



Interim Formative Evaluation of BEACON+

A report from NNFCC

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A report for Aberystwyth University

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1 Summary

This study was commissioned by Aberystwyth University as a mid-term evaluation of the BEACON+ project, which is funded by the European Regional Development Fund (ERDF) 2014-2020 European Programme (West Wales and the Valleys) administered by the Welsh European Funding Office (WEFO). The aims and objectives were to:

- Assess the current monitoring systems and data being collected and examine whether this will meet the requirements of the final project evaluation, and what other data will need to be collected
- Understand how the Cross-Cutting Themes are being embedded in the delivery of the operation;
- Review the progress so far and make recommendations to ensure that the indicators and qualitative measures are achieved, accurately evidenced and reported.

NNFCC was provided with several scheme documents, the business plan, reporting forms, progress reports and funding programme documentation which formed the core of the review. The review involved an examination of the original logic plan for the proposed work; collated data on scheme beneficiaries and activity; review of progress to date; approaches to data capture; omissions in data capture and suggestions for improvement. In a forward-looking phase, the data requirements to enable a future evaluation of the 'additionality' provided by BEACON+ were determined and the data requirements to support this identified.

In review of the project logic table, the logical process behind the programme of activities appears robust and addresses what are commonly seen as the key issues and difficulties affecting commercialisation of new and innovative industries. The planned actions should, and demonstrably are delivering improved opportunities for knowledge transfer to industry to facilitate future interaction, skills development and inward investment into research and development in the target region. Evidence is already building of success being achieved in the latter.

The indicators currently being used by BEACON+ are those prescribed by the ERDF scheme documentation for Research and Innovation proposals. These enable relatively high-level monitoring of 'activity' (number of company interactions, number of research interactions and assessment of 'output' (increased employment, new enterprises supported, number of patents registered, private investment leveraged). There is still ongoing discussion between BEACON+ and WEFO to agree the precise means of reporting against the target indicators which should be resolved as soon as possible as this will affect both target setting and priorities for project actions.

In the most recent progress report available at the time of writing (31 May 2017), BEACON+ was on track to meet or exceed most of its agreed targets. The only exception to this was formal reporting against interim targets for matching private investment (which only kicked-in from 1 January 2017). However, progress reports indicate that there are several secured contracts in contract finalisation stage that will deliver on the target plus advanced work in progress to deliver several co-funded bids (where the outcome of public funding decisions is pending).

In the analysis to date, 40 organisations have been involved in 67 R&D interactions with BEACON+ of these, 23 organisations (58%) represent Welsh SMEs in the convergence area. Within the participating Welsh SMEs, 57% participated in more than one R&D collaboration demonstrating the positive impact of BEACON+ in driving repeat interactions with Welsh SMEs. In addition, 28 further companies were involved in ongoing R&D collaborations, showing a strong pipeline of project interactions.

While the high-level data may on first sight suggest a significant amount of effort is directed at organisations other than SMEs in the convergence region, these contacts represent organisations within a network of interests involved in projects with eligible SMEs and offer potential to contribute to inward investment through a variety of means, providing added benefits for Wales.

A further 35 Welsh SMEs received 'non-financial support', typically this was in the form of consultancy relating to 'problem-solving' or relatively limited lab work. Nine companies provided with early stage support went on to enter into research and development (R&D) collaborations demonstrating the value of the early engagement exercises.

Examination of the existing delivery and impact data at a more granular level as well as considering what other data might be collected on the wider impacts of the service delivery would help provide the management team with a more rounded understanding of the impacts being achieved and/or learning that may affect approaches to future service delivery. However, administrative constraints on the capability to undertake more data collection and collation were expressed in discussions with the project co-ordinator.

In ERDF schemes addressing defined cross cutting themes is a requirement, though not the main driving rationale for BEACON+ activities. However, as a result of its activities BEACON+ should stimulate inward investment, jobs and growth both directly and through associated supply chains, and so in a general sense, it will contribute to tackling poverty and social exclusion. BEACON+ is also pro-active in supporting the Welsh language, in part to avoid any possible social exclusion. Promotional materials are bilingual and partner HEI's have Welsh language policies to promote use and inclusion. BEACON+ by nature of its thematic work areas will also support development of low-carbon technologies and stimulate more environmentally beneficial outcomes. Suggestions are made for simple metrics to provide at

least some limited evidence of impact on greenhouse gas emissions, waste reduction and other environmental impacts of projects.

BEACON+ gathers basic data on ethnicity, gender, disability and equality in its interactions as recommended by ERDF guidance. Mechanisms for how this data could be presented and valorised are discussed. BEACON+ social engagement actions, are in typically in line with expected regional and/or national norms.

The descriptive nature of much of the quarterly reports makes it challenging to gain a clear picture of how efforts are targeted, including by different types of service provision and in relation to the success achieved. Some simple infographics are presented in the programme review section to demonstrate delivery by BEACON+ drawing on existing gathered data. The following suggestions for improvement were made to increase clarity:

- Identify the proportion of supported eligible organisations falling into micro, small and larger SME employee size bands
- Demonstrate the county distribution for supported eligible Welsh SME's drawing on data from the BEACON database
- More clearly identify the numbers by respective size of organisations involved in collaborative R&D projects.

By minor additional data capture it was advised the following metrics could be developed:

- proportion of contacts that engage in multiple interactions
- progress through Technology Readiness Levels for enterprises involved in multiple engagement
- summary details of the business sector breakdown to address either where organisations currently work, or sectors to which new products or services in development will deliver (segregation by sector interests)
- detail of new collaborating networks engaged with or formed
- detail of new interactions initiated between research institutes
- new skills and new research infrastructure developed because of collaboration

These would build through reporting periods to provide a summary overview of impacts.

Moving forward BEACON+ will need to gather information on any private investment secured through projects. As part of the additionality assessment it will also be important to determine what proportion of the revenue has been derived from within and outside the target region.

Part of the additionality provided by BEACON+ includes signposting organisations and individuals to other ERDF innovation schemes and supported facilities. While this is

informally reported currently (through quarterly reporting) suggestions are provided to indicate how such actions could be more formally captured to provide more robust evidence of the BEACON+ role in supporting the innovation process in Wales and the impacts of other regional investments.

Through its work and engagement activities, BEACON+ provides the project partners with a significant platform through which to engage with regional and national initiatives which BEACON is taking full advantage of. This includes supporting business innovation and helping to build significant research projects. The focus provided by BEACON+ helps co-ordinate activities of the partner universities and ensure the most cost-efficient engagement with for example the NIBB and to act as a single entity to engage with Biopilots UK (which otherwise would have been difficult).

At this early stage it is too early to gauge the direct benefits gained by recipients of support. As part of the end of project assessment questioning of scheme beneficiaries will provide a quantitative assessment of direct benefit gained (new jobs, revenue increase). This must be tempered by estimates of what would have happened in the absence of BEACON+, how much of the benefit is leaking from the target area and whether any of the benefit results from substitution or displacement actions. This will require further information provision from scheme beneficiaries at the end of respective projects to address these needs and to ensure appropriate multipliers are adopted to assess the wider economic impacts of the project.

The recommendations made are relatively minor in nature and are primarily aimed at helping the BEACON+ team to more clearly and readily demonstrate the impacts of the programme of activities to WEFO. NNFCC recognises that there may be limits on the administrative resource available to gather and collate the additional information but would urge that as much as possible is addressed to ease communication of the types and breadth of impact made.

2 Background

This study was commissioned by Aberystwyth University as a mid-term evaluation of the BEACON+ project, which is funded by the European Regional Development Fund (ERDF) 2014-2020 European Programme (West Wales and the Valleys).

The aims and objectives of this interim evaluation are to:

- Assess whether the **monitoring systems** and mechanisms are working, and that the data being collected is sufficient and of adequate quality to enable final evaluation of outputs, outcomes and impacts, including assessment of effectiveness, added value, additionality, and unintended outcomes.
- Understand how the **Cross-Cutting Themes** are being embedded in the delivery of the operation;
- Review the **progress** so far and make **recommendations** for adjustments to delivery and monitoring to ensure that the indicators and qualitative measures are achieved, accurately evidenced and reported.

3 Overarching objectives of the programme

As part of a suite of measures to address economic underperformance in Wales, ERDF funding is provided through the Welsh European Funding Office (WEFO) to support initiatives to improve economic development. Within the associated "West Wales and the Valleys Operational Programme" a key objective in supporting economic development is to promote business investment in innovation and encourage development of new and improved commercial products, processes and services (Priority Axis 1, Specific Objective 1.2).

WEFO's aspirations for programmes funded under this Specific Objective are to:

- Stimulate an increase in the successful translation of research and innovation into commercial products, processes and services and encourage increased commercialisation of innovative processes
- improve technology transfer from Higher Education Institutes
- promoting business investment in innovation and research
- develop improved links and synergies between enterprises, R&D centres and higher education (to foster innovation and its commercialisation)

As a WEFO supported project, BEACON+ aims to address barriers affecting the capability of innovative SMEs in carrying out research, development or innovation focussed activities in areas capable of generating regional economic growth.

In addition, WEFO has the additional objective for its innovation programmes of gaining an understanding of “**how and why an intervention works**” to improve the design of future public-funding interventions.

The emerging bioeconomy sector is seen by both the EU and UK government as an opportunity to develop more innovative, resource efficient and sustainable products and services offering the potential to create £billions of added value opportunities in the near to mid-term. BEACON+ focuses on supporting developments in this sector.

In supporting work in the bioeconomy sector, the three partner universities in the BEACON+ project have unique assets and capabilities in plant sciences, microbiology; chemistry; biocomposites and life cycle assessment providing the capacity to provide a range of technical and supporting services to develop a range of products from biomass, including platform and speciality chemicals, biofuels and new materials. Utilising this knowledge and the equipment (including pilot scale capabilities) held within the partner organisations, BEACON+ aims to work with Welsh companies in a wide variety of relevant industrial sectors, with a key focus on stimulation of industries in the West and the Valleys region of Wales.

In addition to supporting economic development, there are broader impacts that it is hoped ERDF funding will have, such as **contributing to tackling climate change, contributing to creating smart sustainable growth** and **bringing about a fairer society**. Working to support the development of the bioeconomy sector provides the opportunity to deliver against some of these wider objectives, for example where more environmentally sustainable materials are developed delivering reduced carbon footprints and energy use and/or high value job opportunities.

4 Introduction to BEACON+

BEACON+ is a 4.5-year research and innovation project, with a projected total cost of £12m, with an ERDF grant of £7.9m and university/private sector co-finance of £4.1m. It brings together three Welsh universities (Aberystwyth, Bangor and Swansea) building on the work of the predecessor BEACON project, to form a delivery partnership to transfer knowledge; support small and medium-sized enterprises (SMEs) in developing biorefining technologies and support the creation of new companies operating in the bioeconomy.

4.1 Aims of BEACON+

In supporting the objectives of the West Wales and the Valleys Operational Programme on exploiting innovation, the key aims of the BEACON+ project are to:

- Exploit knowledge from the partner institutes relating to biorefining to assist Welsh companies in developing new innovative products.

