May 15, 2018

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: California Independent System Operator Corporation
Filing to Comply with Order No. 842
Docket No. ER18-_____-000

Dear Secretary Bose:

The California Independent System Operator Corporation (CAISO)[1] submits this filing in compliance with the Federal Energy Regulatory Commission's (Commission) Order No. 842, which requires newly interconnecting generators to install, maintain, and operate equipment capable of providing primary frequency response.[2] As explained below, the CAISO has adopted the Commission's proscribed *pro forma* language into its generator interconnection agreements (GIAs) with only minor variances to maintain some existing generator terms defined by the CAISO tariff. The CAISO asks that the Commission accept this filing in compliance with its order.

I. Background

Reliable operation of the grid depends on maintaining frequency within predetermined boundaries above and below a scheduled value, which is 60 Hertz (Hz) in North America.[3] Changes in frequency are caused by changes in the balance between load and generation, such as the sudden loss of a large generator or a large amount of load. If frequency deviates too far above or below its scheduled value, it could potentially result in under frequency load shedding (UFLS), generation tripping, or cascading outages.[4]

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1 Capitalized terms not otherwise defined in this filing have the meanings set forth in appendix A to the CAISO tariff. References in this filing to section numbers are references to sections of the current CAISO tariff unless otherwise stated.

2 *Essential Reliability Services and the Evolving Bulk-power System—Primary Frequency Response*, Order No. 842,162 FERC ¶ 61,128 (2018).

3 *Id*. at P 4.

4 *Id*.

Mitigation of frequency deviations after the sudden loss of generation or load is driven by three primary factors: inertial response, primary frequency response, and secondary frequency response.[5] Primary frequency response actions begin within seconds after system frequency changes and are mostly provided by the automatic and autonomous actions (*i.e.*, outside of system operator control) of turbine-governors, while some response is provided by frequency responsive loads. Primary frequency response actions are intended to arrest abnormal frequency deviations and ensure that system frequency remains within acceptable bounds.[6]

Unless otherwise required by tariffs or interconnection agreements, generator owners and operators can independently decide whether to configure their generating facilities to provide primary frequency response.[7] The magnitude and duration of a generating facility's response to frequency deviations is generally determined by the settings of the facility's governor (or equivalent controls) and other plant-level (*e.g.*, "outer-loop") control systems. In particular, the governor's droop and deadband settings have a significant impact on the unit's provision of primary frequency response. In addition, plant-level controls, unless properly configured, can override or nullify a generator's governor response and return the unit to operate at a scheduled pre-disturbance megawatt set-point.

In Order No. 842, the Commission revised its regulations to require public utilities with non-discriminatory open access transmission tariffs (OATTs) to modify the *pro forma* large GIA (LGIA) and small GIA (SGIA) to include provisions requiring newly interconnecting generators to install, maintain, and operate equipment capable of providing primary frequency response.[8] The order also establishes certain minimum operating requirements, including maximum droop and deadband parameters and provisions for timely and sustained response.[9] These requirements apply to newly interconnecting generation facilities that execute, or request the unexecuted filing of, an LGIA or SGIA on or after today, Order No. 842's effective date.[10] These requirements also apply to existing large and small generating facilities that take any action that would require the submission of a new interconnection request that results in the filing of an executed or unexecuted interconnection agreement on or after the effective date.[11] These requirements do not apply to existing generating facilities, a subset of combined heat and power (CHP) facilities, or generating facilities regulated by the Nuclear

5 *Id*.

6 *Id*.

7 *Id*. at P 7.

8 *Id.* at P 1.

9 *Id*.

10 *Id.* at P 2.

11 *Id*.

Regulatory Commission (NRC).[12]

The Commission directed each ISO and RTO to submit, by May 15, 2018, a compliance filing that includes tariff changes adopting the requirements in Order No. 842.[13]

II. Tariff revisions to comply with the Commission's Orders

In compliance with the Commission's orders, the CAISO proposes to incorporate new language into Appendices EE and FF of its tariff, the CAISO's current *pro forma* Large Generator Interconnection Agreement and Small Generator Interconnection Agreement. These agreements apply to recent and new interconnection requests processed under the CAISO Generator Interconnection and Deliverability Allocation Procedures set forth in Appendix DD of the CAISO's tariff. Out of an abundance of caution, the CAISO also proposes to incorporate similar language into Appendices T, BB, and CC, which comprise the CAISO's generator interconnection agreements under previously used generator interconnection processes. The CAISO believes that this will provide transparency to existing generators that have already executed GIAs in the event that they take action that would necessitate a new interconnection request and existing GIA amendment, such as a capacity expansion, modification that results in a substantial change in electrical characteristics, or expansive repowering (*i.e.*, removing a replacing their generating units with new technology).[14] The CAISO notes that the Commission accepted this approach as just and reasonable when the CAISO complied with Order Nos. 827 and 828, which had similar applicability.[15]

The CAISO's proposed tariff revisions are consistent with the *pro forma* language adopted by Order No. 842, or meet the Commission's independent entity variation standard. The CAISO's only variances replace generic terms with CAISO-specific terms (*e.g.*, "the CAISO" in lieu of "Transmission Provider") or otherwise use existing tariff-defined terms to the same effect at the Commission's *pro forma* terms (*e.g.*, "Applicable Reliability Standards in lieu of "an approved NERCY Reliability Standard"). All variances are explained in the following table:

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12 *Id.*

13 *Id.* at PP 251 *et seq*.

14 *Id.* at P 143. *See* Section 25 of the CAISO tariff.

15 *See California Independent System Operator Corp.*, Letter Order Approving Compliance Filing, Docket No. ER17-114 (March 29, 2017).

FERC *Pro Forma* Language	**CAISO Proposed Language**	**Reason for difference**
an approved NERC Reliability Standard	Applicable Reliability Standards	CAISO defines Applicable Reliability Standards to include approved NERC Reliability Standards
Transmission Provider	the CAISO	The CAISO is the Transmission Provider
Transmission System	CAISO Controlled Grid	The CAISO Controlled Grid is the Transmission System
Commission	FERC	The CAISO tariff refers to FERC in lieu of the Commission
Reliability standard	Applicable Reliability Standard	CAISO defined term includes applicable
Agreement	SGIA/ LGIA	CAISO uses SGIA/LGIA to refer to the subject agreement
Large Generating Facility	Electric Generating Unit	Requirement is more applicable at the generating unit level[16]
Control Area	Balancing Authority Area	The terms are synonymous in the CAISO tariff[17]
Transmission Provider and/or the relevant balancing authority	CAISO	The CAISO is the Transmission Provider and the relevant balancing authority
1.8.4	1.8.3	CAISO SGIA lacks an existing 1.8.3

[16] The CAISO GIAs define "Electric Generating Unit" as "an individual electric generator and its associated plant and apparatus whose electrical output is capable of being separately identified and metered." A "Generating Facility" is defined as "the Interconnection Customer's Electric Generating Unit(s) used for the production and/or storage for later injection of electricity identified in the Interconnection Customer's Interconnection Request, but shall not include the Interconnection Customer's Interconnection Facilities." The CAISO believes that Electric Generating Unit better complies with Order No. 842. In the CAISO, interconnection customers may elect to segment generating facilities into separately metered generating units, which can bid, participate, and be settled separately in the CAISO markets. Using the term generating unit thus ensures that when an interconnection customer elects to segment a generating facility into separate generating units, each elected generating unit complies with Order No. 842.

[17] Using Balancing Authority Area spares readers from needing to look up the definition of Control Area, which Appendix A to the CAISO tariff defines as "Balancing Authority Area."

III. Attachments

In addition to this transmittal letter, the CAISO is providing the following attachments:

Attachment A	Clean CAISO tariff records incorporating the proposed Order No. 842 revisions; and
Attachment B	Marked tariff records showing the red-lined revisions incorporating the proposed Order No. 842 revisions.

IV. Communications

Pursuant to Rule 203(b)(3) of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.203(b)(3), please provide communications regarding this filing to the following individuals, whose names should appear on the official service list established by the Commission with respect to this submittal:

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V. Service

The CAISO has served copies of this filing on the California Public Utilities Commission, the California Energy Commission, and all parties with scheduling coordinator agreements under the CAISO tariff. In addition, the CAISO has posted a copy of the filing on the CAISO website.

VI. Conclusion

For the reasons set forth in this filing, the CAISO respectfully requests that the Commission accept this filing as compliant with Order No. 842, and accept the tariff clarifications proposed herein.

Respectfully submitted,

/s/ William H. Weaver

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Attachment A – Clean Tariff Records

FERC Order No. 842 Compliance Filing

California Independent System Operator Corporation

Appendix T

Small Generator Interconnection Agreement

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Article 1. Scope and Limitations of Agreement

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1.8 Reactive Power and Primary Frequency Response

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1.8.3 Primary Frequency Response. Interconnection Customer shall ensure the primary frequency response capability of its Small Generating Facility by installing, maintaining, and operating a functioning governor or equivalent controls. The term "functioning governor or equivalent controls" as used herein shall mean the required hardware and/or software that provides frequency responsive real power control with the ability to sense changes in system frequency and autonomously adjust the Small Generating Facility's real power output in accordance with the droop and deadband parameters and in the direction needed to correct frequency deviations. Interconnection Customer is required to install a governor or equivalent controls with the capability of operating: (1) with a maximum 5 percent droop and ±0.036 Hz deadband; or (2) in accordance with the relevant droop, deadband, and timely and sustained response settings from Applicable Reliability Standards providing for equivalent or more stringent parameters. The droop characteristic shall be: (1) based on the nameplate capacity of the Small Generating Facility, and shall be linear in the range of frequencies between 59 to 61 Hz that are outside of the deadband parameter; or (2) based on Applicable Reliability Standards providing for an equivalent or more stringent parameter. The deadband parameter shall be: the range of frequencies above and below nominal (60 Hz) in which the governor or equivalent controls is not expected to adjust the Small Generating Facility's real power output in response to frequency deviations. The deadband shall be implemented: (1) without a step to the droop curve, that is, once the frequency deviation exceeds the deadband parameter, the expected change in the Small Generating Facility's real power output in response to frequency deviations shall start from zero and then increase (for under-frequency deviations) or decrease (for over-frequency deviations) linearly in proportion to the magnitude of the frequency deviation; or (2) in accordance with Applicable Reliability Standards providing for an equivalent or more stringent parameter. Interconnection Customer shall notify the CAISO that the primary frequency response capability of the Small Generating Facility has been tested and confirmed during commissioning. Once Interconnection Customer has synchronized the Small Generating Facility with the CAISO Controlled Grid, Interconnection Customer shall operate the Small Generating Facility consistent with the provisions specified in Sections 1.8.3.1 and 1.8.3.2 of this SGIA. The primary frequency response requirements contained herein shall apply to both synchronous and non-synchronous Small Generating Facilities.

