# Response ID ANON-XTS2-Y4BH-8

Submitted to **Consultation on a Regulated Asset Base (RAB) Model for Nuclear**
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## About you

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### Are you happy for your response to be published?

Yes

### Would you like to be contacted when the consultation response is published?

Yes

### (optional) How did you hear about this consultation?

**Where did you hear of this consultation?:**
GOV.UK alert

**Other (please specify):**

## A RAB model for nuclear projects

### 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?

Yes

**Please explain your reasoning here:**
Yes, this model balances the risks between different stakeholders and therefore could raise capital to build new nuclear facilities. Projects in other sectors have utilised the RAB model, for example, the Thames Tideway project. The cost of finance was lower than expected. Initially it was estimated in 2011 that the impact of the project would be between £70 and £80 on annual household bills. This figure would reach a peak of £20 to £25 (in 2016-2017 prices). This demonstrates a minimal impact upon consumers and taxpayers, while delivering value for money. However, project cost estimations have varied significantly between 2006 and 2009. Therefore, effective risk and project management is crucial to the success of the RAB model, especially in the case of nuclear new builds [1].

The scale and duration of the investment will be a challenge. This is because new nuclear facilities are complex single asset constructions with significant up-front capital expenditure, long construction periods and a long asset life. The public funding at low interest rates is advantageous for the next decade with sovereign funds interested in secure cash/revenue generating investments. It is proposed that the extent of national Government borrowing for large electrical generating plants will interest sovereign funds that can negotiate with the UK Government and also have equity participation or loan participation in consortia funding of specific projects or programmes.

Risks:

The RAB model considers the risks and stakeholder interests across the full lifecycle. However, risks should be evaluated with respect to the “cost” and “financial returns” required by the project throughout stages in the lifecycle. A holistic risk (owner/operator) management approach needs to be undertaken to improve the financial returns for all stakeholders. Possible sources of risk are summarised in the following points.

• Health, safety and environmental challenges (including zero carbon 2050).
• Design: suitability (selection of appropriate technology vs risk), quality control and culture, development and commercialisation of disruptive technology. Reducing costs whilst maintaining safety provisions and with respect to enhancing legislative requirements.
• Construction: health, safety and environmental considerations, quality and schedule.
• Operations: availability of fuels, performance, reliability and stability (continuity of supply including feed stocks).
• Job creation and retention of knowledge development.

• Misaligned stakeholder interests [2]
• Poor communication along the supply chain [2]

Increasing the number of investors will spread the financial risk and reduce the influence a single investor could wield. However, developing and maintaining a diverse number of investors over decades would present significant challenges. Legal agreements would be required as the investors will have different priorities.

Economic Regulator and Cost Settlement:

A licence is awarded to the company by the economic regulator, the price which the company can charge is independently regulated and assessed. Although, the mechanism and frequency are not defined. This provides an advantage over the previous CfD system as the price can change over time in line with other market forces. However, the lack of stability in the price may deter investment unless lower limits are agreed.

The cost of capital significantly impacts the “total financing costs”. Stage gate payments reduce exposure and finance risk during the design, construction and commissioning phases and confirms the requirements are achieved. This approach also reduces the financial burden on the suppliers and ensuring responsibility (point 41b) and delivery remains under the control of the “selected” contractor. This reduces the opportunity to transfer risk downstream and divides the work into sustainable and manageable work packages. Other approaches are available which carry the following risks.

• Security of supply (national / international).
• Geopolitical.
• Reliability and suitability of “new” technologies (Carbon capture, usage and storage).
• Accessibility of appropriate carbon storage facilities (Not in My Backyard Phenomenon (NIMBY)) will impact local political priorities.

Nuclear RAB Assessment Process:

Assessment criteria need to be carefully considered to ensure that optimal solutions are selected and implemented (point 70). Clear assessment and tendering processes reduce the risk of legal action challenging the selection criteria. Each element of the fuel processing and manufacturing, plant construction, operation and decommissioning stages needs its specific criteria to align with the extent of competition and national interests.

