ALL RISK, NO REWARD FOR TAXPAYERS AND RATEPAYERS
THE ECONOMICS OF SUBSIDIZING THE 'NUCLEAR RENAISSANCE' WITH LOAN GUARANTEES AND CONSTRUCTION WORK IN PROGRESS

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ISSUE BRIEF

The Nuclear Industry's Demands for Direct Subsidies

As the projected costs of nuclear reactor construction have escalated, demand for electricity has declined as result of the recession, and the cost of alternatives has plummeted, the nuclear industry has recognized that new nuclear reactors are simply uneconomic and impossible to fund in the capital markets. Seeking to override the verdict of the marketplace, the industry's lobbying arm has demanded massive increases in subsidies from taxpayers and ratepayers to underwrite the industry.[1] It demands:

- A huge increase in loan guarantees and new rules that would allow the nuclear industry to gobble up all funds earmarked for clean technologies;
- Elimination of conditions that would protect taxpayers in the event of loan defaults;
- Dramatic increases in tax and insurance subsidies; and
- Accelerated and assured recovery of construction costs from ratepayers authorized by state regulators (via "construction work in progress").

These direct subsidies total to hundreds of billions of dollars, but the stakes for consumers could be much higher. Even with subsidies, the cost of nuclear power would be significantly higher than available alternatives. Nuclear subsidies would induce utilities to forego lower-cost alternatives, imposing excessive costs on consumers that could run into the trillions of dollars. This report explains why capital markets will not underwrite nuclear construction at rates that utilities can afford and why taxpayers and ratepayers will bear a heavy burden if they are forced to subsidize the construction of a new generation of nuclear reactors.

Nuclear Reactors are Uneconomic and Highly Risky

Section II builds the framework for analyzing the risks that new nuclear reactors face, as well as the implications for taxpayers and ratepayers. Section III and Appendix B review the concerns of major bond rating agencies (Moody's and Standard & Poor's) and industry

[1] National Energy Institute, Legislative Proposal to Help Meet Climate Change Goals by Expanding U.S. Nuclear Energy Production Capacity, October 21, 2009, http://www.nei.org/resourcesandstats/documentlibrary/newplants/policybrief/2009-nuclear-policy-initiative.

consultants (Towers Perrin and NERA). As summarized in Exhibit IB-1, there are over three dozen specific risk factors that fall into six broad categories – technology, policy, regulatory, execution, marketplace, and financial risk – which have led Moody's to conclude that the decision to build a nuclear reactor is a "bet the farm" decision.[2]

Section IV presents empirical evidence at the national level on these risk factors, while Appendix A presents more detailed evidence from Florida in the context of a regulatory proceeding. The simplest way to capture the essence of the empirical evidence is to note that a recent analysis of nuclear reactor economics, based on a 2009 MIT study that was highly favorable to nuclear reactors, could only arrive at the following, tepid conclusion:

> All things considered, the best economic case supporting a significant expansion in nuclear power capacity involves significant CO2 emissions charges, moderate to high fossil fuel prices (including implicit prices reflecting energy security considerations), declining nuclear plant construction costs, and an efficient licensing regulatory framework.[3]

The empirical analysis of Section IV shows that none of the four conditions that might make the economics of nuclear reactors attractive is present. The absence of those conditions is not a mistake or market failure; it reflects fundamental economic conditions and the risks that nuclear reactors face in the real world.

- CO2 emissions charges are projected to be more modest than originally thought because federal policy is contemplating promoting options that are low-cost approaches to carbon reduction (policy risk).
- Fossil fuel prices have moderated, particularly for natural gas, based on dramatic improvements in technologies to exploit the resource base, and confidence has grown in the ability of efficiency and renewables to meet the needs for electricity at much lower cost than nuclear reactors (technological risk creating marketplace risk).
- Nuclear reactor construction cost estimates have risen substantially (technology risk and execution risk).
- The licensing process has proven challenging, not because the licensing authority is inept, but because the designs are not well-conceived and site-specific issues are substantial (regulatory risk).

  The overwhelming majority of states have refused to subsidize nuclear reactors with ratepayer money and special treatment (regulatory risk).

Subsidies for Nuclear Reactor Construction Harms Taxpayers and Ratepayers

> Attempting to circumvent the sound judgment of capital markets, advocates of loan

[2] Moody's Special Comment, *New Nuclear Generation: Ratings Pressure Increasing*, June 2009.
[3] Paul L. Joskow and John E Parons, "The Economic Future of Nuclear Power," *Daedalus,* Fall 2009, p. 58.

