Phase IIA
Baseline Generation Deliverability Study Report

California ISO
June 30, 2006
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Phase IIA Baseline Generation Deliverability Study Report

Background and Purpose of Study

A Phase I Generation and Import Deliverability Study was completed that demonstrated the deliverability of all existing generation connected to the ISO Controlled Grid. This study included generation projects expected to be commercially operating during summer 2006. The study also demonstrated the deliverability of a level of import specified on each branch group that was tested during the generation deliverability test. However, the study did not consider any new generation projects to be commercially operating after 2006.

Starting from these results, a Phase II study needs to be performed to establish the deliverability of new generation projects that were processed prior to the establishment of the LGIP at the CAISO. As described below, the new generation projects were split into two parts: A and B. This report documents part A of the Phase II study—the remainder of the study, part B, will be completed prior to the end of this year. Once the Phase II study is completed, deliverability assessments can and will be performed on a project by project basis as part of the LGIP.

As a reminder, the Deliverability Study Methodology focuses on the Summer Peak load period, when the need for generation capacity is the greatest. The following excerpt from the Deliverability Study Methodology further characterizes the focus of the deliverability study methodology and its limitations.

[A] generating facility’s interconnection should be studied with the ISO Controlled Grid at peak load, under a variety of severely stressed conditions to determine whether, with the generating facility at full output, the aggregate of generation in the local area can be delivered to the aggregate of load on the ISO Controlled Grid, consistent with the ISO’s reliability criteria and procedures. (This definition for deliverability comes from the FERC interconnection order, and this methodology for assessing deliverability has been developed from consultation with PJM officials about their already-established practices.)

In addition, the ISO recommends, based on guidance in FERC Order 2003, that the deliverability of a new resource should be assessed on the same basis as all other existing resources interconnected to the ISO Controlled Grid.

Because a deliverability assessment will focus on the deliverability of generation capacity when the need for capacity is the greatest (i.e. peak load conditions), it will not ensure that a particular generation facility will not experience congestion during other operating periods. Therefore, other information (i.e. congestion cost analysis for all hours of the year) would be required in addition to the deliverability assessment to evaluate the congestion cost risk of energy purchase agreements, such as a take-or-pay contract with a particular generation facility.
New Generation Projects to Be Included

New generation projects with a queue date prior to March 1, 2005 were studied in the Phase IIA deliverability study, and projects with a queue date after March 1, 2005 will be studied in the Phase IIB deliverability study.

Base Case

Study Year
The Phase II Baseline Deliverability Study was performed on a power flow base case modeling expected conditions during the year 2010. Currently, all generation projects in the queue have operating dates on or before the year 2011, and the ISO Transmission Expansion Planning process develops a detailed transmission plan for a minimum of five years. Therefore, the year 2010 was a good study year choice for the Annual Generation Deliverability Baseline analysis. As such, Phase II results will ensure the deliverability of generation for only the year 2010 modeling assumptions described in this study plan. For example, there may be a planned transmission project with initial operation in 2009, and without this project in-service, a particular generation project may not be deliverable. However, for generators in this Phase II study that go into service between 2007 and 2009, System Impact Studies have been performed that should adequately assess their deliverability in earlier years. Generators that are in-service or are planned for initial service in 2006 were assessed in the Phase I deliverability study.

Development Process
The ISO provided a starting base case to PG&E, SCE, and SDG&E (PTOs). The PTOs modified their areas as described below, in the ISO starting base case, and returned the modified base case to the ISO.

New Generation Projects included in the Base Case
All new generation projects, with a queue date prior to March 1, 2005 were modeled in the Phase IIA base case. New generation projects connected to the distribution system, but large enough to impact the transmission system were also explicitly modeled on the transmission bus electrically closest to the generation project.

New Transmission Projects included in the Base Case
All ISO approved transmission projects expected to be operational by 2010 were modeled in the base case. Transmission mitigation plans to mitigate deliverability problems identified in the Phase I deliverability were also be modeled in the base case. In addition, all reliability and delivery transmission projects identified in generation interconnection studies for generation projects modeled were included in the base case if they are needed to mitigate impacts identified under summer peak load conditions, and noted in the case documentation. Each of the PTO’s ensured that these projects are accurately modeled in the base case that they returned to the ISO. A list of new transmission projects included in the base case is contained in Appendix A.
Generation Project developers should pay close attention to the “Cost Resp.” column in Appendix A. In this column, generation projects are identified, by Queue Position Number, that are assumed to be taking on the cost responsibility for the identified transmission project, in order to be deliverable. Queue Position Numbers are defined in Appendix C. If these projects are not built, their deliverability level identified in this study would be subject to change, and the amount of this change would be addressed during the process described in the Next Steps section of this report.

