

## **The STEP Magnets Technology Development Programme 2025 – 2029**

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***Abstract***—The Spherical Tokamak for Energy Production (STEP) is an ambitious public programme to deliver a UK prototype fusion power plant alongside a pathway to commercial deployment. One of the primary technical challenges facing the programme is the development of the unprecedented scale high temperature superconducting magnets required by the reactor concept design.

This presentation outlines the STEP Magnets Technology Development Programme planned for the period 2025 – 2029, culminating in the delivery of a sub-scale toroidal field model coil demonstrating the key technologies required to provide confidence in the scale-up to production. In summary, these technologies include high-current cable and feeder development, quench detection and protection methodologies, ac loss tolerant cooling systems, and HTS tape selection and quality control.

In support of these technology demonstrations is required a continuous development of modelling and manufacturing capability, and the specification and construction/procurement of test facilities suited to performing the required large-scale tests. The delivery of these capabilities through partnership is a central aspiration of the programme, and feedback and engagement on the plans from the broader fusion magnet community is explicitly invited.

***Keywords (Index Terms)***— Fusion, Spherical Tokamak, Toroidal Field Coils, HTS Cable, Quench, REBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub>, HTS Magnet, Magnet Design

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