California Independent System Operator

# Comments of the California Wind Energy Association and the American Wind Energy Association on the CAISO Issue Paper on Reactive Power Requirements and Financial Compensation

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The California Wind Energy Association ("CalWEA") and the American Wind Energy Association ("AWEA") appreciate the opportunity to comment on the California Independent System Operator Corporation's ("CAISO") Reactive Power Requirements and Financial Compensation Issue Paper, dated May 22, 2015 ("Issue Paper"), a continuation of the CAISO's Reactive Power Requirements for Asynchronous Resources initiative. The Issue Paper presents a straw proposal for requiring the "universal" provision of reactive power and voltage control capabilities by asynchronous generators that will interconnect to the CAISO grid in the future.

Before presenting our specific comments on the Issue Paper, CalWEA and AWEA would like to expressly thank CAISO for its willingness to proactively address two critical issues related to this initiative by:

- Holding a technical workshop to address some of the technical details of the proposed reactive power requirements, particularly those related to automatic voltage regulation and dynamic reactive support; and
- Including compensation for the provision of reactive power and voltage control as part of this latest Issue Paper.

In addition, we want to once again reiterate our support for initiatives that reasonably and cost-effectively improve the reliability and efficiency of the electric power system. By participating in the development of all of the requirements of FERC Order 661A and the interconnection requirements of the CAISO and other transmission operators, the wind industry has consistently played its part in putting this support statement into action. The wind industry has also taken the initiative to provide needed reliability services, including meeting voltage and frequency ride-through standards that are more aggressive than can be met by most conventional generators. At the same time, it is important to evaluate whether the desired capabilities are optimally obtained by imposing requirements on all generators, or whether a need may be better met with solutions that are less costly overall and less burdensome on market participants.

CalWEA and AWEA offer the following specific comments on the Issue Paper. Please note that some of the points raised here repeat those in our March 30, 2015 comments given that additional clarity is still needed on some of those issues.

**1. Prospective Application of the Reactive Power Requirements**

CalWEA and AWEA would like to ask for the following clarifications that CAISO will only applies its proposed reactive power requirements on a prospective basis:

- The requirements will not apply to any existing asynchronous generator that seeks to convert its existing interconnection agreement to a CAISO-compliant interconnection agreement ("paper/contract conversion") or any existing asynchronous generator that is requesting an incremental increase in capacity or energy output using existing or refurbished hardware.
- While the requirement will apply to projects that plan to repower with new turbines, it will not apply to existing turbines that remain (or are simply refurbished) in an otherwise

repowered project (turbines remaining at the same capacity with essentially the same technology).

**2. Technical Requirements of Providing AVR Capability**

CalWEA and AWEA appreciate that CAISO has partially addressed the concern with providing AVR functionality that we raised in our March 20, 2015 comments and further discussed at the CAISO technical workshop on April 22, 2015. As CalWEA and AWEA noted, providing AVR functionality at the Point of Interconnection (POI) can cause serious reliability issues for the grid and can be unduly burdensome for an asynchronous generator as well. CAISO's allowance that the CAISO, in coordination with the PTO, may permit an asynchronous generator to choose to control the voltage at a point before its POI (i.e., the project side of the POI, such as the high or low terminal of the project's main step-up transformer) is a major step in the right direction. CalWEA and AWEA also strongly support CAISO's proposal to allow both the AVR functionality and reactive power capability for an asynchronous generator (or group of generators) to be provided beyond the POI for that generator and are eager to work with the CAISO on the detail of the proposal. With that preamble, CalWEA and AWEA offer the following specific comments on the technical requirements for AVR functionality as follows:

- CAISO stated on the May 28, 2015 stakeholder call that, for an asynchronous generator that chooses to control the voltage at a point before its POI, the selected value for the voltage must be set "with reference to the POI."[1] CalWEA and AWEA understand the need for such referencing for the controlled voltage point; however, we would note that the CAISO's rules should specify that the CAISO, in coordination

[1] "Reference to the POI" for the AVR functionality at a point before the POI is not mentioned in the Issue Paper but was in the CAISO presentation slides for the May 28, 2015 stakeholder call.

with the PTO, must clearly specify the referencing relationship at the time of signing the GIA for the asynchronous generator. We expect that the relationship should keep the voltage on the generator's side of the POI at half a percent or one percent above the scheduled voltage at the POI while the project is boosting, and half a percent or one percent below the scheduled voltage at the POI while the project is bucking. Furthermore, the actual and specific voltage values at the AVR regulation point (whether at the POI or otherwise) must be provided by the CAISO/PTO with sufficient lead time. Also, CAISO should confirm the statement made by Mr. Loutan during the stakeholder call that the voltage schedule is expected to be static and not subject to change more than once or twice in a calendar year.

