Nuclear Industry Association Response to the Department for Energy Security and Net Zero's 'Alternative Routes to Market for New Nuclear Projects' consultation.

The Nuclear Industry Association (NIA) welcomes the chance to respond to the Department for Energy Security and Net Zero's 'Alternative Routes to Market for New Nuclear Projects' consultation.

The NIA is the trade association and representative body for the civil nuclear industry in the UK. We represent around 280 companies operating across all aspects of the nuclear fuel cycle, including the current and prospective operators of nuclear power stations, international designers, and vendors of nuclear power stations, and those engaged in decommissioning, waste management and nuclear liabilities management. Members also include nuclear equipment suppliers, engineering and construction firms, nuclear research organisations, and legal, financial and consultancy companies.

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

Executive Summary

- The NIA welcomes the Government's continued recognition of the importance of nuclear to the energy sector and the opportunity to progress policy and support frameworks for Advanced Nuclear Technologies in the 'Alternative Routes to Market for New Nuclear Projects'' consultation.
    - Advanced nuclear technologies, as well as gigawatt-scale nuclear, have a crucial role in getting the UK to net zero, providing energy security and meeting global energy needs in the future.
    - Looking to the future, nuclear is our only source of clean heat proven at scale. We need clean heat from advanced, high-temperature reactors to provide solutions for industries that are currently reliant on fossil fuels to reach the temperatures they need.
        - A quarter of industrial processes across Europe depend on high-temperature heat. This heat could be generated by advanced nuclear technologies, such as Advanced Modular Reactors (AMRs) with output temperatures in excess of 700°C.
    - Advanced nuclear technologies are also capable of supplying heat for hydrogen production and replacing fossil fuel-generated heat for industrial processes. The small size, modularity, and flexibility of AMRs and SMRs are a major benefit in deploying these low carbon energy sources.
- We encourage Government to empower and support the ONR to participate in joint design review activities with other national nuclear regulators. This presents an opportunity to reduce the burden on the ONR should a design previously licensed abroad be submitted for review in the UK.
- Government should also consider models beyond the CfD and RAB model for AMRs and SMRs, such as the Power Purchase Agreement and the Mankala model. These models may be more appropriate and effective in the application of advanced, high-temperature nuclear reactors for industrial decarbonisation.
- We would encourage Government to launch the Green Taxonomy consultation as soon as possible. The inclusion of nuclear in the forthcoming Green Taxonomy would help raise capital for new nuclear projects and help bring projects to market.
- We would encourage Government to continue to engage with industry as well as end users as advanced nuclear technologies approach deployment.

QUESTIONS

Chapter 1

1. Are there any uses for nuclear energy (beyond those in this document) that you believe government should be considering? If yes, please explain what they are.

a. We agree that there are multiple potential applications of nuclear energy beyond delivering baseload grid power that Government should consider. We encourage Government to pursue opportunities for commercial industrial decarbonisation, low-carbon heat, and hydrogen production.
   i. The World Nuclear Association (WNA)'s 'The many uses of Nuclear Energy' report details many alternative uses of nuclear energy beyond delivering baseload grid power, including for the supply of radioisotopes and medicinal purposes.[1]
   ii. The Royal Society likewise examines how the use of nuclear power could be expanded to improve the overall efficiency and energy system resilience to meet the net-zero 2050 goal in its 'Nuclear cogeneration: civil nuclear energy in a low-carbon future' policy briefing.[2]

b. Some potential new uses of nuclear energy that should be considered include:
   i. Desalination,
   ii. Carbon capture,
   iii. Maritime applications, namely Floating Nuclear Power Plants (FNPP) and nuclear propelled civil shipping,
   iv. Methanol production,
   v. Medical isotopes.

c. Nuclear energy is already being used for desalination purposes in countries such as Kazakhstan, India and Japan and there is potential for much greater use.[3] Research by the IAEA illustrates that nuclear power generated desalination is cost competitive when compared to fossil fuels.[4]
   i. According to the IAEA, "only nuclear reactors are capable of delivering the copious quantities of energy required for large-scale desalination projects" in the future.[5]

d. We recognise that several potential uses for nuclear energy mentioned above are nascent and would encourage Government to focus on creating an enabling framework which facilitates new technologies to come to market based on commercial competitiveness, end user appetite, and ability to attract financing. However, some potential uses are long proven, such as nuclear propelled civil shipping and nuclear power generated desalination, and Government should take this into consideration.

