Beyond Nuclear White Paper

Nuclear Power's Toxic Assets: A Wall Street View

"We aren't going to build a nuclear plant anytime soon. Standard & Poor's and Moody's would have a heart attack. And my chief financial officer would, too."[1]

Thomas Capps, CEO, Dominion Nuclear, May 2, 2005

"Every one of these companies is going through a massive gut check."[2]

John Gilbertson, financial analyst, Goldman Sachs, November 20, 2008

"To date, the banks have stuck their heads in the sand and demanded that they be paid the price of good apples for bad apples."[3]

Lynn E. Turner, a former SEC chief accountant, February 1, 2009

Federal loan guarantees: Congress to rush in where bankers fear to tread?

Investments in new nuclear power plants have long been recognized as bad apples that can spoil the credit rating for any electric power company that ventures into new reactor construction projects. Now, Congress wants to make the federal taxpayer the primary lender of billions of dollars for new reactor projects that carry a very high risk of default on the loans.

The 2008 financial "meltdown" of the most venerable institutions on Wall Street and a deepening global recession has amplified the known risks accompanying financial commitments to the skyrocketing costs associated with building more reactors. The atomic power industry is notoriously known as a risky financial venture even before the current global economic crisis. Hundreds of billions of dollars in federal loan guarantees and taxpayer subsidies would now be needed to finance a resurgence of reactor construction here in the United States.

In fact, Wall Street is more wary of new nuclear power plants, not less, despite Congressional passage of incentive packages, loan guarantees and increased financial protections for the industry. The Energy Policy Act of 2005 (EPACT) gave $13 billion to the nuclear industry in production tax credits, construction "risk insurance" and extended limited liability coverage to incentivize financial investment in new reactor construction.[4] Then in 2007, Congress handed over an additional $20.5 billion in federal loan guarantees making U.S. taxpayers the co-signers on loans that Wall Street still refused to risk.[5] These energy policy carrots have prompted a flood of construction and operating licenses new reactor construction applications to the Nuclear Regulatory Commission[6].

Over the past several years with mounting industry lobbying efforts for more federal loan guarantees and outright federal subsidies for new reactor construction and operations, Wall Street has authored several clearly worded and freshly painted warning signs in a series of analytical reports that detail the many unaddressed economic pitfalls that await new construction projects and their investors whether they are financial institutions, utility ratepayers and federal taxpayers alike.

Nuclear power's historic financial failure soured Wall Street on new investments

The New York Stock Exchange on Wall Street is the symbolic and financial seat of corporate power in the United States of America. The first era of nuclear power plant construction was funded largely by multi-national corporations listed on the stock exchange. Much of the capital for these nuclear projects was raised through the issuance of stocks and bonds underwritten by investment banks and issued through their brokerage firms like Merrill Lynch. These investment firms and bankers assumed partial or total financial risk in the sale of stock to investors contrary to what many might think were ordinary citizens, were mostly controlled by corporations, banks, insurance companies, pension funds and foundations.

While Wall Street and Congress remain cautiously "bullish" on new nuclear power, they are acutely aware of the large "bear" that stalks the financial prospects for an atomic expansion.

Wall Street's deep skepticism of a so-called "nuclear renaissance" is well founded given the history of unpredictable construction costs, undependable licensing schedules and uncertain project completion times. All of these factors remain part of a still dubious formula for a potential repeat of the financial failure now so closely associated with past nuclear power plant construction investment.

In fact, stock and bond options for new reactor construction are not possible today, hence the need for federal loan guarantees issued through Congress. The financing practices that backed the first era of atomic power were hard hit when abandoned construction projects and completion cost ran on average 200% more than projected, tripling the original projected estimates.[7] In fact, the first era of licensing and construction of nuclear power stations became notorious when Forbes magazine described it as "the failure of the nuclear power program which ranks as the largest managerial disaster in business history, a disaster of monumental scale."[8] What started in 1974 with President Nixon's call for "Project Independence" and 1000 nuclear power stations in the United States by 2000 ended in nearly as many costly cancellations as completed projects.

Of the 253 reactor units eventually ordered by U.S. electric utilities, the last order being placed in 1978, 71 units were cancelled before construction began. Between the United States Atomic Energy Commission and its successor, the Nuclear Regulatory Commission, the federal regulator received 182 construction permits of which 50 units

were abandoned in construction with billions of dollars in investment. Only 132 units were licensed, built and operated. Of that number, 28 units have permanently closed in the United States before their 40-year license expired including the two partial core meltdown accidents at Fermi 1 and Three Mile Island Unit 2. Only 104 units are operational nationwide today.[9]

The near collapse of the nuclear industry in the 1980s left the investment industry unwilling to sink any more of private capital into new reactor construction for the 21st Century.

