

# National Labs – a critical element of scientific infrastructure.

Steven Cowley – Princeton Plasma Physics Lab. Faraday Institution  
June 2024

CULHAM



Princeton Plasma Physics Lab  
One of 17 DOE National Labs





- The UK-US research university is a much envied and copied model of research excellence and efficiency.
  - The recent tweak – the Cambridge/Stanford/MIT etc. university tech industry partnership model – is also impressive and effective.
  - **National labs are not competitive in this space.**



- Some very important science problems need **scale, teamwork, skills mix and organization**. *e.g.* You cannot build a nuclear capability from a garage in Palo-Alto or a bench in the Blackett lab at Imperial. **National labs are the tool for delivering this kind of science and technology.**
  - *It is a very successful model. e.g. Lawrence Berkeley National lab. 16 Nobel Laureates.*
  - *Often the best are connected to a major university in the US. (LBNL – Berkeley, SLAC – Stanford, FERMI Lab, PPPL).*
  - *CERN is the envy of all National lab Directors. EU labs are competitive and well funded. .*
  - *UK has a small but excellent set of National labs – they always need nurturing.*

**A Science Superpower needs BOTH Research Universities and National labs.**

I see the need for Institutes but that is not today's topic for me.



- Large scale research facilities (e.g. Large Hadron Collider, JET, Diamond, Isis, ...) play an essential role in science.
  - Such facilities used to be nationally owned and operated.
  - EU facility road map (ESFRI) and ownership solidified international facility model.
  - Future facilities will be global.
- National labs have the capability to conceive, design and build (with industry) such facilities.
  - Teams of engineers and technicians as well as scientists. High value skills, from PhD to apprentices (e.g. UKAEA apprenticeships).
  - At the cutting edge of technology (e.g. super-conducting magnets).
  - Unique one-off engineering. Can be “upskilling” for industry partners. For example, industry partners on STEP (UK fusion pilot plant design).



- National labs are a strategic asset. The ability to conceive – design - build is costly but essential not only for science. Workforce flows to and from National labs and high-tech engineering industry.
  - This must remain part of the UK portfolio.
  
- What is the UK's next great science facility? Is it a global competitor? Who could be our partners? Who could share the cost? EU?
  - There are probably conversations on this topic?