

Valuing new nuclear sites

Suitable sites for new nuclear build in the UK are now available to interested parties. How much are they worth? By Ian Jackson



Both British Energy and the NDA own development land next to the shutdown Magnox reactor site at Bradwell. Last year British Energy secured a transmission connection agreement with National Grid for 1650MWe capacity at Bradwell

The prospect of new nuclear power station build has thrown a much-needed economic lifeline to Britain's soon-to-be decommissioned nuclear sites. Probably the best commercial future for retiring British nuclear facilities lies in attracting major investment from energy firms to build replacement nuclear power stations, making use of the resident nuclear workforce and existing site infrastructure. From an economic standpoint, the government's 'suitable for use' nuclear decommissioning policy makes most sense when sites are reused for continued nuclear activity.

The prospect of major redevelopment for alternative commercial uses, injecting significant new investor cash into the local economy, seems very unlikely indeed. Only the Dounreay nuclear site in northern Scotland had once been mooted as a potential location for a high-tech European spaceport but Sir Richard Branson's Virgin Galactic company instead selected New Mexico in the USA for its first \$225 million headquarters.

The conversion of former nuclear sites to science and business parks is a laudable aim by the government, but this will never deliver commercial success on the same scale as nuclear investment. The capital investment alone in a single modern nuclear power station is worth around £2 billion (\$3.5 billion) for a single reactor spread over a five-year construction period. The crucial difference between nuclear power plant siting today, compared with the past, is that the private sector, not the government, will be constructing and paying for them. Nuclear siting today is fundamentally an economically-driven competitive process decided by investors, liberalised energy markets and energy distribution networks rather than governments. The siting of nuclear stations is driven by two critical factors: proximity to markets and access to supply networks. Like any market and network situation, it is always better to be nearer the centre of demand than at the far edges. This inevitably favours new nuclear build towards the south of England where energy demand is greatest and suffi-

cient land at existing nuclear stations is available. These factors make new build in southern England the least risk solution for nuclear energy utilities and their shareholders. Access to energy distribution networks is critically important for nuclear generators in the same way that roads are vital for car owners. The key thing is not just the ability to generate nuclear electricity at a particular site location, but also having the means of delivering it efficiently to paying electricity customers.

If decommissioned British nuclear sites are to be reused for new nuclear power station build, the central question is: how much would they be worth to private sector investors? This question is important because the value of the land will determine how much money the government can make for taxpayers by selling it, or by renting it out and using the money to pay for the UK's historic nuclear cleanup programme, or for privately held nuclear sites, how much equity the site might be worth as a stake in a joint business venture with a commercial energy utility partner.

LIKELY SITES

An expert group report commissioned by the government, *Siting New Nuclear Power Stations: Availability and Options for Government*, published by the government's Department of Trade and Industry (DTI, now the Department for Business, Enterprise & Regulatory Reform) in May 2007, recommended new nuclear development at the sites of existing Magnox and AGR nuclear power stations. The Magnox sites are owned in the public sector by the Nuclear Decommissioning Authority (NDA), while the AGR sites are owned by British Energy in the private sector. With their winning combination of available land, grid access and close proximity to markets, the five prime locations are generally regarded as British Energy's Hinkley Point, Sizewell and Dungeness sites and the NDA's Bradwell and Wylfa sites, although both the NDA and British Energy together share some development land at Bradwell. Like any market situation, the key to determining value lies in understanding who is buying and who is selling. Nuclear sites are certainly not commodities that are widely available and essentially interchangeable. They are in short supply as there is only likely to be a small pool of economically viable site locations, probably as few as five for the first tranche of new nuclear construction. This is good news for the site owners because the scarcity of supply will increase valuations of the sites.

