Investment Risk of New Coal-Fired Power Plants

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Executive Summary

Billions of dollars will be invested in new power plants in the United States over the next 15 to 20 years. Individual power plants are major pieces of infrastructure— a 500-megawatt (MW) conventional coal-fired power plant may cost over a billion dollars to construct and will incur fuel, operating, maintenance, and environmental compliance costs for about 50 years.

The decision to invest in new power plants is affected by the actions and evaluations of investors, regulators, utility managers, and power plant developers. Utility managers and power plant developers are key decision makers because it is their assessment of the market for electricity that drives the process. In regulated utility markets, regulators also play a crucial role, as their approval of new resources constitutes a commitment on behalf of ratepayers to pay for those resources. Investors look to regulatory, siting, and permitting approvals and contracts for sale of the electricity as signals that revenues will be sufficient to recover costs.
Making billion-dollar investments in new conventional coal-fired power plants entails a risk that costs may not be fully recovered. In particular, there is a potential for costs to significantly exceed the projections used to justify investment in the plant in the first place. Three types of cost escalation “surprises” are especially important:

- **Construction cost surprises:** Construction costs for new power plants have increased in recent years at a rate well in excess of the rate of inflation. Thus, a coal-fired power plant that cost about $1,200 or $1,300 per kilowatt (kW) of generating capacity to construct a few years ago would cost between $2,000 and $2,500 per kW in late 2007.

- **Fuel cost surprises:** Future fuel costs are highly uncertain. The track record of fossil fuel price forecasts is poor, and decisions made on the basis of fuel price forecasts are risky.

- **Greenhouse gas emission regulation surprises:** Costs of complying with impending regulation of greenhouse gas emissions are uncertain, but could add greatly to the cost of generating electricity with conventional coal-fired power plants. These costs may exceed the fuel costs for a coal-fired power plant.

Regulators have made large disallowances in the past for new coal and nuclear power plants due to cost escalation and other factors, and regulatory disallowances can happen again. In deregulated markets, the market itself may reduce the net revenue stream from new conventional coal-fired power plants if construction costs or fuel costs are higher than expected or if greenhouse gas emission regulation compliance costs are sizable. Other generation technologies may then have a cost advantage over electricity generated at conventional coal-fired power plants.

There are alternatives to new conventional coal-fired power plants for serving demand, including energy from renewable resources and savings from expanded energy efficiency programs. Some of these alternatives do not face fuel cost uncertainty because they do not burn fossil fuels, and some do not face compliance cost uncertainty due to greenhouse gas emission regulation because they emit little or no carbon dioxide.

As a result of escalating construction costs and uncertain operating costs, some utility managers are canceling or delaying investments in coal-fired power plants and some regulators are denying applications to construct new coal-fired power plants.
1. Introduction

To serve the growing demand for electricity, utilities and power plant developers sometimes look to new coal-fired power plants as a resource option. As of late 2007, the cost of constructing a new coal-fired power plant was between $2,000 and $2,500 per kW of generating capacity, which means that a 500-MW plant would cost between $1 billion and $1.25 billion. Running a coal-fired power plant would also incur fuel, operating, maintenance, and environmental compliance costs for around 50 years.

This paper examines the risks of not fully recovering the costs of new conventional coal-fired power plants. Cost recovery, including sufficient revenues to pay interest or dividends and to pay a market return on capital, is a central consideration for utilities, developers, regulators, and investors. Factors that might imperil cost recovery include:

- Escalating construction costs
- Increased fuel costs
- Excess generating capacity
- Unexpected costs of complying with greenhouse gas emission reduction regulations

When regulators approve power plant construction, place a power plant in a utility’s rate base for ratemaking purposes, or approve a long-term power purchase contract, they commit consumers to pay for new power plants, without much certainty about what the costs may be over the life of the power plant or purchased power contract. Such approval sends a signal to investors that cost recovery is likely. In deregulated wholesale or retail electricity markets, cost recovery is more likely if the power plant owner has long-term contracts with electricity buyers that commit the buyers to paying for capacity and energy over a long time period.

