IBioIC

Industrial Biotechnology Innovation Centre

PHASE II SUMMARY

WWW.IBIOIC.COM

What is Industrial Biotechnology?

Industrial Biotechnology is a means to manufacture chemicals, pharmaceuticals, consumer products, polymers, fuels and numerous other materials, using innovative manufacturing processes and sustainable raw materials with a reduced carbon footprint.

BBSRC defines Industrial Biotechnology (IB) as *'a set of cross-disciplinary technologies that use biological resources for producing and processing materials and chemicals for non-food applications. These resources can be derived from the tissues, enzymes and genes of plants, algae, marine life, fungi and micro-organisms.'*

https://bbsrc.ukri.org/funding/grants/priorities/ibb-industrial-biotechnology/

IB is delivering new products, new functionalities in existing products, and new markets as a whole new industry sector.

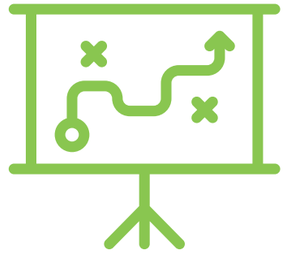
Why Scotland?

#1

Scotland's size permits strong integration and effective collaboration between industry, academia and government.

Network of Innovation Centres.

Scotland CANDO Action Framework.



Scottish Government Strategies are a strategic fit for IB:

Draft Climate Change Plan, Making Things Last: A Circular Economy Strategy for Scotland, Scotland's Economic Strategy.

#2

Scotland has a highly skilled workforce with strong academic capabilities based on existing industry in chemical manufacturing, engineering, biomedical technologies and refining which are highly transferrable to the bioeconomy.

The University of Edinburgh hosts the Edinburgh Genome Foundry – a fully automated facility for the construction of engineered strains which can be used for a multitude of applications.

The University of Glasgow houses the Glasgow Polyomics facility, a world-leading facility designed to address the complex intracellular analytics of bioprocesses.

The University of St Andrews owns Guardbridge, which houses SME biotechnology companies and provides low carbon electricity, heat and cooling along with access to biomass handling facilities.

#3

Scotland has established IB active companies of all sizes engaging with the manufacturing industry and pursuing aggressive growth.

Scotland has a long history in biotechnology from fermentation of yeast and distillation of alcohol by the whisky industry to pharmaceutical manufacturing using microorganisms.

GSK manufacture their largest global product (by volume) using a fermentation process at their site at Irvine Bay.

Current expertise ranges from utilisation of biomass feedstocks and organic waste co-product materials for production of valuable materials to the engineering of microorganisms for the production of high value chemicals.

Scotland has significant strength in synthetic biology, with both world leading academics and a growing ambitious company base.

Next generation molecular genetic engineering for the biotechnological production of:

- pharmaceuticals
- high-value chemicals
- materials
- novel therapeutic treatments
- solutions to address global sustainability and societal challenges.

Scotland's world leading development and implementation of renewable energy means that the country has the potential to produce more energy than it needs. Biotechnology can provide a sustainable use for that additional energy.

Local companies are using Scotland's academic base in chemistry, process engineering and biology to develop technologies for more efficient use of resources to create valuable products through biorefining of materials from biomass or through conversion of the carbohydrate fraction of biomass and other feedstocks to generate high value products.

#4

Scotland's unique natural resources.

Macro and Micro Algae

1. **Globally, macroalgae (seaweed) and microalgae are a potential feedstock for a bio-based economy.**

2. **Potential uses include:**
- Production of nutraceuticals and pharmaceuticals
- Sewage and waste water treatment
- Synthetic fuel

3. **Metabolic engineering (using micro algae as a vessel for producing novel products) is expected to be particularly important in pharmaceutical and chemical advances in the future.**

4. **Scotland has the most abundant source of macro algae in the UK, one of the most available sources worldwide, and has a long history of harvesting and utilising commercially.**

5. **Scotland is home to:**
- the Scottish Association of Marine Science (SAMS), a world leading research institution in the field of marine biotechnology, which houses one of the most diverse culture collections of micro algae in the world
- a small cluster of highly innovative marine biotechnology companies within Scotland

Industrial, agricultural and municipal waste

1. **Annually, Scotland produces 27 million tonnes of bioresources arising from:**
- wastes
- by-products
- agricultural residues
- 3 million tonnes of by-product from brewing and distilling industry

2. **Urban:**
- Concentration of economic activity
- Food and Drink sector - well positioned to realise the economic benefits of biorefining - creating a new Circular Economy

3. **Rural and Coastal:**
- Opportunity for decentralised production facilities – providing new income and employment opportunities

Forestry

1. **Scotland contains:**
- half of the UK forests
- two thirds of the softwood population
- one fifth of the hardwood population

2. **Timber value chain co-products and residues represent a significant resource for biorefinery feedstock**

3. **Tree stumps, brash and thinnings could become a valuable feedstock if they can be effectively extracted.**

#5

Scotland's Existing Infrastructure.