- Create biorefinery supply chains through supporting networks
- Facilitate knowledge transfer between the different groups in the network, particularly between academia and industry
- Expand the knowledge-based bio-economy in Wales through the creation of new high-value jobs in existing or new companies
- Support the demonstration and commercialisation of biorefinery concepts
- Provide demonstrations both of equipment and processes to Welsh companies at pilot scale and across a range of technology platforms to support commercial engagement and develop new products, processes and services.
- Generate and exploit patentable technologies (IP)
- Support existing companies but also attract significant long-term inward investment through industrial collaboration across a wide range of sectors

In delivering the above it is expected that other benefits will accrue, including;

- Achieving better integration between the partner academic sites (to increase collaboration opportunities)
- Increased creation and retention of highly trained staff with skills to assist the growth of a new bio-based industry in Wales
- The opportunity to maximise the probability of Welsh based universities and enterprises being able to capture segments of a growing market
- Formation of a network of enterprises and academics with the potential to catalyse a “green bio-based industry” in Wales, capable of competing with initiatives elsewhere in the UK and Europe.
- Support for activities ultimately capable of reducing GHG (greenhouse gas) emissions in Wales through the development and exploitation of ‘Green Technologies’
- Increased academic and commercial links outside Wales to support inward investment

4.2 Building on the original BEACON project

The first phase of the BEACON project delivered a higher than anticipated demand for collaborative R&D projects. The emphasis in BEACON+ is to develop projects to a higher level of commercial potential (i.e. move them along the technology readiness scale), to a point where they can move to access other sources of finance to support development and commercialisation.

Building on from BEACON, key objectives of BEACON+ are to provide:

- increased emphasis on collaborative R&D projects and medium/long term engagement with SMEs to support them more effectively through the process converting research to commercial success.

- greater focus on target market sectors through the building of clusters of collaborative R&D projects to create critical mass, networks and value chains to facilitate business-business interactions, add resilience to existing supply chains and potentially create new ones.
- greater focus on products (e.g. materials, chemicals) over biofuels and greater focus on use of wastes/ residue valorisation.
- increased focus on climate change & resource efficiency, advanced manufacturing, life sciences & health as most relevant to the developing bioeconomy.
- the aspiration to work with larger SMEs (>10 employees) that have the greatest potential for economic growth and wealth creation, *while recognising the reality that most Welsh SME's are micro SME's (<9 employees) and account for 95% of enterprises in Wales¹.*

In BEACON+ the emphasis has shifted to greater concentration on collaborative R&D activities than enterprise assists, with the aim of supporting technical development (i.e. moving through TRLs 3-6) with parallel activities to raise business awareness on potential avenues for exploitation and build new supply chains.

The BEACON+ approach reflects the need to work collaboratively higher up the TRL chain and bring the relevant industry interests together that are required to drive forward innovation, as all the requisite knowledge rarely resides in one organisation, especially where SMEs are concerned.

4.3 Building on other ERDF investments

BEACON+ also provides opportunities to support business to move to, or utilise, other facilities supported by ERDF investments, including the BEACON facility at Aberystwyth, and the confirmed investment in the Aberystwyth Innovation and Enterprise Campus, AIEC (which provides space for entrepreneurial activity and networked support), the Menai Science Park (M-SParc) and the Institute of Life Science (ILS) (Swansea).

BEACON+ has facilitated such interactions through use of schemes such as ILS Affiliate Membership, which provides shared and hot-desk facilities for individuals and organisations who wish to collaborate with academics and become embedded in the ILS ecosystem. Project Progress Reports detail such interactions.

¹ Size Analysis of Active Businesses in Wales, 2017

<http://gov.wales/docs/statistics/2017/171221-size-analysis-welsh-business-2017-en.pdf>

4.4 Interaction with other ERDF operations

In supporting moves to work further up the technology readiness level and support moves towards commercial development, BEACON+ anticipates working more closely with other ERDF operations to support business development, such as the SMART Innovation programme (providing financial support and innovation advice to support technical/commercial feasibility assessments, industrial research, experimental development and encourage exploitation).

BEACON+ also interacts with ERDF programmes operating in other areas with common areas of interest.

4.5 Cross cutting themes

WEFO identify several cross-cutting themes (CCT) that ERDF funded projects must also address:

- equal opportunities and gender mainstreaming
- sustainable development
- tackling poverty and social exclusion
- supporting the Welsh language

BEACON+ have designated a champion for each of the cross-cutting themes to ensure cross-cutting theme aims and commitments are integrated into the work of BEACON+. Progress relating to CCTs is monitored in-project by these champions, and CCTs are a standing agenda item at the quarterly Operation Management Committee meetings.

- The equal opportunities and gender mainstreaming Champion is Diane Kelly (Swansea)
- The Tackling Poverty and Social Exclusion Champion is Adam Charlton (Bangor).
- The Sustainable Development Champion is Judith Thornton (Aberystwyth)

5 Approach to analysis

In addressing the aims and objectives of the analysis, NNFCC undertook a review of ERDF scheme documentation, processes and project documentation to gain a deeper understanding of the aims and objectives of the work, key target indicators, operational approaches, scheme beneficiaries, types of interaction and activities delivered and the project teams own evaluation of performance against targets in quarterly reporting. A list of the documents reviewed is detailed in below.

5.1 Scheme documents

NNFCC were provided with several operational and reporting documents including:

- **BEACON+ business plan**
- Draft **Logic Plan** for project (8/10/2014 version)
- **Delivery profile** (projects and quarterly targets)
- Project staff lists and contact details
- **Stakeholder Engagement Strategy**, including strategy for approving engagement with small SMEs (<10 employees) – *the latter represent a sizable proportion of SMEs in Wales (35% of all registered businesses in Wales, but WEFO wish to see greater emphasis placed on supporting larger organisations to deliver improved impact)*
- **Company Information Form** – used to capture basic information on companies at first point of formal contact (including location, type (start-up, social enterprise, SME), ownership, activity, turnover, employee numbers by type, SIC code (to enable industrial sector attribution)). Used to assess eligibility for De Minimis EU aid.
- **BEACON+ contract** draft (for formal project engagements)
- **Enterprise Supported Form** – used after a minimum of 6 hours support received. Collects data on company info (similar to Company Information Form, plus additional equal opportunities data) and data from BEACON+ project staff on activities to be undertaken, objectives and targets to which the action is expected to contribute (and outcomes), hrs of support provided, cost of support provided. Provides a basic statement of EU De Minimis aid provided to company/organisation and basic metrics required for formal reporting to WEFO. Used to record incidences of delivery of non-financial support.
- **'Patents registered'** and **'Jobs created'** forms
- Examples of most recent formal **Quarterly Progress Reports** to WEFO, detailing activities (company interactions, meetings and visits etc, external income contributions) and progress against agreed targets and issues affecting delivery, delivery against cross-cutting themes and publicity actions
- A copy of collated **company assist data** gathered to end of March 2017 collated in an Excel sheet (collates outputs for reporting, company data, support received, output metrics (investment, patents, new products, increase in employment)
- A **list of research projects** (Excel sheet)

In addition, WEFO provided the Operational Programme document for 2014-2020 ERDF West Wales and the Valleys which details the overarching priorities for the programme funding BEACON+, and details relating to indicators used for evaluation of ERDF programmes and their definitions: "Guidance on Indicator Definitions, Data and Evidence Requirements ERDF: Priority Axis 1: Research and Innovation" which covers the bulk of indicators adopted by BEACON+ to date.

5.2 Detailed analysis

In reviewing the above documents NNFCC took account of the overarching objectives (see Section 3) to form a view of

- 1) The value of the original Logic Plan in demonstrating a clear path from required outcomes to means of delivery through individual programme activities
- 2) whether the approaches to data capture from company interactions (primarily to address mandated metrics) were sufficient to comprehensively assess delivery and impact
- 3) any omissions in data capture that may cause difficulties in demonstrating delivery and in performing end-of project reviews of performance (including dealing with cross compliance issues)
- 4) data, information and simple metrics that could address any reporting omissions or improve reporting capabilities.

Questions arising from the review process were discussed with the BEACON+ Project Coordinator.

An interim review of BEACON+ performance to date drawing on the detailed company interaction data (Excel data sheets) provided by project staff for organisations supported up to the end of February 2017 as well as quarterly Project Progress reports to 28 Feb 2017 and 31 May 2017, were used to identify any issues or gaps in information that affected analysis of performance against the project and programme objectives.

In a forward-looking phase, NNFCC reviewed the data needs required to enable the future evaluation of the 'additionality' provided by BEACON+ and additional data capture requirements to support this.

6 BEACON+ operation

6.1 Organisation

Within the three sponsoring universities there are five departments involved in delivery of BEACON+:

- the Institute of Biological, Environmental and Rural Sciences (Aberystwyth)
- the Biocomposites Centre (Bangor)
- the School of Chemistry (Bangor)
- the School of Environment, Natural Resources and Geography (Bangor)
- the Institute of Life Science (Swansea)

Together they form the BEACON Biorefining Centre of Excellence.

6.1.1 Co-ordination and management

BEACON+ is co-ordinated by Aberystwyth University and operated as 3 sub projects, one within each of the partner universities, for ease of data collation, monitoring and auditing.

BEACON+ is managed by an Operation Management Committee (OMC) (previously referred to as a Project Management Committee in the Business Plan) which holds quarterly meetings to discuss the performance and direction of the project. The OMC has representatives from each university, and two BEACON+ Business development Managers (BDMs) who feedback on business engagement, market demand and research needs. The OMC is responsible for the overall performance of BEACON+, and progress towards meeting WEFO agreed targets, milestones and expenditure.

Three Local Management Groups (LMG) manage the local delivery of the project at Aberystwyth, Bangor and Swansea universities. The LMG meet monthly, allocating staff and facilities to support agreed business engagements and R&D support. The LMGs report to the OMC on delivery and planned activity matters.

The project has an Advisory Board, composed of staff members from each university and expert peers from industry and academia. The Advisory Board helps to steer the direction and development of BEACON+, supporting on issues such as sector needs and the demands of businesses and identifying key technology areas which have commercial potential.

Each engagement project is individually approved by the LMG of the HEI leading the project, working to an agreed documented engagement strategy.

6.2 BEACON+ business interactions and assists

6.2.1 Target beneficiaries

The key target beneficiaries in the Convergence (least developed) regions of Wales are defined as:

- New and existing SMEs (where most of the support delivery is focussed)
- Larger private organisation
- Public sector organisations
- HEI's also count as beneficiaries in some instances

6.2.2 Modes of interaction with beneficiaries

To deliver on its objectives, the project team engages with target beneficiaries through several activities including:

- technical and knowledge exchange events hosted by BEACON+ (involving a mix of academic, other knowledge providers (e.g. Knowledge Transfer Network representatives) and industry interests)
- equipment demonstration days
- provision of technical scientific literature reviews to guide R&D progress
- presence at other events to promote service offers and the opportunities available
- direct engagement through contact with project staff
- outreach through Business Development Managers with the aim of:
 - providing referrals to appropriate technical experts
 - developing research projects
 - matchmaking

6.3 Modes of collaboration with beneficiaries (principle activities)

The principle modes of operation through which the objectives of BEACON+ are delivered across the West Wales and the Valleys target area are:

- Collaborative research and development projects (lasting from a few days to a few weeks)
- Seminars and workshops (on relevant thematic areas)
- Visits to individual companies to provide support – consultancy (to address immediate needs) and strategic support to stimulate innovation
- Demonstration days – of equipment and resources to engage interest.

Interactions, beneficiary details, delivery details and impacts are recorded across all 3 sites in an Excel database for reporting and data analysis purposes.

Companies receiving non-financial support (up to 6hrs of support) may go on to undertake a collaboration with BEACON+, which would count as an additional interaction, or be signposted to other more relevant schemes where appropriate (e.g. Welsh Government SMART funding, BBSRC NIBB or Innovate UK awards) SMEs may also be signposted to the Welsh Government's Accelerated Growth Programme (AGP) by BEACON, for provision of business support).