To understand the risks of introducing new conventional coal-fired power plants into the generation portfolio, it is useful to look back at similar circumstances in the past and to look forward at anticipated new risks. Historically, utility regulatory commissions have made large disallowances for coal and nuclear power plants. Recently, in the deregulated wholesale market, excess capacity of new gas-fired power plants has led to the sale of some of these plants at a price below the cost of constructing the plant.

Looking forward, an important new risk is the cost of complying with potential greenhouse gas emission regulations. The cost impact is currently uncertain, but if compliance costs are high, regulators may rethink the wisdom of passing along all those costs to ratepayers. In the deregulated sector, given the additional costs of complying with greenhouse gas emission regulations, coal-fired plants may be less competitive with other generation technologies and energy efficiency measures, which emit lower amounts of carbon dioxide or none at all.

Recognition of the risks associated with investments in new conventional coal-fired power plants is beginning to occur. For example, Fitch Ratings1 predicts that a company’s ability to recover any future compliance costs associated with greenhouse gas emission regulations will have important implications for its credit rating. The Wall Street Journal reported that some coal-fired plant investments have been cancelled because of climate change and cost risks.2

As described in the report, A Clean Electric Energy Strategy for Arizona, there are several viable and emerging alternatives to meeting the demand for electric energy services.3 These alternatives include energy efficiency measures, renewable energy, and advanced fossil fuel technologies that capture and store carbon dioxide.

The intended audience for this paper includes utility regulators, utility managers, power plant

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All parties can make more informed decisions if they better understand the financial risks of new coal-fired power plants and take into account which parties bear those risks.

This paper is organized as follows: Section 2 reviews the use of coal in generating electricity in the United States. Section 3 provides an overview of investment decision making. Section 4 examines the effect of economic misjudgments on cost recovery, and Section 5 reviews some cost “surprises” in more detail — escalating construction costs, uncertain fuel costs, and costs of complying with greenhouse gas emission regulations. A summary is presented in Section 6.

2. Generation of Electricity with Coal

Coal is a major energy source for electric power generation. In 2006, coal-fired generation capacity in the United States was about 313,000 MW, and that capacity produced about half the electric energy (in kilowatt-hours, or kWh) generated in the U.S.\(^4\) Coal-fired power plants typically provide baseload or intermediate power, as reflected in their high average net capacity factor of 74% in 2005.\(^5\)

Coal-fired power plants are relatively expensive to build, but generally have low fuel costs. As indicated above, a new 500-MW coal generating unit may cost over a billion dollars to construct. In 2006, the electric power sector paid, on average, $1.69 per million Btu (MMBtu) for coal as compared to $6.94 per MMBtu for natural gas.\(^6\)

As of October 2007, 24 coal-fired power plants were under construction in the United States, eight were near construction, and 13 were in the permitting phase.\(^7\) Another 76 were in the early stages of filing for permits. Of the 45 proposed plants that were permitted, near construction, or under construction, 37 utilize conventional technology, four are supercritical conventional coal-fired plants, and four are integrated gasification combined cycle plants.

The emissions and environmental impact of conventional coal-fired generation can result in signifi-
cant environmental compliance costs and can cause litigation and opposition that slow permitting processes. During 2006, U.S. coal-fired power plants emitted into the atmosphere approximately 1.97 billion metric tons of carbon dioxide, 8.9 million metric tons of sulfur dioxide, 3.0 million metric tons of nitrogen oxides, and, in 2005, about 97,000 pounds of mercury and mercury compounds. A 500-MW conventional coal-fired power plant would emit about 174 million metric tons of carbon dioxide over a 50-year operating life.

The average carbon dioxide emission rate of new coal-fired power plants is slightly less than one metric ton per MWh generated, which is by far the highest of any widely used power generation technology. By way of comparison, natural-gas-fired power plants emit about 0.4 to 0.45 metric tons of carbon dioxide per MWh generated, and many renewable energy technologies emit little or no carbon dioxide at all.

3. Investment Decision-Making

The decision to invest in new power plants is affected by regulators, utility managers, and power plant developers (see Figure 1). Utility managers and power plant developers are key decision makers because it is their assessment of the market for electricity that drives the process. Investors look to regulatory, siting, and permit-

**Utility managers and power plant developers are key decision makers because it is their assessment of the market for electricity that drives the process.**
The preeminent concern is recovery of costs. 

