# Report on 5th Fusion Energy All-Party Parliamentary Group meeting

**Tuesday 27 June 2023, 11:00am-12.30pm –** Committee Room 3A, Palace of Westminster

## *"Fusion gain at the National Ignition Facility: A UK path to fusion energy"*

Speakers:

- Jeremy Chittenden, Professor of Plasma Physics and Co-Director of the Centre for Inertial Fusion Studies, Imperial College London
- Nick Hawker, Co-Founder and CEO, First Light Fusion
- Robbie Scott, Theoretical Plasma Physicist, Science & Technology Facilities Council
- Valerie Jamieson, Development Manager, UK Fusion Cluster

Chair:

- John Howell MP

**Introduction:**

The meeting showcased the progress being made in 'inertial confinement' fusion research, following the recent achievement of 'fusion gain' by the National Ignition Facility (NIF) in the US. The American team for the first time produced more energy than it took to start fusion reactions, known as 'ignition' – a big milestone towards commercial fusion power using this technique.

John Howell opened the meeting and handed over to the UK Atomic Energy Authority's Deputy CEO Tim Bestwick, who put the National Ignition Facility's results in context with the UK's own national fusion strategy.

**Overview of inertial confinement fusion and the NIF results**
**Jeremy Chittenden, Imperial College London**

Jeremy Chittenden recapped on the basics of how fusion works and why it is an attractive energy option for the future, offering sustainable, low-carbon and safe energy for the long-term. He then explained the difference between the two main branches of fusion research. There is a need to develop both in parallel to offer a range of technology options for future powerplants:

- Magnetic confinement, which uses magnets to contain a hot plasma in which particles fuse and release energy. The UK's JET machine and prototype powerplant STEP are examples of this approach.
- Inertial confinement, where lasers or x-rays implode pellets of fuel to drive fusion reactions. The US National Ignition Facility is the largest machine of this type.

The NIF breakthrough results announced in December 2022 were a huge step forward for the inertial fusion field, showing that an energy gain could be achieved with this technology. It has been called 'one of the most impressive scientific feats of the 21st century'.

However, the challenge is to go from a scientific demonstration at NIF to a powerplant producing competitively priced, reliable energy. Various approaches are being explored for this, in both public and private sectors.

UK scientists take part in the research at NIF and are acknowledged as major contributors to its ignition achievement. Our universities are world-leading in this field, and we are therefore well placed to exploit this expertise and take inertial fusion forward to commercialisation.

Questions from the floor from Stephen Metcalfe MP, John Howell and Lord Foulkes centred on comparisons with magnetic fusion and the costs required to turn inertial fusion into a workable energy source.

**First Light Fusion – Solving the problem of fusion power with the simplest machine possible**
**Nick Hawker, First Light Fusion**

Nick Hawker outlined how his company, Oxfordshire-based First Light Fusion, intends to turn the technology tested at NIF into a workable concept for fusion power production.

He spoke about the three main engineering challenges: damage to structural materials; managing intense heat; and fuelling a powerplant with tritium. Instead of NIF's laser technique, First Light uses high-speed projectiles to achieve the implosion of fuel pellets that triggers fusion reactions. Innovations such as a liquid wall design will overcome key engineering challenges.

First Light has successfully proved its method works, with results validated by the UK Atomic Energy Authority. The company now plan to build an ignition demonstration plant at the Culham Campus near Oxford.

The Q&A session covered the economics of fusion (Lord Ravensdale); costs, timescales and funding for First Light's demonstrator (Stephen Metcalfe MP); how solutions to the engineering challenges will be demonstrated (Ashley Strange, Frazer-Nash); and whether fusion is seen as credible by Government and investors (Lord Whitty).

**The UK plan for inertial confinement fusion R&D**
**Robbie Scott, Science & Technology Facilities Council, Harwell**

In his presentation, Robbie Scott went into more detail about UK research on inertial fusion and the R&D roadmap. Researchers will have to move from NIF, which runs three tests per day with a cost of £100,000 for each fuel capsule, to a powerplant capable of continuous operation with a fuel capsule cost of 50p each.

The UK's Central Laser Facility at Harwell plays a leading role in developing inertial fusion and addressing these challenges. As well as building high-quality lasers, they led a European laser fusion plant design project, HiPER, which has laid the foundations for future work.

The UPLiFT project is the UK's plan to develop and integrate technologies for laser fusion energy, culminating in a test plant slated for operations in the 2030s and power on the grid in the 2040s. Initial government investment in UPLiFT will stimulate private investment in the later stages of the project.

Stephen Metcalfe MP asked what researchers required for the next stage of the UPLiFT project, and who funding bids need to go to. Ashley Strange of Frazer-Nash asked why NIF selected the 'indirect drive' laser method.

**UK Fusion Cluster news round-up**
**Valerie Jamieson, UKAEA**

Valerie summarised the latest developments from the UK Fusion Cluster, in which over 200 organisations are working together to get to fusion power faster.

Questions on the Fusion Cluster presentation from Stephen Metcalfe MP related to the fast-changing progress and optimistic atmosphere in UK fusion, as well as the need to develop skilled young people from around the UK to work on fusion projects.

John Howell MP closed the meeting by thanking participants for excellent presentations and for the stimulating discussions in the question and answer sessions.