

Transmission Providers Face Intermittency

As more utility-scale projects come online, transmission issues will continue to arise.

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One of the impediments to the development of utility-scale solar generation projects is the financial impact of mitigating the intermittency of the solar resource. Because transmission provider tariffs are based on the premise that a given generator is able to accurately forecast and then precisely control its output, there are financial penalties associated with deviation of actual generation from the generation scheduled with the transmission provider.

However, most utility-scale solar projects seek to use a project finance structure, which requires the project company to have a stable cashflow to support the relatively higher levels of debt financing used in the project financing structure. The variability of transmission provider tariff provisions related to the settlement of generation imbalances threatens the stability of the project company's cashflow. Thus, obtaining nonrecourse financing for solar projects is comparatively more difficult.

This article surveys the approach to settlement of generation imbalances taken by different transmission providers in the western U.S. and analyzes the impact each approach is likely to have on the stability of a solar generating project's cashflow.

The Federal Energy Regulatory Commission (FERC) first consid-

ered the financial impact of transmission provider tariff imbalance energy provisions through a Notice of Proposed Rulemaking (NOPR) in Docket No. RM05-10. In the NOPR, FERC proposed to "clarify and amend the imbalance tariff provisions that have become outdated and have become unjust, unreasonable, unduly discriminatory or preferential, as applied to intermittent resources."

Specifically, the NOPR proposed to implement a new generator imbalance service to be incorporated into existing Open-Access Transmission Tariffs (OATTs). As proposed by FERC, the generator imbalance service would provide a deviation band of +/- 10% of the scheduled energy (or 2 MW, whichever is greater). Deviations within the band would be priced at the transmission provider's system incremental/decremental cost. Deviations outside the band would be priced at 110% of the incremental cost for generation in excess of 110% of the schedule, or 90% of the transmission provider's system decremental cost for generation of less than 90% of the schedule.

While FERC subsequently closed Docket No. RM05-10, it then addressed settlement of intermittent resource imbalance energy when it issued Order 890, which created the new generator imbalance service (Schedule 9 to the pro forma OATT) and adopted a three-tier approach to

the settlement of generation imbalances with graduated penalties and an exemption from the third tier for intermittent resources.

Specifically, FERC adopted the following:

■ an initial tier for imbalances of less than 1.5% of the scheduled amount (or 2 MW, whichever is greater), with imbalances netted on a monthly basis and settled financially at the end of the month at 100% of the transmission provider's system incremental/decremental cost, as applicable;

■ a second tier for imbalances of 1.5% to 7.5% of the scheduled amount (or 2 MW to 10 MW, whichever is greater), with under-scheduling imbalances settled at 110% of the incremental cost, and over-scheduling imbalances settled at 90% of the decremental cost; and

■ a third tier for imbalances in excess of 7.5% of the scheduled amount (or 10 MW, whichever is greater), with under-scheduling imbalances settled at 125% of the transmission incremental cost, and over-scheduling imbalances settled at 75% of the decremental cost.

However, the third tier would not be applicable to "intermittent resources," which FERC defined as "an electric generator that is not dispatchable and cannot store its fuel source and therefore cannot respond to changes in system demand or respond to transmission security constraints."

In response to numerous requests for rehearing and/or clarification of Order 890, FERC issued Order 890-A on December 28, 2007. In the order, FERC clarified the obligations of a transmission provider under the newly created generator imbalance service.

Order 890-A outlined that a transmission provider “only has to provide generator imbalance service from its own resources to the extent that it is physically feasible to do so,” but, “[i]f it is not physically feasible for the transmission provider to offer generator imbalance service using its own resources, either because they do not exist or they are fully subscribed, the transmission provider must attempt to procure alternatives to provide the service.”

To implement this caveat to the transmission provider’s obligations, FERC revised the pro forma OATT Schedule 9 to read, “The transmission provider must offer this service, to the extent it is physically feasible

Integration Rate Case for wind generation. The California Independent System Operator (CAISO) uses the Participating Intermittent Resource Program (PIRP).

Nevada Power

Nevada Power’s OATT uses a slightly modified version of the pro forma OATT. Generation imbalance service is provided “to the extent it is physically feasible to do so from its resources or from resources available to it.”