2. To what extent do you agree that advanced nuclear can be a valuable energy source when combined with a Thermal Energy Storage System or for cogeneration? Please provide an explanation for your response.

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[1]World Nuclear Association (2021), *The Many Uses of Nuclear Technology*. Available at https://www.world-nuclear.org/information-library/non-power-nuclear-applications/overview/the-many-uses-of-nuclear-technology.aspx. Accessed: 26 March 2024.

[2]The Royal Society (2020), *Nuclear Cogeneration: Civil Nuclear Energy in a Low-Carbon Future*. Available at https://royalsociety.org/-/media/policy/projects/nuclear-cogeneration/2020-10-7-nuclear-cogeneration-policy-briefing.pdf. Accessed: 28 March 2024.

[3]World Nuclear Association (2020), *Desalination*. Available at https://world-nuclear.org/information-library/non-power-nuclear-applications/industry/nuclear-desalination.aspx. Accessed: 9 April 2024.

[4]International Atomic Energy Agency (2015*), New Technologies for Seawater Desalination Using Nuclear Energy*. Available at https://www-pub.iaea.org/MTCD/Publications/PDF/TE-1753_web.pdf. Accessed: 3 April 2024.

[5]Ibid.

a. We strongly agree that advanced nuclear technologies can offer valuable, low emissions energy, which can be combined with a Thermal Energy Storage (TES) system or used for cogeneration, to maximally utilise energy production. The evidence illustrates that TES systems are highly efficient when coupled to a thermal power generator.[6]
    i. The heat generated from advanced nuclear can be stored until required during high demand periods, which can improve the overall efficiency and resilience of the energy system and will help us achieve our net zero goals.
    ii. This use would also result in cost savings and help offset other expensive and inefficient peaking solutions, as energy would be stored during off-peak periods and utilised during high demand periods, reducing the need for expensive peaking gas power.
    iii. Thermal energy from advanced reactors can also provide an energy buffer to cogeneration applications.

3. To what extent do you agree that advanced nuclear could be a valuable energy source for large scale industry. Please provide an explanation for your response.

a. A significant portion of industrial heat demand is difficult to electrify, especially at higher temperatures. Advanced Modular Reactors which have higher temperature outputs could help resolve this challenge.
    i. Industry research shows that advanced nuclear technologies can directly supply process heat, aiding in the efficient decarbonization of various industrial processes.
    ii. High-Temperature Gas Reactors can reach up to 700 – 950°C compared to conventional light-water reactors which can reach around 300°C. Some industrial processes, such as thermochemical hydrogen production and steam electrolysis, require high temperatures in the 700 – 950°C range.
b. We would encourage Government to invest in advanced nuclear in cognisance of future energy requirements, as advanced nuclear becomes an extremely valuable source of energy for industry.

4. In your opinion, what further measures should government take to enable industrial applications of advanced nuclear? Please provide an explanation of the type of support required.

a. We would encourage Government to provide further clarity on how the 'Approach to siting new nuclear power stations beyond 2025' consultation will be considered in enabling industrial applications of advanced nuclear. Government should also demonstrate their clear intent on co-locating advanced nuclear technologies with industries requiring decarbonisation.
    i. For example, the Hartlepool site is recognised by industry as an excellent location for decarbonising industry with nuclear energy, due to local community support, skilled nuclear workforce, and proximity to local industry. Earmarking this site for AMRs could pave the way for enabling industrial decarbonisation with nuclear heat.
b. We would support clarification on Government's 24 GW by 2050 goal - is this value electricity to the grid only or does it cover Small Modular Reactor (SMR) off-take? Our view is that the 24 GW should be focused entirely on on-grid electricity, given the UK's pressing needs in this area, and the UK should separately pursue advanced reactor capacity for non-grid applications.
c. Government should also recognise that there are inherent performance risks presented by technology that is First of a Kind (FOAK) in comparison to nth of a kind.
    i. For example, off-takers may require guarantees from vendors and operators. Whilst off-takers across industry are pro- low carbon technology, performance risk

