate and the projected gas price calculated as described in Section G.1.2, Operation and Maintenance (O&M) adder consistent with Exhibit 4-2 unless a custom O&M adder is negotiated with the CAISO, plus a GMC adder made up of the Market Services Charge and System Operations Charge components and a third value representing the Bid Segment Fee component divided by the resource Pmin. If the resource is subject to a greenhouse gas compliance obligation (as indicated by a 'Y' in the GHG_COMPLIANCE_OBLIG field in Master File for resources within the CAISO Control Area), the CAISO will add to the projected Minimum Load Cost the Greenhouse gas allowance minimum load cost. The cost will be calculated per Attachment K, using the projected Greenhouse Gas Allowance Price described in section G.1.3. In addition, if the resource has a major maintenance adder approved by the CAISO, the CAISO will add a major maintenance cost adder (MMA). See Attachment L for details.

The Minimum Load Cost for a unit cannot exceed the applicable limit of 150% of the unit's Projected Proxy Cost for Minimum Load Costs. The calculation and an example are provided here.

Projected Minimum Load Cost = (Unit Conversion Factor x Minimum Load Heat Rate x Minimum Operating Level x Gas Price) + (O&M x Minimum Operating Level) + (GMC adder x Minimum Operating Level)

Example:
Gas Price = 8.50/MMBtu
O&M adder = $4/MWh
GMC adder = $0.50/MWh

> **Minimum Load Cost =** (0.001 x 14,000Btu/kWh x 20MW x $8.50/MMBtu) + ($4/MWh[3] x 20MW) + ($0.50/MWh x 20MW)
>
> = ($2,380) + ($80) + ($10)
>
> = $2,470

Minimum Load Cost with a GHG component = (Unit Conversion Factor x Minimum Load Heat Rate x Minimum Operating Level x Gas Price) + (O&M x Minimum Operating Level) + (GMC adder x Minimum Operating Level) + (Minimum Operating Level x Unit Conversion Factor x Minimum Load Heat Rate x Emission Rate x GHG Allowance Price)

Example:
Emission Rate = 0.053165 $mtCO_2e$ /MMBtu
GHG Allowance Price = $15.34/$mtCO_2e$

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[3] This example assumes a $4/MWh O&M adder.

= (0.001 x 14,000Btu/kWh x 20MW x $8.50/MMBtu) + ($4/MWh * 20MW) + ($0.50/MWh x 20MW) + (20MW x 0.001 x 14,000Btu/kWh x 0.053165 mtCO2/MMBtu x 15.34)
= ($2,380) + ($80) + (10) + ($228)
= $2,698

Minimum Load Costs including a major maintenance cost adder:

The major maintenance cost adder is a single line item that is added to the Minimum Load cost. Continuing the example above:

Assume major maintenance cost adder calculated by the CAISO is $105.19.
> Minimum Load Cost = $2,695 + major maintenance cost adder
> = $2,698 + 105
> = $2,803

Table G2. Example of Projected Minimum Load Bid and Maximum Bid Calculation
Gas Price = $8.50/MMBtu

Minimum Operating Level (MW)	Heat Rate (MBtu/ MWh)	O&M Cost ($/MWh)	Minimum Load Cost ($)	GHG Allowance Cost & MMA ($/MWh)	Minimum Load Cost with GHG & MMA ($)	Max MLC Bid w/o GHG/MMA ($)	Max MLC Bid with GHG & MMA ($)
20	14,000	4	$2,470	$333	$2,803	$3,705	$4,205

G.1.2   Gas Price Used in Start-up and Minimum Load Cost Caps

After the twenty-first day of each month, the CAISO will calculate a gas price to be used in calculating maximum Start-up and Minimum Load costs that may be registered by gas units under the Registered Cost Option. The resulting gas price will be posted on the CAISO website by the end of each calendar month. The price will be applicable for any unit submitting or revising a Start-up and Minimum Load value under the Registered Cost Option for the following month until a new gas price is calculated and posted on the CAISO website. The gas price will be calculated as follows.

