

Attachment A – Clean Tariff
Hybrid Resources and Co-located Resources
California Independent System Operator Corporation
September 8, 2021

Appendix A

* * * * *

- High Sustainable Limit

The instantaneous generating capability of a variable Generating Unit (or component thereof), provided to the CAISO through telemetry at the Generating Unit.

* * * * *

- Hybrid Dynamic Limit

A Real-Time Market Bid parameter representing the real-time capabilities of Hybrid Resources, used to ensure feasible Schedules.

* * * * *

Section 4

* * * * *

4.6.11 Storage Operating Characteristics

Pursuant to Section 4.6.4, a Scheduling Coordinator for a storage resource participating as a Non-Generator Resource or Pumped-Storage Hydro Unit must submit to the CAISO the operational and technical constraints to the Master File representing an accurate reflection of the resource's design capabilities and its constituent equipment when operating at maximum sustainable performance over Minimum Run Time, recognizing that resource performance may degrade over time. Non-Generator Resources, Hybrid Resources, and Pumped-Storage Hydro Units may include among their Master File parameters the constraints listed in Section 27.9 to the extent they comply with this Section.

* * * * *

4.18 Hybrid Resources

In addition to the rights and obligations of this section, Hybrid Resources are Generating Units subject to Section 4.6. Scheduling Coordinators for Hybrid Resources will provide data regarding the capacity and the operating characteristics of their components as may be reasonably requested from time to time by the CAISO. All information provided to the CAISO regarding the operational and technical constraints in

the Master File must be an accurate reflection of the design capabilities of the Hybrid Resources and their constituent equipment when operating at maximum sustainable performance over Minimum Run Time, recognizing that performance may degrade over time. Hybrid Resources are not Variable Energy Resources or Eligible Intermittent Resources; however, consistent with Section 4.8.2, Hybrid Resources that include a variable component must provide the CAISO with the data for that component that would be required by Appendix Q. Hybrid Resources with a variable or intermittent component also must provide the CAISO with telemetry and Meter Data on the variable components in addition to the Generating Facility's metering requirements under Section 10. Hybrid Resources' telemetry must include the High Sustainable Limit. Hybrid Resources that include an energy storage component must provide the CAISO with telemetry on the energy storage component's State of Charge.

* * * * *

Section 27

* * * * *

27.13 Aggregate Capability Constraint

At the request of the Interconnection Customer, the CAISO may enforce an Aggregate Capability Constraint for Generating Facilities with Co-located Resources that reflects a Generating Facility's maximum and minimum capability or a portion of that capability for purposes of Day-Ahead Market Awards, Real-Time Market Awards, and Real-Time Dispatch as described in the CAISO's Business Practice Manuals. If the combined PMax of Co-located Resources associated with a single Generating Facility would exceed the Interconnection Service Capacity of that Generating Facility, the Interconnection Customer may request that the CAISO enforce an Aggregate Capability Constraint or multiple Aggregate Capability Constraints at the Generating Facility as described in the CAISO's Business Practice Manuals. If the Interconnection Customer requests that the CAISO enforce multiple Aggregate Capability Constraints, the CAISO will enforce an Aggregate Capability Constraint at the Generating Facility level and subordinate Aggregate Capability Constraints at the level of Resource IDs.

If the Interconnection Customer does not elect an Aggregate Capability Constraint(s), the combined PMax of the Co-located Resources registered in the Master File for that Generating Facility may not exceed the Generating Facility's Interconnection Service Capacity. EIM Participating Resource Scheduling Coordinators also may request that the CAISO enforce an Aggregate Capability Constraint or multiple Aggregate Capability Constraints for Co-located Resources, subject to the prior written approval of the applicable EIM Entity Balancing Authority that enforcing an Aggregate Capability Constraint(s) for Co-located Resources does not create a threat to safety or reliability.

As described in the CAISO's Business Practice Manuals the CAISO may relax enforcement of subordinate Aggregate Capability Constraints in its Real-Time Market prior to relaxing enforcement of the system energy-balance constraint specified in Sections 27.4.3.3.4 to ensure there is sufficient Supply to meet the CAISO Forecast of CAISO Demand.

Notwithstanding Section 34.13, a Generating Facility whose Co-located Resources, including Variable Energy Resources, do not comply with Dispatch Instructions such that their output exceeds the

Interconnection Service Capacity of the Generating Facility, will be ineligible for the Aggregate Capability Constraint. In such cases, the CAISO will adjust the PMaxes of those Co-located Resources proportionate to each Generating Unit's capacity such that the sum of the PMax values equals the Interconnection Service Capacity of the Generating Facility, or as requested by the Interconnection Customer so long as the total value does not exceed the Interconnection Service Capacity of the Generating Facility.

Similar to other Generating Facilities with multiple Resource IDs, the CAISO will have no liability with respect to Co-located Resources or their Scheduling Coordinators if Co-located Resources do not comply with Dispatch Instructions and infringe on Interconnection Service Capacity used by other Co-located Resources at a Generating Facility.

In the event that Co-located Resources in an EIM Entity Balancing Authority area do not comply with Dispatch Instructions such that their output exceeds the interconnection service capacity for the Co-located Resources, the CAISO will ask the applicable EIM Entity Balancing Authority whether it will revoke its prior approval of enforcing the Aggregate Capability Constraint for such Co-located Resources. The following resources are not eligible to use the Aggregate Capability Constraint: Multi-Stage Generators, Pseudo-Tie Resources, Proxy Demand Response, Pumped Storage Hydro Units, Metered Subsystems, and Use-Limited Resources.

Scheduling Coordinators may not offer or self-provide Ancillary Services into the CAISO's Markets or receive Uncertainty Awards from Generating Units that are subject to Aggregate Capability Constraints until the CAISO issues a Market Notice stating this restriction will no longer apply. The Pricing Node for the Generating Units or EIM Participating Resources subject to an Aggregate Capability Constraint will be their Point of Interconnection.

* * * * *

Section 29

* * * * *

29.2 EIM Entity Access to the Real-Time Market

* * * * *

(b) Implementation of Access as an EIM Entity.

* * * * *

(7) **Readiness Criteria.**

* * * * *

- (C) **Forecasting Capability.** The CAISO and, to the extent the prospective EIM entity will use its own forecasts or is otherwise required to provide forecasting information to the CAISO, the prospective EIM Entity have demonstrated their respective forecasting capability through –
- (i) the definition of EIM Demand forecast boundaries based on the conforming and non-conforming Load characteristics, as applicable;
 - (ii) the accuracy of the CAISO forecast of EIM Demand based on historical actual Load data for the defined EIM Demand forecast boundaries;
 - (iii) the identification of weather stations locations used in forecasting, as applicable;
 - (iv) the identification of the source of Variable Energy Resource forecasts pursuant to Section 29.11(j); and
 - (v) the identification of the source of Hybrid Resource forecasts pursuant to Section 29.11(j).

* * * * *

29.6 Communications

- (a) **EIM Entity.** The EIM Entity shall meet the technical and communication requirements specified in the Business Practice Manual for the Energy Imbalance Market, which shall be based on the Inter-Control Center Communication Protocol and Reliability Standards.
- (b) **EIM Communications and OASIS.** Section 6 shall govern communications and information availability regarding the participation of EIM Market Participants in the Real-Time Market except that –
- (1) references to internal resources shall be deemed to include EIM Resources;
 - (2) references in Sections 6.2.2.1 and 6.5.2.1 to the CAISO Controlled Grid and references in Sections 6.5.4.2.2(a) and 6.5.5.1.1 to CAISO Balancing Authority Area shall be deemed references to the EIM Area; and
 - (3) the provisions of Section 6.3.1 that authorize the CAISO to communicate directly with Generators and Demand Response Providers to ensure System Reliability shall not apply to Generators and Demand Response Providers in the EIM Entity's Balancing Authority Area or pseudo-tied from an external Balancing Authority Area to the EIM Entity Balancing Authority Area.
- (c) **Loss of Communications.**
- (1) **Procedures.** The CAISO and each EIM Entity and EIM Entity Scheduling Coordinator shall establish procedures to address an interruption of Real-Time Market communications, which shall include steps to be taken to restore

communications and address any impact on system or market operations as provided in Section 29.

- (2) **Responsibilities.** An EIM Entity that loses communication with the CAISO remains responsible for managing its Balancing Authority Area imbalance needs without balancing Energy from the Real-Time Market.
- (d) **Variable Energy Resource Forecast Communications.** If the EIM Participating Resource Scheduling Coordinator for a Variable Energy Resource elects to use an independent forecasting service, it must make data transfer arrangements with the CAISO for the CAISO to receive the forecast in a format and on a schedule set forth in the Business Practice Manual for the Energy Imbalance Market.
- (e) **Hybrid Resource Forecast Communications.** If the EIM Participating Resource Scheduling Coordinator for a Hybrid Resource elects to use an independent forecasting service, it must make data transfer arrangements with the CAISO for the CAISO to receive the forecast in a format and on a schedule set forth in the Business Practice Manual for the Energy Imbalance Market.

* * * * *

29.11 Settlements and Billing for EIM Market Participants.

* * * * *

- (j) **Variable Energy Resource and Hybrid Resource Forecast Charge.**
 - (1) **In General.** The CAISO will charge EIM Entity Scheduling Coordinators and EIM Participating Resource Scheduling Coordinators a fee for the Variable Energy Resource or Hybrid Resource forecasting services in accordance with Appendix F, Schedule 4.
 - (2) **Waiver.** The CAISO will waive the Variable Energy Resource or Hybrid Resource forecast charge if an EIM Entity has an independent forecast for its Variable Energy Resources or Hybrid Resource and provides the independent forecast to the CAISO.

* * * * *

29.34 EIM Operations

* * * * *

- (q) **Variable Energy Resources and Hybrid Resources.** Provisions of Section 34 specifically applicable to Variable Energy Resources and Eligible Intermittent Resources appear in Sections 34.1.3, 34.1.6, 34.2.2, 34.5.1. 34.13.2. Provisions of Section 34 specifically applicable to Hybrid Resources appear in Section 34.1.6.3.

* * * * *

Section 30

* * * * *

30.5.6.1 Hybrid Resource Bids

In addition to the Bid components listed in this Section 30.5, Scheduling Coordinators representing Hybrid Resources will submit Hybrid Dynamic Limits representing Hybrid Resources' upper economic limit and lower economic limit in each Real-Time Market five-minute Trading Interval for a rolling six-hour look-ahead period. These limits will reflect the range of the Hybrid Resource's Economic Bids or Self-Schedules. Hybrid Dynamic Limits should reflect resource availability based on operating capabilities such as State of Charge and forecasted output from the variable component of a Hybrid Resource. Scheduling Coordinators may also use Hybrid Dynamic Limits to manage onsite charging of an energy storage component of a Hybrid Resource.

The CAISO will use reasonable efforts to issue Real-Time Market Schedules that respect Hybrid Dynamic Limits. Scheduling Coordinators may not submit Hybrid Dynamic Limits in the Day-Ahead Market.

* * * * *

Section 31

* * * * *

31.2 Day-Ahead MPM Process

After the Market Close of the DAM, and after the CAISO has validated the Bids pursuant to Section 30.7, the CAISO will perform the MPM process, which is a single market run that occurs prior to the IFM Market

Clearing run. The Day-Ahead MPM process determines which Bids need to be mitigated to the applicable Default Energy Bids in the IFM pursuant to Section 31.2.3. For Maximum Net Dependable Capacity of Legacy RMR Units, Bids will be mitigated to the RMR Proxy Bids pursuant to Section 31.2.3. The Day-Ahead MPM process optimizes resources to meet Demand reflected in Demand Bids, including Export Bids and Virtual Demand Bids, and to procure one hundred (100) percent of Ancillary Services requirements based on Supply Bids submitted to the DAM. Virtual Bids and Bids from Demand Response Resources, Participating Load, Hybrid Resources, and Non-Generator Resources are considered in the MPM process, but are not subject to Bid mitigation. Bids from Participating Load resources that are not subject to Bid mitigation will also be considered in the MPM process. Bids from resources comprised of multiple technologies that include Non-Generator Resources will remain to be subject to all applicable market power mitigation under the CAISO Tariff, including Local Market Power Mitigation. The mitigated or unmitigated Bids and RMR Proxy Bids identified in the MPM process for all resources that cleared in the MPM are then passed to the IFM. The CAISO performs the MPM process for the DAM for the twenty-four (24) hours of the targeted Trading Day.