New nuclear construction is an increasingly risky investment

In its 2006 corporate finance report, Standard & Poor's performed a comparative analysis of nuclear power development in the United States, Canada and Europe.

Chief among their findings was that new reactor construction will come at significant corporate financial risk.

"In general, nuclear plant ownership tends to be less supportive of credit quality because it introduces added levels of operating, regulatory, and environmental risk to a business profile."[10]

"Standard & Poor's sees nuclear generation generally to have the highest overall business risk compared with other types of generation."[11]

"One common theme shared by the North American and European nuclear industries is the concentration of ownership. All three regions exhibit a high ownership concentration. This has not yet hindered credit quality, but too-large a critical mass could cause diminishing economies of scale and may negatively affect credit."[12]

In a subsequent special report on corporate finance published in October 2007, Moody's Corporate Finance said:

"In general, Moody's maintains a favorable bias towards nuclear generation."[13]
"In our opinion, if federal and state governments are serious about reducing carbon emissions, new nuclear power will be part of the solution."[14]

However, *"From a credit perspective, business and operating risk profiles will increase for companies that pursue new nuclear generation."*[15]

"This increase in risk is attributable to the size and complexity of the project, the long term nature of the construction cycle and the uncertainties associated with all-in costs, regulatory oversight and ultimate rate impact to end use consumers and the ability for a utility to recover costs and earn an appropriate return."[16]

The term "*all-in costs*" is short hand for all included costs over the many years of a construction project including design and architecture, licensing, land, interest payments for financing, materials, labor and cost escalations due to delays, inflation and construction cost overruns. This all-in estimate is contrasted by what industry typically presents as the *"overnight cost*"---as if you could build a massive nuclear project in a single day without the risk of cost escalations or mounting finance charges. These costs are a part of the *"life cycle costs"* that include a full range of cost of the nuclear fuel chain from uranium mining and its real clean up costs to the long-term management cost of nuclear waste for the millennia after the last watt of nuclear energy is generated at the reactor.

"From a credit perspective, utilities that pursue the new nuclear generation option will be ascribed a higher relative business and operating risk profile, which may pressure credit ratings over the intermediate to longer term horizon."[17]

The uncertainty of these "all in" costs brings increasing risk to the credit quality of the builder. As Moody's points out, *"A utility that builds a new nuclear power plant may experience an approximately 25%-30% deterioration in cash-flow-related-credit metrics, effectively reducing the ratio of cash flow from operations as a percentage of debt from roughly 25% to the mid teens range."*[18]

Given the bleak economic outlook for a prolonged global recession, the projections for a nuclear expansion are likely to decline due in large part to unpredictable all-in costs and credit crisis. As one Wall Street analyst was quoted in November 2008, "*The global downturn means that many utility companies will be 'pressing the pause button' on new nuclear plans, says John Gilbertson, who tracks financing for nuclear projects as managing director for New York-based brokerage firm Goldman Sachs*."[19]

In fact, other US nuclear utility companies may not be far off from credit quality impacts and announcing the postponement or cancellation of projects like the South Africa state owned electric utility, ESKOM, that it was cancelling plans to build AREVA and Westinghouse pressurized reactors. In part to keep its electricity competitively priced, ESKOM announced in December 2008 that it was cancelling plans to build either two of the AREVA 1,650 megawatt pressurized reactors or three Westinghouse 1,140 megawatt pressurized reactors. "'*It's too big, we can't do it,' said Eskom spokesperson Fani Zulu."*[20] The ESKOM board decision to terminate the project was "due to the magnitude of the investment" and followed Moody's Investors Services slashing ESKOM's credit rating after regulators allowed only a 27% rate hike of a requested 61% increase for support new reactor construction.[21] ESKOM cancelled the project despite the fact that France had promised to tender 85% of the cost of construction of the AREVA European Pressurized Reactors. [22]

Final construction costs of new nuclear power plants cannot now be known

Other than the predictably high cost of construction, no one can accurately predict what the ultimate price tag for the completion of construction of a new reactor will be.

