

# UK FUSION ENERGY LTD STRATEGY

*The boldest endeavours start with a practical STEP*



“ UK Fusion Energy is one of the world’s leading fusion companies. The government completely backs the UK Fusion Energy vision set out in this document, to build on our national strengths to take fusion from the lab to the grid, delivering major benefits to the UK now and for generations to come. ”

Lord Vallance of Balham - Minister for Science, Innovation, Research and Nuclear

The background of the page is a dark blue color with a white line-art illustration of a fusion reactor's cross-section. The illustration shows a central toroidal chamber with various internal components, including what appear to be diagnostic ports and structural supports, arranged in a complex, symmetrical pattern.

## **OUR PURPOSE**

Delivering STEP and successive fusion power plants  
by acting as a national fusion systems integrator,  
and working with industrial partners to develop and deploy  
the technologies and capabilities required.

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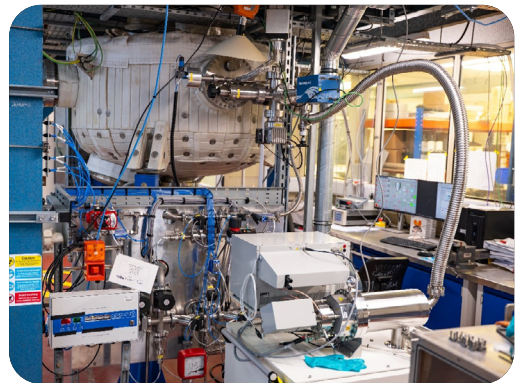
# SUMMARY

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## Who we are

UK Fusion Energy Ltd (UKFE), formerly UK Industrial Fusion Solutions Ltd, is among the most advanced and best-capitalised fusion companies globally. Born out of the UK Atomic Energy Authority (UKAEA), the world's largest national fusion laboratory, and backed by the UK Government, we are building on over 70 years' experience across all aspects of fusion energy development, including 40 years of operating JET<sup>1</sup>, to integrate the delivery of commercial fusion energy plants and build the associated industry.

Our next step on this journey is the STEP Fusion project – a prototype plant we are building and will operate at West Burton, by the River Trent, in the Midlands from 2040, a catalyst for the fusion sector in the energy heartland of the UK. We have strong national and regional support including £1.3bn of funding for the next stage of STEP Fusion. We are proving the technologies required and completing an integrated design which will deliver net power to the grid, breed its own tritium fuel, and demonstrate a path to commercial availability.



<sup>1</sup> Joint European Torus – the most powerful fusion energy device to date and one of only two tokamaks that have ever operated the Deuterium-Tritium fuel mix needed for commercial plants.

## Our strategy on a page

### Global demand and opportunity

Fusion energy is one of the most significant global opportunities of the century. As worldwide demand for clean, secure and scalable power accelerates, fusion offers stable, low-carbon energy capable of deployment anywhere across the globe – an industrial opportunity valued at £3-12 trillion<sup>2</sup> by the end of the century. Progress is rapid, and while major milestones remain, the next critical phase is industrial: building the capability to manufacture and integrate fusion systems at scale. Now is the time for society, industry and investors to help shape, and benefit from, an entirely new energy sector as it matures.

### National strength

With over seven decades of leadership in fusion research, engineering and operations, the UK brings unparalleled depth in science, technology, IP and systems integration. And the UK also leads on the conditions for success, being the first country to set up a positive regulatory approach for fusion and to commit to developing a market framework for fusion energy. The UK's Fusion Strategy<sup>3</sup> sets out the national ambition, and UK Fusion Energy translates this ambition into reality through a distinctive operating model based on commercially relevant integrated design and true partnering with the best of industry.

As whole plant integrator, UK Fusion Energy orchestrates the end-to-end development of fusion facilities - from concept and design through construction and operation - working with industrial primes to co-develop the critical technologies and industrial capabilities needed for fusion at scale - with applications far beyond the sector itself.

### Industrial partners

UK Fusion Energy is now assembling world-class industrial partners and supply chains to bring together and optimise the full suite of technologies and systems required to deliver whole-plant fusion solutions safely. We are already building a thriving industry which benefits from the global market for these technologies with applications spanning beyond fusion. Industrial partners involved in the development of STEP Fusion will be ideally placed to deliver the future fleet of commercial fusion plants.

As integrator, we aim to provide commercial fusion plants globally, enabling our industrial partners to win work around the world. Commercial opportunities exist now in developing technologies for fusion and adjacent sectors.

### Investors

Fusion creates significant investment opportunities from now. At the company level, UK Fusion Energy will come forward with opportunities for investors in due course as we demonstrate further progress on the STEP Fusion prototype. At the supply chain level, and in the very near term, UK Fusion Energy will work with industry partners to secure investment into them, leveraging the capability they build through STEP Fusion and the multiple adjacent advanced technologies they can develop from the IP we license to them. And there are also opportunities on our site at West Burton and in the surrounding region, where our STEP Fusion project is an anchor for the wider Trent Clean Energy Supercluster<sup>4</sup> and its high-value industries, creating scalable pathways for long-term investment.

<sup>2</sup> <https://www.gov.uk/government/publications/clean-energy-industries-sector-plan>

<sup>3</sup> <https://www.gov.uk/government/publications/uk-fusion-strategy-2026>