Investing approvals and contracts for sale of the electricity as signals of project viability. Utilities, developers, and investors seek enough revenue to cover their costs, including dividends or interest and a market return on investment. In regulated utility markets, utility regulators make commitments on behalf of ratepayers, often in a series of reviews over time.

All the actors depicted in Figure 1 face uncertainty in making decisions. They cannot know with perfect foresight future prices and future demand for electricity, for example. The nature of some of these uncertainties will be discussed in subsequent sections of this paper.

To better understand how the financial community analyzes investments in coal-fired power plants, we requested that David Gardiner & Associates (DGA) carry out a survey of analysts and others. In the summer of 2007, DGA reviewed trade literature and interviewed experts at ratings agencies, large financial institutions, and investment advisors. DGA’s key findings include the following:

- The preeminent concern is recovery of costs. Cost recovery is perceived as more certain in regulated markets than deregulated markets, though the level of certainty depends somewhat on the regulators. Costs considered (particularly in deregulated markets) include construction costs, fuel costs, and air pollution permit costs, as well as the ability of the power generator to sell the power.

- Climate legislation and carbon costs are widely seen as inevitable, probably after 2009. While some analysts do not expect federal legislation to be too harsh for coal-fired power, analysts generally agree that carbon costs are an area of uncertainty. Most analysts are looking at possible carbon costs, but are not actually including them in their analyses yet. Because of regulatory risk, many analysts place a great deal of importance on a power generating company’s fuel mix and the attendant exposure to risks from climate legislation. The uncertainty surrounding possible carbon costs and other provisions of impending climate legislation appears to have slowed the predicted wave of coal-fired power expansion.

- There is not unanimity on the implications of a company being proactive in its climate-related governance and actions. Some see heightened climate consideration by a company’s board and management as a good thing, and others see it as irrelevant. While some nongovernmen-

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Investors may invest in a company that has numerous power plants and not in a particular plant.
tal organizations view investments in integrated gasification combined cycle plants or in renewable energy as a hedge against climate risk, analysts tend to evaluate such investments primarily for risks to cost recovery.

• There is not unanimity on when analysts begin to consider proposed coal-fired power plant expansions. Some consider such plants as soon as they are announced, some wait until there are shovels in the ground, and many fill the range in between.

• Analysts rely on a wide array of information sources and types. All use long-term forecasts for a range of data, including demand and prices. Analysts get a lot of information from the companies they value, though there are also other sources (which very rarely include the public media). Quantitative information is important, but analysts also pay attention to political and regulatory developments.

• Financing institutions generally seem to consider many of the same factors as analysts, although the rapidly changing world around coal has put many banks’ policies in flux as they decide what to do with respect to coal-fired power plants.

4. Misjudgment

From time to time, projects do not turn out as planned. For example, the growth in demand for electricity was vastly overestimated in the 1970s, resulting in construction of excess generating capacity and cancellation of power plants that were under construction or on order. In addition, in the 1970s, several other factors resulted in power plant cancellations and delays: increasing construction costs, difficulty in financing construction, slow regulatory review of new plant construction, uncertainties about nuclear power, construction delays, and other problems. Between 1974 and 1978, 184 large planned power plants were cancelled, including 80 nuclear plants and 84 coal-fired plants.

During the 1990s, independent power producers constructed many gas-fired power plants to serve wholesale markets. In some markets there was excess generating capacity, and the owners of some of these new power plants sold the plants to utilities or other buyers at a loss (for example, the sale of the Desert Basin power plant in Arizona by Reliant Energy to Salt River Project and the sale of the Sundance power plant, also in Arizona, by PPL Corporation to Arizona Public Service Company).

Looking forward, misjudgments may occur regarding new conventional coal-fired power plants that result in excess generating capacity, higher than expected fuel or construction costs, or high costs of complying with greenhouse gas emission regulations. These potential events have financial consequences in both the regulated utility sector and deregulated power sector, as described next.

Cost Recovery in the Regulated Utility Sector

In the regulated utility sector, utility regulators may not allow full recovery, through rates, of the costs of building or operating a power plant. Disallowances generally reflect regulators’ conclusions that there was significant management error in the planning, construction, or operation of the plant. Adverse regulatory decisions may also be influenced by the simultaneous occurrence of multiple cost increases, which utilities seek to pass onto ratepayers while regulators try to restrain rate increases.

