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Financing low-carbon generation in the UK: The hybrid RAB model

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We argue that long-term investment in zero-carbon technologies like nuclear power is necessary but requires low financing costs (a low weighted average cost of capital (WACC)). That in turn requires low risk and a credible assurance of returns to the investors. The Regulatory (or Regulated) Asset Base (RAB) approach to utility regulation has been used successfully in the UK since the late 1980s. The RAB model specifies the amount of capital that the regulator recognises as deserving a return. When combined with a statutory obligation to ensure the utility can fund itself, the RAB becomes a very low risk asset. This means a low cost of capital which in turn means lower prices for customers.

The Thames Tideway Tunnel (TTT) is an example of a hybrid RAB, in which the government transfers some potential project risks from customers and investors to taxpayers. The distinctive features of the model used are that it is a discrete, ring-fenced capital investment financed by external investors with explicit construction risk-sharing with customers (through the regulator); and the project receives financial returns before construction is complete. It is a good model for new nuclear since the more the construction risk is borne by customers, the lower are the required returns to the investors, which means lower prices paid by customers. A cap on construction cost above some threshold further reduces risk and the WACC. The actual deal struck with TTT was for a WACC or regulated return of 2.497% (RPI linked, roughly 3% CPI linked).

We model the cost of a second pair of twin GB EPRs at Sizewell C (SZC) with sharing of cost over-runs up to a cap of 130% of the agreed construction cost, and a RAB subject to periodic reviews by Ofgem, assuming a 70% gearing and a WACC of 3.5% real. Investors would receive a return on the RAB during construction, and would then be awarded a life-time (60-year) contract on commissioning, during which they would receive a return on and of the RAB. In the base case with a 10-year construction period and cost of £$_{2018}$5,000/kW, the internal rate of return to the equity

participants would be 7%. The required (constant) strike price over the first period would be £54/MWh. At the next review in year 15, the RAB will have been depreciated and the strike price for years 16-20 would fall to £52/MWh, and then, decreasingly rapidly, to £34/MWh by the end of the contract in year 70. The levelized cost over the entire lifetime at the WACC of 3.5% is £53/MWh. The levelised cost to consumers if on time and budget would be £50/MWh at the social discount rate of 2%. If all the risk were to be placed on SZC (as with HPC), and they were to require an equity return of 8% real, then it would require a contract-for-difference with a strike price of £96/MWh. All of our analysis is in 2018 £.

In the worst case scenario in which the project is 8 years late, 48% over budget, and capped at 30% over-budget, with investors bearing 40% of the cost over-run up to this cap, the value of the regulator Ofgem assuring the allowed RAB is that it still provides an attractive equity return of 4.9%. The levelized cost at the WACC over 60 years is £76/MWh. The levelised cost to consumers if they paid the excess capital cost would be £64/MWh.

In conclusion, with RAB-based finance, nuclear looks sufficiently cost-competitive to be a major future part of the generation mix. National Grid's only two *Future Energy Scenarios* for 2050 that meet the UK's 2050 carbon reduction target both anticipate substantial new nuclear by 2050 (7.8 GW and 17.3 GW respectively).

Delivering that new nuclear will require a change towards a tried and tested model used in other network utility infrastructure projects. This model can deliver an acceptable national and electricity consumer cost, provided there is a regulatory guarantee to enable the RAB to be financed with investment grade debt. To encourage non-infrastructure specialist funders such as pension funds, the Government would provide backstop equity funding above an agreed cost over-run, here assumed to be 30%. This hybrid RAB model appears the most promising, and arguably is the only feasible way to deliver new nuclear build, which, we have argued, is cost-effective at the appropriate and now low discount rates and a likely essential component of meeting the increasingly challenging decarbonisation target.