Deliverability Challenges

An ISO Update

December 12, 2022

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1. Introduction

The ISO prepared this update on deliverability issues responding to industry concerns with access to deliverability for resources seeking to compete in load serving entity procurement processes, to explore root causes of the concerns, and set out a preliminary path forward the ISO is considering. Those industry expressions of concern have more recently been focused on suggesting changes to soften the technical requirements relied upon by the ISO today in determining deliverability.

The ISO's deliverability assessment methodology is an assessment conducted on generation seeking to provide resource adequacy capacity – capacity that can be reasonably relied upon in times of system stress to serve customer demand. The CAISO developed its initial on-peak deliverability study methodology for resource adequacy purposes in 2004 that was then generally adopted in the CPUC's Resource Adequacy (RA) proceeding in that same year. Since then, the methodology has been modified when appropriate, and a comprehensive stakeholder process was conducted in 2019 and 2020. In June of 2022, storage dispatch assumptions were adjusted to reflect the evolving nature of the generation fleet. (Similarly, the ISO sees the need to revisit the dispatch assumptions currently in place for offshore wind).

While the methodology and inputs, including assumptions and technical parameters, are expected to continue to evolve organically, the current need to significantly increase the pace of "deliverable" resource development and the timing of new transmission network upgrades has led to some calls to revisit the current methodology to soften the current technical requirements. Such softening would allow additional resources to be identified as deliverable and participate in the state's resource adequacy program while obviating the need for the additional transmission network upgrades otherwise called for.

The ISO appreciates the concerns regarding access to deliverability that is driving the suggestions to revisit the deliverability methodology, and is setting out in this paper initial thoughts on the broader issues and paths forward as well as providing more background and context regarding the current deliverability methodology.

The ISO will also be seeking comments back on this update paper, and take those comments into account in developing more fulsome issue papers early in 2023.

2. Concerns

2.1. Concerns expressed with the current methodology

Due to concerns about the availability of deliverability for newly proposed resources and the time to develop network upgrades to provide additional deliverability, stakeholders have raised a number of concerns either directly or indirectly regarding the current methodology. To expedite future discussions, these concerns are set out below, together with some discussion regarding those suggestions.

Before itemizing those particular concerns, it is important to reiterate the purpose of the deliverability analysis in serving a critical role in ensuring the availability of sufficient resources to meet customer needs under stressed system conditions.

1. Dispatch assumptions…and in particular, simultaneous dispatch of resources in resource basins

   A recent theme of concerns is in questioning if the current methodology is unrealistically calling on resources in the same area to be simultaneously called upon to serve local load or export from the resource area. It has been suggested that market operation may call upon other resources, and that it is in fact rare for FCDS resources to be called upon simultaneously at their "qualifying capacity" level.

   The ISO agrees that, fortunately, it is rare that FCDS resources are called upon simultaneously to meet system needs. However, this is the inherent purpose of resource adequacy program and the related deliverability analysis – to ensure that the resources qualifying for resource adequacy can be reasonably relied upon in times of system stress.

   The most recent events of September 6 and the other heatwave days have reinforced the need for resource adequacy resources to be capable of simultaneously providing needed capacity under stressed system conditions.

   A related concern is that deliverable capacity in an area exceeding local load – especially in the case of local capacity areas where deliverable resources may exceed the local load requirements – is tested on its ability to serve the aggregate system load, which could necessitate exporting from the area. It has even been suggested that this could compel the ISO to identify needs to increase transfer capability into other remote local areas in other parts of the system to make these resources deliverable. This is inherently inconsistent with the current deliverability methodology that limits the number of resources dispatched at relatively high levels simultaneously. While it is always difficult to prove the negative, the ISO notes that no cases of this occurrence have actually been identified, let alone actually driving network upgrades into one local capacity area to make resources in another remote local capacity area deliverable.

2. The need for a High System Need and Secondary System Need scenario that was developed in 2019 replacing the former single peak load scenario.

   Comments have been made suggesting that the Secondary System Need is unnecessary and posing additional inappropriate burden on resources seeking full capacity deliverability status. The ISO sees these arguments as somewhat contradictory. If the test is in fact binding, then it is necessary, and if it is not identifying issues, then it is not creating a burden. Setting that aside, the basis and status of the secondary system need test needs some context.

   The need to consider more than a single snapshot is tied directly to the evolution of the resource fleet. As the resource portfolio keeps evolving toward more renewable resources, energy efficiency solutions, demand response resources, and behind-the-meter distributed generation, the characteristics of the load profile and the resource portfolio impacted the utility

of the previous assessment methodologies including both the CPUC's qualifying capacity approach and the ISO's corresponding deliverability methodology. Starting in 2018, the CPUC replaced the exceedance based QC calculation with an Effective Load Carrying Capability ("ELCC") calculation. ELCC is a statistical modeling calculation that determines effective capacity values of different resources to serve incremental load over a period of time, usually an entire year. This recognized inherently the need to consider the contributions of various resources in providing a reliable system across more than just a single peak load period. It was correspondingly necessary to consider the ability of the transmission system to deliver generation to load during a broader range of conditions as opposed to focusing exclusively on an examination of peak load conditions. The need to think more holistically has been even further reinforced by the CPUC's consideration of "slice of day" approaches that apply to each of 24 hours somewhat the same approach for intermittent resources the ISO considers for two "slices", including consideration of an exceedance methodology to determine the capacity levels attributed to intermittent resources.

