Generation Interconnection Procedures
Potential Revision to Cluster 4 Study Methodology
Draft for Discussion

Executive Summary

The ISO is considering an alternative methodology to the phase 1 analysis of the network upgrades for Cluster 4, that would be used to assess a cost ceiling and posting requirements for Cluster 4 generation. This alternative methodology was developed out of a concern that the unprecedented volume of generation requests received in Cluster 4 will result in unrealistic results if the current methodology is applied.

The ISO is therefore considering studying a more realistic amount of generation in each study area, based on the greater of the generation amounts studied in Cluster 3, phase 1, or the highest amount of generation forecast in any of the CPUC LTPP renewable generation portfolios. The network upgrade cost results associated with these more realistic generation amounts ($/MW) would then be extrapolated across all the Cluster 4 generation that has applied for interconnection in the study area. Individual generation interconnection facilities (i.e., the upgrades/modifications needed to reliably attach the generation project to the grid) would continue to be studied on a generator-specific basis.

This alternative method is expected to provide more realistic results for phase 1 purposes that anticipate the inevitable withdrawal of a portion of the generation in the clusters; no change in methodology is expected for phase 2 analysis and all generation that continues to advance from Cluster 3 and Cluster 4 phase 1 will be studied together in the Cluster 3 and 4 phase 2 process. The alternative methodology therefore does not impose a limit on the amount of generation that actually proceeds through phase 2, and the network upgrades assessed in phase 2 will be based on the generation projects that elect to continue forward to phase 2.

Introduction

The purpose of cluster studies is to identify the interconnection facilities and network upgrades that would be necessary to integrate the generation seeking interconnection to the transmission system, to estimate the costs of those upgrades and to establish the maximum cost responsibility of each of the generation projects in the cluster.

The cluster study approach has proved an effective way to manage a large number of simultaneous interconnection requests. The study methodology used to assess network upgrades necessary to support each cluster of generation layers the new cluster of generation upon all existing generation and all previous interconnection requests that remain active, as well as the network upgrades associated with the active previous interconnection requests or approved through the ISO's transmission planning process.

The unprecedented volume of generation in Cluster 4 has raised particular concerns that under the existing approach the resulting transmission plans for network upgrades will not produce realistic and meaningful results for the phase 1 analysis. Cluster 4 alone has added 35 GW of renewable generation to bring the total renewable generation in the queue to 68 GW, in a market with a peak load of 50 GW and in which the expected need for new renewable generation is about 20 GW.

The ISO has therefore developed an alternative methodology, relying on the principles employed previously but adapting to produce more reasonable and useful results while still accommodating the

needs of interconnecting parties. This methodology would be applied to the phase 1 study process, and decisions regarding phase 2 studies would be based on the responses of the cluster 3 and 4 generation developers' to their phase 1 costs. No changes to the phase 2 analysis process are anticipated.

This paper sets out the background and issues that led the ISO to the conclusion that methodology changes are required for phase 1 of Cluster 4, an alternative methodology, and the issues associated with implementation of the alternative. The primary concepts characterizing the alternative are to (1) limit the amount of new generation to be studied in the Cluster 4 phase 1 study to a more reasonable and realistic quantity in each study area, based on a combination of the resource portfolios developed by the CPUC and anticipated to be adopted by the ISO for the 2011/2012 transmission planning cycle and the Cluster 3 phase 1 results; and (2) establishing phase 1 cost caps for the Cluster 4 generation projects by extrapolating the cost results.

As stated earlier, no methodology changes are anticipated for phase 2 analysis of Cluster 4. The generation studied in Cluster 4 phase 2 (which will include the Cluster 3 phase 2 analysis) will be based on all generation projects that elected to move forward through the ISO's interconnection process, and the amount studied in each area will not be limited by the generation amounts assumed in the phase 1 analysis. Also, individual interconnection facilities would continue be examined individually; the alternative methodology relates to network upgrades only.

Background

Objectives of the Phase 1 Cluster Study

To be useful and effective, the Phase 1 cluster study efforts should accomplish the following objectives.

1. *Identify transmission facility components*. Provide a realistic initial assessment of the additional network upgrades needed to fulfill the interconnection requests of projects in the cluster that anticipate the inevitable withdrawal of a portion of the generation in the clusters, given the current status of projects earlier in the ISO queue and the network upgrades identified for those earlier projects or approved in the TPP;

2. *Estimate Costs*. Result in reasonable cost estimates for the identified network upgrades based on anticipation of the inevitable withdrawal of a portion of the generation in the clusters, so as to establish a cost cap for each generation project in the cluster that reflects, with reasonable accuracy, the maximum dollar amount the project sponsor will be required to up-front fund for its share of the needed network upgrades.

As explained below, the GW volume of projects in Cluster 4 makes it unlikely that the current methodology can meet these objectives. The problem is that the GW volume may be so large as to produce results well beyond the realm of plausibility the identification of network upgrades that would be produced for the first objective.

