Reactive Power Requirements for Asynchronous Resources Draft Tariff Language

8.2.3.3 Voltage Support

The CAISO shall determine on an hourly basis for each day the quantity and location of Voltage Support required to maintain voltage levels and reactive margins within NERC and WECC reliability standards, and any requirements of the NRC using a power flow study based on the quantity and location of scheduled Demand. The CAISO shall issue daily voltage schedules (Dispatch Instructions) to Participating Generators, Participating TOs and UDCs, which are required to be maintained for CAISO Controlled Grid reliability. All other Generating Units shall comply with the power factor requirements set forth in contractual arrangements in effect on the CAISO Operations Date, or, if no such contractual arrangements exist and the Generating Unit exists within the system of a Participating TO, the power factor requirements applicable under the Participating TO's TO Tariff or other tariff on file with the FERC.

All Participating Generators that operate Asynchronous Generating Facilities subject to the Large Generator Interconnection Agreement set forth in Appendix BB or CC shall maintain the CAISO specified voltage schedule if required under Appendix H of the Large Generator Interconnection Agreement, while operating within the power factor range specified in their interconnection agreements. All Participating Generators that operate Asynchronous Generating Facilities subject to the Large Generator Interconnection Agreement set forth in Appendix or the Small Generator Interconnection Agreement set forth in Appendix or the Small Generator Interconnection Agreement set forth in Appendix or the Small Generator Interconnection Agreement set forth in Appendix or the Small Generator Interconnection Agreement or Attachment 7 of the Small Generator Interconnection Agreement, as applicable, while operating within the power factor range specified in their interconnection agreements. For all other Generating Units, Participating Generators shall maintain the CAISO specified voltage schedule at the Generating Unit terminals to the extent possible, while operating within the power factor range specified in their interconnection Must-Take Generation with Existing QF Contracts or Amended QF Contracts, Regulatory Must-Run

Generation and Reliability Must-Run Generation, consistent with existing obligations. For Generating Units that do not operate under one of these agreements, the minimum power factor range will be within a band of 0.90 lag (producing VARs) and 0.95 lead (absorbing VARs) power factors. Participating Generators with Generating Units existing at the CAISO Operations Date that are unable to meet this operating power factor requirement may apply to the CAISO for an exemption. Prior to granting such an exemption, the CAISO shall require the Participating TO, UDC or other utility to whose system the relevant Generating Units are interconnected to notify it of the existing contractual requirements for Voltage Support established prior to the CAISO Operations Date for such Generating Units. Such requirements may be contained in CPUC Electric Rule 21 or the Interconnection Agreement with the Participating TO, UDC or other utility. The CAISO shall not grant any exemption under this Section from such existing contractual requirements. The CAISO shall be entitled to instruct Participating Generators to operate their Generating Units at specified points within their power factor ranges. Participating Generators shall receive no compensation for operating within these specified ranges.

If the CAISO requires additional Voltage Support, it shall procure this either through Reliability Must-Run Contracts or, if no other more economic sources are available, by instructing a Generating Unit to move its MVar output outside its mandatory range. Only if the Generating Unit must reduce its MW output in order to comply with such an instruction will it be eligible to recover its opportunity cost in accordance with Section 11.10.1.4.

All Loads directly connected to the CAISO Controlled Grid shall maintain reactive flow at grid interface points within a specified power factor band of 0.97 lag to 0.99 lead. Loads shall not be compensated for the service of maintaining the power factor at required levels within the bandwidth. A UDC interconnecting with the CAISO Controlled Grid at any point other than a Scheduling Point shall be subject to the same power factor requirement. The CAISO will establish voltage control standards with UDCs and the operators of other Balancing Authority Areas and will enter into operational agreements providing for the coordination of actions in the event of a voltage problem occurring.

* * *

[The following language would appear as part of an appendix to a new Large Generator Interconnection Agreement appended to the ISO tariff. This language would also appear in an attachment to a new Small Generator Interconnection Agreement appended to the ISO tariff. These new interconnection agreements would apply to project entering Queue Cluster 9 and future clusters.]

Appendix H To LGIA

INTERCONNECTION REQUIREMENTS FOR AN ASYNCHRONOUS GENERATING FACILITY

Appendix H sets forth interconnection requirements specific to all Asynchronous Generating Facilities. Existing individual generating units of an Asynchronous Generating Facility that are, or have been, interconnected to the CAISO Controlled Grid at the same location are exempt from the requirements of this Appendix H for the remaining life of the existing generating unit. Generating units that are replaced or repowered, however, shall meet the requirements of this Appendix H.

