Executive Choices

Even without climate change, executives in the electricity industry face many large challenges and constraints in their future operating environments. Regulatory uncertainties, the need for investment capital to expand and improve generating and transmission infrastructure, high and volatile fuel costs, and the challenges of keeping pace with demand growth are all problems with which industry leaders already struggle. The reality of climate change in addition to these other challenges adds significant new risks, uncertainties, and potential opportunities to the operating environment and is now a key strategic consideration for power companies, regulators, and federal and state legislators. Session II of the Forum discussed some of the current dynamics of the power industry and considered the choices facing energy executives as they aim to position their companies for future success.

A Changing Landscape

For more than a century, the primary mission of electric utility executives has been to ensure the provision of affordable, reliable power. For most of the past century, the cost of electricity steadily declined in real terms, with improvements in technology, economies of scale, and fuel choices that aimed to provide power at least cost. Coal was usually the fuel of choice.

Under the assumption that the U.S. electric power industry will operate in a carbon constrained world and possibly face mandatory greenhouse gas emissions reduction of 50-80 percent by 2050, the historic model of power production will no longer be viable. Instead, the industry's business model will have to be based on maximum productivity gains and optimized efficiency in the use of electricity. On the generation side, most or all existing capacity will also have to be replaced, due to age or in response to climate change and other challenges facing the industry. While the future generation portfolio will certainly include larger shares of renewables such as wind and solar, there will likewise be expanded shares of clean coal and nuclear technologies.

There are also large uncertainties with respect to climate change in the short- to mid-term that present strategic challenges to the industry. For example, the possibility—perhaps even the likelihood—of a federal level cap-and-trade system augments investments risks since such a system would, among its impacts, exacerbate price imbalances between gas and coal. A cap-and-trade regime would put enormous upward price pressure on gas because of its relatively low carbon intensity and could result in a very difficult adjustment period for power producers and consumers over the next decade. Since firms plan to operate new plants for at least 20 to 30 years, such legislative and regulatory uncertainties may retard major capital investments in the industry until legislation is passed.

Under these conditions, diversity among assets in the generating portfolio is essential to many utilities and competitive generators. For example, one small California utility recently purchased 1,000 MW of wind turbines to jumpstart its renewable energy program and has also begun to move into solar photovoltaics technology, despite its current high cost. Through bulk purchases of solar panels (250 MW), the utility hopes to reduce the cost of its entry into solar energy and to deploy the panels in a variety of settings ranging from commercial rooftops to large arrays in the Arizona desert.

While many executives feel that there must be a transformation of the generation and transmission businesses, many of the most

potent changes in the industry's business model may come in the form of technological changes beyond the meter. There are, for example, major opportunities to optimize the system by monitoring and adjusting electricity end use. Some industry executives may decide that it makes more strategic sense to invest billions of dollars to create a digital, smart-grid infrastructure than to invest similar amounts in the construction of a new nuclear plant.

Rising fuel costs, likely carbon constraints and the need for a transformation of the industry's technology and infrastructure all suggest that power prices will rise significantly over the long term. This likelihood suggests that the industry could face widespread consumer resistance, as it has already in states such as Illinois, Maryland and California where significant rate increases after a freeze caught consumers by surprise. In the light of this possibility, it will be essential for the industry to make concerted efforts to educate consumers about the factors underlying the price increases and particularly to help them understand that there will be costs associated with the industry's actions to mitigate climate change. Consumers will also have to be convinced to accept that, like the power industry, they will have to make changes in their behavior and have some tolerance for higher costs in the interest of future generations. Today there is little evidence that consumers have taken an ownership stake in climate change mitigation; the fact that there were virtually no apparent consequences for members of Congress who voted against the 2008 Lieberman-Warner Bill is indicative in this respect.

State-Level Challenges

Both regulated utilities and competitive power companies are, of course, already responding to the need for major change and positioning themselves for an uncertain future and an evolving business and regulatory environment. In high growth states like Nevada, for example, companies will focus on conservation and efficiency in the first instance, and state regulatory agencies are seeking to manage demand and greenhouse gas emissions through building codes and standards. State regulators have provided incentives for power pro-

ducers to adopt this approach by amending Nevada's renewable portfolio standards to include rate-based energy efficiency. Even though Nevada has a strong renewable energy base with major solar and geothermal resources and strong policy incentives, its aggressive target of 15 percent renewables by 2015 presents a major challenge to power companies operating in the state.

