

New Nuclear Power: Opportunities and Challenges

By Jay M. Gutierrez and Stephen J. Burdick

Companies now considering new nuclear generation will be faced with a complex combination of opportunities and challenges. Success may depend on whether the regulatory, financial, and legislative challenges of the past are sufficiently considered by those now planning new projects. Those who do not learn from these past obstacles may be doomed to once again fall prey to them. This article highlights the regulatory, financial, and legislative issues that are likely to impact consideration of any new nuclear projects in the United States.

The first nuclear power plants developed and built in the United States enjoyed broad support from a stable financial community and bipartisan congressional leadership. By the late 1970s, further commercial development of the nuclear option had been hampered by a perceived unpredictable and destabilizing regulatory system, mismanagement of some nuclear projects, significant cost overruns and associated disallowances by state regulators, higher cost of capital, and lower than projected power demand. Orders for new nuclear plants came to a halt with the accident at Three Mile Island in March 1979. Projects not yet completed were either cancelled or subjected to considerable reevaluation and upgrades, resulting in a significantly higher cost than originally projected.



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Over the past 20 years, the existing 104 operating reactors have enjoyed an exemplary safety record, and their reliable performance has contributed to the economic success of the nuclear industry. That record, when coupled with a relatively predictable and stable regulatory environment at the Nuclear Regulatory Commission (NRC), has set the stage for consideration of a second generation of nuclear plants. In contrast to the initial development of nuclear power, however, new nuclear power projects are set to take off amidst unprecedented volatility in the capital markets and a prevailing congressional preference focused more on promoting renewable alternatives and other “green” initiatives.

Regulatory Issues

NRC Licensing

Under the older, so-called “Part 50” licensing regime, NRC licensing decisions followed a two-stage process. First, the NRC authorized construction of a uniquely designed reactor in a construction permit proceeding, without making a final safety decision; then years later, when the plant was substantially complete, the NRC focused on the ultimate safety sufficiency of the constructed design in an operating license proceeding.

This two-stage process resulted in applicants committing vast amounts of capital resources early in a project to procure long lead-time systems and components and to begin construction. All of this capital outlay occurred prior to an applicant securing the NRC approval necessary to eventually operate the plant. In addition, during the protracted period between construction authorization and issuance of an operating license—as long as 10 years—rules often changed, causing further and unexpected capital investment and delay. Given this history, and the demonstrated inability of the nuclear industry to control costs under these circumstances, the old way of licensing reactors was largely seen as an impediment to the development of new reactors.

In 1989, the NRC promulgated the so-called “Part 52” licensing process. This new process was designed to allow key regulatory decisions to be made before an applicant must obtain substantial funding from the capital markets for the engineering, procurement, and construction efforts. While a company considering new nuclear generation must still seek construction approval from the NRC, it may request a single combined license (COL), which includes both the construction permit and the operating license.

A potential COL applicant may now await and reference an NRC certification of a standardized reactor design, which removes design issues from the COL licensing proceeding. Similarly, prospective developers can “bank” sites through

an early site-permitting process prior to incurring any construction costs. The new Part 52 also eliminates the open-ended nature of the former two-stage process by requiring a COL applicant to identify at the outset a predetermined set of inspections, tests, analyses, and acceptance criteria (ITAAC) that, if satisfied during the construction phase, will be sufficient to support an NRC decision authorizing operation.

Cumulatively, these many changes are intended to allow the private sector to better manage resources and secure regulatory approvals far in advance of the need to secure capital and commence construction.

Notwithstanding these intentions, the nuclear industry largely did not take advantage of these revised regulatory processes during the 1990s, except for a few design certifications. Thus, when the industry began to consider new baseload nuclear projects between 2000 and 2005, a large selection of preapproved reactor designs and an inventory of banked sites were unavailable.

In an attempt to jump-start pursuit of new nuclear projects, the Energy Policy Act of 2005 created three financial incentives:

1. Production Tax Credits (PTCs) – The PTCs provide 1.8 cents per kwh for energy produced during the first eight years of operation of qualifying plants. The PTCs have a 6,000 MWe limit that will be allocated pro rata to qualified applicants. To qualify, companies must meet various milestones, including the submission of a COL application by the end of December 2008.

2. Loan Guarantees – This incentive allows the Department of Energy (DOE) to make government loan guarantees for 80 percent of a project's cost. Congress so far has authorized only \$18.5 billion in loan guarantees for new reactors, while the DOE is currently reviewing applications seeking loan guarantees for projects estimated to cost more than \$100 billion.

3. Standby Support Program – The Standby Support Program is an insurance program that provides compensation to applicants for certain delays in operation caused by the regulatory process. This program will only be available to the first few qualifying applicants, and there is currently considerable uncertainty over what delays are covered.