Grangemouth is the largest chemical manufacturing site and crude oil refinery in Scotland.

Guardbridge, owned by the University of St Andrews, provides low carbon electricity, heat and cooling along with access to biomass material handling facilities for SME biotechnology companies.

Irvine Bay in North Ayrshire is home to many global companies including EDF, UPM Caledonian, GSK and DSM. The local UPM Caledonian paper mill uses wood largely from local Scottish forestry with potential to share existing infrastructure.

PHASE I ACHIEVEMENTS | NEXT

Phase I Achievements:

£10M Core grant leveraged into:

£27.4M Direct activity

£23.4M Indirect activity

£100.8M Sector growth

170 New jobs

Phase I Network:

114 Industry Members

18 18 Scottish Partner Universities and Research Institutes plus N8 partner universities

04 Scottish FECs (Further Education Colleges)

+ HND, MSc and PhD courses

Membership Composition:

ORGANISATION

- **33%** Micro
- **32%** SME
- **28%** Large
- **7%** Other

LOCATION

- **41%** UK
- **40%** Scotland
- **11%** EU
- **8%** Other

Member organisations have access to the following benefits:

IBioIC's Technical Network, which connects members with specialist individuals whose expertise covers the vast space of industrial biotechnology.

Access to a **network of companies and events** from micro to multinational to aid in potential new market opportunities for IB.

Skills Programme which operates from HND – PhD level, providing access to CPD opportunities and a pipeline of trained industrial biotechnologists.

Project funding to support projects that bring industrial biotechnology closer to commercialisation.

Use of two open access equipment centres for the provision of scale up of industrial processes.

Learning from Phase I:

INDUSTRIAL ENGAGEMENT: ACHIEVEMENTS

Over **100** paying Industrial members

Networking opportunities with over **160** events

Raised global awareness of IB opportunities in Scotland

Annual conference with over **450** attendees

News/media coverage **>100**

Social media presence

IB National Plan gives focus to activities and targets to aim at

Strong support given to IB companies in developmental stages of their **growth**

INDUSTRIAL ENGAGEMENT: NEXT STEPS

Broader **supply chain** involvement

Government policies to **support** IB

Inward **investment** opportunities

Greater support and nurturing of **home grown start-ups**

Signposting to full suite of **business support facilities**

Broader engagement with supportive technologies (Syn Bio, automation, AI, Big Data etc.)

Horizon scanning for new opportunities

PROJECTS: ACHIEVEMENTS

48 Industry led projects in Scottish universities

2 equipment centres built and operational

Technical network established with access to **22** experts in IB

>£10m of additional funding secured

170 additional people employed in IB since starting

£100.8m growth in IB industry

PROJECTS: NEXT STEPS

Greater economic impact

Broader TRL scope in projects

Greater support for companies directly to de-risk IB adoption

Demonstration scale facilities

Industry access to (underused) facilities that are not IBioIC but which directly support IB advancement and implementation

Facilities tailored to build on **Scotland's unique IB strengths**

Direct **involvement in multi-national projects** that support Scottish IB

Better use of existing capabilities

SKILLS: ACHIEVEMENTS

>52 PhD Studentships awarded at decreasing cost to IBioIC

Collaborative MSc in IB with **>94** students trained over 4 cohorts

Established HND in IB with initial cohort of **15** students

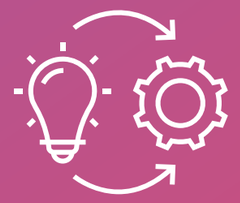
SKILLS: NEXT STEPS

Greater awareness of IB as a career opportunity

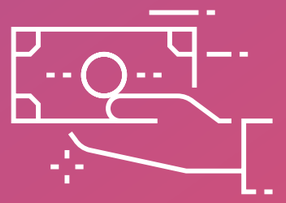
CPD opportunities for industry

The plan for Phase II:

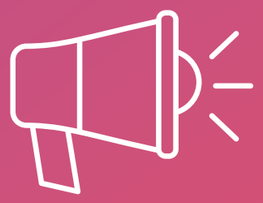
Key Additional Activities:



Leverage IB awareness to drive adoption and implementation.