7 Target setting

It is important that BEACON+ demonstrates impact against its target objectives. There are several target indicators that have been adopted to measure the impact of ERDF and WEFO programmes, to which the outcomes of the BEACON+ project contribute. A sub-set of these have been allocated to the BEACON+ project to measure the progress of delivery and to ensure that delivery remains focussed on WEFO requirements for the West Wales and the Valleys Operational Programme. Both the WEFO and contributing BEACON+ targets are given in Table 1.

Table 1: WEFO and BECON+ target indicators for successful programme delivery (as part of the project or as a legacy result)

Indicator	WEFO value (2023)	BEACON+ (2019) see note 1	Frequency of reporting required
Number of enterprises cooperating with supported research institutions	1,212	100	Quarterly
Number of enterprises receiving non-financial support	3,750	100	Quarterly
Number of new enterprises supported	30	10	Quarterly
Private investment matching public support in innovation or R&D projects	42,8M EUR	£1,2m	Quarterly
Employment increase in supported enterprises	1,125 FTE	20 FTE	Quarterly
Number of enterprises supported to introduce new to the market products	490	16	Quarterly
Number of enterprises supported to introduce new to the firm products	725	100	Quarterly
Number of patents registered for products	519	15	Quarterly

Note 1: These targets are those in the original BEACON+ business plan. However, discussion is ongoing with WEFO about how indicators should be calculated, which is not how BEACON+ originally anticipated when setting the targets. It is not clear whether this could potentially lead to amendment of the targets.

7.1 Eligibility for support

It is important to be clear about eligibility for each of the listed targets used by BEACON+.

“enterprises cooperating with supported research institutions” is counted as the number of eligible Welsh SMEs who enter into **one or more** collaborative R&D projects with the BEACON+ research institutes (recorded at the outset of co-operation). SMEs entering into more than one collaboration **can be counted more than once**. University participants are also counted (although only once). **Non-eligible enterprises** (non-SME or not located in target area in Wales) are also counted if they are a member of a collaboration between an eligible Welsh SME and a research institute.

“**Enterprises receiving non-financial support**” is counted as the number of Welsh SMEs (within the convergence area) that receive a total of either 12 hours indirect support or 6 hours direct support (larger organisations are ineligible for such support).

- Indirect support includes attending conferences and workshops.
- Direct support includes consultation and small pieces of laboratory work.

“**Enterprises supported to introduce new to the firm products**” is counted as the number of Welsh SMEs (within the convergence area) that are carrying out an R&D collaboration with one of the delivery partners, with the aim of generating new to the firm products or services, (regardless of whether this is ultimately successful). Universities generating new to the university products or services are also counted.

The method for accounting for “**private investment matching public support in innovation or R&D projects**” has not yet been defined, as no private investment has yet been reported. In practice this support could take the form of contributory direct funding to the HEI, “in-kind” support (provision of staff labour input, access to equipment or facilities or payment of subcontracts) or a mix of the two. Going forward the BEACON+ project team will need to consider how this metric will be addressed (building on guidance in the WEFO ERDF scheme handbook which has specific detail on eligible forms of funding). Identifying the type of matching support provided will provide more clarity which also needs to take into consideration the scale of the organisation involved as SMEs tend to be financially resource constrained and in-kind support may be more attractive.

The rules regarding eligibility of individual interactions towards meeting targets are agreed between WEFO and BEACON+ and remain subject to scrutiny during the life of the project and potentially occasional change. The counting rules are currently being reviewed by WEFO.

Gaining certainty on such issues is an urgent priority to ensure project actions are effectively targeted, reducing the need to backtrack to obtain supporting data/information where relevant.

7.2 Cross cutting themes

There are no specific targets for delivery of cross cutting actions, but the project gathers data on a range of socio-economic issues from companies including:

- Age, gender and ethnicity of company owners and ability to converse in Welsh
- whether a participating organisation has an equal opportunities policy or an environmental policy in place
- Information on salary bands of any jobs created

This may be of value in examining or comparing any trends that deviate from Welsh 'norms'.

8 Logic model

The BEACON+ team were required to draft a Logic Table as part of the application process for funding. This seeks to succinctly demonstrate how high-level objectives will be addressed in terms of the operational outcomes that will be delivered by the work, the activities that will deliver the outcomes and the indicators and targets that will be used to demonstrate delivery, as well as the anticipated barriers and planned actions required to overcome these.

Due to the difficulty in addressing the breadth of the planned activities and anticipated outcomes in a succinct manner, it is difficult to consistently and clearly express the links between operational plans and desired outcomes in the Logic Table format. However, at a broader generic level it highlights within the sphere of its 'biorefinery' scope that it plans to address issues of 'market failure' in terms of translation of R&D into new products and processes by:

- increasing industry awareness of opportunities in the sector through technology transfer and promotion of Welsh scientific expertise in HEIs including that linked to the bioeconomy
- addressing issues around the need to build new supply chains and new business models
- generating new products and processes and knowledge, and in doing so,
 - contribute to reducing GHG emissions in Wales
- facilitating capacity building, in terms of both expertise and equipment, to capitalise on additional wider national and international grant capture opportunities (e.g. H2020 and Innovate UK funds).
- promote Welsh scientific expertise in HEIs and linked to the bioeconomy.

In delivering these changes the project will

- utilise, mobilise and exploit its internal expertise and sector knowledge

- make use of recent investments in (scale-up) facilities and equipment to support innovation
- support new business development posts to provide integrating services to businesses (knowledge linking, capability linking, stakeholder engagement)
- encourage industry to engage in joint development projects and build expertise in bidding and tendering for consortium projects
- encourage wider international networking (to raise the knowledge base in Wales and opportunities for inward investment)
- build a legacy of skills and experience – including responding to demand-led training needs
- build links with other UK wide open access biorefining centres, to facilitate wider SME engagement, develop joint R&D projects and opportunities for equipment sharing and interchange of staff between institutions (e.g. through the BioPilots UK Alliance)

Addressing what are seen to be issues of

- lack of access to appropriate equipment, knowledge and skills
- under-developed supply chains, or lack of awareness of relevant actors in Wales

The BEACON+ Business Plan builds on the Logic Model to provide a much more detailed outline of planned actions and delivery, as well as detail on how support will be targeted, including a process to review the process for agreeing allocations of support to micro companies and larger SME's.

The logical process behind the programme of activities appears robust and addresses what are commonly seen as the key issues and difficulties affecting commercialisation of new and innovative industries. Successful delivery of its programme of activities should help to reduce these hurdles and improve the chances of delivering commercial successes in West Wales and the Valleys region driving economic development. At the same time the planned actions should deliver improved opportunities for knowledge transfer to industry to facilitate future interaction, skills development and inward investment into research and development in the regions higher education establishments to support further economic development opportunities.

8.1 Indicators currently adopted

The core indicators used by BEACON+ and those listed in the Logic Plan are those prescribed by the ERDF scheme documentation for Research and Innovation proposals. These provide a mix of indicators to monitor the direct impacts of the programme (see Table 1) and must be reported against by grant recipients. The use of a common set of indicators allows collation of data across a wide range of different projects to provide an analysis of wider ERDP programme impacts.

These provide for relatively high-level monitoring of 'activity' required by WEFO (number of company interactions, number of research interactions; and 'output' (increased employment, new enterprises supported, number of patents registered, private investment leveraged)).

In addition to this BEACON+ gathers information through its own database, based on company interactions, allowing a more granular analysis of results around location of supported organisations, sector interests, ownership factors (age/gender), type of support received and value of support, matching financial support by types, holding of diversity and sustainability strategies, and increases in turnover and employment (by type) created as a result of involvement with BEACON+.

However, they have limitations in determining the wider economic value of interventions, particularly where a detailed assessment of 'additionality' is required.

In examining the data at a more granular level as well as considering what other data might be collected on wider impacts of the service delivery, NNFCC advise where investment in further data analysis could provide the management team with a clearer picture of the impacts being achieved and/or learning that helps to demonstrate the value of such interventions and affect approaches to future service delivery.

8.1.1 Supporting indicator development

Data and resulting approaches to data collation for BEACON+ were examined as part of the assessment of progress (Section 9) to examine:

- the ease by which data could be interrogated
- potential gaps in data collection required to determine delivery against project or wider WEFO objectives

A review of the current project progress monitoring system and suggestion for additional indicators is given in Section 10.

In addition, NNFCC reviewed what further data would be required to provide an assessment of the 'additionality' provided by BEACON+ (see Section 11) and identified the additional indicators and associated data demands (Section 11.1).

9 Assessment of progress to date

9.1 Progress towards delivery of agreed indicator targets to June 2017

For the last progress report examined (May 2017), BEACON+ was on track to meet or exceed most of its currently agreed targets with WEFO (

Table 2).

Table 2: Extent to which targets for end June 2017 have been achieved to date (as reported in quarterly reports to WEFO).

Indicator	Q8 targets (end June 2017)	Achieved to end February 2017	Achieved to end May 2017
1. Number of Welsh SME enterprises cooperating with supported research institutions plus non-eligible enterprises (larger companies and companies outside convergence region) involved in research partnerships with eligible Welsh SME's (allows multiple counting)	38	36	62
2. Number of eligible Welsh SME enterprises receiving non-financial support	32	35	46
3. Number of eligible Welsh SME enterprises supported to introduce, or HEI's introducing, new products/processes	20	13	22
4. Number of eligible Welsh SME enterprises supported to introduce, or HEI's introducing, new to the market products/processes		1	1
5. Private investment matching public support in innovation or R&D projects (£)	200,000	0	0

Note Item 1 also includes participating HEI's, but these are only counted once. Item 1 only includes completed R&D projects at the time of quarterly reporting (but this is currently under review).

The rise in impact between February and May reflects an element of catch up in reporting by Bangor following administrative delays in getting collaborations recognised on reporting systems.

While no formal reporting of progress against the first interim target of £200,000 of private investment has been made, progress reports indicate that work has been won and payments are pending. There are also several bids in train with the potential to bring in significant private and public funds in the near future (see Section 9.2.6).

9.2 Detailed analysis of progress

A detailed analysis was undertaken of the results underpinning the progress report covering the project reporting period up to February 2017 to provide a more detailed breakdown of interactions to date and examine any difficulties or limitations encountered in data analysis and interpretation.

9.2.1 Non-financial and R&D support

By the end of February 2017, 35 Welsh (against the interim target of 32) SMEs had received 'non-financial support'². Two additional SMEs received non-financial support, but they were based outside of Wales and were not included in the number of assists.

Active support was typically of the form of consultancy relating to 'problem-solving conversations' or relatively limited lab work (for example to determine the composition of a waste stream). This also included equipment and technique demonstration days.

Nine companies provided with early stage support went on to enter into research and development (R&D) collaborations with the Beacon Biorefining Centre of Excellence. Two further SMEs entered into R&D collaborations without going through the active support stage, bringing the total number of R&D collaborations with commercial interests to 11.

Companies participating in more than one R&D collaboration result in multiple counts towards the number of interactions. Research institutes or non-Welsh companies forming part of these R&D collaborations also count as enterprises co-operating with research institutes. This brings the total number of R&D 'co-operations' to 36 (against the interim target of 38).

All 10 of the commercially active and R&D supported SMEs were deemed to have introduced new-to-firm processes or products (implicit in the signing of a collaboration agreement)³.