1.8.3.1 Governor or Equivalent Controls. Whenever the Small Generating Facility is operated in parallel with the CAISO Controlled Grid, Interconnection Customer shall operate the Small Generating Facility with its governor or equivalent controls in service and responsive to frequency. Interconnection Customer shall, in coordination with the CAISO, set the deadband parameter to: (1) a maximum of ±0.036 Hz and set the droop parameter to a maximum of 5 percent; or (2) implement the relevant droop and deadband settings from Applicable Reliability Standards that provides for equivalent or more stringent parameters. Interconnection Customer shall be required to provide the status and settings of

the governor or equivalent controls to the CAISO upon request. If Interconnection Customer needs to operate the Small Generating Facility with its governor or equivalent controls not in service, Interconnection Customer shall immediately notify the CAISO, and provide the following information: (1) the operating status of the governor or equivalent controls (i.e., whether it is currently out of service or when it will be taken out of service); (2) the reasons for removing the governor or equivalent controls from service; and (3) a reasonable estimate of when the governor or equivalent controls will be returned to service. Interconnection Customer shall make Reasonable Efforts to return its governor or equivalent controls into service as soon as practicable. Interconnection Customer shall make Reasonable Efforts to keep outages of the Small Generating Facility's governor or equivalent controls to a minimum whenever the Small Generating Facility is operated in parallel with the CAISO Controlled Grid.

1.8.3.2 Timely and Sustained Response. Interconnection Customer shall ensure that the Small Generating Facility's real power response to sustained frequency deviations outside of the deadband setting is automatically provided and shall begin immediately after frequency deviates outside of the deadband, and to the extent the Small Generating Facility has operating capability in the direction needed to correct the frequency deviation. Interconnection Customer shall not block or otherwise inhibit the ability of the governor or equivalent controls to respond and shall ensure that the response is not inhibited, except under certain operational constraints including, but not limited to, ambient temperature limitations, physical energy limitations, outages of mechanical equipment, or regulatory requirements. The Small Generating Facility shall sustain the real power response at least until system frequency returns to a value within the deadband setting of the governor or equivalent controls. A FERC-approved Applicable Reliability Standard with equivalent or more stringent requirements shall supersede the above requirements.

1.8.3.3 Exemptions. Small Generating Facilities that are regulated by the Nuclear Regulatory Commission shall be exempt from Sections 1.8.3, 1.8.3.1, and 1.8.3.2 of this SGIA. Small Generating Facilities that are behind-the-meter generation that is sized-to-load (i.e., the thermal load and the generation are near-balanced in real-time operation and the generation is primarily controlled to maintain the unique thermal, chemical, or mechanical output necessary for the operating requirements of its host facility) shall be required to install primary frequency response capability in accordance with the droop and deadband capability requirements specified in Section 1.8.3, but shall be otherwise exempt from the operating requirements in Sections 1.8.3, 1.8.3.1, 1.8.3.2, and 1.8.3.4 of this SGIA.

1.8.3.4 Electric Storage Resources. Interconnection Customer interconnecting an electric storage resource shall establish an operating range in Attachment 5 of this SGIA that specifies a minimum state of charge and a maximum state of charge between which the electric storage resource will be required to provide primary frequency response consistent with the conditions set forth in Sections 1.8.3, 1.8.3.1, 1.8.3.2, and 1.8.3.3 of this SGIA. Attachment 5 shall specify whether the operating range is static or dynamic, and shall consider: (1) the expected magnitude of frequency deviations in the interconnection; (2) the expected duration that system frequency will remain outside of the deadband parameter in the interconnection; (3) the expected incidence of frequency deviations outside of the deadband parameter in the interconnection; (4) the physical capabilities of the electric storage resource; (5) operational limitations of the electric storage resource due to manufacturer specifications; and (6) any other relevant factors agreed to by the CAISO and Interconnection Customer,

and in consultation with the relevant transmission owner or balancing authority as appropriate. If the operating range is dynamic, then Attachment 5 must establish how frequently the operating range will be reevaluated and the factors that may be considered during its reevaluation.

Interconnection Customer's electric storage resource is required to provide timely and sustained primary frequency response consistent with Section 1.8.3.2 of this SGIA when it is online and dispatched to inject electricity to the CAISO Controlled Grid and/or receive electricity from the Participating TO's Transmission System or the CAISO Controlled Grid. This excludes circumstances when the electric storage resource is not dispatched to inject electricity to the CAISO Controlled Grid and/or dispatched to receive electricity from the Participating TO's Transmission System or the CAISO Controlled Grid. If Interconnection Customer's electric storage resource is charging at the time of a frequency deviation outside of its deadband parameter, it is to increase (for over-frequency deviations) or decrease (for under-frequency deviations) the rate at which it is charging in accordance with its droop parameter. Interconnection Customer's electric storage resource is not required to change from charging to discharging, or vice versa, unless the response necessitated by the droop and deadband settings requires it to do so and it is technically capable of making such a transition.

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CAISO TARIFF APPENDIX BB

Standard Large Generator Interconnection Agreement

for Interconnection Requests in a Serial Study Group that are tendered or execute a Large Generator Interconnection Agreement on or after May 15, 2018

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ARTICLE 9. OPERATIONS

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9.6 Reactive Power and Primary Frequency Response.

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9.6.2.1 Voltage Regulators. Whenever an Electric Generating Unit is operated in parallel with the CAISO Controlled Grid and voltage regulators are capable of operation, the Interconnection Customer shall operate the Electric Generating Unit with its voltage regulators in automatic operation. If the Electric Generating Unit's voltage regulators are not capable of such automatic operation, the Interconnection Customer shall immediately notify the CAISO and the Participating TO and ensure that the Electric Generating Unit operates as specified in Article 9.6.2 through manual operation and that such Electric Generating Unit's reactive power production or absorption (measured in MVARs) are within the design capability of the Electric Generating Unit(s) and steady state stability limits. The Interconnection Customer shall restore the speed governors and voltage regulators to automatic operation as soon as possible. If the Large Generating Facility's speed governors and voltage regulators are improperly tuned or malfunctioning, the CAISO shall have the right to order the reduction in output or disconnection of the Large Generating Facility if the reliability of the CAISO Controlled Grid would be adversely affected. The Interconnection Customer shall not cause its Large Generating Facility to disconnect automatically or instantaneously from the CAISO Controlled Grid or trip any Electric Generating Unit comprising the Large Generating Facility for an under or over frequency condition unless the abnormal frequency condition persists for a time period beyond the limits set forth in ANSI/IEEE Standard C37.106, or such other standard as applied to other generators in the Balancing Authority Area on a comparable basis.

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9.6.4 Primary Frequency Response. Interconnection Customer shall ensure the primary frequency response capability of its Electric Generating Unit(s) by installing, maintaining, and operating a functioning governor or equivalent controls. The term "functioning governor or equivalent controls" as used herein shall mean the required hardware and/or software that provides frequency responsive real power control with the ability to sense changes in system frequency and autonomously adjust the Electric Generating Unit's real power output in accordance with the droop and deadband parameters and in the direction needed to correct frequency deviations. Interconnection Customer is required to install a governor or equivalent controls with the capability of operating: (1) with a maximum 5 percent droop and ±0.036 Hz deadband; or (2) in accordance with the relevant droop, deadband, and timely and sustained response settings from Applicable Reliability Standards providing for equivalent or more stringent parameters. The droop characteristic shall be: (1) based on the nameplate capacity of the Electric Generating Unit(s), and shall be linear in the range of frequencies between 59 to 61 Hz that are outside of the deadband parameter; or (2) based on Applicable Reliability Standards providing for an equivalent or more stringent parameter. The deadband parameter shall be: the range of frequencies above and below nominal (60 Hz) in which the governor or equivalent controls is not expected to adjust the Electric Generating Unit's real power output in response to frequency deviations. The deadband shall be implemented: (1) without a step to the droop curve, that is, once the frequency deviation exceeds the deadband parameter, the expected change in the Electric Generating Unit's real power

output in response to frequency deviations shall start from zero and then increase (for under-frequency deviations) or decrease (for over-frequency deviations) linearly in proportion to the magnitude of the frequency deviation; or (2) in accordance with Applicable Reliability Standards providing for an equivalent or more stringent parameter. Interconnection Customer shall notify the CAISO that the primary frequency response capability of the Electric Generating Unit(s) has been tested and confirmed during commissioning. Once Interconnection Customer has synchronized the Electric Generating Unit(s) with the CAISO Controlled Grid, Interconnection Customer shall operate the Electric Generating Unit(s) consistent with the provisions specified in Sections 9.6.4.1 and 9.6.4.2 of this LGIA. The primary frequency response requirements contained herein shall apply to both synchronous and non-synchronous Large Generating Facilities.

9.6.4.1 Governor or Equivalent Controls. Whenever the Electric Generating Unit(s) is operated in parallel with the CAISO Controlled Grid, Interconnection Customer shall operate the Electric Generating Unit(s) with its governor or equivalent controls in service and responsive to frequency. Interconnection Customer shall, in coordination with the CAISO, set the deadband parameter to: (1) a maximum of ±0.036 Hz and set the droop parameter to a maximum of 5 percent; or (2) implement the relevant droop and deadband settings from Applicable Reliability Standards that provides for equivalent or more stringent parameters. Interconnection Customer shall be required to provide the status and settings of the governor or equivalent controls to the CAISO upon request. If Interconnection Customer needs to operate the Electric Generating Unit(s) with its governor or equivalent controls not in service, Interconnection Customer shall immediately notify the CAISO, and provide the following information: (1) the operating status of the governor or equivalent controls (i.e., whether it is currently out of service or when it will be taken out of service); (2) the reasons for removing the governor or equivalent controls from service; and (3) a reasonable estimate of when the governor or equivalent controls will be returned to service. Interconnection Customer shall make Reasonable Efforts to return its governor or equivalent controls into service as soon as practicable. Interconnection Customer shall make Reasonable Efforts to keep outages of the Electric Generating Unit's governor or equivalent controls to a minimum whenever the Electric Generating Unit(s) is operated in parallel with the CAISO Controlled Grid.

9.6.4.2 Timely and Sustained Response. Interconnection Customer shall ensure that the Electric Generating Unit's real power response to sustained frequency deviations outside of the deadband setting is automatically provided and shall begin immediately after frequency deviates outside of the deadband, and to the extent the Electric Generating Unit(s) has operating capability in the direction needed to correct the frequency deviation. Interconnection Customer shall not block or otherwise inhibit the ability of the governor or equivalent controls to respond and shall ensure that the response is not inhibited, except under certain operational constraints including, but not limited to, ambient temperature limitations, physical energy limitations, outages of mechanical equipment, or regulatory requirements. The Electric Generating Unit(s) shall sustain the real power response at least until system frequency returns to a value within the deadband setting of the governor or equivalent controls. A FERC-approved Applicable Reliability Standard with equivalent or more stringent requirements shall supersede the above requirements.

9.6.4.3 Exemptions. Large Generating Facilities that are regulated by the Nuclear Regulatory Commission shall be exempt from Sections 9.6.4, 9.6.4.1, and 9.6.4.2 of this LGIA. Large Generating Facilities that are behind-the-meter generation that is sized-to-load (i.e., the thermal load and the generation are near-balanced

in real-time operation and the generation is primarily controlled to maintain the unique thermal, chemical, or mechanical output necessary for the operating requirements of its host facility) shall be required to install primary frequency response capability in accordance with the droop and deadband capability requirements specified in Section 9.6.4, but shall be otherwise exempt from the operating requirements in Sections 9.6.4, 9.6.4.1, 9.6.4.2, and 9.6.4.4 of this LGIA.