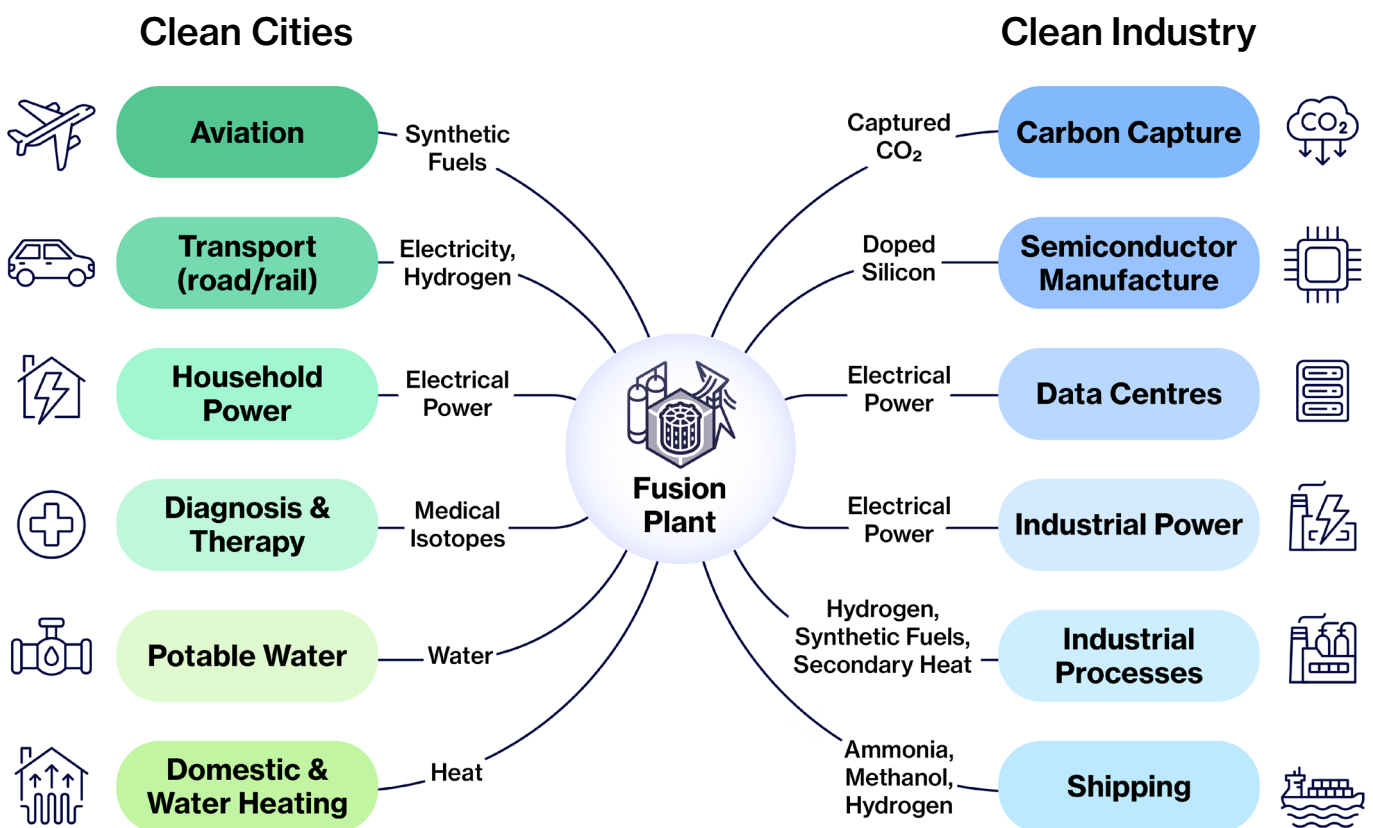
<sup>4</sup> <https://www.eastmidlands-cca.gov.uk/supercluster>

# GLOBAL OPPORTUNITY

## Why fusion?

Fusion energy powers the stars; on earth it can be a game changing technology. The market demand is huge and **those who commercialise fusion will lead an energy revolution with rewards counted in trillions of pounds.**

Fusion energy is **reliable**, it doesn't depend on seasonal variation, the sun or the wind. Fusion fuel is **abundant**, it can be found in our seas and the earth's crust. Fusion is **energy efficient**, it is the most power-dense process available on earth. Fusion energy is **clean**, it is low carbon with low land usage. The fusion process is **safe**, it can be readily controlled. Fusion energy has **many uses** for the neutrons, high grade heat and firm electricity it can produce.



*Many uses for the neutrons, high grade heat and firm electricity produced by a commercial fusion energy plant*

## The global landscape

The race to commercial fusion energy is now accelerating, and nations are moving fast to secure their early position in a future global fusion market, estimated to be worth trillions of pounds by the end of the century. The US hosts the largest cluster of fusion start-ups, China is driving progress through strong state backing, while the EU combines flagship programmes like ITER with a growing mix of public-private initiatives.

**But it is not a winner takes all market.** There are multiple approaches and room for many industrial players across design, manufacturing and operation. Many core capabilities are common to different designs, creating significant export opportunities. With its clear strategy and national fusion integrator, the UK is positioning itself not just to take part in this industry but to lead it.

# UK LEADERSHIP

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## Government commitment

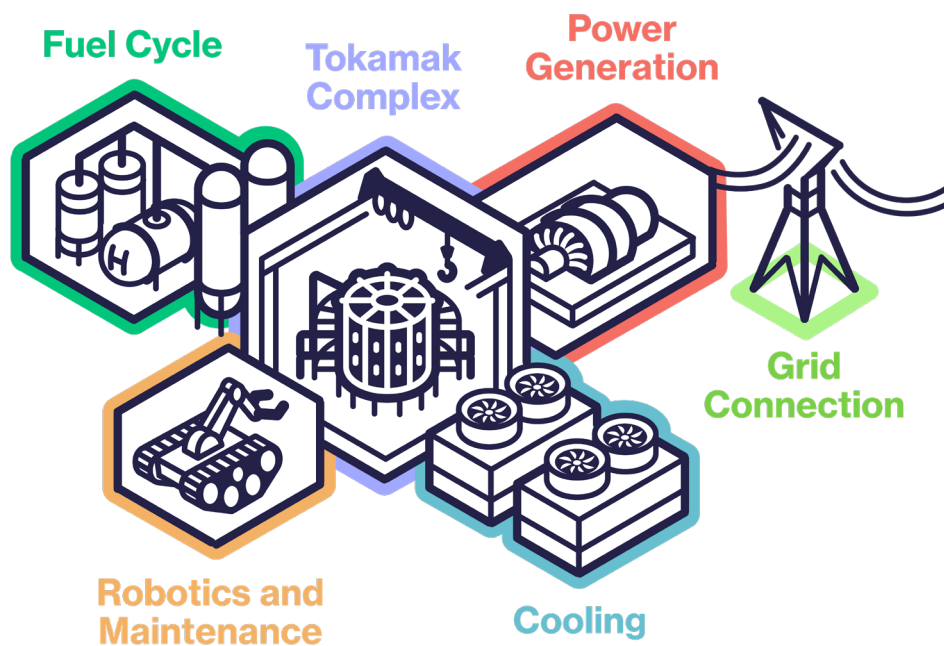
**The UK stands out for its strategic, whole-system approach.** As the first country to publish a national fusion strategy, the first to regulate specifically to help safe fusion deployment and the first to commit to developing a market framework for fusion generated energy, it is setting the conditions for success. In 2025 the Government backed this with £2.5bn of funding for fusion energy, of which £1.3bn funds UK Fusion Energy to deliver the next stage of STEP Fusion.