- Rather than being at the discretion of the CAISO and PTO, any asynchronous generator should have the right to set its voltage regulation point before the POI, e.g., at the generator's own terminal, subject to referencing to the POI.
- The beyond-the-POI voltage regulation and reactive support option for one or more interconnecting asynchronous generators can offer numerous benefits for both the generator and the grid. However, it is not clear how such a scheme would be implemented within CAISO's existing GIDAP and TPP frameworks from a process and technical standpoint. A specific proposal by the CAISO and dialogue with stakeholders is needed.
- While the issue paper is silent on the requirement for the speed of dynamic reactive support, CAISO's May 28, 2015, presentation slides on this initiative place a one-cycle response requirement on the reactive capability of interconnecting asynchronous generators (Slide 18: "[Dynamic reactive r]esponse should be similar

to a synchronous resource i.e. within a cycle to support the system during transient events."). We find this comment confusing as conventional generators are not able to provide dynamic reactive response within one cycle. Our understanding is that the normal response time for a high initial response exciter is 6 cycles, which combined with the normal time constants of the field winding, stator winding, etc. of the machine results in a minimum total response time for a conventional generator on the order of 1 second for a setpoint change. This response would be even slower for a conventional generator with a normal exciter. Imposing a one cycle response requirement on asynchronous generators would be an unreasonable burden with minimal to no benefit, and would likely result in a major cost increase for wind and solar plant inverters. We do not believe this was CAISO's intent, and no response time requirement was specified in the paper, so we simply ask that CAISO clarify that they do not expect 1 cycle response from either conventional generators or asynchronous generators. Asynchronous generators are capable of a response speed that is comparable to that of conventional generators, which meets the intent that we believe CAISO was attempting to convey on that slide and in the paper.

### 3. The Magnitude of the Reactive Power Requirement

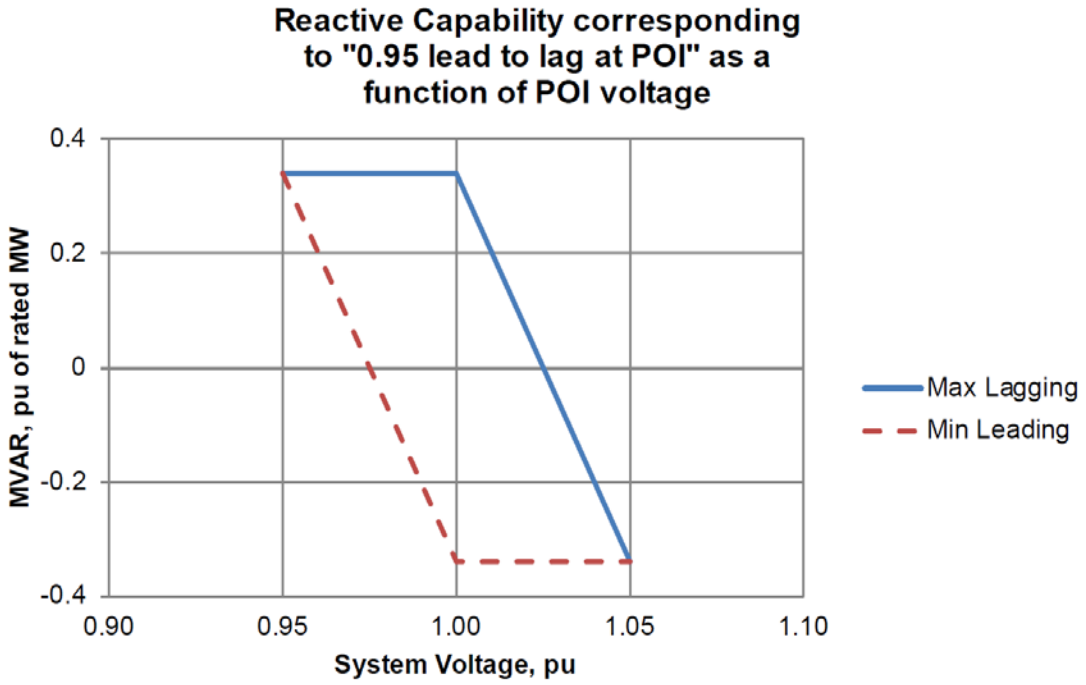
The descriptions of the reactive power requirement in the Issue Paper are conflicting and require clarification. Figure 6 accurately indicates that the magnitude of an asynchronous generator's reactive power requirement will vary with the level of real power generation. However, there are a number of places in the paper that indicate that the asynchronous generator must provide its full reactive power requirement regardless of its level of real power generation.