First, daily closing prices for monthly natural gas futures contracts at Henry Hub for the next month are averaged over the first twenty-one days of the month, resulting in a single average for the next calendar month.   Closing prices for only the first twenty-one days of the month are used in order to allow at least one week for the calculations to be completed and posted on the CAISO website by the end of each month. The purpose of averaging daily closing prices over

this twenty-one day period is to avoid unusually high or low values that may result from taking prices on only one day.

Second, the average monthly price for futures contracts for basis swaps at the ~~trading hub~~ associated with the resource-specific fuel region registered in Master File[4]~~PG&E CityGate natural gas delivery point and futures contracts for basis swaps at the SoCal CityGate natural gas delivery point in California~~ are calculated, using data for the first 21 trade dates in the month.

Consistent with the approach used by the CAISO ~~or its designated agent~~ to calculate the GPI for daily spot market prices used to calculate DEBs and commitment cost bids under the Proxy Cost option, ~~the SoCal CityGate~~average monthly price for futures are ultimately used for units based on the natural gas trading hub defined in the fuel region associated with the resource in Master File. ~~prices are ultimately used for units in the SCE and SDG&E areas, while the PG&E Citygate prices are used for units in the PG&E area.~~

The next step is to combine the average Henry Hub price and the average basis swap price for each of ~~these~~ the ~~two~~ natural gas trading hub delivery points for each month.

Consistent with the approach used by the CAISO ~~or its designated agent~~ to calculate the GPI for daily spot market prices, the final step is to add the appropriate intra-state transport ~~price~~rate~~. For units, t~~The CAISO uses the applicable transportation rate to reflect the delivered price of gas based on the transport rate components defined for the resource-specific fuel region registered in Master File.

~~For units in the SCE and SDG&E areas, the CAISO or its designated agent uses the applicable gas transportation rate from the Southern California Gas Company.[5]~~

~~For units in the PG&E area, the CAISO or its designated agent uses rates from PG&E's Gas Schedule G-EG for Gas Transportation Service to Electric Generation.[6]~~

The source of gas price data used in this calculation will be the commodity price indices from SNL Energy/BTU's Daily Gas Wire, Platt's Gas Daily, or Natural Gas Intelligence Daily publications, or, if necessary, another available source of closing prices for natural gas futures contracts for each trade date.

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[4] See Attachment C of Market Instruments BPM for a link to existing list of fuel regions.

[5] ~~http://www.socalgas.com/regulatory/tariffs/tm2/pdf/GT-F.pdf.~~

[6] ~~http://www.pge.com/tariffs/tm2/pdf/GAS_SCHEDS_G-EG.pdf~~

G.1.3 Greenhouse Gas Allowance Price Used in Start-up and Minimum Load Cost Caps

After the twenty-first day of each month, the CAISO will calculate a projected Greenhouse Gas Allowance Price to be used in calculating maximum Start-up and Minimum Load costs for resources within the CAISO Control Area that may be registered by gas units under the Registered Cost Option. The resulting projected Greenhouse Gas Allowance Price will be posted on the CAISO website by the end of each calendar month. The price will be applicable for any unit submitting or revising a Start-up and Minimum Load value under the Registered Cost Option for the following month until a new projected Greenhouse Gas Allowance Price is calculated and posted on the CAISO website.

The projected Greenhouse Gas Allowance Price will be calculated by averaging the daily Greenhouse Gas Allowance Prices from the first twenty days of the month, resulting in a single average for the next calendar month. Closing prices for only the first twenty days of the month are used in order to allow at least one week for the calculations to be completed and posted on the CAISO website by the end of each month. Per the price principles established in Attachment K, the Daily Greenhouse Gas Allowance price is set at the last valid daily price based on two sources if a given day does not have two sources. A Daily Greenhouse Gas Allowance price set using the last valid daily price based on two sources is included in the calculation of the projected Greenhouse Gas Allowance Price. The purpose of averaging daily closing prices over this twenty day period is to avoid unusually high or low values that may result from taking prices on only one day.

