The National Plan for Industrial Biotechnology 2015-2025
Building on Success
The National Plan for Industrial Biotechnology 2015-2025 – Building on
FOREWORD

In 2013, we launched our National Plan for Industrial Biotechnology which outlined Scotland’s ambition to transform the competitiveness and sustainability of multiple industries through the use of industrial biotechnology. Great progress has been made in the past 2 years. We have seen the industry grow from 43 to 50 companies and their revenues grow by almost 18% to £230m.

In addition, we have seen the Industrial Biotechnology Innovation Centre (IBioIC) establish itself as a “hub” for industry led research and development and the enhancement of training programmes to meet the needs of the current and future industry. Both Industrial Biotechnology MSc and PhD programmes were launched in the first year of IBioIC operations.

This document details our re-focussed plan for the next 10 year period and we urge you to find out more about what industrial biotechnology in Scotland could do for your business.

Fergus Ewing MSP,
Minister for Energy,
Enterprise and Tourism
OUR MISSION

Our mission is to grow industrial biotechnology related turnover in Scotland to £900m by 2025.

The National Plan for Industrial Biotechnology set out to transform the competitiveness and sustainability of multiple industries in Scotland by:

• Increasing awareness of IB as a transformation tool.
• Increasing industry adoption of IB to generate increased turnover.
• Creating robust and sustainable skills programmes to address areas of unmet need.
• Facilitating collaborations, partnerships and investments to drive innovation.
• Creating a positive environment for the establishment of biorefinery and biochemical facilities.

Two Years On...

Much has been achieved over the past two years, particularly around the impact of IB in growing the Scottish economy. In combination with existing capabilities in life sciences, chemicals and engineering, this technology is one of the key mechanisms driving Scottish innovation and business growth.

IB improves process efficiencies, creates new manufacturing systems, reduces greenhouse gas emissions and creates employment opportunities. IB is driving the Scottish bio-economy as an increasing number of businesses recognise the economic and environmental potential and ability to meet customer needs.
STRENGTHS

Scotland’s strengths have evolved since the launch of the National Plan for Industrial Biotechnology in 2013. Factors driving IB in Scotland include:

Natural Resources and Feedstocks – Scotland’s compact geography provides a centralised concentration of population and industry. The length of Scotland’s coastline, increasing forestry production and access to principally Scottish bioresources, provide a range of feedstocks for biorefining.

Industrial leadership – Industry leadership through groups such as the Scottish IB Development Group, Chemical Sciences Scotland, the Life Sciences Advisory Board and the Energy Advisory Board each contribute to the development of IB in Scotland and have been instrumental in establishing Scotland’s IB credentials.

Academic Excellence – Scotland is host to internationally recognised research excellence. The launch of the IBioIC harnesses this excellence by creating a single point of access to 14 academic institutions, as does the recently launched UK Centre for Mammalian Synthetic Biology.

Industrial competitiveness – Scotland’s industrial landscape includes a large and diverse life and chemical sciences company base, ranging from large multi-nationals, small & medium sized enterprises (SMEs) and supply chain technology based businesses. This includes Ineos, Fujifilm, Syngenta, Celtic Renewables, CelluComp, GlaxoSmithKline, ThermoFisher Scientific and Ingenza.

International competitiveness – There is a strong industrial drive to attract new investment and increase focus on partnerships, collaborations and co-location. One such location is Grangemouth, Scotland’s largest industrial site.

Skills – Academic research and industrial capabilities in the chemical and life sciences sectors, along with Scotland’s heritage in engineering, provide a strong skills platform and infrastructure on which to build. The delivery of the IBioIC skills programme is further strengthening this.
INDUSTRY ENGAGEMENT

IB turnover in Scotland has increased from £189m (in 2012) to £230m (in 2015) – exceeding target by £30m.

Progress To Date
• The number of companies adopting an IB technology or process has increased from 43 in 2012 to 50 in 2015.
• The resulting turnover has increased from £189m to around £230m, exceeding the target by £30m.
• This growth has been achieved through a mix of company growth, formation and increased understanding of the sector.

Objectives Going Forward
• Ensure organisations have access to IB information to influence decision making.
• Deliver a programme of company engagement to raise awareness of IB and the opportunities to innovate, reduce costs and generate new revenue opportunities.
• Facilitate partnership working and ensure organisations are aware of collaborative opportunities.
• Facilitate access to funding and investment and connecting with bio-economy support organisations such as Zero Waste Scotland.

What Next?
• Increase focus in building awareness of IB as a transformational technology and increase wider engagement.
• Further supply chain mapping and identification of opportunities for investment.
• Evaluate and implement incentives and packages available to support the development of the industry in Scotland.
• Build on engagement with existing companies in Scotland to help facilitate any expansion or future investment that can help to grow the impact of IB in Scotland.
• Pro-actively engage sectors in understanding and developing the commercial benefits of IB applications.