Regulators employ two main approaches in determining whether managerial error has occurred:

• A prudence test, which looks at whether management decisions related to the selection, construction, and operation of a plant were reasonable given the information that was known or should have been known at the time decisions were made. Costs of imprudent investments or actions may not be fully recovered from ratepayers.

• A used and useful test, which looks at whether a resource, such as a generating unit, produces or delivers power and is actually necessary to provide reliable service given the availability of other resources. For example, a new power plant may represent excess generating capacity for some period of time. Costs of facilities that are not used and useful may not be fully recovered from ratepayers.\(^{14}\)

If a significant management error has been found, regulators may allocate the entire cost of the error to the utility or may adopt a risk-sharing approach in which both ratepayers and shareholders bear the costs.\(^{15}\) Disallowances may occur in several ways, such as denial of cost recovery for excess capacity that is not used and useful, disallowance of a return on equity, and denial of cost recovery for abandoned projects.

Past disallowances have been large. Lyon and Mayo\(^{16}\) examined investment data from 1970 to 1991 on 132 investor-owned electric utilities. During this period, there were over 50 separate disallowances on 37 nuclear, coal, and other generating units; the total amount of disallowances was over $19 billion. The average disallowance was over $500 million per generating unit for those cases where disallowances occurred. The authors’ statistical analysis of investment in utility plants suggests that regulators made the disallowances in response to perceived bad management and poor cost control by plant operators. Because of the absence of reduced investments by other utilities in the same regulatory jurisdiction as the utility experiencing disallowances, the disallowances did not appear to be the result of a broad shift in policy, but stemmed from case-specific situations.

Another study reviewed cancellations, during the period 1974 through 1984, of 58 nuclear power plants that were previously ordered or under construction.\(^{17}\) The authors concluded that these cancellations were associated with negative abnormal stock returns, where the returns were less than returns to a market portfolio. The larger the sunk costs relative to the market value of the utility’s common equity, the larger the decline in stock prices.

Cost Recovery in the Deregulated Power Sector

In a deregulated power market, the consequences of misjudgment depend not on regulatory action, but on the ability of competing suppliers and technologies to offer more economical alternatives. Examples are presented below:

• As noted above in connection with gas-fired power plants constructed in the 1990s or early 2000s, during a period of excess generating capacity, the market value of capacity might fall below the construction cost of a particular plant.

• Fuel prices or construction costs could be higher than expected at the time the plant

\(^{14}\)The U.S. Supreme Court concluded that a “state scheme of utility regulation does not ‘take’ property simply because it disallows recovery of capital investments that are not ‘used and useful in service to the public.’” Duquesne Light Co. et al. v. Barasch et al., 488 U.S. 299, 302 (1989).


was planned, thereby making a new power plant less competitive relative to other resources in the marketplace.

- Compliance costs incurred to meet carbon dioxide emission regulations will affect coal-fired power plants more than other power generation technologies because conventional coal-fired plants emit more carbon dioxide per MWh generated. Thus, renewable resources, which emit little or no carbon dioxide, and gas-fired power plants, which emit about half the carbon dioxide per MWh as a coal-fired plant, would become relatively more competitive as carbon dioxide emission regulation is established.

- Conventional coal-fired plants could become obsolete in the face of strong policies to rapidly reduce carbon dioxide emissions. In this case, coal-fired plants may have to be retrofitted to capture and store carbon dioxide emissions or may be retired early. Extra costs would be incurred, possibly without a corresponding increase in revenues, or the expected revenue streams would disappear as kWh sales from that plant terminate.

The following section looks at cost issues in more detail.

5. Cost Surprises

One of the most important risks faced by utilities, developers, regulators, and investors is the potential for costs to significantly exceed the projections used to justify the investment at the outset. This section examines some key potential cost surprises – increases in construction costs, increases in fuel costs, and costs of complying with greenhouse gas emission regulations.

These surprises should not really be surprises given recent experience. Bazerman and Watkins characterize predictable surprises as events or groups of events that shock people even though they had sufficient information to foresee the events and their ramifications. The following sections examine several salient predictable surprises.

