For economic energy, we need: tritium, large size to obtain hot fusing plasma; high fields and large currents → high running costs, large stored energy (beware disruptions, ELMs)

**Fusion for NEUTRONS (F4N) is easier and can be useful much sooner!**

**MANY APPLICATIONS:** materials research; isotope production; processing fuel for (and waste from) fission plants; hybrids – and Component Test Facilities to aid the Fusion programme

**SMALL SCALE** is possible, using beam - plasma fusion. Jassby (1975!) showed that injection of high energy neutral beams into ‘warm’ plasmas provides a very effective neutron source

**F4N works already** – the MAST Spherical Tokamak at Culham can produce ~ $10^{14}$ neutrons / pulse (in D-D, and not optimised for neutron production)
The smaller scale (and possible near-term commercial applications) of F4N can attract private investment.

F4N studies assist Fusion programme – e.g. via Component Test Facility; by training new fusion scientists

- Aiding the ultimate goal of Fusion for Energy

Example: a Component Test Facility is much needed; ST appears simplest and most economic in tritium: BUT the high cost (> $1B) and uncertainties in materials, start-up etc are delaying construction of a CTF ....

- These uncertainties can be resolved by a small device producing 1-2MW neutrons, costing < $0.2B .... or by a smaller D-D device costing << $0.1B: see:
“Fusion for Neutrons” (F4N) is bringing new impetus to Fusion Research

- Including new interest in small STs both for basic research – and into new studies of beam-plasma fusion

Plasma in START

Design of PRST30 (TSUK Ltd)