9.6.4.4 Electric Storage Resources. Interconnection Customer interconnecting an electric storage resource shall establish an operating range in Appendix C of this LGIA that specifies a minimum state of charge and a maximum state of charge between which the electric storage resource will be required to provide primary frequency response consistent with the conditions set forth in Sections 9.6.4, 9.6.4.1, 9.6.4.2, and 9.6.4.3 of this LGIA. Appendix C shall specify whether the operating range is static or dynamic, and shall consider: (1) the expected magnitude of frequency deviations in the interconnection; (2) the expected duration that system frequency will remain outside of the deadband parameter in the interconnection; (3) the expected incidence of frequency deviations outside of the deadband parameter in the interconnection; (4) the physical capabilities of the electric storage resource; (5) operational limitations of the electric storage resource due to manufacturer specifications; and (6) any other relevant factors agreed to by the CAISO and Interconnection Customer, and in consultation with the relevant transmission owner or balancing authority as appropriate. If the operating range is dynamic, then Appendix C must establish how frequently the operating range will be reevaluated and the factors that may be considered during its reevaluation.

Interconnection Customer's electric storage resource is required to provide timely and sustained primary frequency response consistent with Section 9.6.4.2 of this LGIA when it is online and dispatched to inject electricity to the CAISO Controlled Grid and/or receive electricity from the Participating TO's Transmission System or the CAISO Controlled Grid. This excludes circumstances when the electric storage resource is not dispatched to inject electricity to the CAISO Controlled Grid and/or dispatched to receive electricity from the Participating TO's Transmission system or the CAISO Controlled Grid. If Interconnection Customer's electric storage resource is charging at the time of a frequency deviation outside of its deadband parameter, it is to increase (for over-frequency deviations) or decrease (for under-frequency deviations) the rate at which it is charging in accordance with its droop parameter. Interconnection Customer's electric storage resource is not required to change from charging to discharging, or vice versa, unless the response necessitated by the droop and deadband settings requires it to do so and it is technically capable of making such a transition.

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CAISO TARIFF APPENDIX CC

Large Generator Interconnection Agreement

for Interconnection Requests in a Queue Cluster Window

that are tendered a Large Generator Interconnection Agreement on or after May 15, 2018

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9.6 Reactive Power and Primary Frequency Response.

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9.6.2.1 Voltage Regulators. Whenever an Electric Generating Unit is operated in parallel with the CAISO Controlled Grid and voltage regulators are capable of operation, the Interconnection Customer shall operate the Electric Generating Unit with its voltage regulators in automatic operation. If the Electric Generating Unit's voltage regulators are not capable of such automatic operation, the Interconnection Customer shall immediately notify the CAISO and the Participating TO and ensure that the Electric Generating Unit operates as specified in Article 9.6.2 through manual operation and that such Electric Generating Unit's reactive power production or absorption (measured in MVARs) are within the design capability of the Electric Generating Unit(s) and steady state stability limits. The Interconnection Customer shall restore the speed governors and voltage regulators to automatic operation as soon as possible. If the Large Generating Facility's speed governors and voltage regulators are

improperly tuned or malfunctioning, the CAISO shall have the right to order the reduction in output or disconnection of the Large Generating Facility if the reliability of the CAISO Controlled Grid would be adversely affected. The Interconnection Customer shall not cause its Large Generating Facility to disconnect automatically or instantaneously from the CAISO Controlled Grid or trip any Electric Generating Unit comprising the Large Generating Facility for an under or over frequency condition unless the abnormal frequency condition persists for a time period beyond the limits set forth in ANSI/IEEE Standard C37.106, or such other standard as applied to other generators in the Balancing Authority Area on a comparable basis.

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9.6.4 Primary Frequency Response. Interconnection Customer shall ensure the primary frequency response capability of its Electric Generating Unit(s) by installing, maintaining, and operating a functioning governor or equivalent controls. The term "functioning governor or equivalent controls" as used herein shall mean the required hardware and/or software that provides frequency responsive real power control with the ability to sense changes in system frequency and autonomously adjust the Electric Generating Unit's real power output in accordance with the droop and deadband parameters and in the direction needed to correct frequency deviations. Interconnection Customer is required to install a governor or equivalent controls with the capability of operating: (1) with a maximum 5 percent droop and ±0.036 Hz deadband; or (2) in accordance with the relevant droop, deadband, and timely and sustained response settings from Applicable Reliability Standards providing for equivalent or more stringent parameters. The droop characteristic shall be: (1) based on the nameplate capacity of the Electric Generating Unit(s), and shall be linear in the range of frequencies between 59 to 61 Hz that are outside of the deadband parameter; or (2) based on Applicable Reliability Standards providing for an equivalent or more stringent parameter. The deadband parameter shall be: the range of frequencies above and below nominal (60 Hz) in which the governor or equivalent controls is not expected to adjust the Electric Generating Unit's real power output in response to frequency deviations. The deadband shall be implemented: (1) without a step to the droop curve, that is, once the frequency deviation exceeds the deadband parameter, the expected change in the Electric Generating Unit's real power output in response to frequency deviations shall start from zero and then increase (for under-frequency deviations) or decrease (for over-frequency deviations) linearly in proportion to the magnitude of the frequency deviation; or (2) in accordance with Applicable Reliability Standards providing for an equivalent or more stringent parameter. Interconnection Customer shall notify the CAISO that the primary frequency response capability of the Electric Generating Unit(s) has been tested and confirmed during commissioning. Once Interconnection Customer has synchronized the Electric Generating Unit(s) with the CAISO Controlled Grid, Interconnection Customer shall operate the Electric Generating Unit(s) consistent with the provisions specified in Sections 9.6.4.1 and 9.6.4.2 of this LGIA. The primary frequency response requirements contained herein shall apply to both synchronous and non-synchronous Large Generating Facilities.

9.6.4.1 Governor or Equivalent Controls. Whenever the Electric Generating Unit(s) is operated in parallel with the CAISO Controlled Grid, Interconnection Customer shall operate the Electric Generating Unit(s) with its governor or equivalent controls in service and responsive to frequency. Interconnection Customer shall, in coordination with the CAISO, set the deadband parameter to: (1) a maximum of ±0.036 Hz and set the droop parameter to a maximum of 5 percent; or (2) implement the relevant droop and deadband settings from Applicable Reliability Standards that provides for equivalent or more stringent parameters.

Interconnection Customer shall be required to provide the status and settings of the governor or equivalent controls to the CAISO upon request. If Interconnection Customer needs to operate the Electric Generating Unit(s) with its governor or equivalent controls not in service, Interconnection Customer shall immediately notify the CAISO, and provide the following information: (1) the operating status of the governor or equivalent controls (i.e., whether it is currently out of service or when it will be taken out of service); (2) the reasons for removing the governor or equivalent controls from service; and (3) a reasonable estimate of when the governor or equivalent controls will be returned to service. Interconnection Customer shall make Reasonable Efforts to return its governor or equivalent controls into service as soon as practicable. Interconnection Customer shall make Reasonable Efforts to keep outages of the Electric Generating Unit's governor or equivalent controls to a minimum whenever the Electric Generating Unit(s) is operated in parallel with the CAISO Controlled Grid.

9.6.4.2 Timely and Sustained Response. Interconnection Customer shall ensure that the Electric Generating Unit's real power response to sustained frequency deviations outside of the deadband setting is automatically provided and shall begin immediately after frequency deviates outside of the deadband, and to the extent the Electric Generating Unit(s) has operating capability in the direction needed to correct the frequency deviation. Interconnection Customer shall not block or otherwise inhibit the ability of the governor or equivalent controls to respond and shall ensure that the response is not inhibited, except under certain operational constraints including, but not limited to, ambient temperature limitations, physical energy limitations, outages of mechanical equipment, or regulatory requirements. The Electric Generating Unit(s) shall sustain the real power response at least until system frequency returns to a value within the deadband setting of the governor or equivalent controls. A FERC-approved Applicable Reliability Standard with equivalent or more stringent requirements shall supersede the above requirements.

9.6.4.3 Exemptions. Large Generating Facilities that are regulated by the Nuclear Regulatory Commission shall be exempt from Sections 9.6.4, 9.6.4.1, and 9.6.4.2 of this LGIA. Large Generating Facilities that are behind-the-meter generation that is sized-to-load (i.e., the thermal load and the generation are near-balanced in real-time operation and the generation is primarily controlled to maintain the unique thermal, chemical, or mechanical output necessary for the operating requirements of its host facility) shall be required to install primary frequency response capability in accordance with the droop and deadband capability requirements specified in Section 9.6.4, but shall be otherwise exempt from the operating requirements in Sections 9.6.4, 9.6.4.1, 9.6.4.2, and 9.6.4.4 of this LGIA.

9.6.4.4 Electric Storage Resources. Interconnection Customer interconnecting an electric storage resource shall establish an operating range in Appendix C of this LGIA that specifies a minimum state of charge and a maximum state of charge between which the electric storage resource will be required to provide primary frequency response consistent with the conditions set forth in Sections 9.6.4, 9.6.4.1, 9.6.4.2, and 9.6.4.3 of this LGIA. Appendix C shall specify whether the operating range is static or dynamic, and shall consider: (1) the expected magnitude of frequency deviations in the interconnection; (2) the expected duration that system frequency will remain outside of the deadband parameter in the interconnection; (3) the expected incidence of frequency deviations outside of the deadband parameter in the interconnection; (4) the physical capabilities of the electric storage resource; (5) operational limitations of the electric storage resource due to manufacturer specifications; and (6) any other relevant factors

agreed to by the CAISO and Interconnection Customer, and in consultation with the relevant transmission owner or balancing authority as appropriate. If the operating range is dynamic, then Appendix C must establish how frequently the operating range will be reevaluated and the factors that may be considered during its reevaluation.

Interconnection Customer's electric storage resource is required to provide timely and sustained primary frequency response consistent with Section 9.6.4.2 of this LGIA when it is online and dispatched to inject electricity to the CAISO Controlled Grid and/or receive electricity from the Participating TO's Transmission System or the CAISO Controlled Grid. This excludes circumstances when the electric storage resource is not dispatched to inject electricity to the CAISO Controlled Grid and/or dispatched to receive electricity from the Participating TO's Transmission system or the CAISO Controlled Grid. If Interconnection Customer's electric storage resource is charging at the time of a frequency deviation outside of its deadband parameter, it is to increase (for over-frequency deviations) or decrease (for under-frequency deviations) the rate at which it is charging in accordance with its droop parameter. Interconnection Customer's electric storage resource is not required to change from charging to discharging, or vice versa, unless the response necessitated by the droop and deadband settings requires it to do so and it is technically capable of making such a transition.

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Appendix EE

Large Generator Interconnection Agreement

for Interconnection Requests Processed under the Generator Interconnection and Deliverability

Allocation Procedures (Appendix DD of the CAISO Tariff)

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9.6.4.3 Exemptions
9.6.4.4 Electric Storage Resources

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9.6 Reactive Power and Primary Frequency Response.

