Nuclear Industry Association Response to the Energy Security and Net Zero Committee's 'Keeping the power on: our future energy technology mix' Inquiry.

The Nuclear Industry Association (NIA) welcomes the chance to respond to the Energy Security and Net Zero Committee's 'Keeping the power on: our future energy technology mix' inquiry.

The NIA is the trade association and representative body for the civil nuclear industry in the UK. We represent around 270 companies operating across all aspects of the nuclear fuel cycle.

Due to the diversity of our membership, our views in this submission will cover high-level, industry-wide matters. Our members may choose to make their own detailed submissions.

Executive Summary

Nuclear is essential to the UK's future energy technology mix because it is the only single technology that can provide clean, firm, and sovereign electricity. Since electric vehicles, heat pumps, electric arc furnaces and other low-carbon innovations will need more power, the minimum level of grid demand, or "baseload", will continue to rise. Nuclear is the best way to meet this demand. Currently, falling baseload generation in our electricity system is driving up wholesale prices to extraordinary levels, which has increased consumer bills.

Nuclear is also undeniably a green technology. Analysis conducted by the United Nations Economic Commission for Europe confirms that nuclear has the lowest lifecycle CO2 emissions, the lowest land footprint, and the lowest impact on ecosystem of any electricity source.[1]

Looking to the future, nuclear is our only source of clean *heat* proven at scale. We will need clean heat from advanced, high-temperature reactors to provide solutions for industries that currently rely on burning fossil fuels to reach the temperatures they need.

Given these powerful attributes, and the UK's drive to achieve energy security and net zero together, nuclear is an essential part of a robust clean-energy mix. The Government's ambition to deploy at least 24 GW of nuclear is the right one, although much more nuclear than that is likely to be needed.

To achieve this goal, the Government with Great British Nuclear will have to work closely with the nuclear industry to plan a programme of new nuclear projects. Since the nuclear sector is highly regulated and capital intensive, it is most successful when there is strong sponsorship and direction from Government with appropriate support and risk-sharing for specific projects.

1. **Is the energy sector open enough to new generation technology?**
   i. The UK should try to match the speed with which other advanced economies are embracing the next generation of nuclear technologies. Canada, for instance, is already beginning initial site works for the first commercial Small Modular Reactor (SMR), and the United States has committed more than $4 billion to help fund construction of three separate advanced nuclear demonstrator reactors.
   ii. The Great British Nuclear Small Modular Reactor selection is a very welcome step for the UK to catch up with international competitors. The favoured technologies should be chosen this autumn, and the Government should aim to finalise funding awards by the spring of 2024 to get projects moving as quickly as possible.
   iii. It is also critical that the UK keep companies interested in deploying their technologies here who are not selected by Great British Nuclear in the current process. We believe that

[1]United Nations Economic Commission for Europe (2022), *Carbon Neutrality in the UNECE Region: Integrated Life-cycle Assessment of Electricity Sources*. Available at: https://unece.org/sites/default/files/202208/LCA_0708_correction.pdf. Accessed: 25 August 2023.

there are important changes that need be made to ensure that the companies remain interested in the UK and the energy sector remains open to new generation technology.

iv. The Government should use the consultation on advanced nuclear technologies to clarify the "route to market" for technologies not selected by GBN, including streamlining regulatory, planning, and consenting processes.

v. The Government should consult the industry and investor community to inform the development of appropriate business models to finance advanced reactors, and should provide clarity on what funding models, such as the Contract for Difference (CfD) or Regulated Asset Base (RAB) model are open to developers, and what steps developers need to take to qualify to begin negotiations on these funding models with Government.

vi. We understand that a new EN-7 to include advanced nuclear technologies is in development, and rapid consultation on this should be a key priority for Government to encourage new generation technology.

vii. As part of this, the Government should adopt a new siting approach for new generation technologies based on developers showing that their chosen sites meet a set of published criteria, rather than developers having to choose from a set list of specific sites identified in Strategic Siting Assessments (SSAs). Prescriptive lists will not provide the necessary speed or flexibility to facilitate the required deployment of advanced nuclear technologies.

2. Does the Government sufficiently support development of innovative energy infrastructure?

i. Designating the improvement of the planning system and energy infrastructure a strategic priority will enable the development of new low carbon energy projects at the pace required to ramp up our energy provisions without relying on importing energy from sovereign sources to meet our domestic needs.

