NUCLEAR ECONOMICS CONSULTING GROUP

NECG

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RAB Model for New British Nuclear

Department for Business, Energy & Industrial Strategy

In July 2019, the Department for Business, Energy, and Industrial Strategy (BEIS) opened a consultation on a Regulated Asset Base (RAB) model for new nuclear power plant investment in Great Britain. This NECG Commentary provides our response to that consultation.

This NECG Commentary #30 is the NECG response to the July 2019 BEIS RAB model consultation and includes the following sections:

- Summary;
- Background;
- RAB Model Discussion; and
- Conclusions.

I. Summary

The challenges of delivering new nuclear power plant (NPP) investment in the reformed electricity industry in Great Britain are significant and there is no simple or easy approach to resolve those challenges.

The RAB model may be a useful tool if properly developed and implemented, but:

- Is complex and may be difficult to implement;
- May not clearly reflect the objectives for the British nuclear power industry;
- May not be relevant without a broader review and/or re-opening of the overall approach to the electricity industry structure and electricity market approach in Great Britain; and
- May not deliver desired new NPP investment, or may only deliver new NPP investment with EdF and/or other State-Owned Enterprises (SOEs), such as CGN from China.

We provide a response to the Consultation questions, as context for later sections of this Commentary that describe some issues that must be addressed to attract new NPP investment.

Question 1: Have we identified a model which could raise capital to build a new nuclear power station and deliver value for money for consumers and taxpayers?

Question 2: Do you have any comments on the components of the Economic Regulatory Regime as described?

Question 5: Do you have views on the potential way to design the revenue stream for a nuclear RAB model that we describe, and are there alternative models we should consider?

Question 6: Do you have views on our proposed approach to assessing a new nuclear project under a nuclear RAB model and determining whether it is value for money for consumers and taxpayers?

These four questions (i.e., 1, 2, 5, and 6) assume that the proposed RAB model is a complete and feasible approach that can be implemented in Great Britain to deliver enough new NPP capacity

to close the "nuclear gap". We disagree and, as discussed in later sections, provide some questions and issues that must be answered and resolved before these questions can be answered.

Question 3: Do you have views on how consumer interests are protected under the proposed approach? What else should be considered to protect consumer interests?

There are some features of the proposed RAB model that may, in theory, protect consumer interests, but we are concerned that the proposed RAB model may not do so in practice. The investment in developing and implementing the proposed RAB model will nevertheless be significant, even if it does not deliver the desired level and type of new NPP investment.

Question 4: Do you agree that consumer risk sharing could be value for money for consumers if it achieves a lower expected overall cost for consumers compared to a Contract for Difference model?

In theory, the answer is yes. However, the question assumes that both models can deliver new NPP investment, which may not be true. The incentive package in place for Hinkley Point C (i.e., the Contract for Difference / CfD model in this question) was not successful in delivering new NPP investment by Horizon, NuGeneration, or other developers/projects. As discussed below, we are concerned that the proposed RAB model may not deliver new NPP investment without modifications and without other support measures.

II. Background

Great Britain needs new nuclear power capacity to meet long-term policy goals related to carbon emissions and system reliability. Nuclear power is a proven, large-scale, dispatchable generation technology with load-following capability, minimal carbon emissions, a fuel cycle supporting national energy security, a small environmental footprint, high energy density, and long asset operating life.

The approach to new NPP investment in Great Britain is to facilitate and provide incentives for investment from the private sector, including foreign State-owned Enterprises (SOEs).

The nuclear SOEs, such as those behind the HPC project, have risk preferences, access to national resources, and other features that are very different from private developers and investors seeking to develop new NPPs. The CfD approach used in the HPC project was primarily focused on resolving project risk through post-completion revenue level and certainty, with completion risk absorbed by the foreign SOEs and their governments. If Great Britain is satisfied with new NPP projects negotiated in this political context, RAB may indeed provide an adequate basis to deliver new NPP investment, potentially[1] more favourable for NPP developers than the CfD approach due to more risk being absorbed by the British public.

[1] In this scenario, due to lack of competition, it would be difficult to assess what a fair, price and risk would be. Rather, the negotiated result would likely be determined by arbitrage against other non-nuclear capacity and energy generation alternatives (i.e., willingness to pay).