Table IB-1: The Types of Risks Affecting New Nuclear Reactor Projects

Category	Source	Specific Risks
Technology risk stems from the fact that the new generation of nuclear reactors is new and uncertain. Cost estimates have increased dramatically over the past five years, doubling or tripling. At the same time, costs of efficiency and renewable technologies declining and availability is rising.	New technology risk	First-of-a-kind costs Long lead-time
	Alternative technologies	Efficiency potential identified Renewable cost declines
Policy risk stems from the fact that federal policy is in flux. While nuclear advocates have looked to climate policy, which may put a price tag on carbon emissions, as a primary driver of the opportunity to expand the role of nuclear power, they have failed to take account of the equally strong possibility that climate policy will create a very substantial mandate for conservation and renewables, which will dramatically shrink the need for new, nonrenewable generating, large baseload capacity.	Shifting focus	Emphasis on efficiency reduces need Emphasis on renewables reduces need
	Flexible GHG reductions	Lowers carbon cost
Regulatory risk stems from the chance that regulators will move slowly in approving reactors or authorizing their cost recovery. The new designs have proven challenging, with the reference designs going through numerous revisions. Site-specific issues, which cannot be standardized, have proven contentious. While a few states have approved construction work in progress and other measures to ensure cost recovery, the vast majority has not.	NRC regulatory reviews	Lack of experience Change of requirements Design flaws and revisions Site-specific contentions
	Loan guarantee conditions	Taxpayer protections inhibit guarantees
	Rate review	Recovery of costs challenged

Execution risk stems from the fact that reactors have not been built in the U.S. in decades and the industry does not have a great deal of capacity. Of the 19 projects that have applied for licenses at the Nuclear Regulatory Commission, 17 have suffered from one or more of the following problems: delay, cancellation, cost escalation or financial downgrade.	Construction risk Engineering, procurement and construction contract uncertainties	Lack of experience Counterparty risk Cost escalation and volatility Cost overruns
	Size, cost and complexity	Delays
		Rework costs
Marketplace risk on the demand-side flows from the current recession, the worst since the Great Depression, which has not only resulted in the largest drop in electricity demand since the 1970s, but also appears to have caused a fundamental shift in consumption patterns that will dramatically lower the long-term growth rate of electricity demand. On the supply-side of the market, there are a host of alternatives that have lower cost to meet the need for electricity in a carbon-constrained environment and there is growing confidence in the cost and availability of these alternatives.	Uncertain demand growth	Slowing due to recession Shifting due to debt and loss of wealth
	Uncertain fuel costs	Natural gas price decline
	Reactor costs	Long lead time Cost overruns Rate shock reduces demand
Financial risk stems from all of the above risks and are magnified by tight conditions in money markets and the fact that utility balance sheets are weak and too small to support the large size of nuclear reactor projects. The nature of the projects imposes additional financial risks, so much so that, for most utilities, the projects are so large that Moody's has called them "bet the farm" decisions.	General conditions	Tight money New liquidity requirements High-risk premiums
	Utility finance	Increased nuclear operating exposure Existing debt and need to refinance Financial ratio deterioration Rising cost of debt Limited & declining cash & equivalents Weak balance sheets Underfunded pension plans
	Project finance	High hurdle rate for risky projects Impact of large project Debt load and service burden impact Capital structure distortion

guarantees and construction work in progress claim that they lower the financing costs of nuclear reactors and are good for consumers, but shifting risk does not eliminate it and taxpayers and ratepayer will pay the price.

- Because the subsidy induces the utility to choose an option that is not the least-cost option available, ratepayers will bear a higher burden.
- Subsidies induce the utility to undertake risky behaviors that they would not otherwise have engaged in. When those undertakings go bad, the costs of the failures will be born by taxpayers and ratepayers in the form of expenditures on facilities that do not produce a flow of goods and services.
- If the pre-approval process for loan guarantees and/or construction work in progress reduces scrutiny over cost escalation and overruns, ratepayers will end up paying a higher price than anticipated.
- Even with subsidies, these projects are so risky and large that they tend to have adverse impacts on the utility's financial rating, which results in substantial increases in the cost of service.
- For cash-strapped consumers, taking after-tax dollars out of their pockets is a severe burden. If taxpayers and ratepayers have a higher discount rate than the utility rate of return, they would be better off having the present use of their money.

There is a high probability that some or all of these factors will impose high costs on taxpayers and ratepayers (as described in Exhibit IB-2).

