Memorandum

To: ISO Board of Governors

From: Keith Casey, Vice President, Market and Infrastructure Development

Date: November 7, 2018

Re: **Decision on Interconnection Process Enhancements – Track 3**

This memorandum requires Board action.

EXECUTIVE SUMMARY

The interconnection process enhancement (IPE) 2018 is the California Independent System Operator Corporation's current stakeholder initiative in its ongoing commitment to a continuous improvement process of the Generator Interconnection and Deliverability Allocation Procedures (GIDAP). As discussed at the July and September Board meetings, IPE 2018 identified twenty-five topics for this year. Some require tariff amendments and some will result in modifications to business practice manuals. A total of fifteen enhancements have been approved by the Board to date and a couple more are still being discussed with stakeholders and are planned to be presented at the February 2019 Board meeting. Management now proposes for Board approval of three topics that require tariff amendments, which are as follows:

1. Revise ride-through requirements for inverter-based generation;
2. Revise the reliability network upgrade reimbursement cap; and
3. Define and memorialize the concept of an *affected* participating transmission owner

Management recommends the following motion:

> ***Moved, that the ISO Board of Governors approves the proposed interconnection process enhancements, as described in the memorandum dated November 7, 2018; and***
>
> ***Moved, that the ISO Board of Governors authorizes Management to make all necessary and appropriate filings with the Federal Energy Regulatory Commission to implement the proposal, including any filings that implement the overarching initiative policy but contain discrete revisions to incorporate Commission guidance in any initial ruling on the proposed tariff amendment.***

DISCUSSION AND ANALYSIS

The ISO currently has 288 active projects in the interconnection queue that have not achieved commercial operation. To accomplish the interconnection and queue management processes effectively in a changing environment, the ISO strives to enhance interconnection processes when needed. To that end, Management seeks Board approval of the following enhancements:

1. Revise ride-through requirements for inverter-based generation

On August 16, 2016, fires burning in the southern California area caused several high voltage transmission lines to relay due to smoke contamination. During this time, the ISO observed over 1,100 MW of solar PV generation capacity that was unexpectedly lost during the routine clearing of the transmission line faults. Since that time, the ISO has observed twelve more instances of unexpected loss of solar PV generation, which occurred during the routine clearing of transmission system faults. The most recent event occurred on May 11, 2018. The ISO brought this issue to the attention of NERC, which formed a task force to investigate. The ISO was an active participant in this task force.

In May 2018, NERC issued a reliability guideline and an advisory notice for inverters. The documents contained recommendations for the reliable operation of inverter-based generation systems. Management proposes to update the technical requirements of the large and small generator interconnection agreements to include the basic recommendations contained in the NERC documents.

The proposed new requirements include (1) the elimination of momentary cessation for transient low voltages that typically occur on inverters during the clearing of a transmission line fault, (2) the elimination of inverter tripping for momentary loss of synchronism, and (3) the coordination of the central plant controller with the individual inverter control systems. In addition to these requirements, Management proposes to require the installation of diagnostic equipment for projects executing a large generator interconnection agreement. The diagnostic equipment functions identified in the proposal include constant monitoring of the inverter-based generation output and recording transient data during generation events defined as inverter ride-through or trip conditions. Management also proposes to require that the generator store data for a minimum of 30 days, and make the data available to the ISO and the interconnecting PTO within ten days upon request. There are no telemetry requirements included in the proposal.

These new technical requirements will apply to all new asynchronous generators in the generation interconnection process that have not yet executed a generation interconnection agreement. They also will apply to all asynchronous generators that have executed a generation interconnection agreement and are in development if the generator is changing its inverter equipment through the modification process. Finally, they will apply to all asynchronous generators that are already in service and repower or replace inverter equipment for reasons other than individual inverter replacement in kind (*e.g.*, due to individual inverter failure or other typical maintenance issues).

2. Revise the reliability network upgrade reimbursement cap

In 2012, the ISO established a $60,000 per MW reimbursement cap for reliability network upgrades to provide an incentive for interconnection customers to make efficient siting decisions that take into account the cost of required transmission. This cap establishes the amount of money the interconnection customer is reimbursed from the participating transmission owner for reliability network upgrades once the project achieves commercial operation, thus protecting ratepayers from undue costs.

