

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**

Order Instituting Rulemaking on the
Commission's Own Motion to
improve distribution level
interconnection rules and regulations
for certain classes of electric
generators and electric storage
resources.

Rulemaking 11-09-011
(Filed April 7, 2021)

**RESPONSE OF
THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION
TO ADMINISTRATIVE LAW JUDGE'S RULING REOPENING RECORD TO
CONSIDER THE MODIFICATION OF DECISION 12-09-018 AND RULE 21**

William H. Weaver
Senior Counsel
California Independent System
Operator Corporation
250 Outcropping Way
Folsom, CA 95630
916-608-1225
916-608-7222 (fax)
bweaver@caiso.com

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I. Introduction

The California Independent System Operator Corporation (“CAISO”) hereby provides its response to the Commission’s ruling to reopen the record of R.11-09-011 “to review Rule 21 to determine if an exception in Section B.1 of Rule 21 remains appropriate and whether it could result in reliability and safety concerns for the grid, thereby requiring a modification of Decision 12-09-018.”¹ The CAISO greatly appreciates and fully supports the Commission’s efforts to examine the impact of large and transmission-connected resources interconnecting under Rule 21 and participating under net energy metering (“NEM”) tariffs.² These resources can have a significant impact on reliability and the wholesale markets. As such resources proliferate, their use

¹ ALJ Ruling at 1 (April 7, 2021) (“ALJ Ruling”).

² The CAISO uses the term “resource” or “generator” for simplicity to refer to all supply resources, including conventional generation, variable energy resources, energy storage resources, etc., and excluding demand response resource or energy efficiency programs that do not export energy to the grid.

of Rule 21 to interconnect and their participation under NEM tariffs warrant the Commission's review.

II. Response

The ALJ Ruling states that the Commission's Energy Division recently "became aware of instances where distributed energy resources, sized in the tens to hundreds of megawatts for each installation, are interconnecting to the transmission system and taking service under the net energy metering tariff, raising grid stability issues."³ The Commission is correct that large generators interconnecting under Rule 21 and participating under NEM tariffs can raise significant reliability issues. Furthermore, the CAISO notes that such "distributed energy resources" are in some instances interconnecting to the transmission system, not the distribution grid.⁴ This confusion demonstrates why the Commission's reopening this proceeding is warranted. The CAISO believes that neither the Commission nor the original parties to this proceeding anticipated large resources would use Rule 21 to interconnect directly to the transmission grid and then participate under a NEM tariff. Although interconnecting to the transmission grid was expressly allowed, the original NEM tariffs had a hard cap on generator capacity at 1 MW.⁵ As the Commission notes, since the removal of that cap much larger resources have used Rule 21 to interconnect both to the distribution grid and directly to the transmission grid, which has created challenges and complexities that must be addressed.

³ ALJ Ruling at 2.

⁴ In other words, they are not *distributed* energy resources.

⁵ See CPUC, "Net Energy Metering," <https://www.cpuc.ca.gov/nem/>.

The use of Rule 21 to interconnect large resources leaves the CAISO as an affected system or a complete non-participant to the interconnection process. It is left to the interconnecting utility's discretion whether and when to notify the CAISO that a large resource may require transmission-level upgrades or may impact the operation of the transmission grid. If the CAISO is notified, it is unclear what the CAISO can require of the resource because it is likely non-jurisdictional to the CAISO and Federal Energy Regulatory Commission ("FERC").

In addition to Rule 21 interconnection issues, large resources' participation under NEM tariffs creates its own set of unique operational challenges. To participate under a NEM tariff a resource must be a net consumer over the relevant billing period, which in many cases is a full calendar year. But the CAISO has observed that many of these resources are very large solar PV arrays co-located with smaller loads. Although the customer's demand may barely exceed its generation over the year, this is true because the demand runs all day *and* all night. But during the day the generation can significantly exceed onsite demand, causing the generator to export large amounts of energy every day from sunrise to sunset. Because the generator participates under a NEM tariff, the CAISO has no forecasting, telemetry, or metering regarding its operation. This means the generator itself is invisible to the CAISO even though it is using transmission capacity, changing line flows, and impacting the deliverability of other generators.