Generation imbalances of less than 1.5% of the scheduled energy (or 2 MW, whichever is greater) are settled financially at the system incremental/decremental cost, as applicable, for the hour in which the deviation oc-

at 120% of the incremental cost or 80% of the decremental cost, as applicable, except that intermittent resources are exempt from the 120% of incremental cost or 80% of decremental cost tier.

Finally, if the aggregate imbalance exceeds 20 MW, but the generator’s imbalance is in the opposite direction as the aggregate imbalance, then the imbalance is settled financially as if the imbalance were within the +/-1.5% band.

Compared to the pro forma OATT, the Nevada Power OATT provides some incremental value to an individual generator. Because the Nevada Power OATT considers the aggregate imbalance within a zone as the trigger for settling imbalances at 110% of the incremental cost or 90% of the decremental cost, an individual generator receives the benefit of the law of large numbers.

The more generators there are in the zone, each equally likely to be causing positive or negative deviations, the less likely the aggregate imbalance will reach the threshold level. Thus, whereas the pro forma OATT would assess the higher settlement prices to each generator outside the tier-one tolerance band, the Nevada Power OATT will assess those higher settlement prices only if there is an aggregate impact on the system.

Because of this aggregation, an intermittent generator within the Nevada Power transmission system will still be exposed to uncertain imbalance energy costs (or revenues), but it may be slightly less likely to incur higher imbalance settlement prices than under the pro forma OATT.

While the Nevada Power OATT has its strengths, its primary weakness is the provision limiting the availability of generation imbalance service “to the extent it is physically feasible.” In a filing made by NV Energy, Nevada Power’s parent company, in FERC Docket No. RM05-10, NV Energy stated that Nevada Power cannot accommo-

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to do so from its resources or resources available to it.”

FERC left room for deviations from the pro forma OATT provisions described previously. In Order 890, FERC allowed transmission providers to obtain approval of deviations from the revised pro forma OATT by “demonstrating that the alternative imbalance charge structures are consistent with or superior to the reformed pro forma OATT.” Several transmission providers in the western U.S. have accepted FERC’s invitation. There are now many different approaches to the settlement of imbalances.

In the western U.S., settlement of imbalances may occur in a very different manner from one transmission provider to the next. For example, Nevada Power uses a slightly modified version of the Order 890-A approach. Bonneville Power Administration (BPA) uses a variant of the Order 890-A approach, plus a capacity charge resulting from its 2009 Wind

occurred. Generation imbalances outside this band are settled financially at a price that depends on the zone in which the generator is located and the aggregate imbalance of all loads and resources within that zone.

Using Zone B as an example, if the aggregate imbalance is less than 20 MW, then imbalances are settled financially at the system incremental/decremental cost, as applicable, for the hour in which the deviation occurred.

If the aggregate imbalance exceeds 20 MW, and the generator’s imbalance is in the same direction as the aggregate imbalance, then:

■ if the generator’s imbalance is less than or equal to 5% of scheduled energy (or 5 MW, whichever is greater), the imbalance will be settled financially at 110% of the incremental cost or 90% of the decremental cost, as applicable, or

■ if the generator’s imbalance is more than 5% of scheduled energy (or 5 MW, whichever is greater), the imbalance will be settled financially

date more than 100 MW of intermittent resources without violating North American Electric Reliability Corp. (NERC) reliability criteria. Thus, it is highly likely that Nevada Power would claim that it is not “physically feasible” to provide generation imbalance service to utility-scale solar generation projects, particularly once meaningful intermittent capacity has been installed.

Without generation imbalance service, the intermittent generator would have to schedule based on a very conservative estimate of its potential output, and then curtail its generation within the operating hour if it is capable of generating in excess of the schedule. Because the intermittent generator will be unable to sell output to an off-taker equal to its true generation capability, the project’s revenues will be lower than the resource-based production profile would suggest.

BPA

Like Nevada Power, BPA uses an OATT that is a slightly modified version of the pro forma OATT. BPA settles deviations under generation imbalance service using a three-tier structure.

Generation imbalances of less than 1.5% of the scheduled energy (or 2 MW, whichever is greater) are netted on a monthly basis (with separate categories for on-peak and off-peak deviations), with the net imbalance remaining at the end of the month settled financially based on BPA’s incremental cost.

