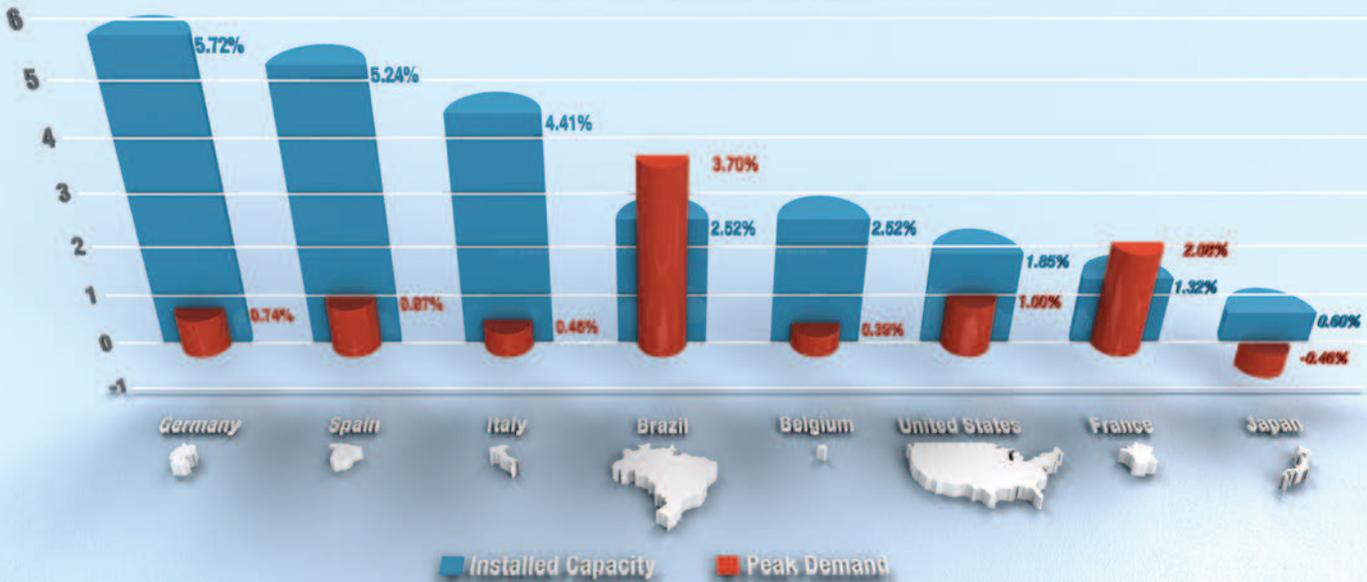


Compound Annual Growth Rate (%), 2003 - 2013



Data Source: EIA

EPRI Explores What Capacity Means for Evolving Electric Grid Systems

The electric grid is changing from a one-way system that takes power from central generating stations to consumers into a multi-dimensional set of connections linking diverse and dynamic sources of both supply and demand. Fundamental shifts in grid operations are changing the role of electric utilities in ensuring that sufficient capacity is maintained to serve the grid's loads. To give stakeholders in industry, government, and the public a factual basis for confronting the economic and policy issues raised by these changes, an EPRI team has created a public whitepaper that lays out the physical realities facing utilities and identifies emerging—and missing—connections.

"We wanted to frame the discussion," said EPRI Engineer Ben York. "Capacity costs are significant for utilities. So what are the key attributes of capacity? What does it mean to have availability? Reliability? Flexibility?"

EPRI defined *capacity* broadly, as the capability to supply and deliver electricity at any point in time, taking into account ancillary services such as frequency regulation and load following needed to maintain grid stability. The paper built on other EPRI work on integrated grids, York said, and aimed to bring together all elements that provide capacity on the changing grid—from solar panels to nuclear plants. New technology means "there are a lot of new players in the industry," he said, from thousands of homeowners with rooftop solar panels to third-party aggregators for both supply and demand. "We have to take a hard look at assumptions that have been generally accepted for a long time, and consider the potential for lots of changes, all at once," he said. "We have to find new ways to keep these systems reliable and affordable with an increasingly different set of resources."

The study team focused on particular gaps in knowledge. For instance, they examined how wholesale markets are defining and planning for capacity, and compared the ways utilities and regulators account for capacity at the retail level. Capacity mar-

kets look ahead just three to four years and tend to be volatile, the team found, leading to a growing sense that capacity mechanisms may need to provide longer-term price signals.

Among the team's key findings is that variable resources such as wind and solar supply energy but little capacity, because their availability is irregular. A utility therefore must maintain other capacity to serve customers when variable resources aren't available, and the cost of maintaining that backup capacity may be significant. And while more energy-efficient appliances, such as residential home heat pumps, are reducing total electrical load, they aren't reducing peak loads—and peak loads determine the amount of capacity required.

Capacity issues extend to many aspects of the power system, including economics, the environment, and social equity. EPRI is "trying to highlight how the physics work" to give stakeholders a basis for policy and regulatory discussions, said York. "We're trying to show the connective tissue in a balanced way."

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