Securing Britain's lead in the race to commercial fusion

First Light Fusion's response to the consultation on a National Policy Statement for fusion energy

Introduction

The world requirement for Fusion Power is significant – if successfully commercialised, it is the last energy source the world will need. Fusion has the potential to be at least 20% of the composition of clean base load energy by 2050 and will contribute to both Energy Security and exiting countries from Fuel Poverty. The world cannot meet 2050 decarbonisation and climate targets without it.

Today, the race to develop commercial fusion is highly active, fiercely competitive and brilliantly collaborative on a global scale. For over six decades, Britain's dedicated efforts in fusion research have positioned us as a leader to date in this critical field. However, the landscape is shifting. Global challengers are rapidly advancing in both technological innovation and funding levels. Our hard-won lead cannot be taken for granted and today we find ourselves at a critical juncture. We either do what we've done in the past – innovated and then been overtaken – or we take the opportunity for the UK to demonstrate true fusion leadership by being clear on how to invest to maintain our lead.

Against this backdrop, First Light Fusion welcomes the development of a National Policy Statement (NPS) for fusion energy. As a company, we have made significant progress in creating a viable and highly promising alternative method for fusion – inertial fusion energy – in only a decade of rigorous research and development. This rapidly advancing technology has the promise to deliver a reliable source of clean baseload electricity, with the physics behind inertial fusion already well proven.

Other countries are pursuing this approach and demonstrating significant progress. Our ambition is to continue advancing this work in the UK rather than elsewhere, contributing to the nation's efforts to lead the fusion race.

To maximise our chances of success, we believe the NPS should enshrine the following key principles:

1. Support for multiple fusion technologies: The NPS should ensure genuine Government support for both magnetic and inertial fusion technologies currently under active development in the UK. This approach will increase the likelihood of a successful breakthrough and reflect the rapid progress made on inertial fusion, even though it is a significantly younger technology compared to the 60 years of research into magnetic confinement.

2. Clear siting guidelines for fusion plants: To avoid potential delays similar to those experienced with grid connections for other types of commercial power plant, the NPS must develop and publish clear guidelines for the siting of fusion plants. Given the power capacity of individual commercial fusion plants will likely be in the hundreds of megawatts, rather than gigawatts, a sizeable fleet will be needed. Understanding and planning for this now will be important to a successful, quicker rollout.

3. A coordinated cross-departmental approach: A coordinated and joined-up approach across both the Department for Energy Security and Net Zero (DESNZ) and the Department for Science, Innovation and Technology (DSIT) will be essential to making progress on fusion research and development. Both departments have a role to play we believe, and bring complementary skillsets and expertise.

4. An ambitious target date for commercial fusion: Establishing a target date for the first *commercial* fusion plant, such as 2040, will catalyse investment, research and focus towards

achieving this goal. This should be ambitious yet achievable to drive progress and demonstrate the UK's ongoing commitment to leading in fusion energy.

Consultation questions – responses

1. **Do you agree that the planning process for fusion energy facilities should be aligned and maintained with other complex energy generation facilities?**

   Yes, we agree. This alignment would lead to a more streamlined and efficient planning process whilst ensuring fusion plants are considered alongside other power-generating sites.

   It is also important to emphasise that fusion power plants pose much lower risks in terms of waste, radiation and related effects compared to nuclear fission plants. This distinction should be reflected in the planning process, without aligning fusion energy facilities with the Office for Nuclear Regulation (ONR).

   Additionally, the planning system must be highly functional and able to deliver timely, effective assessments. Sufficient resources for the planning inspectorate are essential to guarantee this.

2. **Do you agree with the Government's proposal to include all fusion technologies in the NPS process?**

   Yes, we agree. We firmly believe that backing multiple approaches, rather than focusing on a single technology, offers the best opportunity to maintain Britain's competitive edge in the fusion race. This strategy will also increase the likelihood of developing the most effective technology to deliver reliable, clean, baseload fusion energy.

   Government funding and policy support have typically favoured magnetic confinement over inertial fusion. While this has historically been understandable given magnetic confinement's longer history, the rapid rate of progress of inertial fusion now merits rebalancing this.

   It is, therefore, essential that the principle of plurality is at the heart of the NPS.

3. **Do you agree with the Government's proposal to take an open-sited approach in the fusion NPS process?**

   We understand the rationale behind the Government's proposal to take an open-sited approach but would urge a degree of caution. Commercial fusion at scale will require multiple sites to be built and brought online rather than just a few. There are clear parallels with the conventional nuclear industry and the deployment of small modular reactors, as opposed to a few large multi-GW traditional fission reactors.

   In practice, this means that site selection will need to be a priority. Issues around securing grid connections, which can be subject to long delays, and conducting the necessary planning and permitting checks outlined in the NPS document, will need to be considered in this timeframe.

   We agree it is essential to emphasise the significant differences between hosting a fission plant and fusion plant in communities, particularly in terms of risk factors and safety levels. Given fusion plans have significantly lower risk factors, this should be clearly communicated to host communities.

