MOODY'S INVESTORS SERVICE

SPECIAL COMMENT

Rate this Research »

US Regulated Utilities

Regulatory framework holds key to risks and rewards associated with distributed generation

Table of Contents:

Analyst Contacts:

NEW YORK +1.212.553.1653

Jim Hempstead +1.212.553.4318
Associate Managing Director
james.hempstead@moodys.com

Jeffrey Cassella +1.212.553.1665
Analyst
jeffrey.cassella@moodys.com

Ryan Wobbrock +1.212.553.7104
Assistant Vice President - Analyst
ryan.wobbrock@moodys.com

Swami Venkataraman +1.212.553.3633
Vice President-Senior Credit Officer
swami.venkat@moodys.com

Toby Shea +1.212.553.1779
Vice President - Senior Analyst
toby.shea@moodys.com

» contacts continued on the last page

» Trying to assess the impact of distributed generation (DG, including smart grid technologies) on the US regulated utility infrastructure requires a considerable amount of subjective interpretation and qualitative judgment. The technologies are still years from commercial mass-market deployment, which leaves plenty of time for utilities to work with their regulators to amend or restructure the suite of recovery mechanisms, refine its service offerings and protect their credit profiles.

» The benefits that DG brings to a utility's infrastructure could be significant and go beyond simple costs per mega-watt hour ($/MWh) or cost per MW capacity comparisons. Capital expenditures in the distribution component of the rate base could rise materially and steadily, a credit positive, but DG could also pose a threat of spiraling volume declines if consumers look to drop off the grid. Today's suite of recovery mechanisms are not designed to address DG-related technology risks in a timely manner, so if volumes drop, so will cash flows.

» A breakthrough of two unrelated DG technologies could have a material impact on the credit quality of US regulated utilities over the next decade. The commercial deployment of small modular nuclear reactors could be a credit positive, despite their potential to create stranded assets in other parts of the utility's infrastructure, while mass market demand for battery storage associated with new electric vehicles could be a credit negative, possibly offset by sizeable investment increases in a utility's distribution network and better utilization of the infrastructure assets.

» Near-term, the center point of DG's technology risk and the response from utilities and regulators can be found in Arizona and California, because of the growing popularity of residential roof-top solar using net energy metering. We'll keep an eye on the regulatory proceedings, but so far, we see regulators acknowledging a mis-matched allocation of fixed costs, which hurts some customer classes. For now, we think regulators tendency to find a balance between several competing interests, mean they will be reluctant to upset the fragile economic proposition that DG currently enjoys.

» The utility sector has had to contend with these types of long-term technology event risks in the past. About 15 years ago, the sector was worried about the mass market deployment of small fuel cells – devices that were looking to corner the market to power both homes and autos. The consequences associated with the best case outlook for regulated utilities would have been dire, but today's fuel cell technologies are still largely sitting on the laboratory bench.

Distributed generation is a form of energy technology event risk

At its core, DG represents a form of technology event risk, where event risk is low or remote, but with high severity implications should the event actually materialize. In general, our credit analysis does not rate to the outcome of a specific event, such as a catastrophic earthquake, but we take into consideration the risk or exposure associated with any reasonable potential outcomes, as well as any likely mitigation measures a company might implement. For example, in the case of an earthquake, we consider the diversity of the infrastructure and the likelihood of repair costs recovery. In the case of severe storms, we consider the breadth and timeliness of storm recovery mechanisms.

With respect to DG, we consider the technology event risk associated with various forms of distributed generation a longer-term risk factor, which is not, at this time, materially affecting our ratings or rating outlooks. We think the electric grid is efficient and reliable, and because it constitutes a critical infrastructure asset necessary for a functioning economy, we expect a material amount of political and regulatory support to maintain grid reliability. We also note that most of the DG technologies or services currently being evaluated require a connection to the existing grid.

From a credit perspective, we think today's DG risks are more conceptual than specific. To have a truly distributed generation electric network, a number of different technologies would need to be synchronized, spanning all three components of the traditional, vertically integrated electric utility rate base: generation, transmission and distribution.

EXHIBIT 1

Some of the Utilities Currently Contending with the Various Challenges Associated with DG

Utility	Rating	Comment
Arizona Public Service	A3	Roof top solar
UNS Energy	Baa2	Roof top solar
Southern California Edison	A2	Roof top solar; energy efficiency
Pacific Gas & Electric	A3	Roof top solar, energy efficiency
Hawaii Electric	Baa1	Unique island needs

Source: Moody's Investors Service

Potential benefits attributable to DG

We see three key benefits for both utilities and customers associated with DG, which we can broadly categorized as economic; environmental; and reliability and security. Today, all of these benefits are more conceptual than practicable, in our opinion, as a material technological breakthrough is still needed before they reach a state where they become commercially viable on a mass market scale.