* * * * *

Section 34

* * * * *

34.1.5 Mitigating Bids in the RTM

34.1.5.1 Generally

After the Market Close of the RTM, after the CAISO has validated the Bids pursuant to Section 30.7 and Section 34.1.4, and prior to conducting any other RTM processes, the CAISO conducts a MPM process. The results are used in the RTM optimization processes. Bids on behalf of Demand Response Resources, Participating Load, Hybrid Resources, and Non-Generator Resources are considered in the MPM process but are not subject to Bid mitigation. Bids from resources comprised of multiple technologies that include Non-Generator Resources will remain to be subject to all applicable market power mitigation under the CAISO Tariff, including Local Market Power Mitigation.

* * * * *

34.1.6.3 Hybrid Resources

The CAISO will use reasonable efforts to issue Real-Time Market Schedules that observe Hybrid Resources' Dynamic Limits, High Sustainable Limits, State of Charge, and production forecasts, as applicable. Hybrid Resources with a variable component may elect to receive a CAISO forecast to inform their bidding, or they may elect to use their own forecast. For Hybrid Resources that have elected to use their own forecast as specified in Section 4.8.2.1.1, the responsible Scheduling Coordinator must submit to the CAISO its forecast for the variable component for the binding interval by 37.5 minutes prior to flow (the start of the applicable FMM optimization for the binding interval). If such Scheduling Coordinator does not provide such forecast to the CAISO, the CAISO will use the direct telemetry MW output from the resource's variable component.

* * * * *

Section 40

* * * * *

40.9.2 Exemptions

- (a) **Capacity Exempt from RAAIM – All Provisions.** The entire capacity of a resource in any of the following categories is exempt from the RAAIM provisions in Section 40.9 –
- (1) Resources with a PMax less than 1.0 MW;
 - (2) Non-specified resources that provide Resource Adequacy Capacity under contracts for Energy delivered within the CAISO Balancing Authority Area;
 - (3) Participating Load that is also Pumping Load; and
 - (4) Legacy RMR Units.
- (b) **Capacity Exempt from RAAIM – Local/System**
- (1) The entire capacity of a resource in any of the following categories is exempt from the RAAIM provisions in Section 40.9 applicable to local and system Resource Adequacy Capacity –
 - (A) Variable Energy Resources;
 - (B) Combined Heat and Power Resources;
 - (C) Run-of-River Resources; and
 - (D) Hybrid Resources.
 - (2) The capacity of a resource with a Load-following MSS as its Scheduling Coordinator that is designated on a Load-following MSS's monthly Resource Adequacy Plan is exempt from the RAAIM provisions in Section 40.9 applicable to local and system Resource Adequacy Capacity, to the extent that the resource's capacity is also designated as Resource Adequacy Capacity on the monthly Supply Plan of that Load-following MSS or another Load-following MSS.
 - (3) Resources with Existing QF Contracts or Amended QF Contracts that are Resource Adequacy Resources are exempt from the RAAIM provisions in Section 40.9 applicable to local and system capacity --
 - (A) if the QF resource previously provided Resource Adequacy Capacity pursuant to an Existing QF Contract that was executed prior to August 22, 2010 and remained in effect pursuant to California Public Utilities Commission Decision 07-09-040 that extended the term of expiring contracts until such time as the new contracts resulting from that decision are available; or

(B) until the QF Resource's Existing QF Contract or Amended QF Contract terminates or if requested by the Scheduling Coordinator for the resource, whichever is earlier.

(c) **Capacity Exempt from RAAIM – Flexible Capacity.**

- (1) The capacity of Use-Limited Resources in a combination under Section 40.10.3.2(b), 40.10.3.3(b) or 40.10.3.4(b) is exempt from the RAAIM provisions in Section 40.9 applicable to Flexible RA Capacity to the extent that the resources are committed to provide Flexible RA Capacity as a combination on their respective monthly Supply Plans.
- (2) The Capacity of a resource with a Load-following MSS as its Scheduling Coordinator that is designated on a Load-following MSS's monthly Flexible RA Plan is exempt from the RAAIM provisions in Section 40.10 applicable to Flexible RA Capacity, to the extent that the resource's capacity is also designated as Flexible RA Capacity on the monthly Supply Plan of that Load-following MSS or another Load-following MSS.

* * * * *

40.10.4 Effective Flexible Capacity

The CAISO shall calculate the Effective Flexible Capacity value for each resource. The CAISO shall publish the draft and final lists of the Effective Flexible Capacity values for such resources and the Flexible Capacity Categories for which each resource qualifies to provide Flexible Capacity on the CAISO Website each year in accordance with the schedule for publishing the Net Qualifying Capacity values, as set forth in the BPM, for use in the next calendar year.

40.10.4.1 Effective Flexible Capacity Calculation

- (a) **Flexible Resources.** The CAISO will calculate the Effective Flexible Capacity value of a resource, for use (i) if a Local Regulatory Authority has not established criteria for calculating the Effective Flexible Capacity value for eligible resource types, and (ii) for determining if a cumulative deficiency exists under Sections 43A.2.7(a) and (b), as follows, except as provided in Sections 40.10.4.1 (b) through (f) –
 - (1) If the Start-Up Time of the resource is greater than 90 minutes, the Effective Flexible Capacity value shall be the weighted average ramp rate of the resource calculated from PMin to Net Qualifying Capacity multiplied by 180 minutes. The Effective Flexible Capacity shall not exceed the difference between the PMin and PMax of the resource.
 - (2) If the Start-Up Time of the resource is less than or equal to 90 minutes, the Effective Flexible Capacity value shall be the resource's PMin plus the weighted average ramp rate of the resource calculated from PMin to Net Qualifying Capacity multiplied by the difference between 180 minutes and the resource's Start-Up Time. The Effective Flexible Capacity shall not exceed the Net Qualifying Capacity of the resource.
- (b) **Hydroelectric Generating Unit.** The Effective Flexible Capacity of a hydroelectric generating unit will be the amount of capacity from which the resource can produce Energy consistently for 6 hours assuming that the resource's physical storage is at

maximum capacity at the beginning of that six-hour period. The Effective Flexible Capacity of a hydroelectric generation unit cannot, however, exceed its Net Qualifying Capacity.

- (c) **[Not Used]**
- (d) **Energy Storage Resource.** The Effective Flexible Capacity value for an energy storage resource will be determined as follows –
 - (1) for an energy storage resource that provides Flexible RA Capacity but not Regulation Energy Management, the Effective Flexible Capacity value will be the MW output range the resource can provide over three hours of charge/discharge while constantly ramping.
 - (2) for an energy storage resource that provides Flexible RA Capacity and Regulation Energy Management, the Effective Flexible Capacity value will be the resource's 15-minute energy output capability.
- (e) **Multi-Stage Generating Resource.** The Effective Flexible Capacity value for a Multi-Stage Generating Resource will be calculated using the longest Start-Up Time of the resource's configuration that has the lowest PMin.
- (f) **Combined Heat and Power Resource.** The Effective Flexible Capacity value of a Combined Heat and Power Resource will be the lesser of (i) the resource's Net Qualifying Capacity, or (ii) the MW difference between the CHP resource's maximum output and its RMTMax, if the resource has a RMTMax, or its minimum operating level, such quantity not to exceed the quantity of generating capacity capable of being delivered over a three-hour period.
- (g) **Hybrid Resource.** The Effective Flexible Capacity value of a Hybrid Resource is the sum of what the Effective Flexible Capacity values of the constituent components of the Hybrid Resource would be if those components were each a distinct Generating Unit.

* * * * *

Appendix F

* * * * *

Schedule 4

Eligible Intermittent Resources Forecast Fee

A charge up to \$.10 per MWh shall be assessed on the metered Energy from (a) Eligible Intermittent Resources; (b) Variable Energy Resources that are EIM Participating Resources; and (c) the variable component of Hybrid Resources as a Forecast Fee, provided that Generating Units smaller than 10 MW that are not Participating Intermittent Resources and that sell power pursuant to a power purchase agreement entered into pursuant to PURPA prior to entering into a PGA or Net Scheduled PGA shall be exempt from the Forecast Fee.

The rate of the Forecast Fee shall be determined so as to recover the projected annual costs related to developing Energy forecasting systems, generating forecasts, validating forecasts, and monitoring

forecast performance, that are incurred by the CAISO as a direct result of participation by Eligible Intermittent Resources Variable Energy Resources that are EIM Participating Resources, and the variable component of Hybrid Resources in CAISO Markets, divided by their projected annual Energy production.

The initial Forecast Fee, and all subsequent changes as may be necessary from time to time to recover costs incurred by the CAISO for the forecasting conducted on the behalf of Eligible Intermittent Resources, Variable Energy Resources that are EIM Participating Resources, and the variable component of Hybrid Resources pursuant to the foregoing rate formula, shall be set forth in a Business Practice Manual.

* * * * *

Appendix K

Part A CERTIFICATION FOR REGULATION

* * * * *

A 1.2.2.4 Ancillary Service Providers for Non-Generator Resources (whether or not the resource uses Regulation Energy Management) and Hybrid Resources shall provide CAISO the following additional telemetry data as applicable

- Resource Ramp Rate when operating as Generation (MW/min);
- Resource Ramp Rate when operating as Load (MW/min);
- The maximum instantaneous ability to produce or consume Energy in MW; and
- The maximum capability to provide Energy as expressed in MWh over a fifteen (15) minute interval where the Scheduling Coordinator has elected to provide MWh constraints pursuant to Section 27.9 of the CAISO Tariff.

A 1.2.2.5 Ancillary Service Providers for an Eligible Intermittent Resource or a Hybrid Resource with a variable component must provide the CAISO High Sustainable Limit for their resource.

* * * * *

Part B CERTIFICATION FOR SPINNING RESERVE

* * * * *

B 1.7: Ancillary Service Providers for an Eligible Intermittent Resource or a Hybrid Resource with a variable component must provide the CAISO with the High Sustainable Limit for their resource.

Part C CERTIFICATION FOR NON-SPINNING RESERVE

* * * * *

C 2.3 Ancillary Service Providers for an Eligible Intermittent Resource or a Hybrid Resources with a variable component must provide the CAISO with the High Sustainable Limit for their resource.

* * * * *

Appendix Q

Eligible Intermittent Resources Protocol (EIRP)

1 SCOPE

1.1 Scope of Application to Parties

This EIRP applies to the CAISO and to:

- (a) Scheduling Coordinators (SCs);
- (b) Eligible Intermittent Resources that are not certified as Participating Intermittent Resources;
- (c) Participating Intermittent Resources; and
- (d) Hybrid Resources with a wind generation or solar generation component.

1.2 Liability of the CAISO

Any liability of the CAISO arising out of or in relation to this EIRP shall be subject to Section 14 of the CAISO Tariff as if references to the CAISO Tariff were references to this EIRP.

2 REQUIREMENTS FOR ELIGIBLE INTERMITTENT RESOURCES, PARTICIPATING INTERMITTENT RESOURCES, AND HYBRID RESOURCES WITH VARIABLE COMPONENT

2.1 No Mandatory Participation

Eligible Intermittent Resources may elect to be scheduled and settled as the CAISO Tariff provides for Generating Units, and are not required to seek certification as Participating Intermittent Resources.

2.2 Minimum Certification Requirements

Eligible Intermittent Resources, Participating Intermittent Resources, and Hybrid Resources with a variable component must meet the following requirements, as applicable.

2.2.1 Agreements

The following agreements must be executed by the owner or operator of any Eligible Intermittent Resource, unless that resource is not subject to any of these agreements pursuant to the CAISO Tariff, such as an Eligible Intermittent Resource of an MSS Operator:

- (a) A Participating Generator Agreement, Net Scheduled PGA, Dynamic Scheduling Agreement for Scheduling Coordinators, or Pseudo-Tie Participating Generator Agreement that, among other things, binds the Eligible Intermittent Resource to comply with the CAISO Tariff; and
- (b) A Meter Service Agreement for CAISO Metered Entities, for all Eligible Intermittent Resources other than Dynamic System Resources.