On the other hand, there are relatively few potential buyers with the financial muscle to invest the several billion pounds needed to build a modern nuclear power plant. The five leading utility competitors in the soon-to-be expanded UK nuclear energy market are British Energy, the French firm EDF, the German firms RWE and E.ON, and the Spanish firm Iberdrola – all of whom already operate nuclear power stations in Western Europe. Decisions on building a new generation of British reactors will be taken in the corporate boardrooms of these European utility companies, not Whitehall. The total investment cost is a significant barrier to entry because an aspiring nuclear utility company would probably want to build not just one but perhaps a series of three (or more) reactor units to benefit from cheaper economies of scale from placing several orders with a single reactor manufacturer.

THE TRUE VALUE

From the seller's perspective, the best way for establishing the true value of a

rare or unique asset for sale in a specialised marketplace is often through some form of competitive process involving several potential buyers; essentially an auction rather than a negotiated sale. As observers of the auction website *eBay* will testify, competition between buyers drives prices up. The challenge is to determine which utility companies can best use the sites, and how much they are worth to them. This is a difficult balancing act because on the one hand, sellers want to achieve the best price they possibly can, but on the other hand the price tag must not be so high that it restricts the ability of the winning utility company to invest money in actually building the nuclear stations – a situation in auction terminology known as 'winner's curse'. The problem had previously occurred with the government's auction of 3G radio spectrum telecoms licences in April 2000. The auction raised £29 billion – enough to halve income tax for a year – but the high level of company debt led to a serious investment crash by telecoms firms.

The number of utilities bidding for nuclear sites is very important as this can drive up the price a great deal. Game theorists Jeremy Bulow and Paul Klemperer have showed the importance of attracting just one extra bidder in a competitive process. If a nuclear site has a true value of 'V' million pounds, a winning bidder would pay only 50% of this value if the utility had one competitor, but 67% if the utility had two competitors, 80% with four competitors, or 90% with nine competitors. (The mathematical relationship is that if there are n bidders in a first price auction for an asset of true value 'V', then the winning equilibrium bid is theoretically $(1 - 1/n) \times V$.) What's more, the linkage principle of game theory tells us that the more the price paid by the winning utility bidder is linked statistically to the valuations of other bidding utilities, then the higher the average price the bidder ends up paying.

In practice, determining the true value of a nuclear site is extremely difficult as this will depend on each utility company's own individual assessment of the future profitability of the nuclear power station over a projected 40- to 60-year plant operating lifetime. The government's *White Paper on Nuclear Power* published in January 2008 forecast that the net present value (NPV) of replacing Britain's 10GWe of nuclear generating capacity would be of the order of £15 billion assuming a

40-year generating lifetime. This is the government's measure of the expected profitability of the nuclear stations under a central scenario (neither pessimistic nor optimistic) after taking into account the expected electricity generating income offset against lending, construction, operation, decommissioning and waste disposal costs. Under these circumstances a single Westinghouse AP1000 1.1GWe station would be expected to make a profit of £1.7 billion NPV while an Areva EPR 1.6GWe station would make a profit of £2.4 billion NPV. But because a single nuclear site might be able to accommodate two or even three new reactor units, the total profitability of each station could be as high as £4.8 billion NPV for a twin-unit EPR or £5 billion NPV for a triple-unit AP1000.

This still does not tell us what a nuclear site is actually worth to a utility but it does allow us to make an informed guess about the likely price range. Because the best sites are in short supply – only five are immediately available – it is essential for a prospective nuclear utility to gain access to at least one of them. This really is a business critical issue for the utility, essential for the viability of any nuclear business plan, because without a site on which to build a reactor there can be no nuclear investment. This places the site owners – the NDA and British Energy – in a very strong bargaining position in which the normal commodity rules of real estate transactions will not apply very well. The price that a utility is willing to pay for access to a suitable nuclear build site is likely to be linked in some way to the profit that the business can reasonably make from operating the nuclear station. This could result in extremely high land valuations. For example, a 5% gain-share of the nuclear utility's generating profit would value a site at £83 million NPV if the land was used for building a single AP1000 station or £240 million NPV if the land was used for building a twin EPR station. In real estate terms, the nuclear development land could be worth between £2 million to £6 million per acre for a typical 40-acre footprint PWR nuclear power station – about the same cost as prime residential development land in London and southeast England according to the government's Valuation Office Agency.