Economic: For the consumer, the economic benefits associated with DG are primarily related to self-generation, where consumers can avoid or lower their reliance on the utility's grid and infrastructure, thereby saving money. For example, if a consumer can pair a roof-top solar installation with the storage capacity embedded in an electric vehicle, or install an air-conditioner-sized, fuel-cell-powered electric generating device in the home, he or she could disconnect from its local utility and save approximately \$100 per month, or \$1,200 per year.[1] Another economic benefit for the consumer includes the use of smart meter technologies, which provide remote (active or passive) management of a home's heating and cooling needs, thus potentially reducing its volume demand.

[1] Assumes 10 cents per kWh residential rate and 1,000 kWhs usage per month.

For the utility, the economic benefits associated with DG relate primarily to the creation of a more efficient load (demand) curve, where peak volume requirements are smoothed out, which reduces capital investment needs and operating costs. A wide-spread intelligent network also provides a utility with a more interactive grid management tool (at the local level) which results in better outage management and keeps customers reasonably happy.

Environmental: The environmental benefits associated with DG comes in two forms. The first is a reduction in greenhouse gas emissions, especially if the technologies are associated with solar and electric vehicle (EV) battery storage. The second is a reduction in the need for land resources associated with both big generation needs and big transmission lines.

Reliability and security: The principal reliability benefit is associated with reduced outage times and higher-quality power. The principal security benefit is two-fold. First, a wide-spread deployment of DG creates a stronger and more resilient electric grid, which can better withstand storms, cyber-attacks or other large disruptions. This is most helpful for other critical infrastructure assets, such as military stations, telecommunications equipment and hospitals. Second, DG can also help insulate a region from energy import needs, or the security of energy supplies, such as natural gas transmission to New England during a polar vortex.

Potential negative consequences attributable to DG on a utility

There are large negative consequences for regulated utilities associated with a widespread DG deployment, but only if we assume everything else associated with the utility structure as we know it today stays the same. In other words, if DG emerges quickly and catches a utility and regulator somewhat flat-footed where neither has taken any meaningful strategic steps to address whatever the impact DG has created, the likelihood of negative credit events would rise due to the technological disruption.

Taking this assumption a step further, widespread deployment of economically compelling DG technologies means that consumers could easily decide to disconnect from their utilities and drop off the grid. If enough customers decided to go this route, a potential "death spiral" scenario could develop where the customers that stay with the utility will bear the increasing burden of covering the utility's fixed costs. In this scenario, the utility's volumes would steadily decline, pressuring its revenues and cash flows, damaging its credit profile and upsetting its equity owners. This would undoubtedly evolve into an environment of consumer backlash as non-DG customers became intolerant of absorbing steadily rising rates. We think this would create a period of heightened regulatory contentiousness, and the risk of a sizeable amount of stranded assets.

Nevertheless, we are reluctant to incorporate a view that the utility sector will enter a period of material and significant volume reductions associated with a mass market DG deployment without a change in the rate making structure. These technologies are all still in the very early stages of development, which leaves time – decades, perhaps – for utilities to evaluate and adapt. Moreover, utilities have seen this movie before, about 15 years ago when fuel cells were looking to corner the energy market for both homes and autos. For example, we recall a time when big industrial companies such as General Electric Company (Aa3 stable) were promoting a fuel cell generating device (the size of an air conditioning unit) that would eventually allow millions of home-owners to drop off the utility grid. Other companies, such as General Motors Company (Ba1 stable) and Toyota Motor Corporation (Aa3 stable), were promoting fuel cell-powered vehicles. At the time, the market was anticipating that more than one million fuel cell powered cars would be on the road by 2010.