If an Eligible Intermittent Resource intends to become a Participating Intermittent Resource, it must also execute a letter of intent, which when executed and delivered to the CAISO shall initiate the process of certifying the Participating Intermittent Resource. The form of the letter of intent shall be specified by the CAISO in a Business Practice Manual.

Hybrid Resources with a variable component must execute all agreements that are otherwise required in this CAISO tariff.

2.2.2 Composition of a Participating Intermittent Resource

The CAISO shall develop criteria to determine whether one or more Eligible Intermittent Resources may be included within a Participating Intermittent Resource. Such criteria shall include:

- (a) A Participating Intermittent Resource must be at least one (1) MW rated capacity.
- (b) A Participating Intermittent Resource may include one (1) or more Eligible Intermittent Resources that have similar response to weather conditions or other variables relevant to forecasting Energy, as determined by the CAISO.
- (c) Each Participating Intermittent Resource shall be electrically connected at a single point on the CAISO Controlled Grid, except as otherwise permitted by the CAISO on a case-by-case basis as may be allowed under the CAISO Tariff. Interconnection to a portion of the CAISO Controlled Grid outside or not contiguous to the CAISO Balancing Authority Area does not make an Eligible Intermittent Resource that is a Dynamic System Resource or Pseudo-Tie Generating Unit eligible to be included within a Participating Intermittent Resource.
- (d) The same Scheduling Coordinator must schedule all Eligible Intermittent Resources aggregated into a single Participating Intermittent Resource.

2.2.3 Equipment Installation

Eligible Intermittent Resources and Hybrid Resources with a variable component must install and maintain the communication equipment required pursuant to Section 3 of this EIRP, and the equipment supporting forecast data required pursuant to Section 4 of this EIRP.

2.2.4 Forecast Model Validation

The CAISO must determine that sufficient historic and real-time telemetered data are available to support an accurate and unbiased forecast of Energy generation by a Participating Intermittent Resource, according to the forecasting process validation criteria described in Section 4 of this EIRP.

2.2.5 [Not Used]

2.3 Notice of Certification of a Participating Intermittent Resource

When all requirements described in Section 2.2 of this EIRP applicable to Participating Intermittent Resources have been fulfilled, the CAISO shall notify the Scheduling Coordinator and the representatives of the Eligible Intermittent Resources comprising the Participating Intermittent Resource that the Participating Intermittent Resource has been certified, and is eligible for the settlement terms provided under Section 11.12 of the CAISO Tariff, as conditioned by the terms of this EIRP.

2.4 Additional Requirements

2.4.1 Forecast Fee

An Eligible Intermittent Resource must pay the Forecast Fee for all metered Energy generated by the Eligible Intermittent Resource, as specified in CAISO Tariff Appendix F, Schedule 4. A Hybrid Resource with a variable component must pay the Forecast Fee for all metered Energy generated by variable component, as specified in CAISO Tariff Appendix F, Schedule 4, if it elects, per section 3.1 of this EIRP, to have the CAISO produce a forecast of the output of the Hybrid Resource's variable component.

2.4.2 Modification of Participating Intermittent Resource Composition

A Participating Intermittent Resource may seek to modify the composition of the Participating Intermittent Resource (e.g., by adding or eliminating an Eligible Intermittent Resource from the Participating Intermittent Resource). Such changes shall not be implemented without prior compliance with the written approval by the CAISO. The CAISO will apply consistent criteria and expeditiously review any proposed changes in the composition of a Participating Intermittent Resource.

2.4.3 Changes in Scheduling Coordinator

This EIRP does not impose any additional requirement for CAISO approval to change the Scheduling Coordinator for an approved Participating Intermittent Resource than would otherwise apply under the CAISO Tariff to changes in the Scheduling Coordinator representing a Generating Unit.

2.4.4 Continuing Obligation

Eligible Intermittent Resources (including Participating Intermittent Resources) and Hybrid Resources with a variable component have a continuing obligation to meet all applicable obligations established under the CAISO Tariff and this EIRP, and must fully cooperate in providing all data, other information, and authorizations the CAISO reasonably requests to fulfill its obligation to validate forecast models and explain deviations.

2.4.5 Failure to Perform

If the CAISO determines that a material deficiency has arisen in the Participating Intermittent

Resource's fulfillment of its obligations under the CAISO Tariff and this EIRP, and such Participating Intermittent Resource fails to promptly correct such deficiencies when notified by the CAISO, then the eligibility of the Participating Intermittent Resource for the settlement accommodations provided in Section 11.12 of the CAISO Tariff shall be suspended until such time that the unavailable data is provided or other material deficiency is corrected to the CAISO's reasonable satisfaction. Such suspension shall not relieve the Scheduling Coordinator for the deficient Participating Intermittent Resource from paying the Forecast Fee over the duration of the period covered by the letter of intent described in Section 2.2.1(c) of this EIRP.

3 COMMUNICATIONS

3.1 Forecast Data

The CAISO may require various data relevant to forecasting Energy from an Eligible Intermittent Resource or Hybrid Resource with a variable component to be telemetered to the CAISO, including appropriate operational data, meteorological data or other data reasonably necessary to forecast Energy.

In order for the CAISO to forecast Energy, an Eligible Intermittent Resource or Hybrid Resource with a variable component must provide the CAISO with MW production data and meteorological data as outlined in this Eligible Intermittent Resources Protocol. This data must be collected for a minimum of thirty (30) consecutive days and be of sufficient quality as determined by a CAISO to produce a state of the art forecast.

A Hybrid Resource with a wind generation or solar generation component may elect to provide its own forecasted production in lieu of a CAISO forecast but such election does not relieve the resource of the obligation to provide production data and meteorological data as otherwise required in this Eligible Intermittent Resources Protocol.

3.1.1 Wind Generation Meteorological Station Requirements

Each wind Eligible Intermittent Resource or Hybrid Resource with a wind generation component must install and maintain equipment required by the CAISO to support accurate power generation forecasting and the communication of such forecast, meteorological, and other required data to the CAISO consistent with the timeframes specified in this Eligible Intermittent Resource Protocol.

3.1.1.1 Each wind Eligible Intermittent Resource or Hybrid Resource with a wind generation component shall install a minimum of one meteorological station to measure barometric pressure, temperature, wind speed and direction. If such a resource has a rated capacity of five (5) MW or greater, then the resource shall install a minimum of two meteorological stations to measure barometric pressure, temperature, wind speed and direction. If an Eligible Intermittent Resource or Hybrid Resource with a wind generation component, as part of compliance with any other contractual or regulatory requirement outside of this Eligible Intermittent Resource Protocol, provides data from more than the two required meteorological stations to an entity other than the CAISO, then the resource must also submit data from any additional meteorological station to the CAISO.

3.1.1.2 Each wind Eligible Intermittent Resource or Hybrid Resource with a wind generation component shall locate its meteorological station(s) on the windward side of the wind farm. Each such resource must install one meteorological station at the average hub height of the wind turbines. Hub height is the distance from the ground to the center of the turbine axis. If a second meteorological station is required, then it may be so co-located with the primary station. The approximate distance separating the primary station and the secondary station shall be an average of one (1) rotator blade length. Where placement of the meteorological station(s) in accordance with this Eligible Intermittent Resource Protocol would reduce production or violate a local, state, or federal statute, regulation or ordinance, the CAISO, in coordination with any

applicable forecast service provider, will coordinate with the resource to identify an acceptable placement of the meteorological station.

3.1.1.3 The use of SODAR¹ and/or LIDAR² equipment may be an acceptable substitute for wind direction and velocity only after obtaining prior agreement from the CAISO.

3.1.1.4 Wind Eligible Intermittent Resources and Hybrid Resources with a wind generation component may not satisfy the meteorological station location requirements through a sharing agreement with another resource.

3.1.2 Wind Generation Meteorological Data Requirements

Table Q-1 details the units and accuracy of measurements for telemetry data points wind Eligible Intermittent Resources and Hybrid Resources with a wind generation component must send to the CAISO in real time (i.e., every 4 seconds).

Table Q-1 Wind Telemetry Data Points

Element	Device(s) Needed	Units	Accuracy
Wind Speed (Meter / Second)	Anemometer, wind vane and wind mast	m/s	± 2m/s
Air Temperature (Degrees Celsius)	Temperature probe & shield for ambient temp	°C	± 1°
Barometric Pressure (hecto Pascals)	Barometer	hPA	± 60 hPa
Real Time Data		MWs*	
High Sustainable Limit (for Hybrid Resources with a wind generation component and wind EIRs that are a Co-located Resource)		MWs**	

* Hybrid Resources with a wind generation component must provide MW values through telemetry for both the wind generation component and the overall Hybrid Resource

** High Sustainable Limit may be updated every 12 seconds.

3.1.3 Designated Turbines

For any wind eligible Intermittent Resource or Hybrid Resource with a wind generation component, designated turbines are required to improve forecast accuracy within a wind park. The CAISO shall identify a designated turbine, from which the resource shall provide nacelle wind

¹ SODAR means Sonic Detection and Ranging- a meteorological instrument also known as a wind profiler which measures the scattering of sound waves by atmospheric turbulence.

² LIDAR means Light Detection and Ranging - a meteorological instrument which measures the properties of scattered light waves caused by atmospheric turbulence.

speed and wind direction every four seconds. Wind EIRs with a PGA or NS PGA that are operating or have final regulatory approvals to construct as of November 1, 2018, that have wind turbines without nacelle anemometers need not comply with the requirements of this section for Designation Turbines. However, when the wind EIR repowers or replaces a portion of its existing wind turbines, then the Wind EIR must become compliance with the requirements of this section for Designated Turbines.

3.1.4 Topographical Map

A wind Eligible Intermittent Resource or Hybrid Resource with a wind generation component must submit a topographical map that illustrates the location and height for each wind turbine within a wind park. The map must identify all meteorological stations and turbine location by latitude and longitude and should be in degrees/decimals using WGS84 geodetic datum only.

3.1.5 Site Information

A wind Eligible Intermittent Resource or Hybrid Resource with a wind generation component must provide the site information specified below in the manner and format as specified through the CAISO new resource implementation process. Latitude and Longitude should be in degrees/decimals using WGS84 geodetic datum only.

1. Park Potential (MW; numeric-float field [example: 100.5])
2. Resource Project Corner Coordinates in WGS84 format
3. Meteorological Station ID Numbers
4. Meteorological Station Coordinates in WGS84 format
5. Address
6. Resource ID
7. MW Generation Capacity
8. Plant Location (Latitude and Longitude in WGS84)
9. Lidar or Sodar (required)
10. Make (required; alphanumeric)
11. Model (required; alphanumeric)
12. Wind Speed (Anemometer) (required; alphanumeric)
13. Wind Direction (Anemometer) (required; alphanumeric)
14. Air Temperature (required; alphanumeric)
15. Barometric Pressure (required; alphanumeric)
16. Wind Turbine Group Numbers
17. Turbine Specifications:
18. Number of Turbines (numeric field)
19. Turbine Manufacturer (alphanumeric field)
20. Turbine Model (alphanumeric field)
21. Turbine Maximum Generation Capacity (numeric field)
22. Turbine Height Above Ground Level (numeric field)
23. Cut in Speed (numeric field; in m/s)
24. Cut Out Speed (numeric field; in m/s)
25. Cold Weather Package (Yes or No Dropdown)
26. Hot Weather Package (Yes or No Dropdown)
27. Low Temperature Cut Out (numeric field)
28. High Temperature Cut Out (numeric field)
29. Wind Turbine ID Numbers (alphanumeric field)
30. Elevation (numeric field; in meters)
31. Hub Height. (numeric field; in meters)
32. Turbine(s) Latitude(s) and Longitude(s) Coordinates (WGS84 Coordinate Field)
33. Turbine ID
34. Turbine Latitude and Longitude
35. Turbine Elevation

- 36. Turbine Hub Height
- 37. Turbine Group Number

3.1.6 Shape-File Submission

Each wind Eligible Intermittent Resource and Hybrid Resource with a wind generation component must submit a shape-file that illustrates, at a minimum, the location of the meteorological station(s), resource project corner, and all individual wind turbines comprising the resource. The shape-file must be submitted in .shp, .dbf, or other file format upon which the CAISO and resource mutually agree.