[6]The Royal Society (2020), *Nuclear Cogeneration: Civil Nuclear Energy in a Low-Carbon Future*. Available at https://royalsociety.org/-/media/policy/projects/nuclear-cogeneration/2020-10-7-nuclear-cogeneration-policy-briefing.pdf. Accessed: 28 March 2024.

must be considered. Government could support industrial off-takers in mitigating risk by creating a risk underwriting mechanism for early nth of a kind technology.

ii. The inclusion of nuclear in the forthcoming Green Taxonomy as a sustainable technology on par with renewables would also help give confidence to future off-takers.

5. To what extent do you agree that advanced nuclear could be a valuable energy source for hydrogen and synthetic fuel production? Please explain your answer.

a. We strongly agree that advanced nuclear could be a valuable energy source for hydrogen and synthetic fuel production. The UK already has existing supply chain capability that could help facilitate the development of hydrogen capabilities in the UK, including nuclear research facilities which have transferable skills that could be used for hydrogen chemistry and materials research.
   i. Nuclear offers a reliable option for hydrogen, in electrolysis driven by clean, firm power, and allows for options for hydrogen in the future, in steam electrolysis and thermochemical water splitting.
   ii. Sizewell C has the potential to make significant quantities of green hydrogen, using both electricity and heat. Heat assisted green hydrogen is projected to be more efficient (by around 10%) than hydrogen produced from electricity only.[7]
   iii. In addition, nuclear can provide heat, and heat makes electrolysis more efficient.

b. Rolls-Royce SMR and Sumitomo Corporation, a global business and investment company, have completed a joint feasibility study which illustrates that SMRs can provide a significant advantage over other energy sources in producing low-carbon hydrogen. [8]

c. The Climate Change Committee (CCC) has stated that to reach net zero we will need 270TW of hydrogen.
   i. This is significantly more than can be provided by renewables and electrolysis alone and so we will be reliant on Carbon Capture Utilisation and Storage (CCUS) enabled hydrogen and less secure fossil fuels, including natural gas, to meet demand if nuclear-enabled hydrogen-coupled systems are not considered.

6. To what extent do you agree government should explore the opportunity of using nuclear plants to provide district heating to help decarbonise our domestic and commercial buildings? Please provide an explanation and include suggestions on mitigating any potential barriers.

a. We strongly agree that Government should explore the opportunity to use nuclear to provide district heating to decarbonise domestic and commercial buildings. This is a well-established use of nuclear technology, particularly within northern European due to the cold climate and long heating periods which create favourable conditions for district heating and cogeneration development.[9]

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[7]Nuclear Industry Association (2021), *Hydrogen Roadmap*. Available at https://www.niauk.org/hydrogen-roadmap/. Accessed: 10 April 2024.

[8]Rolls-Royce SMR (2023), *Joint Study with Sumitomo Corporation shows that Rolls-Royce SMRs could help 'power' the UK's hydrogen network.* Available at https://www.rolls-royce-smr.com/press/joint-study-with-sumitomo-corporation. Accessed: 3 April 2024.

[9]World Nuclear Association (2021), *Nuclear Process Heat for Industry*. Available at https://world-nuclear.org/information-library/non-power-nuclear-applications/industry/nuclear-process-heat-for-industry.aspx. Accessed: 26 March 2024.

i. In 1964, the Ågesta heavy water reactor was commissioned in Sweden to deliver heat and electricity to the Stockholm suburbs. The Agesta reactor operated until 1974 and supplied 68 MW of district heating in addition to the electricity supplied.[10]

b. We would support the consideration of access to current and potential future district heat networks in the siting of new nuclear technologies as this could act as a potential barrier to the deployment of these technologies at these locations.

