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SOUTH WEST
NUCLEAR HUB

# Advanced Nuclear Technology Cluster

*South West Capability to Support the Development & Deployment of Next-Generation Nuclear Fission and Fusion Technologies*

University of BRISTOL

This prospectus outlines the unique advantages offered by the South West region, a natural home for the UK's next generation reactor programme.

The region hosted the world's first commercial nuclear fission power station at Berkeley and remains uniquely prepared to deliver world first nuclear reactor projects such as small and advanced modular fission and fusion power plants.

These are apex projects, part of a co-ordinated programme of advanced nuclear energy technology development and, like the nuclear laboratories at Berkeley, would become a world-leading centre of research and innovation.

The South West has a unique combination of infrastructure, workforce, knowledge supply chain, R&D capability, skills and sites that can support the deployment of advanced nuclear energy technologies.

The Local Industrial Strategies for the South West region are united around a desire for ambitious but clean growth, aligned to a national industrial strategy that re-energises the economy and creates a step change in workforce productivity.

Focussing the UK's advanced reactor programme in the South West builds on a highly capable science and industry base, driving up productivity within and outside the region.

# The Advanced Nuclear Opportunity

The UK stands at the threshold of an unprecedented challenge, to comprehensively decarbonise energy supply by 2050, during which time demand for electricity is forecast to quadruple with the electrification of transportation and domestic heat. By then all but one of the present fleet of nuclear power plants, which provide the largest share of the UK's low carbon electricity, are expected to retire. New nuclear capacity, alongside all low carbon energy options, is urgently needed, not just to replace existing supply but to increase capacity to meet these ambitious and essential goals.

For the South West region, this is an equally unprecedented opportunity – to leverage the capability in nuclear energy and complimentary high value engineering industries to create a centre of nuclear innovation of global significance. This centre will help create the new technologies that enable nuclear to make the maximum possible contribution. It could enable the region not only to become the first zero-carbon economy in the UK, but to become a net exporter of clean, affordable and secure energy.

*Below: A CGI image of Hinkley Point C in Somerset; the JET fusion facilities in Oxfordshire*

## Nuclear Sector Deal

"The government recognises growing local and regional interest in a number of sites for further nuclear development. In principle, it notes the arguments of developers that new, smaller power plants should (re)use existing, licensed sites to take advantage of past investment in infrastructure and grid connections, and the skilled workforces around them.

Taken together, the government believes that this enabling framework will create a fertile environment for the development and deployment of advanced nuclear technologies in the UK. The challenge for the industry is to bring forward technically and commercially viable propositions that would lead to the deployment of new reactors that would be investable and cost competitive in the energy system".

## David Eccles

### EDF Energy New Nuclear Build Public Engagement

*"Hinkley Point C always envisioned that it would provide the catalyst for further technological investment in the South West and we would be delighted if some of these initiatives came to fruition and so generated sustained economic benefit for the region"*

## David Ralph

### CEO, Heart of the South West LEP

*"Low carbon energy self sufficiency enabled through nuclear, in addition to the transferable skills and supply chains within nuclear and other high value engineering supply chains are at the fulcrum of delivering a south west clean growth economy."*

# Capabilities

## Research and Innovation

The South West Nuclear Hub is an alliance of Universities and industry pursuing world-leading research, innovation and teaching in support of nuclear energy for electricity and other high-value applications.

The Bristol Robotics Laboratory is the most comprehensive academic centre for multi-disciplinary robotics research in the UK, home to a vibrant community of over 300 academics, researchers and industry practitioners.


The National Composites Centre brings together dynamic companies and enterprising academics to develop new technologies for the design and rapid manufacture of high-quality composite products. The combination of academic and business strengths is speeding progress from laboratory to design to factory and into products.

## Nuclear Construction Workforce

Hinkley Point C, the most recent new nuclear power station to begin construction in Europe, has brought together a large and diverse workforce capable of supporting other advanced nuclear projects.

Highly skilled people with experience of the nuclear safety culture are an asset to the UK, such as supporting the strategic defence sector, which demands similar skills to sustain nuclear submarine design, build and maintenance capability.

## High Value Engineering Knowledge and Supply Chains

The South West is home to a unique specialist knowledge, including high temperature reactor operation (at EDF Energy's technical headquarters at Barnwood and at technical support organisations like Frazer Nash and Atkins), nuclear project delivery (with key suppliers like Framatome and other contractors such as Cavendish Nuclear) and a growing supply chain capable of helping to deliver a first-of-a-kind new nuclear reactor.