3.2.1 Solar Generation Meteorological Station Requirements

Each solar Eligible Intermittent Resource and Hybrid Resource with a solar generation component must install and maintain equipment required by the CAISO to support accurate power generation forecasting and the communication of such forecast, meteorological, and other required data to the CAISO consistent with the timeframes specified in this Eligible Intermittent Resource Protocol.

3.2.1.1 Each solar Eligible Intermittent Resource and Hybrid Resource with a solar generation component shall install a minimum of one meteorological station. If such a resource has a rated capacity of five (5) MW or greater, the resource shall install a minimum of two meteorological stations. If an Eligible Intermittent Resource or Hybrid Resource with a solar generation component, as part of compliance with any other contractual or regulatory requirement outside of this Eligible Intermittent Resource Protocol, provides data from more than the two required meteorological stations to an entity other than the CAISO, then the resource must also submit data from any additional meteorological station to the CAISO.

3.2.1.2 Solar Eligible Intermittent Resources and Hybrid Resources with a solar generation component that require direct normal irradiance (DNI) and global horizontal irradiance (GHI) measurements may provide alternate radiometry meteorological station data. For example, one meteorological station may report DNI and another meteorological station may report GHI. All other meteorological data reporting requirements shall remain the same.

3.2.1.3 Meteorological stations for solar Eligible Intermittent Resources shall cover at least 90 percent of the facility's footprint for each Resource ID. Meteorological stations for Hybrid Resources with a solar generation component must cover at least 90 percent of the solar generation component's footprint.

3.2.1.4 Subject to the CAISO's prior approval, Solar Eligible Intermittent Resources and Hybrid Resources with a solar generation component may satisfy the meteorological station location requirements by entering a mutually agreeable sharing agreement(s) with another solar Eligible Intermittent Resource or Hybrid Resource with a solar generation component. The following conditions must apply for the CAISO to grant approval:

- (a) One resource (the host plant) meets the meteorological station requirements; and
- (b) The site of the other resource (the sharing plant) lies contiguous to or overlaps the site of the host plant, or
- (c) Meteorological conditions on the sharing plant site are substantially similar to those on the host plant site.

Proof of the agreement between the host plant and sharing plant must be provided to the CAISO.

Should the agreement terminate, the sharing plant must independently demonstrate it meets the meteorological tower requirements specified in this Eligible Intermittent Resource Protocol.

3.2.2 Solar Meteorological Data Requirements

Table Q-2 details the units and accuracy of measurements for telemetry data points solar Eligible Intermittent Resources and Hybrid Resources with a solar generation component must send to the CAISO in real time (i.e., every 4 seconds).

Table Q-2 Solar Eligible Intermittent Resources Telemetry Data Points

Element	Device(s) Needed	Units	Accuracy
Wind Speed (Meter / Second)	Anemometer, wind vane and wind mast	m/s	± 2m/s
Wind Direction (Degrees - Zero North 90CW)	Anemometer, wind vane and wind mast	Degrees	± 5°
Air Temperature (Degrees Celsius)	Temperature probe & shield for ambient temp	°C	± 1°
Barometric Pressure (hecto Pascals)	Barometer	hPA	± 60 hPa
Back Panel Temperature (Degree C)	Temperature probe for back panel temperature	°C	± 1°
Plane of Array Irradiance Watts\Meter Sq.	Pyranometer or Equivalent	W/m ²	± 25 W/m ²
Global Horizontal Irradiance Watts\Meter Sq.	Pyranometer or Equivalent	W/m ²	± 25 W/m ²
Direct Irradiance Watts\Meter Sq.	Pyranometer or Equivalent	W/m ²	± 25 W/m ²
Real Time Data		MWs*	
High Sustainable Limit (for Hybrid Resources with a solar generation component and solar EIRs that are a Co-located Resource)		MWs**	

* Hybrid Resources with a solar generation component must provide MW values through telemetry for both the solar generation component and the overall Hybrid Resource

** High Sustainable Limit may be updated every 12 seconds.

Table Q-3 details the minimum required (R) measurement of solar irradiance by each solar generating technology that solar Eligible Intermittent Resources and Hybrid Resources with a solar generation component must send to the CAISO consistent with the requirements of this Eligible Intermittent Resource Protocol.

Table Q-3 Irradiance and Back Plane Required Measurements

	Direct Irradiance (DIRD)	Global Horizontal Irradiance (GHIRD)	Global Irradiance/ Plane of Array (PAIRD)	Back Panel Temperature (BPTEMP)
Flat-Plate PV (fixed / horizontal / flat roof)			R	R
Flat-Plate PV (fixed angle / azimuth tracking)			R	R
Flat-Plate PV (DNI zenith & azimuth tracking)	R		R	R
Flat-Panel Solar (thermal fixed angle mounted)			R	R
Flat-Panel Thermal Collector (azimuth tracking)			R	R
Low Concentrating PV (LCPV)	R	R		
High Concentrating PV (HCPV)	R	R		
Concentrated Solar Thermal (solar through zenith tracking)	R	R		
Heliostat Power (tracking focusing mirrors)	R	R		
Greenhouse Power Tower (hot air convection turbine)			R	
Stirling Engine (concentrated solar power generation)	R	R		

3.2.3 Site Information

A solar Eligible Intermittent Resource or Hybrid Resource with a solar generation component must provide the site information specified below in the manner and format as further specified in the CAISO new resource implementation process. Latitude and Longitude should be in degrees/decimals using WGS84 geodetic datum only.

General Resource Information

1. Park Potential (MW; numeric-float field [example: 100.5])
2. Resource Project Corner Coordinates in WGS84 format
3. Meteorological Station ID Numbers
4. Meteorological Station Coordinates in WGS84 format
5. Address
6. Resource ID
7. MW Generation Capacity
8. Plant Location (Latitude and Longitude in WGS84)
9. Lidar or Sodar (required)
10. Make (required; alphanumeric)
11. Model (required; alphanumeric)
12. Wind Speed (Anemometer) (required; alphanumeric)
13. Wind Direction (Anemometer) (required; alphanumeric)
14. Air Temperature (required; alphanumeric)
15. Barometric Pressure (required; alphanumeric)
16. Irradiance (required; alphanumeric)
17. Back Panel Irradiance (required; alphanumeric)
18. MW Generation DC
19. Meteorological Station Sharing (Y or N: If 'Yes', require the project ID of the resource that is being shared) (Validate that project key/code of host site exists)
20. Solar Panel Group Number

Solar Panel Specifications:

1. Panel Manufacturer (alphanumeric field)
2. Panel Model (alphanumeric field)
3. Number of Panels (numeric field)
4. Panel Power Rating (numeric field)
5. Number of Inverters (numeric field)
6. Inverter Ratings (alphanumeric field)
7. Tracking (Yes or No Dropdown)
8. Single or Dual Axis Tracking (Single, Dual, or None Dropdown)
9. Tracker Manufacturer (alphanumeric field)
10. Tracker Model (alphanumeric field)
11. Wind Protection (Speed in m/s)
12. Altitude Angle of Panels (alphanumeric field)
13. Azimuth Angle of Fixed Panels (alphanumeric field)
14. Height of Panels Above Ground Level
15. (alphanumeric field)
16. Concentrating PV (Yes or No Dropdown)
17. Solar Panel Coordinates (WGS84)

3.2.4 Shape-File

Each solar Eligible Intermittent Resource and Hybrid Resource with a solar generation component must submit a shape-file that illustrates, at a minimum, the location of the

meteorological station(s) and resource project corner. The shape-file must be submitted in .shp, .dbf, or other file format upon which the CAISO and resource mutually agree.

3.3 Power Reliability Requirements

Each Eligible Intermittent Resource and Hybrid Resource with a wind generation or solar generation component shall provide a backup power source for the Remote Intelligent Gateway, meteorological station equipment, revenue meter, and essential communication equipment (including, but not limited to, the router, network switch, fiber optic transceiver, 120V plug-in power supplies). The backup power source shall be sized accordingly to carry that equipment load. A backup power supply may include, but is not limited to, an uninterruptable power source (UPS) or a battery bank with solar panel charger. Whichever backup power source the Eligible Intermittent Resource installs, it shall be sized and provide power until the primary power source is restored.

3.4 Standards

The standards for communications shall be the monitoring and communications requirements for Generating Units providing only Energy; as such standards may be amended from time to time, and published on the CAISO Website.

3.5 Cost Responsibility

An Eligible Intermittent Resource is responsible for expenses associated with engineering, installation, operation and maintenance of required communication equipment.

4 FORECASTING

The CAISO is responsible for overseeing the development of tools or services to forecast Energy for Participating Intermittent Resources. The CAISO will use its best efforts to develop accurate and unbiased forecasts, as limited by the availability of relevant explanatory data. Objective criteria and thresholds for unbiased, accurate forecasts shall be used to certify Participating Intermittent Resources in accordance with Section 2.2.4 of this EIRP.

4.1 [Not Used]

4.2 [Not Used]

4.3 Confidentiality

The CAISO shall maintain the confidentiality of proprietary data for each Participating Intermittent Resource in accordance with Section 20 of the CAISO Tariff.

5 SCHEDULING AND SETTLEMENT

5.1 Schedules

For all Generating Units that comprise the Participating Intermittent Resources shall comply with the Bidding and scheduling rules specified in Sections 4.8, 30, 31, and 34.

5.2 Settlement

After a Participating Intermittent Resource is certified, Settlement shall be determined for each Settlement Period based on consistency of Bids submitted on behalf of such Participating

Intermittent Resource with the rules specified in the CAISO Tariff and this EIRP.

5.3 [Not Used]

6 DATA COLLECTION FACILITIES

An Eligible Intermittent Resource not otherwise exempt and Hybrid Resource with a variable component that elects to have a CAISO forecast must install and maintain equipment to collect, record and transmit data that the CAISO reasonably determines is necessary to develop and support a forecast model that meets the requirements of Section 4 of this EIRP.

6.1 Other Eligible Intermittent Resources

Eligible Intermittent Resources other than wind or solar projects will be required to provide data of comparable relevance to estimating Energy generation. Standards will be developed as such projects are identified and will be specified in this Eligible Intermittent Resources Protocol.

7 PROGRAM MONITORING

The CAISO shall monitor the operation of these rules, and will in particular seek to eliminate any gaming opportunities provided by the flexibility provided Participating Intermittent Resources to self-select participation on an hourly basis.

Participating Intermittent Resources are expected to bid, schedule, and otherwise perform in good faith, and not seek to act strategically in a manner that causes financial gain through systematic behavior, where such gain results solely from the settlement accommodations provided under CAISO Tariff Section 11.12.

If requirements specified in this EIRP are not met, then Participating Intermittent Resource certification may be revoked pursuant to Section 2.4.5 of this EIRP. Any patterns of strategic behavior by Participating Intermittent Resources will be tracked, and the statistical significance of such deviations will be used by the CAISO to evaluate whether changes in the rules defined in this EIRP are appropriate.

The CAISO will monitor the impact of rules for Participating Intermittent Resources on FMM or RTD imbalance energy and Regulation costs to the CAISO.

8 AMENDMENTS

If the CAISO determines a need for an amendment to this EIRP, the CAISO will follow the requirements as set forth in Section 15 of the CAISO Tariff.

Attachment B – Marked Tariff
Hybrid Resources and Co-located Resources
California Independent System Operator Corporation
September 8, 2021

Appendix A

* * * * *

- High Sustainable Limit

The instantaneous generating capability of a variable Generating Unit (or component thereof), provided to the CAISO through telemetry at the Generating Unit.

* * * * *

- Hybrid Dynamic Limit

A Real-Time Market Bid parameter representing the real-time capabilities of Hybrid Resources, used to ensure feasible Schedules.

* * * * *

Section 4

* * * * *

4.6.11 Storage Operating Characteristics

Pursuant to Section 4.6.4, a Scheduling Coordinator for a storage resource participating as a Non-Generator Resource or Pumped-Storage Hydro Unit must submit to the CAISO the operational and technical constraints to the Master File representing an accurate reflection of the resource's design capabilities and its constituent equipment when operating at maximum sustainable performance over Minimum Run Time, recognizing that resource performance may degrade over time. Non-Generator Resources, Hybrid Resources, and Pumped-Storage Hydro Units may include among their Master File parameters the constraints listed in Section 27.9 to the extent they comply with this Section.

