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# New Approach Needed for Renewable Integration

By Steven F. Greenwald and Jeffrey P. Gray

It is time for the renewable integration discussion to move beyond simply identifying the challenges of ensuring reliability in a nation increasingly served by intermittent renewable resources and toward developing real-world solutions to these challenges.

Significant increases in intermittent renewable generation are expected this decade to meet renewable portfolio standard (RPS) requirements and greenhouse gas emissions reduction measures. In its 2010 *Long-Term Reliability Assessment*, the North American Electric Reliability Corp. estimates that approximately 180,000 MW of variable wind and solar generation may be added in North America by 2019. Such a massive build-out will place significant stress on grid operators across the country, who have traditionally assessed system needs in terms of planning reserve margins, as opposed to resource flexibility. However, the availability of flexible resources, such as gas-fired generation, is precisely where grid operators and regulators need to focus their attention to ensure grid reliability going forward.

## Increased Reliance on the Gas-Fired Fleet Expected

From a grid operator's perspective, wind and solar generation present several operational challenges. Generation from these resources varies over operational time periods as short as seconds, and forecasting actual production, while improving, is still prone to error. The net effect is that gas-fired resources will need to be utilized in new ways by grid operators to balance load and generation.

In a 2010 study, the California Independent System Operator (CAISO) looked at the operational requirements necessary to reliably integrate a 20% RPS requirement. CAISO found that responding to the inherent variability in wind and solar generation will require flexible resources capable of providing load-following and regulation services "in wider operating ranges and at ramp rates that are faster and of longer sustained duration than are currently experienced." CAISO concluded that integrating the expected increase in renewable generation will require gas-fired generators to cycle more frequently, with an expected 35% increase in "starts" for combined cycle units.

More recently, the California Public Utilities Commission has been looking at renewable integration needs under the state's new 33% RPS requirement. Early indications from preliminary modeling suggest that a significant amount of flexible gas-fired generation above current planning reserve margins (much of it already existing or planned) will be needed to ensure grid reliability.

Improved forecasting, additional transmission to facilitate inter-balancing authority transactions, greater demand response, and increased energy storage are other tools warranting further development to help integrate renewable resources. However, grid operators can be expected to lean heavily on the nation's gas-fired generation fleet to meet integration needs.

## The Numbers Don't Add Up

Ensuring that a viable gas-fired generation fleet is available when and where it is needed is a challenge that grid operators and regulators will soon have to confront. The same CAISO study that projected a 35% increase in "starts" for combined cycle units also forecasts that revenues for these units will drop by 16% as the influx of wind and solar generation on the system drives down energy prices and reduces the overall need for energy from gas-fired units. Revenues for gas-fired steam and simple cycle turbines are expected to decrease by even greater amounts—29% and 39% respectively.

Flexible gas-fired generation in excess of historic planning reserve margins will be needed to reliably integrate increased renewable generation. However, capacity markets that have traditionally viewed resource procurement in terms of planning reserve margins and "resource adequacy" are not equipped to appropriately value and compensate generators for renewable integration services. This implicit bias works to devalue capacity above the planning reserve margin. Thus, at the very time grid operators will be looking to the gas-fired generation fleet to help integrate renewables, the market structure necessary to support new development and encourage investment in maintenance activities to ensure resource availability does not exist.

## A New Approach Is Needed

A paradigm shift away from "business as usual" resource planning is necessary. Reliability must be considered in terms of resource "flexibility" as well as resource adequacy. Specific renewable integration products that are not tied to traditional planning reserve margins need to be defined, and a procurement mechanism that will provide a reliable and adequate revenue stream for generators supplying these products must be developed.

Potential solutions include multi-year procurement requirements whereby load-serving entities would directly contract with generators for ramping and regulation products or capacity markets where new and existing generation could compete to provide renewable integration products over a multi-year time period. The common denominator is a market structure that offers generators revenue stream visibility several years out.

To many, it may sound counterintuitive to suggest that, as renewable penetration increases, the importance of flexible gas-fired generation will increase. However, reliability in a renewables world demands dispatchable resources with specific load-following capabilities, ramp rates, and regulation capacity—attributes to be found in the gas-fired generation fleet. ■

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