7. What do you think are the opportunities and challenges associated with other potential uses for nuclear power? Please explain your answer.

Opportunities:

a. The production of hydrogen and synthetic fuel from nuclear energy benefits from the reliability and high-capacity factor of nuclear along with the ability to provide low-carbon electricity, heat, and hydrogen from a small land mass. Many of these processes need constant power, so nuclear has an inherent advantage and can reduce all costs associated with grid reinforcement, energy storage and backup generation which are often hidden for other low carbon technologies.

Challenges:

a. Long term storage solution
   i. The government has shown that it backs nuclear power as part of the net zero solution, however the issue of the Geological Disposal Facility (GDF), that is expected to be operational in the 2050s, has not been adequately addressed.
   ii. Although the policy for managing the UK's most hazardous radioactive waste, spent fuel and nuclear materials is the GDF, we would encourage Government to keep its options open for the future, and consider an interim waste storage plan and the introduction of a secondary legislation on the basis that GDF will be operational in the 2050s.
   iii. This is an opportunity to ensure that nuclear power is not disadvantaged or weighted as "worse" when compared to other low carbon energy sources based on the long-term storage solution which has not yet been confirmed or designed.

b. We welcomed positive intent in the recent 'Approach to siting new nuclear power stations beyond 2025' consultation and the Government's proposal to empower developers, as site access is a key barrier for the deployment of new nuclear.

<u>Chapter 2</u>

8. To what extent do you agree that the current regulatory pathways cover new uses? Are there any areas that are not covered? Please explain your answer.

a. We would encourage Government to take a pragmatic approach to the application of the existing framework to ANTs and agree that the current regulatory pathways cover new uses as many advanced nuclear plants are not significantly different in design philosophy to existing Nuclear Power Plants (NPP). However, there are some minor exceptions to this:
   i. The current regulatory framework has some implicit assumptions with regards to scale and criticality due to the historical deployment of large-scale nuclear reactors in the UK. For example, it is unclear how microreactors will be dealt with given their smaller power output.
   ii. There are gaps in relation to Floating Nuclear Power Plants (FNPP) as well as nuclear propelled civil ships as we look to the future as the current regulatory pathways apply to land bases NPP. Further to this point, the Maritime and Coastguard Agency (MCA) would need to be included within the regulatory pathways, as a key regulatory

[10]World Nuclear Association (2024), *Nuclear Power in Sweden*. Available at https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden.aspx. Accessed: 9 April 2024.

stakeholder for the licensing of marine based NPP. We would encourage Government to consider and complement the Maritime & Coastguard Agency's existing guidance on nuclear ships.[11]

- We do emphasise the strategic importance of enabling floating nuclear and direct civil nuclear propulsion. Currently, only Russia deploys these technologies, which have great promise for decarbonising a huge section of the global economy. It is imperative that Russia does not remain the technology leader in this area and that Russia does not capture the economic benefits of first-mover advantage. The UK must understand that the question is whether or not we will match Russia, and likely China, in deploying these technologies, not whether they will be used at all.

iii. Some advanced nuclear developers are also proposing the use of existing thermal sites and making use of existing conventional island systems, structures, and components to which they would add on a nuclear island to provide steam. It is not clear how the permitting for this would work and whether any existing permits for the conventional island would be able to be carried over. There is an opportunity here for Government to streamline this process.

9. What, if any, are the main opportunities and challenges for streamlining regulation while maintaining high standards of safety, security, and environmental protection? Please explain your answer.