## A strong science base

UK Fusion Energy has come from UKAEA, the world's largest national fusion laboratory and the only one with the experience of operating a fusion machine with a powerplant relevant fuel mix – the Joint European Torus (JET) – for 40 years. UKAEA supports UK Fusion Energy as its Fusion Partner, bringing unrivalled expertise in plant integration and operation, as well as plasma science, robotics, materials research and fusion fuel systems. And the National Lab continues to drive new understanding with investments in its world leading spherical tokamak (MAST Upgrade), in tritium breeding research through the LIBRTI programme, and in digital technologies through the Culham Campus being the first UK AI Growth Zone.

## Taking the next STEP

UK Fusion Energy's purpose is to deliver STEP Fusion and successive fusion power plants by acting as a national fusion systems integrator, and working with industrial partners to develop and deploy the technologies and capabilities required, leveraging, strengthening and amplifying the UK-based industrial and technology ecosystem.



*The key systems to be integrated in a fusion power plant*



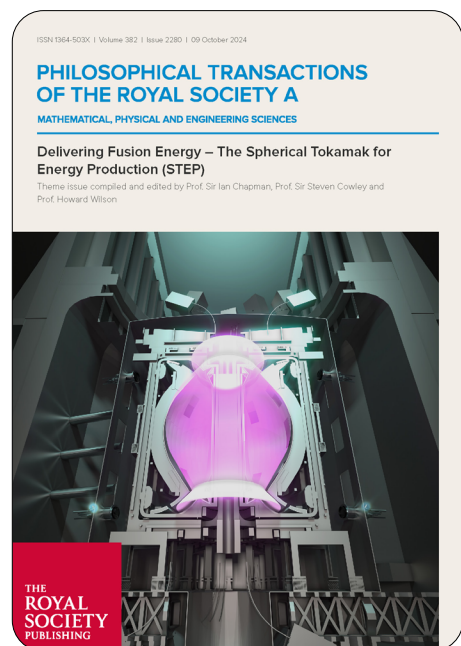
And we are making rapid progress. Our concept design is validated progressively by an independent international panel (an earlier version was presented in the Royal Society's Journal<sup>5</sup>).

## Recent technical highlights include:

- ✦ **Next-generation High Temperature Superconducting (HTS) magnet designs** that confine fusion plasma with dramatically reduced power demand, pushing magnet performance to the forefront of global innovation
- ✦ **Proof-of-principle remountable magnet joints**, a critical enabler for practical maintenance strategies and long-term plant operability
- ✦ **Advanced microwave gyrotron development**, improving heating efficiency and reliability, essential for sustaining a stable fusion reaction
- ✦ **Maintenance-led design** that cleverly integrates multiple parts of a tokamak to enable faster maintenance and component upgrade, without compromising safety
- ✦ **Integrated digital engineering and design management**, laying the foundation for AI-powered digital twins that link experimental data to high-fidelity simulation - boosting accuracy, efficiency, and confidence in our designs



In 2024 the Royal Society published a special edition giving a complete snapshot of the STEP Fusion design



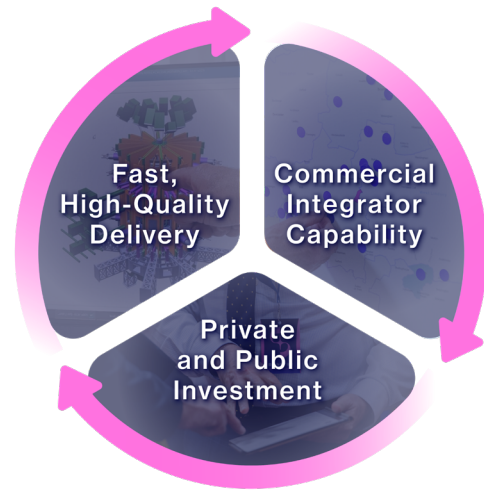
<sup>5</sup> <https://royalsocietypublishing.org/rsta/issue/382/2280>

# UK FUSION ENERGY – THE INTEGRATOR

## An integrated delivery team

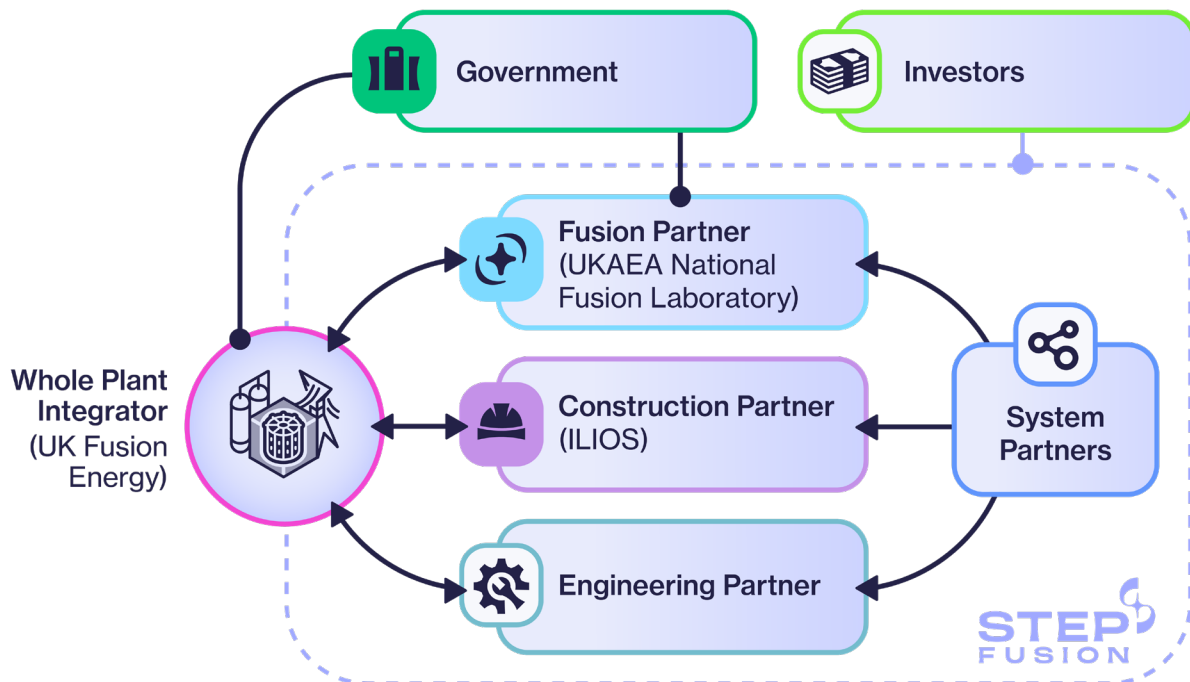
Delivering fusion energy is not just a technical challenge, it is an organisational one. To deliver the fusion power plants of the future, UK Fusion Energy is now sourcing and selecting the best industrial partners to build a world leading Integrated Delivery Team.