Easier access to direct funding.



Promote advancement of policies to support commercialisation of IB.

Access to facilities to de-risk scale-up and demonstration.

Expand community into new value chains.

Project Activities:

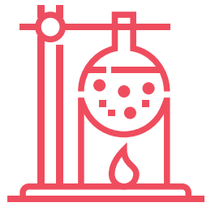
Phase I:
TRL 3 - 5

Phase II:
TRL 3 - 8

Proposed Development Facilities:

Marine Bioprocessing Centre.

Engineering Biology Innovation Centre.



Industrial Biotechnology Demonstration Centre.

5 key themes:

IBioIC Phase II Themes
Existing and Extended Services

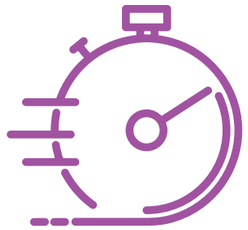
Providing Strategic Leadership #1

EXISTING SERVICES

- Lead and attend events conferences and workshops
- Promote Scotland on an international scale
- Raise awareness of Scotland's IB activity
- Represent company members at European level through BIC SME cluster membership

EXTENDED SERVICES

- Advocate for industry to influence IB friendly Government policy
- Provide continued horizon scanning for new opportunities and emerging technologies that meet Scotland's industrial and academic strengths
- Lead the development and delivery of the National Plan for IB with the SIBDG
- Lead on IB partnership development/relationship management with SE/HIE/Scottish Gov/UK Gov agencies, relating to the National Plan
- Develop and deliver an International strategy for IB, liaising with SDI as appropriate, including company targeting activity
- Develop all future IB propositions for indigenous and inward Investment opportunities, liaising with SDI as appropriate
- Lead for IB in Scotland at International Events, Trade missions, and similar activities as needs emerge



Accelerating Commercialisation #2

EXISTING SERVICES

- Provide access and support to strain optimisation through the IBioIC Rapid Bioprocess Prototyping Centre
- Provide access and support to process development at the IBioIC Flexible Bioprocessing Centre
- Coordinate access to all UK facilities through BioPilotsUK

EXTENDED SERVICES

- Support marine biotechnology company development through access to scale up facilities, primarily through the development of the Marine Bioprocessing Centre within the Highlands and Islands region
- Support the exploitation and development of synthetic biology strengths within Scotland
- Support the construction of bespoke demonstration plants to accelerate commercialisation

Developing New Value Chains #3

EXISTING SERVICES

- Increase the awareness of IB through the Network Integrator Project
- Expand IBioIC's reach into new sectors
- Attend and participate in events outside the mainstream scope of IBioIC

EXTENDED SERVICES

- Design and manage awareness events for industry interested in engaging with the IB community
- Extend value chain activity and technology scope to develop complete value chains from feedstock to market application
- Connect to European and Global value chains and webs
- Extend coverage of the product life cycle to work at higher TRLs
- Identify potential start-up companies and support
- Provide support packages for FDI targets

Investing in Value Chains using Biotechnology #4

EXISTING SERVICES

- Provide project calls for industry/ academic projects with funding secured and made available for the academic contribution
- Provision of mentoring and support for growing businesses
- Provide access to the IBioIC Technical Network ensuring the best expertise and advise for members

EXTENDED SERVICES

- Secure and provide funding support to industry to de-risk technology investment, commercialisation and adoption, TRL 5-8
- Catalyse the establishment of an IB incubator/accelerator to support new ventures and spin-out companies
- Enable the setting-up of an IB investment fund
- Become an expert in and champion for public sector support programmes
- Enable "proof of application" of new technologies /processes

Skilling the Necessary Workforce #5

EXISTING SERVICES

- Support and sponsor a collaborative MSc in IB
- Maintain an industry driven PhD programme
- Support an HND in IB through Scotland's FECs
- Contribute to STEM learning and provide school support for early adoption of IB