### Professor Tom Scott

University of Bristol

*"With a growing climate crisis there is a national imperative to make nuclear energy cheaper and faster to install. We can only achieve this with well targeted and coordinated research and innovation activities strongly supported by the government as well as industry."*

### Stefan Cecchini

Framatome UK Business Development Manager

*"A progressive and collaborative approach from the HPC tier 1 community to integrate UK SME's is needed. This will create the necessary environment for extended facilities, ranging across research, qualification, test, fabricate and assembly, to form a synchronized UK utility that will underpin further nuclear supply chain growth."*

# Key Centres of Capability

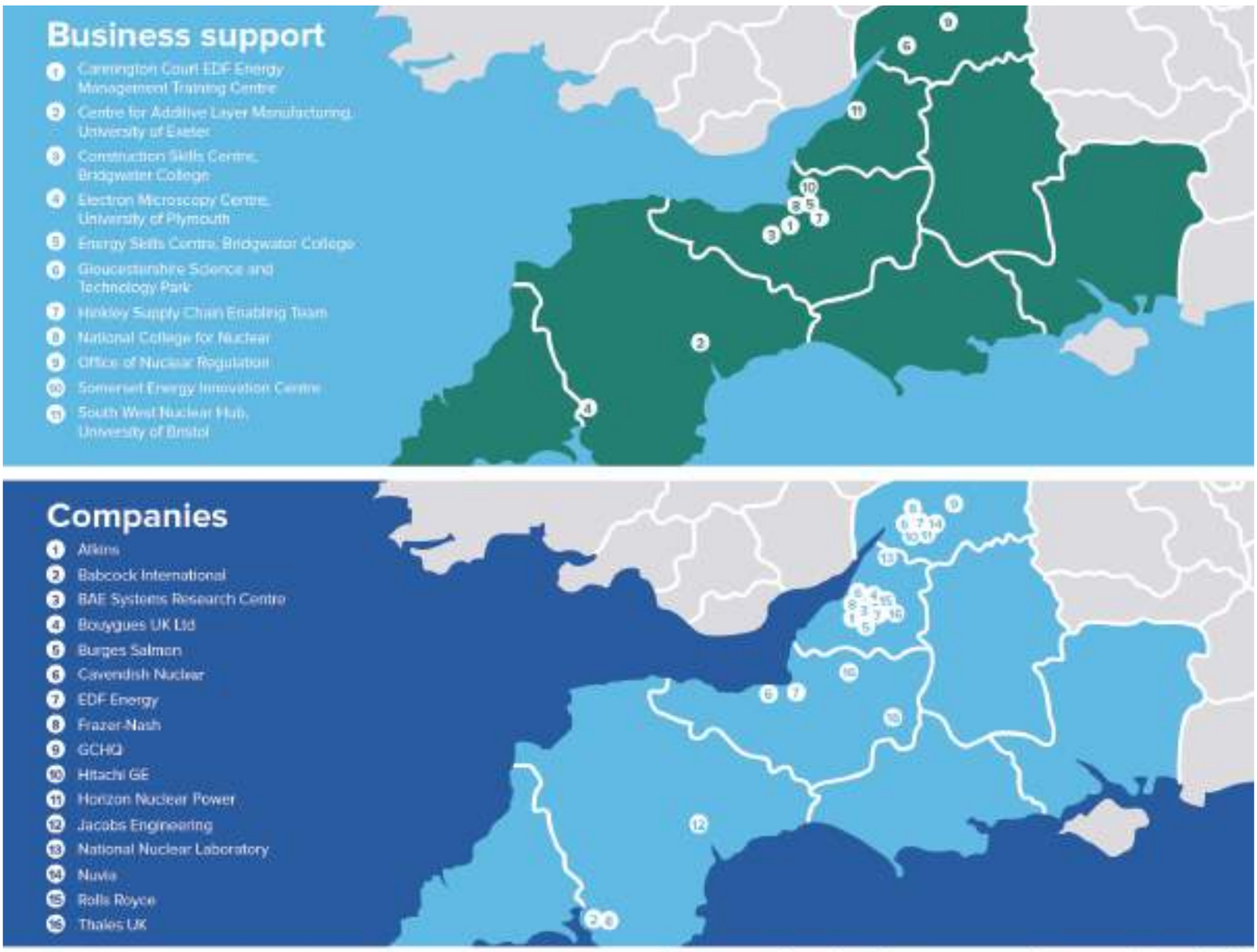


*Image credit: Nuclear South West*

# Capabilities

## Public Acceptance of New Nuclear

Living with some of the longest established nuclear sites in the world, home to a new nuclear construction project of global significance and with a proud history of engineering innovation, the general public in the South West have demonstrated a well-developed understanding and acceptance of nuclear technology for energy and defence applications.