G.1.4 Non-Gas Units

For non-gas units, maximum Start-up and Minimum Load values under the Registered Cost Option will be based on Start-up and Minimum Load fuel or fuel equivalent cost information submitted and validated by the CAISO for each unit under the requirements for the Proxy Cost Option. The CAISO will add to the fuel or fuel equivalent costs in Master File, plus a GMC adder representing the Market Services Charge and System Operations Charge components and a third value representing the Bid Segment Fee component divided by the bid segment MW size, greenhouse gas allowance costs if applicable, and major maintenance costs if applicable. The GMC adder is calculated the same as for gas-fired units as explained above. Start-Up and Minimum Load Costs under the Registered Cost Option may not exceed 150 percent of the unit's validated Start-Up and Minimum Load Costs under the Proxy Cost Option.

For non-natural gas-fired resources subject to a greenhouse gas compliance obligation (as indicated by a 'Y' in the 'GHG_COMPLIANCE_OBLIG field in Master File for resources within the CAISO Control Area), the SC CAISO shall should include the greenhouse gas allowance cost in the Start-up and Minimum Load cost values submitted under the Registered Cost Option.

The CAISO shall include major maintenance costs for non-natural gas-fired resources that have established a major maintenance adder. See Attachment L for details.

As part of the process of validating Start-Up and Minimum Load Costs submitted under the Proxy cost Option, the CAISO may request additional information from the Scheduling Coordinator.

G.2   Proxy Cost Option

Scheduling Coordinators with resources subject to the Proxy Cost Option must also submit Master File values for the parameters used in Proxy Start-Uup Costs and Proxy Minimum Load Cost in the Master File, as described in Attachment B. Multi-stage generating resources must also submit Resource Data Template values for the parameters used in proxy Transition Costs in the Master File, as described in Attachment B.

G.2.1   Natural Gas Units

G.2.1.1 Maximum Proxy Cost Start-up Costs

For purposes of determining maximum Start-up costs[7] that may be approved for gas-fired units under the Proxy Cost Option, the calculated Start-up costs will be calculated by combining the unit's Startup fuel and electrical energy consumption curves in the Master File, the daily Gas Price Index plus applicable transportation rates calculated as described in Attachment C and the electricity price index as described in attachment M, plus a Grid Management Charge (GMC) adder representing the Market Services Charge and System Operations Charge components. If the resource is subject to a greenhouse gas compliance obligation (as indicated by a 'Y' in the GHG_COMPLIANCE_OBLIG field in Master File for resources within the CAISO Control Area), the CAISO will add to the calculated Start-up costs the greenhouse gas allowance start-up cost. The cost will be calculated per Attachment K, using the Greenhouse Gas Allowance Price described in Attachment K.   In addition, if the resource has major maintenance expenses approved by the CAISO, the CAISO will add a major maintenance cost adder (MMA).   See Attachment L for details.

For purposes of this calculation, the cost of any auxiliary power needed for start-up (as indicated in the STARTUP_ENERGY field in the Master File) will be calculated multiplying the MWh energy input with the Electricity Price Index. See Attachment M for details.

A Scheduling Coordinator may bid Start-up Costs daily in either DAM or RTM. However, RTM submissions will not be used for the RTM trade hour if the resources was received a financially

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[7] Multi-stage generating resources have both start-up and indicative start-up costs, as described in greater detail in Attachment H. This section refers to both generically as start-up costs.

binding integrated forward market award or a binding residual unit commitment start-up instruction committed in the DAM,; instead, the DAM Daily Components will be copied to the RTM bid. The Start-up Cost bid for a unit cannot exceed the applicable limit of 125 percent of the unit's calculated Proxy Cost for Start-up Costs plus a Start-Up Opportunity Cost adder if applicable.

