ENERKNOL RESEARCH

North America

Power and Utilities | Energy Efficiency

FERC Order 764 and the Integration of Renewable Generation

Intra-Hour Output Scheduling and Generator Forecasting Data aim to Reduce Inefficiencies in Integrating Renewables into the Grid

July 28, 2014

Policy Brief

Authors

Erin Carson
Senior Research Analyst

Eric Davis
Research Manager

Brian Bowman
Analyst

Contact

(212) 537.4797
info@enerknol.com

Key Takeaways:

- FERC Order 764 requires transmission providers to offer intra-hour scheduling of output and variable generation facilities to supply meteorological and operational forecasting data
- Renewable power producers will be better positioned to provide to the grid cost competitive electricity relative to traditional generation
- Transmission providers will be better able to predict wind and solar output enabling more efficient resource scheduling, which will result in improved system reliability

Entities Mentioned:

- California Independent System Operator
- Clean Line Energy Partners
- Federal Energy Regulatory Commission
- Iberdrola Renewables
- Midcontinent Independent System Operator
- NaturEner USA
- National Renewable Energy Laboratory
- PJM Interconnection

Related Research

New FERC and EPA Regulations will Impact Cost and Security of Electricity Supply

Memoranda of Understanding Aim to Increase Transparency of Energy Market Oversight

Operational Barriers to Renewable Energy Integration

The intermittent nature of renewable energy production exists within an operational environment developed around traditional generation, which – as stated by the Federal Energy Regulatory Commission (FERC) – can be "scheduled with relative precision" and which does not witness significant intra-hour generation variation. These traditional transmission system protocols are not well suited to effectively integrate the variable and unpredictable production associated with renewable energy resources. The inadequacy of these protocols in integrating renewable power production has resulted in operational barriers that impede renewable generation integration. FERC Order 764 – issued June 22, 2012 – requires transmission providers to offer intra-hour scheduling of output and requires variable generation facilities to supply their transmission provider with meteorological and operational data necessary to implement production forecasting. As a result, these rules encourage the development of operational protocols that facilitate the integration of renewable energy generation.

FERC Order 764 aims to remove barriers to renewable energy grid integration.

The Underlying Causes of Intermittent Renewable Generation

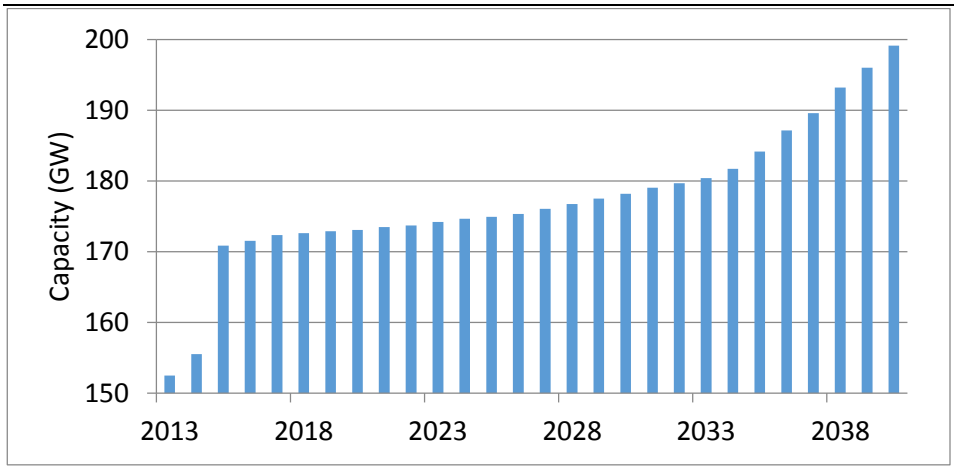
Wind and solar energy generators intermittently produce electricity, giving their respective operators limited control over their output. In overseeing the grid, system operators must constantly ensure that the balance between the supply and demand of electricity on the grid is maintained. The variable output from renewable generation facilities contributes to grid imbalance, and additional energy derived from other generation resources is required to balance supply and demand. To accomplish this, system operators must dispatch system generators with a call to inject power to the grid to balance actual generation.

Variable output from renewable generation facilities contributes to grid imbalance.