Construction Cost and Fuel Cost Surprises

Two major costs of generating electricity are the construction costs of the power plant and the fuel costs for operating the power plant. We begin with construction costs.

Since 2000, inflation in private fixed investment in electric power structure costs has outpaced general inflation in the economy as measured by the Gross Domestic Product Implicit Price Deflator (see Figure 2). Structure cost increases are due to higher material and equipment costs, higher labor costs, and more expensive construction management services. One expert indicated that the cost of building a new coal-fired plant was about $2,200 per kW in late

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19Inflation in the cost of electric power structures applies to all types of power structures, including coal-fired power plants. Data are from the U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts, Tables 11.9 and 5.4.4B. For prices that existed in the year 2000, the index equals one. Index values after 2000 reflect price increases that occurred for electric power structures and for goods and services in the economy as a whole.

Coal price forecasts are not reliable, especially over the long life of a power plant.

2007 as compared to $1,200 to $1,300 per kW two years earlier.\(^2\)

If construction costs are underestimated, the decision to build a power plant may turn out to be less advantageous than projected at the time it was initially justified to regulators, managers, or investors.

Justifying investment in a new coal-fired power plant also rests, in large part, on projections of future coal prices. However, coal price forecasts are not reliable, especially over the long life of a power plant. For example, the National Petroleum Council’s 2003 analysis of the gas industry assumed that coal prices for power generation would decline in real (inflation-adjusted) terms.\(^2\)

However, real coal prices have actually increased at an average annual compound growth rate of about 5.4% over the period 2003 to 2007.\(^3\)

The U.S. Department of Energy’s Energy Information Administration\(^4\) has tracked forecasting errors in its Annual Energy Outlooks for the period 1985 through 2005, comparing forecasted coal prices paid by electric generating plants and actual prices. The average absolute percent error is 46.7%. These examples indicate that projections of coal prices are unreliable. Consequently, it is not possible to conclude that coal-fired generation will or will not be the lowest cost technology over the long run.

If coal price increases occur at the same time as other cost increases, utility regulators may be reluctant to allow a timely pass-through of fuel costs, resulting in delays of fuel cost recovery.\(^5\) In a deregulated market, higher than expected coal costs make coal generation less competitive with gas-fired generation, renewable energy, and energy efficiency.

Greenhouse Gas Emission Regulation Cost Surprises

Despite the widening recognition that limitations on greenhouse gas emissions will affect the power supply industry in the next few years, some utilities, developers, regulators, and investors may be surprised by the cost impact of these pending limitations. In contrast, other utility managers are actively seeking to incorporate greenhouse gas emissions policy into their investment and operation decisions.\(^6\)

Furthermore, some market analysts are


\(^3\)Prices are those paid by the electric power sector as reported by the Energy Information Administration’s Short-Term Energy Outlook, various issues, adjusted for inflation using the Gross Domestic Product Implicit Price Deflator.


recognizing that coal carries with it an uncertain burden of complying with future greenhouse gas emission regulations, making coal companies riskier investments. Nonetheless, there remains the potential for misjudgment by underestimating or even neglecting the costs of complying with greenhouse gas emission regulations. This section examines those compliance costs.

**Current Regulatory Context**

In some states, power plant emissions of carbon dioxide are restricted. For example, California requires the California Air Resources Board to adopt a statewide greenhouse gas emission limit equivalent to 1990 emission levels to be achieved by 2020. Furthermore, long-term financial commitments by an electrical corporation are prohibited if the greenhouse gas emissions from the generation exceed the rate of emissions of greenhouse gases for combined cycle natural gas baseload generation. In the Northeast, several governors signed a Memorandum of Understanding in December 2005 to create a Regional Greenhouse Gas Initiative (RGGI). RGGI includes a carbon dioxide allowance trading program with state emission caps for fossil fuel-fired electric power plants of at least 25 MW of generating capacity, scheduled emission reductions, and provisions for use of offsets. Additionally, some states are setting greenhouse gas emission targets. For example, Arizona’s governor issued Executive Order 2006-13, which sets a goal of reducing greenhouse gas emissions in Arizona to the state’s 2000 emissions level by 2020 and 50% below its 2000 emissions level by 2040. New Mexico’s governor set a goal of reducing New Mexico’s total greenhouse gas emissions to 2000 levels by 2012, 10% below 2000 levels by 2020, and 75% by 2050. In addition, several western states have joined together in a Western Climate Initiative (initially signed by five governors on February 26, 2007) to set, within six months, an overall regional goal to reduce greenhouse gas emissions, consistent with individual state goals, and to develop within 18 months a design for a regional market-based, multi-sector mechanism, such as a cap and trade program. These actions signal an intent to reduce greenhouse gas emissions and suggest that additional, more specific, actions may be taken later.