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9.6.2.1 Voltage Regulators. Whenever an Electric Generating Unit is operated in parallel with the CAISO Controlled Grid and voltage regulators are capable of operation, the Interconnection Customer shall operate the Electric Generating Unit with its voltage regulators in automatic operation. If the Electric Generating Unit's voltage regulators are not capable of such automatic operation, the Interconnection Customer shall immediately notify the CAISO and the Participating TO and ensure that the Electric Generating Unit operates as specified in Article 9.6.2 through manual operation and that such Electric Generating Unit's reactive power production or absorption (measured in MVARs) are within the design capability of the Electric Generating Unit(s) and steady state stability limits. The Interconnection Customer shall restore the speed governors and voltage regulators to automatic operation as soon as possible. If the Large Generating Facility's speed governors and voltage regulators are improperly tuned or malfunctioning, the CAISO shall have the right to order the reduction in output or disconnection of the Large Generating Facility if the reliability of the CAISO Controlled Grid would be adversely affected. The Interconnection Customer shall not cause its Large Generating Facility to disconnect automatically or instantaneously from the CAISO Controlled Grid or trip any Electric Generating Unit comprising the Large Generating Facility for an under or over frequency condition unless the abnormal frequency condition persists for a time period beyond the limits set forth in ANSI/IEEE Standard C37.106, or such other standard as applied to other generators in the Balancing Authority Area on a comparable basis.

* * * * *

9.6.4 Primary Frequency Response. Interconnection Customer shall ensure the primary frequency response capability of its Electric Generating Unit(s) by installing, maintaining, and operating a functioning governor or equivalent controls. The term "functioning governor or equivalent controls" as used herein shall mean the required hardware and/or software that provides frequency responsive real power control with the ability to sense changes in system frequency and autonomously adjust the Electric Generating Unit's real power output in accordance with the droop and deadband parameters and in the direction needed to correct frequency deviations. Interconnection Customer is required to install a governor or equivalent controls with the capability of operating: (1) with a maximum 5 percent droop and ±0.036 Hz deadband; or (2) in accordance with the relevant droop, deadband, and timely and sustained response settings from Applicable Reliability Standards providing for equivalent or more stringent parameters. The droop characteristic shall be: (1) based on the nameplate capacity of the Electric Generating Unit(s), and shall be linear in the range of frequencies between 59 to 61 Hz that are outside of the deadband parameter; or (2) based on Applicable Reliability Standards providing for an equivalent or more stringent parameter. The deadband parameter shall be: the range of frequencies above and below nominal (60 Hz) in which the governor or

equivalent controls is not expected to adjust the Electric Generating Units' real power output in response to frequency deviations. The deadband shall be implemented: (1) without a step to the droop curve, that is, once the frequency deviation exceeds the deadband parameter, the expected change in the Electric Generating Units' real power output in response to frequency deviations shall start from zero and then increase (for under-frequency deviations) or decrease (for over-frequency deviations) linearly in proportion to the magnitude of the frequency deviation; or (2) in accordance with Applicable Reliability Standards providing for an equivalent or more stringent parameter. Interconnection Customer shall notify the CAISO that the primary frequency response capability of the Electric Generating Unit(s) has been tested and confirmed during commissioning. Once Interconnection Customer has synchronized the Electric Generating Unit(s) with the CAISO Controlled Grid, Interconnection Customer shall operate the Electric Generating Unit(s) consistent with the provisions specified in Sections 9.6.4.1 and 9.6.4.2 of this LGIA. The primary frequency response requirements contained herein shall apply to both synchronous and non-synchronous Large Generating Facilities.

9.6.4.1 Governor or Equivalent Controls. Whenever the Electric Generating Unit(s) is operated in parallel with the CAISO Controlled Grid, Interconnection Customer shall operate the Electric Generating Unit(s) with its governor or equivalent controls in service and responsive to frequency. Interconnection Customer shall, in coordination with the CAISO, set the deadband parameter to: (1) a maximum of ±0.036 Hz and set the droop parameter to a maximum of 5 percent; or (2) implement the relevant droop and deadband settings from Applicable Reliability Standards that provides for equivalent or more stringent parameters. Interconnection Customer shall be required to provide the status and settings of the governor or equivalent controls to the CAISO upon request. If Interconnection Customer needs to operate the Electric Generating Unit(s) with its governor or equivalent controls not in service, Interconnection Customer shall immediately notify the CAISO, and provide the following information: (1) the operating status of the governor or equivalent controls (i.e., whether it is currently out of service or when it will be taken out of service); (2) the reasons for removing the governor or equivalent controls from service; and (3) a reasonable estimate of when the governor or equivalent controls will be returned to service. Interconnection Customer shall make Reasonable Efforts to return its governor or equivalent controls into service as soon as practicable. Interconnection Customer shall make Reasonable Efforts to keep outages of the Electric Generating Units' governor or equivalent controls to a minimum whenever the Electric Generating Unit(s) is operated in parallel with the CAISO Controlled Grid.

9.6.4.2 Timely and Sustained Response. Interconnection Customer shall ensure that the Electric Generating Units' real power response to sustained frequency deviations outside of the deadband setting is automatically provided and shall begin immediately after frequency deviates outside of the deadband, and to the extent the Electric Generating Unit(s) has operating capability in the direction needed to correct the frequency deviation. Interconnection Customer shall not block or otherwise inhibit the ability of the governor or equivalent controls to respond and shall ensure that the response is not inhibited, except under certain operational constraints including, but not limited to, ambient temperature limitations, physical energy limitations, outages of mechanical equipment, or regulatory requirements. The Electric Generating Unit(s) shall sustain the real power response at least until system frequency returns to a value within the deadband setting of the governor or equivalent controls. A FERC-approved Applicable Reliability Standard with equivalent or more stringent requirements shall supersede the above requirements.

9.6.4.3 Exemptions. Large Generating Facilities that are regulated by the Nuclear Regulatory Commission shall be exempt from Sections 9.6.4, 9.6.4.1, and 9.6.4.2 of this LGIA. Large Generating Facilities that are behind-the-meter generation that is sized-to-load (i.e., the thermal load and the generation are near-balanced in real-time operation and the generation is primarily controlled to maintain the unique thermal, chemical, or mechanical output necessary for the operating requirements of its host facility) shall be required to install primary frequency response capability in accordance with the droop and deadband capability requirements specified in Section 9.6.4, but shall be otherwise exempt from the operating requirements in Sections 9.6.4, 9.6.4.1, 9.6.4.2, and 9.6.4.4 of this LGIA.

9.6.4.4 Electric Storage Resources. Interconnection Customer interconnecting an electric storage resource shall establish an operating range in Appendix C of this LGIA that specifies a minimum state of charge and a maximum state of charge between which the electric storage resource will be required to provide primary frequency response consistent with the conditions set forth in Sections 9.6.4, 9.6.4.1, 9.6.4.2, and 9.6.4.3 of this LGIA. Appendix C shall specify whether the operating range is static or dynamic, and shall consider: (1) the expected magnitude of frequency deviations in the interconnection; (2) the expected duration that system frequency will remain outside of the deadband parameter in the interconnection; (3) the expected incidence of frequency deviations outside of the deadband parameter in the interconnection; (4) the physical capabilities of the electric storage resource; (5) operational limitations of the electric storage resource due to manufacturer specifications; and (6) any other relevant factors agreed to by the CAISO and Interconnection Customer, and in consultation with the relevant transmission owner or balancing authority as appropriate. If the operating range is dynamic, then Appendix C must establish how frequently the operating range will be reevaluated and the factors that may be considered during its reevaluation.

Interconnection Customer's electric storage resource is required to provide timely and sustained primary frequency response consistent with Section 9.6.4.2 of this LGIA when it is online and dispatched to inject electricity to the CAISO Controlled Grid and/or receive electricity from the Participating TO's Transmission System or the CAISO Controlled Grid. This excludes circumstances when the electric storage resource is not dispatched to inject electricity to the CAISO Controlled Grid and/or dispatched to receive electricity from the Participating TO's Transmission system or the CAISO Controlled Grid. If Interconnection Customer's electric storage resource is charging at the time of a frequency deviation outside of its deadband parameter, it is to increase (for over-frequency deviations) or decrease (for under-frequency deviations) the rate at which it is charging in accordance with its droop parameter. Interconnection Customer's electric storage resource is not required to change from charging to discharging, or vice versa, unless the response necessitated by the droop and deadband settings requires it to do so and it is technically capable of making such a transition.

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Appendix FF

Small Generator Interconnection Agreement for Interconnection Requests Processed Under the Generator Interconnection and Deliverability Allocation Procedures (Appendix DD to the CAISO Tariff)

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1.8 Reactive Power and Primary Frequency Response

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1.8.3 Primary Frequency Response. Interconnection Customer shall ensure the primary frequency response capability of its Small Generating Facility by installing, maintaining, and operating a functioning governor or equivalent controls. The term "functioning governor or equivalent controls" as used herein shall mean the required hardware and/or software that provides frequency responsive real power control with the ability to sense changes in system frequency and autonomously adjust the Small Generating Facility's real power output in accordance with the droop and deadband parameters and in the direction needed to correct frequency deviations. Interconnection Customer is required to install a governor or equivalent controls with the capability of operating: (1) with a maximum 5 percent droop and ±0.036 Hz deadband; or (2) in accordance with the relevant droop, deadband, and timely and sustained response settings from Applicable Reliability Standards providing for equivalent or more stringent parameters. The droop characteristic shall be: (1) based on the nameplate capacity of the Small Generating Facility, and shall be linear in the range of frequencies between 59 to 61 Hz that are outside of the deadband parameter; or (2) based on Applicable Reliability Standards providing for an equivalent or more stringent parameter. The deadband parameter shall be: the range of frequencies above and below nominal (60 Hz) in which the governor or equivalent controls is not expected to adjust the Small Generating Facility's real power output in response to frequency deviations. The deadband shall be implemented: (1) without a step to the droop curve, that is, once the frequency deviation exceeds the deadband parameter, the expected change in the Small Generating Facility's real power output in response to frequency deviations shall start from zero and then increase (for under-frequency deviations) or decrease (for over-frequency deviations) linearly in proportion to the magnitude of the frequency deviation; or (2) in accordance with Applicable Reliability Standards providing for an equivalent or more stringent parameter. Interconnection Customer shall notify the CAISO that the primary frequency response capability of the Small Generating Facility has been tested and confirmed during commissioning. Once Interconnection Customer has synchronized the Small Generating Facility with the CAISO Controlled Grid, Interconnection Customer shall operate the Small Generating Facility consistent with the provisions specified in Sections 1.8.3.1 and 1.8..2 of this SGIA. The primary frequency response requirements contained herein shall apply to both synchronous and non-synchronous Small Generating Facilities.

1.8.3.1 Governor or Equivalent Controls. Whenever the Small Generating Facility is operated in parallel with the CAISO Controlled Grid, Interconnection Customer shall operate the Small Generating Facility with its governor or equivalent controls in service and responsive to frequency. Interconnection Customer shall, in coordination with the CAISO, set the deadband parameter to: (1) a maximum of ±0.036 Hz and set the droop parameter to a maximum of 5 percent; or (2) implement the relevant droop and deadband settings from Applicable Reliability Standards that provides for equivalent or more stringent parameters. Interconnection Customer shall be required to provide the status and settings of the governor or equivalent controls to the CAISO upon request. If Interconnection Customer needs to operate the Small Generating Facility with its

governor or equivalent controls not in service, Interconnection Customer shall immediately notify the CAISO, and provide the following information: (1) the operating status of the governor or equivalent controls (i.e., whether it is currently out of service or when it will be taken out of service); (2) the reasons for removing the governor or equivalent controls from service; and (3) a reasonable estimate of when the governor or equivalent controls will be returned to service. Interconnection Customer shall make Reasonable Efforts to return its governor or equivalent controls into service as soon as practicable. Interconnection Customer shall make Reasonable Efforts to keep outages of the Small Generating Facility's governor or equivalent controls to a minimum whenever the Small Generating Facility is operated in parallel with the CAISO Controlled Grid.