A. Technical Requirements Applicable to Asynchronous Generating Facilities

iii. Power Factor Design Criteria (Reactive Power)

- 1. Asynchronous Generating Facilities shall meet the following design requirements:
 - a. An Asynchronous Generating Facility shall be designed to have net reactive power sourcing and absorption capability sufficient to achieve or exceed the net reactive power range of .95 leading to 0.95 lagging as referenced to the Point of Interconnection voltage, without exceeding the ratings of any equipment in the Asynchronous Generating Facility. The Point of Interconnection voltage is specified in per-unit of the nominal voltage. When the real power output of the Asynchronous Generating Facility is at its maximum capability, the Asynchronous Generating Facility shall have the capability to provide reactive power at 0.95 lagging when voltage levels are between 0.95 per unit and 1 per unit at the Point of Interconnection. The capability to provide reactive power will decrease as the voltage at the Point of Interconnection exceeds 1 per unit of scheduled voltage. An Asynchronous Generating Facility shall have the capability to absorb reactive power at 0.95 leading when voltage levels are between 1 per unit and 1.05 per unit at the Point of Interconnection. The capability to absorb reactive power will decrease as the voltage at the Point of Interconnection. The capability to absorb reactive power will decrease as the voltage levels are between 1 per unit and 1.05 per unit at the Point of Interconnection. The capability to absorb reactive power will decrease as the voltage at the Point of Interconnection. The capability to absorb reactive power will decrease as the voltage at the Point of Interconnection. The capability to absorb reactive power will decrease as the voltage at the Point of Interconnection. The capability to absorb reactive power will decrease as the voltage at the Point of Interconnection drops below 1 per unit of scheduled voltage.
 - b. Net power factor shall be measured at the Point of Interconnection as defined in this LGIA.
 - c. Asynchronous Generating Facilities may meet the power factor range requirement by using power electronics designed to supply the required level of reactive capability (taking into account any limitations due to voltage level and real power output) or fixed and switched capacitors, or a combination of the two. Or fixed and switched capacitors, fixed or switched reactors, or any combination thereto.
 - d. Asynchronous Generating Facilities shall also provide dynamic voltage support between 0.985 leading and 0.985 lagging at the maximum real power capability at the Point of Interconnection. Within this range, Asynchronous Generating Facilities shall vary the reactive output between full sourcing and full absorption capabilities in a continuous manner. At maximum real power capability of the Asynchronous Generating Facility, the expected dynamic reactive capability will between 0.985

lagging to 0.985 leading. Also, at maximum real power capability, the overall expected continuous reactive capability will be between 0.95 lagging to 0.95 leading.

iv. Voltage Regulation and Reactive Power Control Requirements

- 1. Asynchronous Generating Facilities shall meet the following control requirements:
 - a. The Asynchronous Generation Facility's reactive power capability shall be controlled by an automatic system having both voltage regulation and a net power factor regulation operating modes. The default mode of operation will be voltage regulation.
 - b. The voltage regulation function mode shall automatically control the net reactive power of the Asynchronous Generating Facility to regulate the Point of Interconnection scheduled voltage assigned by the Participating TO or CAISO, within the constraints of the reactive power capability of the Asynchronous Generating Facility and in proportion to its actual real power output pursuant to the following formula:

MVARs shall equal MW $* \tan(\cos^{-1}(.95))$

- c. The Interconnection Customer may elect to regulate the voltage at a point on the Asynchronous Generating Facility's side of the Point of Interconnection. Regulating voltage to a point other than the Point of Interconnection shall not change the Asynchronous Generating Facility's net power factor requirements set forth in Section A.iii of this Appendix H.
- d. With the prior agreement of the Participating TO, the Interconnection Customer may elect to regulate the voltage at a point on the Participating TO's side of the Point of Interconnection. Regulating voltage to a point other than the Point of Interconnection shall not change the Asynchronous Generating Facility's net power factor requirements. Any regulation point other than the Point of Interconnection shall not change the Asynchronous Generating Facility's net power factor requirements set forth in Section A.iii of this Appendix H.
- e. The Interconnection Customer shall not disable voltage regulation controls without the permission of the CAISO.