Opportunities:

a. There is an opportunity for Government to capitalise on international collaboration and streamline regulatory processes. The 'A Framework for International Regulatory Efficiency to Accelerate Nuclear Deployment' report by the World Nuclear Association illustrates how international collaboration could be capitalised upon. The report details a phased approach that could drive efficient international regulatory design review activities, facilitating the ability of a regulator to leverage all, or part, of the outcomes from reviews undertaken by other regulators to support their own regulatory process.[12]

b. Although the non-prescriptive approach to regulation taken by UK regulators is easier for developers to work with than other international regulators, there are still opportunities for improvement. For example, we should make maximum use of the outputs of design reviews conducted by nuclear regulatory authorities in other countries. This presents an opportunity to reduce the burden on the ONR should a design previously licensed abroad be submitted for review in the UK.

   i. Government could allocate additional funding to the ONR to audit the work conducted by international regulators and give them more confidence in overseas processes. This would also provide an export opportunity for UK regulatory expertise.

   ii. The Government should empower and support the ONR to participate in joint design review activities with other national nuclear regulators should a design be submitted for review simultaneously in the UK and overseas, wherever possible.

Challenges:

c. There are differences in terms of social and environmental impacts between GW-scale reactors and ANTs. The gross size differential should be recognised and addressed in the forthcoming NPS through proportional regulation.

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[11]Maritime & Coastguard Agency (2022), *Guidance on the application of the Merchant Shipping (Nuclear Ships) Regulations 2022 (SI 2022/1169), which regulate UK commercial nuclear-powered ships and foreign commercial nuclear-powered ships visiting UK waters*. Available at https://www.gov.uk/government/publications/mgn-679-nuclear-ships/mgn-679-m-nuclear-ships. Accessed: 4 April 2024.

[12]World Nuclear Association (2023), *A Framework for International Regulatory Efficiency to Accelerate Nuclear Deployment*. Available at https://world-nuclear.org/our-association/publications/online-reports/a-framework-for-international-regulatory-efficienc.aspx. Accessed: 3 April 2024.

d. The new early engagement process will potentially require a significant resource increase for the regulators. We would support this process being offered on a cost recovery basis.

10.Following government's streamlining work to date, do you agree the next phase should focus on process efficiencies? Please explain your answer.

a. We agree that the regulation process should focus on increasing efficiency with actions that will result in shorter time scales for deployment, whilst maintaining the current regulatory standards. For the ONR, this includes activities such as the early engagement through meetings with vendors, the provision of advice, and proportionate regulation based on perceived risk.
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.
    i. Nuclear project planning applications (Development Consent Orders) are likely to increase because of the smaller size of individual projects as ANTs 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.
    ii. Increased resources for ONR could also enable them to participate in international regulatory workstreams which could accelerate design reviews as mentioned in our response to Question 9.

11.To what extent do you agree that advanced nuclear technologies and new uses of nuclear are accommodated within the existing legal landscape? Please explain your answer.

a. Advanced nuclear technologies and new uses of nuclear are well accommodated within the existing legal landscape. However, one of the challenges for deployment of new nuclear is the complexity of the legal landscape in comparison to other low carbon energy technologies.
b. We encourage the Government to proactively support developers to navigate the legal landscape and reduce barriers to entry for new project developers.

12.What are the opportunities and the challenges of the proposed engagement approach? Please explain your answer.

Opportunities:

a. The proposed engagement approach could potentially reduce time spent in the licensing phase by setting out expectations between the regulator and vendors. Early engagement with the regulators is critical to enable new nuclear projects to be brought to market.
b. For the rapid deployment of new nuclear, proportionate and enabling regulation is essential; regulation that considers the specific characteristics of the generation unit.
    i. This proportionality could be in terms of energy output, quantity of fissile material, land footprint, degree of proven technology, how much of the balance of plant that still needs to be nuclear certified and systems considerations, such as the criticality of an individual asset to the grid.
    ii. Proportional regulation should also consider the different safety approaches associated with ANTs.

Challenges:

c. The level of design maturity for effective engagement should be defined, along with a minimum level of project credibility to ensure that the best use of ONR's resources.
d. Given the number of designs currently in development, a selection process may need to be developed to prioritise ONR resources.
e. For the ONR's proposed preliminary design review, there should be clear guidelines on the number, content and size of submissions that can be submitted by a vendor, to allow for the ONR to correctly allocate time and resource to submission review.

f. Regulators will have to engage with multiple vendors, who may be based abroad, and therefore the question of international collaboration is crucial. There is the opportunity to help streamline GDA process, but also there is a challenge in managing these international interfaces.

