

SMRs could resuscitate UK nuclear sector

The UK power sector could be left in an impasse after blows delivered by Japan's Hitachi and Toshiba over recent months. In addition, British engineering giant Rolls-Royce was reported earlier in March to be advancing plans to dispose of its nuclear division. The future of nuclear energy in the UK will be one strand of the discussion in inspiratia's upcoming [breakfast briefing on regulated utilities on 27 March](#)

Small modular reactors (SMRs) – also known as advanced nuclear reactors producing up to 300MW of electric power – could be the last resort for the UK to swiftly revive its nuclear programme, considering the long development and construction times required for larger projects.

"The [UK government](#) seems very committed to furthering the development and deployment of SMRs," says Amjad Ghori, affiliate of the Nuclear Economics Consulting Group (NECG).

Ghori was part of the Expert Finance Working Group (EFWG) assembled by the UK's [Department for Business, Energy and Industrial Strategy](#) in early 2018 to make recommendations on the government role in attracting private sector financing for SMRs.

"SMRs have to be considered seriously as part of any solution to diversifying the UK energy pipeline. Many experts are hoping that the UK government's efforts to date will help the programme to progress faster."

The smaller reactors can be completed in factories as modules, which will minimise on-site construction costs which are usually high for nuclear.

Hitachi's Horizon and Toshiba's NuGen withdrawing from the plants of Wylfa Newydd in January 2019 and Moorside in November 2018, respectively, was a strong sign of a decelerating nuclear sector.

Meanwhile, Rolls-Royce plan to sell its nuclear division is understood to not impact the company's involvement in [EDF Energy's](#) Hinkley Point C plant, under construction in Somerset, or its commitment to provide technical support for SMRs.

The company expects to receive up to £200 million (€232.5m US\$263.1m) for its nuclear division. This sale will not include the SMR design the company is currently working on. [KPMG](#) was hired to find a suitable buyer for the civil nuclear business.

SMR drivers

As existing UK nuclear power plants seem to be swiftly reaching their planned closure dates, the market is wondering whether this is the end for the sector in the country. But the approved Hinkley Point C plant, expected to open in 2023, as well as an ambitious SMR development programme, offers hope for nuclear in the UK.

The graph below offers information on all operational plants across UK, including their installed capacities and the year of planned closure.

Planned closure of UK nuclear power stations, including installed capacity in MW



Source: UK Government, inspiratia

Hinkley Point C is expected to have a 3.2GW installed capacity and to be in operation for 60 years, from 2023 to 2083. As shown, all plants in the above graph are due for closure over the next 16 years, with most of them closing within the next nine years.

Replacing these facilities with new, large reactors will likely involve lengthy development, procurement and construction processes which could take at least 6-10 years and 8-10 years, respectively. But for certain project sizes, SMRs could be a much more viable solution to replace the fast closing plants.

There is a stronger case to develop carbon-free SMRs across the UK, but also in Canada and the US, as interested parties believe this could be the only way in which these countries will reach their emissions targets.

A joint venture between Penultimate Power – a UK-based consortium to build SMRs – and Japan Atomic Energy Agency was agreed on at the beginning of this year to build an approximately 10MW, high-temperature, gas-cooled nuclear reactor in the northeast of England.

"It will be difficult to achieve emission targets without nuclear as part of the generation mix. Storage is not yet there and faces some challenges when it comes to large-scale projects," says Ghori.

"Germany provides a good example of the consequences of not having nuclear as part of the system. The country has had to start scaling up coal power plants and is not meeting its emission targets."

De-risking SMRs

The UK government was reportedly prepared to take on a one-third equity stake in the Wylfa Newydd nuclear project before it was abandoned by Hitachi.

Nonetheless, with the lowering costs of energy generation and more particularly energy from offshore wind, Hitachi's Horizon was offered a £75 per MWh (€87.3 US\$98.7) strike price, a lower offer than the guaranteed £92.5 per MWh (€107.7 US\$121.7) EDF received for Hinkley Point C at 2012 prices, and not perceived as viable for such a risky undertaking.

Considering pessimistic perspectives on nuclear private financing, de-risking SMRs is at the forefront of agendas.

"The private sector alone is not going to take the risk on nuclear new build projects. Unless you are EDF or CGN [[China General Nuclear Power Group](#)], both state-owned companies who have the financial wherewithal and are supported by their respective governments, it is very difficult for other private sector companies to take on this risk," says NECG's Ghori.

Rolls-Royce has already developed what is considered by market experts as a very good concept for SMR development in the UK. An additional £200 million (€232.5m US\$263.1m) requested from the British government is aimed at supporting the company to complete a detailed SMR design. So far, only £40 million (€46.5m US\$52.6m) to £60 million (€69.8m US\$78.9m) has been made available by the public sector.

"Rolls-Royce de-risked the construction and the manufacturing processes, they've done a very nice job so far, but they need the support of the government to ensure the detailed design is ready," emphasises Ghori.

More clarity from the government is quintessential to speed up the development of SMRs.

Financing models

The regulated asset base (RAB) model could be used to finance nuclear plants going forward, which is a very interesting market development. RAB is a number that quantifies past investments, including what investors paid when an asset was originally privatised, and the subsequent capital expenditure adjusted for depreciation.

The RAB model returns were previously not considered big enough to attract significant interest in nuclear, although this is presently a changing situation.

"The market is now looking at the RAB model as an option for nuclear on a risk-adjusted basis. The more risk developers take, the higher the returns will be. This is different from the standard RAB model where developers were assured of a low return for taking little risk in developing an asset that would be folded into the regulated asset base," explains Ghori.

A "nuclear sector deal" published in June 2018 by the UK government proposes a two-stage competition, which will fund eight GEN IV design feasibility studies (stage one). Up to £40 million (€46.5m US\$52.6m) is made available for manufacturing and development (stage two). Roughly £20 million (€23.3m US\$26.3m) could be awarded to developers demonstrating advanced manufacturing in the nuclear sector and more specifically within modular construction.

Further research on SMR financing models was conducted, with the EFWG due to report its findings to the UK government in the summer of 2018.

"The government has shown a willingness to do more with the very generous proposal for Hitachi's Horizon NPP, which surprisingly still wasn't enough. If similar proposals can be put forth in support of development of SMRs, we are in a good space," concludes Ghori.

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