"Throughout our due diligence process, Moody's has not been able to make a finite determination of the range for the all-in cost associated with new nuclear. As a result, we believe the ultimate costs associated with building new nuclear generation do not exist today—and that the current cost estimates represent best estimates, which are subject to change."[23]

In October 2007, *"Moody's believes the all-in cost of a nuclear generating facility could come in between $5,000-$6,000/kw."*[24]

However, in its next special comment published in May 2008, eight months later, the still timidly bullish Moody's revised its best cost estimate upwards stating, *"The technology is very costly, potentially reaching over $7000 per kilowatt (kw) of capacity."*[25]

At the same time, Fitch Ratings, advertising "Know Your Risk", in a presentation to the National Association of Regulatory Utility Commissioners noted the still widening range of construction cost estimates and projected the "high end" to be upwards of $9000 per kilowatt.[26]

By October 2008, a Standard & Poor's commentary "Construction Costs to Soar for New U.S. Nuclear Power Plants," concluded that the "capital costs for nuclear power projects will be significantly higher than what we have seen in the power industry thus far, and that costs will vary among technologies" from $5000 to $8000 per kilowatt.[27]

Moody's notes that *"In choosing to build a nuclear plant, a utility is making a long-term bet on a technology that has locked in a design (currently being reviewed by the Nuclear Regulatory Commission) and where construction cost are rising rapidly (primarily associated with labor and commodities). As a result, market and technology risks might emerge that position a new nuclear plant as uneconomic over the course of construction. These developments, in turn, could put a significant amount of pressure on legislators and regulators to protect rate-payers from incorporating the full cost of a new reactor into rates at the expense of a less costly alternative, even if the alternative is developed (or materializes) in the future."*[28]

The range in these economic snapshots of the vapor trail on a cost skyrocket are clear indicators of unpredictable and uncontrolled expense once construction commits company, stockholder, ratepayer, taxpayer, and government energy policy.

Federal "socialization of up-front costs" will not eliminate industry credit risks

The nuclear power industry has repeatedly stated that it will not build new reactors without significant and still unstipulated federal government investment and protection.

In response to industry demand and the significant financing challenge associated with new reactor construction, Congress passed the Energy Policy Act of 2005 (EPACT) which provided four key incentives for a nuclear industry re-emergence:

1) an extension of the Price Anderson Act which limits the liability of nuclear operators to no more than $10 billion in the event of a serious nuclear accident;
2) "risk insurance" of approximately $2 billion in total-up to $500 million for the first two projects and $250 million for an additional four projects to cover licensing or litigation delays;
3) Production Tax Credits (PTC) in the amount of 1.8 cents per kilowatt hour for the first 6 gigawatts (6,000 megawatts) of new reactor capacity based on the submittal of a Combined Operating License Application by late 2008 and commencement of construction in 2014;
4) Unlimited taxpayer-backed loan guarantees for up to 80% of the cost of new nuclear power plants, authorizing "such sums as are necessary."[29]

The Omnibus Appropriations Act, the Act that funds the running of government agencies, passed Congress in 2007 appropriating $20.5 billion in Federal loan guarantees and authorized the Department of Energy to guarantee 100% of the debt on nuclear loans of 80% of the total cost of the project.[30]

Moody's notes that while federal incentives could be helpful in lowering the electric rate shock to consumers from a new project, *"loan guarantees by themselves, will not be enough to completely mitigate the increased business and operating risk profile of a company seeking to build new nuclear generation."*[31] This is particularly true by the admitted fact that no one can project how high the all-in cost will actually be.

In Moody's view, *"While understandable why the Federal loan guarantees are of particular interest to the merchant companies given the high level of risks associated with nuclear construction, it is debatable whether the Federal government should be involved in enhancing the profitability of the merchant market by socializing the up-front costs. However, the merchant operator would be responsible for paying the cost for the loan guarantee---the formula for which has not yet been determined."*[32]

Investment banks seek federal protection against the risk of nuclear loan defaults

In fact, the risk of the nuclear industry broadly defaulting on Federal loans has been a concerned recognized by both Congressional studies and investment bank analysis. In light of the 2008 crisis in US and global financial markets, irresponsible investment activity has amplified the risks associated with the uncertainty of completion costs.