3. Is the Governments plan for energy security sufficiently long term?

i. Programme Clarity

a) The current one-by-one approach that has been taken to deploying new nuclear is not enough to meet the Government's aim for deploying 24 GW of nuclear capacity by 2050.

b) DESNZ should use its Nuclear Roadmap, promised for autumn 2023, to set out a substantial and specific programme of nuclear new build to meet the commitments outlined in the Government's British Energy Security Strategy (BESS). This should include a roadmap of the specific projects on specific sites needed to reach 24 GW, the preferred funding and financing arrangements, the powers of GBN, and the route to market for technologies that are not selected by GBN.

c) It is now too late to fill the gap that will be created by the long-planned and expected retirement of the existing Advanced Gas-Cooled Reactor (AGR) plants by 2028. Eight reactors, representing 4.7 GW of capacity will retire, and Hinkley Point C will only replace 3.2 GW of that loss. This decline of domestic, low carbon emitting sources of baseload power will create upward pressure on prices, slow our progress in emissions reductions, and increase our demand for imported fossil fuels.

d) Nuclear generation will drop imminently, and it will stay low unless we invest urgently in new capacity. Building 3.2 GW of capacity at Sizewell C is essential to restore lost baseload power. However, even with Sizewell C, the UK will only have the same amount of nuclear capacity that it had in October 2021, and well below its peak of 12.9 GW in the late 1990s.

e) Building new fleets of nuclear reactors beyond Sizewell C is therefore urgently needed to close this gap as soon as possible, meet the needs of a growing grid, and mitigate similar events such as the recent energy crisis, making the UK less reliant on imported energy from foreign sources.

- Our own analysis found that if the UK committed to building two large scale nuclear stations at Wylfa and Sizewell, along with a fleet of SMRs, it could replace more than 10bn cubic metres of gas imports.

ii. Financing

a) It is of the upmost importance that the Government ensures Sizewell C reaches Final Investment Decision in 2024, as this project is essential to the vitality of the UK supply chain, the future of the nuclear industry in the UK and securing energy security. A speedy decision will ensure a more efficient transfer of the skilled workforce from Hinkley Point C to Sizewell C to capture the benefits of replication.
b) The financing of new gigawatt-scale plants from the private sector alone without risk sharing from the public sector has been challenging because of the capital intensity and length of nuclear construction. The cost of capital for Hinkley Point C, which has no public sector risk sharing during construction, accounts for approximately 2/3 of the £92.50/MWh strike price.
c) The Government has rightly prioritised reducing the cost of financing at Sizewell C by introducing the Regulated Asset Base (RAB) funding model and taking an equity stake in the project. These are both crucial to increasing investor confidence.
    - This model cuts the cost of capital, which substantially cuts the ultimate price of electricity paid by the consumer. The nuclear industry has found that a 1% reduction in the upfront cost would reduce the cost to the consumers by £8-9/MWh.
d) The Government should thus establish the RAB model as the preferred funding model for future gigawatt scale projects, and a Government "cornerstone" equity stake should also be the standard position where it is welcomed by private sector participants in projects.
e) To stimulate investment in nuclear, the Government should pursue a level playing field for all low-carbon technologies in the drafting of the UK Taxonomy and review the exclusion of nuclear from the Green Financing Framework.
    - The finance sector looks to Governments for assurance on which low-carbon technologies are a safe investment for them. Therefore, the inclusion of nuclear power in the UK Taxonomy, and Green Financing Framework, would be a significant indication that nuclear power is a good investment.
    - Without investment, these projects cannot be built, and the UK will not meet its energy security goals.
    - It is also important to note that projects financed under green bonds can be done so at a slightly lower yield than standard debt. As noted above, the cost of capital has a very substantial effect on the ultimate price of electricity paid by the consumer.

iii. Planning and Siting

a) Planning consent for nuclear projects must accelerate dramatically if the UK is to meet its ambition for nuclear to provide 25% of its electricity supply from 24 GW of capacity that the Government set out in its British Energy Security Strategy.
    - NIA analysis indicates that the speed of planning consent must rise approximately 50% from 0.4 GW/year from 2008 to 2023 to 0.6 GW/year between 2023 and 2050 to reach this goal. From 2008 to 2023, 6.4 GW of nuclear capacity received planning consent, however, an additional 16.4 GW must receive consent before 2050 to reach our 24 GW goal.
b) The Government should impose a Net Zero Duty on the Planning Inspectorate and all relevant regulators to ensure that decisions are proportionate to the urgent need for low-carbon generation, including from nuclear power, as identified by the Government.
c) A study on potential GW-scale sites in England and Wales should be undertaken as a matter of urgency, to enable new build projects.
d) We strongly recommend the designation of nuclear as a Critical National Priority in the forthcoming National Policy Statement. This should increase the likelihood of consent being granted and provide increased certainty with which project developers can raise development finance.

