

Is a second coming nigh?

The market value of the current fleet of reactors in the USA has greatly increased over the last five years as a result of efficiencies brought about by industry consolidation, reactor upgrades and plant licence renewals. Will these improvements translate into the construction of new plants? By Neil Numark and Michael Terry

The high capital costs of nuclear plants continue to be a significant obstacle to new plant construction, particularly in deregulating markets that favour technologies with short lead times and the potential for quick recovery of capital costs. In addition, although public opposition to nuclear has declined, remaining concerns over plant safety and nuclear waste disposal continue to present risk factors as far as the investment community is concerned.

economy in recession and the collapse of Enron fresh in people's minds, the euphoric mood of power producers and equipment suppliers subsided as it became clear that the perceived power shortages had been overstated. Non-utility generators (NUGs) brought a total of 59GWe of new capacity (mostly gas) on line in 2002, but in the same year cancelled 5GWe and delayed another 37GWe beyond 2002.

New gas-fired capacity continues to come on line, and analysts for the

growth has come in the form of gas turbines used for peaking and intermediate loads, it is not clear that any glut exists in traditional baseload power sources. It will likely become necessary to rely on the new gas-fired capacity for a portion of baseload generation, introducing economic risk and possible concerns about reliability of supply. Some analysts are concerned electric reserve margins could drop to dangerously low levels by the latter half of this decade if significant additional baseload capacity is not built.

Thus, serious doubts remain regarding the effectiveness of deregulation in ensuring that adequate generating capacity is maintained. To guard against the possibility that competitive markets will fail to stimulate sufficient investment in generating capacity, the US Federal Energy Regulatory Commission (FERC) has proposed a 'reserve adequacy requirement' (RAR) within its Standard Market Design (SMD) proposal, which it announced on 31 July 2002. The RAR would mandate a 12% reserve margin in deregulated electricity markets across the country. However, many experts are sceptical whether such requirements would actually be enforceable.

Nevertheless, it appears likely that deregulation will continue, despite questions arising in the wake of the California energy crisis and now the Northeast blackout of 14 August 2003. There is too much at stake for the continued competitiveness of US industry to expect otherwise, particularly among energy-intensive segments. Companies in these industries are a major source of revenue for power producers, and can opt to invest in cogeneration facilities if necessary to avoid high-regulated power rates. They can also forego expansion plans or move operations to another state, or offshore. State policymakers, at least in the Northeast and Midwest, are heavily invested in establishing competitive power markets and unlikely to reverse course.

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However, conditions could be changing. The three largest nuclear fleet operators – Entergy, Exelon and Dominion – remain cautious concerning new nuclear orders but are proceeding with pre-licensing work to obtain “Early Site Permits” from the US Nuclear Regulatory Commission (NRC) in any case. The US Department of Energy's (DoE's) stated goal of deploying new plants by 2010 may be optimistic, but it may be possible to achieve this a few years later.

RESERVE MARGINS

California's energy crisis raised considerable concern over looming power shortages nationwide, and increased the enthusiasm for new nuclear plants in early 2001. The newly inaugurated Bush-Cheney team announced that the USA would have to build 1300 to 1900 new power plants over the next 20 years, and voiced strong support for nuclear power as a component of this. A large amount of new capacity was coming on line in the form of gas turbines, and it appeared for a time that new nuclear orders would be forthcoming as well.

But by early 2002, with the US

North American Electric Reliability Council (NERC) project that the national average reserve margin will peak at 37% in 2004. NERC's most recent *Reliability Assessment* finds that electricity demand is expected to grow 71GWe by 2006, but that new resource additions of 159-263GWe are expected over the same time period.

But there are two important caveats concerning these high reserve margins. Firstly, even with the widespread capacity overbuild nationally, there are concerns about adequate reserve margins in key regional markets. Regions such as New England and the Pennsylvania-New Jersey-Maryland Interconnection have succeeded in maintaining healthy reserve margins, but states such as California and New York have had far less success. NERC's *Reliability Assessment* indicates that New York will not meet its 18% installed reserve margin requirement beyond 2004. In May 2003, the New York Independent System Operator called for the approval of 5000-7000MWe of new generating capacity in the next five years to maintain a reliable supply and keep prices competitive.

Secondly, since the recent capacity

NUCLEAR POWER'S FORTUNES

What do recent trends in reserve margins and future deregulation policy mean for nuclear? A key point is the declining share of traditional baseload power sources in the generating mix. It is important to emphasise that the recent overbuild of generating capacity has come mainly in the form of NUGs building gas turbines. Rising gas prices already challenge the wisdom of having built a large number of these gas-fired units to meet electricity demand in deregulated markets. The current circumstances should lead energy companies and investors in coming years to look again to traditional baseload technologies as the best means of ensuring adequate capacity, recognising that their higher capital costs are offset by their lower and more predictable fuel costs.