The above data relates to companies where R&D actions had been completed at the time of reporting. In addition, 28 further companies were involved in R&D collaborations, showing a strong pipeline of project interactions, of which 12 represent interactions with Welsh SMEs

² least 6 hours of active support or 12 hours of passive support (see section 7.1)

³ Supported firms can only be counted once in relation to bringing forward new products or processes but in this case Universities do not count. The contributing Universities do count towards new R&D collaborations.

(the remainder were outside Wales or were not SMEs and represented larger partners in projects). The most recent progress report providing summary data for progress up to May 2017 (

Table 2) support this assertion.

9.2.2 Number of R&D interactions with supported companies

In total, to date 40 organisations have been involved in 67 R&D interactions with BEACON+ (involving interactions with large enterprises, NGO's, none-eligible and eligible-SMEs). Of these, 23 organisations (58%) represent eligible Welsh SMEs.

Within the overall total, only 37.5% of organisations participated in more than one R&D collaboration. However, within the participating Welsh SMEs, 57% participated in more than one R&D collaboration. As collaboration with a Welsh SME is a requisite for BEACON+ support this difference between 2 cohorts is not surprising. However, it does demonstrate the positive impact of BEACON+ in driving repeat interactions with Welsh SMEs.

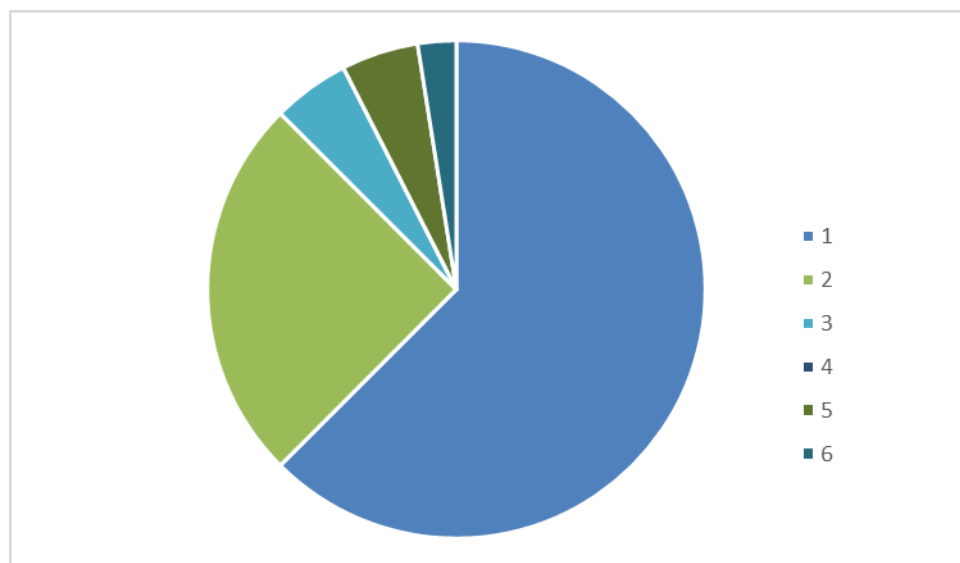


Figure 1. Proportion of single and multiple R&D collaborations (of 40 collaborations in total) entered into by supported organisations.

9.2.3 Typical size of SME supported

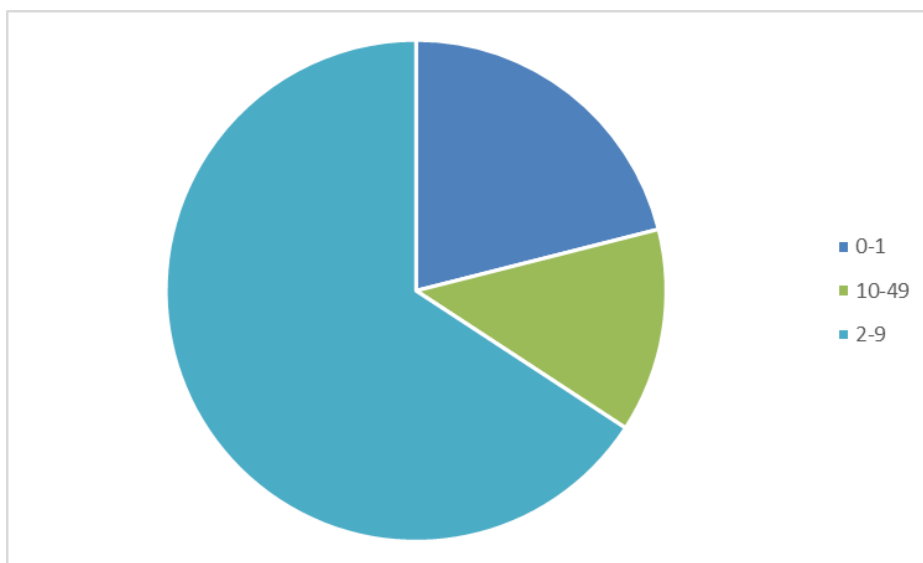


Figure 2. Proportion of Welsh SMEs supported by BEACON+ falling into different employee size bands

Considering only the eligible Welsh SMEs or social enterprises involved in interactions with BEACON+ (R&D collaborations or non-financial) in employment terms most of the participating organisations were micro businesses (<10 employees); 66% employed between 2 and 9 people, 21% had only 1 employee and 13% had between 10 and 49 employees.

This is an area of key interest to WEFO with the objective of moving the focus of BEACON+ to support the development of larger SMEs. However, the pattern of support delivered needs to be compared against the regional demographic for SME size in Wales, as over 90% of existing businesses employ less than 10 people.

9.2.4 Regional picture of delivery

The breakdown of the locations providing eligible SMEs (by proportion of SMEs supported in each Unitary Authority) is provided in Figure 3. The location and spatial distribution of individual Welsh SMEs supported can be seen in Figure 4.

Areas delivering the highest levels of interaction, included Swansea that hosted 32% (12 SMEs) of the participating SMEs and Gwynedd hosting 21% (8 SMEs). Both represent areas of high population density in Wales and the location of participating Research Centres (Bangor and Swansea).

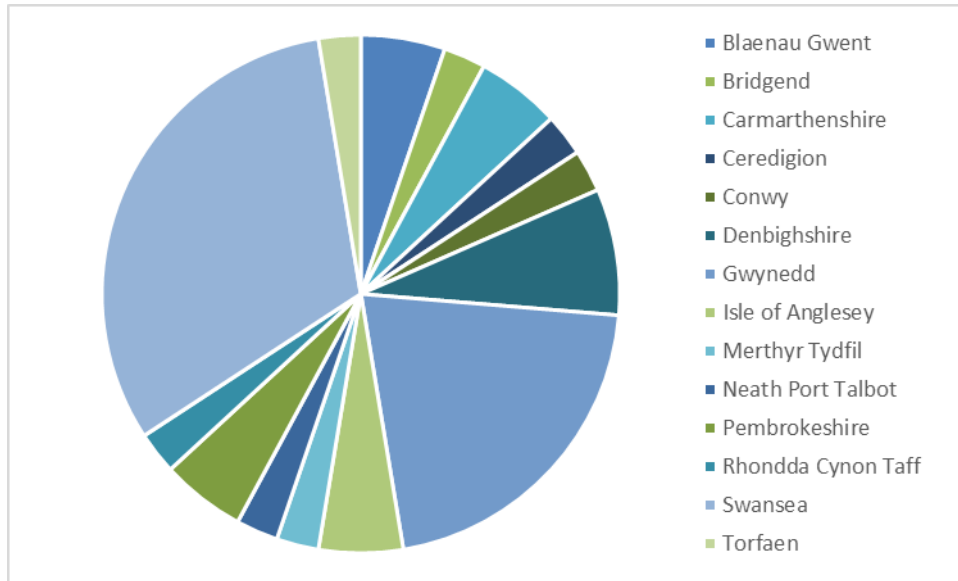


Figure 3: Distribution of SMEs (by number of enterprises) supported by BEACON+ in the different Welsh unitary authorities.



Figure 4: Locations of supported Welsh SMEs.

9.2.5 Impacts outside of the target SME's

Considering all 40 organisations involved in collaborative R&D interactions with BEACON+(including completed or ongoing work at the time of reporting) 58% were eligible SMEs (Figure 5), 23% were ineligible SMEs (only included as a project partner), the remaining 19% were either large companies, government bodies or charities.

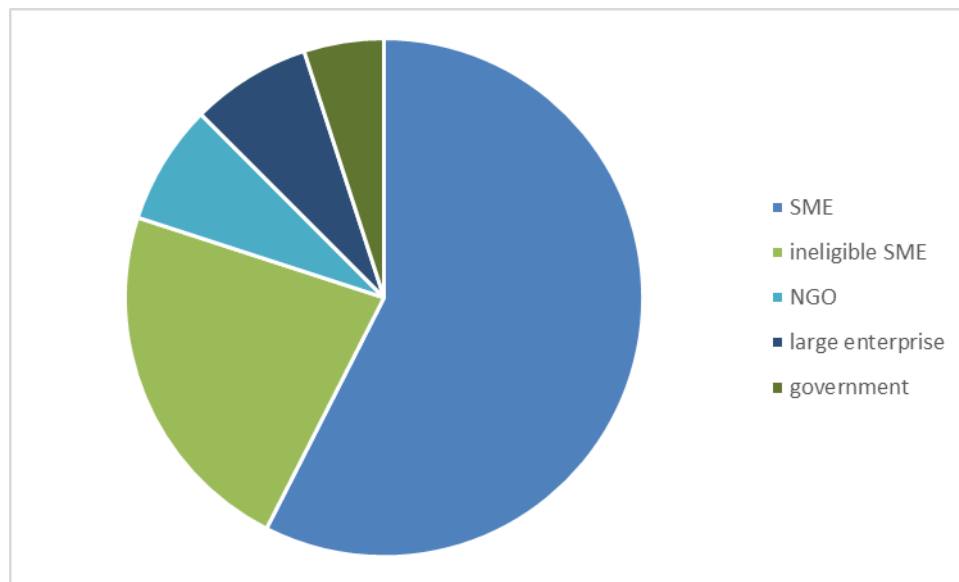


Figure 5: Types of organisation supported in collaborative R&D.

While this may suggest a significant amount of effort is being directed at organisations other than SMEs in the convergence region, these contacts represent organisations within a network of interests that are involved in projects with eligible SMEs and offer potential to contribute to inward investment either;

- directly,
- through participation in consortia to attract external funding, or
- through development of joint commercial exploitation opportunities in Wales.

A key objective of BEACON+ is to widen engagement with industry, which will encourage such interactions.

9.2.6 Attracting R&D investment into Wales

There are several bidding opportunities listed in quarterly reports that identify potential to draw-in a mix of public and private funds from SMEs in the convergence region. For example:

- Stevia- a joint project with Aberystwyth with a total value of £563,084 and a grant of £119,000 to Bangor with match funding from an SME in the convergence area (South Caernarfon Creameries)
- HIGHBARPACK- Total value of £315,198 with a grant of £157,599 to Bangor and match funding offered from 2 micro SMEs in the convergence area (Envirobalance in Cwmbran and Jones Crisps in Pwllheli)
- LaserCure £300,000 bid with Welsh Company in Swansea
- HDTBioPol High Deflection Temperature Bio-based polymers for horticulture & food service applications, £250,000 with Welsh company in Wrexham

In addition, the co-ordinating HEI's have been successful in drawing in relevant national innovation funding into the region:

- BBSRC NIBB P2P, broccoli extraction and process optimisation (BEPO) - £9960
- BBSRC P2P NIBB, botanical Extracts – Swansea, £5000
- BBSRC, characterising enzymes from the guts of sheep that eat seaweed - £15663
- BBSRC, an integrated approach to explore a novel paradigm for biofuel production from lignocellulosic feedstocks - IBERS, £496,658
- BBSRC, Process improvement to enable economic production of prebiotics and demonstration of efficacy in feeding trials (PIPP) - £194,263
- BBSRC, Bioreactor system for Industrial Biotechnology process development - £389,401
- Innovate UK, Process development of lactic acid production, £319,000

There are several other bids that have been submitted to public funding bodies for consideration including:

- Lightweight wooden composite electricity pole development with SME in NE England. £1.1m bid to innovate UK, £169,000 potential to Bangor
- Sustainable fruit and veg packaging for Uganda to reduce post-harvest losses. Innovate UK, Agri-tech proposal. £402K, Bangor Lead.
- Natural fungicides against air and soil pathogens (NAPSA funding) 3m euro, with approx. 0.5m euro to Bangor University potentially.