* * * * *

4.18 Hybrid Resources

In addition to the rights and obligations of this section, Hybrid Resources are Generating Units subject to Section 4.6. Scheduling Coordinators for Hybrid Resources will provide data regarding the capacity and the operating characteristics of their components as may be reasonably requested from time to time by the CAISO. All information provided to the CAISO regarding the operational and technical constraints in

the Master File must be an accurate reflection of the design capabilities of the Hybrid Resources and their constituent equipment when operating at maximum sustainable performance over Minimum Run Time, recognizing that performance may degrade over time. Hybrid Resources are not Variable Energy Resources or Eligible Intermittent Resources; however, consistent with Section 4.8.2, Hybrid Resources that include a variable component must provide the CAISO with the data for that component that would be required by Appendix Q. Hybrid Resources with a variable or intermittent component also must provide the CAISO with telemetry and Meter Data on the variable components in addition to the Generating Facility's metering requirements under Section 10. Hybrid Resources' telemetry must include the High Sustainable Limit. Hybrid Resources that include an energy storage component must provide the CAISO with telemetry on the energy storage component's State of Charge.

* * * * *

Section 27

* * * * *

27.13 Aggregate Capability Constraint

At the request of the Interconnection Customer, ~~the~~ the CAISO may enforce an Aggregate Capability Constraint for Generating Facilities with Co-located Resources that reflects a Generating Facility's maximum and minimum capability or a portion of that capability for purposes of Day-Ahead Market Awards, Real-Time Market Awards, and Real-Time Dispatch as described in the CAISO's Business Practice Manuals. If the combined PMax of Co-located Resources associated with a single Generating Facility would exceed the Interconnection Service Capacity of that Generating Facility, the Interconnection Customer may request that the CAISO enforce an Aggregate Capability Constraint or multiple Aggregate Capability Constraints at the Generating Facility as described in the CAISO's Business Practice Manuals. If the Interconnection Customer requests that the CAISO enforce multiple Aggregate Capability Constraints, the CAISO will enforce an Aggregate Capability Constraint at the Generating Facility level and subordinate Aggregate Capability Constraints at the level of Resource IDs.

If the Interconnection Customer ~~elects to forego~~ does not elect an Aggregate Capability Constraint(s), the combined PMax of the Co-located Resources registered in the Master File for that Generating Facility may not exceed the Generating Facility's Interconnection Service Capacity. EIM Participating Resource Scheduling Coordinators also may request that the CAISO enforce an Aggregate Capability Constraint or multiple Aggregate Capability Constraints for Co-located Resources, subject to the prior written approval of the applicable EIM Entity Balancing Authority that enforcing an Aggregate Capability Constraint(s) for Co-located Resources does not create a threat to safety or reliability.

As described in the CAISO's Business Practice Manuals the CAISO may relax enforcement of subordinate Aggregate Capability Constraints in its Real-Time Market prior to relaxing enforcement of the system energy-balance constraint specified in Sections 27.4.3.3.4 to ensure there is sufficient Supply to meet the CAISO Forecast of CAISO Demand.

Notwithstanding Section 34.13, a Generating Facility whose Co-located Resources, including Variable Energy Resources, do not comply with Dispatch Instructions such that their output ~~would exceed~~ the Interconnection Service Capacity of the Generating Facility, will be ineligible for the Aggregate Capability Constraint. In such cases, the CAISO will adjust the PMaxes of those Co-located Resources' PMaxes proportionate to each Generating Unit's capacity such that the sum of the PMaxes values equals the Interconnection Service Capacity of the Generating Facility, or as requested by the Interconnection Customer so long as the total value does not exceed the Interconnection Service Capacity of the Generating Facility.

Similar to other Generating Facilities with multiple Resource IDs, the CAISO will have no liability with respect to Co-located Resources or their Scheduling Coordinators if Co-located Resources do not comply with Dispatch Instructions and infringe on Interconnection Service Capacity used by other Co-located Resources at a Generating Facility.

In the event that Co-located Resources in an EIM Entity Balancing Authority area do not comply with Dispatch Instructions such that their output exceeds the interconnection service capacity for the Co-located Resources, the CAISO will ask the applicable EIM Entity Balancing Authority whether it will revoke its prior approval of enforcing the Aggregate Capability Constraint for such Co-located Resources. The following resources are not eligible to use the Aggregate Capability Constraint: Multi-Stage Generators, Pseudo-Tie Resources, Proxy Demand Response, Pumped Storage Hydro Units, Metered Sub-~~S~~systems, and Use-Limited Resources.

Scheduling Coordinators may not offer or self-provide Ancillary Services into the CAISO's Markets or receive Uncertainty Awards from Generating Units that are subject to Aggregate Capability Constraints until the CAISO issues a Market Notice stating this restriction will no longer apply. The Pricing Node for the Generating Units or EIM Participating Resources subject to an Aggregate Capability Constraint will be their Point of Interconnection.

* * * * *

Section 29

* * * * *

29.2 EIM Entity Access to the Real-Time Market

* * * * *

(b) Implementation of Access as an EIM Entity.

* * * * *

(7) Readiness Criteria.

* * * * *

- (C) **Forecasting Capability.** The CAISO and, to the extent the prospective EIM entity will use its own forecasts or is otherwise required to provide forecasting information to the CAISO, the prospective EIM Entity have demonstrated their respective forecasting capability through –
- (i) the definition of EIM Demand forecast boundaries based on the conforming and non-conforming Load characteristics, as applicable;
 - (ii) the accuracy of the CAISO forecast of EIM Demand based on historical actual Load data for the defined EIM Demand forecast boundaries;
 - (iii) the identification of weather stations locations used in forecasting, as applicable; ~~and~~
 - (iv) the identification of the source of Variable Energy Resource forecasts pursuant to Section 29.11(j); ~~and-~~
 - (v) the identification of the source of Hybrid Resource forecasts pursuant to Section 29.11(j).

* * * * *

29.6 Communications

- (a) **EIM Entity.** The EIM Entity shall meet the technical and communication requirements specified in the Business Practice Manual for the Energy Imbalance Market, which shall be based on the Inter-Control Center Communication Protocol and Reliability Standards.
- (b) **EIM Communications and OASIS.** Section 6 shall govern communications and information availability regarding the participation of EIM Market Participants in the Real-Time Market except that –
 - (1) references to internal resources shall be deemed to include EIM Resources;
 - (2) references in Sections 6.2.2.1 and 6.5.2.1 to the CAISO Controlled Grid and references in Sections 6.5.4.2.2(a) and 6.5.5.1.1 to CAISO Balancing Authority Area shall be deemed references to the EIM Area; and
 - (3) the provisions of Section 6.3.1 that authorize the CAISO to communicate directly with Generators and Demand Response Providers to ensure System Reliability shall not apply to Generators and Demand Response Providers in the EIM Entity's Balancing Authority Area or pseudo-tied from an external Balancing Authority Area to the EIM Entity Balancing Authority Area.
- (c) **Loss of Communications.**

- (1) **Procedures.** The CAISO and each EIM Entity and EIM Entity Scheduling Coordinator shall establish procedures to address an interruption of Real-Time Market communications, which shall include steps to be taken to restore communications and address any impact on system or market operations as provided in Section 29.
- (2) **Responsibilities.** An EIM Entity that loses communication with the CAISO remains responsible for managing its Balancing Authority Area imbalance needs without balancing Energy from the Real-Time Market.
- (d) **Variable Energy Resource Forecast Communications.** If the EIM Participating Resource Scheduling Coordinator for a Variable Energy Resource elects to use an independent forecasting service, it must make data transfer arrangements with the CAISO for the CAISO to receive the forecast in a format and on a schedule set forth in the Business Practice Manual for the Energy Imbalance Market.
- (e) **Hybrid Resource Forecast Communications.** If the EIM Participating Resource Scheduling Coordinator for a Hybrid Resource elects to use an independent forecasting service, it must make data transfer arrangements with the CAISO for the CAISO to receive the forecast in a format and on a schedule set forth in the Business Practice Manual for the Energy Imbalance Market.

* * * * *

29.11 Settlements and Billing for EIM Market Participants.

* * * * *

- (j) **Variable Energy Resource and Hybrid Resource Forecast Charge.**
 - (1) **In General.** The CAISO will charge EIM Entity Scheduling Coordinators and EIM Participating Resource Scheduling Coordinators a fee for the Variable Energy Resource or Hybrid Resource forecasting services in accordance with Appendix F, Schedule 4.
 - (2) **Waiver.** The CAISO will waive the Variable Energy Resource or Hybrid Resource forecast charge if an EIM Entity has an independent forecast for its Variable Energy Resources or Hybrid Resource and provides the independent forecast to the CAISO.

* * * * *

29.34 EIM Operations

* * * * *

- (q) **Variable Energy Resources and Hybrid Resources.** Provisions of Section 34 specifically applicable to Variable Energy Resources and Eligible Intermittent Resources appear in Sections 34.1.3, 34.1.6, 34.2.2, 34.5.1. 34.13.2. Provisions of Section 34 specifically applicable to Hybrid Resources appear in Section 34.1.6.3.

* * * * *

Section 30

* * * * *

30.5.6.1 Hybrid Resource Bids

In addition to the Bid components listed in this Section 30.5, Scheduling Coordinators representing Hybrid Resources will submit Hybrid Dynamic Limits representing Hybrid Resources' upper economic limit and lower economic limit in each Real-Time Market five-minute Trading Interval for a rolling six-hour look-ahead period. These limits will reflect the range of the Hybrid Resource's Economic Bids or Self-Schedules. Hybrid Dynamic Limits should reflect resource availability based on operating capabilities such as State of Charge and forecasted output from the variable component of a Hybrid Resource. Scheduling Coordinators may also use Hybrid Dynamic Limits to manage onsite charging of an energy storage component of a Hybrid Resource.

The CAISO will use reasonable efforts to issue Real-Time Market Schedules that respect Hybrid Dynamic Limits. Scheduling Coordinators may not submit Hybrid Dynamic Limits in the Day-Ahead Market.

* * * * *

Section 31

* * * * *

31.2 Day-Ahead MPM Process

After the Market Close of the DAM, and after the CAISO has validated the Bids pursuant to Section 30.7, the CAISO will perform the MPM process, which is a single market run that occurs prior to the IFM Market

Clearing run. The Day-Ahead MPM process determines which Bids need to be mitigated to the applicable Default Energy Bids in the IFM pursuant to Section 31.2.3. For Maximum Net Dependable Capacity of Legacy RMR Units, Bids will be mitigated to the RMR Proxy Bids pursuant to Section 31.2.3. The Day-Ahead MPM process optimizes resources to meet Demand reflected in Demand Bids, including Export Bids and Virtual Demand Bids, and to procure one hundred (100) percent of Ancillary Services requirements based on Supply Bids submitted to the DAM. Virtual Bids and Bids from Demand Response Resources, Participating Load, Hybrid Resources, and Non-Generator Resources are considered in the MPM process, but are not subject to Bid mitigation. Bids from Participating Load resources that are not subject to Bid mitigation will also be considered in the MPM process. Bids from resources comprised of multiple technologies that include Non-Generator Resources will remain to be subject to all applicable market power mitigation under the CAISO Tariff, including Local Market Power Mitigation. The mitigated or unmitigated Bids and RMR Proxy Bids identified in the MPM process for all resources that cleared in the MPM are then passed to the IFM. The CAISO performs the MPM process for the DAM for the twenty-four (24) hours of the targeted Trading Day.

* * * * *

Section 34

* * * * *

34.1.5 Mitigating Bids in the RTM

34.1.5.1 Generally

After the Market Close of the RTM, after the CAISO has validated the Bids pursuant to Section 30.7 and Section 34.1.4, and prior to conducting any other RTM processes, the CAISO conducts a MPM process. The results are used in the RTM optimization processes. Bids on behalf of Demand Response Resources, Participating Load, Hybrid Resources, and Non-Generator Resources are considered in the MPM process but are not subject to Bid mitigation. Bids from resources comprised of multiple technologies that include Non-Generator Resources will remain to be subject to all applicable market power mitigation under the CAISO Tariff, including Local Market Power Mitigation.