Power producers in Nevada will still have to expand their conventional generation to meet future demand growth. Power companies built no generation capacity in-state over the past 25 years, having decided to import electricity to meet rising demand. When electricity producers were caught short on one recent occasion, they lost $500 million as a result. Consequently, one company is planning a new coal-fired plant in-state to ensure reliability of service, and has gained the support of state regulators for the project. Yet even under favorable conditions at the state level, the project faces resistance from the federal Bureau of Land Management, and related delays are likely to stall the completion of the plant to 2015.

In California, the 2006 Global Warming Solutions Act has presented new challenges to utilities, which are now struggling with implementation of the law. In addition, utilities are also working to respond to several other pieces of legislation mandating, for example, one million solar roofs, and an aggressive renewable portfolio standard with targets of 10 percent by 2010 and 20 percent by 2017. For fully resourced, vertically integrated California utilities that rely on coal, this environment presents clear difficulties. Key constraints include the fact that renewable energy costs are rising sharply and renewable projects face grid integration problems. Moreover, with climate technologies such as CCS at least 10 to 15 years away from commercial deployment, technological silver bullet solutions appear unlikely. California utilities are responding to these challenges in many ways, for example through concerted customer education campaigns, through efficiency upgrades and replacement of older generating capacity, expansion of renewables, and by taking advantage of tax incentives and options to buy into purchase power agreements.

Technology Needs, Risks, and Opportunities

Several executives noted that technology will be a decisive factor in the success of climate policy and in the industry's ability to respond to climate change. While many existing technologies, including solar, wind and nuclear, are likely to be more widely deployed in the future, at least one critical technology, CCS, has yet to demonstrate its potential on a large scale. Many industry leaders are counting on the commercial availability of CCS by 2020 to sustain the viability of fossil fuel generation in the long term, yet its large-scale viability remains uncertain. The technology itself is still at an early stage, and only a few small- to mid-size demonstration projects have been undertaken.

While many in the industry have high hopes for CCS, other emerging technologies may also have a transformational effect on the industry and on the energy economy as a whole. For example, plug-in hybrid electric vehicles hold the potential to transform transportation by dramatically reducing gasoline use and boosting efficiency from roughly 15 percent (for today's internal combustion engines) to 85 percent or more. With major new investments to update the U.S. grid, plug-in hybrids could potentially be integrated into the electric power system as well to serve as supply technologies rather than solely as system load. In the absence of grid upgrades, the advent of plug-in hybrids could place additional pressures on natural gas and coal prices and increase carbon emissions from electricity production. Even though these emissions increases on some systems could be offset by reduced emissions from gasoline consumption, this situation would place additional pressures on the power industry, especially under a national climate policy.

Several participants called attention to the need for new approaches to energy research and development (R&D) in the light of the many technological challenges facing the nation. Major investments are needed not only in CCS and transportation technologies but in all areas, including renewables, nuclear, fossil fuels, efficiency and storage technologies. The carbon cap-and-trade systems that have been proposed in the U.S. have included some provi-

sions for R&D funding, yet none would raise the estimated $100 billion needed for an aggressive effort to transform energy technology. Many participants were certain that a sufficient R&D funding stream would not be provided through the federal budget process but would more likely result from some off-budget mechanisms such as an R&D wires charge. By one estimate, a 3 mil per kWh charge could yield $11 billion annually for a dedicated R&D fund. Depending on the method of allocation, off-budget funding could also help to reduce earmarks and bureaucracy and allow researchers both the independence and funding stability they need to pursue ambitious projects.

Whether or not the federal government plays a smaller role as a funder and performer of energy R&D in the future, it will play a critical part in managing and buying down the risks associated with new technologies. Since emerging technologies such as CCS entail large risks and uncertainties, the government will be uniquely able to provide incentives and guarantees to early adopters and to garner public acceptance through information and education initiatives. A recent study by the Massachusetts Institute of Technology concluded, for instance, that CCS would only be likely to reach commercial viability after the successful completion of five to seven or more major demonstration projects. If the domestic regulatory environment does not evolve quickly enough and if the U.S. government is not able to work with industry to manage technology risks, some participants felt that the industry might work with other governments, most likely in the developing world, to field new technologies in pilot and demonstration projects.