In 2003, the Congressional Budget Office (CBO) estimated a completion cost figure of $2.5 billion (2003 dollars) for an 1100 megawatt nuclear project utilizing a design certified by the US Nuclear Regulatory Commission. Where that construction would be financed under Federal loan guarantees, the CBO stated: *"The question of defaulting on Federal loan guarantees is of concern. CBO considers the risk of default on such a loan guarantee to be very high—well above 50 percent. The key factor accounting for this risk is that we expect that the plant would be uneconomic to operate because of its high construction costs, relative to other electricity generation sources. In addition, this project would have significant technical risk because it would be the first of a new generation of nuclear plants, as well as project delay and interruption risk due to licensing and regulatory proceedings."*[33]

In a 2007 letter, six prominent investment banks including the now bankrupt Lehman Brothers, the financially subsumed Merrill Lynch and federally bailed-out Citigroup, along with Credit Suisse, Goldman Sachs and Morgan & Stanley, sent a *"set of minimum conditions"* to the United States Department of Energy that they thought would be necessary to launch a successful loan guarantee program to finance new reactor construction. Among those conditions, the *"Guarantees must be 100% unconditional"* backed by the U.S. taxpayer, least that the nuclear corporations would likely be shutout from *"accessing capital markets."* [34]

"We believe many new nuclear construction projects will have difficulty accessing the capital markets during construction and initial operation without the support of a federal government loan guarantee. Lenders and investors in the fixed income markets will be acutely concerned about a number of political, regulatory and litigation-related risks that are unique to nuclear power, including the possibility of delays in commercial operation of a completed plant or 'another Shoreham'. We believe these risks, combined with the higher capital costs and longer construction schedules of nuclear plants as compared to other generation facilities, will make lenders unwilling at present to extend long-term credit to such projects in a form that would be commercially viable." [35]

"The mechanism that will allow lenders to receive payment under the irrevocable, unconditional guarantee in an event of default will also have to be well defined, market-based, and court tested, in order for it to be relied on by the capital markets."[36]

The investment bankers went on to state that the $2 billion *"standby support 'insurance' (provided by Section 638 of the Energy Policy Act of 2005) is inadequate"* to address the many regulatory, construction and large capital cost risks associated with new reactor construction.[37]

"Untested technology" comes with financial and future safety risks

The construction of new design and previously untested designs is proving to be more and more problematic.

Standard & Poor's succinctly identified that *"Our analysis addresses the risk to credit quality arising from a limited or more typically, a complete absence of a track record, commercially untested technology, or a technology that faces more regulatory hurdles. These risks can result in credit deterioration due to schedule delays or cost increases."*[38]

When reviewing the purported advantages of new reactor designs and "passive" safety systems (i.e. gravity-fed systems) versus "active" safety systems (i.e. electrical power operated systems) S&P recognized the obvious financial benefits in lowering the operating and maintenance costs as a result of having fewer components like power operated pumps, valves and motors.

At the same time, S&P describes *"However, passive systems have never been proven in a commercial application. No real-life occurrences with commercial-scale reactors operating at full power have occurred that would validate computer models of passive systems."*[39]

"When NRC analyzed the AP 600 design (the 600 MW predecessor of the AP1000), it assumed that these uncertainties could raise the chance of a meltdown probability by a factor of 100. If that were also true for the AP1000, it would negate the 100-fold improvement in meltdown probability likely as a result of passive systems, leaving the AP1000 as vulnerable to meltdown as reactors in today's fleet."[40]

Manufacturing and quality control bottlenecks risk schedules, cost and safety

The financial and safety risks brought on by untested nuclear technology are compounded by the presence of "significant bottlenecks to construction that have not yet been resolved."[41] In 2007, Moody's outlined many of the problem areas that added to construction risks, among them:

1) Ultra Heavy and Ultra Large Forgings - some reactor designs will require 6 to 12 ultra heavy forgings per unit with extremely limited forging capacity globally;
2) Large manufactured components such as steam turbines and reactor pressure vessels and;
3) Engineering resources are part of the skilled labor shortage;

S&P more recently confirmed that a "Tight supply chain and long lead times for certain major components will complicate procurement efforts for new nuclear plants." [42] As an example, Japan Steel Works is currently the only ultra heavy and ultra large forge in the world capable of casting a 600 ton iron ingot into a seamless Reactor Pressure Vessels (RPV).

S&P assures "The single supplier problem is not surmountable since the RPV can also be built by welding together a larger number of smaller forgings for which there are many globally." [43] However, in the case of the largest and most safety critical reactor

component designed to contain the highly radioactive and harsh operational environment in a nuclear power plant, this type of economic and schedule driven production agenda can come at potentially significant reductions in reactor quality control and operational safety margins.