The partial unpredictability of renewable generation is related but, at the same time, distinct from variability. Partial unpredictability stems from the impossibility of predicting with exactness if the wind or sun will be available for power generation at a certain point in the future. System operators manage the grid through the process of "unit commitment," in which generation is scheduled ahead by several hours or up to a full day in advance in order to meet expected load. When actual production does not match forecasted production, the grid operator must balance the difference. The increased use of renewable energy resources increases the cost of this function by increasing the difference between predicted and supplied energy. The unit commitment process and reserve calculation is thus more complex with renewable generation due to output uncertainty.

Grid-connected renewable electricity generation is projected to undergo significant growth in the years to come (Figure 1). However, the power generation profile of intermittent generation resources is mismatched with the protocols which system operators have traditionally used to operate the grid. FERC Order 764 is intended to ease the inefficiencies of this mismatch.

Figure 1 – Current and Projected U.S. Renewable Electricity Generation



Source: EnerKnol analysis of EIA data

Order 764 Emphasizes Frequent and Enhanced Renewable Energy Scheduling

In its final form, FERC Order 764 encourages grid protocols that allow for more efficient integration of renewable generation. The rule requires:

1. Public utility transmission providers to offer customers the option to schedule transmission service on an intra-hour basis, in intervals of at least 15 minutes; and
2. The operators of renewable generation facilities 20 MW or larger to provide meteorological and operational data to the transmission providers to allow for more accurate power production forecasting.

Intra-hour scheduling requirement will allow system operators to incorporate renewable generation with fewer reserves while maintaining overall system balance.

The first requirement of Order 764 is the intra-hour scheduling requirement, which amends the pro-forma open access transmission tariff to "provide transmission customers the option to schedule transmission service on an intra-hour basis, at intervals of 15 minutes." Prior to this rule, transmission operators were not required to offer customers the option to schedule generation output in less than one-hour intervals. This intra-hour scheduling requirement will, over the long term, allow system operators to incorporate renewable generation, and its associated intermittency, with fewer reserves while still maintaining overall system balance.

The second requirement of Order 764 amends the pro forma large generator interconnection agreement that requires new customers of public utility transmission providers – whose generating facilitates are wind or solar facilities – to send to the transmission provider meteorological and operational data necessary to conduct power production forecasting. In promulgating this requirement, FERC is attempting to "eliminate a significant source of forecasting errors by ensuring that [transmission providers have] accurate information regarding the capacity actually available to produce electricity" for a given time frame. The more accurate forecast system operators can utilize in implementing the unit commitment process, the greater the benefits to system reliability and allow for scheduling using more economical non-

Increased renewable generation forecasting will add system reliability and reduce the need for supplemental reserves.

spinning or supplemental reserves – offline capacity capable of being brought online within ten minutes – rather than spinning reserves or regulation.

Allocating Costs Associated with Renewable Generation Facilities

The inadequacy of the historical grid system protocols in integrating renewables and their intermittent power production results in costs. These costs present themselves in different forms and can vary across systems. One such cost is an imbalance charge, levied by system operators on transmission customers that operate renewable generators – with which they had been disproportionately impacted. The Order 764 requirement that system operators must offer scheduling in 15-minute blocks is intended to place variable generation facilities on footing similar to traditional generation technologies in regard to their potential exposure to fees for generator imbalance service. Implementing these new protocols will result in costs to transmission providers, which, according to several commenters, includes energy management, accounting, and staff costs and will be in the range of $1 million to $2 million per year. These costs will ultimately be allocated broadly across all customers throughout the transmission system.

The intra-hour scheduling requirement included in Order 764 is an example of FERC allocating costs from variable renewable power generators to the transmission provider. When generation asset output deviates from scheduled output, the transmission system operator charges the transmission customer a fee for generation imbalance service. This fee compensates the system operator for having to ramp-up or ramp-down other generation assets to properly address the imbalance. Intra-hour scheduling will ease the generator imbalance fees that variable generation facilities have traditionally endured. Many industry participants – including renewable energy power generation and transmission participants – have responded positively to this requirement. For example, NaturEner USA, Iberdrola Renewables, and Clean Line Energy Partners all submitted comments to FERC that speak to the rule's potential in creating a more efficient and cost-effective scheduling environment.