An issue for future evaluation will be determining whether such income (when achieved) would have accrued in the absence of BEACON+ or should be treated as 'additional' and attributable to efforts of BEACON+, and secondly whether commercial support is made on a financial or 'in-kind' basis.

9.3 Signposting to other schemes

In seeking to increase the successful translation of R&I into commercial products, BEACON+ can provide only part of the solution. Partner initiatives can address other innovation support needs. BEACON+ therefore provides signposting to, and works with, other ERDF or government-supported initiatives such as the Aberystwyth Innovation and Enterprise Campus (AIEC) and M-SPARC (Menai Science Park) or SMART Innovation services. BEACON+ also works with the Bay Campus at Swansea University in support of the Welsh BioInnovation Project, the Centre for Environmental Biotechnology at Bangor and the RE-Direct project (biomass conversion to activated carbon).

BEACON+ has been signposting companies to M-SPARC and AIEC and several supported companies now have a registered address there. BEACON+ also directs companies to the Business Wales Accelerated Growth Programme (AGP) and supports the Advanced Training Partnership (ATP), supporting post-graduate distance learning.

9.4 Wider networking activities

BEACON+ is part of the BioPilots UK alliance of open access biorefining centres. This aims to increase joint working between the four relevant centres (including the Biorenewables Development Centre near York, Centre for Process Innovation in the North East and the Industrial Biotechnology Innovation Centre in Scotland). BEACON+ is a key partner in the Alliance which is seeking to secure external funding to develop a programme to support industrial engagement with the centres and promote awareness raising.

BEACON+ staff also engage with relevant collaborative Networks in Industrial Biotechnology and Bioenergy (NIBB) (from which proof of concept funds have been secured by BEACON+ – see earlier). The associated 13 NIBB networks seek to foster collaborations between academia, industry, policy makers and NGOs to tackle research challenges and build links to support engagement.

9.5 Cross-cutting themes

There are a range of additional cross-cutting themes that WEFO ERDF projects should address (see Section 4.5) but there are no formal metrics that BEACON+ needs to meet in relation to these.

The BEACON+ project by nature of its thematic work areas will undertake some projects with the potential to support development of low-carbon technologies and deliver more environmentally beneficial outcomes in organisations it works with. While there is no formal requirement to monitor such impacts, work in such areas delivers an added value impact of the BEACON+ work.

BEACON+ should stimulate inward investment, jobs and growth both directly and through associated supply chains, and so in a general sense, it will contribute to tackling poverty and social exclusion over the longer term in the stimulation of new manufacturing roles, creating jobs in both rural and urban economies in Wales, delivering a legacy impact beyond the project lifetime.

The planned activities for gathering data on number and value of jobs created as part of follow-up of enterprise assists should provide data on an ongoing basis against which to measure more immediate impacts. While some high-technology and therefore high value jobs could be created, impacts down the supply chain to supply feedstocks etc could also help to underpin and protect lower paid manual jobs in the rural economy.

In its work to date BEACON+ shows no bias in the geographical areas in which it is engaged which represent a wide range of levels of deprivation (see Appendix, section 14.1)

Via public engagement and outreach as part of its wider remit, BEACON+ aims to stimulate interest in science and research and highlight the equal opportunities available to all genders (addressing under-representation of women in science in particular). This is achieved through BEACON+ staff attendance at a number of public events including public Science Festivals, agricultural events (Royal Welsh and Anglesey shows) Open Farm days and organised business visits. This information is captured in the WEFO quarterly reports and on the BEACON database.

Two BEACON staff are STEMM ambassadors involved in outreach activities. These areas are of particular importance to Swansea University, with recognised experience in promoting women into science in the medical sector (Athena SWAN Silver award), which is also being rolled out into arts and humanities sectors at the university, but also wider into the NHS sector with the aim of gaining the same level of recognition for local NHS Trusts.

BEACON+ is pro-active in supporting the Welsh language, in part to avoid any possible social exclusion. Promotional materials are bilingual and partner HEI's have Welsh language policies to promote use and inclusion which cover activities undertaken within BEACON+. BEACON+ also provides a Welsh speaking Business Development Manager to facilitate company engagement through the medium of Welsh when required. In its dealings to date, BEACON+ appears to represent the general Welsh population in terms of engagement with Welsh speaking owner interests (see Appendix, section 14.2.5).

While BEACON+ does not have any specific targets for cross-cutting themes, the impact of BEACON+ on these will still need some form of evaluation. The mandatory data collected by the BEACON+ team on ethnicity and gender of employment and company control in supported SME's, as well as data on job creation allows a rather basic evaluation of the impact of BEACON+ on the cross-cutting themes. Some of this base data is collated in the

Appendix as an indication of how such data can be more readily evaluated and utilised. This basic data (gathered around company ownership) show that BEACON+ interactions are generally representative of trends in the wider Welsh population and there are no specific areas of under-representation in areas of gender, ethnicity or language. The representation of disability in senior positions is low compared to the population average, as is the proportion of younger owners of companies (see Appendix). However, there are broader issues that influence such effects over and above disability prevalence and age distribution in the general population, where specific actions are required to address such issues.

The regular progress reports written by the BEACON+ team indicate that they understand the importance of incorporating equal opportunities and consider other cross cutting themes in their activities. However, dealing primarily with SMEs that operate on a 'lean' operational basis there are limited opportunities to encourage adoption of procedures above and beyond those delivering mandatory employment rights and obligations.

10 Analysis of the current monitoring system

10.1 Current monitoring system

To guide data collection from ERDF scheme beneficiaries, WEFO provide a list of monitoring data requirements⁴ and supporting Excel sheets for data collection and collation. This includes information relating to enterprise data and cross-cutting themes. The BEACON+ project management team collect this information which currently underpins reporting back to WEFO on a quarterly basis. The supporting Excel sheet was utilised by NNFCC in its analysis of performance delivery to date.

In addition to this mandatory data, BEACON+ progress reports list research funding applied for, new projects started, and examples of collaborative R&D work carried out.

10.2 Analysis of monitoring system

The information collected by the BEACON+ management team meets the required mandatory reporting objectives of WEFO Priority 1, Specific Objective 1.2, as given in (Table 1). The BEACON+ team has experience of such monitoring developed from the first phase of the BEACON project and management staff are in regular contact with WEFO to determine how these metrics should be applied (for example to clarify whether only completed R&D collaborations should be counted).

Through examination of the current monitoring system and reporting back to WEFO, it's clear that the BEACON+ management team collect and collate a wide range of information

⁴ <http://gov.wales/docs/wefo/publications/170524-erdf-enterprise-data-requirements.pdf>

for reporting purposes. Much of which is of a descriptive nature in progress reports and relates to reporting on delivery actions.

Because of the WEFO focus on high-level generic indicators (for the purpose of cross project collation) and the additional time involved in further data collection and collation, there is currently limited concentration on more detailed analysis of the impacts of interventions, which would provide a more detailed understanding of what aspects work best when seeking to stimulate innovation and commercial success.

The primarily descriptive nature of the quarterly reporting makes it difficult to gain a rapid understanding of how project efforts are being targeted, the effort expended into the different types of service provision and the success achieved through such efforts. The analysis of progress to date by NNFCC as part of this analysis (Section 9) show how some simple infographics can help to demonstrate delivery, drawing on existing data. In some cases, this required further painstaking investigation to gain an understanding of for example multiple interactions with individual companies. Such data can easily be made more readily available/accessible and provide valuable insights and learning to improve future delivery. NNFCC will look to means of further interrogating the BEACON+ database to provide such data in the final assessment.

Based on this analysis of the available data and resources provided by the BEACON+ management team to date, NNFCC make the following suggestions where improvements could be made to reporting or data collection to support wider projects objectives. NNFCC recognises that resource constraints may hamper what is feasible and so looked to try to minimise time impacts where possible.

10.3 Addressing leveraged research funding

Moving forward BEACON+ will need to monitor and present data on **private investment encouraged in the target region** (through R&D collaborations or to support another part of the innovation process). As part of the additionality assessment at the end of the project it is important to know whether this, or **what proportion has been derived from within and outside the target region**. A set of suggested questions for beneficiaries is:

- Grant support received £
 - Proportion derived from outside the Welsh Government or target region
- Non-grant financial support received £
 - Proportion derived from outside the Welsh Government or target region
- Received as match funding? Y/N
- Would this support have been obtained in the absence of the interaction with BEACON+? (Y/N) (providing rationale for answer (evidence))

10.4 Suggestions to improve the current approach to project monitoring and presentation

Based on existing approaches to data capture, NNFCC advise that the following be collated on a year to date basis to inform reporting to the management and Advisory Board and back to WEFO:

- **Proportion of supported eligible Welsh SME's falling into micro, small and larger SME employee size bands** (enterprise support plus R&D collaborations). As WEFO wish to see increased focus on larger SME's. Counterfactual for comparison could be the proportion of SME's by employee numbers in relevant sectors such as the Welsh health and/or processing industry sector.
- **The county of origin for supported eligible Welsh SME's** (non-financial and R&D interactions) to demonstrate the efficiency of cover in the target region along with rationale for any observed regional aggregation(s).
- **Organisations segregated by type involved in collaborative R&D projects** (where there is a wider remit for inclusion within the overarching indicator) to demonstrate key areas of impact and facilitate later 'leakage' assessments.

Driving commercial innovation commonly requires multiple interactions between technology providers, developers and supporting interests to advance. The fact that BEACON+ is involved in multiple engagements with companies is a positive sign. This could be more readily recognised and demonstrated as it is difficult to discern from the raw data currently. The project co-ordinator advises that the BEACON+ database has the capability to provide this function.

- A tally of the **number of interactions with individual companies** will help to examine the **proportion of contacts that engage in multiple interactions** (as demonstrated in Figure 1).

BEACON+ collects information on the number of hours or costs incurred in service supply. It would be a useful metric to identify:

- **how much time is invested in individual projects** as part of the lessons learnt from the project to inform similar future initiatives looking to supporting innovation actions. The BEACON+ database should have the capability to provide this function.

Building on basic data captured in the BEACON+ database, it would be helpful to monitor staff efforts being placed into different activities, including a summary of staff inputs into:

- 1 seminars, workshops, demo days, awareness raising actions (technology transfer)
- 2 company assists - R&D projects

3 company assists – short-term consultancy and strategic assistance

This would provide an analysis of **proportion of delivery time spent on specific activities**. This would help to underpin learning about the balance of activities achieved complimented by views on their contribution to overall project objectives, to help inform future initiatives.

Again, NNFCC is assured that the BEACON+ database has the capability to provide this information.