13.Are there new or additional nuclear safeguard challenges associated with ANT innovation and/or new uses of nuclear energy? Please explain your answer.

a. The following nuclear safeguards associated with ANT innovation should be considered:
   i. Microreactors present new challenges with their deployment in remote locations and their transportability. While these are a beneficial aspect to their design, there will be new challenges in terms of their fuelling cycles, operation and ultimately decommissioning.
   ii. Fuels with higher levels of enrichment are planned for certain reactor designs will require a different approach to conventional LEU fuel.

Chapter 3

14.What else should government do to ensure that new nuclear projects can be brought to market? Please explain your answer.

a. Policy certainty is critical to investor confidence and essential for new nuclear projects to be brought to market. We welcomed the Civil Nuclear Roadmap published earlier this year and we would encourage the Government build on this momentum by continuing to make clear-long term decisions on nuclear to provide certainty to the market.
b. We would welcome further clarity on the role of Great British Nuclear (GBN) in the delivery of ANTs beyond the SMR programme, particularly on if, and how, GBN will support projects outside of the SMR programme. As a government owned body supporting the delivery of privately led nuclear projects, this position could potentially lead to a delay in privately funded projects coming forward while they wait for the position of GBN to be clearer.
c. Nuclear projects require a Suitably Qualified and Experienced Personnel (SQEP) operator body for the lifetime of the project, which encompasses a vastly different organisational capability to a project developer. Government should consider how it could best utilise and build-upon the UK's existing operator capability to help support advanced nuclear projects.
d. We support the opportunity for nuclear to play a more flexible role in the electricity system in an economical way. We would suggest incentivising stand-by/ duty arrangements to ensure that flexible output can be achieved, whilst ensuring that plant maintenance and other ad-hoc servicing can be performed.

15.What, if any, structures do you think are appropriate for advanced nuclear technologies? Please explain your answer.

a. We believe that the Contracts for Differences (CfD) scheme will have an important role to play in the deployment of advanced nuclear technologies, along with the Regulated Asset Base (RAB) model.
b. Government should also consider models beyond the CfD and RAB model, such as the Power Purchase Agreement and the Mankala model.
c. The Mankala model is used in Finland, where several companies, some of which include municipal energy companies and large mining and metals companies, jointly establish a non-profit limited company for a common purpose, such as TVO, which operates the 3.5 GW Olkiluoto nuclear power plant. Each shareholder of TVO is obliged to pay the costs incurred during construction and operation of a nuclear power plant in proportion to their ownership. Likewise, they are entitled to the electricity produced based on proportion of ownership. This model spreads the risk across a broad asset base.
   i. This type of model, where several companies pool risks and rewards, may be effective for the application of advanced, high-temperature nuclear reactors for industrial decarbonisation. These reactors are intended to be co-located with heavy industries that consume large amounts of heat and power, to provide them with constant, reliable

clean energy directly. A single industrial customer is unlikely to finance a nuclear project itself, but a cluster of interested industrial users is more viable.

16.What are some key areas government should consider in a potential business model to bring a first-of-a-kind project to market? Please explain your answer.

a. Nuclear projects, as high CAPEX projects in the energy sector, will require large upfront investment, with high risk loaded into the construction and commissioning phases. Given the initial risk profile, initial investment into these nuclear projects may be challenging.
    i. Re-distributing this risk profile across the value chain, or under-writing this risk will be key to gaining investor buy in and deploying First of a Kind (FOAK) technology.
    ii. Government should consider how risks can be appropriately shared through all stages of the value chain.
b. Interfaces with other SMR support revenue mechanisms (for Hydrogen, Sustainable Aviation Fuels (SAF), and Ammonia for example) should also be considered, unless Government foresee only electricity relevant for the final investment decision. We would ask for clarity on this point and would encourage Government to be cognisant of policies from other relevant departments.
c. Continuity of investment is integral for FOAK projects; Government has a key role to play in ensuring that financial momentum is not lost.