Given these federal incentives, coupled with the increasing need for baseload generation, as well as the increased environmental costs of coal and the volatility of the price of natural gas, utilities now appear to be ready to consider new nuclear generation in earnest.

By the end of 2007, five COL applications had been filed with the NRC to construct and operate a total of eight nuclear units. In 2008, an additional 12 COL applications were filed

seeking to develop an additional 18 units. In 2009, the NRC is expecting three more COL applications to be filed for five more units, with a few more applications anticipated during 2010 and 2011.

In part due to the scheduling milestones in the Energy Policy Act of 2005, as well as other market considerations, Part 52 is not being tested under ideal circumstances. For example, COL applications have been filed referencing designs not yet certified, and early site issues are being considered as a component of a COL application rather than as part of an early site permit application. The orderly progression of regulatory approvals embedded in Part 52 has been compressed for lead plants. Nonetheless, although the NRC has identified issues in processing this large number of new applications under an essentially untested process, the Part 52 regime appears to be working.

The NRC has issued design certifications and early site permits, and more are pending. The NRC has found all 17 submitted COL applications to be complete and ready for docketing, and most of the projects have been noticed for hearing. The regulatory schedules for these projects ultimately appear to support commencing construction of the new nuclear power plants in the 2012–2014 time frame, while some work that does not require NRC approval (e.g., excavation) may begin as early as this year for some plants. In short, the federal licensing of new reactor projects by the NRC appears to be working in a reasonably predictable and stable manner, and individual projects are on schedule.

State Regulation

Apart from the initial success under the federal regime just outlined, states will continue to play a critical role in the process for the vast majority of nuclear projects. Under traditional state regulation, many projects will first need to obtain a state determination that there is a need for power within the state that would be supplied by the new project. Additionally, many states will retain jurisdiction to review the prudence of a utility's decision as to the choice of reactor technology and the cost of engineering, procurement, and construction activities. These decisions will be considered in the context of alternative energy portfolio standards and retirement of plants that cause more pollution.

Whether applicants are granted the authority to immediately pass through the costs of construction to ratepayers also is a significant factor in overall project costs. The issue is whether a state will allow a utility to begin to obtain a return on its investment from ratepayers as costs are being incurred during the construction effort (construction work in progress) or whether utilities must wait until the project begins operation. This one financing element alone

could make a difference of a few billion dollars in the price tag for a new two-unit nuclear facility.

In some states, enabling legislation will need to be enacted. For example, 30 years ago many states passed legislation prohibiting development of new nuclear power plants for economic reasons. These same states are now considering the repeal of such prohibitions to set the stage for new nuclear projects. Additionally, states that want to further encourage nuclear development are considering enacting construction work in progress allowances to further enhance the prospects of project development. Finally, states are increasingly asserting an independent role on environmental issues, particularly the availability and allocation of limited water rights among competing commercial, industrial, and public projects. For many projects, water is the key threshold issue in whether to further consider a project.

Financial Issues

Beyond state rate treatment for new projects, the two commercial components that could significantly impact the prospects for future plants are long-term engineering, procurement, and construction (EPC) contracts, such that developers have a stable and predictable cost to plan against over the life of the project, and associated financing of the costs under those contracts.

Negotiating EPC contracts for nuclear projects presents a number of special challenges. The time required to complete reactor design certification and obtain a COL means that the lead time between signing an EPC contract and commencement of construction is extraordinarily long—perhaps four or more years. Due to these long lead times, it is particularly difficult for an EPC contractor to accurately predict the costs of labor and commodities (e.g., steel and concrete) so as to offer a fixed price. In addition, the interplay of the design certification and the COL issuance processes and potentially resulting design changes mean that the contractor is dealing with a somewhat changeable design. For these reasons, EPC contractors are unwilling to accept the same degree of cost risk that they would accept in a conventional construction project. To the extent EPC contractors will not or cannot take substantial cost risk, this risk will fall to the owner and, in the case of regulated utilities, the ratepayer. Steps to mitigate risk include cost sharing among multiple project participants and evaluating and more precisely fixing costs at predetermined milestones.

One goal of an EPC contract, in addition to price certainty, is a fixed time schedule. In a conventional EPC contract, the contractor has sole control of the project site until completion and testing of the plant, and as a result does not have the risk that there will be a delay due to actions by

the owner. In the nuclear context, such “turnkey” projects are disfavored, as the owner-licensee must exercise greater control throughout the process, and especially once fuel is delivered to the site. There is also the risk of a delay due to action or inaction by the NRC. This necessitates the creation of a mechanism for determining whether a delay is caused by the contractor or results from actions by the owner or the NRC.