4. **Do you agree with the Government's proposal to include all fusion energy facilities in England, independent of capacity, in the fusion NPS process?**

   We broadly agree with this intention. However, we believe that different types of fusion technology require different levels of attention. While smaller fusion plants, or mini plants, may be less expensive and benefit from economies of repeatable build, larger plants such as those projected

by First Light Fusion (100MW+) should not be overlooked. Including all fusion energy facilities in the NPS process, independent of capacity, would ensure a comprehensive approach that balances the benefits of quicker deployment and funding attraction with the development of more impactful, larger-scale facilities.

5. **Do you agree with the Government's proposal to include both thermal and electrical facilities in the fusion NSIP process?**

   Yes, we agree. By accommodating both types of facilities, the NSIP process can enhance the versatility and market appeal of fusion technology, making it more attractive to a broader range of stakeholders and furthering its commercial viability.

   While production of electrical power is likely to be a primary focus of commercial fusion plants, our own experience at First Light Fusion has shown us how the research and development process to reach commercial stage is creating a much broader range of potential use cases – both for fusion power directly, and some of the innovations required to realise a commercial power plant.

   Enshrining flexibility therefore feels pertinent as a way to encourage and accelerate progress towards commercial fusion power, but also support its wider usage in other potential areas.

6. **Do you think the definition of a fusion energy facility, as provided in the Energy Act 2023, is suitable for distinguishing between a fusion energy facility and/or fusion research facility for the purpose of this NPS?**

   Yes, we believe the current definition is suitable for the purpose of the NPS. The Act's definition clearly distinguishes between fusion energy facilities and fission facilities, acknowledging that fusion facilities do not involve fissile materials and present significantly lower hazards and waste. We support maintaining this approach as it provides a proportionate regulatory framework that encourages innovation and development in the fusion energy sector.

7. **Do you agree with the Government's proposal to not set a deployment deadline for fusion energy facilities?**

   No, we do not agree. We believe that a combination of societal imperatives for clean, cost-effective and secure energy, the rapid progress being made by companies such as First Light in inertial fusion energy, and the increasingly likely predictions made by many fusion companies about timescales to reach commercial power demonstrate that fusion is likely to become a commercial reality sooner than anticipated.

   As a result, we believe setting a deployment deadline for *commercial* fusion of 2040 – or at the very least a well-defined ambition or target date around this – would reinforce confidence among fusion company developers, attract more certainty among current and potential fusion investors, and serve as a guiding objective to drive the commercial development of this technology forward.

   Without such a target or deadline, some or all of these important factors may suffer.

8. **Should developers consider any other factors in assessing reasonable alternatives for fusion energy facilities?**

   We agree with the points raised in the NPS. We would additionally emphasise the value, at least initially, of clustering fusion-related facilities together, as had been proposed for the Cudham site. This approach can create a positive accelerator effect through the establishment of a centre of excellence for fusion.

   In addition, given that commercial fusion will likely involve tens of plants at a sub-1GW scale rather than a handful of multi-GW plants as seen with conventional fission, one of the most critical factors

to consider will be the ability to secure a grid connection quickly and efficiently. This factor is essential for the timely deployment of operational success of fusion energy facilities.

9. **Do you believe that the proposed criteria cover all aspects necessary for assessing the suitability of sites for fusion energy facilities?**

   The proposed criteria are comprehensive and align with the expectations for suitability assessments of other commercial power plants.

   While grid connections are included in the criteria, it is important to emphasise the significance of this factor for the timely deployment and operational success of fusion energy facilities. Given the nature of commercial fusion, which will likely involve lots of sub-1GW plants rather than a handful of multi-GW plants as seen with conventional fission, securing a grid connection quickly and efficiently will be particularly important.

   Furthermore, the current grid connection capability in the UK does not yet support the rollout of clean baseload energy. This limitation must be addressed to ensure the successful integration of fusion energy facilities into the national grid.

10. **Are there any additional criteria that should be considered in the assessment process?**

    See our answer to question 9.

11. **Do you think there should be a separate set of criteria for different fusion technologies?**

    Yes, there should be a separate set of criteria. You cannot compare magnetic confinement with inertial fusion as they are fundamentally different processes. MCF involves a continuous process similar to a furnace, while ICE operates in pulses. Such differences present unique challenges and requirements for each technology. Therefore, separate or a range of criteria would ensure a fair and effective assessment of each technology.

12. **Do you agree with the proposed model for implementation of the Fusion NPS?**

    Yes, we agree. As above, it aligns with what would be expected for any other commercial power plant, and we do not foresee any obvious challenges. The model appears to be well-structured to support the development and deployment of fusion energy facilities effectively.

About First Light Fusion

First Light Fusion is a pioneering, UK-based start-up leading Britain's efforts in the race to nuclear fusion. Founded a decade ago and based in Oxford, it is central to the UK's efforts in developing inertial fusion energy, a rapidly advancing technology with the promise to deliver a reliable source of clean baseload electricity.

First Light's R&D has the potential to power UK innovation and technological capabilities in crucial sectors like defence and security. Its work, along with others in the fusion industry, is creating a new home for scientists, mechanical and electrical engineers, and AI experts at every level, from apprenticeships to PhD recipients.