When generation asset output deviates from scheduled output, the transmission customer is charged a fee for generation imbalance service.

Order 764 aims to provide grid benefits beyond renewable energy generation integration. The meteorological and operational data requirement included in Order 764 – which gives transmission providers information necessary to conduct power production forecasting – is estimated by the National Renewable Energy Laboratory (NREL) to potentially reduce grid operating costs in some regions by 14 percent, which could equate to as much as $5 billion in savings per year.

NREL estimates renewables forecasting to potentially reduce some regional grid operating costs 14 percent.

Policymakers Should Continue to Take Steps to Shift the Costs Related to the Integration of Renewables

As the power industry transitions to an era of rapid growth in the amount of interconnected renewable generation, there is a clear policy choice to be made: allocate the costs associated with renewable power integration to the renewable generators – which puts upward pressure on the cost of renewable energy – or incentivize protocols that encourage the development of a grid better capable of efficiently and cost-effectively absorbing an ever larger amount of intermittent generation. The requirements of FERC Order 764 encourage grid protocols that will result in a more reliable and robust transmission system and that could significantly improve system operating costs.

The requirements of FERC Order 764 encourage grid protocols that will result in a more reliable and robust transmission system.

The compliance burden for renewable energy producers will, in many cases, be minimal, as the required meteorological and forecast data is already collected. The AWEA stated in initial Order 764 comments that "many public utility commissions [had already] imposed [such] reporting requirements." FERC Order 764 also complements many state enacted policies that are intended to promote renewable energy production. These state programs typically take the form of renewable energy portfolio standards and require utilities to procure a certain percentage of their electricity sales from renewable sources by a certain point in time.

The compliance burden for renewable energy generators is minimal.

In an April 17, 2014 FERC meeting, staff reported 42 initial Order 764 compliance filings – 36 from public utilities outside of RTO markets and 6 from RTOs. Compliance for RTOs and ISOs – CAISO, MISO, and PJM in particular – has been more complicated due to adjusting intricacies of existing intra-hour scheduling protocols and undertaking wider-scale market reforms. Implementation is ongoing across the nation, however complete compliance may take years to achieve.

Compliance for RTOs and ISOs has been more complicated than non-organized market regions.

Disclosures Section

RESEARCH RISKS

Regulatory and Legislative agendas are subject to change.

AUTHOR CERTIFICATION

By issuing this research report, **Erin Carson** as author of this research report, certifies that the recommendations and opinions expressed accurately reflect her personal views discussed herein and no part of the author's compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

IMPORTANT DISCLOSURES

This report is for industry information only and we make no investment recommendations whatsoever with respect to any of the companies cited, mentioned, or discussed herein. EnerKnol, Inc. is not a broker-dealer or registered investment advisor.

Information contained herein has been derived from sources believed to be reliable but is not guaranteed as to accuracy and does not purport to be a complete analysis of the company, industry or security involved in this report. This report is not to be construed as an offer to sell or a solicitation of an offer to buy any security or to engage in or refrain from engaging in any transaction. Opinions expressed are subject to change without notice. The information herein is for persons residing in the United States only and is not intended for any person in any other jurisdiction.

This report has been prepared for the general use of the wholesale clients of the EnerKnol, Inc. and must not be copied, either in whole or in part, or distributed to any other person. If you are not the intended recipient you must not use or disclose the information in this report in any way. If you received it in error, please tell us immediately by return e-mail to info@enerknol.com and delete the document. We do not guarantee the integrity of any e-mails or attached files and are not responsible for any changes made to them by any other person. In preparing this report, we did not take into account your investment objectives, financial situation or particular needs. Before making an investment decision on the basis of this (or any) report, you need to consider, with or without the assistance of an adviser, whether the advice is appropriate in light of your particular investment needs, objectives and financial circumstances. We accept no obligation to correct or update the information or opinions in it. No member of EnerKnol Inc. accepts any liability whatsoever for any direct, indirect, consequential or other loss arising from any use of this report and/or further communication in relation to this report. For additional information, please visit enerknol.com or contact management at (212) 537-4797.