Current methodology:

The cluster study approach requires the ISO first to define study areas based on geography and network topology, and to group the generation projects in the cluster into these study areas. The definition of study areas is intended to group together generation projects that will impact the same transfer paths on the grid and therefore will be responsible for shares of the same network upgrades.

The current cluster study approach next calls for the ISO to do the following for each study area, focusing on one study area at a time:

- **Within the study area:**
- Model all existing generation, generation remaining active from prior serial or cluster processes, and the related transmission from those projects,
- Layer on all of the Cluster 4 generation in that area,
- Model a dispatch of the Cluster 4 generation in the study area as follows:
    - Initially dispatch at 80% of each generator's capacity;
    - Next, increase generation in the study area up to a maximum of 1500 MW additional output by "ramping up" as many as 20 of these Cluster 4 generating facilities. Under the model protocol, those generators identified for adjustment (i.e., ramping up) are the ones with the most significant impact on *the transmission system limitation* being studied.
- **Outside of the study area**
- Next, the generation in other areas outside of the study area are dispatched down to create sufficient demand to balance the generation in the study area to the load/demand in the subject area.
- The network upgrades necessary to meet the requirements of the new generation are then determined and allocated among all of the generation having a *material impact* (i.e., at least a 5% shift factor) on the transfer path the network upgrades are reinforcing.

Application of current methodology to Cluster 4:

While this methodology has generally produced realistic and therefore useful results in cluster studies up through Cluster 2, applying the same methodology for Cluster 3 and now Cluster 4 has raised concerns that unrealistic dispatch scenarios may result, which will dictate unrealistic transmission plans being produced, due to a large number and aggregate GW generating capacity of generators seeking to interconnect in areas where there is general recognition that only a portion of generators will ultimately be sited. Because the current methodology accommodates *all generation that has submitted an interconnection request within the queue*, the resulting transmission plan can appear overly unrealistic.

This situation, which generated some level of dissatisfaction in earlier clusters, is exacerbated in Cluster 4 analysis, as Cluster 4 includes close to 35 GW of renewable capacity alone (with the peak load in the ISO's entire footprint reaching only 50 GW) and bringing the total amount of renewable generation in the ISO queue to over 68 GW. In contrast, the ISO's footprint requires less than 20 GW of new renewable capacity to reach the 33% RPS goals by 2020.

In reviewing the CPUC generation portfolios the ISO is planning to use in the 2011/2012 transmission planning cycle, it is observed that in a number of areas, the generation included in Cluster 3 and earlier processes already surpasses the amount of generation expected in those areas under any scenario in the CPUC portfolios. The addition of Cluster 4 generation obviously increases this gap.

When there is high volume of generation in a Cluster 4 study area, under the current approach described above a significant amount of generation within the study area is, in effect, exported further and further from the study area as generation in other areas across the ISO BAA must be dispatched down to compensate.

For example, interconnection requests in the southern PG&E area and considering the generation in the PTO's WDAT queue, it would be necessary to export approximately 15 GW of generation from the southern PG&E area north and south to accommodate dispatching the study area generation, and could require two to four new 500 kV lines in addition to the new 500 kV line identified in the Cluster 3 phase 1

study.[1] Supplying a quarter of the ISO's market load from this single area is unreasonable in light of the existing generation fleet and similar interest in generation development in other renewable energy zones in the state.

Similarly, the eastern Riverside area has already been studied with 7,800 MW in Cluster 3, and earlier queued generation, requiring one new 500 kV line. This is in addition to a new 500 kV line and four reconductored 230 kV lines already approved by the ISO, and another new 500 kV line identified in Clusters 1 and 2. Cluster 4 adds another 5,800 MW (for a total of 13,600 MW), which are expected to trigger two to four more 500 kV lines (for a total of six to eight new 500 kV lines).

Based on past experience, it is expected that a significant number of projects in Clusters 3 and 4[2] will drop out of the queue once the interconnection costs are estimated in the Phase 1 process, and a more realistic plan will then be developed in Phase 2. With the current renewable generation queue being a multiple of the requirements for new capacity, the attrition rate is expected to be even higher for Cluster 4 than previous clusters. This is compounded by Cluster 3 security posting dates (and Cluster 3 withdrawals), which will occur after the Cluster 4 phase 1 studies are almost completed. The gap between the phase 1 plans and the phase 2 plans is therefore expected to be even more pronounced in the future.

Impact of Unrealistic Dispatch Scenarios and Resulting Unrealistic Transmission Plans

A number of concerns have been identified internally and externally, both formally and informally. These have been considered to be reasonable concerns, but we have not validated all of them at this point:

- Artificially high ceilings are being established due to the exponential increase in $/MW, raising unnecessary financing concerns for generation developers.
- Creating plans to accommodate unrealistic generation development scenarios is more time consuming than developing reasonable plans for more conservative and realistic generation development, placing unnecessary workload burdens on ISO and PTO staff.
- These plans can be unnecessarily alarming to regulators and entities outside of the industry.
- The resulting plans are of little use in narrowing down the facilities that will actually be required once generation developers respond to the Phase 1 price signal and drop out, as the two scenarios can be so far apart. This:
    - Increases the workload in developing essentially a new (not just modified) plan,
    - Can be disruptive for utilities forecasting their workload.
- Being assigned a portion (admittedly small) of a large transmission build-out can unnecessarily complicate a generation developer's permitting process.

