



WHY A FUTURE FOR THE NUCLEAR INDUSTRY

# IS RISKY

## SYNOPSIS OF PRESENTATIONS BY

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## DESPITE THE SIGNIFICANT SUBSIDIES PROVIDED IN THE ENERGY POLICY ACT OF 2005 (EPACT 2005), INVESTMENTS IN NEW NUCLEAR PLANTS REMAIN VERY RISKY

- The estimated cost of \$1,500-\$2,000 per KW for the new generation of nuclear plants is extremely optimistic and unlikely to be achieved.
- The prices of recently built nuclear power plants in Japan were much higher, ranging between \$1,796 and \$2,827 per KW, in 2003 dollars.<sup>1</sup>
- The subsidies provided in EPACT 2005 largely require annual or other congressional appropriations which are never guaranteed in changing political environments.
- None of the new nuclear power plant designs under consideration in the U.S. have ever actually been built.
- Under present market rules, nuclear power is unlikely to be able to demonstrate favorable economics to potential investors for at least twenty years. The U.S. Department of Energy has recently moved its target for bringing a new nuclear unit online from 2010 to 2014.
- Nuclear construction cost estimates here in the United States have been notoriously inaccurate. In fact, the estimated costs of some existing nuclear units were frequently wrong by factors of two or more. For example, data provided by the U.S. Department of Energy (DOE) reveals that the total estimated cost of 75 of today's existing nuclear units was \$45 billion (in 1990 dollars).<sup>2</sup> The actual costs turned out to be \$145 billion (also in 1990 dollars). This \$100 billion cost overrun was more than 200 percent above the initial cost estimates.
- New billion dollar mega-projects traditionally cost much more than their original estimates. As a result, a 1988 RAND Corporation study concluded that "the data on cost growth, schedule slippage and performance shortfalls of mega-projects are certainly sobering, but the most chilling statistic is that only about one in three of these projects is meeting its profit goals."<sup>3</sup>
- Standard & Poor's has agreed that "given that construction [of new nuclear plants] would entail using new designs and technology, cost overruns are highly probable."<sup>4</sup>
- The U.S. DOE's Energy Information Administration has clearly and concisely stated that, "new [nuclear] plants are not expected to be economical."
- A 2003 study by the Massachusetts Institute of Technology forecasted that the base case real levelized cost of electricity from new nuclear reactors with an estimated 85 percent capacity would be \$.067 per kilowatt hour over a projected forty year operating life, more expensive than energy from pulverized coal or natural gas.<sup>5</sup>
- A 2005 assessment by Synapse Energy Economics, Inc., showed that the levelized cost of electricity from a new 2,180 megawatt nuclear power plant would be \$.068 per kilowatt hour, which was significantly higher than obtaining the same amount of energy from a combination of wind and gas-fired capacity and energy efficiency measures.<sup>6</sup>
- Nuclear owning utilities have acknowledged that there are significant economic risks associated with the operation of nuclear power plants.
  - The costs of decommissioning and dismantling nuclear plants will be significantly higher than estimated.
  - Plant O&M and capital expenditures will increase or the plant(s) will experience outages as a result of events at other operating nuclear power plants, new rules or regulations issued by the U.S. Nuclear Regulatory Commission (NRC), or as the result of deficiencies identified by the NRC.<sup>7</sup>
  - Plant owners will have to pay for the significantly higher replacement power costs associated with unplanned outages.

- Deregulation of the electric utility industry adds additional uncertainty to the ownership of new nuclear power plants. The financial effects of extended outages, forcing the unregulated plant owner to purchase potentially more expensive replacement power on the spot market to honor any existing supply contracts, higher O&M expenses, and higher decommissioning costs, makes ownership of new plants more risky given the inability to recover such unexpected costs through the regulatory process.
- For example, Standard & Poor's has stated that "Decommissioning risk remains an important factor in determining credit quality of U.S. 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."<sup>8</sup>

## WALL STREET HAS EXPRESSED SERIOUS CONCERNS ABOUT THE CREDIT WORTHINESS OF COMPANIES THAT PURSUE NEW NUCLEAR PLANTS

- Standard & Poor's Ratings Services found that "an electric utility with a nuclear exposure has weaker credit than one without and can expect to pay more on the margin for credit. Federal support of construction costs will do little to change that reality. Therefore, were a utility to embark on a new or expanded nuclear endeavor, Standard & Poor's would likely revisit its rating on the utility."<sup>9</sup>
- Standard & Poor's also has expressed concern that "from a credit perspective, [2005 Energy Policy Act] provisions may not be substantial enough to sustain credit quality and make [Nuclear Generation] a practical strategy."<sup>10</sup>
- The credit rating service Fitch reminds potential investors that "the overarching concern [regarding nuclear power generation] is the financial effect of an extended outage, forcing the generating company to buy potentially more expensive replacement power on the spot market to honor any existing supply commitments."<sup>11</sup>



## NUCLEAR POWER PLANTS ARE STATED TERRORIST TARGETS: A SUCCESSFUL ATTACK COULD HALT NEW CONSTRUCTION EVEN AFTER SIGNIFICANT EXPENDITURE

FBI director Robert S. Mueller testified before the Select Committee on Intelligence in the U.S. Senate in February 2005 stating, "Another area we consider vulnerable and target rich is the energy sector, particularly nuclear power plants. Al-Qa'ida planner Khalid



Sheikh Mohammed had nuclear power plants as part of his target set and we have no reason to believe that Al-Qa'ida has reconsidered."<sup>12</sup>

<sup>1</sup> "Economic Future of Nuclear Power," The University of Chicago for the U.S. DOE, August 2004, at page 2-14.