Case Study: Horizon Proteins
Horizon Proteins develops processes for the recovery and re-use of protein and other valuable products from fermentation and distillery by-products. The company identifies and implements effective processes for production of new protein feeds to provide a new sustainable, local source of quality protein to the Scottish animal feed sectors.

Scotland’s Chemicals sector is targeted to increase exports by 50% to £4.5bn by 2020; IB has emerged as a key element of this strategy.
BIOREFINERY AND BIOCHEMICALS

Leading the way in biorefining – 2015 saw the opening of Scotland’s first biorefinery plant.

Progress To Date
• The opportunity for a biorefinery or biochemical facility in Scotland has been articulated through the publication of the “Biorefinery Roadmap for Scotland” in February 2015.
• CelluComp is breaking ground - not only in Scotland, but across Europe - with the inception of its first biorefinery plant to produce material based on the by-products of vegetables.
• Celtic Renewables was recently named “Europe’s Most Innovative Biotech SME” by EuropaBio after revealing the world’s first ever samples of biobutanol derived from whisky production residues. The company has also secured £11m investment from the UK Department for Transport.

Objectives Going Forward
• Continue to identify sources of biomass as feedstocks for bio-based chemicals and processes.
• Engage the entire potential biorefinery and biochemical value chain.
• Address the barriers around regulation and legislation.
• Understand market access for the products.
• Ensure adequate provision and access to R&D scale, test, demo and scale-up infrastructure.

What Next?
• Identify and work with the companies that will deliver biorefineries in Scotland.
• Strengthen research and innovation in biorefining technologies.
• Create a positive environment for investment.

Company Insights
“With the natural resources we have in Scotland, coupled with the commitment made by the Scottish Government to support the growth of the industry, particularly around innovation, R&D, knowledge transfer and funding, Scotland is on the cusp of a real step change.”

Christian Kemp-Griffin, CEO, CelluComp

• Deliver a specific proposition for biorefining in Scotland to attract investment either through direct investment or partnership / collaboration.
• Provide a framework to help ensure that when heat and energy production uses renewable resources, the exploitation of all possible higher value products from those feedstocks utilised has been considered.

To read Scotland’s Biorefinery Roadmap, please visit www.scottish-enterprise.com/biorefineryroadmap

I believe that Scotland really is a global leader in Industrial Biotechnology. There has been a significant commitment made by the Scottish Government to grow the IB sector in Scotland.

Mark Simmers, CEO, Celtic Renewables
£10m Industrial Biotechnology Innovation Centre (IBioIC) established in 2014.

Progress To Date
- The Industrial Biotechnology Innovation Centre (IBioIC) was established in January 2014 with a £10m investment from the Scottish Funding Council (SFC).
- Two new equipment centres have secured funding and are set to open in 2015; offering test and demo support to industry. These complement CPI facilities and are The Rapid Bioprocess Prototyping Centre at Strathclyde University and The Flexible Downstream Bioprocessing Centre at Heriot-Watt University.
- Launch of the UK Centre for Mammalian Synthetic Biology.

Objectives Going Forward
- Link Scottish academic research base to business base.
- Deliver a single point of access for industry.
- Build international collaborations and leverage grants through UK Research Councils, Innovate UK and the European Commission.
- Ensure investment propositions are leveraged.

What Next?
- An increased engagement with other Innovation Centres relevant to the IB space including Medicines Manufacturing Initiative, Oil and Gas Innovation Centre and Aquaculture Innovation Centre.
- Further emphasis on building international relationships and collaborations.
- Increase the participation in the “BBSRC Networks in Industrial Biotechnology and Bioenergy” and success through the IB Catalyst and Innovate UK funding mechanisms.

Case Study: Industrial Biotechnology Innovation Centre (IBioIC)
IBioIC was launched in January 2014 primarily funded by the Scottish Funding Council (SFC) to establish and develop transformational collaborations between industry and academia across the life and chemical sciences and renewable energy sectors. The Centre represents all four colours of biotechnology, facilitating collaborations and guiding organisations from a concept or idea, through to industry adoption.

Since its inception, the Centre has aided in the drive of industry engagement, project and product specific developments, the delivery of a comprehensive, cross-disciplinary skills programme and has contributed substantially to the recognition and standing of Scotland within the European and global IB community.

For further information on IBioIC, please visit www.ibioic.com and for further information on BBSRC please visit www.bbsrc.ac.uk

IBioIC has an ambitious plan to generate between £1BN-£1.5BN GVA to the Scottish economy by 2030.
SKILLS

Skills investment plans for Chemical Sciences, Life Sciences & Engineering have been delivered.