Table IB-2: Threats to Taxpayers and Ratepayers

Area of Impact	Threat to Taxpayers and Ratepayers	Likelihood of Impact
Technology choice	Failure to adopt least cost approach	Certain
Project completion	Burden of failed projects	Highly likely
Project oversight	Lax review of project management	Highly likely
Financial ratings	Downgrade or negative	Near certainty
Discount rate	Misallocation of resources	Certain

The Bottom Line on Nuclear Subsidies

From the societal point of view, the push to subsidize dozens, if not hundreds, of reactors in the next couple of decades is not compelling. While it can be argued that a few of the challenges that nuclear reactors face can be seen as "market failures" that might justify government intervention, most of the obstacles are not market failures; they are a reflection of the market's sound judgment about the nature of the technology and the economic conditions new nuclear reactors. The rejection of new reactors by financial markets is not a case of market failure, it is an example of market success, markets properly assessing risk and acting

accordingly by refusing to underwrite unacceptable risks. The existence of numerous lower-cost, lower-risk options to meet the need for electricity[4] in a low-carbon environment undercuts the claim that nuclear reactors are the solution to the externality problem of climate change.

It is difficult to predict in advance how much larger the burden on taxpayers and ratepayers will be if the construction of new nuclear reactors is subsidized. That will depend on a number of factors:

- Above all, the number that are actually ordered, which is uncertain, with numbers running from 45 to 100 as a near-term goal, and as high as 187 for a long-term goal;
- The cost of those reactors, with estimates still rising;
- The number that will be cancelled or abandoned, with a high probability that the number will be substantial;
- When in the development and construction process the projects are terminated; and
- What the alternatives that could have been pursued, but were not, would have cost.

There are clear indications that the risk is high and that the cost will be substantial.

- The reactor projects are far too large to be a prudent investment for utilities – as much as ten times the size of a reasonable investment should be, which will have an impact on their financial ratings.
- The utilities that have proposed projects are having severe difficulties finding neighboring utilities to partner in the project and share the risk.
- Government agencies that have looked at the risk of the loan guarantees have concluded that half the projects could go bad and half the investment in those projects could be lost.
- The risk premium that industry consultants suggest should be demanded by equity owners that fund these projects is about twice the return on equity utilities usually earn.
- Delays and downgrading of financial ratings have already begun, long before concrete has been poured, which is where the construction and rework problems are most severe.

All of these indicators of risk call to mind the previous effort to build nuclear reactors in the U.S., when

[4] See Mark Cooper, *The Economics of Nuclear Reactors: Renaissance or Relapse?* (Institute for Energy and the Environment, June 2009), Chapters V and VI, for a discussion of the available resources and their cost.

- half of the reactors ordered were cancelled or abandoned;
- those that were completed took, on average, twice as long to build as originally planned and cost twice as much as originally estimated;
- four-fifths of the utilities that undertook nuclear construction suffered large financial downgrades and all suffered substantial financial distress; and
- investments in new reactors resulted in spectacular bankruptcies of both investor-owned and publicly-owned utilities.

The last time the nuclear industry circumvented the judgment of the marketplace, it resulted in what Forbes magazine called the "largest managerial failure in American history."[5] The past could be the prologue. A repetition of that history with taxpayers and ratepayers as the underwriters of nuclear reactors would cost not just hundreds of billions in losses for taxpayers on reactors that are cancelled, but also trillions in excess costs for ratepayers when reactors are brought to completion by utilities that fail to pursue the lower-cost, less-risky options that are available.

This is an avoidable error that policymakers can prevent from happening. If policymakers conclude that there is a market failure in the research, development and demonstration phase of the nuclear industry, loan guarantees should

- not be used to fund deployment of mature, expensive, and risky technologies;
- subject to rigorous fiscal, technology and administrative oversight; and
- structured with maximum taxpayer protections and transparency built into the conditions of the loan guarantees.

States should not shift construction risk to ratepayers, but rather should protect ratepayers from those risks by

- rejecting construction work in progress, or other guarantees for nuclear construction costs;
- demanding binding fixed-cost contracts before construction begins; and
- imposing strong incentive/penalty mechanisms to control cost overruns.

By following these principles, the financing of new nuclear reactors would be left to private capital markets, which are fulfilling their function in assessing risk. It is ironic that at a moment when the nation has suffered mightily from the misallocation of the cost of risk in the financial sector, some of the strongest supporters of free markets and critics of government-sponsored enterprises, would urge another massive federal subsidy intended to circumvent the judgment of the capital markets and put another multi-billion dollar program of federal support onto the backs of the American people as taxpayers and ratepayers.

[5] Cook, James, 1986 "Nuclear Follies," *Forbes*, February 11, 1985.