**Transmission Facility Ratings**
Transmission facility ratings in the base case are consistent with ratings in the ISO transmission register where the facilities have been linked together between the two databases. ISO approved Planned Transmission facilities upgrades that will increase the existing facility rating were modeled in the base case. A list of new projects, including reconductorings and reratings, included in the base case, is contained in Appendix A.

**Load Modeling**
ISO Control Area load was modeled in the base case for a coincident 1-in-5-year heat wave. Each of the PTO’s modified the load in their area of the starting base case to be 96% of their areas coincident 1 in 5 year heat wave load level. The 96% represents a diversity factor to convert the three area peak load levels to a coincident ISO peak load level.

**Generation Capacity (Pmax) and behind the meter load in the base case**
The generation capacity values used in the Phase I baseline study were used for this study, with the exception of a few updates. The data used is consistent with the Qualified Capacity data provided to the ISO prior to January 12, 2006. However, in Area 30 (PG&E area), adjustments to generation unit pmax data are made to account for on-site load modeled in the base case by the PTO. In addition, wind generation pmax data was updated using available data for the maximum production during summer peak load hours used to calculate the average production for the Qualified Capacity valuation.

**Generation Dispatch in the base cases**
Existing generation previously determined to be deliverable was consistently dispatched near pmax in a manner similar to the Phase I deliverability base case. During the study, new generation was grouped geographically and dispatched together in geographic groups, at a level similar to the existing generation, to balance loads and resources in the base case. A school of several base cases were spawned to assess the deliverability of each of the generation groups. In all cases, all new generation modeled was available to be dispatched to full output, based on the study methodology, during the study.

**Import Levels**
The import level was based on the historical level of imports determined to be deliverable in the Phase I baseline study.

**San Diego Wind Generation Project Modeling**
Several wind generation projects (ISO Queue #s 25, 26, 32 have Point of Interconnections at or near Crestwood 69 kV bus. Modeling these projects at this interconnection point resulted in precontingency powerflow model mathematical solution.
divergence which prohibited further study. In order to resolve this problem it was assumed that these projects interconnection point was moved to Los Coches 138 kV bus which was considered to be the geographically closest bus that could accommodate the generation projects without divergence problems.

The Study

**Contingencies analyzed**
The PTOs provided contingency files with all NERC Category B, C.5 contingencies, and WECC-S2 contingencies on the 500 kV system (common corridor 500 kV lines). The contingency files included an accurate modeling of all existing and ISO approved RAS/SPS assuming generation was at full output. These contingency files were used by the ISO for this study.

**Study Methodology**
The study methodology is described in Generation and Import Deliverability to the Aggregate of Load (Baseline) Study Methodology on the ISO Website [http://www.caiso.com/docs/2005/05/03/200505031708566410.pdf](http://www.caiso.com/docs/2005/05/03/200505031708566410.pdf).

Study Results

**Summary of Study Results**
For the sole purpose of facilitating the understanding of these study results, they have been generalized by grouping the study areas produced by the study methodology into geographic areas and subareas. Study area boundaries are determined by the location of the generation in the identified constrained generation pockets. Table 1 shows this generalized summary of results.

**Description of the Summary of Results (Table 1)**
The Area/Sub-Area Names are based on either a commonly known geographic area or the major electrical substation(s) in the area. Figure 1 shows the geographic locations of the Areas and sub-areas. As evident from the figure, sub-areas are located inside of Areas. The Limiting Facility is the Monitored Facility that requires the generation output to be limited in order to prevent exceeding that transmission facility or path rating prior to or immediately following the contingency described in the Contingency Description. The Contingency Type is based on NERC Table 1 definitions and the ISO Grid Planning Standards. The “Gen in Queue” represents the total MW amount of new generation in the Phase IIA study that is in the Area or sub-area. The “Not Deliverable” represents the total MW amount of generation that did not pass the deliverability test due to the particular limiting facility/contingency combination. “Queue Gen In-service” represents the total MW amount of the “Gen in Queue” expected to be in-service during summer.