For multi-stage generating resources, a Scheduling Coordinator may bid Transition Costs daily.[8] The Transition Cost bid for a unit cannot exceed the applicable limit of 125 percent of the unit's calculated Proxy Cost for Transition Costs plus a transition opportunity cost adder if applicable. If the Scheduling Coordinator does not bid, the CAISO will generate daily bids based on the calculated Proxy Costs plus any applicable Start-Up Opportunity Cost.

Example: Proxy Start-Up Cost Calculation and Bid Cap for Gas-Fired Resource

An example of this calculation based on a natural gas price index of $8.50/MMBtu is provided in the following table.

For purposes of the GMC adder, assume a PMin of 20 MW, a Start-Up Time Period of 600 minutes, and a GMC adder of $0.50/MWh (made up of a $0.15/MWh Market Services Charge and a $0.35/MWh System Operations Charge). Note that the fastest Start-Up Time Period registered in the Master File is used in this calculation, regardless of segment. In other words, even for warm starts or cold starts, the fastest start-up time will be used. For MSG resources this applies to each configuration. That is, the fastest time period registered for the segment, not the entire resource, will be used.

Proxy Start-Up Cost = (Start-Up Fuel x Gas Price) + (Start-Up Energy x Electricity Price Index) + (PMin x Start-Up Time Period in min / 60 min/hour x GMC adder / 2)

Gas price index = 8.50/MMBtu

Example of Proxy Start-Up Cost calculation (first Start-Up segment):
Proxy Start-Up Cost = (1,083 MMBtu x $8.50/MMBtu) + (20MWh x $80/MWh) + (20 MW x (600 minutes/(60 minutes/hour)) x $0.50/MWh / 2)
$$= (9,205.5) + (1,600) + (50)$$
$$= 10,855.50$$
$$= 10,856 \text{ (rounded)}$$

Proxy Start-Up Costs including a GHG Compliance Obligation:

Proxy Start-Up Cost = (Start-Up Fuel x Gas Price) + (Start-Up Energy x Electricity Price Index) + (PMin x Start-Up Time Period in min / 60 min/hour x GMC adder / 2) + (Start-Up Fuel x GHG Emission Rate x GHG Allowance Price)

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[8] See Attachment H for transition cost calculations.

GHG Allowance Price = $15.34/mtCO$_2$e
GHG Emission Rate = 0.053165 mtCO$_2$e /MMBtu

Example of proxy Sstart-uUp Cost:
Proxy Start-Up Cost = (1,083 MMBtu x $8.50/MMBtu) + (20MWh x $80/MWh) + (20 MW x (600 minutes / (60minutes/hour)) x $0.50/MWh / 2) + (1083 MMBtu x 0.053165 mtCO$_2$e /MMBtu x $15.34)

    = (9,205.5) + (1,600) + (50) + (883.24)
    = 11,738.74
    = 11,739 (rounded)

Proxy Start-Up Costs including a GHG Compliance Obligation and a major maintenance cost adder:

The major maintenance cost adder is a single line item that is added to the proxy Start-Up Cost. Continuing the example above:

Assume major maintenance cost adder approved by the CAISO is $800.98 (same value applied to all segments).
Proxy Start-Up Cost = $11,738.74 + major maintenance cost adder

    = $11,738.74 + 800.98
    = $12,539.72
    = $12,540 (rounded)

Table G3. Example of ~~Calculated~~ Proxy Start-up Cost and ~~Maximum Proxy~~Start-up Cost Bid CapCalculation
(Gas Price = $8.50/MMBtu, EPI = $80/MWh, Headroom Scalar = 125%, Start-up Opportunity Cost = $2,000/start)