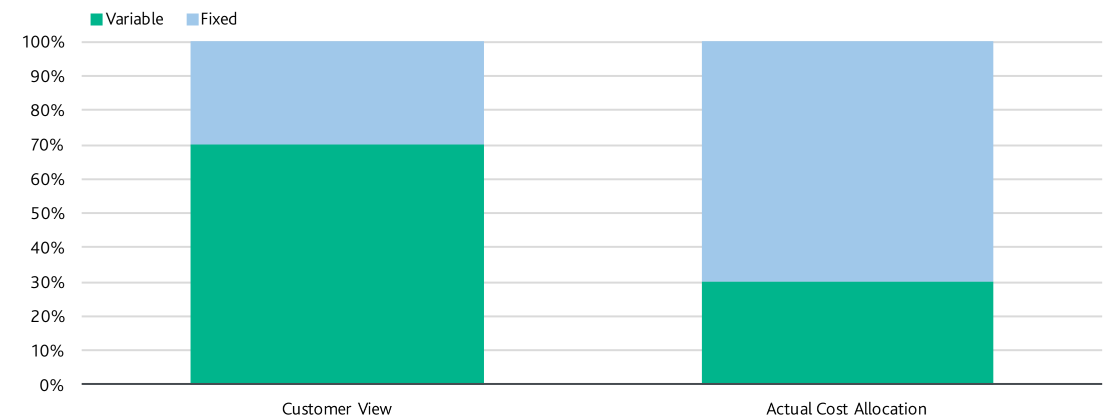
The key resides with the regulated rate structure

The risks and rewards associated with commercially available DG technologies ultimately reside with the regulators, because they approve the revenue recovery mechanisms associated with the grid's installed infrastructure. As DG technologies develop and mature, utilities will be keen to change the rate design to properly capture any benefits and allocate their costs.

The basic premise before the regulators is the allocation of a utility's fixed and variable rates, and how to classify their customers. Assuming an average monthly residential bill of $100, we think around $70 would be associated with the utility's fixed costs (on the high end of the range) – that is, the infrastructure built to serve a customer. However, today's rate structure is actually inverted in the manner in which it is presented to the customer. For example, a customer sees an average monthly demand charge (i.e., the fixed costs) of approximately $30 and a variable (i.e., volumetric charge) of $70. The rationale for why the regulated rate structure is presented to customers this way is long and complex and is beyond the scope of this report.

EXHIBIT 2

Illustrative Mis-match: How Utilities Present Costs to Customers, Compared to Actual Allocation



Source: Moody's Investors Service

With respect to customer classification, utilities consider most residential customers "full requirements customers", which means that these customer get 100% of their electrical energy needs from the utility's infrastructure – its grid. Moreover, the utility's infrastructure is designed to meet the customer's need on both the hottest and coldest days of the year. So by design, the infrastructure is underused on most "normal" weather days.

Theoretically, if a customer decided to self-generate a portion of his or her electric needs, the utility would no longer view the customer as full-requirements customer. If a utility, or its regulator, changed the designation of the DG customer to a "partial requirements customer", that customer's allocation of the utility's fixed and variable costs would change, as would the economic proposition that the DG service provider is using to market its product or service.

In this case, were the regulator to change the customers' classification, we still think DG customers would have lower bills, but the lower bills would be solely due to reduced energy usage associated with lower volume needs. A change in rate classification would address the mis-allocation of fixed charges. Because this solution appears to be so simple, that is, a change in the rate making structure, we think today's DG economic proposition is somewhat fragile.

Another big regulated consideration relates to planning. Because utilities manage the electric grid, a critical infrastructure asset, a considerable amount of planning goes into the engineering of the grid's reliability. As a result, we do not, at this time, think regulators will allow customers to add numerous DG devices across the grid without including some form of planning in the mix.

For example, with respect to rooftop solar installations, the lack of planning and coordination between roof-top solar installers and utilities in our view is an area that might get addressed over the next two to three years. Whereas rooftop solar companies prefer customers with high credit scores and southern facing roofs (which maximize solar output and thus potential savings for the customer), a utility might prefer roof-top solar installations concentrated in a more diverse section of its service territory or with the panels facing west (to better coordinate solar production with the utility's peak need).

Two distributed generation technologies to monitor

We illustrate two unrelated distributed generation technologies that deserve watching because breakthroughs could have a material impact on the credit quality of US regulated utilities over the next few decades: the development of (1) small modular nuclear reactors to supplement or replace large power plants and (2) battery storage devices associated with electric vehicles. For now, we think these technologies are at least a dozen years away from full commercial adoption, leaving the utility sector with plenty of time to refine long-term strategic plans.

SMRs look good on paper

Conceptually, small modular reactors (SMRs) look really good on paper, and could be a compelling complement to today's big, central station utility model. SMR designs are likely to share many common principles with existing reactor technologies to address safety and produce a competitive economic proposition. They require a much smaller footprint than big reactors and can be built in stages, which helps a utility layer in its generation supplies with its load demands. The primary system components are being designed into a single vessel, which should help with passive cooling designs, much like the advanced technologies associated with the much larger Westinghouse AP1000, and thus reduce "first of a kind" risk.