In the 2018 IPE, stakeholders representing interconnection customers expressed concern that this $60,000 per MW reimbursement figure has remained static since 2012. Management agrees that updating the $60,000 per MW figure annually to account for inflation and construction cost escalation is appropriate and consistent with the original intent.

Management proposes to escalate annually the $60,000 per MW cap by an industry-based escalation factor for reliability network upgrade reimbursements, starting in year 2013. The ISO will work with stakeholders to identify the most appropriate industry escalation factor, and will incorporate the reliability network upgrade cost cap escalation into the annual PTO per-unit cost guide update process, publishing the annual updated reliability network upgrade cost cap on the ISO web site with the updated PTO per-unit cost guides.

3. Define and memorialize the concept of an *affected* participating transmission owner

The tariff addresses the participating transmission owner as the entity where the interconnection customer's project interconnects. However, depending on the electrical proximity of a project, an interconnection sometimes may impact a nearby participating transmission owner as well. In effect, the ISO and the generator must mitigate an interconnection's impact with the "interconnecting PTO" and the "affected PTO."

This type of interconnection creates two sets of issues: (1) how the reliability network upgrade reimbursement cap, financial security postings, cost responsibilities, and cost repayment for network upgrades are allocated between the interconnecting and affected PTOs; and (2) and whether the contractual arrangements should be a separate agreement with each PTO or one combined four-party agreement with both PTOs executing a single agreement.

<u>Financial Considerations</u>

Management proposes to modify the tariff to describe separate network cost estimates for the interconnecting PTO and any affected PTOs. These PTO cost estimates will sum to establish a single maximum cost responsibility for the interconnection customer's entire project. This framework enables the ISO to consider potential alternative network upgrades that might provide more efficient and lower overall network

cost solutions without being constrained by an interconnection customer having multiple maximum costs responsibilities across multiple PTOs.

The interconnection customer will make their first and second interconnection financial security posting to the interconnecting PTO and will make the third interconnection financial security posting to each PTO separately based on each PTO's network upgrade cost estimate. In addition, interconnection customers will be entitled to receive repayment for their contribution to the cost of network upgrades from each PTO separately. Repayment of amounts advanced for reliability network upgrades will be paid by each PTO up to a combined maximum of $60,000 (escalated per item 2, above) per MW of generating capacity as specified in the generator interconnection agreement. Total repayment from each PTO will be applied proportionately based on the amount paid to each PTO for its reliability network upgrades.

Single vs Multiple Generation Interconnection Agreements

The ISO currently documents the contractual rights and obligations of the ISO, interconnection customer, interconnecting PTO and affected PTO in two separate agreements. The ISO enters into a *pro forma* small or large generator interconnection agreement with the interconnection customer and interconnecting PTO under which interconnection service is provided to the interconnection customer. If an interconnection request also requires mitigations to another PTO's facilities, the ISO enters into a non *pro forma* affected participating transmission owner agreement with the interconnection customer and affected PTO that establishes the mitigation measures required on the affected PTO's electric system due to the interconnection of the interconnection customer's generating facility to the ISO controlled grid.

The ISO could not reach sufficient support with stakeholders on a proposal to continue with the existing contracting process or move to a single agreement. Therefore, the ISO is not proposing a change to the tariff at this time. However, the ISO did commit, if all parties agree, to pilot a single four-party generator interconnection agreement, which will seek to ensure that all parties affected by the interconnection customer's interconnection are accountable to each other in a single agreement.

POSITIONS OF THE PARTIES

The ISO conducted stakeholder outreach on these topics consisting of an issue paper on January 24, 2018, a straw proposal on May 21, 2018, a revised straw proposal on July 10, 2018, and a draft final proposal on September 17, 2018. Stakeholders were able to provide comments at each phase with a majority fully or partially supporting the four Track 3 topic proposals with some exceptions. The more notable exceptions are

summarized below along with Management's response to them. A comprehensive summary of all stakeholder comments is provided in Attachment A.

1. Modify ride-through requirements for inverter-based generation

Pacific Gas & Electric (PG&E), the Large-scale Solar Association (LSA), and EDF Renewables (EDF-R) all indicated their support for the proposal.

