

FULL BUSINESS CASE

Swansea Bay City Deal:

The Internet Coast

Homes as Power Stations Programme



Version 3.0
March 2020



Confidentiality Statement

Information in this document must be kept confidential and in accordance with the rules of disclosure.

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Distribution List

Organisation	Position	Name
Value People	Director	Stefan Sanchez
Homes as Power Stations	SRO	Gareth Nutt Nicola Pearce
City & County Swansea		Martin Nicholls
Carmarthenshire County Council		Wendy Walters
Pembrokeshire County Council		Steven Jones
Cardiff University, WSA		Phil Jones

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Acronyms	Description
HAPS	Homes as Power Stations
SBCR	Swansea Bay City Region
SBCD	Swansea Bay City Deal
‘the partners’	The local authority partners comprising the Swansea Bay City Region: Neath Port Talbot CBC, City and County of Swansea, Carmarthenshire County Council and Pembrokeshire County Council

Introduction

The Swansea Bay City Region 'Internet Coast' deal will establish the Homes as Power Stations (HAPS) programme, led by Neath Port Talbot County Borough Council, on behalf of the four local authority partners in the Swansea Bay City Region programme area: Neath Port Talbot County Borough Council, City and County of Swansea, Carmarthenshire County Council and Pembrokeshire County Council. Swansea University is a strategic partner through the Active Building Centre¹ and SPECIFIC.²

The Homes as Power Stations programme has been developed in response to a number of drivers:

- UK and Welsh Government policy to tackle climate change and meeting carbon emission reduction targets;
- The need to deliver low carbon, energy efficient homes to reduce fuel poverty and its impact on health and wellbeing;
- Energy efficiency and demand side management is needed to reduce energy costs and provide affordable warmth for housing.

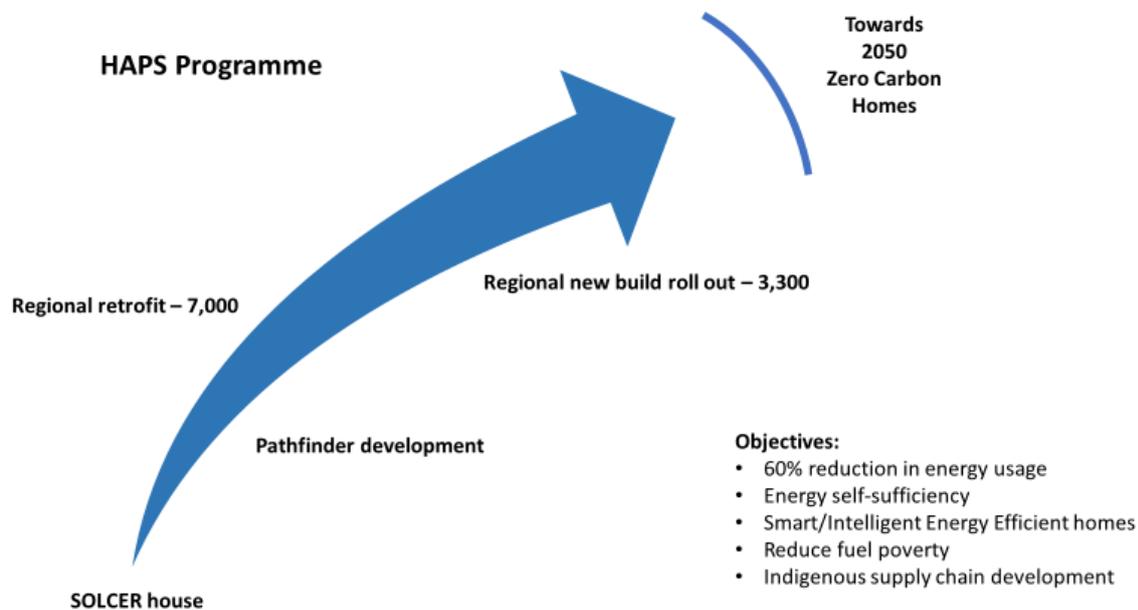
The HAPS programme is a pioneering programme to facilitate the adoption of the HAPS approach to integrate energy efficient design and renewable technologies into the design of new build homes and retrofit programmes carried out by the public, private and third sectors. The programme aims to encourage the HAPS approach to become mainstream in new build design and retrofit programmes.