10.5 Minor additional data capture requirements to improve current approaches to monitoring

The following represent suggestions to where further data capture or collation could provide useful insights, but NNFCC recognises that this will have implications for administrative time inputs and costs. The BEACON+ management team would need to take a decision on what, if any, further monitoring is feasible within the available budget.

It would be helpful if the BEACON+ project could show that its R&D interactions help to push enterprises up the development process. However, it is recognised that the relatively brief period of involvement (in most cases) with BEACON+ makes this difficult. One means to consider could be monitoring and assessing Technology Readiness Levels (TRL) at the initial and end of engagement where multiple interactions occur with individual companies during the project, to show number of TRL stages moved through.

The relevant indicator could be **progress through TRLs for enterprises involved in multiple engagement with BEACON+** (presented by proportion of interactions passing through either none or increasing TRL steps). While recognising that TRL assessment is rather subjective, a common set of TRL parameters need to be defined for use. A relevant example as used by the EU is provided in Appendix 3. This would rely on BEACON+ staff making the appropriate assessments.

Gaining an understanding of the **business sectors that business either currently work in, or to which new products or service will deliver** would help to identify any emerging sector trends and help demonstrate breadth of sector delivery. Using a common set of topic areas will also assist subsequent data analysis. A suggested list of sector interests includes:

- Biofuels/bioenergy
- Bio-based feedstocks
- Bio-based products
- Nutraceuticals
- Healthcare
- Food and feed

- Waste management
- Environmental
- Platform Chemicals

Data could be presented in terms of individual company interests per thematic area.

No detailed information is currently captured on whether new collaborations have been developed. Gathering data on which of the listed organisations are collaborating in R&D projects (number of networks) and whether these are **new collaborating networks** would provide useful additional information to demonstrate the impact of BEACON+.

Furthermore, gathering data on **new interactions initiated between research institutes** would provide a useful indicator of increased technology transfer and collaboration between research institutes both in the region and externally.

Collating information, simply as ongoing lists of **new skills and new research infrastructure developed because of collaboration** and a brief description of what value these add would be a useful information resource that is not currently captured.

Additional resource would be required in collation and encouraging data collection.

10.6 Signposting to other schemes to support commercial development

As part of the drive to increase the successful translation of R&I into commercial products, it is important to formally record whether BEACON+ beneficiaries have been directed to other ERDF or government-supported initiatives (this activity is currently reported on more generally in quarterly project reports). This could be completed as part of follow-up operations with beneficiaries.

The suggestion is to provide BEACON+ delivery staff involved with beneficiary follow-up with an outline list of relevant schemes/facilities for beneficiaries to select from along with a dialogue box to provide additional information where necessary/informative, for example:

- Were you made aware of other schemes in Wales to support your development needs? - Y/N
- If Y, which of the following were you directed to:
 - Aberystwyth Innovation and Enterprise Campus
 - M-SPARC
 - SMART Innovation (or another SMART Suite)
 - Business Wales e.g. Accelerated Growth Programme (AGP)
 - Other relevant schemes etc
- Have you subsequently engaged formally with the identified facility/initiative - Y/N

Alternatively, this could be followed up with scheme beneficiaries at the end of the project, but response rates are likely to be much reduced at this stage.

10.7 Cross cutting themes

While there are no specific targets set for BEACON+ in relation to cross cutting themes, as these are not primary drivers for the work of BEACON+, previous sections (Section 9.5) examine how relevant data currently being collected can be presented (see Appendix 1) and used. In relation to sustainable development it may be possible to provide further insight.

10.7.1 Sustainable development

A key focus of the actions of BEACON+ is to promote the bio-economy and biorefinery concepts and associated products, many of which may have a business case that is predicated on their environmental credentials (in product use or manufacturing process). However, beyond individual LCA projects that BEACON+ has delivered in some cases, there is no mechanism currently adopted (or required) to collect and collate more generalised information on such aspects.

While full environmental assessment of the potential impacts of derived product and services is beyond the scope of the BEACON+ project (i.e. full LCA study), it may be possible to derive some simple metrics. At the end of individual projects (R&D or where significant 1:1 support has been provided) individual project officers or scheme beneficiaries should be able to provide an indication of the likely impact of work, for example to provide simple answers to question such as:

Is the developed or target product or service expected to deliver:

- a saving in greenhouse gas emissions in use or manufacturing compared to current alternatives? Y/N/don't know.
- a reduction in waste compared to current alternatives? Y/N/don't know
- a positive environmental impact in use compared to current alternatives? Y/N/don't know (if Yes, how?).

This would permit the collation of simple subjective metrics on the **numbers of relevant interactions likely to lead to positive environmental outcomes**, that could be further segregated by type given sufficient positive responses or expressed as a proportion of the total number of relevant interactions.

11 Approach to assessment of counterfactual and additionality

The aim of an additionality evaluation to be performed in detail as part of the final summative evaluation of the project is to determine if the net outcome of a project within a target region is positive and delivers over and above what otherwise might have occurred through other existing mechanisms (the counterfactual situation). Questioning of scheme beneficiaries provides a quantitative assessment of the direct benefit gained in terms of new jobs created (and their salary bands) and the proportion of revenue or increased turnover related to the support received.

A further key set of issues involved in evaluating the net benefit of the BEACON+ programme involves gaining an assessment of the following:

- what would have happened anyway in the absence of BEACON+ (**Deadweight**)
- how much of the additional value generated is actually realised outside the target region (**Leakage**)
- what proportion of the outcome can be accounted for by displacement or reduced outcomes elsewhere in the target region (**Displacement or Substitution**)
- What is the additional economic additionality stimulated beyond that directly achieved by the scheme recipients (**Multipliers**).

The net impact of an intervention is therefore

$$\text{Net additionality} = (\text{direct impact}^5 - (\text{deadweight}) - (\text{leakage}) - (\text{displacement})) \times (\text{multiplier})$$

Given the limited amount of data that can be gathered easily from scheme beneficiaries, much of the above can only be addressed in a semi-quantitative manner based on responses to relatively simple questions posed by project staff in follow up visits during the life of the project and by project evaluators at the end of the project – these are outlined in the following section. Some of the baseline data required to assess additionality is already being collected through the projects 'Company Information Form' which provides baseline data on turnover and employee numbers. Also, through separate forms used in follow-up with beneficiaries BEACON+ plans to derive information on jobs created and associated salary band (Jobs Created Form). However, further data is required from beneficiaries to support the additionality assessment as detailed in the following section.

11.1 Suggested indicators for assessment of additionality

In addition to the data currently or planned to be collected by BEACON+ project staff (jobs created and salaries etc, matched private investment secured, investment secured in

⁵ Reported or measured

enterprise) to address net additionality, NNFC will require additional information from scheme beneficiaries. The success rate achieved in gaining beneficiary responses to these, as well as any sector specific multiplier metrics for different industrial sectors will impact on both the robustness and scale of the additionality impacts reported for the project. So, it will be important to ensure responses are achieved from as many relevant business sectors as possible.

The additional data that will be required are provided below, with an assessment of the ease by which such data could be obtained.

Deadweight

Question to beneficiaries: *Would any of the benefits arising from the support provided by BEACON+ (employment, increase in revenue etc.) have been achieved in the absence of the support?*

- Y/N
- If yes, what proportion (all or partial (provide estimate of percentage))
- Follow-up on rationale for selecting "yes" to provide insights

Ease of obtaining data:

While the answer is relatively simple to deduce by beneficiaries, collation still depends on the willingness or capability of companies to provide data

Leakage

Question to beneficiaries (1): *What proportion of any benefits gained from the support provided by BEACON+ have been achieved outside of the target area?*

- Proportion of additional revenue generated that remains outside target area
- Proportion of additional jobs generated that remain outside target area

Ease of obtaining data:

Difficult – relies on follow up with companies and willingness to provide data which may require further internal company evaluation

Question to beneficiaries (2): *What proportion of any increased expenditure occurring because of the supported development is flowing to intermediaries outside the target region?*

- Proportion of any additional expenditure incurred outside of target region because of intervention

Ease of obtaining data:

Difficult – relies on follow up with companies and willingness to provide data which may require further internal company evaluation

Displacement/substitution

Question to beneficiaries: *Has any of the benefit reported been at the expense of other areas of the business or suppliers in the target region?*

This is one of the most difficult issues to address in terms of factors affecting additionality. It is assumed that only net increases in employment or turnover will be captured so to that extent any internal displacement or substitution within the company will already have been accounted for, but these need validating with beneficiaries directly.

In this case the suggestion is to include a simple Y/N response option to the question and to seek further descriptive information where any impact is indicated.

Ease of obtaining data:	Anticipate few responses to this question and because of recording of net impacts within a beneficiary this is not expected to unduly impact on results
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Multipliers, while widely used as an economic evaluation tool, are very difficult to estimate. Multipliers address both indirect and induced impacts. Indirect impacts include for example the increased expenditure on intermediary goods and services because of the intervention and induced impacts include the effects attributable to factors such as increased spending on local goods and services by the workforce because of any intervention. In undertaking analysis of additionality at the end of the project, NNFCC will utilise industry multipliers provided in official national input-output tables⁶ with justification given for the values used. To facilitate this, it is important that beneficiaries can clearly indicate the business or service sector in which they currently or aim to operate to enable selection of the most appropriate multipliers. A concise list of the sectors deemed to be most appropriate to project beneficiaries is given in Appendix 2 for use by the project team in discussion with beneficiaries.

Multipliers

Question to beneficiaries: *Which industry classification code (SIC code) most accurately reflects your area of business*

BEACON+ already has the facility to collect this data via the Company Information Form – **but it is important to ensure this information is collected and recorded by project team members as it will impact on the choice of multipliers used by the evaluation team.**

6

<https://www.ons.gov.uk/economy/nationalaccounts/supplyandusetables/datasets/ukinputoutputanalyticaltables/detailed>

Ease of obtaining data:

Should be easy to select from relevant list provided to beneficiary (see Appendix 2)

12 Concluding remarks

BEACON+ activities are focussed on increasing innovation in the biobased industries in the West and the Valleys region of Wales, utilising expertise in the regions universities to assist SMEs in developing biorefining technologies, build projects, attract inward public and private investment and promote opportunities for development. BEACON+ is close to meeting its formal intermediate targets and is on track to meet its final targets. The monitoring data required to date has been captured, collated and formally reported. The maintenance of this and compliance with its proposed data capture processes, to be used in follow-up work with scheme beneficiaries, should provide the base information required to assess the direct impacts of the project. To date, it has been too early to gather much data on this aspect (no jobs or new investment have been recorded yet).

It is clear that the project is building added value through the growing project work secured through networking activities both inside and outside Wales and collaborations built with other academic partners and industry interests. An important one being the development of BioPilots UK, an alliance of the Industrial Biotechnology (IB) and Biorefinery scale-up centres in the UK, which will form an important conduit to future national government funding in the bioeconomy and IB sectors.

Much of the formal reporting back to WEFO to date is descriptive in nature and predominantly focusses on activities undertaken in the preceding quarter and related outputs via detailed descriptive lists, indicator outputs and reporting against agreed project progress indicators.

Moving forward there will be a greater need to focus on how work has been targeted and resulting impacts and outcomes to:

- ensure delivery retains effective focus to ensure progress against agreed project and wider programme objectives
- quantify the direct and wider benefits that the programme of work is delivering to support the case for continued and further investment.

BEACON+ is a large project, involving multiple centre and staff input so it is difficult to quickly glean an overview of the scope, range of activities and impacts. NNFCC, through this review, makes several suggestions and presents examples where effort spent collating some of the existing metrics, supplemented by perhaps a few additional metrics could help to provide a range of infographics that could make such high-level data more accessible and

quicker to assimilate to help identify where trends are occurring and/or actions may be required. This will entail project management staff investing more time in data analysis.