1.8.3.2 Timely and Sustained Response. Interconnection Customer shall ensure that the Small Generating Facility's real power response to sustained frequency deviations outside of the deadband setting is automatically provided and shall begin immediately after frequency deviates outside of the deadband, and to the extent the Small Generating Facility has operating capability in the direction needed to correct the frequency deviation. Interconnection Customer shall not block or otherwise inhibit the ability of the governor or equivalent controls to respond and shall ensure that the response is not inhibited, except under certain operational constraints including, but not limited to, ambient temperature limitations, physical energy limitations, outages of mechanical equipment, or regulatory requirements. The Small Generating Facility shall sustain the real power response at least until system frequency returns to a value within the deadband setting of the governor or equivalent controls. A FERC-approved Applicable Reliability Standard with equivalent or more stringent requirements shall supersede the above requirements.

1.8.3.3 Exemptions. Small Generating Facilities that are regulated by the Nuclear Regulatory Commission shall be exempt from Sections 1.8.3, 1.8.3.1, and 1.8.3.2 of this SGIA. Small Generating Facilities that are behind-the-meter generation that is sized-to-load (i.e., the thermal load and the generation are near-balanced in real-time operation and the generation is primarily controlled to maintain the unique thermal, chemical, or mechanical output necessary for the operating requirements of its host facility) shall be required to install primary frequency response capability in accordance with the droop and deadband capability requirements specified in Section 1.8.3, but shall be otherwise exempt from the operating requirements in Sections 1.8.3, 1.8.3.1, 1.8.3.2, and 1.8.3.4 of this SGIA.

1.8.3.4 Electric Storage Resources. Interconnection Customer interconnecting an electric storage resource shall establish an operating range in Attachment 5 of this SGIA that specifies a minimum state of charge and a maximum state of charge between which the electric storage resource will be required to provide primary frequency response consistent with the conditions set forth in Sections 1.8.3, 1.8.3.1, 1.8.3.2, and 1.8.3.3 of this SGIA. Attachment 5 shall specify whether the operating range is static or dynamic, and shall consider: (1) the expected magnitude of frequency deviations in the interconnection; (2) the expected duration that system frequency will remain outside of the deadband parameter in the interconnection; (3) the expected incidence of frequency deviations outside of the deadband parameter in the interconnection; (4) the physical capabilities of the electric storage resource; (5) operational limitations of the electric storage resource due to manufacturer specifications; and (6) any other relevant factors agreed to by the CAISO and Interconnection Customer, and in consultation with the relevant transmission owner or balancing authority as appropriate. If the operating range is dynamic, then Attachment 5 must establish

how frequently the operating range will be reevaluated and the factors that may be considered during its reevaluation.

Interconnection Customer's electric storage resource is required to provide timely and sustained primary frequency response consistent with Section 1.8.3.2 of this SGIA when it is online and dispatched to inject electricity to the CAISO Controlled Grid and/or receive electricity from the Participating TO's Transmission System or the CAISO Controlled Grid. This excludes circumstances when the electric storage resource is not dispatched to inject electricity to the CAISO Controlled Grid and/or dispatched to receive electricity from the Participating TO's Transmission System or the CAISO Controlled Grid. If Interconnection Customer's electric storage resource is charging at the time of a frequency deviation outside of its deadband parameter, it is to increase (for over-frequency deviations) or decrease (for under-frequency deviations) the rate at which it is charging in accordance with its droop parameter. Interconnection Customer's electric storage resource is not required to change from charging to discharging, or vice versa, unless the response necessitated by the droop and deadband settings requires it to do so and it is technically capable of making such a transition.

Attachment B – Marked Tariff Records

FERC Order No. 842 Compliance Filing

California Independent System Operator Corporation

Appendix T

Small Generator Interconnection Agreement

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Article 1. Scope and Limitations of Agreement

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1.8 Reactive Power and Primary Frequency Response

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1.8.3 Primary Frequency Response. Interconnection Customer shall ensure the primary frequency response capability of its Small Generating Facility by installing, maintaining, and operating a functioning governor or equivalent controls. The term "functioning governor or equivalent controls" as used herein shall mean the required hardware and/or software that provides frequency responsive real power control with the ability to sense changes in system frequency and autonomously adjust the Small Generating Facility's real power output in accordance with the droop and deadband parameters and in the direction needed to correct frequency deviations. Interconnection Customer is required to install a governor or equivalent controls with the capability of operating: (1) with a maximum 5 percent droop and ±0.036 Hz deadband; or (2) in accordance with the relevant droop, deadband, and timely and sustained response settings from Applicable Reliability Standards providing for equivalent or more stringent parameters. The droop characteristic shall be: (1) based on the nameplate capacity of the Small Generating Facility, and shall be linear in the range of frequencies between 59 to 61 Hz that are outside of the deadband parameter; or (2) based on Applicable Reliability Standards providing for an equivalent or more stringent parameter. The deadband parameter shall be: the range of frequencies above and below nominal (60 Hz) in which the governor or equivalent controls is not expected to adjust the Small Generating Facility's real power output in response to frequency deviations. The deadband shall be implemented: (1) without a step to the droop curve, that is, once the frequency deviation exceeds the deadband parameter, the expected change in the Small Generating Facility's real power output in response to frequency deviations shall start from zero and then increase (for under-frequency deviations) or decrease (for over-frequency deviations) linearly in proportion to the magnitude of the frequency deviation; or (2) in accordance with Applicable Reliability Standards providing for an equivalent or more stringent parameter. Interconnection Customer shall notify the CAISO that the primary frequency response capability of the Small Generating Facility has been tested and confirmed during commissioning. Once Interconnection Customer has synchronized the Small Generating Facility with the CAISO Controlled Grid, Interconnection Customer shall operate the Small Generating Facility consistent with the provisions specified in Sections 1.8.3.1 and 1.8.3.2 of this SGIA. The primary frequency response requirements contained herein shall apply to both synchronous and non-synchronous Small Generating Facilities.

1.8.3.1 Governor or Equivalent Controls. Whenever the Small Generating Facility is operated in parallel with the CAISO Controlled Grid, Interconnection Customer shall operate the Small Generating Facility with its governor or equivalent controls in service and responsive to frequency. Interconnection Customer shall, in coordination with the CAISO, set the deadband parameter to: (1) a maximum of ±0.036 Hz and set the droop parameter to a maximum of 5 percent; or (2) implement the relevant droop and deadband settings from Applicable Reliability Standards that provides for equivalent or more stringent parameters. Interconnection Customer shall be required to provide the status and settings of

the governor or equivalent controls to the CAISO upon request. If Interconnection Customer needs to operate the Small Generating Facility with its governor or equivalent controls not in service, Interconnection Customer shall immediately notify the CAISO, and provide the following information: (1) the operating status of the governor or equivalent controls (i.e., whether it is currently out of service or when it will be taken out of service); (2) the reasons for removing the governor or equivalent controls from service; and (3) a reasonable estimate of when the governor or equivalent controls will be returned to service. Interconnection Customer shall make Reasonable Efforts to return its governor or equivalent controls into service as soon as practicable. Interconnection Customer shall make Reasonable Efforts to keep outages of the Small Generating Facility's governor or equivalent controls to a minimum whenever the Small Generating Facility is operated in parallel with the CAISO Controlled Grid.

1.8.3.2 Timely and Sustained Response. Interconnection Customer shall ensure that the Small Generating Facility's real power response to sustained frequency deviations outside of the deadband setting is automatically provided and shall begin immediately after frequency deviates outside of the deadband, and to the extent the Small Generating Facility has operating capability in the direction needed to correct the frequency deviation. Interconnection Customer shall not block or otherwise inhibit the ability of the governor or equivalent controls to respond and shall ensure that the response is not inhibited, except under certain operational constraints including, but not limited to, ambient temperature limitations, physical energy limitations, outages of mechanical equipment, or regulatory requirements. The Small Generating Facility shall sustain the real power response at least until system frequency returns to a value within the deadband setting of the governor or equivalent controls. A FERC-approved Applicable Reliability Standard with equivalent or more stringent requirements shall supersede the above requirements.

1.8.3.3 Exemptions. Small Generating Facilities that are regulated by the Nuclear Regulatory Commission shall be exempt from Sections 1.8.3, 1.8.3.1, and 1.8.3.2 of this SGIA. Small Generating Facilities that are behind-the-meter generation that is sized-to-load (i.e., the thermal load and the generation are near-balanced in real-time operation and the generation is primarily controlled to maintain the unique thermal, chemical, or mechanical output necessary for the operating requirements of its host facility) shall be required to install primary frequency response capability in accordance with the droop and deadband capability requirements specified in Section 1.8.3, but shall be otherwise exempt from the operating requirements in Sections 1.8.3, 1.8.3.1, 1.8.3.2, and 1.8.3.4 of this SGIA.

1.8.3.4 Electric Storage Resources. Interconnection Customer interconnecting an electric storage resource shall establish an operating range in Attachment 5 of this SGIA that specifies a minimum state of charge and a maximum state of charge between which the electric storage resource will be required to provide primary frequency response consistent with the conditions set forth in Sections 1.8.3, 1.8.3.1, 1.8.3.2, and 1.8.3.3 of this SGIA. Attachment 5 shall specify whether the operating range is static or dynamic, and shall consider: (1) the expected magnitude of frequency deviations in the interconnection; (2) the expected duration that system frequency will remain outside of the deadband parameter in the interconnection; (3) the expected incidence of frequency deviations outside of the deadband parameter in the interconnection; (4) the physical capabilities of the electric storage resource; (5) operational limitations of the electric storage resource due to manufacturer specifications; and (6) any other relevant factors agreed to by the CAISO and Interconnection Customer,

and in consultation with the relevant transmission owner or balancing authority as appropriate. If the operating range is dynamic, then Attachment 5 must establish how frequently the operating range will be reevaluated and the factors that may be considered during its reevaluation.

Interconnection Customer's electric storage resource is required to provide timely and sustained primary frequency response consistent with Section 1.8.3.2 of this SGIA when it is online and dispatched to inject electricity to the CAISO Controlled Grid and/or receive electricity from the Participating TO's Transmission System or the CAISO Controlled Grid. This excludes circumstances when the electric storage resource is not dispatched to inject electricity to the CAISO Controlled Grid and/or dispatched to receive electricity from the Participating TO's Transmission System or the CAISO Controlled Grid. If Interconnection Customer's electric storage resource is charging at the time of a frequency deviation outside of its deadband parameter, it is to increase (for over-frequency deviations) or decrease (for under-frequency deviations) the rate at which it is charging in accordance with its droop parameter. Interconnection Customer's electric storage resource is not required to change from charging to discharging, or vice versa, unless the response necessitated by the droop and deadband settings requires it to do so and it is technically capable of making such a transition.