The purpose of the secondary system need was to focus on a time of day when renewables – especially solar – still playing a large role in serving load in the late afternoon and early evening, and cannot conflict with other resources ramping up to backfill the decline. Those other resources must also be physically capable of filling the role for which they are required to maintain reliability through the transition.

The existing and projected needs have changed as system-wide resource projections have evolved. It is noteworthy that the 2020-2021 ISO transmission plan was based on projected additions of 10.4 GW of installed capacity being added to the system over a 10 year period. The CPUC's draft portfolios for the 2023-2024 transmission plan call for over 70 GW of installed capacity additions over a 10 year period. This massive change in the size and composition of the resource fleet does require the ISO to monitor and adjust its requirements based on the latest available information. When the ISO revised its deliverability methodology in 2019 and 2020, the study assumptions were based on data from the 2018 summer assessment. The deliverability study dispatch assumptions were reviewed in mid-2022, leading to a reduction in the dispatch assumptions for storage study amount for the SSN study. For short-term deliverability assessments, in the SSN study, the ISO found that storage should be studied at 80% of installed capacity, and for mid and long-term deliverability assessments, in the SSN study, storage should be studied at 50% of installed capacity.

These new levels were used in the draft 2022-2023 transmission planning analysis shared with stakeholders on November 17, and in all but the SCE metro study area the SSN was less binding than the HSN study. The ISO notes that in the Cluster 14 phase 1 reports, there were several binding constraints identified in the SSN study. Based on these preliminary results, these SSN constraints should go away and be replaced by less binding HSN constraints in the Cluster 14 phase 2 studies.

3. Consideration of n-2 and extreme events per NERC Standard TPL-001

The study of n-2 contingencies and extreme event contingencies are dictated in NERC Standard TPL-001. In essence, the planning standards allow controlled loss of load and generation for n-2 contingencies defined at Category P7 contingencies in the standard, but not facility overloads or voltage limit violations. Extreme events that threaten system-wide reliability must also be studied, but only mitigated depending on consideration of the level of risk they pose.

In consequence, N-2 and extreme events can prevent simultaneous operation of resources, with some level of mitigation first being achieved by use of alternatives such as remedial action schemes (RAS). Congestion management is not a legitimate mitigation for resources seeking deliverability, as by definition, the objective is to provide reasonable certainty that the resources in an area can be called upon simultaneously.

The ISO uses remedial action schemes quite frequently to mitigate n-2 contingency impacts through shedding of generation, up to the point where the volume of generation shed is unacceptable or where the RAS would be overly complex to reliably operate. Note that the ISO has by far the most remedial action schemes in operation of any ISO or RTO in North America.

If not addressed in the generation interconnection and deliverability allocation process, the requirements for the system to withstand n-2 and extreme events without unacceptable facility overloads, voltage limit violations, or system collapse would fall to the transmission planning process, not obviate the need for mitigation. Further, it would make the imposition of the RAS requirements on the resources more difficult, notwithstanding being driven by the latest resource additions. In addition, when RAS is fully utilized and transmission upgrades are found to be needed in the transmission planning process, the cost of these transmission upgrades would not be accounted for in the procurement processes that are supposed to consider the total cost of the resource, not just the contracted costs. This deliberate oversight would result in burdening ratepayers with extra costs that would be intentionally missed.

While study methodologies and processes differ, the consideration of n-2 contingencies is not unique to the ISO, and is reflected in PJM and MISO processes. The study processes, terminology, and sequence of study can and do differ from the ISO's, of course.

Initially, the ISO's analysis of n-2 contingencies included both:

- Multiple contingency of two adjacent circuits on common structure (P7.1) and loss of a bipolar DC line (P7.2); and,
- Two adjacent transmission circuit according to WECC's Project Coordination, Path Rating and Progress Report Processes.

When WECC's Project Coordination, Path Rating and Progress Report Processes were modified to remove the criterion regarding two adjacent transmission circuits, the ISO removed that contingency as well from its n-2 contingency analysis and only studies the P7 contingencies, e.g. common tower contingencies.

To put the issue in context, the ISO reviewed the recent Cluster 14 results and has summarized them as follows.

- There were six binding P7 contingencies in the SCE area. RAS could be viable for three of them, but for an Area constraint we identified reconductoring as the high end of the cost range. For two of them the RAS was not sufficient, and for one RAS was not feasible.
- There were three binding P7 Area constraint contingencies in SDG&E and the RAS was not sufficient.
- There were many P7 contingencies in the PG&E area and most of them were addressed by reconductoring.