Moreover, a NEM resource does not have a scheduling coordinator the CAISO can contact in the event of a reliability issue caused by its production. Where the CAISO could ask a wholesale resource to operate at a precise dispatch target to maintain

reliability,⁶ the CAISO has almost no recourse with NEM resources. In the event of a reliability issue, the CAISO would be forced to issue dispatch instructions to nearby wholesale generation and load, or open the breaker where the NEM resource interconnects, thereby islanding both the NEM generator and all load at that point of interconnection.

These issues are significant, and they could become serious challenges to reliability as large NEM resources proliferate both at the distribution level and, especially, the transmission level. The CAISO greatly appreciates the Energy Division staff and Commission's attention to these issues, and welcomes the opportunity to work through them with the Commission, Energy Division staff, utilities, developers, and stakeholders. It is *not* the CAISO's intent to require every resource to interconnect and participate under the CAISO tariff. The CAISO believes that there are a number of simple, straightforward solutions that will allow resources to continue to interconnect under Rule 21 and participate under NEM tariffs reliably.

The Commission should consider whether allowing transmission-connected NEM resources that export energy directly onto the CAISO controlled transmission grid was an intended result of Decision 12-09-018. The CAISO believes it may be an unintended result of the Decision and the subsequent removal of the capacity cap on NEM resources. As such, the Commission should consider whether generation capable of exporting that is directly interconnected to the CAISO controlled grid should interconnect under the CAISO tariff and participate as wholesale resources. Alternatively, the Commission

⁶ Either via dispatch schedules or a direct call to the scheduling coordinator.

should consider imposing some additional requirements on all transmission-connected NEM resources, as described below.

For distribution-connected NEM export energy, the CAISO recommends the Commission impose additional requirements if the generation capacity exceeds peak load capacity or causes backfeed power from the distribution grid to the transmission grid.

The CAISO recommends the Commission require the following additional information is provided to the CAISO:

- Interconnecting utilities include the CAISO as an affected system at the beginning of the interconnection process.
- Developers and utilities provide the following information before synchronization under the CAISO's new resource implementation process,⁷ which begins 84 days before commercial operation:
 - Single line-diagram of generation and load,
 - Generator and load PMax and PMin, and
 - Modeling and study assumptions, including short circuit/fault duty, steady state (thermal and voltage) and stability analyses.
- Once operating, resources provide the CAISO with direct real-time telemetry including:
 - Substation Interconnection Circuit Breaker Status (Open/Closed),
 - Generation connectivity status (Online/Offline), and
 - Net energy flow (+/-) at point of interconnection to grid.

⁷ <http://www.aiso.com/participate/Pages/NewResourceImplementation/Default.aspx>.

- Once operating, intermittent resources provide the CAISO with meteorological data for the CAISO to forecast their output.
- A point of contact that can operate the generator immediately in the event of a reliability issue.

The CAISO believes these requirements are critical to ensure the reliable and safe operation of the electric grid. They should not be overly burdensome or expensive to developers of transmission-connected projects or distribution-connected projects with generation capacity that exceeds peak load capacity or cause distribution-to-transmission-level exports. The CAISO recommends the Commission use this proceeding to continue to explore which NEM generator configurations, sizes, and locations warrant CAISO operational requirements in order to ensure safety and reliability on the transmission grid.

The CAISO offers the following responses to the questions in the ALJ ruling. Because the CAISO is not a part of the Rule 21 interconnection process, the CAISO defers to utilities and other stakeholders to comment on that process and any significant differences to CAISO processes.

1. Do differences in smart inverter settings or telemetry requirements exist for distributed energy resource systems interconnecting to the California Independent System Operator (CAISO)-controlled utility transmission grid through the Rule 21 tariff versus systems interconnecting through the CAISO tariff?