* * * * *

34.1.6.3 ~~[Not Used]~~ Hybrid Resources

The CAISO will use reasonable efforts to issue Real-Time Market Schedules that observe Hybrid Resources' Dynamic Limits, High Sustainable Limits, State of Charge, and production forecasts, as applicable. Hybrid Resources with a variable component may elect to receive a CAISO forecast to inform their bidding, or they may elect to use their own forecast. For Hybrid Resources that have elected to use their own forecast as specified in Section 4.8.2.1.1, the responsible Scheduling Coordinator must submit to the CAISO its forecast for the variable component for the binding interval by 37.5 minutes prior to flow (the start of the applicable FMM optimization for the binding interval). If such Scheduling Coordinator does not provide such forecast to the CAISO, the CAISO will use the direct telemetry MW output from the resource's variable component.

* * * * *

Section 40

* * * * *

40.9.2 Exemptions

- (a) **Capacity Exempt from RAAIM – All Provisions.** The entire capacity of a resource in any of the following categories is exempt from the RAAIM provisions in Section 40.9 –
- (1) Resources with a PMax less than 1.0 MW;
 - (2) Non-specified resources that provide Resource Adequacy Capacity under contracts for Energy delivered within the CAISO Balancing Authority Area;
 - (3) Participating Load that is also Pumping Load; and
 - (4) Legacy RMR Units.
- (b) **Capacity Exempt from RAAIM – Local/System**
- (1) The entire capacity of a resource in any of the following categories is exempt from the RAAIM provisions in Section 40.9 applicable to local and system Resource Adequacy Capacity –
 - (A) Variable Energy Resources;
 - (B) Combined Heat and Power Resources; ~~and~~
 - (C) Run-of-River Resources; ~~and-~~
 - (D) Hybrid Resources.
 - (2) The capacity of a resource with a Load-following MSS as its Scheduling Coordinator that is designated on a Load-following MSS's monthly Resource Adequacy Plan is exempt from the RAAIM provisions in Section 40.9 applicable to local and system Resource Adequacy Capacity, to the extent that the resource's capacity is also designated as Resource Adequacy Capacity on the monthly Supply Plan of that Load-following MSS or another Load-following MSS.
 - (3) Resources with Existing QF Contracts or Amended QF Contracts that are Resource Adequacy Resources are exempt from the RAAIM provisions in Section 40.9 applicable to local and system capacity --
 - (A) if the QF resource previously provided Resource Adequacy Capacity pursuant to an Existing QF Contract that was executed prior to August 22, 2010 and remained in effect pursuant to California Public Utilities Commission Decision 07-09-040 that extended the term of expiring contracts until such time as the new contracts resulting from that decision are available; or

(B) until the QF Resource's Existing QF Contract or Amended QF Contract terminates or if requested by the Scheduling Coordinator for the resource, whichever is earlier.

(c) **Capacity Exempt from RAAIM – Flexible Capacity.**

- (1) The capacity of Use-Limited Resources in a combination under Section 40.10.3.2(b), 40.10.3.3(b) or 40.10.3.4(b) is exempt from the RAAIM provisions in Section 40.9 applicable to Flexible RA Capacity to the extent that the resources are committed to provide Flexible RA Capacity as a combination on their respective monthly Supply Plans.
- (2) The Capacity of a resource with a Load-following MSS as its Scheduling Coordinator that is designated on a Load-following MSS's monthly Flexible RA Plan is exempt from the RAAIM provisions in Section 40.10 applicable to Flexible RA Capacity, to the extent that the resource's capacity is also designated as Flexible RA Capacity on the monthly Supply Plan of that Load-following MSS or another Load-following MSS.

* * * * *

40.10.4 Effective Flexible Capacity

The CAISO shall calculate the Effective Flexible Capacity value for each resource. The CAISO shall publish the draft and final lists of the Effective Flexible Capacity values for such resources and the Flexible Capacity Categories for which each resource qualifies to provide Flexible Capacity on the CAISO Website each year in accordance with the schedule for publishing the Net Qualifying Capacity values, as set forth in the BPM, for use in the next calendar year.

40.10.4.1 Effective Flexible Capacity Calculation

- (a) **Flexible Resources.** The CAISO will calculate the Effective Flexible Capacity value of a resource, for use (i) if a Local Regulatory Authority has not established criteria for calculating the Effective Flexible Capacity value for eligible resource types, and (ii) for determining if a cumulative deficiency exists under Sections 43A.2.7(a) and (b), as follows, except as provided in Sections 40.10.4.1 (b) through (f) –
 - (1) If the Start-Up Time of the resource is greater than 90 minutes, the Effective Flexible Capacity value shall be the weighted average ramp rate of the resource calculated from PMin to Net Qualifying Capacity multiplied by 180 minutes. The Effective Flexible Capacity shall not exceed the difference between the PMin and PMax of the resource.
 - (2) If the Start-Up Time of the resource is less than or equal to 90 minutes, the Effective Flexible Capacity value shall be the resource's PMin plus the weighted average ramp rate of the resource calculated from PMin to Net Qualifying Capacity multiplied by the difference between 180 minutes and the resource's Start-Up Time. The Effective Flexible Capacity shall not exceed the Net Qualifying Capacity of the resource.
- (b) **Hydroelectric Generating Unit.** The Effective Flexible Capacity of a hydroelectric generating unit will be the amount of capacity from which the resource can produce Energy consistently for 6 hours assuming that the resource's physical storage is at

maximum capacity at the beginning of that six-hour period. The Effective Flexible Capacity of a hydroelectric generation unit cannot, however, exceed its Net Qualifying Capacity.

- (c) **[Not Used]**
- (d) **Energy Storage Resource.** The Effective Flexible Capacity value for an energy storage resource will be determined as follows –
 - (1) for an energy storage resource that provides Flexible RA Capacity but not Regulation Energy Management, the Effective Flexible Capacity value will be the MW output range the resource can provide over three hours of charge/discharge while constantly ramping.
 - (2) for an energy storage resource that provides Flexible RA Capacity and Regulation Energy Management, the Effective Flexible Capacity value will be the resource's 15-minute energy output capability.
- (e) **Multi-Stage Generating Resource.** The Effective Flexible Capacity value for a Multi-Stage Generating Resource will be calculated using the longest Start-Up Time of the resource's configuration that has the lowest PMin.
- (f) **Combined Heat and Power Resource.** The Effective Flexible Capacity value of a Combined Heat and Power Resource will be the lesser of (i) the resource's Net Qualifying Capacity, or (ii) the MW difference between the CHP resource's maximum output and its RMTMax, if the resource has a RMTMax, or its minimum operating level, such quantity not to exceed the quantity of generating capacity capable of being delivered over a three-hour period.
- (g) **Hybrid Resource.** The Effective Flexible Capacity value of a Hybrid Resource is the sum of what the Effective Flexible Capacity values of the constituent components of the Hybrid Resource would be if those components were each a distinct Generating Unit.

* * * * *

Appendix F

* * * * *

Schedule 4

Eligible Intermittent Resources Forecast Fee

A charge up to \$.10 per MWh shall be assessed on the metered Energy from (a) Eligible Intermittent Resources; (b) Variable Energy Resources that are EIM Participating Resources; and (c) the variable component of Hybrid Resources as a Forecast Fee, provided that Eligible Intermittent Resources Generating Units smaller than 10 MW that are not Participating Intermittent Resources and that sold-sell power pursuant to a power purchase agreement entered into pursuant to PURPA prior to entering into a PGA or Net Scheduled PGA shall be exempt from the Forecast Fee.

The rate of the Forecast Fee shall be determined so as to recover the projected annual costs related to developing Energy forecasting systems, generating forecasts, validating forecasts, and monitoring

forecast performance, that are incurred by the CAISO as a direct result of participation by Eligible Intermittent Resources Variable Energy Resources that are EIM Participating Resources, and the variable component of Hybrid Resources -in CAISO Markets, divided by the ir projected annual Energy production by all Eligible Intermittent Resources.

The initial Forecast Fee, and all subsequent changes as may be necessary from time to time to recover costs incurred by the CAISO for the forecasting conducted on the behalf of Eligible Intermittent Resources, Variable Energy Resources that are EIM Participating Resources, and the variable component of Hybrid Resources pursuant to the foregoing rate formula, shall be set forth in a Business Practice Manual.

* * * * *

Appendix K

Part A CERTIFICATION FOR REGULATION

* * * * *

A 1.2.2.4 Ancillary Service Providers for Non-Generator Resources (whether or not the resource uses Regulation Energy Management) and Hybrid Resources shall provide CAISO the following additional telemetry data as applicable

- Resource Ramp Rate when operating as Generation (MW/min);
- Resource Ramp Rate when operating as Load (MW/min);
- The maximum instantaneous ability to produce or consume Energy in MW; and
- The maximum capability to provide Energy as expressed in MWh over a fifteen (15) minute interval where the Scheduling Coordinator has elected to provide MWh constraints pursuant to Section 27.9 of the CAISO Tariff.

A 1.2.2.5 Ancillary Service Providers for an Eligible Intermittent Resource or a Hybrid Resource with a variable component must provide the CAISO High Sustainable Limit for their resource.

* * * * *

Part B CERTIFICATION FOR SPINNING RESERVE

* * * * *

B 1.7: Ancillary Service Providers for an Eligible Intermittent Resource or a Hybrid Resource with a variable component must provide the CAISO with the High Sustainable Limit for their resource.

Part C CERTIFICATION FOR NON-SPINNING RESERVE

* * * * *

C 2.3 Ancillary Service Providers for an Eligible Intermittent Resource or a Hybrid Resources with a variable component must provide the CAISO with the High Sustainable Limit for their resource.

* * * * *

Appendix Q

Eligible Intermittent Resources Protocol (EIRP)

1 SCOPE

1.1 Scope of Application to Parties

This EIRP applies to the CAISO and to:

- (a) Scheduling Coordinators (SCs);
- (b) Eligible Intermittent Resources that are not certified as Participating Intermittent Resources;
- (c) Participating Intermittent Resources; and
- (d) Hybrid Resources with a wind generation or solar generation component.

1.2 Liability of the CAISO

Any liability of the CAISO arising out of or in relation to this EIRP shall be subject to Section 14 of the CAISO Tariff as if references to the CAISO Tariff were references to this EIRP.

2 REQUIREMENTS FOR ELIGIBLE INTERMITTENT RESOURCES, -AND- PARTICIPATING INTERMITTENT RESOURCES, AND HYBRID RESOURCES WITH VARIABLE COMPONENT

2.1 No Mandatory Participation

Eligible Intermittent Resources may elect to be scheduled and settled as the CAISO Tariff

provides for Generating Units, and are not required to seek certification as Participating Intermittent Resources.

2.2 Minimum Certification Requirements

~~These~~ Eligible Intermittent Resources, ~~and~~ Participating Intermittent Resources, and Hybrid Resources with a variable component must meet the following requirements, as applicable.

2.2.1 Agreements

The following agreements must be executed by the owner or operator of any Eligible Intermittent Resource, unless that resource is not subject to any of these agreements pursuant to the CAISO Tariff, such as an Eligible Intermittent Resource of an MSS Operator:

- (a) A Participating Generator Agreement, Net Scheduled PGA, Dynamic Scheduling Agreement for Scheduling Coordinators, or Pseudo-Tie Participating Generator Agreement that, among other things, binds the Eligible Intermittent Resource to comply with the CAISO Tariff; and
- (b) A Meter Service Agreement for CAISO Metered Entities, for all Eligible Intermittent Resources other than Dynamic System Resources.

If an Eligible Intermittent Resource intends to become a Participating Intermittent Resource, it must also execute a letter of intent, which when executed and delivered to the CAISO shall initiate the process of certifying the Participating Intermittent Resource. The form of the letter of intent shall be specified by the CAISO in a Business Practice Manual.

Hybrid Resources with a variable component must execute all agreements that are otherwise required in this CAISO tariff.