The programme will target both new build developments and the retrofit of existing buildings. The programme aims to promote the benefits of energy positive homes, initially through the public-sector housing stock and after proving the process and financial measures, target rollout to private sector landlords and owner-occupiers. Energy retrofits will be linked to other housing improvement programmes to optimise efficiency of delivery. There will also be a focus on supply chain development, skills development, an education / dissemination programme and a financial incentive scheme.

The Homes as Power Stations programme is a regional activity and aims to 'prove' the HAPS concept in the public sector at relatively small scale with the intention of scaling up activity across the region and sectors as shown in the following Figure:

¹ <https://www.activebuildingcentre.com/>

² <http://www.specific.eu.com/about>



This Full Business Case (FBC) is structured in accordance with HM Treasury’s revised Green Book³ and the Better Business Cases guidance, organised around five cases designed to systematically demonstrate the investment proposal:

- Is supported by a compelling case for change – the **Strategic Case**
- Optimises value for money – the **Economic Case**
- Is commercially viable – the **Commercial Case**
- Is financially affordable – the **Financial Case**
- Is achievable – the **Management Case**

This FBC confirms the indicative funding envelope of £15 million of Swansea Bay City Deal investment to deliver the programme.

Formal approval of this FBC will enable programme definition to commence to prepare for the Homes as Power Stations programme and the FBC describes the outline programme management arrangements.

³ The Green Book: Central Government Guidance on Appraisal and Evaluation:
<https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>

Executive summary

Strategic Case

The primary and overarching strategic driver for the HAPS programme is the Swansea Bay city Deal 'Internet Coast' investment programme which was signed in March 2017 by the UK Government, Welsh Government, and the four local authorities of the Swansea Bay City Region. The 'Internet of Energy' is a key theme within the Swansea Bay City Deal Internet Coast Investment Programme. This commitment is underpinned by the availability of funding and a range of national, regional and local strategies which confirm the strength of strategic drive for action in this area, in particular:

- The need to meet the UK's clean energy challenges with a focus on the need to address climate change and carbon emissions linked to housing to deliver the decarbonisation agenda
- The need for clean, affordable and secure energy
- Addressing climate change through delivering carbon neutral alternatives, in line with the decarbonisation agenda
- Improving health and well-being
- Tackling fuel poverty
- Ensuring people have the necessary skills which reflect the broad nature of the renewables sector

In response to above drivers, it is proposed that the HAPS programme will:

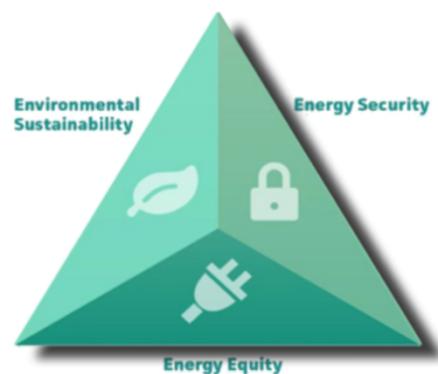
- Facilitate the adoption of the HAPS approach in new house build developments and housing retrofit programmes which integrates new technologies and design features to allow buildings to generate, store and release energy;
- Develop and seek to attract new sector supply chains incorporating leading research and high value manufacturing and construction operations;
- Help to generate sustainable and affordable homes and address fuel poverty and improve health and wellbeing;
- Focus on smart technologies in relation to energy demand management.