	Cooling Time (minutes)	Start-Up Time (minutes)	Start-Up Fuel (MMBtu)	Start-Up Energy (MWh)	Proxy Start-Up Cost w/o GHG/MMA ($)	Proxy Start-Up Cost with GHG & MMA ($)	~~Max~~ Start-Up Bid Cap w~~ith/~~ Headroom Scalar ~~w/o GHG/MMA~~ ($)	~~Max~~ Start-Up Bid Cap with Headroom Scalar and ~~GHG & MMA~~Opportunity Cost ($)
Hot	0	600	1,083	20	$10,856	$12,540	$~~13,569~~15,675	$1~~7~~5,675
Warm	240	1390	1,633	40	$17,196	$19,329	$~~21,495~~24,161	$~~24,161~~26,161
Cold	480	1400	2,000	60	$21,917	$24,349	$~~27,396~~30,436	$~~30,436~~32,436

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G.2.1.2 Maximum Proxy Cost Minimum Load Costs

For purposes of determining maximum Minimum Load Cost that may be calculated for gas-fired units under the Proxy Cost Option, the calculated Minimum Load Cost will be calculated using the unit's Minimum Load Heat Rate and the daily Gas Price Index plus applicable transportation rates calculated as described in Attachment C, plus a GMC adder made up of the Market Services Charge and System Operations Charge components and a third value representing the Bid Segment Fee component divided by the resource Pmin. If the resource is subject to a greenhouse gas compliance obligation (as indicated by a 'Y' in the GHG_COMPLIANCE_OBLIG field in Master File for resources within the CAISO Control Area), the CAISO will add to the calculated Minimum Load Cost the Greenhouse gas allowance minimum load cost. The cost will be calculated using the Greenhouse Gas Allowance Price described in Attachment K. In addition, if the resource has minimum load major maintenance adder approved by the CAISO, the CAISO will add a major maintenance cost adder (MMA). See Attachment L for details.

A Scheduling Coordinator may submit daily bids for Minimum Load Costs ~~daily~~ in either DAM or RTM. However,~~,~~ RTM submissions will not be used for the RTM trade hour if the resource ~~s was~~ received a financially binding integrated forward market award or a binding residual unit commitment start-up instruction ~~committed~~ in the DAM, instead the DAM Daily Components will be copied to the RTM bid. The Minimum Load Cost bid for the unit cannot exceed the cap of 125 percent of the unit's calculated Proxy Cost for Minimum Load Costs plus a Minimum Load Opportunity Cost ~~adder~~ if applicable. If the Scheduling Coordinator does not bid, the CAISO will generate daily bids based on the calculated Proxy Costs plus any applicable Minimum Load Opportunity Cost. The calculation and an example are provided below.

Example: Proxy Minimum Load Cost Calculation and Bid Cap for Gas-Fired Resource

Proxy Minimum Load Cost ~~Cap~~ = (Unit Conversion Factor x Minimum Load Heat Rate x Minimum Operating Level x Gas Price) + (O&M x Minimum Operating Level) + (GMC adder x Minimum Operating Level)

Example:
Gas price index = 8.50/MMBtu
O&M adder = $4/MWh
GMC adder = $0.50/MWh

Proxy Minimum Load Cost = (0.001 x 14,000Btu/kWh x 20MW x $8.50/MMBtu) + ($4/MWh[9] x 20MW) + ($0.50/MWh x 20MW)

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[9] This example assumes a $4/MWh O&M adder.

= ($2,380) + ($80) + ($10)

= $2,470

Proxy Minimum Load Cost with a GHG component = (Unit Conversion Factor x Minimum Load Heat Rate x Minimum Operating Level x Gas Price) + (O&M x Minimum Operating Level) + (GMC adder x Minimum Operating Level) + (Minimum Operating Level x Unit Conversion Factor x Minimum Load Heat Rate x Emission Rate x GHG Allowance Price)

Example:
Emission Rate = 0.053165 mtCO$_2$e /MMBtu
GHG Allowance Price = $15.34/mtCO$_2$e

= (0.001 x 14,000Btu/kWh x 20MW x $8.50/MMBtu) + ($4/MWh * 20MW) + ($0.50/MWh x 20MW) + (20MW x 0.001 x 14,000Btu/kWh x 0.053165 mtCO2/MMBtu x 15.34)

= ($2,380) + ($80) + ($10) + ($228)

= $2,698

Proxy Minimum Load Costs including a major maintenance cost adder:

The major maintenance cost adder is a single line item that is added to the Minimum Load cost. Continuing the example above:

Assume major maintenance cost adder approved by the CAISO is $105.19.