Initially through the STEP Fusion project, we will learn by delivering, fast, safely, and to a high quality; this will build our collective capability; which will help secure investment at all levels of the enterprise we create.



## Key partners

As the whole plant integrator, we lead overall plant design and delivery and take the associated risk. Through working with us, partners at every level develop capabilities and products that can serve multiple fusion programmes, and markets well beyond fusion now. **We are guiding and inspiring all the capabilities required to take fusion to market.** This includes combining world-class engineering with commercial expertise, major programme delivery, investment insight, design authority, business development and strategic partnering – supported by an operating model that aligns us and our partners around a shared mission. The unique know-how, experience and systems-level understanding developed through **STEP Fusion positions UK Fusion Energy and its partners to deploy commercial fusion plants globally.**



*Our partnering model for delivering STEP Fusion*

## Fusion Partner

The UKAEA National Fusion Laboratory is UK Fusion Energy's Fusion Partner, providing unparalleled support through its mission to "*Deliver foundational research, technology and innovation in support of the fusion sector through world-leading fusion expertise and capability.*" UKAEA will also commercialise some aspects of its fusion expertise through a pipeline of spin outs, IP licenses, and joint ventures with industry partners. The companies created and enhanced in this way will play a key part in the UK Fusion Energy supply chain.



## Construction Partner

We have already appointed the Construction Partner for STEP Fusion, ILIOS<sup>6</sup>. This collaboration brings strong construction expertise, programme delivery capability and industry leadership into STEP Fusion.



## Engineering Partner

We will need world leading capability in major engineering, from concept through to manufactured product and we intend to approach the market with this opportunity. In the near-term, engineering works will be delivered by a range of partners, a pipeline of opportunities for these works will be published. This includes partners specialising in specific systems, as outlined below.

## System Partners

We are also now identifying key partners at the system level, those companies that specialise in specific critical technologies needed for STEP Fusion and beyond. Our first System Partner is Tokamak Energy, a UK firm with leading capability in High Temperature Superconducting (HTS) Magnets and a pedigree in fusion. UK Fusion Energy's pipeline of opportunities, including those for major system partners, will fill out over the next 2 years.

**Tokamak Energy** 

*Tokamak Energy (TE), founded in 2009 as a spinout from the UK Atomic Energy Authority, has become a global leader in fusion and HTS magnet technologies.*

*The company has raised \$335 million from private and government sources, enabling rapid expansion of its devices, magnet systems and international reach.*

<sup>6</sup> A Joint Venture of Kier and Nuvia, supported by AECOM, AL\_A and Turner and Townsend.

# UK FUSION ENERGY – THE INTEGRATOR (continued)

## Digital & AI underpinning our partnerships

UK Fusion Energy is working with global digital companies to maximise the role of digital and AI in developing its capability. The three main areas we are exploring are:

### ✦ Developing fusion technology

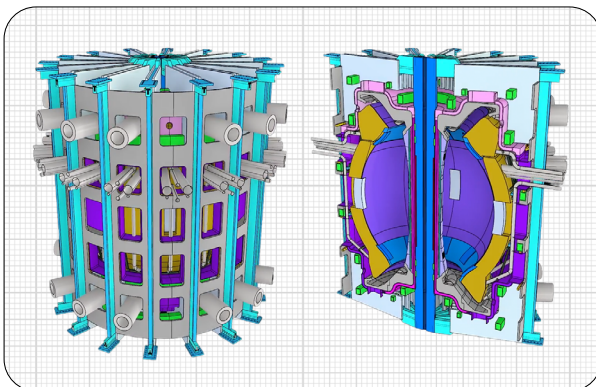
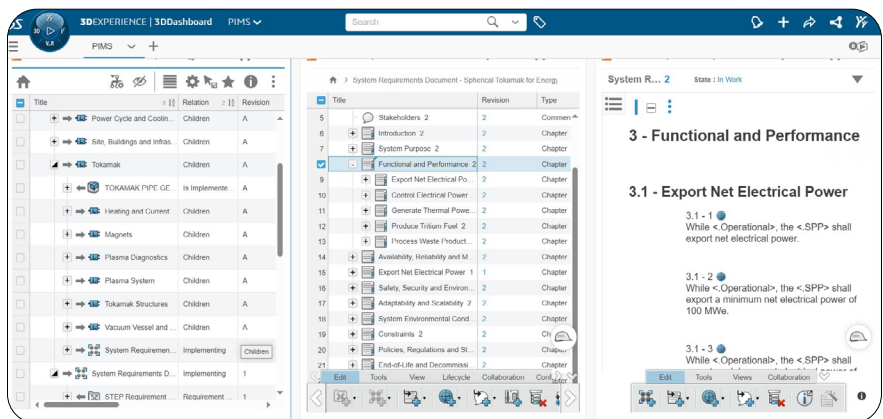
AI techniques could play a significant role in plasma control, in developing and qualifying materials, and in accelerating our leading edge high performance computing simulations

### ✦ Supporting the whole plant integrator role

Integrating a wide range of organisations across a supply chain requires a strong digital backbone. Learning lessons from other industries and projects, UK Fusion Energy is now investing significantly in digital approaches and is supported by Dassault Systèmes in this area

### ✦ Accelerating the schedule

Digital and AI techniques could play a significant role in reducing the time from concept to detailed design – a major opportunity for industry to develop and test new approaches



*STEP Fusion has a digital backbone, accelerating innovation, reducing risk, and maximising value*

## West Burton - the heart of the fusion revolution

**The fusion industry that we are now growing will be rooted in West Burton, by the River Trent, home of STEP Fusion in the East Midlands.** The benefits will be felt across the whole of the UK, building on our existing national strengths. West Burton will be the centre of a globally significant cluster that we are now catalysing, attracting high-tech industries and investment into the region, bringing in businesses and creating a knowledge hub for advanced technology.