In review of recommendations, and discussions with key project staff, there are significant concerns about the implications on administrative staff time of any additional reporting and data analysis requirements. NNFCC recognise this problem. BEACON+ is collecting sufficient data to address its mandatory reporting requirements. The suggestions for additional data collection or analysis are made to help BEACON+ more clearly demonstrate impact and more importantly, identify the information that NNFCC will require to undertake the additionality requirement. It is up to the BEACON+ management team to decide whether the additional efforts required to deliver these are worthwhile in each case.

In the case of 'additionality' this is an area where additional data will need to be collected. Recommendations are provided for the additional questions that should be incorporated into follow-up with scheme beneficiaries to help address additionality; leakage and deadweight; and displacement. The responses to these, along with derivation of suitable multipliers, will be used to estimate net additionality at the close of the project.

Clearly the greater the response rate, the more reliable will be the estimate of impacts. Based on previous experience, response rates with scheme recipients at the close-out of projects (typically with a different team) tend to be lower than those during project engagement.

In other areas;

Wider WEFO and ERDF objectives for actions supporting research and innovation provide a framework to assess the BEACON+ projects likely contribution

Increase the successful translation of R&I into commercial products, processes and services / More commercialisation of innovative processes, and improve technology transfer from HEIs

The core delivery functions to SME's in provision of non-financial 'consultancy' advice as well as direct R&D support will facilitate additional knowledge transfer opportunities from HEI's in Wales, and already appears to have led to the ongoing development of several new products and services that hopefully will lead to valuable commercial outcomes. This will be an important part of the final assessment of the project. Further evidence of the role that BEACON+ plays in helping to link companies to next-step help in terms of other agencies, support programmes and facilities will be useful to the final evaluation of the project.

BEACON+ involvement with the NIBB has already helped to secure proof of concept funding to further developments and involvement with Biopilots UK could provide future opportunities to expand on this significantly.

Promote business investment in R&I

Although it's still early days in the project lifetime (and the innovation cycle for newly commissioned projects) the project has started to demonstrate the intention of companies to invest directly into R&D through agreement to participate in co-funded research projects currently under consideration by funders.

Develop links and synergies between enterprises and R&D

The fact that the BEACON+ project is developing multiple interactions with beneficiaries is an important indicator of growing confidence in the relationships being built. Examination of what proportion of these, lead to R&D collaborations will be a further useful evaluation metric in the final analysis.

Understand 'why' and 'how' an intervention works

Bridging the gap between early stage development and scale up to commercialisation is a well-recognised difficulty for all sectors of innovation. Regular evaluation and discussion of impacts (supported by the advised actions in this report) will help shape responses and future actions to improve outcomes. The lessons learnt from this have an important wider value to other schemes looking to support innovation. Gathering this into a set of future recommendations will form part of the final review of the project.

NNFCC will continue to work with BEACON+ to advise on the proposed indicators and approaches to data collection in support of the final project evaluation exercise. Within this, a key issue for the BEACON+ management team to resolve is the prioritisation of time available for admin and data collation and the costs implications of this. The foregoing analysis highlights the typical questions and requirements for evidence that NNFCC will ask of BEACON+ and scheme recipients as part of the final analysis of the project and areas where BEACON+ has advised it can deliver.

13 References

1. Welsh European Funding Office. ERDF: Priority Axis 1: Research and Innovation. In: Guidance on Indicator Definitions, Data and Evidence Requirements [Internet]. Version: 1.2. 2016 [cited 2017 Jul 19]. Available from: <http://gov.wales/funding/eu-funds/2014-2020/wefo-guidance/monitoring/erdf-indicators/?lang=en>
2. Welsh Government. West and the Valleys European Regional Development Fund Operational Programme (Operational Programmes). 2014UK16RFOP005 [Internet]. 2014 [cited 2017 Jul 19]. Available from: <http://gov.wales/funding/eu-funds/2014-2020/west-wales/?lang=en>
3. Regulation (EU) No 1301/2013 of the European Parliament and of the Council of 17 December 2013 on the European Regional Development Fund and on specific provisions concerning the Investment for growth and jobs goal and repealing Regulation (EC) No 1080/2006 [Internet]. Available from: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32013R1301>
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5. Directorate-General for Research and Innovation (European Commission). Innovating for sustainable growth: A bioeconomy for Europe [Internet]. Luxembourg: European Union; 2012. Available from: <https://publications.europa.eu/en/publication-detail/-/publication/1f0d8515-8dc0-4435-ba53-9570e47dbd51>

14 Appendix 1 - Cross-cutting themes

14.1 Tackling poverty

The Welsh Index of Multiple Deprivation⁷ defines Lower Super Output Areas (LSOAs), each with a population of around 1,500, and ranks them based on deprivation criteria (income and access to resources). The most deprived LSOAs are defined as those in the lowest ranked 10% (the first decile).

The SMEs supported in BEACON+ are spread equally across poorer and wealthier areas (Figure 6). Based on their LSOA, half of the companies are located in the poorer half of the country and half are in the wealthier part of the country. Four of the companies were in the lowest ranked 10%, the first decile. Another 4 were in the second decile, meaning a total of 21% were in the lowest 20%. No companies were in wealthiest areas, although 9 companies were in the 9th decile.

By reason of its focus on the Convergence Area of Wales, BEACON+ has a strategic aim to provide support to SMEs in more deprived areas. So far, no jobs have been reported as created in SMEs as a direct result of interaction with BEACON+. This will be addressed in future evaluations of the impacts of the project.

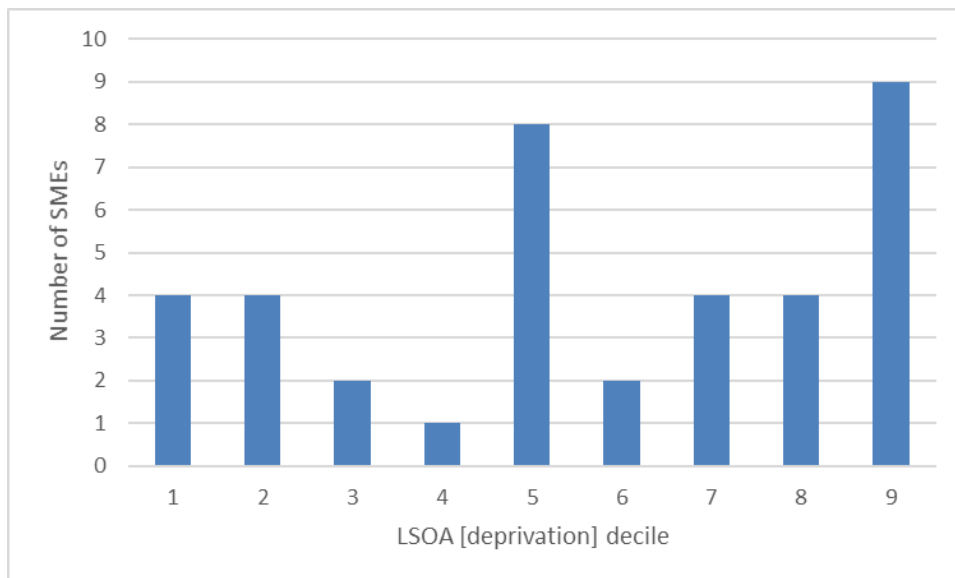


Figure 6: Number of Welsh SMEs located in each LSOA decile, where 1 is the most deprived decile and 10 is the least deprived decile

⁷ Statistics for Wales. Welsh Index of Multiple Deprivation (WIMD) 2014 [Internet]. 2014. Available from: <http://gov.wales/docs/statistics/2015/150812-wimd-2014-revised-en.pdf>

14.2 Equal opportunities

14.2.1 Equal opportunities: gender

Of the companies supported by BEACON+, around 8% of owners are female. As around 41% of the private sector workforce in Wales is female⁸, at first sight this figure may appear. However, it is not untypical of the UK economy in general. Female Directors typically represent 1 in 4 directors, and around 1 in 10 businesses are run by women and the proportion of women owners falls when considering larger organisations⁹.

As seen in Figure 7, none of the companies supported are owned exclusively or predominantly by women, although 17% are half owned by women. In all cases this was in two-person ownership teams, often involving a married couple. Around 64% of companies have no female owners. The remaining 19% have at least one female owner. From the sample of companies that BEACON+ interacted with, the level of female involvement at a senior level was therefore higher than the current national average.

The partner universities all have equal opportunities policies in place and the BEACON+ team is aware of gender diversity in their own hiring activities. BEACON+ supports wider gender diversity through self-funded actions and activities associated with the project.

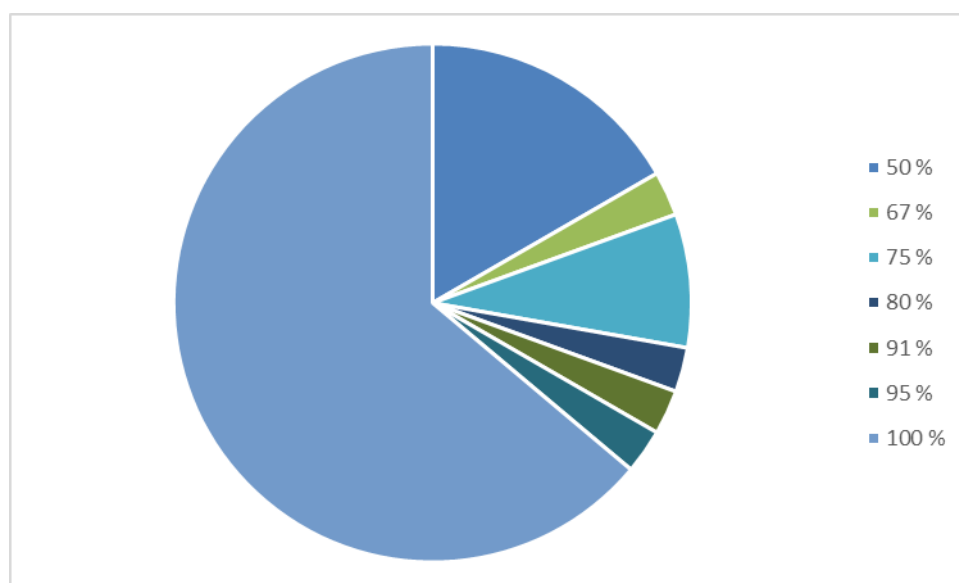


Figure 7: SMEs BEACON+ has engaged with categorised by percentage of male owners

⁸ Statistics for Wales. Employment in the public and private sectors by Welsh local authority and status [Internet]. 2017 [cited 2017 Sep 12]. Available from: <https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Employment/Persons-Employed/publicprivatesectoremployment-by-welshlocalauthority-status>

⁹ Martin, L. M. et. al. (2008) Boards of directors and gender diversity in UK companies. *Gender in Management* 23 (3) p194-208 <https://tees.openrepository.com/tees/bitstream/10149/99950/2/99950.pdf>

14.2.2 Equal opportunities: ethnicity

In terms of company ownership, 45% of enterprises either did not respond to questions on ethnicity of ownership or failed to understand the relevance of the question (answer was left blank). The rationale for asking such questions may need better explanation to improve response rates.

Of those that responded, the majority of enterprises had only white owners and 5% of the enterprises had only Black and Minority Ethnic (BME) owners. As the number of BME residents of Wales (all ages) was estimated to be 4% in 2009¹⁰ (8), 5% is close to being representative of the ethnicity of the general population in Wales.