The SMR designs will also rely on a modular assembly that optimizes manufacturing and construction costs, construction schedules and quality control through standardized components and processes. And because nuclear power does not produce any harmful greenhouse gas emissions, more widespread adoption of SMRs can help with climate change concerns, especially if the SMRs are deployed to replace fossil-fueled generation.

In effect, the SMR concept marries the logic of economies of scale with the economies of mass production. Together, these SMR designs will translate into operating-cost efficiencies, and can help reduce transmission congestion if they are sited near load pockets.

Regulated utilities, especially the municipally owned and G&T cooperative sectors, stand to benefit the most from the development of SMRs, especially if they are located in regions where coal sets the price of power on the margin or in the Pacific North West, where population densities are lower.

EXHIBIT 3

Selected Utilities That Could Benefit from Commercially Available SMR Generation

Utility	Rating	Region	Comment
Tri-State G&T	Baa1	Western US	Benefits from low population density; need for incremental generation supplies
Idaho Power	A3	Western US	Benefits from low population density; need for incremental generation supplies
TVA	Aaa	Eastern US	Proto-type partner for SMR

Source: Moody's Investors Service

Storage – the holy grail for utilities

A breakthrough in battery storage would disrupt the regulated utility and unregulated power business models because revenues and volumes would fall as homeowners decide to drop off the grid (for electric power needs only, not natural gas or water and sewer). We think the likelihood of this technology is also remote for now, given an apparently higher level of uncertainty than for the SMR technology.

Tesla Motors (not rated) made a big splash in the marketplace when it announced plans to build a massive new battery production facility to facilitate a ramp-up in its electric vehicle production plans. If Tesla is successful in driving down the costs for its EVs, which can be recharged by some other form of distributed generation thereby prompting customers to drop from the grid, the regulated utility revenue model will likely experience some stress on the allocation of its fixed demand charges. Specifically, customers who cannot afford a new EV and do not drop off the grid will likely end up with higher utility bills, which raises the risk of equitable rate allocation for regulators.

We don't think EVs will have a dramatic market acceptance over the near-term, in part because the of the material performance advancements in internal combustion engines, with more to come. In addition, battery storage technologies will need a technological leap in size, or customers will need to string several batteries together in order to provide enough power to serve all of a home's appliances. There are also some engineering constraints associated with the power surges needed to cycle the bigger appliances, such as an air conditioner. Still, the process of marrying battery storage with increasingly competitive distributed generation is something to monitor.

From a credit perspective, we'd expect to see a material increase in a utility's distribution capital investments, as the grid is refurbished to meet the needs of a mass market EV network which could offset some of the risks presented by a mass deployment of battery storage devices.

Appendix A: *The following was originally published in the Global Infrastructure Focus in September 2013*

Technology risks represent a material threat to utilities, but resiliency of business model remains intact

In the technology sector, everything gets cheaper and more efficient exponentially. For the global utility sector, the technology model could smash into utilities' existing market framework and create material threats to the business model. These big-picture, long-term risks have been highlighted as a challenge for utilities for decades, but the resiliency of the utility business model will be very difficult to attack.

When Moody's thinks about technology risks for the utility sector, we usually focus on distributed generation resources, such as solar power, accompanied by smart grid products that empower a customer to manage their usage. We can envision a scenario where every home-owner and building within a defined, monopoly service territory is equipped with a battery capable of managing the load. Under this scenario, customers would likely be inclined to drop off the utility's grid, thereby creating significant stranded assets, and destroying the utility of the utility business model. But such a day seems to be many years in the future, absent a major technological breakthrough, so threats like these are considered, for now, as remote probability-high severity event risks.

Still, we see the emergence of the scenario developing, especially in some US states such as California and Arizona, where subsidized roof-top solar programs with net-metering rate structures are distorting the fixed cost allocation among different consumer groups. While still small, and not material to the consolidated financial profile of the utilities involved, Arizona Public Service (A3 stable), Southern California Edison (A2 stable) and Pacific Gas & Electric (A3 stable), if extrapolated to a more meaningful penetration, the existing regulatory recovery mechanisms will create big costs for those consumers left on the grid. This will, theoretically, incentivize more consumers to leave the grid, thereby creating a negative spiral.

We don't think the existing model can be applied and extrapolated indefinitely. Instead, we see a material restructuring to the traditional suite of rate recovery mechanisms, where the utility's fixed costs are more equitably distributed across its customer base.

In Germany, we see the social and political agendas focusing on climate change, a push towards renewable solar and wind power and the avoidance of fossil and nuclear generation. This has created significant financial stress for the big German generators, such as RWE (Baa1 stable) and E.ON (A3 negative). Have consumers really benefited?