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CAISO TARIFF APPENDIX BB

Standard Large Generator Interconnection Agreement

for Interconnection Requests in a Serial Study Group that are tendered or execute a Large Generator Interconnection Agreement on or after May 15, 2018~~July 3, 2010~~

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ARTICLE 9. OPERATIONS

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9.6 Reactive Power and Primary Frequency Response.

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9.6.2.1 ~~Governors and~~Voltage Regulators. Whenever an Electric Generating Unit is operated in parallel with the CAISO Controlled Grid ~~and the speed governors (if installed on the Electric Generating Unit pursuant to Good Utility Practice)~~ and voltage regulators are capable of operation, the Interconnection Customer shall operate the Electric Generating Unit with its ~~speed governors and~~ voltage regulators in automatic operation. If the Electric Generating Unit's ~~speed governors and~~ voltage regulators are not capable of such automatic operation, the Interconnection Customer shall immediately notify the CAISO and the Participating TO and ensure that the Electric Generating Unit operates as specified in Article 9.6.2 through manual operation and that such Electric Generating Unit's reactive power production or absorption (measured in MVARs) are within the design capability of the Electric Generating Unit(s) and steady state stability limits. The Interconnection Customer shall restore the speed governors and voltage regulators to automatic operation as soon as possible. If the Large Generating Facility's speed governors and voltage regulators are improperly tuned or malfunctioning, the CAISO shall have the right to order the reduction in output or disconnection of the Large Generating Facility if the reliability of the CAISO Controlled Grid would be adversely affected. The Interconnection Customer shall not cause its Large Generating Facility to disconnect automatically or instantaneously from the CAISO Controlled Grid or trip any Electric Generating Unit comprising the Large Generating Facility for an under or over frequency condition unless the abnormal frequency condition persists for a time period beyond the limits set forth in ANSI/IEEE Standard C37.106, or such other standard as applied to other generators in the Balancing Authority Area on a comparable basis.

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9.6.4 Primary Frequency Response. Interconnection Customer shall ensure the primary frequency response capability of its Electric Generating Unit(s) by installing, maintaining, and operating a functioning governor or equivalent controls. The term "functioning governor or equivalent controls" as used herein shall mean the required hardware and/or software that provides frequency responsive real power control with the ability to sense changes in system frequency and autonomously adjust the Electric Generating Unit's real power output in accordance with the droop and deadband parameters and in the direction needed to correct frequency deviations. Interconnection Customer is required to install a governor or equivalent controls with the capability of operating: (1) with a maximum 5 percent droop and ±0.036 Hz deadband; or (2) in accordance with the relevant droop, deadband, and timely and sustained response settings from Applicable Reliability Standards providing for equivalent or more stringent parameters. The droop characteristic shall be: (1) based on the nameplate capacity of the Electric Generating Unit(s), and shall be linear in the range of frequencies between 59 to 61 Hz that are outside of the deadband parameter; or (2) based on Applicable Reliability Standards providing for an equivalent or more stringent parameter. The deadband parameter shall be: the range of frequencies above and below nominal (60 Hz) in which the governor or

equivalent controls is not expected to adjust the Electric Generating Unit's real power output in response to frequency deviations. The deadband shall be implemented: (1) without a step to the droop curve, that is, once the frequency deviation exceeds the deadband parameter, the expected change in the Electric Generating Unit's real power output in response to frequency deviations shall start from zero and then increase (for under-frequency deviations) or decrease (for over-frequency deviations) linearly in proportion to the magnitude of the frequency deviation; or (2) in accordance with Applicable Reliability Standards providing for an equivalent or more stringent parameter. Interconnection Customer shall notify the CAISO that the primary frequency response capability of the Electric Generating Unit(s) has been tested and confirmed during commissioning. Once Interconnection Customer has synchronized the Electric Generating Unit(s) with the CAISO Controlled Grid, Interconnection Customer shall operate the Electric Generating Unit(s) consistent with the provisions specified in Sections 9.6.4.1 and 9.6.4.2 of this LGIA. The primary frequency response requirements contained herein shall apply to both synchronous and non-synchronous Large Generating Facilities.

9.6.4.1 Governor or Equivalent Controls. Whenever the Electric Generating Unit(s) is operated in parallel with the CAISO Controlled Grid, Interconnection Customer shall operate the Electric Generating Unit(s) with its governor or equivalent controls in service and responsive to frequency. Interconnection Customer shall, in coordination with the CAISO, set the deadband parameter to: (1) a maximum of ±0.036 Hz and set the droop parameter to a maximum of 5 percent; or (2) implement the relevant droop and deadband settings from Applicable Reliability Standards that provides for equivalent or more stringent parameters. Interconnection Customer shall be required to provide the status and settings of the governor or equivalent controls to the CAISO upon request. If Interconnection Customer needs to operate the Electric Generating Unit(s) with its governor or equivalent controls not in service, Interconnection Customer shall immediately notify the CAISO, and provide the following information: (1) the operating status of the governor or equivalent controls (i.e., whether it is currently out of service or when it will be taken out of service); (2) the reasons for removing the governor or equivalent controls from service; and (3) a reasonable estimate of when the governor or equivalent controls will be returned to service. Interconnection Customer shall make Reasonable Efforts to return its governor or equivalent controls into service as soon as practicable. Interconnection Customer shall make Reasonable Efforts to keep outages of the Electric Generating Unit's governor or equivalent controls to a minimum whenever the Electric Generating Unit(s) is operated in parallel with the CAISO Controlled Grid.

9.6.4.2 Timely and Sustained Response. Interconnection Customer shall ensure that the Electric Generating Unit's real power response to sustained frequency deviations outside of the deadband setting is automatically provided and shall begin immediately after frequency deviates outside of the deadband, and to the extent the Electric Generating Unit(s) has operating capability in the direction needed to correct the frequency deviation. Interconnection Customer shall not block or otherwise inhibit the ability of the governor or equivalent controls to respond and shall ensure that the response is not inhibited, except under certain operational constraints including, but not limited to, ambient temperature limitations, physical energy limitations, outages of mechanical equipment, or regulatory requirements. The Electric Generating Unit(s) shall sustain the real power response at least until system frequency returns to a value within the deadband setting of the governor or equivalent controls. A FERC-approved Applicable Reliability Standard with equivalent or more stringent requirements shall supersede the above requirements.

9.6.4.3 Exemptions. Large Generating Facilities that are regulated by the Nuclear Regulatory Commission shall be exempt from Sections 9.6.4, 9.6.4.1, and 9.6.4.2 of this LGIA. Large Generating Facilities that are behind-the-meter generation that is sized-to-load (i.e., the thermal load and the generation are near-balanced in real-time operation and the generation is primarily controlled to maintain the unique thermal, chemical, or mechanical output necessary for the operating requirements of its host facility) shall be required to install primary frequency response capability in accordance with the droop and deadband capability requirements specified in Section 9.6.4, but shall be otherwise exempt from the operating requirements in Sections 9.6.4, 9.6.4.1, 9.6.4.2, and 9.6.4.4 of this LGIA.

9.6.4.4 Electric Storage Resources. Interconnection Customer interconnecting an electric storage resource shall establish an operating range in Appendix C of this LGIA that specifies a minimum state of charge and a maximum state of charge between which the electric storage resource will be required to provide primary frequency response consistent with the conditions set forth in Sections 9.6.4, 9.6.4.1, 9.6.4.2, and 9.6.4.3 of this LGIA. Appendix C shall specify whether the operating range is static or dynamic, and shall consider: (1) the expected magnitude of frequency deviations in the interconnection; (2) the expected duration that system frequency will remain outside of the deadband parameter in the interconnection; (3) the expected incidence of frequency deviations outside of the deadband parameter in the interconnection; (4) the physical capabilities of the electric storage resource; (5) operational limitations of the electric storage resource due to manufacturer specifications; and (6) any other relevant factors agreed to by the CAISO and Interconnection Customer, and in consultation with the relevant transmission owner or balancing authority as appropriate. If the operating range is dynamic, then Appendix C must establish how frequently the operating range will be reevaluated and the factors that may be considered during its reevaluation.

Interconnection Customer's electric storage resource is required to provide timely and sustained primary frequency response consistent with Section 9.6.4.2 of this LGIA when it is online and dispatched to inject electricity to the CAISO Controlled Grid and/or receive electricity from the Participating TO's Transmission System or the CAISO Controlled Grid. This excludes circumstances when the electric storage resource is not dispatched to inject electricity to the CAISO Controlled Grid and/or dispatched to receive electricity from the Participating TO's Transmission system or the CAISO Controlled Grid. If Interconnection Customer's electric storage resource is charging at the time of a frequency deviation outside of its deadband parameter, it is to increase (for over-frequency deviations) or decrease (for under-frequency deviations) the rate at which it is charging in accordance with its droop parameter. Interconnection Customer's electric storage resource is not required to change from charging to discharging, or vice versa, unless the response necessitated by the droop and deadband settings requires it to do so and it is technically capable of making such a transition.

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CAISO TARIFF APPENDIX CC

Large Generator Interconnection Agreement

for Interconnection Requests in a Queue Cluster Window

that are tendered a Large Generator Interconnection Agreement on or after May 15, 2018 ~~July 3, 2010~~

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ARTICLE 9. OPERATIONS

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9.6 Reactive Power and Primary Frequency Response.

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9.6.2.1 ~~Governors and~~Voltage Regulators. Whenever an Electric Generating Unit is operated in parallel with the CAISO Controlled Grid ~~and the speed governors (if installed on the Electric Generating Unit pursuant to Good Utility Practice)~~ and voltage regulators are capable of operation, the Interconnection Customer shall operate the Electric Generating Unit with its ~~speed governors and~~ voltage regulators in automatic operation. If the Electric Generating Unit's ~~speed governors and~~ voltage regulators are not capable of such automatic operation, the Interconnection Customer shall immediately notify the CAISO and the Participating TO and ensure that the Electric Generating Unit operates as specified in Article 9.6.2 through manual operation and that such Electric Generating Unit's reactive power production or absorption (measured in MVARs)

are within the design capability of the Electric Generating Unit(s) and steady state stability limits. The Interconnection Customer shall restore the speed governors and voltage regulators to automatic operation as soon as possible. If the Large Generating Facility's speed governors and voltage regulators are improperly tuned or malfunctioning, the CAISO shall have the right to order the reduction in output or disconnection of the Large Generating Facility if the reliability of the CAISO Controlled Grid would be adversely affected. The Interconnection Customer shall not cause its Large Generating Facility to disconnect automatically or instantaneously from the CAISO Controlled Grid or trip any Electric Generating Unit comprising the Large Generating Facility for an under or over frequency condition unless the abnormal frequency condition persists for a time period beyond the limits set forth in ANSI/IEEE Standard C37.106, or such other standard as applied to other generators in the Balancing Authority Area on a comparable basis.