Imbalances of 1.5% to 7.5% of the scheduled amount (or 2 MW to 10 MW, whichever is greater) are settled financially, with under-scheduling imbalances settled at 110% of BPA’s incremental cost and over-scheduling imbalances settled at 90% of BPA’s incremental cost.

Imbalances in excess of 7.5% of the scheduled amount (or 10 MW, whichever is greater) are settled fi-

nancially, with under-scheduling imbalances settled at 125% of BPA’s highest incremental cost for the day and over-scheduling imbalances settled at 75% of BPA’s lowest incremental cost for the day (with incremental cost determined separately for on-peak and off-peak hours).

The BPA OATT provides a higher level of certainty than either the pro forma OATT or the Nevada Power OATT because the provision of imbalance service is not limited only to the extent “physically feasible.”

Even with this assurance, however, there is still a substantial risk to proj-

ect cashflows because the cost of imbalance energy settlements is highly variable. While first-tier energy imbalances within 1.5% of the schedule (or 2 MW, whichever is greater) can be settled in kind, any imbalances in excess of the threshold are settled financially with unknown financial impact on the project company’s cashflow.

regardless of the size of the imbalances, and the net imbalance at the end of the month is settled financially based on the monthly weighted average of the location-specific, real-time price. If the Participating Intermittent Resource exports its generation out of the CAISO, it must also pay an export fee.

FERC and individual transmission providers have clearly taken steps to address the issue of imbalance energy from intermittent resources.

CAISO PIRP

As an independent system operator with a centralized energy market, the CAISO takes a much different approach to settlement of intermittent resource energy imbalances. Under the CAISO OATT, energy imbalances are typically settled on a 10-minute basis based on the location-specific, real-time energy price calculated using a bid-based, security-constrained economic dispatch. There are no deviation bands. Any deviation, regardless of magnitude, is settled at the location-specific, real-time price.

Eligible intermittent resources, however, may apply for certification as a Participating Intermittent Resource. To be certified as a Partici-

pating Intermittent Resource and take part in PIRP, the generator must agree to comply with the CAISO OATT, install a meteorological station and telemetry meeting the CAISO’s requirements, pay a forecasting fee to a third-party forecaster selected by the CAISO, and submit bids into the CAISO’s real-time market for a quantity of energy that is equal to the hour-ahead forecast quantity provided by the third party forecaster.

If the generator complies with these obligations, then the energy imbalances are netted on a monthly basis, regardless of the size of the imbalances, and the net imbalance at the end of the month is settled financially based on the monthly weighted average of the location-specific, real-time price. If the Participating Intermittent Resource exports its generation out of the CAISO, it must also pay an export fee.

An eligible intermittent resource is defined, in part, as a generator that is powered by solar energy, “except for a de minimis amount of [e]nergy from other sources.” Thus, solar photovoltaic generation clearly qualifies as an eligible intermittent resource, and solar thermal applications with de minimis use of fossil fuels for auxiliary boilers likely qualify, as well.

To participate in PIRP, the eligible intermittent resource must install a meteorological station meeting the CAISO’s requirements. This presents a problem for solar generators, however, because the CAISO has not yet specified the technical requirements for solar generators. But this problem will likely be resolved, as the CAISO is currently engaged in a

stakeholder process to develop solar generation meteorological data requirements.

Because the CAISO PIRP structure permits the netting of all imbalances of any size on a monthly basis, it provides the highest level of certainty of any of the OATs analyzed herein. In exchange for ceding control over the amount to be scheduled each hour to a third party, the CAISO has effectively removed most of the imbalance risk for the generator by allowing all imbalances to be netted on a monthly basis.

In addition, regardless of price swings that may have occurred at

the time of the energy imbalances, the generator will pay (or be paid) only the monthly weighted average price. Thus, the volume risk is small, and the price volatility is small, as well. This combination leads to a much more predictable cashflow for the project company, which leads to more accommodating lenders.

FERC and individual transmission providers have clearly taken steps to address the issue of imbalance energy from intermittent resources, with varying levels of success. Prospectively, policy-makers must take further action to address the financial impact of resource intermittency in order to

further encourage the development of solar resources. ☞

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