Quality control in the nuclear manufacturing supply line in fact encompasses safety concerns from the largest to the smallest components. Safety and cost are increasingly interrelated particularly with the significant loss of a global nuclear manufacturing base with the end of the atomic boom in the late 1970s. A 1990 United States General Accounting Office report to Congress (now the Government Accountability Office), "Nuclear Safety and Health: Counterfeit and Substandard Products Are a Governmentwide Concern," pointed out where the high cost of quality control and assurance for the remaining nuclear safety grade parts from circuit breakers to nuts and bolts resulted in utilities installing "nonconforming products" with less assurance of safe performance. The GAO warned that the *"magnitude of the problem, cost to the taxpayers, and potential dangers are not known."* [44] The GAO added *"Nonconforming parts can fail and result in death and injury to the public and workers, increase program costs significantly, and waste tax dollars."*[45]

In response to the decreased availability of nuclear grade parts and the rise of installed counterfeit components the US NRC re-categorized reactor systems, structures and components to downgrade the treatment to what were re-categorized functions with lower significance to safety for a large portion of formerly significant-to-safety related parts with lower quality assurance and quality control standards.[46] While NRC efforts have helped to address the procurement needs and a paper fix regulatory non-compliance issues, it reintroduces old safety concerns as new reactor construction runs the increased risk of being built with previously substandard grade but now "compliant" parts.

Radioactive cleanup costs are an increasing financial and environmental concern

In addition to the uncertain and high construction cost risks, the eventual cost of radioactive reactor site decontamination, dismantlement and long-term waste management raises additional financial uncertainty and risks now recognized by government, investors and public, all alike.

The nuclear industry collects its decommissioning money from its ratepayers that is then placed in external trusts and invested on the stock market. In good times, the rate of return can provide the financial assurance that the funds will be available for site cleanup. An extended financial crisis as witnessed with Wall Street's free fall beginning in 2008 brings about a dramatic reduction and potentially a significant shortfall in nuclear power plant decommissioning trust funds. Vermont Yankee nuclear power station, whose parent company is Entergy Nuclear, reported a 10% loss in its decommissioning trust fund equaling $40 million in a single month. The loss was dramatic enough that the State of Vermont moved to have the nuclear power company

change its fund status reporting requirements from biannual to every month.[47] In fact, the decommissioning trust funds of some of the largest nuclear power companies in the US have been publicly documented with losses projected as high as 29% of the available decommissioning funds in the first few months of the financial market's bumpy but steady ride down.[48]

As Standard & Poor's reports, *"Decommissioning risk remains an important factor in determining credit quality of US firms and weighs more in the analysis of competitive nuclear generators. This is the case because, again, a regulatory process can provide recovery for underfunding. Unlike many of their peers who own nuclear plants in rate base, owners of nuclear power plants not in rate base neither collect decommissioning costs in rates nor do they have recourse to the local regulator for relief. Therefore, the funding responsibility falls squarely on the owners of nonrated-based nuclear plants."*[49]

In other words, nuclear operations in states that have de-regulated their electric utilities from state oversight could see such companies financially unable to complete the clean-up of radioactive hulks and their contents as well as the radioactive contamination of the soil, groundwater, waterways and sediments surrounding the nuclear power plant. Completion of decontamination and decommissioning of those nuclear power stations with bankrupt owners then becomes the financial responsibility and liability of unidentified entities very likely the state, essentially the residents and taxpayers of that state in which the facility formerly operated.

"To make matters more challenging, given that the decommission trust funds cannot be commingled, it is possible that a utility with multiple nuclear plants not in rate base may have a plant whose decommissioning trust fund appears fully funded today, and another whose decommissioning trust fund is underfunded. However, give the consolidated presentation of this information in company financial statements it may be difficult to discern the true funding level of each plant."[50]

Conclusion

According to Wall Street's analyses, many factors still make nuclear power an increasingly risky financial venture including the exposure to a company's credit quality to the uncertain but increasing cost of labor and materially intensive construction, the industry's scant construction record for unproven reactor designs, a tight supply chain for key nuclear grade components and a lack of assurance that adequate cleanup funds will be available after the reactors are shuttered. Replacing the private investor with the federal taxpayer does very little to change the risk profile of the power companies and merely shifts the financial risks and burdens to the public and a failing economy.

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