The Investment Objectives for the programme are to:

1. Future proof at least 10,300 properties (7,000 retrofit, 3,300 new build) within five years to increase 'affordable warmth' and reduce fuel poverty
2. Improve health and wellbeing and reduce the burden on health and social services
3. Deliver a sustainable (commercially viable), cost effective and holistic housing programme by:
 - a. Taking a 'whole house' approach and developing proven, flexible designs
 - b. Demonstrating the viability of the HAPS concept to the rest of Wales/UK
 - c. Creating skilled jobs, a legacy and mainstreaming the HAPS concept
 - d. Creating a sustainable regional supply chain that retains the creation of design, construction and maintenance jobs
4. Invest in the professional evaluation of the quality and experience of solutions and understanding of the application of new technologies
5. Promote awareness of how key stakeholders (particularly energy users) optimise their interface with the technology
6. Support measures to mitigate climate change by reducing CO₂ emissions and energy demand
7. Create an energy system that is compatible with future smart developments, maximising benefits to the occupant/owner and reducing pressure on the grid by providing local energy generation and security

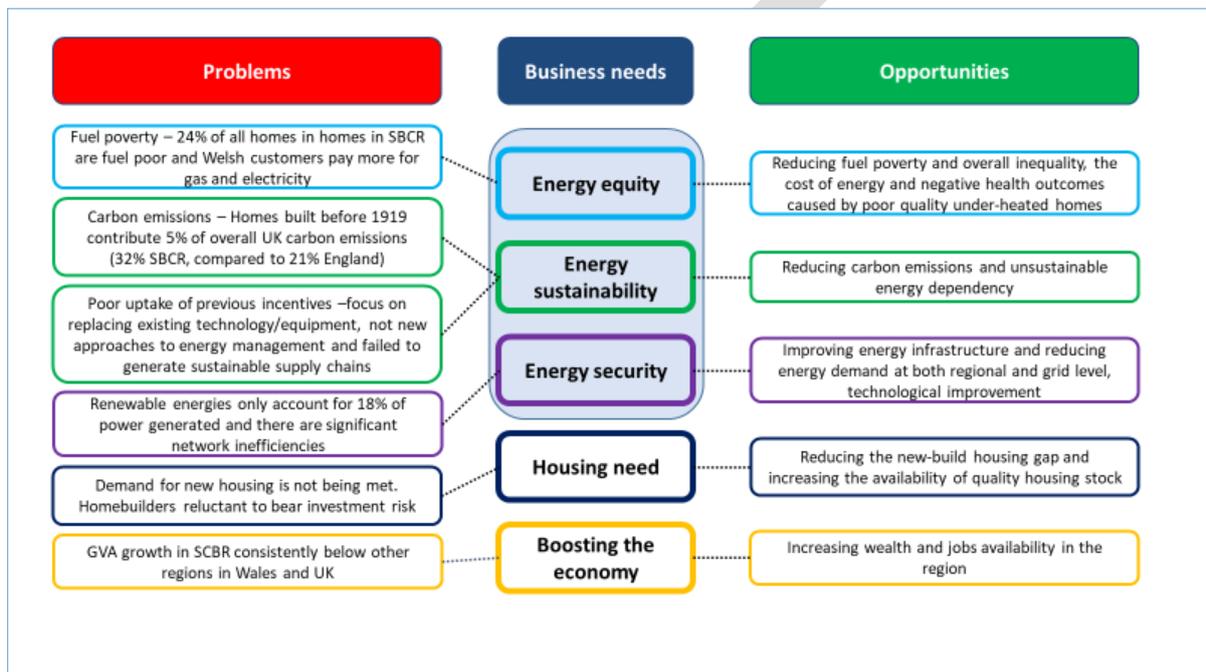
The 'Energy Trilemma', entails complex interwoven links between public and private sectors, governments and regulators, economic and social factors, national resources, environmental concerns and individual behaviours.

Delivering policies which simultaneously address energy security, universal access to affordable energy services and environmentally sensitive production and use of energy is a formidable challenge facing government and industry. The 'Energy Trilemma' provides a clear



framework within which to deliver energy transformation and make sustainable energy systems a reality.⁴

There is a need to provide safe, efficient and affordable homes and address the energy trilemma which is one of the most pressing universal themes and global challenges of our time and addressing these issues is a key business need and presents the most compelling reason for investment. The following Figure summarises the problems and opportunities:



The key service requirements are for a Homes as Power Stations programme to:

- To facilitate the adoption of the ‘homes as power stations’ concept i.e. energy positive homes through an innovative combination of design and flexible technology solutions to allow buildings to generate, store and release energy
- Develop an indigenous sustainable supply chain incorporating leading research and high value manufacturing and construction operations
- Develop a skilled workforce in renewable technologies
- Develop an affordable flexible design approach

