

What Moves the *Ex Post* Variable Profit of Natural-Gas-Fired Generation in California?

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Executive Summary

In restructured electricity markets with active wholesale trading, the problem of “missing money” (or revenue inadequacy) is a serious concern because the competitive market prices may be insufficient to justify and support investment in new generating capacity. Public policies that promote renewable energy development and demand response (DR) programs exacerbate the “missing money” problem. Specifically, vast expansion of renewable resources with zero fuel costs (e.g., solar and wind) likely reduces wholesale market prices by displacing the output from the fossil-fueled power plants, which in turn reduce the incentive to invest in natural-gas-fired generation. While useful for maintaining system reliability, large-scale development of DR programs tends to reduce the high prices during hours of severe shortage, thus cutting the investment incentive.

Based on a regression analysis of a large sample of over 32,000 hourly observations in the 45-month period of 04/20/2010 – 12/31/2014, we analyze California’s “missing money” problem, thereby highlighting the state’s challenges in developing energy policies for a clean, reliable and affordable electricity future. We find wind and solar generation development tends to reduce the California energy market prices and therefore reduce the investment incentive for combustion turbines (CT) and combined cycle gas turbines (CCGT), whose flexibility is essential for the California Independent System Operator (CAISO) to maintain the state’s load-resource balance in real time. While expanding DR programs can clip the state’s peak demand, it may also cut the market price spikes that offer the most profitable opportunities for a CT or CCGT plant. Finally, rising natural gas prices and the loss of a nuclear reactor tend to raise market prices and therefore the incentives for investing in CCGT and CT.

Our findings support the “missing money” problem’s remedy in California’s adopted resource adequacy program: “Each [load serving entity’s] system requirement is 100 percent of its total forecast load plus a 15 percent reserve, for a total of 115 percent.” In compliance with its system requirement, a load-serving-entity (LSE) such as Pacific Gas and Electric Company prepares a long-term procurement plan for the state’s public utilities commission’s approval, announces its capacity needs based on the approved procurement plan, and issues requests for proposal (RFP) to bilaterally contract with suppliers of conventional and renewable generation, as well as DR resources. Under the LSE’s RFP process, a developer of a new CCGT (or CT) may submit its proposal for a long-term contract, which presumably has sufficient revenues to cover the plant’s variable costs plus the returns on and of investment. Hence, the winning proposal and the subsequently signed contract of a chosen developer would yield sufficient revenues to enable the new plant’s construction.