Other challenges for nuclear plant EPC contracts include the scarcity of qualified engineering and skilled labor personnel and manufacturing capacity limits for heavy forgings for reactor vessels. These issues create additional project risk that may not be fully covered by the EPC contractor.

Assuming an EPC contract can be negotiated, financing remains a significant variable. The market capitalization of leading financial institutions has been dramatically reduced. From 2007 to the present, a number of leading financial institutions have disappeared, merged, or survived with only drastically reduced market capital to lend. Beyond this unprecedented instability in the market, the utility sector as a whole faces significant capital needs for the current fleet of generating facilities and infrastructure issues apart from considerations of new nuclear build. With the need for capital to not only construct new generating facilities but also provide for transmission, while retrofitting old plants and other infrastructure demands, the potential for an industry-wide funding gap presents increasing concern.

These competing demands on the market cause some financial analysts to see first movers as having an advantage. Other, more conservative analysts believe a “wait and see” approach better positions a company to take advantage of a potential second wave of nuclear projects after further clarification on the regulatory, legislative, and financial fronts.

Those who counsel holding back argue that there is still considerable variation in the estimates for new building. They further argue that, despite the NRC’s efforts in standardization and industry consolidation, Part 52 remains largely untested and a utility’s ability to construct a massive project on time and on budget remains suspect. Similarly, while some point to recent experiences in Japan as evidence of the ability to construct nuclear plants on schedule and on budget, others point to current experiences in Europe for delays and cost increases.

These competing arguments suggest that all but the bold first movers will ultimately wait to construct new nuclear projects. Although a handful of utilities have already negotiated and signed EPC contracts, press releases indicate that these contracts do not necessarily commit

these companies to construction. Such decisions may await additional stability in the financial markets and clarification by state regulators, as well as the nature and scope of possible federal energy legislation.

Legislative and Environmental Issues

Although some argue that further legislative incentives may not be necessary to pursue nuclear, the relative value proposition for nuclear will only increase as the real costs and practical constraints of renewable power and the environmental costs of fossil generation are better understood and taken into account. Should there be a comprehensive clean air bill enacted that includes a cap and trade regime for fossil plants, or if the Environmental Protection Agency (EPA) initiates rule-making in this area, then nuclear will become more attractive from both a financial and environmental perspective. Indeed, many believe the “greening of nuclear” is the task that remains to enable the public to see nuclear in the same way that it currently views wind and solar, but with the added value of being able to provide significant baseload generation for the future.

President Obama and congressional leaders have made clear that climate change legislation is a top priority. In his first budget, President Obama assumed that a cap and trade system for greenhouse gases would pass in 2009, effective in 2012. The cap and trade proposal outlined in the budget calls for a 14 percent reduction in emissions below 2005 levels by 2020, with an 83 percent reduction by 2050. In the House of Representatives, Congressman Waxman (D-CA), who chairs the most important committee for such legislation, has recently proposed comprehensive energy legislation that may come to a vote on the House floor in the near future. While passage of climate legislation is more uncertain in the Senate, Senate Majority Leader Reid (D-NV) has indicated that a climate change bill will be a priority, and the addition of new Democratic senators improves the chances for passage in that chamber.

Also gaining traction in Congress is a federal renewable portfolio standard requiring utilities to provide a certain percentage of their energy from renewable sources. Congressman Waxman’s proposed legislation for example, would require electricity suppliers to meet 6 percent of their load from renewable energy by 2012, and 25 percent by 2025. Renewable energy is not defined to include nuclear power in Congressman Waxman’s bill, although the ranking member of the Senate Energy and Natural Resources Committee, Senator Murkowski (R-AK), has called for including nuclear power in any renewable portfolio standard.

Further, the EPA is currently reconsidering whether

the Clean Air Act is an appropriate mechanism to regulate greenhouse gases. Action by the EPA could put pressure on Congress to pass cap and trade legislation, or it could result in regulation of greenhouse gases under EPA’s current authority, thereby increasing the costs for fossil fuel-based energy. Any of these developments would appear to provide additional benefits to any company considering nuclear.

Conclusion

Companies considering new nuclear generation face significant opportunities and challenges. Some of the opportunities are provided by the streamlined NRC regulatory regime for issuing new reactor licenses, the financial incentives in the Energy Policy Act of 2005, and beneficial construction cost recovery mechanisms. Challenges remain, including unprecedented instability in the capital markets, negotiations for EPC contracts, and potential heavy scrutiny from state regulators.

While some companies continue to move forward under these conditions, the merits of the nuclear option will become clearer only after improvements in the financial markets and realization of its environmental and financial benefits when compared to other energy options.