* * * * *

9.6.4 Primary Frequency Response. Interconnection Customer shall ensure the primary frequency response capability of its Electric Generating Unit(s) by installing, maintaining, and operating a functioning governor or equivalent controls. The term "functioning governor or equivalent controls" as used herein shall mean the required hardware and/or software that provides frequency responsive real power control with the ability to sense changes in system frequency and autonomously adjust the Electric Generating Unit's real power output in accordance with the droop and deadband parameters and in the direction needed to correct frequency deviations. Interconnection Customer is required to install a governor or equivalent controls with the capability of operating: (1) with a maximum 5 percent droop and ±0.036 Hz deadband; or (2) in accordance with the relevant droop, deadband, and timely and sustained response settings from Applicable Reliability Standards providing for equivalent or more stringent parameters. The droop characteristic shall be: (1) based on the nameplate capacity of the Electric Generating Unit(s), and shall be linear in the range of frequencies between 59 to 61 Hz that are outside of the deadband parameter; or (2) based on Applicable Reliability Standards providing for an equivalent or more stringent parameter. The deadband parameter shall be: the range of frequencies above and below nominal (60 Hz) in which the governor or equivalent controls is not expected to adjust the Electric Generating Unit's real power output in response to frequency deviations. The deadband shall be implemented: (1) without a step to the droop curve, that is, once the frequency deviation exceeds the deadband parameter, the expected change in the Electric Generating Unit's real power output in response to frequency deviations shall start from zero and then increase (for under-frequency deviations) or decrease (for over-frequency deviations) linearly in proportion to the magnitude of the frequency deviation; or (2) in accordance with Applicable Reliability Standards providing for an equivalent or more stringent parameter. Interconnection Customer shall notify the CAISO that the primary frequency response capability of the Electric Generating Unit(s) has been tested and confirmed during commissioning. Once Interconnection Customer has synchronized the Electric Generating Unit(s) with the CAISO Controlled Grid, Interconnection Customer shall operate the Electric Generating Unit(s) consistent with the provisions specified in Sections 9.6.4.1 and 9.6.4.2 of this LGIA. The primary frequency response requirements contained herein shall apply to both synchronous and non-synchronous Large Generating Facilities.

9.6.4.1 Governor or Equivalent Controls. Whenever the Electric Generating Unit(s) is operated in parallel with the CAISO Controlled Grid, Interconnection Customer shall operate the Electric Generating Unit(s) with its governor or equivalent controls in service and responsive to frequency. Interconnection Customer shall,

in coordination with the CAISO, set the deadband parameter to: (1) a maximum of ±0.036 Hz and set the droop parameter to a maximum of 5 percent; or (2) implement the relevant droop and deadband settings from Applicable Reliability Standards that provides for equivalent or more stringent parameters. Interconnection Customer shall be required to provide the status and settings of the governor or equivalent controls to the CAISO upon request. If Interconnection Customer needs to operate the Electric Generating Unit(s) with its governor or equivalent controls not in service, Interconnection Customer shall immediately notify the CAISO, and provide the following information: (1) the operating status of the governor or equivalent controls (i.e., whether it is currently out of service or when it will be taken out of service); (2) the reasons for removing the governor or equivalent controls from service; and (3) a reasonable estimate of when the governor or equivalent controls will be returned to service. Interconnection Customer shall make Reasonable Efforts to return its governor or equivalent controls into service as soon as practicable. Interconnection Customer shall make Reasonable Efforts to keep outages of the Electric Generating Unit's governor or equivalent controls to a minimum whenever the Electric Generating Unit(s) is operated in parallel with the CAISO Controlled Grid.

9.6.4.2 Timely and Sustained Response. Interconnection Customer shall ensure that the Electric Generating Unit's real power response to sustained frequency deviations outside of the deadband setting is automatically provided and shall begin immediately after frequency deviates outside of the deadband, and to the extent the Electric Generating Unit(s) has operating capability in the direction needed to correct the frequency deviation. Interconnection Customer shall not block or otherwise inhibit the ability of the governor or equivalent controls to respond and shall ensure that the response is not inhibited, except under certain operational constraints including, but not limited to, ambient temperature limitations, physical energy limitations, outages of mechanical equipment, or regulatory requirements. The Electric Generating Unit(s) shall sustain the real power response at least until system frequency returns to a value within the deadband setting of the governor or equivalent controls. A FERC-approved Applicable Reliability Standard with equivalent or more stringent requirements shall supersede the above requirements.

9.6.4.3 Exemptions. Large Generating Facilities that are regulated by the Nuclear Regulatory Commission shall be exempt from Sections 9.6.4, 9.6.4.1, and 9.6.4.2 of this LGIA. Large Generating Facilities that are behind-the-meter generation that is sized-to-load (i.e., the thermal load and the generation are near-balanced in real-time operation and the generation is primarily controlled to maintain the unique thermal, chemical, or mechanical output necessary for the operating requirements of its host facility) shall be required to install primary frequency response capability in accordance with the droop and deadband capability requirements specified in Section 9.6.4, but shall be otherwise exempt from the operating requirements in Sections 9.6.4, 9.6.4.1, 9.6.4.2, and 9.6.4.4 of this LGIA.

9.6.4.4 Electric Storage Resources. Interconnection Customer interconnecting an electric storage resource shall establish an operating range in Appendix C of this LGIA that specifies a minimum state of charge and a maximum state of charge between which the electric storage resource will be required to provide primary frequency response consistent with the conditions set forth in Sections 9.6.4, 9.6.4.1, 9.6.4.2, and 9.6.4.3 of this LGIA. Appendix C shall specify whether the operating range is static or dynamic, and shall consider: (1) the expected magnitude of frequency deviations in the interconnection; (2) the expected duration that system frequency will remain outside of the deadband parameter in

the interconnection; (3) the expected incidence of frequency deviations outside of the deadband parameter in the interconnection; (4) the physical capabilities of the electric storage resource; (5) operational limitations of the electric storage resource due to manufacturer specifications; and (6) any other relevant factors agreed to by the CAISO and Interconnection Customer, and in consultation with the relevant transmission owner or balancing authority as appropriate. If the operating range is dynamic, then Appendix C must establish how frequently the operating range will be reevaluated and the factors that may be considered during its reevaluation.

Interconnection Customer's electric storage resource is required to provide timely and sustained primary frequency response consistent with Section 9.6.4.2 of this LGIA when it is online and dispatched to inject electricity to the CAISO Controlled Grid and/or receive electricity from the Participating TO's Transmission System or the CAISO Controlled Grid. This excludes circumstances when the electric storage resource is not dispatched to inject electricity to the CAISO Controlled Grid and/or dispatched to receive electricity from the Participating TO's Transmission system or the CAISO Controlled Grid. If Interconnection Customer's electric storage resource is charging at the time of a frequency deviation outside of its deadband parameter, it is to increase (for over-frequency deviations) or decrease (for under-frequency deviations) the rate at which it is charging in accordance with its droop parameter. Interconnection Customer's electric storage resource is not required to change from charging to discharging, or vice versa, unless the response necessitated by the droop and deadband settings requires it to do so and it is technically capable of making such a transition.

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Appendix EE

Large Generator Interconnection Agreement

for Interconnection Requests Processed under the Generator Interconnection and Deliverability

Allocation Procedures (Appendix DD of the CAISO Tariff)

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9.6 Reactive Power and Primary Frequency Response.

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9.6.2.1 ~~Governors and~~Voltage Regulators. Whenever an Electric Generating Unit is operated in parallel with the CAISO Controlled Grid ~~and the speed governors (if installed on the Electric Generating Unit pursuant to Good Utility Practice)~~ and voltage regulators are capable of operation, the Interconnection Customer shall operate the Electric Generating Unit with its ~~speed governors and~~ voltage regulators in automatic operation. If the Electric Generating Unit's ~~speed governors and~~ voltage regulators are not capable of such automatic operation, the Interconnection Customer shall immediately notify the CAISO and the Participating TO and ensure that the Electric Generating Unit operates as specified in Article 9.6.2 through manual operation and that such Electric Generating Unit's reactive power production or absorption (measured in MVARs) are within the design capability of the Electric Generating Unit(s) and steady state stability limits. The Interconnection Customer shall restore the speed governors and voltage regulators to automatic operation as soon as possible. If the Large Generating Facility's speed governors and voltage regulators are improperly tuned or malfunctioning, the CAISO shall have the right to order the reduction in output or disconnection of the Large Generating Facility if the reliability of the CAISO Controlled Grid would be adversely affected. The Interconnection Customer shall not cause its Large Generating Facility to disconnect automatically or instantaneously from the CAISO Controlled Grid or trip any Electric Generating Unit comprising the Large Generating Facility for an under or over frequency condition unless the abnormal frequency condition persists for a time period beyond the limits set forth in ANSI/IEEE Standard C37.106, or such other standard as applied to other generators in the Balancing Authority Area on a comparable basis.

* * * * *

9.6.4 Primary Frequency Response. Interconnection Customer shall ensure the primary frequency response capability of its Electric Generating Unit(s) by installing, maintaining, and operating a functioning governor or equivalent controls. The term "functioning governor or equivalent controls" as used herein shall mean the required hardware and/or software that provides frequency responsive real power control with the ability to sense changes in system frequency and autonomously adjust the Electric Generating Unit's real power output in accordance with the droop and deadband parameters and in the direction needed to correct frequency deviations. Interconnection Customer is required to install a governor or equivalent controls with the capability of operating: (1) with a maximum 5 percent droop and ±0.036 Hz deadband; or (2) in accordance with the relevant droop, deadband, and timely and sustained response settings from Applicable Reliability

Standards providing for equivalent or more stringent parameters. The droop characteristic shall be: (1) based on the nameplate capacity of the Electric Generating Unit(s), and shall be linear in the range of frequencies between 59 to 61 Hz that are outside of the deadband parameter; or (2) based on Applicable Reliability Standards providing for an equivalent or more stringent parameter. The deadband parameter shall be: the range of frequencies above and below nominal (60 Hz) in which the governor or equivalent controls is not expected to adjust the Electric Generating Units' real power output in response to frequency deviations. The deadband shall be implemented: (1) without a step to the droop curve, that is, once the frequency deviation exceeds the deadband parameter, the expected change in the Electric Generating Units' real power output in response to frequency deviations shall start from zero and then increase (for under-frequency deviations) or decrease (for over-frequency deviations) linearly in proportion to the magnitude of the frequency deviation; or (2) in accordance with Applicable Reliability Standards providing for an equivalent or more stringent parameter. Interconnection Customer shall notify the CAISO that the primary frequency response capability of the Electric Generating Unit(s) has been tested and confirmed during commissioning. Once Interconnection Customer has synchronized the Electric Generating Unit(s) with the CAISO Controlled Grid, Interconnection Customer shall operate the Electric Generating Unit(s) consistent with the provisions specified in Sections 9.6.4.1 and 9.6.4.2 of this LGIA. The primary frequency response requirements contained herein shall apply to both synchronous and non-synchronous Large Generating Facilities.

9.6.4.1 Governor or Equivalent Controls. Whenever the Electric Generating Unit(s) is operated in parallel with the CAISO Controlled Grid, Interconnection Customer shall operate the Electric Generating Unit(s) with its governor or equivalent controls in service and responsive to frequency. Interconnection Customer shall, in coordination with the CAISO, set the deadband parameter to: (1) a maximum of ±0.036 Hz and set the droop parameter to a maximum of 5 percent; or (2) implement the relevant droop and deadband settings from Applicable Reliability Standards that provides for equivalent or more stringent parameters. Interconnection Customer shall be required to provide the status and settings of the governor or equivalent controls to the CAISO upon request. If Interconnection Customer needs to operate the Electric Generating Unit(s) with its governor or equivalent controls not in service, Interconnection Customer shall immediately notify the CAISO, and provide the following information: (1) the operating status of the governor or equivalent controls (i.e., whether it is currently out of service or when it will be taken out of service); (2) the reasons for removing the governor or equivalent controls from service; and (3) a reasonable estimate of when the governor or equivalent controls will be returned to service. Interconnection Customer shall make Reasonable Efforts to return its governor or equivalent controls into service as soon as practicable. Interconnection Customer shall make Reasonable Efforts to keep outages of the Electric Generating Units' governor or equivalent controls to a minimum whenever the Electric Generating Unit(s) is operated in parallel with the CAISO Controlled Grid.