⁴ <https://www.worldenergy.org/work-programme/strategic-insight/assessment-of-energy-climate-change-policy/>

- Help to provide clean, affordable and secure energy to tackle fuel poverty and address health and wellbeing issues associated fuel poverty

The scope of this work is defined by the Swansea Bay City Deal and the geographic area of the four local authorities that have signed the joint agreement. The potential scope of activity is to facilitate the adoption of the HAPS approach in new build homes and retrofit programmes, while developing an indigenous sustainable supply chain across the stock of Local Authority/RSL properties, which can be scaled up to include private sector properties.

Economic Case

Through extensive stakeholder engagement, a wide range of programme options were considered, and a short-list of options agreed. Following evaluation of the short-listed options, a cost benefit analysis demonstrates that action to improve energy efficiency in homes represents excellent value for money, particularly through:

- A substantial return on investment from GVA added (jobs in this sector are particularly valuable and deliver a much higher GVA than an 'average' job); and
- The value of energy savings has substantial potential for cost and efficiency savings

The preferred option for the HAPS programme would deliver a mean NPV return over the 15 years of the City Deal of £106 million.

Commercial Case

The preferred way forward described in the Economic Case proposes a programme of activity across the Swansea Bay City Region focused on the following elements:

- Facilitating the uptake of the HAPS approach in new build developments and retrofit programmes
- Supply chain development fund
- Monitoring and evaluation

Facilitating the uptake of the HAPS approach in new build and retrofit developments

Under the direction of a Programme Manager (to be appointed by the Lead Local Authority); two project managers will be appointed to the

HAPS programme, one to facilitate the new build developments and the other for retrofit programmes. They will ensure the adoption of the HAPS concept in the public and private housing sectors.

Supply chain development fund

Funding will be identified within the HAPS programme to create a sustainable and skilled regional supply chain to deliver the HAPS concept during the life of the programme and beyond. The HAPS programme will continue to liaise with the City Deal Skills and Talent programme in addition to FE, HE and the Renewable Energy Skills Forum (Wales) to ensure that there is a sufficient pool of skilled workers to develop, install and maintain the next generation of energy efficient technologies.

To assist suppliers to grow, develop and diversify into renewable technologies, the HAPS programme will establish a HAPS Supply Chain Investment Fund which will be managed by the programme team, overseen by the SRO.

Monitoring and evaluation

The HAPS programme will procure the services of an organisation to monitor and evaluate its activities. The programme manager will scope the tender specification based on the HAPS Investment Objectives including material use, whole life assessment, and monitoring and evaluating the quality of build / retrofit to avoid a legacy of problems due to poor workmanship, design etc. This will be developed into a good practice model. It is envisaged that monitoring and evaluation will be in three phases across the five years of the programme, including the social aspect and health and wellbeing benefits of HAPS:

Phase 1 – at the beginning of the programme baseline data will be collated

Phase 2 – at the end of tranche 1, an interim evaluation will be carried out. By this time, it is expected that the first 200 new build and 250 retrofit homes incorporating the HAPS approach will have been completed.

Phase 3 – toward the end of the programme, a full and final evaluation will be undertaken to inform decisions about future rollout of HAPS technologies.

Financial Case

The Swansea Bay City Deal has determined sufficient funds are affordable for the programme and £15 million is available subject to the submission and approval of the Full Business Case.

The main activities will be to establish a programme team which will manage the new build and retrofit programmes (including financial incentives), manage the supply chain development fund (including a business grant process), marketing and procure an organisation to undertake monitoring and evaluation at key stages of the programme.