<sup>2</sup> The 1986 study prepared by the Energy Information Administration of the U.S. DOE, "An Analysis of Nuclear Power Plant Construction Costs."

<sup>3</sup> Merrow, Edward W., Understanding the Outcomes of Megaprojects: A Quantitative Analysis of Very Large Civilian Projects, RAND Corporation, March 1988.

<sup>4</sup> "Credit Aspects of North American and European Nuclear Power," Standard & Poor's, January 9, 2006.

<sup>5</sup> "The Future of Nuclear Power - Summary Report," MIT, 2003. Available at <http://web.mit.edu/nuclearpower/pdf/nuclearpower-summary.pdf>.

<sup>6</sup> Affidavit of Bruce Biewald, Synapse Energy Economics, in U.S. NRC Docket No. 52-007-ESP, at page 23.

<sup>7</sup> For example, see the Testimony of Thomas Aller, in Iowa Utility Board Docket No. SPU-05-15, at page 15.

<sup>8</sup> "Credit Aspects of North American and European Nuclear Power," Standard & Poor's, January 9, 2006.

<sup>9</sup> "Credit Aspects of North American and European Nuclear Power," Standard & Poor's, January 9, 2006.

<sup>10</sup> *Ibid.*

<sup>11</sup> "Fitch's Approach to Rating U.S. Wholesale Energy Companies," dated October 2004.

<sup>12</sup> "Testimony of Robert S. Mueller, III, Director, Federal Bureau of Investigation Before the Senate Committee on Intelligence of the United States Senate," February 16, 2005. Available at <http://www.fbi.gov/congress/congress05/mueller021605.htm>.



## NUCLEAR REGULATORY COMMISSION (NRC) SHORTCOMINGS: MANY TROUBLESOME INDICATIONS THAT THE NRC IS PUTTING NUCLEAR ECONOMIC INTERESTS AHEAD OF ENSURING SAFETY AND PUBLIC CONFIDENCE

- The NRC has in recent years fallen back into the mindset described in the post-Three Mile Island reports of President Carter's Commission as being a major contributor to the accident. As the Commission described, "We find that the NRC is so preoccupied with the licensing of plants that it has not given primary consideration to overall safety issues... With its present organization, staff and attitudes, the NRC is unable to fulfill its responsibility for providing an acceptable level of safety for nuclear power plants."<sup>13</sup>
- Shortcomings of the U.S. nuclear regulatory process were clearly implicated in the 2001 near-accident at the Davis-Besse plant in Ohio. The NRC Inspector General's report found a clear connection between cost considerations and NRC laxity in the fact that (the licensee) sought and staff allowed Davis-Besse to operate without performing these inspections was driven in large part by a desire to lessen the financial impact that would result from an early shutdown.<sup>14</sup>
- A loss of coolant accident at Davis-Besse might well have eliminated all discussion of a nuclear revival in the U.S. for many years. The failure of nuclear power proponents to review the caliber of nuclear regulation necessary to support a major expansion of nuclear power is a significant shortcoming, even allowing for the difficulty of reaching clear conclusions on the topic.
- A 2002 internal NRC survey showed that almost half of all NRC employees thought that their careers would suffer if they raised safety concerns and nearly one-third of those who had raised safety concerns felt they had suffered harassment and/or intimidation as a result.

## NUCLEAR POWER WILL NOT REDUCE U.S. DEPENDENCE ON ENERGY SUPPLIES FROM ABROAD

- In 2004, over 80 percent of the uranium for U.S. nuclear plants came from foreign countries, with 51.8 million pounds being imported and 12.3 million pounds being supplied from domestic mines.<sup>15</sup>
- There are 14 foreign countries that sell uranium to the U.S. including Australia, Canada, Russia, Kazakhstan, Uzbekistan, South Africa, and Namibia.
- The estimated recoverable uranium reserves in the United States, once the world's largest uranium producer, now rank only eighth in the world. These recoverable reserves are far less than needed to fulfill the maximum requirements for U.S. nuclear power plants.<sup>16</sup>
- Demand for uranium is expected to grow, but the supply is expected to be significantly below the demand. The International Atomic Energy Agency's assessment "Analysis of Uranium Supply to 2050" concludes that "As we look to the future, presently known resources fall short of demand."
- The imbalance between the demand for uranium for domestic U.S. nuclear plants and potential supplies may grow more uncertain around the time that new nuclear plants would come on line. Between 2013 and 2015, the United States-Russian Highly Enriched Uranium agreement will expire and Russia may decide to keep its domestically produced uranium for its own nuclear industry.
- Shortages are already leading to significantly higher uranium prices, which have increased since 2003 from \$10 per pound to \$30 per pound. Some industry experts project further increases, perhaps to as high as \$100 per pound.