In a competitive process it is possible that a nuclear utility might be willing to pay more than 5%, particularly if the cashflows took the form of a periodic rent based on utility profits,

spread over the generating lifetime of the station. Renting a site is a good option for both buyers and sellers because it will generate a steady income for the site owners, while avoiding high up-front capital costs that would otherwise need to be paid by the nuclear utility to buy the land outright. Gearing the rental payments to a fixed percentage of electricity generating profits would also help to reduce the long-term financial risks to the utility arising from market fluctuations in the wholesale price of electricity and any unexpected reactor outages in the future.

As few as three or four nuclear sites might be needed to accommodate twin AP1000 stations or twin EPR stations that could replace all of Britain's 9GWe of nuclear capacity expected to be lost over the next 15 years. But as many as eight sites would be needed if the stations were built in single configuration. Modern reactor designs have much higher capacity ratings, typically in the range from 1.1GWe to 1.6GWe, compared with their earlier British predecessors, which have capacities of around 0.4GWe to 0.6GWe for each reactor.

THE BEST SITES

Historically, new nuclear generating capacity is often added to the site of existing nuclear power stations rather than developed at completely new locations. For example, Europe's newest nuclear reactor presently under construction at Olkiluoto in Finland is being built on the site of two existing reactor units. Energy utility companies wanting to enter the nuclear market in Britain face a potential problem: probably the best development sites are owned by a major competitor, British Energy – the country's sole commercial nuclear energy supplier. Aware of the market monopoly position, the government's energy review report published by the DTI in July 2006 noted that it would be up to potential participants of new nuclear build to discuss with the owners appropriate access to suitable sites and promised that it would monitor whether an appropriate market in suitable sites is developing. The government went on to say that there might be other attractive sites for nuclear power such as sites with retiring fossil fuel generating stations. The government's *Our Energy Challenge* consultation document published earlier in January 2006 had noted that around half of Britain's 14 coal-fired power stations may retire by 2015. Building replacement nuclear

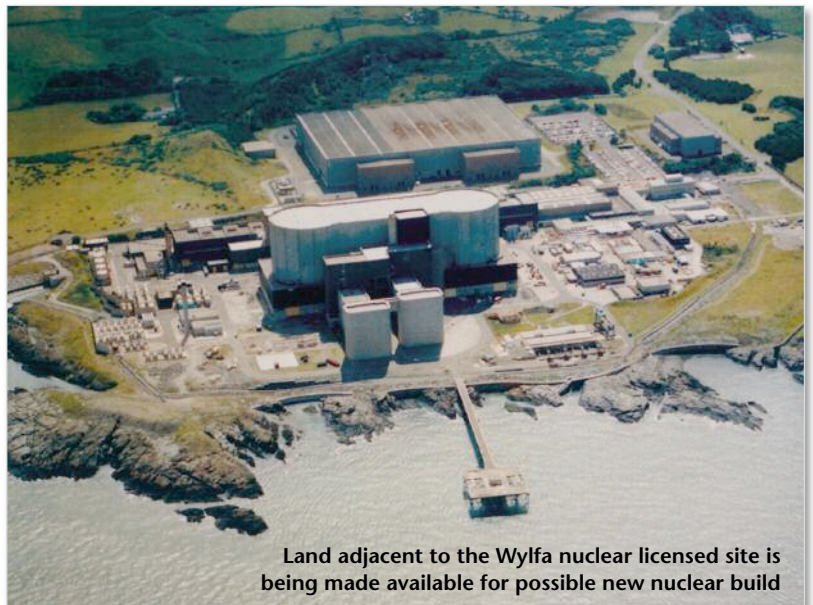
plants on the sites of retiring coal-fired power stations might offer similar economic advantages to construction on existing nuclear sites: proximity to markets, excellent electricity distribution infrastructure, good cooling water supplies and a labour force with energy sector experience. Widening the pool of available sites for nuclear build in this way would reduce the scarcity of development sites, lowering the price for utilities to buy them.