## Nuclear Cluster

The South West region is uniquely well coordinated, with a well-established nuclear cluster that unites the public sector (the West of England Combined Authority, Heart of the South West and Gloucestershire First Local Enterprise Partnerships), academia (the South West Nuclear Hub at the University of Bristol), the supply chain (the Hinkley Point Supply Chain Team and Business West) and skills (the National College for Nuclear Southern hub at Bridgwater and Taunton College).

## Education and Training

The complete range and number of skilled people needed to deliver the ambitious programme of potential advanced nuclear energy projects do not yet exist, including the need to create completely new knowledge and capability in areas as diverse as materials science and augmented reality.

The South West is home to internationally leading institutions capable of training new entrants and upskilling the existing workforce to meet the demands, including the University of Bristol masters and doctoral programmes in nuclear science and engineering, the National College for Nuclear and two Institutes of Technology connecting to a proactive and reactive Further Education Sector.

## Sites

The South West is home to a number of existing nuclear licensed sites, (such as Berkeley, Oldbury), close to centres of urban and industrial electricity consumption, with existing grid connections and access to cooling water, identified in the National Policy Statement for new nuclear and with local communities likely to accept new nuclear projects.

It is also home to other large non-nuclear sites such as the Gravity Enterprise Zone, which aims to be a pan-sector Hub supporting the shift to a cleaner economy. Together these sites provide the opportunity for nuclear technology to prove its suitability in a range of contexts around the world.

*Images: Top: National College for Nuclear Southern Hub Middle: Berkeley Nuclear Laboratories Bottom: proposed view of Hinkley Point C*

## Regulation

Advanced nuclear reactors are an unparalleled technological leap, offering more than just electricity to the future low carbon economy. Innovative regulation will be essential to ensure that new technology can have the maximum positive impact, such as the production of Hydrogen and other high-value products.

The UK has a uniquely adaptable goal-based regulatory system and both the principle nuclear regulators in England, the Office for Nuclear Regulation and the Environment Agency, have major offices within the region focussing on the nuclear sector.

# Complimentary High Value Engineering Sectors

## Nuclear

The South West is unique in the UK in being home a range of activities that span the nuclear lifecycle, including new nuclear construction (EDF Energy's construction headquarters at Bridgwater House), fleet operation (EDF Energy's technical headquarters at Barnwood) and decommissioning and waste management (the Magnox Technical Centre at Oldbury).

## Aerospace

The region is home to a strong and established supply chain in the aerospace and aviation sectors, key innovation assets and cutting-edge expertise in emerging technologies, brought together by the SMART Aviation Cluster. This places the region at the forefront of aviation technology and is delivering a step-change in skills, innovation and growth.

## Marine

The South West is home to a range of world class companies and institutions with overlapping and complimentary capability across a wide breadth of the 'ocean economy'. Brought together by the South Coast Marine Cluster, the sector includes centres of excellence in Autonomy and Robotics; Design and Manufacturing; Offshore Renewables; and Sensors, Satellites, and Environmental Technology. Overall, the marine sector represents £2.54bn GVA per year to the economy and 104,000 jobs in almost 8,000 businesses.

## Digital & Creative Industries

The South West is a meeting point between engineering and creative capability, containing some of the UK's most advanced digital infrastructure. It is part of the UK Government's '5GUK Testbeds and Trials Programme' to create a world-class 5G technology Test Network that places Britain at the forefront of the next wave of mobile technology, adding up to £173bn to the economy by 2030.

It is also home to the innovative Bristol VR Lab and the recently announced Bristol Digital Futures Institute, which has recently received £55m of industrial funding from 27 partners including BT, Dyson, BBC, Airbus and Aardman.

## Defence

The Submarine Delivery Agency, based predominantly at the MoD Abbey Wood site, exists to procure and programme the construction of all new UK submarines. The Devonport Naval Dockyard is home to a number of retired nuclear powered submarines, the cost of dismantling and disposing of each is estimated at £96m.

There are opportunities to transfer knowledge, technology and capability between the defence and other allied sectors to ensure that these projects of national strategic importance are delivered safety and economically.

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