In October 2007, the Kansas Department of Health and En-

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29 California Senate Bill 1368, 2006.
30 The original signatories to the RGGI Memorandum of Understanding are Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, and Vermont. Maryland joined in 2007.
31 New Mexico Governor, Executive Order 2005-033.
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The Kansas Department of Health and Environment (KDHE) denied an air quality permit for two proposed 700-MW coal-fired power plants near Holcomb. In making this decision, the Secretary of KDHE stated that “it would be irresponsible to ignore emerging information about the contribution of carbon dioxide and other greenhouse gases to climate change and the potential harm to our environment and health if we do nothing.” The secretary’s decision cited the U.S. Supreme Court decision in Massachusetts v. EPA that found that carbon dioxide is an air pollutant under the Clean Air Act, indicating that Kansas has a similarly broad definition of air pollution.

Outside the states that have adopted greenhouse gas emission policies, utility regulators have not generally provided much guidance on recovery of the costs of complying with greenhouse gas emission regulations. For example, in 2006, the South Dakota Public Utilities Commission, in authorizing construction of the Big Stone II coal-fired power plant, found that the power plant would contribute only a small portion of total global carbon dioxide emissions, concluded that greenhouse gas emissions would have to be regulated at the national or international level, and concluded that reasonable estimates for the costs of complying with carbon dioxide emission regulations were expected to be low and would not affect the decision to build the power plant. The commission ordered the applicants to submit an annual report on state and federal actions to regulate carbon dioxide, how the applicants will comply with such actions, the expected costs and rate impacts, operational techniques and commercially available equipment to control carbon dioxide emissions, and the prudence of adopting those methods. This decision hints at an off-ramp based on information contained in the annual reports required by the commission, but the basic message appears to be that the regulators will deal with cost recovery later, after the power plant has been constructed and its owners face actual costs of complying with greenhouse gas emission regulations.

Lastly, utilities and developers may expect that if they rush a new coal-fired plant to completion, the emissions would be part of the base level emissions allowed under future federal greenhouse gas emission regulations.

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33127 S. Ct. 1438 (April 2, 2007).
34In addition to greenhouse gas emission restrictions, decisions to build coal-fired plants may be affected by other environmental considerations. For example, in August 2006, the Governor of Idaho directed the state Department of Environmental Quality to develop rules to keep Idaho out of a national mercury cap and trade program (news release, Office of Governor James E. Risch, August 9, 2006). As a result, no coal-fired power plants could be built in Idaho. Idaho currently has no coal-fired power plants.
35South Dakota Public Utilities Commission, Final Decision and Order, Case No. EL05-022 (Big Stone II), 2006.
gas regulations. However, this is a risky strategy. Senators Bingaman and Boxer\textsuperscript{36} indicated that there is a low probability that future greenhouse gas emission legislation would allow coal-fired plants built right before the law takes effect to get free allowances for those plants’ emissions.\textsuperscript{37}

**Compliance Costs**

The cost of complying with greenhouse gas emission regulations is uncertain. Fischer and Morgenstern\textsuperscript{38} reviewed 11 models of the costs of various carbon emission reduction policies. For the United States, a 20% reduction in carbon emissions relative to reference cases has a projected marginal abatement cost of between about $40 and $250 per metric ton of carbon in 1990 dollars (about $15 to $97 per metric ton of carbon dioxide in 2006 dollars).