The CAISO's inverter setting requirements are set forth in the CAISO tariff and the CAISO's *pro forma* Generator Interconnection Agreements ("GIAs").⁸ CAISO generators generally are subject to NERC reliability standard PRC-024. The CAISO prohibits momentary cessation for transient low voltages, but allows momentary

⁸ See Section A of Appendix H of Appendix EE to the CAISO tariff; Section A of Attachment 7 of Appendix FF to the CAISO tariff.

cessation for high voltages where doing so would avoid tripping the breaker. The CAISO also requires inverters to inject reactive current during a low voltage events. Upon the cessation of transient voltage conditions and the return of the grid to normal operating voltage inverters automatically must transition to normal active (real power) current injection. The CAISO also requires that the plant controller, if used, will coordinate with the individual inverters so that the controller will not preclude rapid synchronization of the inverters following a voltage or frequency transient. Inverters may not trip or cease to inject current for momentary loss of synchronism; however, current injection may be limited to protect the inverter. Any inverter may trip if the phase lock loop is unable to regain synchronism 150 milliseconds after loss of synchronism.

In addition, generators over 20 MW are required to install monitoring equipment for the inverter voltages and currents (AC and DC) during voltage transients. Any transients must be captured and recorded. All time stamping must be synched to 1 mSec (typically achieved using a GPS clock). All data must be stored for a minimum of 30 calendar days. In the event of a reliability issue, the generator owner must make this data available to the CAISO.

For telemetry, the CAISO notes that telemetry requirements are not part of the interconnection process or considered interconnection requirements. Providing direct, real-time telemetry is an operational requirement for CAISO participating generators regardless of their interconnection level or what interconnection process they used.⁹ In any case, the fundamental difference in telemetry requirements for resources interconnecting under Rule 21 and participating under a NEM tariff and under the

⁹ See Section 7.6.1 of the CAISO tariff.

CAISO tariff is that NEM resources do not provide *any* telemetry to the CAISO. As described above, these generators essentially are invisible to the CAISO even though they use transmission capacity, change line flows, and impact the deliverability of other generators. The CAISO notes that its telemetry requirements are very flexible and allow developers to use a large number of available technologies to provide real-time telemetry.¹⁰ It should not be necessary for NEM generators to provide duplicative telemetry to the CAISO beyond what the NEM generator would provide under Rule 21. The CAISO could receive the generator's telemetry from the utility.

a. If so, specify the differences and explain in detail how each difference in settings affects transmission grid stability and reliability. Be as specific and as technical as possible.

Please see discussion above.

b. Elaborate on any other technical differences between interconnecting to the transmission grid through Rule 21 versus the CAISO tariff.

The CAISO notes that there are three ways to interconnect to the CAISO controlled grid under the CAISO tariff:

1. The two-year cluster study process for any resource,¹¹
2. The independent study process for any resource that seeks to interconnect more quickly than the cluster study process,¹² and
3. The fast track process for resources 5 MW and smaller.¹³

¹⁰ See CAISO Business Practice Manual for Direct Telemetry, available at <https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Direct%20Telemetry>.

¹¹ Section 3 of Appendix DD to the CAISO tariff.

¹² Section 4 of Appendix DD to the CAISO tariff.

¹³ Section 5 of Appendix DD to the CAISO tariff.

These three processes provide significant flexibility to resources depending on their scale, interconnection timeline, and whether they seek deliverability to provide resource adequacy capacity. The fast-track process, for example, only requires a \$500 study fee and takes approximately ten weeks to complete.¹⁴

c. What are the technical advantages/disadvantages of allowing transmission interconnection through Rule 21 instead of the CAISO tariff?

The Rule 21 process generally will be simpler and quicker for many resources, especially for those that cannot use the CAISO's fast track interconnection process. A distinct advantage of the CAISO's interconnection processes, however, is the ability to be studied for deliverability so the resource can be eligible to provide resource adequacy capacity and a load-serving entity can account for that capacity in its resource adequacy portfolio.

2. What technical requirements and changes are necessary to bring the installed systems interconnected to utility transmission grids via Rule 21 into compliance with CAISO's requirements (specifically smart inverter, telemetry settings and other technical requirements)? Are these changes affected by system size? Please indicate changes necessary system-by-system.