Other points:

It is doubtful the RAB model alone can raise sufficient capital if this includes meeting the future costs of decommissioning as now understood from legacy decommissioning. This element of the nuclear cycle is better addressed separately, as are the fuel production and reprocessing elements. This is because these elements require comparable scales of investments for the plants, operations and upkeep of processing and storage/depository facilities.

The current Hinkley C investment that has been underwritten by foreign Governments and initiated under a contract for difference is not considered to be value for money as construction time and costs increase and this is without the associated costs of fuel production and future decommissioning. There is a national necessity for baseload electrical generation and the nuclear and gas capacities will need to be larger than current capacities. To construct and operate sufficient plants to meet future demands, requires the creation of similar arrangements to Hinkley C currently suggesting a RAB model needs to be structured to provide similar guarantees to those for Hinkley C.

References:

[1] National Audit Office (2017) Review of the Thames Tideway Tunnel. Available online: https://www.nao.org.uk/wp-content/uploads/2017/03/Review-of-the-Thames-Tideway-Tunnel.pdf [Accessed 02/10/2019].
[2] World Nuclear Association (2018) Lesson-learning in nuclear construction projects. Available online: https://world-nuclear.org/getattachment/e9c28f2a-a335-48a8-aa4f-525471a6795a/REPORT-Lesson-learning-in-Nuclear-Construction.pdf.aspx [Accessed 03/10/2019].

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

**Please provide your comments here:**
The entire lifecycle of the plant needs to be carefully considered. This is to ensure that the potential costs of decommissioning/ end of life are priced into the RAB model. It was found that estimated decommissioning costs for a nuclear power plant in Finland increased by 20% between 2003 and 2008 [1]. The risks attributed to decommissioning and the associated costs and must not be excessively passed to the taxpayer or consumer. It is suggested that having a separate model for this, rather than implementation into the RAB model, will be more suitable.

To help to mitigate risk, standardisation of materials and construction across multiple plants would be beneficial; both at the point of construction and at of point of decommissioning. Further to this, the allocation of large nuclear plants could include a maximum number of designs, for example, three types at most. The legacy mistake was that all types of rods used for Magnox units complicated the processing and decommissioning. Furthermore, the life span of boilers and resulting equipment changes are an issue; especially in later life periods. Therefore, steam side standardisation must be defined. Finally, as there are a number of ageing phases during the lifetime of operation, as noted with Magnox power generation plants, each ageing phase must be recognised as carrying different depreciation and maintenance/renewal costs. There needs to be an acceptance that ownerships and interests change during the lifetime. This is seen with Channel Tunnel and the remaining UK legacy nuclear plants.

Additional Comments:

• ERR specifically identifies the construction and operation function for RAB payment which makes sense. It is assumed that all additional overheads (regulatory compliance, research and development, commissioning etc.) are funded from these allocations.
• The decommissioning programme is contained within the “allowed revenue”. The transference of “operational” waste liability which might only become accessible during the decommissioning phase should be evaluated.
• Item 26 identified a pragmatic protection system for low probability but high impact risk events. There is the need to limit the loss risks of the investors from catastrophic accidents/incidents. (Three Mile Island and Chernobyl type incident protections)
• What happens if a supplier is experiencing serious financial hardship? Recent financial support from the UK Government would not inspire confidence (British Steel, Thomas Cook, Carillion).
• Incentive should be provided for exceeding key design requirements, for example, extending lifetime, demonstrating enhanced capability and generation capacity, base load availability/reliability. Ex post (current market price, minus the price the investor paid) cost settlement through transparent costs and charges reporting.
• Ex-ante could more resilient to ‘scope creep’ than the ex-post cost model. This is because a target is set for the total cost of construction from the outset, compared to a periodical review of cost. The result of this would be a reduced risk of overspending.

References:

[1] OECD (2016) Costs of decommissioning nuclear power plants. Available online: https://www.oecd-nea.org/ndd/pubs/2016/7201-costs-decom-npp.pdf [Accessed 08/10/2019].