Investment in additional baseload capacity will become increasingly important as the economy grows in the coming years, and it is difficult to imagine power producers adding baseload capacity without a significant contribution from nuclear. Consider the alternatives:

- Investment in new coal plants – already the largest source of baseload electricity – would run the risk of worsening economics due to carbon constraints that seem inevitable at some point in the next few years and are indeed already proceeding at the state level.
- Recent gas prices show that fuel to be a choice ill-suited to baseload generation.
- Renewables will continue to gain market share, but it may take decades before they provide a significant portion of the country's baseload generating capacity.

Wind energy costs, for example, are down about 90% since the 1980s, from 80¢/kWh to about 4¢/kWh today, and the industry is poised to reach 6000MWe of capacity nationwide by the end of this year. But as a recent report for the World Wildlife Fund observes: "Since wind is an intermittent electricity generator and does not provide power on an 'as needed' basis, it loses some value on a per kilowatt-hour basis, compared to traditional electric generation that can provide baseload power."

Geothermal plants, as well as biomass derived from energy crops, may be better suited to baseload generation, but the degree of market penetration is expected to be relatively modest.

Even given nuclear plants' higher capital costs, the plants, once built, have generally lower operating costs than

their fossil-fired counterparts – an advantage that will increase as greater restrictions are placed on fossil fuel pollutants. According to the Nuclear Energy Institute, 2002 was the fourth successive year in which "nuclear energy was the low-cost leader for baseload production of electricity," with production costs of 1.71¢/kWh, in comparison with coal-fired power plants, 1.85¢/kWh; natural gas plants, 4.06¢/kWh; and oil-fired plants, 4.41¢/kWh.

Increased demand will make investment in new baseload capacity imperative in coming years. It is highly likely that when this occurs, nuclear power will be the only available technology well-suited to baseload operation that can contribute substantially to meeting this demand without also contributing to global warming, urban ozone pollution, acid rain and other environmental and public health impacts of burning fossil fuels.

EXISTING PERFORMANCE

The biggest surprise to date regarding nuclear power in a deregulating environment is simply how well nuclear plants have survived. As deregulation began in the 1990s, nuclear was considered a dying industry. The market value of nuclear plants had plummeted and some owners were anxious to get rid of them. But with the industry's restructuring under deregulation, large power companies like Exelon, Entergy, Dominion and Constellation have purchased these plants from regional utilities. These consolidators and other operators have improved operations and turned nuclear plants into sound, highly competitive investments. Load factors have risen and refuelling outages have shortened to record levels. Plants are also applying for

Assuming continuing safety improvements, the good fortunes of existing plants in the deregulating electricity industry will contribute to improving the prospects for new ones. One key factor is that the restructuring of the power industry has resulted in larger and stronger nuclear operating companies that are more likely to build new nuclear units.

INVESTMENT COMMUNITY

Despite the greatly improved operational efficiency of existing plants, and the improved economies of scale resulting from industry restructuring, the investment community remains generally sceptical of new projects in competitive electricity generation. Wall Street is shying away from construction of any type of new plant until debts from the recent merchant energy fiasco are paid off. Power industry stocks have suffered major losses, especially those companies relying heavily on natural gas. Most of the failures to date have been in the merchant energy sector and were a result of over-investment in gas-fired units. However, Wall Street does have some special concerns about nuclear investment, based on uncertain construction costs and risks to company earnings during potentially protracted construction of the first new nuclear plants. Moreover, the investment community views the potential for accidents, and concerns about nuclear waste and terrorism directed at the nuclear industry, as risks that must be taken into account.

The companies that could build the new nuclear units also remain sceptical, concerned that in a competitive environment they cannot afford to tie up a large investment for several years before any earnings on that investment will

“Rising gas prices challenge the wisdom of building a large number of gas-fired units to meet electricity demand”

20-year licence extensions to their initial 40-year licences. The market value of reactors has thus increased, and power companies with nuclear assets generally have outperformed those without them in the stock market.

Industry critics question whether this operational improvement has come at the expense of safety. NRC safety performance indicators show continuing safety improvement through 2001, but clearly NRC and the industry itself must continue to be vigilant in ensuring that competitive pressures do not compromise plant safety.

materialise. Thomas Capps, chairman of Dominion Resources, put it the most bluntly, in recent comments to *Public Utilities Fortnightly*: "Right now I don't think anyone in this country is going to build another nuclear plant. We certainly are not. There is too much risk."

Entergy could be the most serious contender. Writing recently in *Nuclear Plant Journal*, Entergy Nuclear CEO Gary Taylor said: "Entergy is considering a two-track course on new nuclear – advanced light water reactors for the near-term and advanced gas-cooled reactors that could be built under-

ground and are supersafe for the longer term." Taylor noted that the gas-cooled option could produce hydrogen at a low cost and fuel a new hydrogen economy. However, he cautioned: "We have not decided to build a new reactor."