Also note the ISO is only aware of one extreme event consideration that limits deliverability at this time by creating an unacceptable risk to the system if not addressed. The loss of one Windhub line results in exposing the entire ISO and surrounding areas to voltage collapse driven cascading outages for loss of the second Windhub line in Cluster 13 and Cluster 14 studies. This results in the need to immediately curtail up to 5000 MW of generation. An area deliverability constraint has been enforced to address this voltage collapse and loss of resource issue. In addition, an excessive amount of resource adequacy resources would be lost every time a fire starts burning in the area. As stated in the Cluster 14 phase 1 reports:

> ***Windhub Substation Export Deliverability Constraint***
> *The simultaneous or overlapping outage of Antelope – Windhub 500kV Line and Whirlwind – Windhub 500 kV Line without time for system adjustments is an extreme event for planning purposes. Under this event there is cascading caused by the islanding of the Windhub System and the consequential loss of generation. The total export from Windhub Substation must be limited to prevent the cascading. This exporting limit imposes a deliverability constraint for generators interconnecting to Windhub Substation at all voltage levels and at the Highwind Substation 230 kV Bus.*

The cluster study volumes exceed portfolio volumes used in transmission planning studies – even the 30 MMT sensitivity portfolio in the 2022-2023 TPP did not result in exceeding the Windhub Area constraint limits. However, the ISO expects this area to receive additional attention in the future.

2.2. Concerns regarding the timeliness and availability of deliverability

The ISO acknowledges that the interest in finding ways to soften the technical requirements for deliverability – enabling more projects to receive Full Capacity Deliverability Status and be able to move forward either in obtaining PPAs or with actual construction, stems from serious concerns. These can be considered as two primary concerns:

1. The timeliness of deliverability for projects with PPAs seeking to move forward; and,

2. The sufficient availability of deliverability – or a path to deliverability – for the admittedly excessive volume in the interconnection queue and those applying for interconnection, in order to participate in LSEs' procurement efforts.

The ISO shares these concerns, as the volume and timing of necessary resource additions is unprecedented and the ISO is actively supporting a number of other efforts to expedite the largest number of new resources to commercial operation.

First, regarding resources negatively impacted by new requirements being identified by participating transmission owners or delays in deliverability network upgrades, the ISO is interested in exploring with state agencies and the industry if some transitional relief could suffice to avoid disrupting contracting and construction activities when network upgrade schedules are impacted.

Second, the ISO does consider that further integration of the planning, procurement and interconnection processes are needed. As that evolves, however, it may be warranted to work with state agencies to assess if some transitional relief is warranted here as well to avoid network upgrade requirements overly limiting new resource procurement.

In both cases, transitional relief implies that the resources may not necessarily meet the full slate of technical requirements set out in the current deliverability methodology. However, from a system risk perspective, this needs to be weighed against the impracticality of LSEs then seeking to replace those resources with new contracts for different resources with very short timelines remaining for project development.

3. Path Forward

Above concerns highlight the industry challenge – which is that the hyper level of competition among potential resources and the speed of development impinging on an orderly settling out of successful from unsuccessful projects through current planning, procurement and interconnection processes is creating a real barrier to successful execution.

Accordingly, the ISO sees three tracks:

1. The ISO intends to initiate a review of the methodology by the end of Q1 2023 to ensure the deliverability requirements strike the appropriate balance between reliability and cost containment, and that the reliability requirements are not unduly burdensome. While the ISO has not found the specific concerns raised to the ISO to date substantiating a material issue with the existing methodology, the ISO agrees this is a critical issue, and worth ensuring all options have been considered.

2. In the meantime, the ISO will continue to incorporate any changes to inputs and assumptions that developed organically as system needs and the current and projected resource fleet evolves – in particular, the ISO expects to revisit the dispatch assumptions for offshore wind in the very near future.

3. The third issue stems from the current concerns with (1) the timeliness of deliverability for projects with PPAs seeking to move forward and (2) sufficient availability of deliverability – or a path to deliverability – for the excessive volume in the interconnection queue and those applying for interconnection and seeking to participate in LSEs' procurement efforts. In both of these cases, the ISO is interested in exploring if some sort of transitional relief would be appropriate, particularly when delays to network upgrades impact resource development. We will also look to explore initiating stakeholder discussion on this issue by the end of Q1 2023.

The ISO does also agree that tighter coupling of resource and transmission planning, procurement, and interconnection processes is needed to focus near and midterm activities. The ISO is considering next steps in light of the recent changes to its resource interconnection process, and concerns that despite those changes, the industry may be facing another round of excessive interconnection applications far outstripping procurement requirements. We have not determined the timing of this effort but will keep our stakeholders informed as the situation evolves.

4. Next Steps

In light of the above discussion, we propose the following next steps:

- The ISO requests stakeholder comments and feedback on this update, preferably by December 31, 2022.
- The ISO will review and incorporate relevant stakeholder feedback and prepare issue papers regarding items (1) and (3) above to initiate stakeholder processes on these topics by the end of Q1 2023.
- Regarding the need for future Interconnection Process Enhancements, the ISO will keep stakeholders informed as the situation evolves.

Please submit comments using the commenting tool linked on the initiative webpage.