This is inconsistent with Figure 6, which shows that the full reactive power requirement should apply only when the generator is at full rated real power). Examples of this inconsistency can be found at p.20 of the CAISO Issue Paper:

> "An Asynchronous Generating Facility shall have an over-excited (lagging) reactive power producing capability to achieve a net power factor from 0.95 lagging up to unity power factor at the Point of Interconnection, at the Generating Facility's maximum real power capability."

> "An Asynchronous Generating Facility shall have an under-excited (leading) reactive power absorbing capability to achieve a net power factor from 0.95 leading up to unity power factor at the Point of Interconnection, at the Generating Facility's maximum real power capability."

Furthermore, Figure 5 of the CAISO Issue Paper, which illustrates what the reactive power response should be as the voltage at the POI changes, incorrectly labels the Y-axis as MVARs per unit of "rated" capacity, rather than its power factor requirement.




The above statements and Figure 5 in the Issue Paper imply that, regardless of its level of real power generation, the asynchronous generator must provide its full reactive power requirement. In order to address this inconsistency in the paper, as well as to address another

concern that we raised during the May 28, 2015 stakeholder call (re-stated below), CalWEA and AWEA would ask the following:

- All specific statements regarding the magnitude of reactive power, such as the ones noted above, should be modified to make it clear that the magnitude of the reactive power requirement varies with the magnitude of real power generation. We suggest the following as examples for the CAISO's consideration:

  "An Asynchronous Generating Facility shall have an over-excited (lagging) reactive power producing capability to achieve a net power factor from 0.95 lagging up to unity power factor at the Point of Interconnection, at the Generating Facility's maximum real power capability. However, the generator's maximum reactive power requirement would vary based on its level of real power generation as shown in Figure 6."

  "An Asynchronous Generating Facility shall have an under-excited (leading) reactive power absorbing capability to achieve a net power factor from 0.95 leading up to unity power factor at the Point of Interconnection, at the Generating Facility's maximum real power capability. However, the generator's maximum reactive power requirement would vary based on its level of real power generation as shown in Figure 6."

  In addition, Figure 5, which specifies the magnitude of the reactive power requirement from the asynchronous generator based on the POI voltage, should be modified to label the vertical coordinates as "Power Factor at POI" and the scale should range between 0.95 leading and 0.95 lagging. Alternatively, the vertical coordinate could be re-labeled as "MVARs per unit of actual real power generation."

- The description of Figure 5 should clearly state that voltage (the horizontal axis) corresponds to the voltage schedule at the point of voltage regulation (normally the POI).

- As we discussed during the stakeholder call of May 28, 2015, an asynchronous generator should be allowed to stop providing reactive power capability if its real power output falls below a certain real power level to be agreed to as part of the GIA.

CalWEA and AWEA understand that, if an asynchronous generator does not provide reactive power due to its real power output falling below the agreed-upon real power generation level and at the same time CAISO determines that the asynchronous generator must be fully curtailed due to system reliability concerns, the CAISO can order the asynchronous generator to curtail its real power generation to zero.

### 4. Compensation for Providing Reactive Power Capability

CalWEA and AWEA support the added provision to compensate asynchronous generators for the provision of reactive power by providing for two payment streams:

- Reactive Power Capability Payment: Payment to the asynchronous generator to, among other things, cover the cost of equipment, such as additional inverters, needed by the asynchronous generator to be able to provide the reactive power service including dynamic VAR and AVR functionalities; and
- Reactive Power Provision Payment: Payment to the asynchronous generator to cover the cost of actually providing the reactive power.

CalWEA and AWEA recommend that asynchronous generators be compensated on a cost-based basis, which will ensure that the payments are fair as well as straightforward, and is consistent with general practice. We suggest the following simple approaches for calculating these payments.

#### 4.1 Reactive Power Capability Payment

This payment should cover the cost of retrofitting the generating facility to meet the reactive power and voltage control capability specified by the GIA. These costs should include:

- The cost of adding inverters and/or other reactive support devices to make it possible for the asynchronous generator to provide the required power factor range at full rated power;
- The cost of "upgrading" inverters and/or other reactive support devices to allow for specific dynamic performance requirements (e.g., the one-cycle response time for response time, as noted in the CAISO presentation slides, or dynamic voltage response for the 0.985 lag/lead Power Factor range); and
- The cost of monitoring and controlling voltage to a pre-specified schedule.

### 4.2 Reactive Power Provision Payment

This payment should principally cover the opportunity cost to the asynchronous generation for withholding real power generation in order to provide the requested reactive power, which corresponds to lost revenue based on the Power Purchase Agreement (PPA) price and lost PTC, if any, rather than the generator's LMP. Only in this fashion we would be able to capture the true economic opportunity cost for the asynchronous generator and properly incentivize the provision of reactive power.