Alternative for Cluster 4 Phase 1 Study

In response to the concerns expressed with application of the current methodology to the Cluster 4 phase 1 generation queue, the ISO has developed an alternative focusing on the following design principles:

- Reasonable and Useful: provide meaningful estimated costs and useful transmission development plans.

[1] The numbers discussed here include all counties in the southern PG&E territory. The three big areas in the southern PG&E are Fresno, Kern, and Carrizo. In earlier cluster studies the ISO studied Fresno as one area and Kern combined with Carrizo as a different area. The Fresno area only has about 8000 MW in the ISO queue.

[2] Due to the timing of the completion of the Cluster 3, study the financial security postings from customers in that cluster are not due until well after the ISO needs to begin the Cluster 4 study. As a result, all of the Cluster 3 generation will need to be carried into the Cluster 4 study.

- Efficient: make best use of past technical analysis and study efforts.

The results of this methodology, to be employed only in phase 1 analysis, would be used for all purposes the results of the current methodology are used for, including setting the ceiling for network upgrade costs for the generators in cluster 4.

The stages in the revised methodology are:

Step 1 – Assess whether a methodology change is appropriate for each specific study area:

- Assess the maximum amount of generation forecast in each area by 2020 in any of the identified CPUC portfolios (to be referred to as the CPUC study area ceiling).

- For study areas that the total generation including Cluster 4 applications is less than the maximum identified in any of the CPUC's generation portfolios, no changes will be made to the methodology.

Step 2 - Determining network upgrades and costs:

- For each study area where Cluster 3 results are already based on more generation than was identified in any of the CPUC portfolios for that area, the Cluster 3 network upgrades and costs will be carried forward to the cost allocation stage.

- For each study area where Cluster 3 results are based on less generation than the highest CPUC portfolio area result, network upgrades will be identified and costs estimated that would support the ceiling established in the CPUC portfolios. The incremental network upgrades and costs will be added to the upgrades and costs to support Cluster 3 generation, so that the total upgrades and costs will reflect all of Cluster 3 and the portion of Cluster 4 generation necessary to reach the CPUC ceiling for the study area.

Step 3 – Allocation of costs to Cluster 4 generation:

- Determine for the study area the $/MW network upgrade cost by dividing the network upgrade costs identified in Step 2 by the incremental generation in that area. The incremental generation is the Cluster 3 generation plus the Cluster 4 generation added to the study area (if any) to reach the CPUC ceiling for that study area.
- Apply the $/MW value to each project in the study area to the capacity of that project, to determine the network upgrade cost responsibility for that project.

The following advantages and disadvantages of this methodology have been identified:

Advantages:

- The network upgrade costs for each project are based on a pro-rata share of a more reasonable transmission development, recognizing that not all of the 79 GW (renewable plus conventional) in the generation interconnection queue will be constructed, but at the time of the phase 1 study it is not clear which generation will proceed and which won't.
- Going forward, the cost of producing the phase 1 plans (which are funded by the interconnecting customer) is reduced (although until FERC grants our waiver request to implement this alternative for Cluster 4 we must proceed with the existing process, and Cluster 4 customers will have to provide the deposits and postings associated with the existing process). In addition, scarce industry staff resources (ISO and participating transmission owners) are conserved for use in other activities such as refining the more critical phase 2 results for other cluster studies.

Disadvantages:

- In the event that the amount of generation in the queue up to and including Cluster 4 that is actually constructed exceeds the assumed GW ceiling in any study area, the sum of the cost ceilings attributed to the Cluster 4 generation that does proceed could be less than the cost of the required network upgrades. This could occur if the CPUC ceiling for a given study area turns out to be overly conservative and more generation proceeds than identified in any of the CPUC portfolios. (Note that the current methodology also contains a risk that the amount of generation constructed is sufficient to require network upgrades, but insufficient to "fill up" the capacity enabled by the upgrades, also resulting in insufficient generator funding for the required upgrades.)
- This solution may require significant time to implement, including obtaining a FERC waiver for certain aspects of the existing tariff. As model development is already in progress, the ISO will likely have to commence phase 1 studies under the current methodology, so that the process can remain on schedule in case the industry is not supportive of the change or the necessary FERC approvals are not obtained.

Next Steps

The alternative methodology will be tested with stakeholders through posting of this discussion paper, and a stakeholder conference call. Pending positive response, the ISO will seek Board of Governor approval for an application for the necessary FERC waivers at the July or August Board meeting.