*West Burton has been powering the UK for 60 years. As the home of STEP Fusion it is pioneering clean energy for generations to come*

As UK Fusion Energy grows into a global commercial fusion plant integrator, we will help secure UK jobs and capabilities across the entire supply chain for decades to come, ensuring that the economic value of fusion is felt locally, nationally and for generations into the future.

STEP Fusion has already catalysed the creation of the Trent Clean Energy Supercluster, led by the East Midlands Combined County Authority (EMCCA).

# UK FUSION ENERGY – THE INTEGRATOR (continued)

## Value in the journey

Building a fusion power plant requires integrating the solutions to some of the hardest engineering challenges on Earth:

- ✦ Components operate at extreme limits
- ✦ Robotics must work reliably in extreme environments where humans cannot
- ✦ Heat, radiation, materials, and safety must be managed simultaneously
- ✦ Thousands of highly complex systems designed and integrated into a single, coherent machine

Solving these challenges creates enduring capability, the kind that underpins the wellbeing of populations, national resilience, economic strength and global influence. That capability in turn creates new products and services that drive growth. We are already seeing fusion-led development driving value in healthcare, infrastructure, space, defence, and future energy systems, through adjacent applications.

### HTS magnets for healthcare

STEP Fusion derived advances in HTS magnets offer transformative benefits for Magnetic Resonance Imaging (MRI) systems, resulting in economic and social benefits in a global market. More powerful HTS magnets lead to reduced scan times and better image quality, which is particularly beneficial for brain imaging. The market for MRI body scanning systems is estimated to be worth \$23.4bn by 2035.

Beyond MRI, HTS magnets will improve particle therapy for cancer treatments and Nuclear Magnetic Resonance (NMR) systems for drug discovery, markets expected to be worth \$4.2bn and \$2.6bn respectively in 2035.



### Microwave sources powering 6G

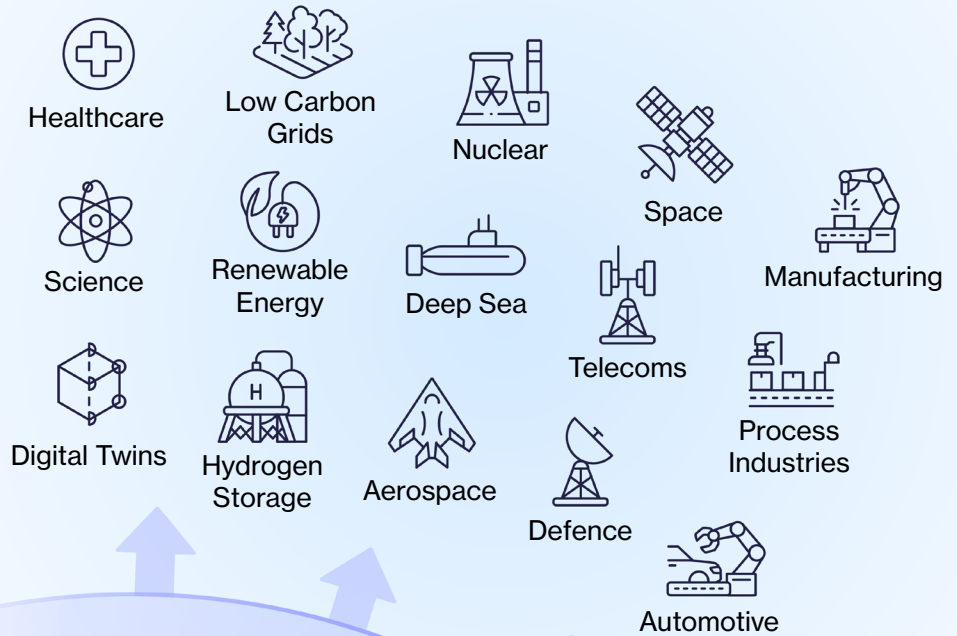
More efficient and lower cost microwave sources known as gyrotrons are being developed for STEP Fusion to heat the plasma. As well as being a key building block for commercialising fusion energy, gyrotrons have a range of other valuable uses from high tech manufacture and deep drilling to telecoms.

Gyrotrons can play a key role as high frequency microwave sources for 6G, the next generation of mobile telecoms. 6G will provide ultra-fast speeds of up to 1 TBps, bringing numerous benefits from native AI integration to improved access for rural communications. STEP Fusion developed gyrotrons can capture a share of a projected market of over \$20bn by 2033.



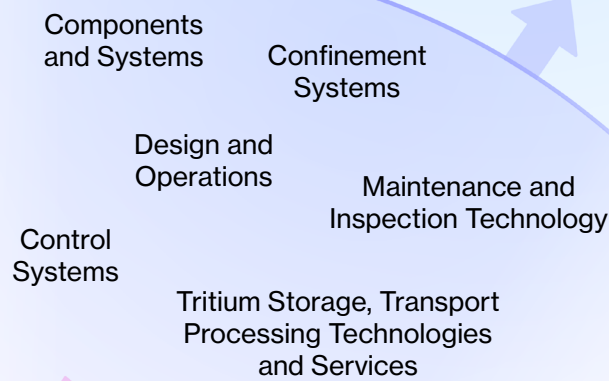
## Adjacent Markets

Companies deploying or supplying technology to other high-value sectors beyond fusion.



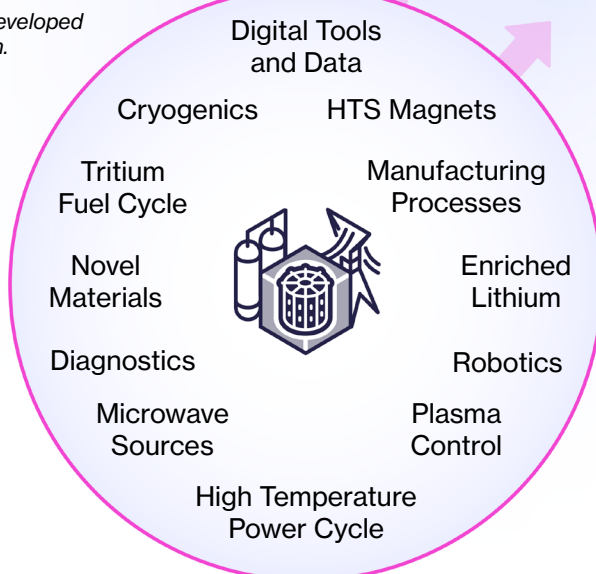
## UK Fusion Industry

Companies deploying or supplying technology to the global fusion energy sector, e.g. power plants, fuel cycle, services.



