Comments for CAISO 2021-2022 Transmission Planning Process

SDGE appreciates the opportunity to comment on the 2021-2022 Transmission Planning Process. As CAISO gathers assumptions and performs other preliminary work in preparation of the TPP, it is important to consider the following:

- SDGE would like to reiterate our comments submitted for the 2020-2021 TPP on 2/25/21 regarding the prevalence of RAS in SDGE's system. The overall reliability, ability of operators to operate excessive RAS, and loss of resources are among the issues to consider when recommending RAS as a TPP mitigation.
- There is a large amount of Off-Shore Wind (OSW) referenced in the 2021-2022 TPP process so far. With the high amounts of OSW sharing gen-ties, CAISO should assess the implications with regards to MSSC and N-1 BAL reliability in addition to transmission. It could be the case in the future that the new MSSC is OSW and we should plan for this scenario.
- Frequency setting of legacy BTM-PV inverters:

    Historically, the CAISO and PTOs have not properly factored in their composite load models how legacy inverters, such as the ones installed before the IEEE1547-2018 standard or the newer Rule 21 requirements, would react during a low frequency event. Legacy inverters that followed mainly the IEEE1547-2003 standard did not have ride through capabilities and were designed to trip 59.3 Hz after 10 cycles (0.16 s). The following NERC report shares the same concerns on legacy inverter and their potential unpredicted behavior if not modeled properly in the TPP models.

    https://www.nerc.com/comm/Other/essntlrlbltysrvcstskfrcDL/Distributed_Energy_Resources_Report.pdf

    "The voltage and frequency performance of DER is currently not coordinated with BPS requirements. DER resources are not explicitly modeled as generating resources in operating and planning analysis tools either in real-time or off-line studies. Therefore, an event that causes a large amount of DER to isolate from the power grid could result in unpredicted BPS behavior.

    Similar issues apply for frequency ride-through. In WECC, the largest credible generation contingency is the outage of two nuclear units at the Palo Verde plant. This could result in a loss of 2,740 MW with a resulting frequency decline of 0.29 Hz, or a 59.71 Hz nadir (BAL-003-1 interconnection frequency response obligation (IFRO) calculation for WECC). This is above the IEEE 1547 separation point of 59.3 Hz. However, the WECC Off-Nominal Frequency Plan begins tripping at 59.5 Hz and continues tripping down to 58.3 Hz. If UFLS event occurred, DER are likely to trip off-line at 59.3 Hz, dramatically increasing perceptible load on the BPS and further depressing frequency. It is important to recall that IEEE 1547 specifies minimum performance requirements: DER equipment manufactures may exceed 1547 trip requirements resulting in DER tripping before 59.3 Hz is reached. This implies that significant DER separation could occur at frequencies higher than 59.3 Hz, but all separation would occur by 59.3 Hz

    If a system event occurs, be it a voltage or frequency excursion, and that excursion exceeds the inverter isolation settings, it is likely that a significant amount of DER may automatically disconnect. This can instantaneously and significantly increase net load during such an event, thereby exacerbating the underlying disturbance that caused the voltage or frequency excursion. The impact of the change in net load is proportional to the amount of DER that isolates from the power grid. As DER penetration increases, the effects of this sudden load surge on the BPS increase

PRC-024-2 frequency ride-through requirements are designed such that UFLS schemes will operate before generators begin to disconnect from the BPS. Smaller DER installations, under 30 kW, can begin disconnecting from the BPS without respect to coordination with the area UFLS. When DER disconnect, BPS net load will increase. This will further depress frequency, potentially leading to premature system instability.

Table 4.2: Frequency Ride-Through Conditions (DER must isolate when these conditions are met)		
DER Size	**Frequency Range (Hz)**	**Clearing Times (sec)**
≤ 30 kW	> 60.5	0.16
	< 59.3	0.16
	> 60.5	0.16
> 30 kW	< 59.8 – 57.0 adjustable	0.16 – 300 adjustable
	< 57.0	0.16

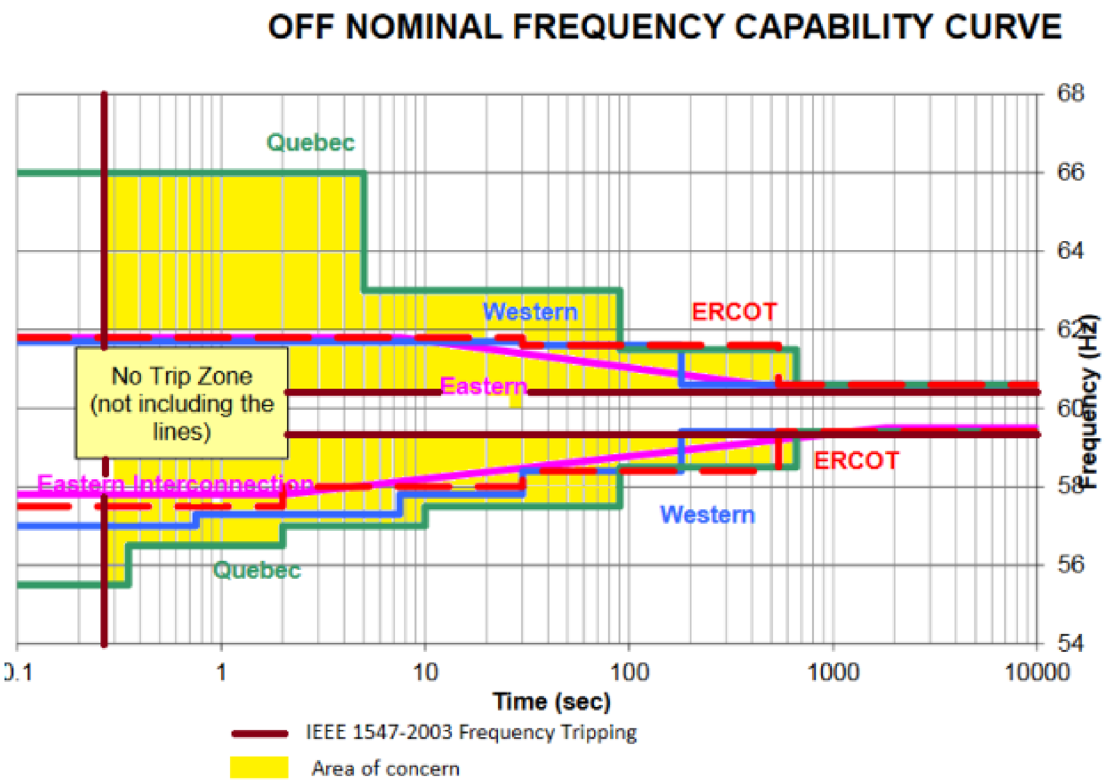

Figure 4.2: NERC PRC-024-1 and IEEE 1547-2003 and Frequency Ride-Through

SDG&E's recommendation is for the CAISO and the PTOs to model both the legacy inverters (IEEE1547-2003) and the new inverters (IEEE1547-2018) in the planning models. The number of legacy inverters could be estimated by using data from the "California Distributed Generation Statistics". As of 2020, the website was showing of the ~8000 MW of BTM-PV installed today in California, ~5000 MW were installed before the first round of smart inverter requirements rolled out on 9/8/2017 (i.e. legacy inverters). If needed, this data can be further improved and disaggregated at the PTO level.