<sup>13</sup> "Report of the President's Commission on the Accident at Three Mile Island: The Need for Change," October, 1979, pp. 51, 56.

<sup>14</sup> "NRC's Regulation of Davis Besse Regarding Damage to the Reactor Vessel Head", NRC Inspector General, December 30, 2002, p. 23.

<sup>15</sup> "2004 Uranium Marketing Annual Report," Energy Information Administration of the U.S. DOE. Available at [www.eia.doe.gov/cneaf/nuclear/umar/umar.html](http://www.eia.doe.gov/cneaf/nuclear/umar/umar.html).

<sup>16</sup> "Analysis of Uranium Supply to 2050," International Atomic Energy Agency, at page 5.

<sup>17</sup> The MIT Study, in discussing the 2002 sale of 88% of the Seabrook station, notes that the price "implies that the market value of a fully licensed and operational nuclear power plant with a good performance record is less than half of the most optimistic cost estimates for building a new nuclear power plant...Comparable analyses of other nuclear power plant sales come to very similar conclusions. The market value of nuclear plants is far below their replacement cost, a result that is inconsistent with merchant investment in new nuclear plants." (The Future of Nuclear Power, Appendix 5, p. 140)

## USED NUCLEAR FUEL STORAGE REMAINS UNRESOLVED

One of the riskiest elements of building new nuclear plants is that the long term disposition of the waste is far from resolved. The planned Yucca Mountain repository in Nevada is considerably behind schedule and may never open. A recent plan announced by the Bush administration, the Global Nuclear Energy Partnership (GNEP), to reprocess (reuse) the used nuclear fuel will face significant technical, legal, and political challenges and cannot be counted on as a realistic solution. Indeed, similar attempts to reprocess spent fuel in the past have been unsuccessful and the U.S. Department of Energy (DOE) still does not have a lifecycle cost analyses for the program.



Reprocessing would be a dangerous shift in U.S. global nonproliferation policy, and would increase the likelihood that a terrorist could obtain fissile material to build a nuclear

bomb. Moreover, DOE is trying to build momentum for the program before deliberations have been conducted by Congress to determine whether this path is in the best interests of U.S.

national and energy security, as well as fiscally sound, even if it should eventually prove technically possible to do so.

Reprocessing would increase the number of nuclear waste streams to be managed and is the most polluting part of the nuclear fuel cycle. U.S. taxpayers are still paying several billion dollars each year to clean up contamination from reprocessing programs in the 1960s and 1970s for

nuclear weapons at the Hanford Site (WA) and the Savannah River Site (SC), as well as the reprocessing of naval irradiated fuel at the Idaho National Laboratory (ID) and commercial reprocessing at West Valley (NY), which all make the prospect of this new reprocessing push unlikely and illogical.

## HOW THE EVOLUTION OF POWER SUPPLY MARKETS AFFECTS NUCLEAR POWER

The future of nuclear power begins by understanding the past. Nuclear power is a technology force fed into an unsophisticated power supply selection process at a pace too fast for the nuclear industry to assimilate the lessons of operating experience. Moreover, the evolution occurred in ways that concealed or understated the real costs and problems, assuring a series of unpleasant surprises, a deepening public mistrust and ultimately reform of the power supply selection processes under which nuclear power had momentarily thrived.

A real nuclear revival does not exist until private capital is available to build plants, which will require market prices that assure competitive success on one hand and profitability on the other. However, even with their ability to compete on the

basis of operating costs clearly established, the most recent sales of nuclear units have not been at a price that would support the building of a new plant.<sup>17</sup>

In short, nuclear power's asserted comeback rests not on a newfound competitiveness in power plant construction, but on an old formula: subsidy, tax breaks, licensing shortcuts, guaranteed purchases with risks borne by customers, political muscle, ballyhoo and pointing to other countries (once the Soviet Union, now China) to indicate that the U.S. is "falling behind". Climate change has replaced oil dependence as the bogeyman from which supposedly only nuclear power can save us.

## WHAT ABOUT GLOBAL WARMING? THERE ARE MUCH BETTER SOLUTIONS.

Global warming is occurring and we need to take action, but more nuclear power plants are not the answer. Further investment in nuclear power would squander the resources necessary to implement meaningful climate change mitigation policies. Moreover, nuclear power's role in mitigating climate change (and in reducing oil dependence) is constrained because its impact is limited to the electric sector.

Wind power and other renewables along with energy efficiency and conservation and cogeneration are much more cost effective and can be deployed much faster. In practice, operating existing reactors and building new ones will divert private and

public investment from the cheaper, near-term options needed to protect our climate.

Instead of head-to-head economic competition, nuclear proponents seek to persuade governments to conclude that theirs is the best option for averting climate change. This effort may succeed for a time in some countries. However, persuading government officials to adopt pin-the-tail-on-the-donkey power supply policy, rather than create technology-neutral incentives to achieve policy goals through competitive markets, has generally been a prelude to expensive disappointment, and no basis for long term prosperity in the nuclear industry.

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