EXTENDED SERVICES

- Increase the technical and commercial capabilities of Scotland's workforce by providing continued professional development (CPD)
- Develop a part-time option of the current MSc to allow greater uptake as part of CPD

ENGAGEMENT ACTIVITIES NEXT

Table of Engagement Activities

Table 6: Summary of Industry Engagement Activities

Activity	Year 18/19	Year 19/20	Year 20/21	Year 21/22	Year 22/23	Total
IBioIC Engagement Events	8	9	10	11	12	50
IBioIC Conferences	1	1	1	1	1	5
Trade Visits and Press Trips	2	2	3	3	4	14
External Conferences	25	25	25	25	25	125
External Seminars/ Workshops	75	75	75	75	75	375
BBI Flagship Investment	0	0	0	1	0	1

Key milestones and KPIs

Logic Model: IBioIC Phase II

LOGIC MODEL IBIOIC PHASE II

NEXT

Key milestones and KPIs:

Input:

DIRECT FINANCIAL INPUT

- SFC
- Scottish Enterprise
- Highlands and Islands Enterprise
- Industry
- Academia

INDIRECT FINANCIAL INPUT

- Innovate UK
- BBSRC
- H2020

EXPERTISE

- Technical
- Financial/funding
- Commercial
- Operational

NETWORKS

- Industry
- Academic
- Public funders

FACILITIES

- Rapid Bioprocess Prototyping Centre
- Flexible Downstream Bioprocessing Centre
- Access to BioPilotsUK

Activities:

PROVIDING STRATEGIC LEADERSHIP AND DEVELOPING NEW VALUE CHAINS

- **5** IBioIC Annual Conferences
- **50** IBioIC-led engagement events
- **125** External conference attendance
- Network Integrator project
- **375** External seminars/ workshops
- **14** Trade visits and press trips
- Develop and deliver National Plan for IB
- Lead on IB partnership development with SE/HIE/ UK & Scottish Gov
- Develop and deliver an International strategy for IB
- Develop all future IB propositions for indigenous and inward Investment opportunities
- Lead for IB in Scotland at International Events, Trade missions, and similar activities

ACCELERATING COMMERCIALISATION

- Access to IBioIC equipment centres
- Coordinate access to BioPilotsUK
- **210** Equipment Centre Projects
- **3** Development facilities
- Support company demonstration facilities

DEVELOPING VALUE CHAINS USING BIOTECHNOLOGY

- **78** Collaborative industry-led projects
- **5** Core projects
- **25** Fact-finding projects
- **190** Technical Network projects
- **35** Higher TRL support projects
- IB incubator and investment fund
- **77** Signposts to other organisations and funding opportunities
- **£37.5m** Challenge funds/ UKRI funds and H2020 projects

SKILLING THE NECESSARY WORKFORCE

- **75 PhD** students
- **165 MSc** students
- **150 HND** students
- **100 STEM** engagements
- **200** Continued Professional Development attendees

CROSS CUTTING ENGAGEMENT

- Grow industry membership
- Further develop academic engagement
- Effective Centre marketing
- Establish IBioIC legal entity
- Deliver National Plan for IB

Outputs:

CONNECTIONS

- **435** Unique enquiries to the Centre
- **1500** Unique contacts initiated by the Centre
- **1050** Industrial attendees at Centre events
- **18** HEIs engaged
- **4** Further Education Colleges engaged

FOLLOW-ON FROM COMPLETED PROJECTS

- **38** Signposted to SE/HIE
- **32** Signposted to other public bodies
- **11** Signposted to private investment
- **20** New IC projects supported
- **49** Projects not taken forward
- **3** Taken forward to commercialisation

INDIVIDUALS GAINING QUALIFICATION

- **44 PhD** graduates
- **139 MSc** graduates
- **78** completed HND

NEW FACILITIES

- Marine Bioprocessing Centre
- Engineering Biology Innovation Centre
- Demonstration Centre
- IB Incubator and Investment Hub

COMMERCIAL

- **250** industry members
- **100** Scottish companies actively involved in IB
- **20** New spin out companies
- **120** New products, processes, services, business models delivered to market

Outcomes:

GVA SUPPORTED/ CREATED

- **£89m** by 2021
- **£120m** by 2023
- **£130m** by 2025

JOBS SUPPORTED/CREATED

- **900+** by 2021
- **1200+** by 2023
- **1400+** by 2025

SCOTTISH COMPANIES ENGAGED IN IB

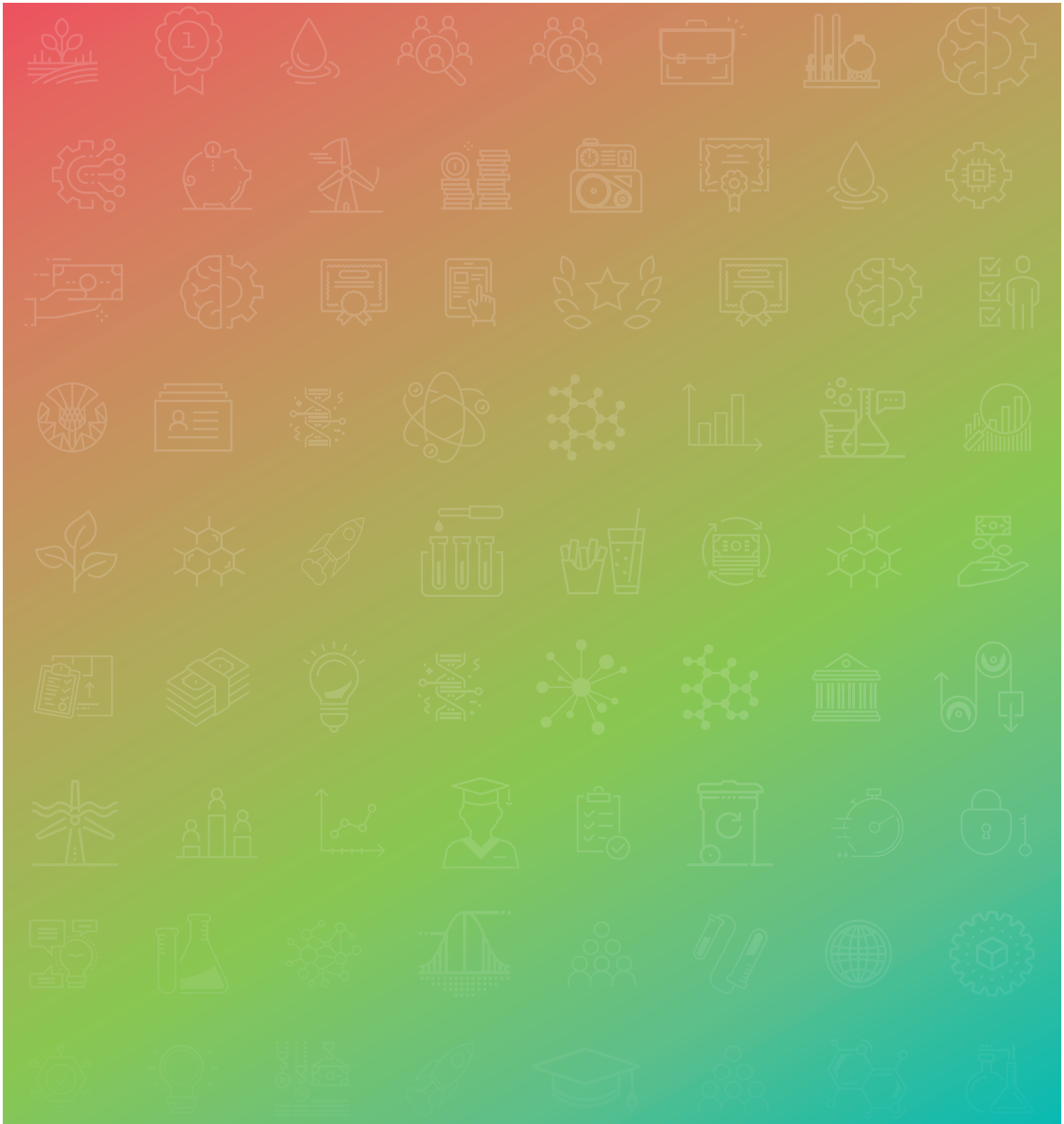
- **73+** by 2021
- **100+** by 2023
- **115+** by 2025

KNOWLEDGE AND SKILLS

- **93 HEI** Research posts supported /created

WIDER BENEFITS

- Regional development
- Reduced CO2 emissions
- Societal benefits



Prepared by:

IBioIC

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*Content correct at time of printing

Innovation Centres

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