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

**Please provide your comments here:**
Diversity of power generation is important to ensure continuity of supply in all circumstances. Nuclear should form part of this diversity, as investment in Nuclear also offers consumers protection from other factors such as insecurity of supply of gas for generation by Gas + CCUS plants. There is little insecurity in the next 50 years because of the diversity of supplies currently available. Although, electricity interconnectors are an insecurity risk as the French nuclear programme is ageing. Gas enables RAB to succeed in its’ base load variation, therefore it’s better to not see Gas as a victim of RAB. Gas will continue to be competitive, even in long term future use. The use of gas to generate electricity is required in order to offset the increasing loss of legacy nuclear. It is better to view gas (with or without CC) on its merits. Nuclear is mainly unviable when the UK is short of on and off national balance sheet investments. A lack of diverse investments will result in an insufficient spread of risk along the UK’s of portfolio investments. As a result, the large risk attributed to the development of nuclear will result in investment seeming less attractive. Diversification of investment appetites are therefore required.

Renewable power may have the potential to offer a lower cost per KWh at the point of generation, but the technology possesses an inherent variability in generation. Renewable power would not be able to meet total energy requirements for all periods during the day. The cost of storage would reduce the cost advantage demonstrated. However, renewable power is still a valid contributor to the overall energy mix and will enhance energy security as whole.

Cost:

The resultant cost to the consumer is comprised of:

• Capital cost (including risk and profit)
• Operating cost
• Decommissioning fund payment

The RAB model (points 40 – 48) indicates methods by which construction cost overruns could be managed. These methods also ensure that the supply chain is incentivised to remain effective and efficient without discouraging engagement. The “construction” cost is effectively a summation of all contracts and overheads. The quality, efficiency and cost (fixed or variable) contained within each contract are impacted by the initial tender package. The quality of the tender return is affected by the scope, clarity of the requirements, “achievability”, duration the tender is in the market, supplier margin and reputation of the customer. Early and sustained engagement with the supply chain can improve the quality and number of the responses and improve the accuracy of the initial estimate. The communication of accurate estimates (cost and schedule) are required to provide confidence to the end customer that the process is being efficiently managed with minimal changes in strategy. The operating costs are impacted by reliability, consumable costs, waste costs and staff. Efficient management of these factors will minimise the impact on consumers. Additionally, the decommissioning fund built during construction and operation reduces the long-term liability, protecting future consumers.

The economic return of new nuclear builds is determined by the cost of alternative generators. The cost (resultant charges) of alternative generators are governed by market forces (supply and demand). Consumers expect uninterrupted supplies, which have been provided through diversity. However, as the mix of technologies used for power generation change, the risk of interruption increases. Power demand is expected to grow due to the transition away from natural gas and hydrocarbons for domestic heating and transport respectively. The cost to the consumer may be “tempered” by the regulator (Ofgem) and political pressure, however the true cost will be funded through taxation.

Project Quality:

Government contracts exceeding €200k are managed by the OJEU process which mitigates numerous risks (including legal challenges) but does not mandate a minimum quality level. For example, a tender was rushed (Procurement of Additional Ferry Capacity) and subsequent legal challenges included an out of court settlement to Eurotunnel for £33 million [1]. The stability, efficiency and productivity of the project management team (overheads) is dependent on applicable knowledge, experience and continuity. Continued engagement with the regulators and operators, paired with the formation of a consistent approach, is required to

manage expectations (quality, cost and schedule).

Other points:

There needs to be more confidence by investors in the ability of the UK to manage and deliver the electricity generation construction and operations programme as was achieved by the CEGB for over 40 year previously, with funding based on Government guaranteed public sector investments with the fuel production and reprocessing facilities and the decommissioning and long-term waste storage being funded as Government owned organisations. The investor's need to know what the Government is committed to provide.

Consumer interests are for lower priced electricity especially as the era of electrically powered road transport emerges. There has not been a policy to oversupply electricity at a subsidy but as a result manufacturing and process industries have declined in the UK. The excess capacity of the generation of electricity can stimulate the growth in the UK economy if the Government policy is changed to supply electrical energy very competitively.