9.6.4.2 Timely and Sustained Response. Interconnection Customer shall ensure that the Electric Generating Units' real power response to sustained frequency deviations outside of the deadband setting is automatically provided and shall begin immediately after frequency deviates outside of the deadband, and to the extent the Electric Generating Unit(s) has operating capability in the direction needed to correct the frequency deviation. Interconnection Customer shall not block or otherwise inhibit the ability of the governor or equivalent controls to respond and shall ensure that the response is not inhibited, except under certain operational constraints including, but not limited to, ambient temperature limitations, physical energy limitations, outages of mechanical equipment, or

regulatory requirements. The Electric Generating Unit(s) shall sustain the real power response at least until system frequency returns to a value within the deadband setting of the governor or equivalent controls. A FERC-approved Applicable Reliability Standard with equivalent or more stringent requirements shall supersede the above requirements.

9.6.4.3 Exemptions. Large Generating Facilities that are regulated by the Nuclear Regulatory Commission shall be exempt from Sections 9.6.4, 9.6.4.1, and 9.6.4.2 of this LGIA. Large Generating Facilities that are behind-the-meter generation that is sized-to-load (i.e., the thermal load and the generation are near-balanced in real-time operation and the generation is primarily controlled to maintain the unique thermal, chemical, or mechanical output necessary for the operating requirements of its host facility) shall be required to install primary frequency response capability in accordance with the droop and deadband capability requirements specified in Section 9.6.4, but shall be otherwise exempt from the operating requirements in Sections 9.6.4, 9.6.4.1, 9.6.4.2, and 9.6.4.4 of this LGIA.

9.6.4.4 Electric Storage Resources. Interconnection Customer interconnecting an electric storage resource shall establish an operating range in Appendix C of this LGIA that specifies a minimum state of charge and a maximum state of charge between which the electric storage resource will be required to provide primary frequency response consistent with the conditions set forth in Sections 9.6.4, 9.6.4.1, 9.6.4.2, and 9.6.4.3 of this LGIA. Appendix C shall specify whether the operating range is static or dynamic, and shall consider: (1) the expected magnitude of frequency deviations in the interconnection; (2) the expected duration that system frequency will remain outside of the deadband parameter in the interconnection; (3) the expected incidence of frequency deviations outside of the deadband parameter in the interconnection; (4) the physical capabilities of the electric storage resource; (5) operational limitations of the electric storage resource due to manufacturer specifications; and (6) any other relevant factors agreed to by the CAISO and Interconnection Customer, and in consultation with the relevant transmission owner or balancing authority as appropriate. If the operating range is dynamic, then Appendix C must establish how frequently the operating range will be reevaluated and the factors that may be considered during its reevaluation.

Interconnection Customer's electric storage resource is required to provide timely and sustained primary frequency response consistent with Section 9.6.4.2 of this LGIA when it is online and dispatched to inject electricity to the CAISO Controlled Grid and/or receive electricity from the Participating TO's Transmission System or the CAISO Controlled Grid. This excludes circumstances when the electric storage resource is not dispatched to inject electricity to the CAISO Controlled Grid and/or dispatched to receive electricity from the Participating TO's Transmission system or the CAISO Controlled Grid. If Interconnection Customer's electric storage resource is charging at the time of a frequency deviation outside of its deadband parameter, it is to increase (for over-frequency deviations) or decrease (for under-frequency deviations) the rate at which it is charging in accordance with its droop parameter. Interconnection Customer's electric storage resource is not required to change from charging to discharging, or vice versa, unless the response necessitated by the droop and deadband settings requires it to do so and it is technically capable of making such a transition.

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Appendix FF

Small Generator Interconnection Agreement for Interconnection Requests Processed Under the Generator Interconnection and Deliverability Allocation Procedures (Appendix DD to the CAISO Tariff)

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1.8 Reactive Power and Primary Frequency Response

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1.8.3 Primary Frequency Response. Interconnection Customer shall ensure the primary frequency response capability of its Small Generating Facility by installing, maintaining, and operating a functioning governor or equivalent controls. The term "functioning governor or equivalent controls" as used herein shall mean the required hardware and/or software that provides frequency responsive real power control with the ability to sense changes in system frequency and autonomously adjust the Small Generating Facility's real power output in accordance with the droop and deadband parameters and in the direction needed to correct frequency deviations. Interconnection Customer is required to install a governor or equivalent controls with the capability of operating: (1) with a maximum 5 percent droop and ±0.036 Hz deadband; or (2) in accordance with the relevant droop, deadband, and timely and sustained response settings from Applicable Reliability Standards providing for equivalent or more stringent parameters. The droop characteristic shall be: (1) based on the nameplate capacity of the Small Generating Facility, and shall be linear in the range of frequencies between 59 to 61 Hz that are outside of the deadband parameter; or (2) based on Applicable Reliability Standards providing for an equivalent or more stringent parameter. The deadband parameter shall be: the range of frequencies above and below nominal (60 Hz) in which the governor or equivalent controls is not expected to adjust the Small Generating Facility's real power output in response to frequency deviations. The deadband shall be implemented: (1) without a step to the droop curve, that is, once the frequency deviation exceeds the deadband parameter, the expected change in the Small Generating Facility's real power output in response to frequency deviations shall start from zero and then increase (for under-frequency deviations) or decrease (for over-frequency deviations) linearly in proportion to the magnitude of the frequency deviation; or (2) in accordance with Applicable Reliability Standards providing for an equivalent or more stringent parameter. Interconnection Customer shall notify the CAISO that the primary frequency response capability of the Small Generating Facility has been tested and confirmed during commissioning. Once Interconnection Customer has synchronized the Small Generating Facility with the CAISO Controlled Grid, Interconnection Customer shall operate the Small Generating Facility consistent with the provisions specified in Sections 1.8.3.1 and 1.8.4.2 of this SGIA. The primary frequency response requirements contained herein shall apply to both synchronous and non-synchronous Small Generating Facilities.

1.8.3.1 Governor or Equivalent Controls. Whenever the Small Generating Facility is operated in parallel with the CAISO Controlled Grid, Interconnection Customer shall operate the Small Generating Facility with its governor or equivalent controls in service and responsive to frequency. Interconnection Customer shall, in coordination with the CAISO, set the deadband parameter to: (1) a maximum of ±0.036 Hz and set the droop parameter to a maximum of 5 percent; or (2) implement the relevant droop and deadband settings from Applicable Reliability Standards that provides for equivalent or more stringent parameters. Interconnection Customer shall be required to provide the status and settings of the governor or equivalent controls to the CAISO upon request. If Interconnection Customer needs to operate the Small Generating Facility with its

governor or equivalent controls not in service, Interconnection Customer shall immediately notify the CAISO, and provide the following information: (1) the operating status of the governor or equivalent controls (i.e., whether it is currently out of service or when it will be taken out of service); (2) the reasons for removing the governor or equivalent controls from service; and (3) a reasonable estimate of when the governor or equivalent controls will be returned to service. Interconnection Customer shall make Reasonable Efforts to return its governor or equivalent controls into service as soon as practicable. Interconnection Customer shall make Reasonable Efforts to keep outages of the Small Generating Facility's governor or equivalent controls to a minimum whenever the Small Generating Facility is operated in parallel with the CAISO Controlled Grid.

1.8.3.2 Timely and Sustained Response. Interconnection Customer shall ensure that the Small Generating Facility's real power response to sustained frequency deviations outside of the deadband setting is automatically provided and shall begin immediately after frequency deviates outside of the deadband, and to the extent the Small Generating Facility has operating capability in the direction needed to correct the frequency deviation. Interconnection Customer shall not block or otherwise inhibit the ability of the governor or equivalent controls to respond and shall ensure that the response is not inhibited, except under certain operational constraints including, but not limited to, ambient temperature limitations, physical energy limitations, outages of mechanical equipment, or regulatory requirements. The Small Generating Facility shall sustain the real power response at least until system frequency returns to a value within the deadband setting of the governor or equivalent controls. A FERC-approved Applicable Reliability Standard with equivalent or more stringent requirements shall supersede the above requirements.

1.8.3.3 Exemptions. Small Generating Facilities that are regulated by the Nuclear Regulatory Commission shall be exempt from Sections 1.8.3, 1.8.3.1, and 1.8.3.2 of this SGIA. Small Generating Facilities that are behind-the-meter generation that is sized-to-load (i.e., the thermal load and the generation are near-balanced in real-time operation and the generation is primarily controlled to maintain the unique thermal, chemical, or mechanical output necessary for the operating requirements of its host facility) shall be required to install primary frequency response capability in accordance with the droop and deadband capability requirements specified in Section 1.8.3, but shall be otherwise exempt from the operating requirements in Sections 1.8.3, 1.8.3.1, 1.8.3.2, and 1.8.3.4 of this SGIA.

1.8.3.4 Electric Storage Resources. Interconnection Customer interconnecting an electric storage resource shall establish an operating range in Attachment 5 of ~~its~~this SGIA that specifies a minimum state of charge and a maximum state of charge between which the electric storage resource will be required to provide primary frequency response consistent with the conditions set forth in Sections 1.8.3, 1.8.3.1, 1.8.3.2, and 1.8.3.3 of this SGIA. Attachment 5 shall specify whether the operating range is static or dynamic, and shall consider: (1) the expected magnitude of frequency deviations in the interconnection; (2) the expected duration that system frequency will remain outside of the deadband parameter in the interconnection; (3) the expected incidence of frequency deviations outside of the deadband parameter in the interconnection; (4) the physical capabilities of the electric storage resource; (5) operational limitations of the electric storage resource due to manufacturer specifications; and (6) any other relevant factors agreed to by the CAISO and Interconnection Customer, and in consultation with the relevant transmission owner or balancing authority as appropriate. If the operating range is dynamic, then Attachment 5 must establish

how frequently the operating range will be reevaluated and the factors that may be considered during its reevaluation.

Interconnection Customer's electric storage resource is required to provide timely and sustained primary frequency response consistent with Section 1.8.3.2 of this SGIA when it is online and dispatched to inject electricity to the CAISO Controlled Grid and/or receive electricity from the Participating TO's Transmission System or the CAISO Controlled Grid. This excludes circumstances when the electric storage resource is not dispatched to inject electricity to the CAISO Controlled Grid and/or dispatched to receive electricity from the Participating TO's Transmission System or the CAISO Controlled Grid. If Interconnection Customer's electric storage resource is charging at the time of a frequency deviation outside of its deadband parameter, it is to increase (for over-frequency deviations) or decrease (for under-frequency deviations) the rate at which it is charging in accordance with its droop parameter. Interconnection Customer's electric storage resource is not required to change from charging to discharging, or vice versa, unless the response necessitated by the droop and deadband settings requires it to do so and it is technically capable of making such a transition.