

Supplementary written evidence submitted by Tokamak Energy Ltd (CGE0075)

This supplementary evidence is presented by **Tokamak Energy Ltd** and supported by our Scientific Advisory Board.

In our original evidence submitted in October, we made the case for vigorous pursuit of fusion energy from compact tokamaks with high temperature superconducting magnets.

The UK is well placed to be first to develop and deliver fusion energy. Although still an exceptionally tough challenge, fusion is one of the best options available globally for the deep decarbonisation necessary in the 2030s and 2040s.

Since October then there have been notable policy developments in the UK and US that increase the likelihood of fusion energy being commercially deployable for the first time in the 2030s

Introduction

1. Tokamak Energy Ltd is a private company that aims to accelerate the development and deployment of fusion energy. The company is a spin-out from Culham Laboratory near Oxford which is currently the world-leading centre for magnetic confinement fusion energy research. Fusion is one of the very few areas today with enormous long term global economic potential where the UK has a distinctive global lead.
2. In December 2018 Tokamak Energy announced that it has now raised a total of over £50m of private investment for the development of fusion energy. This is the moment when private investment in fusion energy is starting to accelerate.
3. The proceedings of a Royal Society meeting entitled "Fusion energy using tokamaks: can development be accelerated?" have just been published in Philosophical Transactions of the Royal Society A <https://royalsocietypublishing.org/toc/rsta/377/2141>. These proceedings are a record of the scientific debate in March 2018 between those who can see a way to make rapid progress and those who recommend proceeding more cautiously.

New US policy and legislation

4. The US National Academy of Sciences published a report in December 2018 on a Strategic Plan for U.S. Burning Plasma Research which recommends a program of research and technology leading to a compact pilot plant (CPP) to produce electricity from fusion at the lowest possible capital cost. The report acknowledges that "Opportunities exist to encourage and support private investment in fusion energy" and also that investment in fusion research will have benefits to other disciplines including high field magnets employing high temperature superconductors (HTS). The recommendation of a CPP with HTS magnets is basically an endorsement of the approach that Tokamak Energy and one fusion venture in the US are already taking.

5. The US Nuclear Energy Innovation and Modernization Act (NEIMA) was passed in January 2019. It explicitly includes fusion in the definition of “advanced nuclear reactor” and provides for establishment of a regulatory framework for advanced nuclear power plants, including fusion, by December 2027.

New UK initiatives

6. UKAEA announced a new “Spherical Tokamak for Energy Production” (STEP) project in January 2019. STEP is aimed at designing and ultimately building a compact fusion power station in the UK by 2040. UK Government has committed an initial £20M for work on a conceptual design and intends that this should give plenty of opportunities for academia and industry to get involved.
7. The All Party Parliamentary Group on Nuclear Fusion, chaired by John Howell, MP, met in January to discuss “Private and Public Fusion Energy – the opportunities to collaborate”. Former Science Ministers, Lord Willets and Ian Taylor spoke at the meeting to emphasize how valuable public-private collaboration in fusion can be, particularly to ensure that the UK gets the best economic impact from Government investment in research.
8. HM Treasury published a report with the 2018 budget called “Getting smart about intellectual property and other intangibles in the public sector”. The Treasury is now following up with an implementation study to turn the recommendations into actions. Fusion is potentially one of the most important examples of where long-term Government investment in science and technology can be turned into economic (and environmental) benefits for the UK. Tokamak Energy is pleased to be contributing to the Treasury study.

Conclusion

9. The STEP project shows that the UK Government has appreciated the new evidence supporting the compact spherical tokamak route to fusion power.
10. However, the Government should recognise that its own scientific research establishments work cautiously and are not configured for accelerated innovation, development and deployment of new technology.
11. The Government should therefore still do more to encourage stronger private investment in fusion energy development, for example by matching some of the legislative and policy measures used in the USA to encourage private ventures to develop fusion technology and future fusion power plants.

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