The inflation adjusted capital requirement for this programme will be funded through the City Deal as follows (note – only five years’ appraisals are shown, consistent with the proposed programme duration):

Yr.	Programme team	Financial incentives	Supply chain development	Marketing	Monitoring & evaluation	Total	Inflation Factor	Total
0	£200,000	£1,450,000	£250,000	£50,000	£50,000	£2,000,000	1	£2,000,000
1	£200,000	£2,950,000	£750,000	£50,000	£50,000	£4,000,000	1.028	£4,112,000
2	£200,000	£3,700,000	£1,000,000	£50,000	£50,000	£5,000,000	1.0609	£5,304,500
3	£200,000	£2,450,000	£1,000,000	£50,000	£50,000	£3,750,000	1.1087	£4,157,625
4	£200,000	-	-	£50,000	£50,000	£250,000	1.1475	£286,875
	£1,000,000	£10,500,000	£3,000,000	£250,000	£250,000	£15,000,000		£15,861,000

Management Case

A phased introduction of the programme is envisaged over the first year and the programme team will need to be in place following approval.

Over the course of the programme, the strategic intention is to scale up, from proof of concept in the public sector to a targeted roll out of the HAPS concept to the private sector. Through this scaling up of activity it is anticipated that the costs associated with HAPS innovation will move to a more affordable cost envelope and the concept will be de-risked. Therefore, the HAPS programme is an evolving ‘live’ activity and the programme plan will be updated on a regular basis, with individual projects moving from proof of concept, to design, to funding secured.

At this stage it is envisaged that there will be three tranches within the five year programme:

Tranche 1 – establish the programme infrastructure, procure the independent organisation that will undertake the monitoring and evaluation, baseline the programme, integrate existing/related project activity, ensure the uptake of the HAPS approach for 200 new builds and 250 retrofits in line with the HAPS flexible design approach and flexible technology solutions.

It is important to note that the allocation of public housing in line with ‘nomination rights’ is the responsibility of the Local Authorities and

Housing Associations and these organisations will be consulted by the Project Managers.

Tranche 2 – undertake an interim evaluation and ensure that any recommendations are integrated into the programme, continue with new builds and retrofits (supported by financial incentives), initiate the supply chain development fund (including the business grant scheme) supported by business teams from the participating Local Authorities.

Tranche 3 – continue with new builds and retrofits through to the end of the programme, ensure that the supply chain is robust and sustainable for the future, showcase the programme to Welsh and UK interests, commence the final monitoring and evaluation and implement the exit strategy.

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Strategic Case

Introduction

The purpose of the Strategic Case is to make the case for change and to demonstrate how the proposed Homes as Power Stations (HAPS) programme aligns with the overall direction of national, regional and local strategies and policies, as well as other ongoing initiatives, projects and programmes. The Strategic Case comprises three parts as follows:

Part 1 – Strategic context

This section provides an overview of the sponsoring organisation as well as a review of relevant strategies, policies and other ongoing initiatives, projects and programmes to demonstrate strategic fit.

Part 2 – The case for change

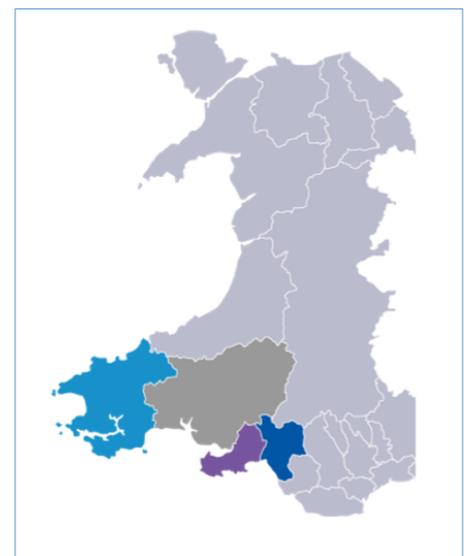
This section sets out the rationale for the project. This rationale is based on desired project outcomes, existing arrangements and an analysis of what needs to change to bridge this gap.

Part 3 – Potential project scope

This section starts the process of considering how best to address these needs, including potential project scope and service requirements, the potential benefits and risks that might arise, as well as any constraints and dependencies that will need to be considered in establishing the preferred way forward.

Part 1: Strategic context

The first part of the Strategic Case outlines the **strategic context** for this programme, which is provided through an overview of the sponsoring organisation, Neath Port Talbot County Borough Council (NPTCBC), and a review of relevant national, regional and local strategies and policies, including ongoing initiatives, projects and programmes to show how the proposed project supports the achievement of approved policy goals and fits within the organisation's overall business strategy.