iv. Skills

a) The leadership of Great British Nuclear has estimated that a 24 GW programme will require 250,000 people, yet there are only 70,000 people in the civil nuclear workforce today. The Nuclear Skills Taskforce should produce a workforce plan from now to 2050 integrating the civil nuclear construction pipeline with the nuclear submarine construction programme. This integration is essential to maximise supply chain activation and efficiency and minimise the poaching of skilled people within the industry.

v. Regulatory Resources

a) Nuclear project planning applications (Development Consent Orders) are likely to increase because of the need to meet the 24 GW target and because of the smaller size of individual projects as SMRs are introduced. This will likely place a significant amount of pressure on the resources of the Planning Inspectorate. Appropriate levels of resources are thus vital to deal with future pressures.

b) Recruitment and retention of regulatory resources are already under pressure from a range of factors, including industry demand and uncompetitive salaries. This must be addressed by Government to ensure that the regulators and decisionmakers can meet the demands of new nuclear projects.

4. What current technologies could usefully be deployed at scale to deliver better energy security in the UK?

i. <u>Gigawatt-scale Nuclear</u>

a) Large-scale reactors, as well as SMRs, will be required to meet the 24 GW target set by Government and ensure energy security in the UK.

b) Large scale reactors are proven, reliable technology that produce huge amounts of power with limited land use. For example, Hinkley Point C will power six million homes from less than a quarter of a square mile.

c) These power plants can be built in good time and competitively, helping the UK to secure energy security. France and Korea have illustrated that it is possible to build large-scale reactors in less than seven years per unit, when a rigorous fleet mentality is applied to nuclear construction.

d) All Western large-scale reactor designs have reached commercial operation in the last year: the EPR at Olkiluoto in Finland, the AP1000 in Georgia in the USA, and the Korean APR-1400s at Barakah in the UAE and Shin Hanul in South Korea. Western large-scale nuclear has had its best year in two decades, and the UK should take advantage of the project expertise, construction experience, and supply chain activation created to pursue further large-scale nuclear after Sizewell C.

e) Replicating reactor designs, utilising an existing supply chain, and keeping workers within the sector will reduce costs and build new reactors more efficiently.

ii. <u>Advanced Nuclear Technologies</u>

a. SMRs will allow us to take full advantage of existing nuclear sites, many of which are too small for large-scale nuclear, but could provide valuable capacity by hosting smaller reactors.

b. SMRs can be flexible in their output, providing baseload electricity when variable technologies aren't providing high enough output. In periods of high renewable generation, SMRs can load follow by diverting to hydrogen or producing synthetic fuel for aviation and shipping. They can also be sited next to energy intensive industries to decarbonise processes and reduce the demand on the Grid.

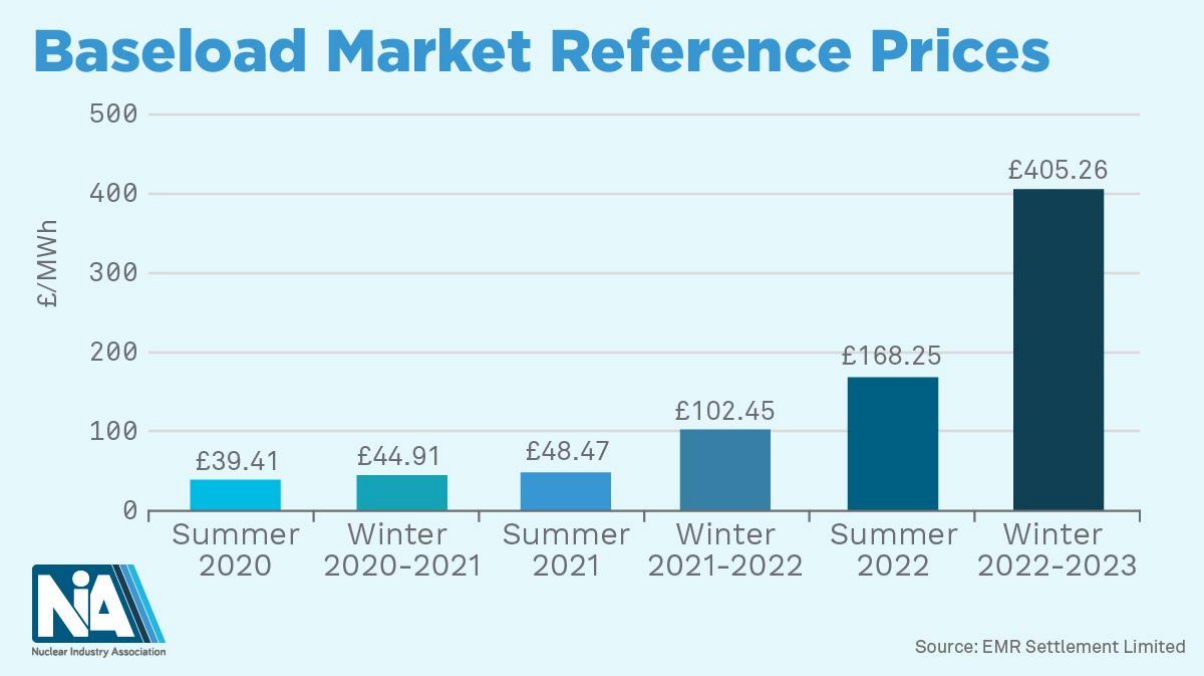
c. SMRs also promise to expand the economy by increasing exports and supporting high-value jobs across the UK.