In an ideal world, the outcomes of the electricity markets would provide incentives for new investment in nuclear power. In the real world, liberalized electricity markets, do not provide adequate financial incentives for new generation investment in high-capital-cost generation assets, like NPPs, without out-of-market subsidies to provide adequate and certain long-term revenue.

This is due to at least four reasons:

- Liberalized electricity markets have short-term prices that may be too low and too uncertain to support new NPP investment;

- Little recognized or realized value in electricity markets for the public goods provided by NPPs (e.g., emission-free electricity, energy security, energy diversity);

- The long asset life of modern reactor designs (licensed for 60 years; possible life extensions to up to 100 years) are not captured by financial models, which fail to assess asset values after roughly 30 years; and

- New NPP investments, with high capital-intensity and long NPP operating life, may not be "bankable." Financial markets do not treat private investment in NPP projects favourably, so that new NPP investment requires additional financial support and risk reduction measures.

British government ("Government") measures to address these challenges in Great Britain to date have worked to a degree, but have not resulted in new NPP investment needed to close the nuclear gap.

New NPP project challenges include the large size and duration of the investment; a long and uncertain development and construction period; an unfavourable new build track-record; the complexity, cost, tenor, and uncertainty of nuclear safety regulation; and uncertain revenue after commercial operation. NPP completion risk includes delays, cost-overruns, and the possibility of abandonment prior to completion. NPP project returns, even with enhanced revenue after the start of commercial operations, may not be adequate to compensate investors for overall project risk.

The RAB model strives to address these challenges, but will require a large, complex process to develop and agree arrangements that satisfy all parties involved and protect the public interest. A new regulatory body must be established undertake the critical tasks of monitoring and managing the RAB model.

Depending on the details and implementation of the RAB model, a regulated NPP developer/owner could get a fair return on and of its NPP capital investment and get recovery of

NPP generating costs. The ratepayers (i.e. customers of the regulated utility) could bear completion risk within agreed parameters.[2]

However, addressing the risk of cost overruns and project cancellation would be extremely challenging. If coverage of this risk is not provided for NPP developers and their supply chain, then the fundamental problem is not resolved. If coverage of this risk is included with few limitations, the public could be at risk for because of incompetent or negligent NPP project developers.

III. RAB Model Discussion

As a general matter, we see the RAB model as a way for the Government to address NPP project challenges and deliver the desired level of new NPP investment, with some severe limits.

A. Why stop with RAB?

NECG understands the need for Great Britain to switch the approach to providing incentives for new NPP investment, given the limits of the CfD approach. In the NECG submission to the BEIS Inquiry on Financing Energy Infrastructure[3], we outlined a range of options including regulated asset approaches.

If Great Britain is willing to seriously consider the RAB model for a few new NPP investment, it is one small step further to consider a more direct Government role in new NPP projects. A simpler, more efficient, faster, more certain, and more flexible approach might involve the creation of a new "National New NPP Development Crown Corporation."

This new entity would act as an owner or funder of new NPP projects from inception to commercial operation, with NPP project risks and benefits during development and construction remaining with HMG. This new NPP Crown Corporation could allow the Government to optimize the new NPP fleet build programme (i.e., sites, timing, amount of capacity, resources, lessons learned); could reduce capital costs significantly; and would provide the Government with a great deal of leverage. Once completed, the ready-to-operate NPP projects could be auctioned to market.

This approach could also incorporate several market features, including:

- Competition from programme managers, vendors, technologies, and developers/builders to provide NPP equipment and services to the Crown Corporation;

- Competition for funding, with credit support from the Government; and

[2] This would be determined and monitored through *ex ante* agreements with, and *ex post* reviews by, the economic regulator that oversees the NPP (e.g., "prudency" reviews by US state-based economic regulators).

[3] See https://nuclear-economics.com/2019-04-02-necg-submission-to-uk-inquiry-financing-energy-infrastructure/

- The auction of completed and operational NPP projects to private investors, with suitable revenue support (CfD, RAB, PPAs or Critical Infrastructure Contracts, or other); and

- Revenue support measures developed at market conditions at the time of the auction, rather than 5 to 10 years earlier.

The RAB model should be benchmarked against such a Crown Corporation approach.

B. What is the objective for British nuclear power industry?

The RAB model should consider the objectives for the nuclear power industry in Great Britain.