## STEP Fusion Programme

Technologies developed for STEP Fusion.



Adjacent markets which may benefit from fusion technology

# OPPORTUNITIES

## Industry opportunities

Fusion energy is a tough problem, but solving tough problems develops new capabilities, products and services that can grow new revenue streams and new businesses. That is already happening. A key part of UK Fusion Energy's role as a whole plant integrator is to bring together the right industrial team to deliver fusion, and to support its growth and sustainability. As well as acting as "first customer" for many companies in fusion, we will help open doors to other programmes and, through licencing IP, will help our partners grow.

Our industrial partners are and will be highly diverse, from large to small, from well-established names to new startups, from those with a laser focus on fusion to those reaching into a range of sectors. UK Fusion Energy's approach to integrated delivery draws on global success stories from industries such as aerospace, automotive, energy and defence. The announcement of TE as our Magnets Partner is one such success story.

We will publish a growing pipeline of commercial opportunities and would like to hear from companies now that have capabilities and innovations that could make a difference.

*STEP Fusion supply chain impact  
April 2019 - February 2026*

**49**

**West Burton  
local/regional  
suppliers**

74% since 2023

**31**

**UK academic &  
international  
agreements**

~£3.4m value

**521**

**Small to Medium  
size Enterprise  
(SME) suppliers**

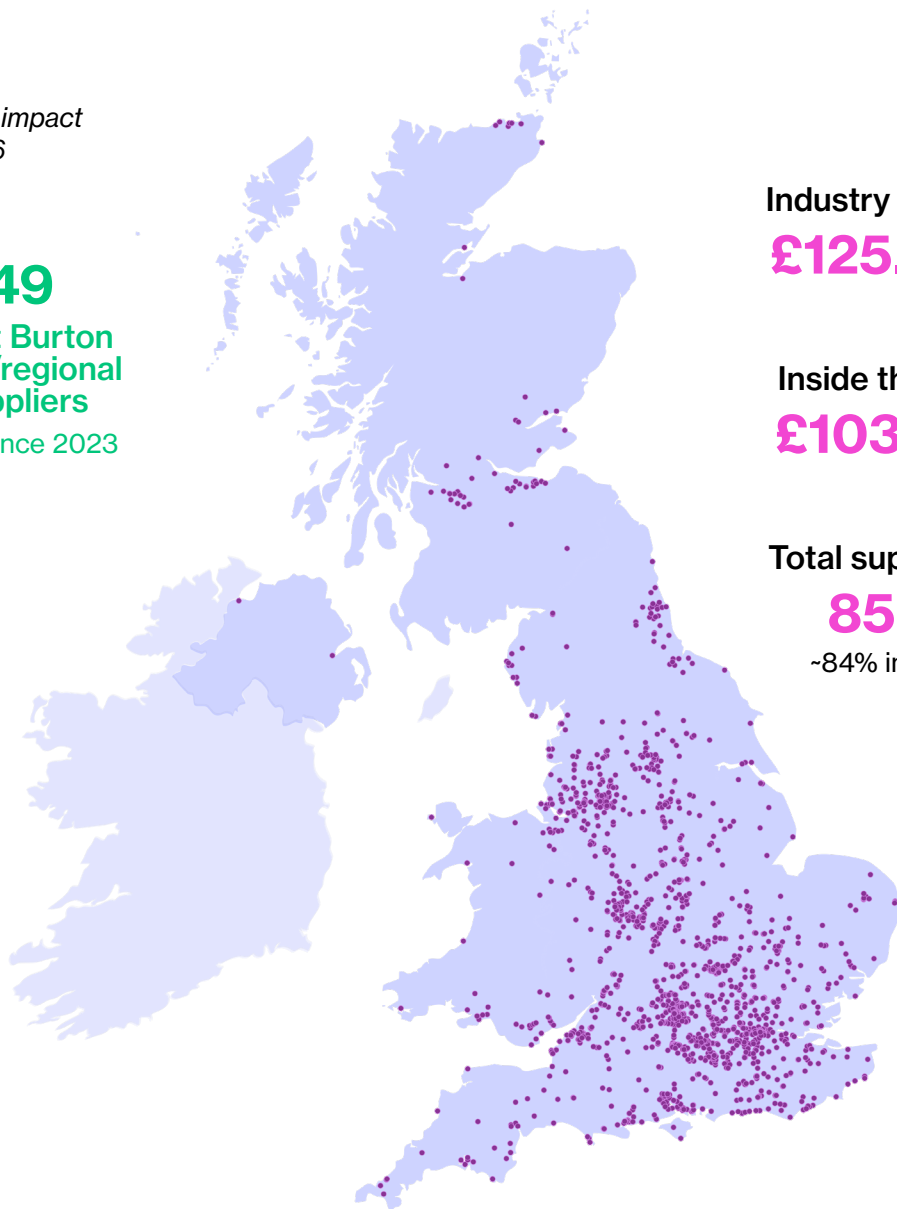
*SMEs are defined as suppliers  
that had 250 employees or fewer  
at any point since 2019. Some  
suppliers have since grown  
beyond the SME threshold.*