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1 Common circuit tower contingencies (C.5) and common corridor 500 kV contingencies were considered for facilities that shared the same towers or same corridor over a significant length (e.g. more than a single common tower).

2 Deliverability Areas and Sub-Areas can overlap Locational Capacity Requirement (LCR) Areas and Sub-Areas. Please see Appendix E for a discussion and examples of why they can overlap.
“Net Additional Deliverable Capacity” is the “Gen in Queue” amount remaining after the “Not Deliverable”, and “Queue Gen In-service” amounts have been subtracted, and is an approximate value of the new generation that can be brought online between now and 2010, within the Area or sub-area, before the identified deliverability problems would occur.

A particular Area or sub-area may have more than one limiting facility/contingency combination. In most cases, the most limiting Area or sub-area facility/contingency combination would need to be mitigated before the remaining Area or sub-area constraints would be limiting.

In some cases the Area constraint is more limiting than the sub-area constraints. In this situation, the Area constraint would need to be mitigated before the sub-area constraints would be limiting. In some cases the sub-area constraints are more limiting than the Area constraint. In this situation, for the generation in that sub-area, the sub-area constraint is limiting before or at the same time that the Area constraint is limiting. Limiting Areas and sub-areas are shown in red font in the table.

Detailed Study Results

Units that did not pass the deliverability test, along with the undeliverable MW of capacity associated with those units, have been identified in Appendix B. For each overloaded facility identified, the Deliverability Study methodology and tools produced a list of all new generation units responsible for that overload. This list was then be ranked by queue position and MW output from those units were removed sequentially (last on, first off) until the overload was eliminated. The MW removed indicate the capacity that did not pass the deliverability test.

Conceptual Mitigation Plans

New conceptual transmission project alternatives have been identified in Table 2 that would allow the new generation projects to pass the deliverability test. Although these conceptual projects have been modeled and tested under post-contingency steady state conditions to demonstrate that they effectively mitigate the identified deliverability problems, the feasibility of these projects is unknown, and transient stability and post-transient stability analyses were not performed. In addition, the per-unit costs provided should generally be considered to be an estimate of the minimum cost for these projects. Per-unit cost data available from the PJM web-site was used. These plans are provided for informational purposes only to help generation developers select their desired level of Interconnection Service, and proceed with the next steps described below.

Description of the Conceptual Mitigation Plans (Table 2)

Area/Sub-Area Names, Limiting Facility, and Contingency Description are the same information included in Table 1. The Conceptual Mitigation Project Alternatives column contains a description of the facilities that could potentially address the Deliverability problems identified for the Area/Sub-Area Names, Limiting Facility, and Contingency Descriptions aligned with the cell containing the description. The Per Unit Cost is the
minimum cost estimated for the project alternatives and does not include the cost of obtaining use of the necessary land. In cases where multiple alternatives are provided, the cost estimate pertains to the first alternative listed. The Potential Beneficiaries is a list of the new generation projects that have identified Deliverability problems that could potentially be corrected by the Conceptual Mitigation Project Alternatives described.

Next Steps

The CAISO offers two levels of Interconnection Service: a base level Interconnection Service for reliable interconnection, and a higher level of Interconnection Service to ensure that generation capacity can be counted for resource adequacy planning purposes (Deliverability Service). In order to obtain Deliverability Service the generation project must pass the CAISO’s Deliverability Assessment Test. The next step in this baseline study process is for new generation projects included in the Phase IIA deliverability study (see Appendix C) to notify the CAISO the level of Deliverability Service they wish to obtain. A notification template that should be filled out and submitted to the ISO by _____ is included as Appendix D. The CAISO will work with Interconnection Customers to ensure that their desired level of Interconnection Service is recorded in a timely manners and the Phase IIB portion of baseline study process can proceed.

New generation projects requesting Deliverability Service that did not pass this Deliverability Assessment Test (see Appendix C) would need to execute a study agreement for a supplemental Interconnection Facilities Study (SIFS) to determine the estimated cost of equipment, engineering, procurement and construction work needed to ensure the Deliverability of the new generation project. It is envisioned that one study would be performed that would include all Phase IIA generation projects needing an SIFS.