17.How do you think the support required for projects should differ for later, nth-of a-kind project compared with a first-of-a-kind project? Please explain your answer.

a. For FOAK projects, we would encourage the Government to offer co-funding incentives, such as concessionary financing.
b. The underlying risk burden should remain with Government when moving from FOAK to nth of a kind nuclear project, however, the risk profile will change as projects are deployed and become operational.
    i. By using lessons learnt and applying relevant good practice, deployment risks will be reduced.
    ii. Additionally, as confidence increases in the deployment of advanced nuclear projects, Government's support to projects is likely to need to transition to focus on mechanisms that encourage fleet deployment to meet net zero goals.

18.What financial risks sit with government and cannot be transferred to private actors? What is the minimum protection that government will need to provide to mitigate financial risks to taxpayers? Please explain your answer.

a. The ultimate financial risk should rely on Government, and should not be transferred to private actors, to mitigate risks associated with company insolvency.
b. Industry off-takers will require confidence that in the event of loss of energy production via an NPP on site. Government may be required to mitigate these risks by providing off-takers with a guarantee of supply in this event.

19.How should government mitigate insolvency risk at privately funded nuclear plants? How can this be achieved without imposing undue costs on taxpayers? Please explain your answer.

a. Government can mitigate insolvency risk at privately funded nuclear plants by implementing robust regulatory oversight and financial mechanisms.
b. Some methods to mitigate this risk include:
    i. Establishing contingency funds/insurance schemes funded by operators to cover insolvency risks.
    ii. Stringent financial stress testing and ongoing monitoring to identify early signs of financial distress.

iii. Encouraging diversified revenue streams, such as long-term power purchase agreements, similar to those that wind power uses, to stabilise finances.
iv. Risk Sharing Mechanisms, such as setting up liability caps or sharing the cost of decommissioning and waste management through a GDF.

20.What support infrastructure, or other enablers, would help bring projects to market, in addition to those highlighted above, should government introduce to help private developers bring projects to market? Please explain your answer.

a. We encourage Government to launch the Green Taxonomy consultation as soon as possible.
    i. The inclusion of nuclear in the forthcoming Green Taxonomy would help raise capital for new nuclear projects and help bring projects to market.
    ii. Nuclear should be treated equally with other low-carbon energy generation technologies and have access to affordable finance.
b. It is also vital that following the launch of the Green Taxonomy, that the Government sets out clear timelines for how and when the outcomes of the consultation will be implemented and adhered to.
c. Continued support across the supply chain to ensure projects are de-risked as far as possible, especially for components and material which is critical to nuclear operation, is also important to help bring projects to market.

21.To what extent do you agree that government will always need to put measures in place to protect citizens, consumers, and taxpayers, even where a nuclear project is entirely privately financed? Please explain your answer.

a. We agree that Government engagement should be required for privately financed nuclear projects, particularly to mitigate the long-term financial risks of decommissioning.

22.To what extent do you think companies wishing to negotiate with government should be tested against suitability criteria before entering negotiations? Please explain your answer.

a. We agree with that companies negotiating with Government should go through a suitability criteria assessment before entering negotiations.
b. We suggest that Government considers the following criteria:
    i. The ability of a company to comply with Government policies e.g. sanctioned entities, non-proliferation;
    ii. The credibility of a company's technical proposals;
    iii. Financial criteria e.g. the ability of a company to have funds in place to scope and cover liabilities;
    iv. A credibility test on all parties to be involved in the project e.g. technology vendor, developer, operator, funder;
    v. The capability of the people tasked with performing key roles in the company.
c. We would encourage the suitability criteria to be set to be as inclusionary as possible, with the aim of not inhibiting any company from entering into negotiations. The criteria should be proportionate to the level of risk that the Government may be exposed to.