- **A few new NPPs** - If the Government is satisfied with one or two additional new NPP and is not concerned if these new NPPs are developed and owned by SOEs, the current CfD approach and the proposed RAB Model may both be feasible options. In either approach, we expect that a separate agreement for each new NPP project between the Government and foreign government owner would be negotiated. The RAB model might lead to lower electricity rates than the CfD approach, depending on details of the commercial arrangements negotiated.

- **A new commercial NPP fleet** - If the Government seeks competition, new investors, less political intervention, a new nuclear power industry, and potentially more than one or two new SOE-owned NPPs, then a new approach must provide long-term resolution of key issues.

  Any new NPP investor will want assurance about revenue risk. Both the CfD approach and the RAB model can do this, but the RAB model may do so at lower cost and with greater flexibility than the CfD approach.

  New NPP investors will also want help managing completion risk. The RAB model helps with this, but depends on how risk is assigned. Key issues include what costs are included in regulatory arrangement (i.e., development costs prior to Financial Investment Decision, project implementation costs prior to start of nuclear construction, construction costs thru commercial operation date, or other) and how risk/liability for poor performance or NPP project non-completion are allocated.

In our opinion, a new RAB model for nuclear power will be too difficult and complex to form the basis for a long-term nuclear industry and will only lead to one or two negotiated RAB model NPP projects.

A Crown Corporation approach would be a more straight-forward approach to delivering new NPP capacity.

C. Will the RAB model work?

Developing and implementing the RAB model for new NPP investment in Great Britain will require a lot of work, take a long time, will face political and public opposition, and most importantly, it may not deliver the desired level and type of new NPP investment. The regulated nuclear utility approach in the U.S. also faces challenges, despite decades of successful experience in delivering new NPP investment.

Developing and implementing a RAB model that is balanced and meets the various stakeholders' objectives (including consumers and NPP investors) will be a substantial task. This process may be more difficult due to the complexity of the RAB model.

Further, it is unclear who would make new NPP investment in Great Britain under a RAB model. The British RAB approach appears to assume that new entities will come forward to develop new NPP projects.

In concept, the Horizon and NuGeneration projects might have moved forward under a RAB model, but the corporate transformation issues (i.e., nuclear industrial companies striving to become NPP developers, NPP EPC vendors, NPP long-term investors, and NPP Operators) added to the already large challenges faced by any new NPP project.

If the British RAB approach is aimed at U.S. regulated nuclear utilities (e.g., Exelon, Duke, Entergy), a closer focus on how to encourage these companies to invest in new British NPPs should be considered. Most of the U.S. existing and operational NPPs, and the one NPP now under construction, are regulated utility investments.

An RAB model negotiated with a relatively small number of new NPP investment projects raises issues about whether the time and work to develop and implement the RAB model can be justified.

If the British RAB model only delivers more SOE nuclear project developers, it may be easier to achieve this with other approaches (i.e., the CfD approach).

D. Long-term stable approach needed

Any approach to delivering new NPP investment in Great Britain, including the RAB model must provide a way for the NPP developer to address completion risk and revenue risk.

Completion risk can be addressed through the RAB model, if properly structured, or by more direct involvement by the Government in the NPP project during development and construction.

Revenue risk can be addressed through a long term, stable revenue stream that is known early in the NPP development process (i.e., before development starts and certainly before the NPP investment decision) even if the revenue will not be received until after the NPP is completed and placed into commercial operation. The revenue must be assured by a creditworthy counterparty.

In the BEIS Consultation web site, there is a suggestion that the RAB model might be used to help "finance future new nuclear projects, alongside the existing CfD model." This suggests that NPP project revenue after commercial operation would be composed of at least two different sources of revenue with different approaches – the RAB return payments based on capital investment and CfD payments linked to electricity market prices and sales. This will increase the complexity of the arrangements both for the Government and related entities (i.e., regulators) and for the NPP developer, as both streams of revenue must be assessed to support an NPP financial investment decision.

NPP developers and owners will be focused on returns over the initial decades of operation, but also concerned about revenue and returns for the entire NPP operating life, including potential for life extensions. Electricity markets may allow the NPP to shift to more reliance on market revenue after some initial period (i.e., after debt repayment). However, as the experience with U.S. merchant nuclear plants has shown, electricity market revenue alone may not cover cash generating costs, especially in a future, more volatile, decentralized market environment.

E. Sharing Completion Risk

One large issue for any new NPP is completion risk; this is the risk that the NPP will take longer than planned and/or will cost more than planned. The situation in the nuclear power industry has shown that this risk is real and large.