2.2.2 Composition of a Participating Intermittent Resource

The CAISO shall develop criteria to determine whether one or more Eligible Intermittent Resources may be included within a Participating Intermittent Resource. Such criteria shall include:

- (a) A Participating Intermittent Resource must be at least one (1) MW rated capacity.
- (b) A Participating Intermittent Resource may include one (1) or more Eligible Intermittent Resources that have similar response to weather conditions or other variables relevant to forecasting Energy, as determined by the CAISO.
- (c) Each Participating Intermittent Resource shall be electrically connected at a single point on the CAISO Controlled Grid, except as otherwise permitted by the CAISO on a case-by-case basis as may be allowed under the CAISO Tariff. Interconnection to a portion of the CAISO Controlled Grid outside or not contiguous to the CAISO Balancing Authority Area does not make an Eligible Intermittent Resource that is a Dynamic System Resource or Pseudo-Tie Generating Unit eligible to be included within a Participating Intermittent Resource.
- (d) The same Scheduling Coordinator must schedule all Eligible Intermittent Resources aggregated into a single Participating Intermittent Resource.

2.2.3 Equipment Installation

~~An~~ Eligible ~~Participating~~ Intermittent Resources and Hybrid Resources with a variable component must install and maintain the communication equipment required pursuant to Section 3 of this EIRP, and the equipment supporting forecast data required pursuant to Section ~~6-4~~ of this EIRP.

2.2.4 Forecast Model Validation

The CAISO must determine that sufficient historic and real-time telemetered data are available to support an accurate and unbiased forecast of Energy generation by a Participating Intermittent Resource, according to the forecasting process validation criteria described in Section 4 of this EIRP.

2.2.5 [Not Used]

2.3 Notice of Certification of a Participating Intermittent Resource

When all requirements described in Section 2.2 of this EIRP applicable to Participating Intermittent Resources have been fulfilled, the CAISO shall notify the Scheduling Coordinator and the representatives of the Eligible Intermittent Resources comprising the Participating Intermittent Resource that the Participating Intermittent Resource has been certified, and is eligible for the settlement terms provided under Section 11.12 of the CAISO Tariff, as conditioned by the terms of this EIRP.

2.4 Additional Requirements

2.4.1 Forecast Fee

An Eligible Intermittent Resource must pay the Forecast Fee for all metered Energy generated by the Eligible Intermittent Resource, as specified in CAISO Tariff Appendix F, Schedule 4. A Hybrid Resource with a variable component must pay the Forecast Fee for all metered Energy generated by variable component, as specified in CAISO Tariff Appendix F, Schedule 4, if it elects, per section 3.1 of this EIRP, to have the CAISO produce a forecast of the output of the Hybrid Resource's variable component.

2.4.2 Modification of Participating Intermittent Resource Composition

A Participating Intermittent Resource may seek to modify the composition of the Participating Intermittent Resource (e.g., by adding or eliminating an Eligible Intermittent Resource from the Participating Intermittent Resource). Such changes shall not be implemented without prior compliance with the written approval by the CAISO. The CAISO will apply consistent criteria and expeditiously review any proposed changes in the composition of a Participating Intermittent Resource.

2.4.3 Changes in Scheduling Coordinator

This EIRP does not impose any additional requirement for CAISO approval to change the Scheduling Coordinator for an approved Participating Intermittent Resource than would otherwise apply under the CAISO Tariff to changes in the Scheduling Coordinator representing a Generating Unit.

2.4.4 Continuing Obligation

~~A Participating Intermittent Resource or~~ Eligible Intermittent Resources (including Participating Intermittent Resources) and Hybrid Resources with a variable component must have a continuing obligation to meet all applicable obligations established ~~for Participating Intermittent Resources or~~

~~Eligible Intermittent Resources~~ under the CAISO Tariff and this EIRP, and must fully cooperate in providing all data, other information, and authorizations the CAISO reasonably requests to fulfill its obligation to validate forecast models and explain deviations.

2.4.5 Failure to Perform

If the CAISO determines that a material deficiency has arisen in the Participating Intermittent Resource's fulfillment of its obligations under the CAISO Tariff and this EIRP, and such Participating Intermittent Resource fails to promptly correct such deficiencies when notified by the CAISO, then the eligibility of the Participating Intermittent Resource for the settlement accommodations provided in Section 11.12 of the CAISO Tariff shall be suspended until such time that the unavailable data is provided or other material deficiency is corrected to the CAISO's reasonable satisfaction. Such suspension shall not relieve the Scheduling Coordinator for the deficient Participating Intermittent Resource from paying the Forecast Fee over the duration of the period covered by the letter of intent described in Section 2.2.1(c) of this EIRP.

3 COMMUNICATIONS

3.1 Forecast Data

The CAISO may require various data relevant to forecasting Energy from ~~the an~~ Eligible Intermittent Resource or Hybrid Resource with a variable component to be telemetered to the CAISO, including appropriate operational data, meteorological data or other data reasonably necessary to forecast Energy.

In order for the CAISO to forecast Energy, an Eligible Intermittent Resource or Hybrid Resource with a variable component must provide the CAISO with MW production data and meteorological data as outlined in this Eligible Intermittent Resources Protocol. This data must be collected for a minimum of thirty (30) consecutive days and be of sufficient quality as determined by a CAISO to produce a state of the art forecast.

A Hybrid Resource with a wind generation or solar generation component may elect to provide its own forecasted production in lieu of a CAISO forecast but such election does not relieve the resource of the obligation to provide production data and meteorological data as otherwise required in this Eligible Intermittent Resources Protocol.

3.1.1 Wind Generation Meteorological Station Requirements

Each wind Eligible Intermittent Resource or Hybrid Resource with a wind generation component must install and maintain equipment required by the CAISO to support accurate power generation forecasting and the communication of such forecast, meteorological, and other required data to the CAISO consistent with the timeframes specified in this Eligible Intermittent Resource Protocol.

3.1.1.1 Each wind Eligible Intermittent Resource or Hybrid Resource with a wind generation component shall install a minimum of one meteorological station to measure barometric pressure, temperature, wind speed and direction. If ~~a wind Eligible Intermittent Resource~~ such a resource has a rated capacity of five (5) MW or greater, ~~then the resource~~ Eligible Intermittent Resource shall install a minimum of two meteorological stations to measure barometric pressure, temperature, wind speed and direction. If an Eligible Intermittent Resource or Hybrid Resource with a wind generation component, as part of compliance with any other contractual or regulatory requirement outside of this Eligible Intermittent Resource Protocol, provides data from more than the two required meteorological stations to an entity other than the CAISO, then the ~~Eligible~~

Intermittent Resource-resource must also submit data from any additional meteorological station to the CAISO.

3.1.1.2 Each wind Eligible Intermittent Resource or Hybrid Resource with a wind generation component shall locate its meteorological station(s) on the windward side of the wind farm. Each wind Eligible Intermittent Resource-such resource must install one meteorological station at the average hub height of the wind turbines. Hub height is the distance from the ground to the center of the turbine axis. If a second meteorological station is required, then it may be so co-located with the primary station. The approximate distance separating the primary station and the secondary station shall be an average of one (1) rotator blade length. Where placement of the meteorological station(s) in accordance with this Eligible Intermittent Resource Protocol would reduce production or violate a local, state, or federal statute, regulation or ordinance, the CAISO, in coordination with any applicable forecast service provider, will coordinate with the Eligible Intermittent Resource-resource to identify an acceptable placement of the meteorological station.

3.1.1.3 The use of SODAR¹ and/or LIDAR² equipment may be an acceptable substitute for wind direction and velocity only after obtaining prior agreement from the CAISO.

3.1.1.4 Wind Eligible Intermittent Resources and Hybrid Resources with a wind generation component may not satisfy the meteorological station location requirements through a sharing agreement with another resource.

3.1.2 Wind Generation Meteorological Data Requirements

Table Q-1 details the units and accuracy of measurements for telemetry data points wind Eligible Intermittent Resources and Hybrid Resources with a wind generation component must send to the CAISO in real time (i.e., every 4 seconds).

Table Q-1 Wind Eligible Intermittent Resources-Telemetry Data Points

Element	Device(s) Needed	Units	Accuracy
Wind Speed (Meter / Second)	Anemometer, wind vane and wind mast	m/s	± 2m/s
Air Temperature (Degrees Celsius)	Temperature probe & shield for ambient temp	°C	± 1°
Barometric Pressure (hecto Pascals)	Barometer	hPA	± 60 hPa
Real Time Data		MWs*	
<u>High Sustainable Limit (for Hybrid Resources with a wind generation component and wind EIRs that are a Co-located Resource</u>		<u>MWs**</u>	

¹ SODAR means Sonic Detection and Ranging- a meteorological instrument also known as a wind profiler which measures the scattering of sound waves by atmospheric turbulence.

² LIDAR means Light Detection and Ranging - a meteorological instrument which measures the properties of scattered light waves caused by atmospheric turbulence.

* Hybrid Resources with a wind generation component must provide MW values through telemetry for both the wind generation component and the overall Hybrid Resource

** High Sustainable Limit may be updated every 12 seconds.

3.1.3 Designated Turbines

For any wind eligible Intermittent Resource or Hybrid Resource with a wind generation component, designated turbines are required to improve forecast accuracy within a wind park. The CAISO shall identify a designated turbine, from which the ~~Eligible Intermittent Resource~~ resource shall provide nacelle wind speed and wind direction every four seconds. Wind EIRs with a PGA or NS PGA that are operating or have final regulatory approvals to construct as of November 1, 2018, that have wind turbines without nacelle anemometers need not comply with the requirements of this section for Designation Turbines. However, when the wind EIR repowers or replaces a portion of its existing wind turbines, then the Wind EIR must become compliance with the requirements of this section for Designated Turbines.

3.1.4 Topographical Map

A wind Eligible Intermittent Resource or Hybrid Resource with a wind generation component must submit a topographical map that illustrates the location and height for each wind turbine within a wind park. The map must identify all meteorological stations and turbine location by latitude and longitude and should be in degrees/decimals using WGS84 geodetic datum only.

3.1.5 Site Information **Form**

A wind Eligible Intermittent Resource or Hybrid Resource with a wind generation component must provide the site information specified below in the manner and format as specified through the complete and submit the site information in Table Q-2 according to the schedule and data submittal requirements of the CAISO new resource implementation process. Latitude and Longitude should be in degrees/decimals using WGS84 geodetic datum only.

1. Park Potential (MW; numeric-float field [example: 100.5])
2. Resource Project Corner Coordinates in WGS84 format
3. Meteorological Station ID Numbers
4. Meteorological Station Coordinates in WGS84 format
5. Address
6. Resource ID
7. MW Generation Capacity
8. Plant Location (Latitude and Longitude in WGS84)
9. Lidar or Sodar (required)
10. Make (required; alphanumeric)
11. Model (required; alphanumeric)
12. Wind Speed (Anemometer) (required; alphanumeric)
13. Wind Direction (Anemometer) (required; alphanumeric)
14. Air Temperature (required; alphanumeric)
15. Barometric Pressure (required; alphanumeric)
16. Wind Turbine Group Numbers
17. Turbine Specifications:
18. Number of Turbines (numeric field)
19. Turbine Manufacturer (alphanumeric field)
20. Turbine Model (alphanumeric field)
21. Turbine Maximum Generation Capacity (numeric field)
22. Turbine Height Above Ground Level (numeric field)

(m/s)					
Rated Speed (m/s)					
Cut-Out Speed (m/s)					
Cold Weather Package (Yes or No)					
Hot Weather Package (Yes or No)					
Low Temperature Cut-Out (deg-C)					
High Temperature Cut-Out (deg-C)					

3.1.6 Shape-File Submission

Each wind Eligible Intermittent Resource and Hybrid Resource with a wind generation component must submit a shape-file that illustrates, at a minimum, the location of the meteorological station(s), resource project corner, and all individual wind turbines comprising the resource. The shape-file must be submitted in .shp, .dbf, or other file format upon which the CAISO and resource mutually agree.

3.2.1 Solar Generation Meteorological Station Requirements

Each solar Eligible Intermittent Resource and Hybrid Resource with a solar generation component must install and maintain equipment required by the CAISO to support accurate power generation forecasting and the communication of such forecast, meteorological, and other required data to the CAISO consistent with the timeframes specified in this Eligible Intermittent Resource Protocol.

3.2.1.1 Each solar Eligible Intermittent Resource and Hybrid Resource with a solar generation component shall install a minimum of one meteorological station. If such a resource a solar Eligible Intermittent Resource has a rated capacity of five (5) MW or greater, the Eligible Intermittent Resource resource shall install a minimum of two meteorological stations. If an Eligible Intermittent Resource or Hybrid Resource with a solar generation component, as part of compliance with any other contractual or regulatory requirement outside of this Eligible Intermittent Resource Protocol, provides data from more than the two required meteorological stations to an entity other than the CAISO, then the Eligible Intermittent Resource resource must also submit data from any additional meteorological station to the CAISO.