In the current investment environment – recession, excess capacity, and bad experiences with power sector projects – it is understandable that no US utility has yet committed to the high capital costs and long construction duration of a new nuclear unit. But the investment climate could be changing for two reasons:

- The rising cost of natural gas. The recent increase in gas prices probably improves the economic attractiveness of new nuclear only to a limited extent, since the projected price of natural gas a few years down the road matters more than the current figures. But if gas prices remain high into next year, these projections will likely adjust upward; executives and investors may then have increased concern over the risks of over-dependence on gas.

“To keep a level playing field, it would be necessary either to eliminate all production incentives or to keep a balanced mix”

- The potential for a carbon policy. Exelon CEO John Rowe described the influence of a carbon policy very clearly, in an interview with the Sustainable Energy Institute: "Sooner or later, we're going to have ever-tightening standards on carbon and that is going to force a new generation of nuclear in this country."

Edward Tirello of Berenson & Company's Power and Utilities Group recently provided an upbeat assessment of nuclear power's future, telling *Fortune* magazine last year: "If they use advanced designs, and get all the litigating done up front before construction starts, and the companies have assured Wall Street that they have markets for the power output, these plants are bankable."

The key to future nuclear orders may be the industry's ability to share risks for first-of-a-kind plants, and produce economies of scale, by forming a consortium that would build several plants. Southern Nuclear CEO George Hairston told *Fortune* this might involve "a group of four or five utilities, vendors,

and financial institutions coming together and building perhaps eight plants, and charging everybody the average cost, so nobody has to bear the risk of the first plant alone."

The timing of new plants may also depend on whether investors differentiate risks between non-utility generators and traditional utilities. NUGs carry enormous debt from the recent overbuilding, while utilities do not; and NUGs build new capacity based on price signals, while utilities building baseload units appear to continue to focus on demand growth. It may be that the bad experience with deregulation is still too fresh in investors' minds to differentiate the risks this way. Moreover, utilities may not yet see sufficient baseload demand growth to justify new nuclear units, but an increasing dependence on expensive gas-fired units for baseload generation could quickly change this view.

In the hope of overcoming hesitation on Wall Street and in power company boardrooms, the nuclear industry has lobbied for some form of stimulus or support from the federal government. The industry's concern is that the first

new plants – which will likely be new ALWR designs going through a new NRC licensing procedure – could be delayed because of licensing uncertainties as well as first-time engineering risks. Incentives such as a production tax credit, similar to the 1.7¢/kWh tax credit that wind energy plants currently enjoy, are likely to emerge from the energy bill negotiations now underway in a House-Senate conference.

Such credits are often criticised as unnecessary federal handouts to mature industries. However, it is important to recognise that the energy bills that have passed the House and Senate are loaded with stimuli for just about every other fuel type, amounting to about \$18 billion in tax credits most heavily allocated to the oil and gas, renewable energy and alternative fuels industries. To keep a level playing field, it would be necessary either to eliminate all production incentives or to keep a balanced mix.

FEDERAL ROLE

It is increasingly clear that under deregulation, a federal role is necessary to ensure a sufficient overall level of generation nationwide as well as a diversity of new generation facilities, including baseload capacity. Federal action will

also probably be necessary to provide sufficient incentives for this new capacity to be clean burning. The most effective policy solution towards achieving these goals would be an across-the-board stimulus to develop and install clean energy technologies, which is precisely what a carbon policy would accomplish. Further incentives may take the form of the FERC reserve adequacy requirement and other incentives to build, such as production tax credits or 'portfolio standards' specifying minimum levels of generation from desired technologies. Without such intervention, deregulated markets will continue to yield only the type of new plants having the quickest payback.

A national carbon policy would be simple, in contrast with a complex regime of different production incentives for different electricity generation sources. The energy bill now under debate seems headed for a patchwork of production incentives, which is not necessarily a bad approach as long as there is an emphasis on clean technologies, diversity and long-term reliability.

Carbon constraints, or financial incentives for non-carbon technologies, would significantly improve the future of nuclear power generation. Clearly, the Bush administration's recent decision to scuttle the 'New Source Review' policy for ageing coal plants, which allows these plants to continue operating without installing costly pollution control equipment, holds down the average cost of baseload power and thus does not help nuclear power's prospects – or public health for that matter. Nevertheless, carbon constraints will become a reality as the decade progresses, based on state if not federal policies, and probably consumer pressure as well.

It is likely that new nuclear plants will eventually get built in the USA with or without government intervention. Some combination of growing demand, rising gas prices and lower nuclear capital costs will eventually convince investors, and the time may not be far off. But government action could have a very large impact on the timing and extent of a nuclear second coming. Most significantly, if US energy policy would internalise the public health and environmental costs of fossil fuel combustion, market forces alone would bring about new nuclear orders and there would be no need for direct government support. Absent such a policy, direct incentives for new nuclear plants, as will likely appear in the energy bill, will serve as a reasonable hedge against the risks from increased reliance on natural gas, especially for baseload generation. ■

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