The Government is required to have a long-term stable electricity generation policy, free from political interferences to succeed in protecting consumer interests and investor interests. The Government also needs to accept that there are limitations and will be gaps between demand and supply from solar and wind generation and that the base loads and peaks will require nuclear and gas generation to address grid stability and national generating extreme demands. This argument is highly re-enforced in the book "Sustainability without the hot air", highlighting limitations of renewable technologies and the current requirements in the UK [2].

References:

[1] Calder., S. (2019) Brexit: Chris Grayling criticised for wasting tens of millions on 'rushed and risky' no-deal ferry planning. Available online: https://www.independent.co.uk/news/uk/politics/brexit-grayling-public-accounts-committee-ferry-procurement-dft-a8997446.html [Accessed 02/10/2019].
[2] MacKay D. (2009) Sustainable energy--without the hot air. Cambridge, England: UIT.

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### 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?

Yes

**Please explain your reasoning here:**
Yes, but consumers need to be informed to understand the risk that they are taking on in exchange for the lower cost of energy initially. It is not proven that there is a lower cost of energy, when the current prices are too high for most residential consumers and businesses. Moreover, the nation does not have a credible delivery organisation for the RAB nuclear plants. A version of the CEGB (Central Electricity Generating Board) must be created to enable long period large nuclear projects to be delivered and operated. Currently, this is an under resourced and under debated area of the RAB application. For less complex RABs, there are stable delivery clients. However, this is not the case for large gas plant and certainly not the case for large nuclear plants. As reported by Cockburn, Sellafield's decommissioning operation was running significantly overbudget by approximately £1bn at the time of writing [1]. It is therefore clear that consumers must be told what uncertainties there are or are likely to be. Every single large infrastructure project, only news is overcost or overbudget, overschedule.

As RAB becomes more widely used then its implications on consumers will be better understood. The spread of risk across a portfolio of RAB funded projects in different sectors will help to mitigate risks to consumers, although it may by important to distinguish between the differences in risk. RAB is not a rudimentary method as different levels of complexity and costs of mistakes create spikes in risk. See recent nuclear plant bankruptcies in the USA and generator liabilities. The Chinese design may, for example, carry more loss risks than a Sizewell version of the Hinkley "European Pressurised Water Reactor".

References:

[1] Cockburn, H. (2018) Sellafield nuclear decommissioning work significantly delayed and nearly £1bn over budget report reveals. Available online: https://www.independent.co.uk/environment/sellafield-nuclear-power-plant-decommission-overspend-delays-budget-report-a8609671.html [Accessed 08/10/2019].

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## Revenue stream

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

**Please provide your comments here:**
The model given in the consultation document fundamentally seems to balance the risk between the different stakeholders in an equitable way. Except where operations are separated from fuel processing and decommissioning there is not a revenue stream available to provide the return on investment required by investors. This is demonstrated by the low appetite for the UK nuclear projects in the past 3 years. However, when extreme financial hazards and time hazards arise, revenue streams may not be able to cover the quantity of capital required for the rescue of a power generator. Examples such as Thomas Cook, Carillion and Keir come to mind. Construction and manufacturing require inward flows of money and they do not have the provision for losses.

Furthremore, selling low grade steam to nearby district heating networks or large processes (depending on the quantity of steam produced) will result in the

generation of additional revenue. This is largely a consequence of the increased thermodynamic efficiency of the overall system. A balance between demand from domestic users and what goes out to the environment (ie.cooling) should be achieved. This will also lead to the decarbonisation of district heating creating an additional stream of revenue.

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## Nuclear RAB assessment process

### 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?

**Please provide your comments here:**
The consultation document picked up the major points for assessment – the detail of how each of these components is balanced will be crucial to achieving the desired outcome. Currently there does not appear to be sufficient clarity or a specific focus on nuclear power plants, fuel production/reprocessing and decommissioning to separate out these areas with their own funding and justifications. Keeping these elements in a single RAB distorts the application to power generation. There are limitations to the proposition that there is a market for nuclear electrical power generation plants, as the basis of its previous existence was to meet a national security and defence policy. The global sectors for nuclear electrical power generation require distortion of their market economics. The significant nuclear fuel processing (France) and nuclear facility decommissioning (UK and Japan) demonstrate the need for national funding alongside third-party investment.

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