There are other scenarios to consider, especially with respect to the mass adoption of electric vehicles (EV's). To be clear, today, we do not view electric vehicles as a material threat for utilities. We consider these auto-manufacturer's product lines as both low volume and low margin – not a robust business line for major global industrials. Moreover, we think auto-manufacturers have already identified significant and material advancements in the efficiency of their internal combustion engines, so we are at least another decade before EV's start to compete for consumer attention.

Still, for illustrative purposes, lets imagine a scenario where a multi-story parking garage opened in center city London or New York. The parking garage only allows EV's, and the costs for a monthly parking pass is offered at a significant discount to other parking alternatives. Once safely parked, the driver plugs his EV into the garage's grid and is given a key-fob which the driver will activate about 30 minutes before returning to take his vehicle.

Theoretically, the parking garage has just become a 15[2] MW power plant, located in the heart of the load demand pocket. On the hot summer day, usually around mid-day when electric demand is highest, the utility would access the garage's capacity, and drain every EV's battery. Once the peak demand passes, usually in the early afternoon, the EV's begin to recharge – just in time for the evening rush home.

Of course, a mass adoption to EV's also brings material challenges for many toll road operators. Some toll roads, such as the New Jersey Turnpike Authority and the Pennsylvania Turnpike Authority, rely on the concession fees and gasoline taxes that motorists utilize at rest stops. EV's don't use gasoline, so those revenues will fall. In addition, EV's ought to have a range many times greater than a standard gasoline tank, so perhaps they will be less likely to stop as well. In Virginia, we see elected officials moving to revamp their gasoline tax structures, in part to address the improving mileage of today's auto's.

Technology also brings the promise of energy efficient gains, so the expected volumes that utilities might be looking to sell are going to flatten, or worse, decline. This phenomena is most evident in the natural gas distribution sector, which has experienced falling volumes for years. More efficient appliances use less power and natural gas, and if consumers were given easy control of their thermostats, perhaps through their wireless mobile phones, utilities could see a more meaningful drop in volumes.

Declining volumes spell more trouble for electric utilities than gas distribution utilities, because in the gas distribution sector, a more proactive approach to reallocating the fixed costs across all customers is already well underway.

In summary, technology risks are a threat, but the adoption rates are likely to prove slow enough for both utilities and regulators to revise and amend their recovery mechanisms.

[2] Assumes 500 parking spots and an average EV engine capacity of 30kw's.

Moody's Related Research

Sector Comments:

» Risks in Commercial Solar Contracts Differ from Residential, June 2013 (SF333536)

» Long Contract Tenors Accentuate Four Major Risks for Residental Solar Securitizations, April 2013 (SF327239)

» Expiration of Department of Energy Loan Guarantee Program Is Credit Negative for US Solar Companies, October 2011 (136546)

Special Comments:

» Rooftop Solar, Distributed Generation Not Expected to Pose Threat to Utilities, November 2013 (160080)

» Regulatory Changes Have Proved Beneficial to Date but Affordability Issues May Exert Negative Pressure on Electricity TSOs, August 2013 (156573)

» German Utilities Face Structural and Cyclical Challenges to Profitability and Credit Profile, July 2013 (156251)

» Spanish Utilities: Further Regulatory Reform Likely Despite Measures to Eliminate Tariff Deficit, April 2013 (148485)

» Wind and Solar Power Will Continue to Erode Thermal Generators' Credit Quality, November 2012 (146913)

» Solar Photovoltaic (PV) Industry Faces Challenges from Overcapacity, June 2011 (133234)

» Renewable generation in the US: Sunny skies or storm clouds ahead, April 2011 (132140)

» PV Solar Power Generation Projects, July 2010 (125811)

Pre-Sale Reports:

» Solar Star Funding LLC, June 2013 (154989)

» CPV Power Plant No. 1 Bond SPV (RF) Limited, December 2012 (148012)

» Topaz Solar Farms LLC, February 2012 (139706)

To access any of these reports, click on the entry above. Note that these references are current as of the date of publication of this report and that more recent reports may be available. All research may not be available to all clients.

Rate this Research »

» contacts continued from page 1

Analyst Contacts:

NEW YORK	+1.212.553.1653
Franklin Sherman *Associate Analyst* franklin.sherman@moodys.com	+1.212.553.4635
Michael G. Haggarty *Senior Vice President* michael.haggarty@moodys.com	+1.212.553.7172
W. Larry Hess *Managing Director-Utilities* william.hess@moodys.com	+1.212.553.3837

Report Number: 165944

Author
James Hempstead

Production Associate
Prabhakaran Elumalai

MOODY'S
INVESTORS SERVICE