If it turns out that nuclear build sites remain scarce and hard to acquire, foreign utility bidders might ask the energy market regulator – the Office of Gas and Electricity Markets (Ofgem) – to intervene, breaking up the siting monopoly position of British Energy and the NDA. Both Ofgem and the Office of Fair Trading (OFT) have statutory powers to carry out market investigations and order breakups if necessary. Ofgem is an especially powerful player because it has legal powers to compulsory purchase land needed for energy development under the Electricity Act 1989. Ofgem has never before carried out such a market investigation on energy plant siting. But there had previously been regulatory concern about the closure of coal-fired stations in the 1990s, when some utility companies had placed restrictive covenants on redevelopment of the land preventing re-use for new generating plant. This partly explains why most gas-fired generation was subsequently built on greenfield sites during the 'dash for gas' of the early 1990s.

The lack of suitable nuclear sites has not really been a competition issue over the past decade because nobody had proposed to build any new nuclear generating plant. However that posi-

tion has clearly changed with the publication of the government's 2008 *White Paper on Nuclear Power* and it is possible that Ofgem might in the future become involved in an examination of fair competitive access to nuclear sites. The most likely trigger for such a market investigation would be a complaint from a utility company wishing to expand into the UK nuclear energy market. But other companies investing in the energy sector may also have reason to complain. The environmental organisation Greenpeace has pointed out that the grid connections of shutdown coastal nuclear power stations could be re-used for connecting offshore renewable generation instead of nuclear. This is particularly true in Scotland where there is a shortage of grid connection capacity for renewables, coupled with political rejection of new nuclear power station development by the Scottish National Party (SNP) government.

The risk of a market investigation by the competition regulators is lessened by the government's plans expressed in the *White Paper on Nuclear Power* to undertake a high level strategic siting assessment by 2009. This is essentially a screening exercise for candidate sites nominated by site owners and potential utility investors. This is mainly a policy driven assessment designed to rule out environmentally unacceptable or technically infeasible sites, leaving the final choice of investment locations to the market. But ultimately only a few of these will be economically viable for investors. For example, despite its substantial nuclear workforce, the remote Sellafield complex in northwest England is a poor location for a modern nuclear power station



Land adjacent to the Wylfa nuclear licensed site is being made available for possible new nuclear build

because its electricity transmission infrastructure cannot carry the energy output of a large nuclear station. Securing planning permissions from Cumbria County Council and capital investment from National Grid for major transmission upgrade stretching across the Lake District are key logistical and economic barriers at Sellafield.

MAXIMISING REVENUE

The NDA's first five-year strategy published in March 2006 was distinctly neutral on any involvement with new nuclear build projects, regarding them as "an issue clearly outside our remit." Two years later that position had changed substantially with the publication of the NDA's *Business Plan 2008/2011* in March 2008. In a surprising move for an agency dedicated to nuclear decommissioning, the *Business Plan* set out goals to maximise commercial revenue which included engagement with potential developers and operators of nuclear plants to maximise income from NDA sites that could host new generating facilities. Two factors are driving renewed interest by the NDA in new nuclear build: the need to generate commercial income to help fund the government's UK-wide nuclear cleanup programme; and the socio-economic need to offset expected future job losses at NDA sites transitioning from operations to decommissioning. Indeed there has been strong pressure by some members of the NDA's National Stakeholder Group (NSG) for the NDA to consider just giving the land up for a nominal price to utility businesses if this will help promote socio-economic regeneration. The NDA responded that properties have to go on the open market and that the NDA would like to retain some of the income for site management. Leasing land for new build seems to be the best option because this would generate long-term income for the NDA, whereas the income received from a direct sale of the land would simply divert to the Treasury, which receives the cash from disposal of any surplus NDA assets under the Energy Act 2004. The Treasury would probably want to sell new build sites to release their value for taxpayers, whereas the NDA would want to rent them out keeping the cash to fund decommissioning work.

