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Electricity Markets \$64,000 Question

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Each summer, I have the good fortune of being able to teach a class in Edinburgh, Scotland, where I am as I write this. Today, I turned on the BBC equivalent of C-SPAN to find the UK Energy Minister, Andrea Leadsom, testifying before a parliamentary committee about the very same question that plagues American electricity markets: namely, how to ensure a reliable and affordable supply of electricity as renewables command a growing share of the supply and competitive markets set the price. This has been the \$64,000 question in electricity markets for some time now, one that is not as simple (and is more worrisome) than either free marketeers or green energy advocates appreciate.

One might ask why this is a problem at all. As with any good or service, when the supply gets scarce, the price will go up, consumers will purchase less of the product, and suppliers will supply more of it. Just let the market work its magic and all will be

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fine. But applying textbook microeconomic principles to electricity markets has proven difficult for regulators. They have an obligation to ensure a secure supply and a long tradition – indeed, a statutory mandate – to ensure the prices are fair. And they answer to elected leaders who will be unhappy if the lights go out or the price spikes to unprecedented levels, as it did in California in 2000-01.

In those American markets that retain traditional electric utility price regulation, security of supply is provided by government-set rates that guarantee generators a positive rate of return on their generation investments. But in the Northeast, Midwest, California, and center of the country (the Great Plains and Texas), wholesale electricity prices are set by competitive markets, and regulators there worry that market prices will not provide a sufficient incentive for generators to remain on the grid or for investors to build new generation.

Why might that be?

Buyers on wholesale markets don't much care what generation technology supplies their electricity; they simply want electricity when they need it. Competitive markets drive down the price of electricity pretty efficiently, to the benefit of buyers on wholesale markets, and ultimately their customers. But those markets do not do a good job of capturing the reliability of supply from a particular generator, or of the system as a whole, in the wholesale spot price.

Regulators traditionally impose a very high standard of reliability on electricity markets; keeping the lights on has traditionally been the prime directive for electricity market regulators. Reliability includes the security of the fuel supply (Is it there when you need it?) and the speed with which a generator can meet an increased demand for power. Different generators have different abilities to satisfy these two dimensions of reliability.

Coal-fired power plants and nuclear power plants, the traditional base load sources of electricity, each have a relatively secure fuel supply. Neither depends upon real-time supply of fuel, and supplies of coal and uranium are abundant from domestic or via imports from friendly, stable countries. On the other hand, these types of plants are not able to “ramp” – to increase or decrease production levels, especially from a cold start – as quickly as other

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technologies.

Natural gas-fired power plants can ramp much more quickly and are better at responding to short-term increases in demand. On the other hand, they rely upon real-time supply via pipelines for fuel supply. Thus, interruptions of gas supply mean interruptions in electricity generation from gas-fired plants. We saw this in Texas in the cold snap of 2011, and northeastern markets experienced the same thing during the polar vortex of 2014.

Renewable generators like wind and solar power also rely on an interruptible real-time supply of “fuel” and can generate only when the wind and the sun are available. Despite great progress in predicting when and how much wind and solar power will be available, at least over short periods of time, these sources score lower on both dimensions of reliability than traditional sources.

Under traditional regulation, utilities or regulators could insist on fuel diversity in the electricity generation mix to ensure that these various dimensions of reliability were well satisfied. Under competition, however, it is the market that determines which plants will be used, and which will be built. As these different technologies compete in wholesale spot markets, it is the marginal price (closely associated with the fuel price) of each generator that determines the spot price. Thus, the drastic reduction in the price of natural gas in recent years (caused by the shale gas revolution) has allowed natural gas-fired power to command an ever larger share of electricity markets at the expense of both coal-fired and nuclear power plants. And because the “fuel” for wind and solar power is free, their increasing presence on wholesale spot markets drive down the spot market price even further.

The result over time is the [displacement of more reliable sources of electricity with less reliable ones](#). Hence regulators concerns about system reliability.

That is why managers of some competitive wholesale markets in the United States have turned to so-called “capacity markets,” which provide extra payments to generators merely to be available in case they are needed at some specified time in the future. The British also have a capacity market, about which the energy

minister, Ms. Leadsom, was testifying today.

Capacity markets are controversial with some politicians (hence the Parliamentary hearing today) because they represent an added cost that consumers ultimately must pay. Some economists don't like them because they represent a departure from the way markets ought to work. Ideally, if buyers on wholesale markets want reliability, they should pay for it via higher prices when electricity is scarce. Perhaps consumers don't want as much reliability as regulators insist upon. Perhaps they would prefer not to pay prices that reflect capacity payments to generators, and would accept a less reliable electric supply. Let buyers' willingness to pay be our guide, they say.

Politicians and regulators seem unwilling to follow this prescription, however. In her testimony, Ms. Leadsom (representing the Conservative Party government) made clear that maintaining a mandatory, high level of system reliability was "non-negotiable," and that capacity markets provided generators with an important and necessary income supplement to ensure that reliability. Wholesale market managers in the American northeast and Midwest have made a similar choice. Indeed, some American regulators are growing increasingly concerned about the inability of nuclear power plants to remain viable on competitive wholesale markets, and are exploring other ways to compensate them for remaining open. Even in Texas, where politicians and regulators have tried to create a market that follows a textbook design, regulators still worry about (and intervene to ensure) system reliability.

And they do so for understandable reasons. Economists often assume that market behavior produces a better and more accurate reflection (or expression) of the popular will than does political participation. That assumption, embraced by a sizeable segment of legal scholars as well, is dubious. In addition to the problem of pricing reliability, real-world electricity markets impose barriers to entry for generation that slow or prevent rational supply-side reactions to price fluctuations. There are other friction points between wholesale sellers and retail sellers of electricity as well that interfere with the efficient transmission of price signals to consumers. And more fundamentally, willingness to pay is a flawed

measure of “what people want” because it is so dependent on their ability to pay.

I have written about this at greater length [here](#), but the key take-away is that electricity market regulation (including the imposition of capacity markets) reflects a collective choice to change the market allocation of the costs and benefits among the various participants in those markets. To characterize it as some sort of political distortion of a market ideal is unhelpful and misleading. The goal of electricity market policy is to balance cost-effectiveness, reliability, and environmental performance in ways the public prefers. It is not to vindicate economists’ view of human nature or how to maximize welfare.

This interplay between electricity markets and their regulators over how to provide the balance the public wants is the \$64,000 question of electricity policy. More literally, it is probably closer to a \$billion question. And as competitive markets in Europe, the United States and elsewhere integrate more and more renewable generation, the task will grow more difficult, requiring regulators to use an increasingly deft touch.

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