**Industry spend  
£125.5m**

**Inside the UK  
£103.1m**

**Total suppliers  
854**

~84% in UK



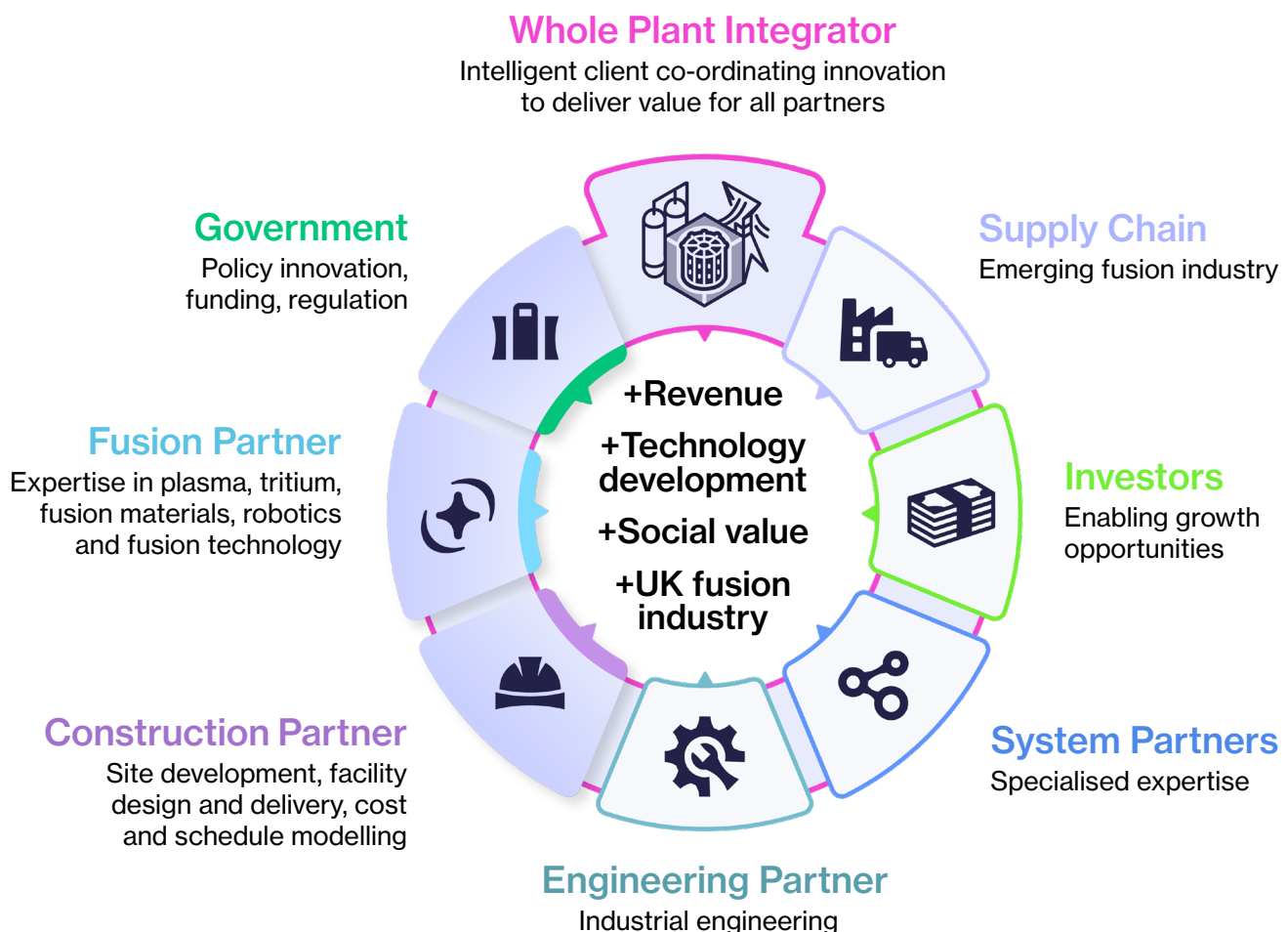
## Investor opportunities

As UK Fusion Energy develops and delivers STEP Fusion with partners, significant opportunities open from now for a range of investors – financial partners, industrial majors and partner nations. Our aim is to provide integrated commercial fusion plants globally, enabling our industrial partners to compete and trade in global markets, providing huge opportunities for returns to investors at two levels.

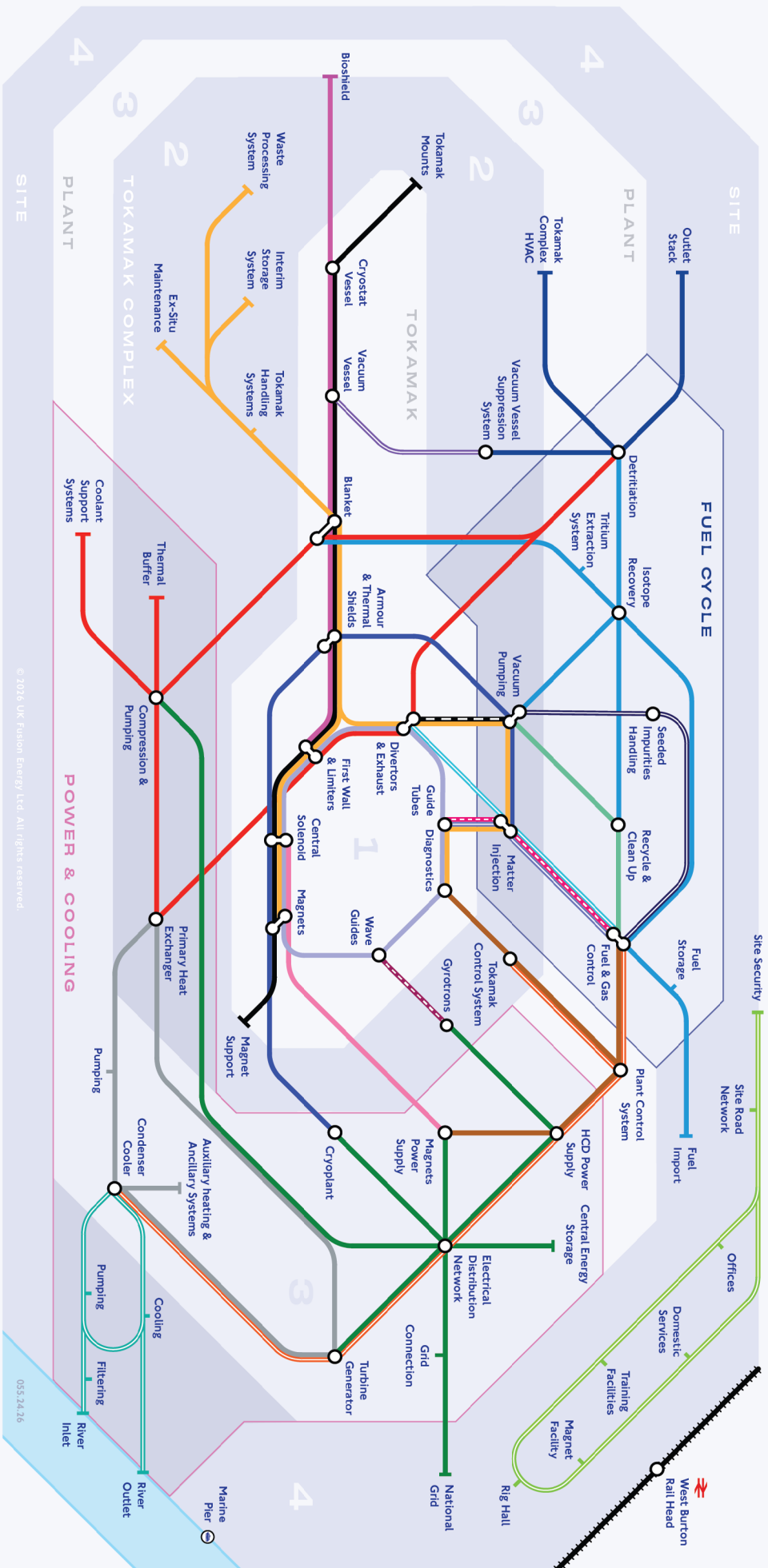
Firstly, there are opportunities through investing in the supply chain that will learn and develop through working with UK Fusion Energy on STEP Fusion, developing capabilities, products and services applicable to other fusion programmes worldwide, and also developing adjacent technologies such as new materials, new digital capabilities and robotics. These opportunities exist now and will continue to grow.