The NDA's 2005 *Management Statement and Financial Memorandum* – the financial rules set by the government on the operation of the NDA – specifies conditions on the disposal of sur-

plus assets and proceeds from disposal of assets, which essentially require that the NDA's assets will usually be sold by auction or competitive tender and will be sold for the best price, taking into account any costs of sale and high value. The NDA can retain sales receipts only if these do not exceed 3% of the NDA's funding – capping sales at around £74 million per year on annual funding of £2472 million in 2007/8 – with the caveat that sales proceeds over £1 million must be surrendered to the government who will consider whether to reimburse them to the NDA.

An outright sale of NDA land is also attractive from a state aid perspective because it would avoid the NDA becoming directly involved in new electricity generation activities that may be prohibited under the terms of the European Commission's (EC's) April 2006 state aid decision – *Commission Decision of 4 April 2006 on the State Aid which the United Kingdom is planning to implement for the establishment of the Nuclear Decommissioning Authority*. State aid, where governments subsidise commercial companies using taxpayers' money, is unlawful because it breaches European Union competition law. It would not be fair on other commercial energy utility companies if the government subsidised the costs of running the NDA's Magnox nuclear power stations for example. A state aid investigation was triggered in December 2004 following a complaint from Greenpeace that the government might subsidise the commercial businesses of the NDA, principally the remaining Magnox nuclear power stations, the Thorp spent fuel reprocessing plant and the Sellafield MOX Plant (SMP). Because all of the Magnox stations were scheduled to close by 2010 anyway, the UK government gave an undertaking to the EC that the NDA will not start any new electricity generation activities nor build any other new assets. The commission had considered requiring the NDA to shut down the Magnox stations but decided against this measure partly because of the assurances given by the government on early Magnox closure. While the EC's final decision did not expressly prohibit future NDA involvement in new nuclear build, the NDA's planned exit from Magnox electricity generation by 2010 was clearly an important background factor.

With nuclear site valuations potentially in the range from £83 million NPV for a small station to £240 million NPV for a large one, it seems most

likely that some form of government sale process may well occur in which access to an NDA site for new nuclear build is granted to the highest bidder – with the lion's share of the cash proceeds probably going to the Treasury to help fend off the threat of national economic recession and to avoid potentially messy state aid complications for the NDA.

BRITISH ENERGY'S TRUMP CARD

For British Energy, the siting game is played differently. The 2002 financial rescue of British Energy has left the company in a weaker position to invest than its bigger European energy utility competitors. Instead, British Energy's sites and staff are its trump card for building the next generation of nuclear power stations; the company has a portfolio of eight nuclear development sites that might be worth around £1.9 billion in total, assuming the land value of each site is worth £240 million for a large twin-unit EPR station or triple-unit AP1000 station. British Energy will want to get the best deal it can negotiate with partners, not necessarily in cash, but probably as a significant equity stake in a nuclear generation partnership with one or more utility companies. But British Energy is vulnerable to takeover. In March 2008 the government announced a possible sale of its remaining 35% shareholding. Under stock exchange takeover rules, any energy firm buying the government's entire stake in British Energy would immediately be required to launch a full offer for the whole company. In April 2008 British Energy's share price jumped to 741p on news that the company was in takeover talks – valuing the market capitalisation of the company at £7.6 billion, (£11.7 billion once the government's 35% equity stake is taken into account), with roughly one quarter of the £7.6 billion being the value of its development land for new nuclear build. Yet a foreign takeover to form a Euro-British super-utility raises significant competition problems, since British Energy's obvious nuclear siting monopoly won't be resolved unless the company's development sites are broken up fairly. Unless energy utility bidders can reach an agreement to share the sites between them, an Ofgem or OFT investigation of the nuclear energy market looks on the cards. ■

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