Proxy Minimum Load Cost = $2,695 + major maintenance cost adder

= $2,698 + 105

= $2,803

Table G4. Example of ~~Calculated~~ **Proxy Minimum Load Cost and Minimum Load** ~~Maximum~~ **Bid** ~~Calculation~~**Cap**

(Gas Price Index = $8.50/MMBtu, Headroom Scalar = 125%, Minimum Load Opportunity Cost = $500/run-hour)

Minimum Operating Level (MW)	Heat Rate (MBtu/ MWh)	O&M Cost ($/MWh)	Minimum Load Cost ($)	GHG Allowance Cost & MMA ($/MWh)	Proxy Minimum Load Cost with GHG & MMA ($)	~~Max~~ Minimum Load~~LC~~ Bid Cap with~~/~~ Headroom Scalar ~~w/o GHG/MMA~~ ($)	~~Max MLC~~Minimum Load Bid Cap w~~ith/~~ Headroom Scalar and Opportunity Cost~~with GHG & MMA~~ ($)

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20	14,000	4	$2,470	$333	$2,803	$3,5043,088	$3,5044,0048

G.2.2   Non-Gas Units

For non-gas units, maximum Start-up and Minimum Load values under the Proxy Cost Option will be based on Start-up, Minimum Load and Transition Cost fuel or fuel equivalent cost information submitted and validated by the CAISO for each unit under the requirements for the Proxy Cost Option. , plus The CAISO will add to the fuel or fuel equivalent costs in Master File a GMC adder representing the Market Services Charge and System Operations Charge components and a third value representing the Bid Segment Fee component divided by the bid segment MW size, greenhouse gas allowance costs if applicable, and major maintenance costs if applicable. The GMC adder is calculated the same as for gas-fired units explained above. Start-Up, Minimum Load, and Transition Costs under the Proxy Cost Option may not exceed 125 percent of the unit's validated Start-Up, Minimum Load, and Transition Costs under the Proxy Cost Option.

For non-natural gas-fired resources subject to a greenhouse gas compliance obligation (as indicated by a 'Y' in the 'GHG_COMPLIANCE_OBLIG field in Master File for resources within the CAISO Control Area), the CAISO will add to the calculated Start-up costs the greenhouse gas allowance start-up cost. Start-up greenhouse gas compliance obligation costs may be calculated for non-gas thermal resources as they are for gas-fired resources if sufficient data is submitted in Master File (GHG Emission Rate and start-up fuel requirement (MMBTU/start-up)). The CAISO shall include major maintenance costs for non-natural gas-fired resources which have such costs approved by the CAISO. See Attachment L for details.

As part of the process of validating Start-Up, Minimum Load, and Transition Costs submitted under the Proxy cost Option, the CAISO may request additional information from the Scheduling Coordinator.

A Scheduling Coordinator may bid Start-Up, Minimum Load, and Transition Costs daily in either DAM or RTM. However, RTM submissions will not be used for the RTM trade hour if the resource received a financially binding integrated forward market award or a binding residual unit commitment start-up instruction in the DAM;, instead, the DAM Daily Components will be copied to the RTM bid. For multi-stage generating resources, a Scheduling Coordinator may bid Transition Costs daily.[10] If the Scheduling Coordinator does not bid, the CAISO will generate daily bids based on the calculated Proxy Costs.

Start-Up, Minimum Load, and Transition Cost Bids under the Proxy Cost Option may not exceed 125 percent of the unit's Start-Up, Minimum Load, and Transition Costs under the Proxy Cost Option plus any applicable Start-Up, Minimum Load, or Transition Opportunity Costs.

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[10] See Attachment H for transition cost calculations.