Secondly, as we gain confidence in overall fusion plant viability, UK Fusion Energy will itself look to raise investment as we demonstrate our ability to be the whole plant integrator of commercial plants beyond the prototype. In due course UK Fusion Energy will come forward with an investment prospectus.

There are also important opportunities at the site of STEP Fusion in the Midlands. We aim to help develop a vibrant business park around the STEP Fusion plant and are now looking to attract companies to locate on the site, or nearby in the region. We are working closely with key stakeholders such as EMCCA to support that inward investment.



*Our integration model for delivering commercial fusion plants*



- Neutron
- Structural Loads
- Maintenance
- Atmosphere Protection
- LOCA Protection
- Fuel
- Thermal Power Transfer
- Power
- Cryo Cooling
- Seeding
- Vacuum
- Plasma

- Rapid Tritium Recovery
- Gas Injection
- Pellet
- Disruption
- Magnet Power
- Working Fluid Systems



# SYSTEM OF SYSTEMS

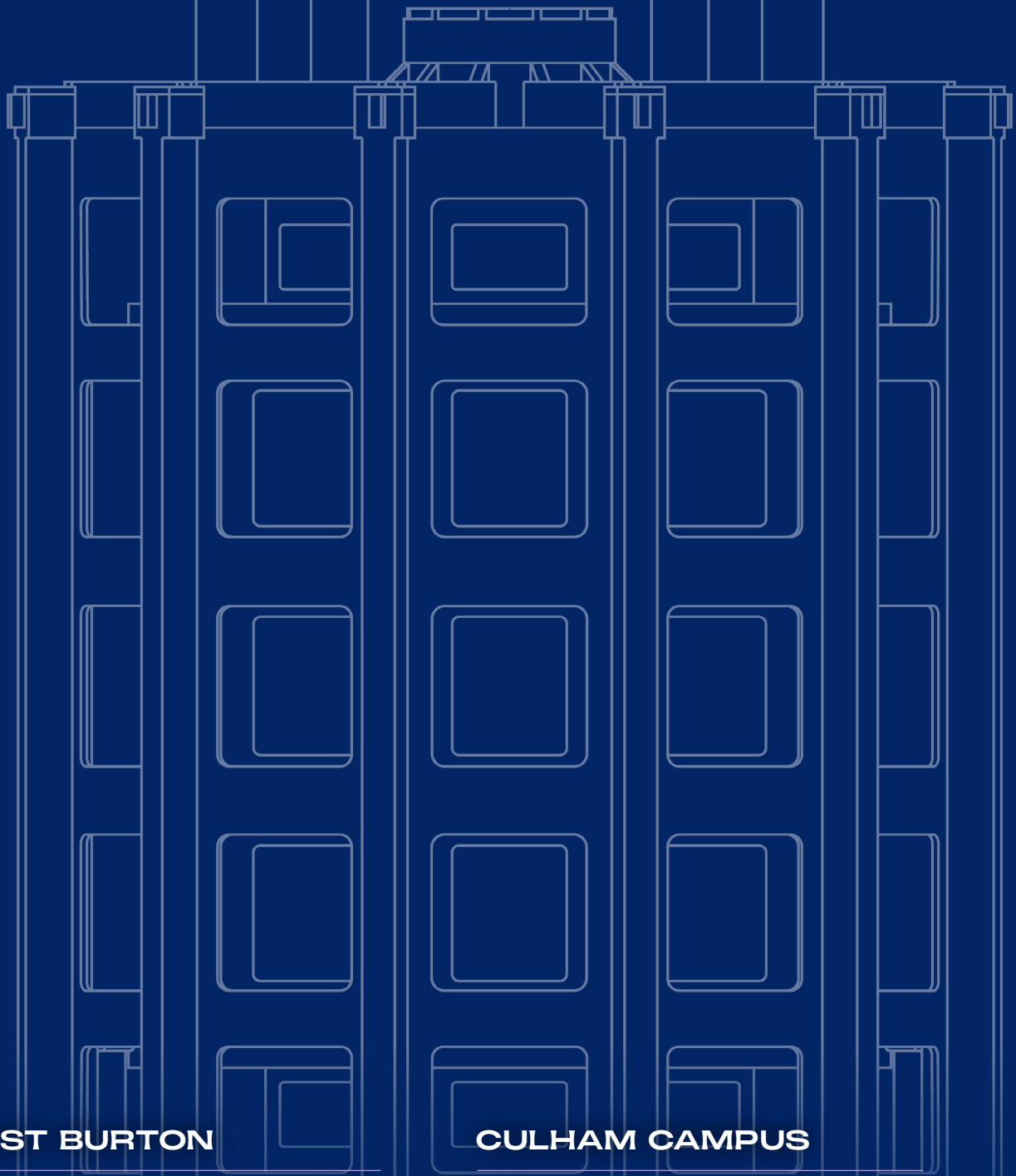
## MISSION TO FUSION

Our design team are mapping out the complexities of realising the STEP Fusion plant, understanding how all the systems interact and optimising our prototype to deliver the essential features required for commercial fusion plants; net power, tritium fuel self sufficiency and a path to commercial availability.

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## **WEST BURTON**

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