Progress To Date
• Skills Investment Plans for Chemical Sciences, Life Sciences and Engineering have been delivered.
• iBioIC MSc and PhD Programmes were launched in 2014.
• Approval of HND in IB programme.

Objectives Going Forward
• Enhance Scotland’s training portfolio for IB skills.
• Deliver and review appropriate Skills Investment Plans for Life Sciences, Chemical Sciences and Engineering and ensure that they reflect applications in IB.
• Develop appropriate IB skills and training activities based on the 3 Skills Investment Plans.
• Develop and grow a cross-disciplinary workforce to contribute to meeting the challenges of transitioning towards a bio-economy.

What Next?
• The IB skills sub-group to continue to work closely with Chemical Sciences Scotland and the Life Sciences Advisory Board Skills groups to review skill challenges and solutions.
• Focus on STEM (science, technology, engineering and maths) activity to ensure an awareness of IB as a technology and career option.
• Shared training and coordinated placement activity to provide relevant skills and industry experience.
• Grow the uptake of Modern Apprenticeships and current academic programmes.

Case Study: Industrial Skills
Working closely with iBioIC, industrially relevant IB MSc and PhD programmes were launched to fill gaps, with 18 MSc Students graduating Autumn 2015 and 8 PhD students now in their second year. Industrial partners are closely involved in the course design and hosting student placements to ensure the ongoing relevance and benefit to companies and students alike.

Industry and suppliers are welcome to contribute to the work of the Skills Group and Skills Investment Plans to steer the ongoing relevance of the skills portfolio. Contact us to find out more.

I definitely learned a lot of new skills, about the regulation of these industries and the manufacturing of different bio-products. And I’ve found full-time employment out of it!
Marianne O’Bryne, MSc Industrial Biotechnology Graduate and MBL Research Scientist
KEY MILESTONES

Industry Engagement

By 2016
• Map the IB supply chain in Scotland.
• Deliver and evaluate a successful European Forum for Industrial Biotechnology and Bioeconomy Conference in partnership with EuropaBio and others.

By 2017
• A Scottish organisation to become a lead member of the BioBased Industries Joint Undertaking.
• Scotland to have a leading role in at least one EU Bio-economy collaborative project.

By 2020
• The number of IB using companies to be increased to 80.
• IB related turnover to be increased to £400m.

By 2025
• The number of IB using companies to be increased to 200.
• IB related turnover to be increased to £900m.
• Enhance uptake of IB technologies in other sectors eg energy, oil & gas, food & drink.

Biorefinery & Biochemicals

By 2017
• Complete technology appraisals of Biotransformations and Integrated Bioprocessing.
• Create a compelling business case for biorefineries in Scotland.
• Define and deliver support packages for the development of Biorefineries in Scotland.

By 2018
• Concept development for front end processing in Biomass CHP (combined heat and power) facilities.

By 2020
• Pilot a partial biorefinery / biochemical facility (or facilities).

By 2025
• Establish a partial biorefinery / biochemical facility (or facilities).

Networks of Innovation Centres

By 2016
• Identify and commence delivery of a Scottish Synthetic Biology roadmap.
• Provide a location proposition for Synthetic Biology Investment opportunities.
• Complete the RBPC (Rapid Bioprocess Prototyping Centre) and FlexiBio equipment centres and make them operational.
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Networks of Innovation Centres

By 2017

• Working with the HEIs (Higher Education Institutions), develop IBioIC as the hub of centres of technical excellence.

By 2018

• Develop operational plans for open access facilities.

By 2020

• Establish at least one major global industry collaboration with IBioIC.
• Establish at least one other IB innovation facility in Scotland.

By 2025

• Deliver open access pilot facilities for IB development across a range of technologies including Synthetic Biology and Catalysis.

Skills

By 2016

• STEM Pilot programme to be completed and evaluated for roll out across Scotland.

• Industry review of skills requirements across IB to be undertaken on a yearly basis and encompassed within revised Skills Investment Plans / National Plan for Industrial Biotechnology activity.

By 2017

• Feasibility for an IBioIC Training Facility complete, preferred model established and operational.
CONCLUSIONS

“Scotland is ambitious and plans to create, build and grow successful companies using industrial biotechnology. This next ten year period will see acceleration in our collective efforts to exploit the opportunities presented and to achieve industry revenues of £900m by 2025. Now is the time for companies to investigate these opportunities and I would urge people to contact us to have discussions with one of our IB sector specialists. The opportunities are growing for international organisations to consider Scotland as a leading location for IB base manufacturing or to become part of the supply chain. I would also urge those companies to contact us to find out more.’

Professor Alan Wolstenholme,
Chair, Scottish IB Development Group