If the cost of complying with greenhouse gas emission regulations is $20 per metric ton of carbon dioxide equivalent, a 500-MW coal-fired power plant would incur additional costs of $19 per MWh generated, or about $70 million per year.\textsuperscript{39} Because of the large range of possible costs of complying with carbon dioxide emission restrictions, some utilities investigate the impact of a

![Figure 3: Fuel Costs and CO\textsubscript{2} Emission Regulation Compliance Costs for a Conventional Coal-Fired Power Plant](image)


\textsuperscript{37}Another potential source of limitations on greenhouse gas emissions is the courts. In State of Connecticut et al. v. American Electric Power Company, Inc., et al. (filed in 2004), the plaintiffs argued that the defendants’ power plants emit large volumes of carbon dioxide, which is a major contributor to climate change. These emissions were argued to be a public nuisance because climate change has begun to alter the climate of the United States, resulting in prolonged heat waves, smog, beach erosion, inundation of coastal lands, reduction in snow pack, drought, ecological damages, and other impacts. The defendants have alternative means to meet the demand for electric energy services. The plaintiffs asked the court to require the defendants to abate their contribution to the nuisance by capping emissions of carbon dioxide and reducing emissions over time. The U.S. District Court for the Southern District of New York dismissed the suit as a non-justiciable political question: 04 Civ. 5669 (LAP) and 04 Civ. 5670 (LAP), Opinion and Order, September 15, 2005. This decision has been appealed. See also David Grossman, “Warming Up to a Not-So-Radical Idea: Tort-Based Climate Change Litigation,” Columbia Journal of Environmental Law 28, no. 1 (2003): 1-61.


\textsuperscript{39}Cost projections assume a capacity factor of 85% and 2,059 pounds of carbon dioxide emissions per MWh generated.
Costs of complying with carbon dioxide emission regulations could be larger than fuel costs. Figure 3 shows the fuel costs and compliance costs per MWh for a coal-fired power plant for a range of coal prices and a range of carbon dioxide emission regulation compliance costs. For example, if the fuel (coal) cost is $1.25 per MMBtu and compliance cost is $20 per metric ton of carbon dioxide, the fuel cost would be $11.83 per MWh and the compliance cost would be $18.68 per MWh. Thus, the costs of complying with carbon dioxide emission regulations could exceed fuel costs for a coal-fired power plant, and the impact of neglecting costs related to carbon dioxide emissions could be quite large.

Preventing Predictable Surprises

In their analysis of predictable surprises, Bazerman and Watkins identified three elements for preventing surprises: recognition of the threats, prioritization of the threats, and mobilization of the organization to deal with the threats. In this paper, we have identified major threats to utilities, power plant developers, investors, and regulators contemplating new large coal-fired power plants – escalation of construction costs, uncertainty of fuel costs, and costs of complying with carbon dioxide emission regulations.

With the growing recognition of these threats, public and private sector leaders should explicitly and comprehensively address the management of the potential for higher costs. Leaving the potential for significantly higher costs until another day, after major commitments to coal-fired power plants have been made, may be financially disastrous if the power plants are not competitive or if regulators disallow full cost recovery.

Assuming that the cost threats are recognized, leaders must assign sufficient priority to these threats. Because the construction and operating costs of a new coal-fired power plant are so large, the need to give priority to the threats is clear. High priority must be accompanied by the resources necessary to manage the risk of high costs.

Some utilities, power plant developers, and regulators are responding to threats to coal-fired generation by canceling, delaying, or rejecting new coal-fired power plants. Idaho Power Company (IPC) summarized its perspective as follows: “Due to escalating construction costs, the transmission cost associated with a remotely located resource, potential permitting issues, and continued uncertainty surrounding future [greenhouse gas] laws and regulations, IPC has determined that coal-fired generation is not the best technology to meet its resource needs in 2013. IPC has shifted its focus to the development of a natural gas-fired combined cycle combustion turbine located closer to its load center in southern Idaho. IPC will be adding 101 MW of wind generation in December, 2008 and 45.5 MW of geothermal generation in phases between 2007 and 2011.” Westar Energy announced in December 2006 that it was postponing a decision to allow further study of a future baseload coal-fired plant because of escalating construction costs. The

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41Other assumptions used to prepare the graph are a heat rate of 9,465 Btu/kWh and 2,059 pounds of carbon dioxide emitted per MWh generated.