3.2.1.2 Solar Eligible Intermittent Resources and Hybrid Resources with a solar generation component that require direct normal irradiance (DNI) and global horizontal irradiance (GHI) measurements may provide alternate radiometry meteorological station data. For example, one meteorological station may report DNI and another meteorological station may report GHI. All other meteorological data reporting requirements shall remain the same.

3.2.1.3 Solar Eligible Intermittent Resources' Meteorological stations for solar Eligible Intermittent Resources shall cover at least 90 percent of the facility's footprint for each Resource ID. Meteorological stations for Hybrid Resources with a solar generation component must cover at least 90 percent of the solar generation component's footprint.

3.2.1.4 Subject to the CAISO's prior approval, Solar Eligible Intermittent Resources and Hybrid

Resources with a solar generation component may satisfy the meteorological station location requirements by entering a mutually agreeable sharing agreement(s) with another solar Eligible Intermittent Resources or Hybrid Resource with a solar generation component. The following conditions must apply for the CAISO to grant approval after obtaining the CAISO's prior approval when the following conditions apply:

- (a) One Eligible Intermittent Resource resource (the host plant) meets the meteorological station requirements; and
- (b) The site of the other Eligible Intermittent Resource resource (the sharing plant) lies contiguous to or overlaps the site of the host plant, or
- (c) Meteorological conditions on the sharing plant site are substantially similar to those on the host plant site.

Proof of the agreement between the host plant and sharing plant must be provided to the CAISO. Should the agreement terminate, the sharing plant must independently demonstrate it meets the meteorological tower requirements specified in this Eligible Intermittent Resource Protocol.

3.2.2 Solar Meteorological Data Requirements

Table Q-~~23~~ details the units and accuracy of measurements for telemetry data points solar Eligible Intermittent Resources and Hybrid Resources with a solar generation component must send to the CAISO in real time (i.e., every 4 seconds).

Table Q-~~23~~ Solar Eligible Intermittent Resources Telemetry Data Points

Element	Device(s) Needed	Units	Accuracy
Wind Speed (Meter / Second)	Anemometer, wind vane and wind mast	m/s	± 2m/s
Wind Direction (Degrees - Zero North 90CW)	Anemometer, wind vane and wind mast	Degrees	± 5°
Air Temperature (Degrees Celsius)	Temperature probe & shield for ambient temp	°C	± 1°
Barometric Pressure (hecto Pascals)	Barometer	hPA	± 60 hPa
Back Panel Temperature (Degree C)	Temperature probe for back panel temperature	°C	± 1°
Plane of Array Irradiance Watts\Meter Sq.	Pyranometer or Equivalent	W/m ²	± 25 W/m ²

Global Horizontal Irradiance Watts\Meter Sq.	Pyranometer or Equivalent	W/m ²	± 25 W/m ²
Direct Irradiance Watts\Meter Sq.	Pyranometer or Equivalent	W/m ²	± 25 W/m ²
<u>Real Time Data</u>		<u>MWs*</u>	
<u>High Sustainable Limit (for Hybrid Resources with a solar generation component and solar EIRs that are a Co-located Resource)</u>		<u>MWs**</u>	

* Hybrid Resources with a solar generation component must provide MW values through telemetry for both the solar generation component and the overall Hybrid Resource

** High Sustainable Limit may be updated every 12 seconds.

Table Q-34 details the minimum required (R) measurement of solar irradiance by each solar generating technology that solar Eligible Intermittent Resources and Hybrid Resources with a solar generation component must send to the CAISO consistent with the requirements of this Eligible Intermittent Resource Protocol.

Table Q-34 Irradiance and Back Plane Required Measurements

	Direct Irradiance (DIRD)	Global Horizontal Irradiance (GHIRD)	Global Irradiance/ Plane of Array (PAIRD)	Back Panel Temperature (BPTTEMP)
Flat-Plate PV (fixed / horizontal / flat roof)			R	R
Flat-Plate PV (fixed angle / azimuth tracking)			R	R
Flat-Plate PV (DNI zenith & azimuth tracking)	R		R	R
Flat-Panel Solar (thermal fixed angle mounted)			R	R
Flat-Panel Thermal Collector (azimuth tracking)			R	R
Low Concentrating PV (LCPV)	R	R		

	Direct Irradiance (DIRD)	Global Horizontal Irradiance (GHIRD)	Global Irradiance/ Plane of Array (PAIRD)	Back Panel Temperature (BPTMP)
High Concentrating PV (HCPV)	R	R		
Concentrated Solar Thermal (solar through zenith tracking)	R	R		
Heliostat Power (tracking focusing mirrors)	R	R		
Greenhouse Power Tower (hot air convection turbine)			R	
Stirling Engine (concentrated solar power generation)	R	R		

3.2.3 Site ~~Form~~ Information

A solar Eligible Intermittent Resource or Hybrid Resource with a solar generation component must provide the complete and submit the site information specified below in the manner and format as further specified in in Table Q-5 according to the schedule and data submittal requirements of the CAISO new resource implementation process. Latitude and Longitude should be in degrees/decimals using WGS84 geodetic datum only.

General Resource Information

1. Park Potential (MW; numeric-float field [example: 100.5])
2. Resource Project Corner Coordinates in WGS84 format
3. Meteorological Station ID Numbers
4. Meteorological Station Coordinates in WGS84 format
5. Address
6. Resource ID
7. MW Generation Capacity
8. Plant Location (Latitude and Longitude in WGS84)
9. Lidar or Sodar (required)
10. Make (required; alphanumeric)
11. Model (required; alphanumeric)
12. Wind Speed (Anemometer) (required; alphanumeric)
13. Wind Direction (Anemometer) (required; alphanumeric)
14. Air Temperature (required; alphanumeric)
15. Barometric Pressure (required; alphanumeric)
16. Irradiance (required; alphanumeric)
17. Back Panel Irradiance (required; alphanumeric)
18. MW Generation DC
19. Meteorological Station Sharing (Y or N: If 'Yes', require the project ID of the resource that

is being shared) (Validate that project key/code of host site exists)
20. Solar Panel Group Number

Solar Panel Specifications:

1. Panel Manufacturer (alphanumeric field)
2. Panel Model (alphanumeric field)
3. Number of Panels (numeric field)
4. Panel Power Rating (numeric field)
5. Number of Inverters (numeric field)
6. Inverter Ratings (alphanumeric field)
7. Tracking (Yes or No Dropdown)
8. Single or Dual Axis Tracking (Single, Dual, or None Dropdown)
9. Tracker Manufacturer (alphanumeric field)
10. Tracker Model (alphanumeric field)
11. Wind Protection (Speed in m/s)
12. Altitude Angle of Panels (alphanumeric field)
13. Azimuth Angle of Fixed Panels (alphanumeric field)
14. Height of Panels Above Ground Level
15. (alphanumeric field)
16. Concentrating PV (Yes or No Dropdown)
17. Solar Panel Coordinates (WGS84)

~~Table Q-5 CAISO Solar Site Required Information Form~~

Site Name & Physical Address								
CAISO_RES_ID								
Plant Type	PV or Thermal		If thermal, supplemental heating?		Y/N			
Plant Location Use as many points as necessary to describe the site	Corner 1		Corner 2		Corner 3		Corner 4	
	Lat	Long	Lat	Long	Lat	Long	Lat	Long
Meteorological Station Location Provide the location of all met data collection point at the site.	Met 1		Equipment Type		Met 2		Equipment Type	
Met Information	ID	Lat	Long	Height Agl	ID	Lat	Long	Height Agl
Generation Capacity	DC				AC			

Use multiple Groups for different panel types and installations					
	Group-1	Group-2	Group-3	Lat	Long
Panel Manufacturer					
Panel Model					
Number of Panels					
Panel Power Rating					
Number of inverters					
Inverter ratings					
Tracking (Yes or No)					
Single or Dual Axis Tracking					
Tracker Manufacturer					
Tracker Model					
Wind Protection (Speed in m/s for storage)					
Altitude Angle of Panels					
Azimuth Angle of Fixed Panels					
Height of Panels Above Ground Level					
Concentrating PV (Yes or No)					

3.2.4 Shape-File

Each solar Eligible Intermittent Resource and Hybrid Resource with a solar generation component must submit a shape-file that illustrates, at a minimum, the location of the meteorological station(s) and resource project corner. The shape-file must be submitted in .shp, .dbf, or other file format upon which the CAISO and resource mutually agree.

3.3 Power Reliability Requirements

Each Eligible Intermittent Resource and Hybrid Resource with a wind generation or solar generation component shall provide a backup power source for the Remote Intelligent Gateway, meteorological station equipment, revenue meter, and essential communication equipment (including, but not limited to, the router, network switch, fiber optic transceiver, 120V plug-in power supplies). The backup power source shall be sized accordingly to carry that equipment load. A backup power supply may include, but is not limited to, an uninterruptable power source (UPS) or a battery bank with solar panel charger. Whichever backup power source the Eligible Intermittent Resource installs, it shall be sized and provide power until the primary power source is restored.

3.4 Standards

The standards for communications shall be the monitoring and communications requirements for Generating Units providing only Energy; as such standards may be amended from time to time, and published on the CAISO Website.

3.5 Cost Responsibility

An Eligible Intermittent Resource is responsible for expenses associated with engineering, installation, operation and maintenance of required communication equipment.

4 FORECASTING

The CAISO is responsible for overseeing the development of tools or services to forecast Energy for Participating Intermittent Resources. The CAISO will use its best efforts to develop accurate and unbiased forecasts, as limited by the availability of relevant explanatory data. Objective criteria and thresholds for unbiased, accurate forecasts shall be used to certify Participating Intermittent Resources in accordance with Section 2.2.4 of this EIRP.

4.1 [Not Used]

4.2 [Not Used]

4.3 Confidentiality

The CAISO shall maintain the confidentiality of proprietary data for each Participating Intermittent Resource in accordance with Section 20 of the CAISO Tariff.

5 SCHEDULING AND SETTLEMENT

5.1 Schedules

For all Generating Units that comprise the Participating Intermittent Resources shall comply with the Bidding and scheduling rules specified in Sections 4.8, 30, 31, and 34.

5.2 Settlement

After a Participating Intermittent Resource is certified, Settlement shall be determined for each Settlement Period based on consistency of Bids submitted on behalf of such Participating Intermittent Resource with the rules specified in the CAISO Tariff and this EIRP.

5.3 [Not Used]

6 DATA COLLECTION FACILITIES

An Eligible Intermittent Resource not otherwise exempt and Hybrid Resource with a variable component that elects to have a CAISO forecast must install and maintain equipment to collect, record and transmit data that the CAISO reasonably determines is necessary to develop and support a forecast model that meets the requirements of Section 4 of this EIRP.

6.1 Other Eligible Intermittent Resources

Eligible Intermittent Resources other than wind or solar projects will be required to provide data of comparable relevance to estimating Energy generation. Standards will be developed as such projects are identified and will be specified in this Eligible Intermittent Resources Protocol.-

7 PROGRAM MONITORING

The CAISO shall monitor the operation of these rules, and will in particular seek to eliminate any gaming opportunities provided by the flexibility provided Participating Intermittent Resources to self-select participation on an hourly basis.

Participating Intermittent Resources are expected to bid, schedule, and otherwise perform in good faith, and not seek to act strategically in a manner that causes financial gain through systematic behavior, where such gain results solely from the settlement accommodations provided under CAISO Tariff Section 11.12.

If requirements specified in this EIRP are not met, then Participating Intermittent Resource certification may be revoked pursuant to Section 2.4.5 of this EIRP. Any patterns of strategic behavior by Participating Intermittent Resources will be tracked, and the statistical significance of such deviations will be used by the CAISO to evaluate whether changes in the rules defined in this EIRP are appropriate.

The CAISO will monitor the impact of rules for Participating Intermittent Resources on FMM or RTD imbalance energy and Regulation costs to the CAISO.

8 AMENDMENTS

If the CAISO determines a need for an amendment to this EIRP, the CAISO will follow the requirements as set forth in Section 15 of the CAISO Tariff.