SPower responded that the technical revisions seem reasonable, but that the proposal should apply only to projects submitting new interconnection requests after the new provisions become effective. SPower expressed concern that the new standards should not apply retroactively to projects already operating or in the study process, even if a request is made to modify the inverters. As discussed, the proposed technical revisions recommended by NERC seek to solve critical grid reliability issues, and Management believes that these revisions should apply to as many asynchronous generators as possible going forward. Moreover, FERC has used execution of the GIA (or substantial modifications thereafter) as the point of demarcation for similar new requirements, most recently the capability to provide primary frequency response. This would include all projects that have not executed a generation interconnection agreement, generators who repower, and generators that are changing their inverters through the modification process. Management agrees that the technical requirements should not apply to generators that are not changing their inverters through the modification process simply to replace individual inverters due to inverter failure or other maintenance issues. However, for substantial modifications, the new requirements should apply.

San Diego Gas & Electric (SDG&E) generally supports the proposal, but suggested that the voltage units specified in the technical proposal be specified in per unit values versus root mean square (RMS). Management's proposal uses RMS voltage values to be consistent with existing NERC Standard PRC-024. SDG&E also proposed that the ISO include a requirement that all generators provide data for frequency events below 59.9 Hz. Management does not agree with this proposal because no other generators are required to automatically report data for frequency events.

First Solar provided comments that the proposal should be more specific and identify minimum time parameters of recorded data both pre- and post-event. First Solar also commented that the proposal should provide clear guidance as to what events need to be recorded. Management agrees. The ISO held a technical workshop after the last stakeholder meeting. Various attendees, including First Solar, participated and consensus was reached on the time ranges and the scope of events to be recorded. It was agreed with stakeholders at the technical workshop that this would be reflected in the tariff filing.

California Wind Energy Association (CalWEA) commented that it is aligned with the ISO's objectives to address ride-through requirements, but that there should be no rush to a solution unless the industry is "completely on board" with the proposed requirements. Further, CalWEA stated that the requirements should apply to all inverter-based generation throughout the ISO service territory, including on the distribution system. The ISO notes that

the requirements identified in its proposal are based on recent NERC advisories and in the recently issued NERC Reliability Guideline for bulk connected inverter-based generation. Further, the ISO notes that these proposed requirements cannot be applied to inverter-based generation connected to the distribution system. Generation interconnected to the distribution system is subject to the CPUC's Rule 21, which is contained in each PTO's distribution tariff. The ISO's proposed requirements will apply to all new inverter-based generators interconnecting to the transmission system.

2. Modify the reliability network upgrade reimbursement cap

All stakeholders who responded to the ISO's proposal on this issue support escalating the $60,000 per MW cap for reliability network upgrade reimbursement.

CalWEA suggested that the same escalation factor applied by each PTO in estimating the future escalated cost of reliability network upgrades should be applied to the reliability network upgrade reimbursement cap for that PTO. EDF-R, Nextera, SPower, and LSA each commented that the index mechanism that the ISO selects should be shared with stakeholders, open to comment, and monitored when implemented to ensure it is representative of any changes in PTO per-unit costs. As discussed earlier in this memo, the ISO will work with stakeholders to identify the most appropriate escalation factor for this industry.

PG&E requested clarification on whether the ISO intends for changes in the per-MW reliability network upgrade reimbursement cap to be retrospective or prospective. Management proposes that the escalation of the reimbursement cap will apply to all generators that have not yet achieved commercial operation.

Stakeholder discussions on this topic also raised a concern that the $60,000 per-MW maximum reimbursement amount for funds advanced for reliability network upgrades has the potential to be circumvented in instances where earlier-queued projects withdraw from the queue but the upgrades are still needed by later-queued resources. SCE continues to believe that such a situation could play out in a manner that results in the reliability network upgrade reimbursement cap being circumvented. Management believes that a proposal is not justified at this time because no actual gaming has occurred and potential future gaming was determined to be unlikely. The ISO will monitor the situation and address any issue on an *ad-hoc* basis.

3. Define and memorialize the concept of an *affected* participating transmission owner

Stakeholders unanimously support the proposals to address how the interconnection customer's financial security postings, cost responsibility, and affected PTO repayment will be disbursed among the interconnecting and affected PTOs.

CONCLUSION

Management recommends that the Board approve the three proposals in this memorandum. These changes are generally supported by stakeholders and were refined to address many of their comments and concerns throughout the stakeholder process. The proposed modifications improve the effectiveness of the interconnection process and the reliability of the transmission system. The proposed modifications will continue to improve the ISO's generator interconnection procedures to help California and the West to have robust capacity and meet their public policy goals while protecting ratepayers from undue costs.