23.What do you think the criteria should be to warrant entering negotiations with government? Please explain your answer.

a. N/A

<u>Chapter 4</u>

24.What further steps should government take to support R&D for Advanced Nuclear Technologies? Please explain your answer.

a. A well-funded Government backed R&D programme for ANTs is essential for continued innovation in the sector.
b. We would also encourage Government to acknowledge that the development of the UK project safety case will require adequate R&D and testing activities. There are opportunities to collaborate and share the cost burden of this development activity across multiple technologies and jurisdictions.

25.To what extent do you agree that there are current or future gaps or constraints in the UK R&D landscape for Advanced Nuclear Technologies, either for that high TRL R&D and demonstration or earlier stage R&D? Please explain your answer.

a. High or Low TRL R&D support should cover all aspects of the value chain and be fully interfaced with R&D support for downstream applications. There is significant scope to increase the efficiency of outputs of the products from nuclear systems and R&D programmes must cover the entire value chain and the integration of such to accelerate the path to commercialisation.

26.To what extent do you agree that there are current or future gaps or constraints in the UK supply chain for Advanced Nuclear Technologies? Please explain your answer.

a. The nuclear supply chain will go where it is required, including for projects which also provide off-grid applications of nuclear beyond electricity production, including but not limited to heat generation, low carbon hydrogen production and desalination for electrolysis.
b. A thorough analysis of the supply chain must be undertaken to identify areas supply gaps and where there are areas of competing demand in different regions.
c. Government should ensure that it takes decisions on bolstering support for new generation technologies and projects without delay, to retain and continually build appetite for the UK market, which will in turn encourage greater supply chain investment in the energy industry.
d. To help rebuild the domestic supply chain and justify investment in plant and equipment, Government must insist that UK content is maximised in the deployment of new nuclear and place a sufficiently large number of orders to facilitate the necessary investments. This holds for both grid and non-grid applications.
e. Nuclear fuel availability will also need to be scaled up as advanced nuclear reactors approach deployment.
f. High Assay Low Enriched Uranium (HALEU) will be required to fuel many of the advanced nuclear reactors that are approaching demonstration and deployment. The first deliveries of HALEU will be required beginning in 2028, however, Russia is currently the only viable supplier of HALEU to commercial reactor developers. The Government's intention to provide grant funding for a HALEU facility in the UK and for the associated deconversion is very welcome, and we urge that this is formally agreed and disbursed as soon as possible.
    i. Not only is the expansion of our own capabilities and capacity strategically important, but advanced nuclear reactor vendors require optionality to obtain supplies from more than one country.
g. The Government should continue to support efforts to restore uranium conversion at Springfields in Lancashire and work with allies to remove the use of Russian nuclear fuel with time, to create an investment environment to develop Western capacity.
h. A robust domestic advanced fuel supply chain is essential to ensure fuel supply for advanced reactors in the UK.

27.Please add any comments or reflections which have not been covered in the previous questions.

a. N/A

28.The Public Sector Equality Duty (PSED) requires government to have due regard to the need to eliminate unlawful discrimination, harassment, victimisation, and other conduct

prohibited by the Equality Act 2010, advance equality of opportunity between people who share a protected characteristic and those who do not and foster good relations between people who share a protected characteristic and those who do not.

Protected characteristics include age, gender reassignment, being married or in a civil partnership, being pregnant or on maternity leave, disability, race, religion or belief, sex, and sexual orientation.

Do you have any views about the implications of the policy measures explored in this consultation on people with protected characteristics? If you have identified any positive or negative impacts in the consultation, please provide any relevant evidence.

a. N/A

29.The Environment Act 2021 sets out a legal duty for government ministers to have due regard for the Environmental Principles Policy Statement (EPPS) when making policy.

Do you have any views about the implications of the policy measures explored in this consultation on environmental protection? If you have identified any positive or negative environmental impacts in the consultation, please provide any relevant evidence.

a. N/A

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 Nuclear Industry Association, at Lauren.Rowe@niauk.org to do this.