The RAB model has a process of sharing completion risk. The approach suggests that an NPP developer may have made a financial investment decision, started construction, and experienced cost overruns and/or schedule delays ***before*** having a clear view of how much, if any of the increases in capital cost will be recovered in regulated returns. Also, this NPP developer may face the situation where regulatory returns are only available if the NPP project is completed, even if completion means a loss for the NPP developer.

The RAB model must include a process to reach an agreement between the NPP developer and the economic regulator in the event of NPP project cost overruns or delays to either:

- Proceed with the NPP project with an agreed increase in regulated asset recovery amounts; or

- Abandon the NPP project with recovery of the amounts spent to date.

F. Construction Work in Progress

RAB proposed to lower the financial risk to NPP project developers by allowing recovery of returns on amounts invested during the construction process. There is a track record in Great Britain and in some U.S. states (e.g., Georgia) that this will lower financing costs due to better rates and avoidance of accrued Interest during Construction that would otherwise build up during the construction process.

However, in the context of British electricity market and nuclear new build timelines there may be tax and accounting issues that could offset some of these benefits (e.g., accrued revenues during construction may be treated as corporate liabilities / debt).

G. NPP project development costs are an important issue

The costs incurred by an NPP developer include development costs (e.g., design, licensing, site preparation, engineering, and other activities leading up to a financial investment decision and the start of NPP construction). The total NPP asset value subject to regulatory treatment should include these costs.

The problem is that some or all these development costs must be incurred to have a clear view of NPP project economics, to enter into an agreement for RAB or other incentives (e.g., CfD approach), and to support a financial investment decision. In some instances, the NPP developer may decide not to proceed after making a significant investment in these development costs.

If these development costs are only recovered if the NPP is completed and placed into operation, this will make the NPP development process riskier and more uncertain for developers.

Great Britain should consider if and how the RAB model could provide a means for NPP developers might recover these costs if they do not go forward to complete the NPP. This would increase the potential that real NPP projects will proceed to a successful financial investment decision. For example, some U.S. States have an approach to allow regulated utilities to incur and recover in rates the cost of developing a nuclear power option, including, in some instances, the cost of obtaining an NRC license.

On the other hand, if this approach is too generous, it could lead to less well-prepared developers moving forward, with resultant difficulties during project implementation.

H. RAB model should be simple and linked to other programmes

Some have noted that the CFD approach included long, complicated, and difficult to understand documentation and agreements. The RAB model appears even more complex than the CfD approach.

The RAB model and its implementation should not be done in isolation, but should include other financial support and risk reduction measures. Presumably the discussions concerning the Horizon project about how HMG could aid in the overall financing and the ideas in those discussions (e.g., a Loan Guarantee Programme) may be useful.

I. U.S. regulated nuclear may provide useful lessons

The British RAB approach has had its main applications in the privatization of Government entities, with an administrative determination of regulated assets based on issues other than actual capital investments in the regulated companies.

There is a long and rich history of U.S. regulated nuclear investment. The U.S. experience is centred on regulated monopoly utilities that invest in NPPs as a part of the generation portfolio they need to meet customer demand, different from the standalone NPP projects anticipated in Great Britain.

The U.S. experience covers multiple states, each with a different approach and different economic regulator. The U.S. experience has included NPP projects with cost overruns and schedule delays and economic regulator responses that include prudence reviews and disallowances. In a response to earlier NPP issues, some states implemented processes to limit regulatory uncertainty for both NPP developers and economic regulators (e.g., Integrated Resource Planning processes and nuclear option allowances).

The U.S. regulated utility approach has a century of experience covering investment in many completed NPPs and many more NPP projects that were abandoned prior to completion. The U.S. utility regulatory approach has a solid legal basis, with decisions in multiple legal cases over many decades providing guidance and limits. Great Britain has less experience with the RAB model and no experience with new NPPs developed as regulated assets.

IV. Conclusion

The British RAB model may work to deliver new NPP investment. However, the RAB model presents significant uncertainty to NPP developers, may not be fully developed and implemented for some time, and may not be attractive to NPP developers, investors, and lenders. Also, the RAB model will need to be combined with other NPP project financial support and risk reduction measures.

Great Britain should also consider other simpler and faster approaches, such as setting up a new Crown Corporation to invest in new NPPs.

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