d. AMRs, especially those operating at high temperatures, offer the immense potential for industrial decarbonisation and co-generation of heat and power. The Government should continue its support for the AMR Research, Development and Demonstration

programme and remain open to the wide range of technologies which are currently in development across the globe.

5. **Are there technologies that have not been able to develop their potential and should be abandoned?**
   i) No comment.

6. **What energy generation mix will get us to net zero the quickest in the most affordable way?**
   i. The cheapest energy system will have clean, reliable, sovereign energy provided by nuclear to complement the contribution of variable renewable sources.
   ii. The NIA sees both gigawatt-scale nuclear and advanced nuclear technologies as having a crucial role in getting the UK to net zero, providing energy security and meeting global energy needs in the future.
   iii. The cheapest and fastest way to deploy new nuclear capacity is through cheap financing, enabled by the RAB model and direct Government equity stakes in projects, and through continuous fleet deployment. The UK must build multiple units of any reactor design it chooses to capture the benefits of replication, and it must not stop building reactors to keep the supply chain active and efficient. This model is tried, tested, and proven by France and South Korea, who built cheap fleets of large-scale reactors on this basis.
      a) On New Year's Day 1980, France had 34 large-scale reactors under construction at once. It finished 6 reactors that year, all in less than 6 years' construction time.
   iv. It is also worth reflecting on the consequences of the UK not deploying more nuclear power:
      a) Nuclear capacity in the UK has fallen to 5.9 GW, the lowest level since 1975.
      b) Combined with the retirement of coal-fired units, the amount of baseload-capable generating capacity has fallen significantly.
      c) This past winter, the Baseload Market Reference Price for Winter 2022-2023 for electricity reached £405.26/MWh, nearly 10 times the normal level.
      d) Despite the fall in gas prices internationally, the Baseload Market Reference Price has been £207.07/MWh during the summer months of 2023. This is extraordinarily high.
      e) For comparison, this is nearly twice Hinkley Point C's inflation-adjusted strike price of £128/MWh, which is a First of a Kind nuclear project, the first in the UK in a generation, and the first UK nuclear project to be financed without any public sector risk sharing in the construction phase. Sizewell C will be a replica with more competitive financing and public sector risk sharing.
      f) National Grid issued more Capacity Market Notices in 2022, than it did in the previous four years.
      g) National Grid data also indicates that the carbon intensity of the UK grid has only declined about 3% in the last 3 years, far too slow to achieve the UK's decarbonisation targets.
   v. As our last coal units (about 1.5 GW) are scheduled for closure by the end of 2024, and four existing nuclear power stations (4.7 GW) retire, the shortage of our baseload electricity will become more profound. The demand for electricity is set to rise, and even though we will require more baseload power, we will have less and less, unless we start to commence new nuclear projects.



7. **Are the energy solutions universal across the UK or are there regional and local approaches on fuel and energy?**
   i. No comment.

Further Information

The NIA is happy to provide more context or any clarifications desired on the content of our response and to ask our members where appropriate for additional information that may be useful.

Please contact Lauren Rowe, Policy Analyst for the NIA, at Lauren.Rowe@niauk.org to do this.