announcement noted that “when equipment and construction cost estimates grow by $200 million to $400 million in 18 months, it’s necessary to proceed with caution.” 45

Sempra Generation’s proposed 1,200-MW coal-fired power plant in Gerlach, Nevada was cancelled after the California Public Utilities Commission indicated that it would place a cap on greenhouse gas emissions from power plants, thereby restricting the use of new coal-fired power plants.46

A final example is the 1,960 MW ultra-supercritical pulverized coal-fired power plant project proposed by Florida Power and Light Company (FPL), Glades Power Park Units 1 and 2. The Florida Public Service Commission denied an application for a determination of need because FPL “failed to demonstrate that the proposed plants are the most cost-effective alternative available, taking into account the fixed costs that would be added to base rates for the construction of the plants, the uncertainty associated with future natural gas and coal prices, and the uncertainty associated with currently emerging energy policy decisions at the state and federal level.” The commission also found that “the potential benefits regarding fuel diversity offered by FPL in support of the [project] fail to mitigate the additional costs and risks of the project, given the uncertainty of present fuel prices, capital costs, and current market and regulatory factors.” 47

6. Summary

Utilities and power plant developers continue to consider and propose construction and operation of new conventional coal-fired power plants to serve customer demand.

- A typical conventional coal-fired generating station may cost a billion dollars or more to construct.
- Over a 50-year lifetime, a 500-MW conventional coal-fired power plant would emit 174 million metric tons of carbon dioxide into the atmosphere.

Decisions to invest in new power plants are the product of multiple parties’ evaluations and actions.

- Key decision makers are utilities, power plant developers, utility and environmental regulators, and investors.
- Investment decisions are made in the face of considerable uncertainty about demand for electricity and costs of constructing and operating power plants.
- In regulated states, utility regulators commit consumers to pay for a new power plant; consequently, consumers have a stake in decisions to proceed with new power plants.

The regulatory and financial landscape is in flux and likely will be for several years.

- Some states have developed regulations to limit carbon dioxide emissions while other states have not.
- Legislation to limit greenhouse gas emissions has been introduced in Congress, and some form of national regulation is expected in the next decade, thereby creating the potential for additional costs of operating coal-fired power plants.
- Utilities, power plant developers, investors, and analysts appear to be most concerned with the ability to recover the costs of building and operating a new coal-fired power plant. However, the ability to recover costs is uncertain in light of historical disallowances, competing generation technologies, and potential future cost increases.

Despite what is currently known or reasonable to expect, decision makers may face cost surprises if they proceed with conventional coal-fired power plants.

- Construction costs for all types of power plants are, at present, increasing rapidly.

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46 San Diego Union-Tribune, March 30, 2006. Subsequent California legislation aimed at reducing greenhouse gas emissions is described in the “Current Regulatory Context” section of this paper.
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This report does not constitute investment advice or investment recommendations nor does it provide risk assessments for specific companies, projects, or transactions.

- Fuel prices cannot be forecast reliably over the long term.
- The costs of complying with greenhouse gas emission regulations is uncertain and may exceed fuel costs for a conventional coal-fired power plant.
- As a result, the costs of conventional coal-fired generation of electricity may significantly exceed the projections assumed in justifying the plant at the outset.

Misjudgment of future conditions can have adverse financial consequences for utilities, power plant developers, investors, and consumers.

- If costs exceed projections, coal-fired power plants may prove to be less competitive than expected compared to other generation technologies and energy efficiency measures.
- In deregulated electricity markets, misjudging the costs of power plants or misjudging the balance of supply and demand may lead to reduced profitability of power generation.
- When they have concluded that utility managers misjudged market conditions or mismanaged resource acquisition, utility regulators have made large disallowances in the past, precluding utilities from fully recovering the costs of new power plants in rates.
- If regulators permit utilities to recover costs through rate increases, consumers would bear the financial burden of additional construction costs, increased fuel prices, and costs of complying with greenhouse gas emission regulations.

Some utilities, developers, and regulators are canceling, delaying, or rejecting plans for coal-fired power plants in light of escalating construction costs and uncertainty about both future fuel costs and costs of complying with greenhouse gas emission regulations.