The Commission could incorporate CAISO inverter, telemetry, and operational requirements by reference in the Rule 21 tariffs, or it could broadly require transmission-connected or oversized distribution-connected resources to comply with CAISO tariff requirements. The Commission also could consider prohibiting export-capable generators from interconnecting to the CAISO controlled grid and participating under a NEM tariff.

3. Does interconnecting to the transmission system through Rule 21 further the State of California's renewable energy, climate change and environmental justice goals in a way that cannot be accomplished by interconnecting to the distribution system through Rule 21 or to the transmission system through the CAISO tariff?

¹⁴ *Id.*

Please see the CAISO's response to question five.

4. Does transmission interconnection through Rule 21 lead to monetary benefits for California ratepayers? If so, what are these benefits and are these benefits only achievable via transmission level interconnection under Rule 21?

Please see the CAISO's response to question five.

5. Do responses to questions 1-4 differ between Net Energy Metering and Non-Export systems? If so, how do responses differ? If responses differ, be as specific as possible about why this is the case.

As described in the introduction, resources only affect the grid where they export energy in excess of onsite demand. Regardless of the level of interconnection, the CAISO does not require any unique interconnection or operational information from NEM resources incapable of exporting. The CAISO can continue to model, forecast, and monitor such resources as load reductions only, just like most non-exporting rooftop solar.

On the other hand, a resource that consistently exports large amounts of energy onto the grid should not be able to evade minimum interconnection and operational requirements simply because it is a net consumer over an entire year. These resources use transmission capacity financed by and constructed for CAISO participating generators (nearly all of which provide resource adequacy capacity), impact market pricing, and can affect reliability. At a minimum these resources should provide the CAISO with modeling data, direct real-time telemetry, meteorological data, and a point of contact for reliability issues.

In response to questions 3 and 4 with regard to net energy metering, the CAISO has not conducted any independent analysis but instead refers to the Commission’s own analysis presented at the February 24, 2021 *en banc* on energy rates and costs.¹⁵

6. For Pacific Gas and Electric Company, San Diego Gas & Electric Company and Southern California Edison Company only: What lines (voltages) in your electric grids are deemed Transmission versus Distribution (or sub-Transmission)?

N/A.

7. What was the initial rationale for allowing transmission interconnection for Rule 21 through the Settlement Agreement as specified in D.12-09-018 (Appendix A, at A-1–A-2)?¹⁶ Is the initial rationale for allowing transmission interconnection for Rule 21 systems still valid? If so, why? Please provide specific examples.

The CAISO notes that the original NEM tariffs capped all resources at 1 MW in capacity.¹⁷ Larger resources would have been required to be CAISO participating generators at either the distribution or the transmission level. This is the fundamental

[continued on next page]

¹⁵ California Public Utilities Commission, *Utility Costs and Affordability of the Grid of the Future: An Evaluation of Electric Costs, Rates and Equity Issues Pursuant to P.U. Code Section 913.1.*, February 2021, p. 27.

¹⁶ “All Generating Facilities seeking Interconnection with the Distribution Provider’s Transmission System shall apply to the California Independent System Operator (CAISO) for Interconnection and be subject to CAISO Tariff except for 1) Net Energy Metering Generating Facilities and 2) Generating Facilities that do not export to the grid or sell any exports sent to the grid (Non-Export Generating Facilities). NEM Generating Facilities and Non-Export Generating Facilities subject to Commission jurisdiction shall interconnect under this Rule regardless of whether they interconnect to Distribution Provider’s Distribution or Transmission System.”

¹⁷ See CPUC, “Net Energy Metering,” <https://www.cpuc.ca.gov/nem/>.

change that warrants re-evaluation of the Rule 21 and NEM tariffs for all transmission-connected resources, and for distribution-connected resources with generation that exceeds peak load, or that would cause backfeed power to the transmission grid.

Respectfully submitted,

By: /s/ William H. Weaver

Roger E. Collanton

General Counsel

William H. Weaver

Senior Counsel

California Independent System

Operator Corporation

250 Outcropping Way

Folsom, CA 95630

T – 916-608-1225

F – 916-608-7222

bweaver@caiso.com

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