Again, the partner universities all have equal opportunities policies in place and the BEACON+ team is aware of diversity in their own hiring activities. The project has little ability to influence ethnicity in its day to day activities other to ensure effective delivery irrespective of any such considerations.

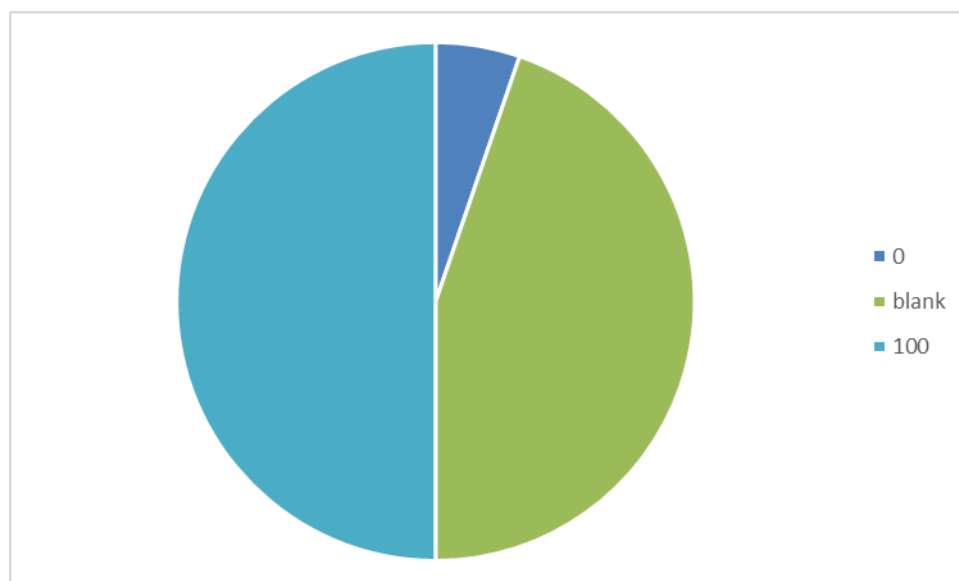


Figure 8: Proportions of SMEs supported defined by percentages of non-BME owners. Blank means respondent did not answer the relevant question, 0 means all owners are BME, and 100 means all owners are white (data for first 38 SMEs supported)

¹⁰ Statistics for Wales. Population Estimates by Ethnic Group, 2001-2009 [Internet]. 2011. Available from: <http://gov.wales/docs/statistics/2011/110518sb422011en.pdf>

14.2.3 Equal opportunities: disability

Around 5% of SME's engaged with had one or more owners with an assessed disability. Around one fifth of the working age population of Wales is disabled, and around three quarters of disabled people are work limited¹¹. However, questions on disability were only asked in relation to ownership rather than the workforce in general. There are likely to be wider issues affecting the ability of disabled people to establish new companies or rise to more senior positions.

Again, the partner universities all have equal opportunities policies in place and the BEACON+ team is aware of diversity in their own hiring activities.

14.2.4 Equal opportunities: age

Within the SMEs supported, no company owners were under 25 and only 5% of owners were under 45 (Figure 9). Around 70% of companies had no owners under 45, and 10.5% of companies (4 in total) were owned exclusively by people under 45. One of these is a plastics company with only one owner. Two are micro-breweries with more than one owner. The last is an engineering design company with two owners.

While there is a preconception that youth equates to greater innovation and motivation, this is not exclusively so and knowledge of markets and how to work within a system are equally valuable in developing successful business models. Accessing finance is a critical business development issue, where younger individuals are more likely to struggle if they have a limited track record.

¹¹ Statistics for Wales. Prevalence of disability in Wales, 2007-2010 [Internet]. 2011. Available from: <http://gov.wales/docs/statistics/2011/111206sb1152011en.pdf>

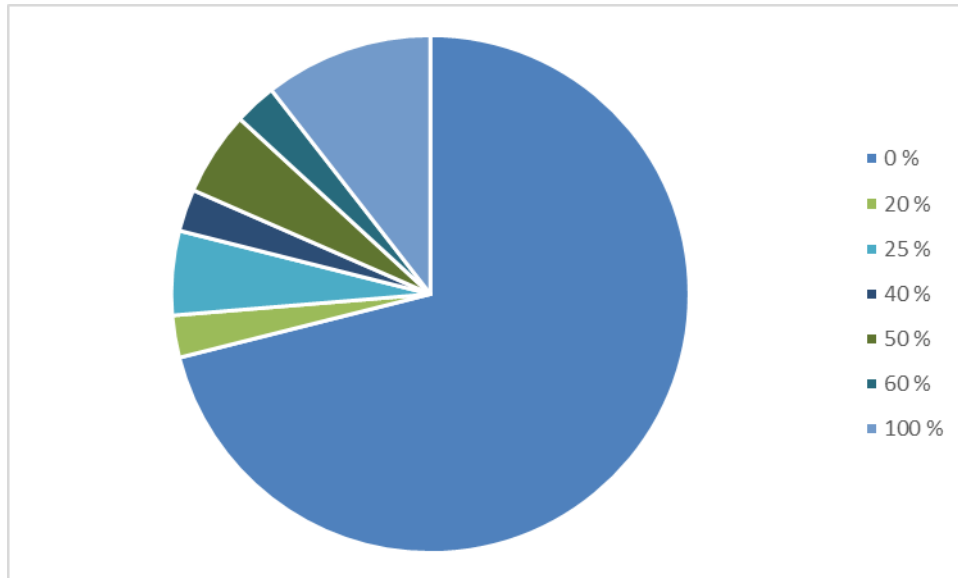


Figure 9: SMEs ownership segregated by proportion of owners who are under 45,

14.2.5 Equal opportunities: Welsh language

Around 26% of SMEs engaged with have at least one owner who speaks Welsh. This compares to the general population of Wales where 19% of residents of Wales speak Welsh, according to the 2011 census¹² (10). The proportion of Welsh speakers in the population varies between Unitary Authorities in Wales and is lower in the south of the country including around Swansea where most SMEs were engaged with.

Just under 8% of the SMEs engaged with are half owned by Welsh speakers, and 16% have one Welsh speaking owner. The BEACON+ team includes several Welsh speakers, so SME support is available in Welsh where required. The BEACON+ website and many other information sources are also made available in Welsh.

¹² Statistics for Wales. Welsh speakers by local authority, gender and detailed age groups, 2011 Census [Internet]. 2011. Available from: <https://statswales.gov.wales/Catalogue/Welsh-Language/WelshSpeakers-by-LocalAuthority-Gender-DetailedAgeGroups-2011Census>

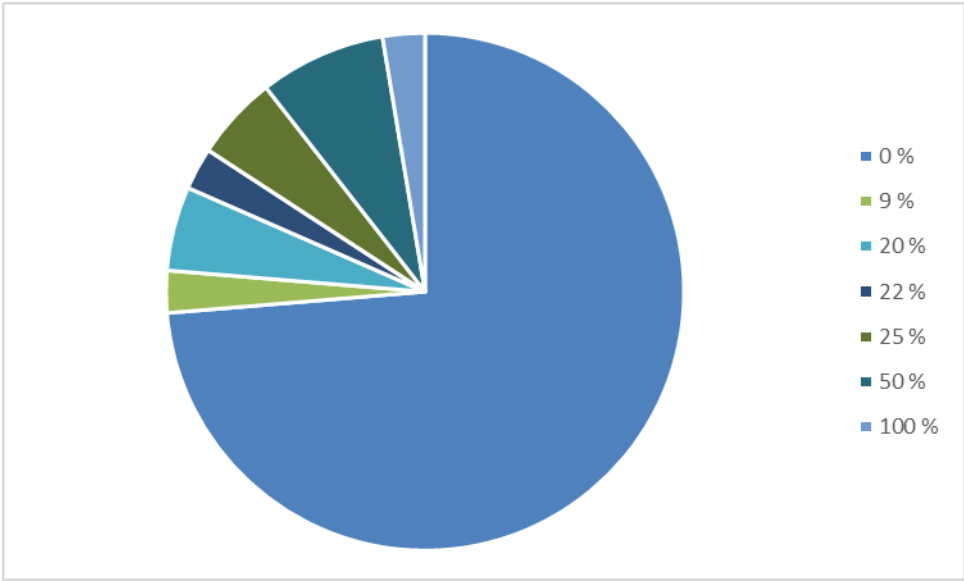


Figure 10: SMEs segregated by the proportion of company owners who speak Welsh

15 Appendix 2 – Sector activity codes

Sectors of activity for national multipliers (most relevant shortlist)

01	Products of agriculture, hunting and related services
02	Products of forestry, logging and related services
03	Fish and other fishing products; aquaculture products; support services to fishing
06&07	Extraction of Crude Petroleum and Natural Gas & Mining of Metal Ores
10.1	Preserved meat and meat products
10.2-3	Processed and preserved fish, crustaceans, molluscs, fruit and vegetables
10.4	Vegetable and animal oils and fats
10.5	Dairy products
10.6	Grain mill products, starches and starch products
10.7	Bakery and farinaceous products
10.8	Other food products
10.9	Prepared animal feeds
11.01	Alcoholic beverages
11.07	Soft drinks
13	Textiles
14	Wearing apparel
15	Leather and related products
16	Wood and of products of wood and cork, except furniture; articles of straw and plaiting materials
17	Paper and paper products
19	Coke and refined petroleum products
20A	Industrial gases, inorganics and fertilisers (all inorganic chemicals) - 20.11/13/15
20B	Petrochemicals - 20.14/16/17/60
20C	Dyestuffs, agro-chemicals - 20.12/20
20.3	Paints, varnishes and similar coatings, printing ink and mastics
20.4	Soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations
20.5	Other chemical products
21	Basic pharmaceutical products and pharmaceutical preparations
22	Rubber and plastic products
31	Furniture
35.1	Electricity, transmission and distribution
35.2-3	Gas; distribution of gaseous fuels through mains; steam and air conditioning supply
36	Natural water; water treatment and supply services
37	Sewerage services; sewage sludge

38	Waste collection, treatment and disposal services; materials recovery services
39	Remediation services and other waste management services
41-43	Construction
46	Wholesale trade services, except of motor vehicles and motorcycles
47	Retail trade services, except of motor vehicles and motorcycles
49.3-5	Land transport services and transport services via pipelines, excluding rail transport
50	Water transport services
51	Air transport services
52	Warehousing and support services for transportation
56	Food and beverage serving services
58	Publishing services
61	Telecommunications services
62	Computer programming, consultancy and related services
63	Information services
64	Financial services, except insurance and pension funding
65	Insurance and reinsurance, except compulsory social security & Pension funding
66	Services auxiliary to financial services and insurance services
69.1	Legal services
72	Scientific research and development services
73	Advertising and market research services
74	Other professional, scientific and technical services
75	Veterinary services
85	Education services
93	Sports services and amusement and recreation services
100	"Other" please specify: <i>(The Evaluation team will determine the most appropriate sector from long list of available activity sector codes if not sufficiently covered above)</i>

16 Appendix 3 - TRL definitions

Technology Readiness Level and description

- TRL 1. basic principles observed
- TRL 2. technology concept formulated
- TRL 3. experimental proof of concept
- TRL 4. technology validated in lab
- TRL 5. technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 6. technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 7. system prototype demonstration in operational environment
- TRL 8. system complete and qualified
- TRL 9. actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies)

As Adopted by EC

NNFCC

NNFCC is a leading international consultancy with expertise on the conversion of biomass to bioenergy, biofuels and bio-based products.



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