Part 1.1: Organisational overview

The Swansea Bay City Region consists of four local authority partners: Neath Port Talbot County Borough Council, City and County of Swansea, Carmarthenshire County Council and Pembrokeshire County Council. The HAPS programme is a regional programme with Neath Port Talbot CBC as lead local authority, therefore this section provides an overview of the lead local authority and each of the partner local authorities.

Neath Port Talbot County Borough Council (NPTCBC)

Neath Port Talbot CBC is the lead local authority for the HAPS programme.

Neath Port Talbot CBC has a proven track record of managing and delivering large capital projects and programmes, including European structural fund projects, Welsh Government funded projects and other externally funded projects, for example:⁵

- PDR Harbour Way – £111m
- 21st Century Schools Programme - £122m
- Neath Port Talbot Physical Regeneration – £15m
- Vibrant & Viable Places – £35m

NPTCBC has extensive experience of lead body status for several collaborative projects including:

- South West Workways – £23m
- Workways+ - £7.5m
- Engage – £21m

NPTCBC key facts:

- formed in April 1996 after local government reorganisation
- it is an amalgamation of the former Neath and Port Talbot Borough Councils with parts of Lliw Valley Borough Council and West Glamorgan County Council
- the 8th most populous local authority areas in Wales – 140k population (2011 census)
- 17 areas are within the top 10% most deprived in Wales

⁵ All sums are approximate total project costs

City and County of Swansea (CCS)

Swansea Council has a track record in delivering large scale regeneration programmes and projects, having been involved in the management and delivery of such programmes since its formation in 1996.

Programmes funded and delivered by the Council have included:

- Construction of the Liberty Stadium for Swansea City Football Club & Ospreys Rugby Club
- A £32m Leisure Centre in the city centre
- Joint ventures progressed with Welsh Government (and formerly WDA) to deliver:
 - Swansea Vale Mixed Use Development
 - Felindre Strategic Business Park

Over £120 million of programmes were facilitated during the EU Objective 1 2000-2006 programme including landmark schemes such as the National Waterfront Museum (£28m total cost).

During the Convergence 2007-2013 programme period, a series of large scale initiatives were delivered including:

- Quadrant Bus Station – £10m
- Waterfront City, which invested £30m in a range of improvements to the fabric of the city centre including major public realm and property façade alterations

Carmarthenshire County Council (CCC)

Carmarthenshire County Council has a track record of delivering large scale regeneration projects and programmes, for example:

- South West Wales Property Development Fund – £25m
- South West Wales Local Investment Fund – £20m
- Cross Hands East development – £13m
- Carmarthenshire Physical Regeneration programme – £11m
- 21st Century Schools Programme

Swansea Council key facts:

- formed in 1996 after local government reorganisation
- it is the second largest Local Authority in Wales (with a population of 244,513 in 2016)
- it has some of the most deprived areas in Wales, with 12.2% of Lower Super Output Areas (18 of 148) in the top 10% most deprived in Wales

Carmarthenshire County Council key facts:

- formed in 1996 after local government reorganisation
- it is the third largest county in Wales covering some 2,365km² with a population of 184,681

- Vibrant & Viable Places (Welsh Government regeneration programme)

Pembrokeshire County Council (PCC)

Pembrokeshire County Council has a track record in delivering large scale regeneration projects and programmes including:

- Withybush Strategic Development Site (business Infrastructure and access roads)
- Advance build Factory Programme
- Pembrokeshire Technium Development
- Several European Social Fund regional collaborative projects
- 21st Century Schools programme
- Haverfordwest Leisure Centre
- Bulford Road
- Pembroke and Pembroke Dock Physical Regeneration project
- Coastal Tourism Centre of Excellence
- One Historic Garden
- Haverfordwest Townscape Heritage Initiative

Pembrokeshire County Council key facts:

- formed in 1996 after local government reorganisation
- population of over 123,000

Part 1.2: Strategic fit – review of relevant strategies and policies (and ongoing relevant initiatives, projects and programmes)

The second section of this strategic context part of the Strategic Case presents a review of all relevant UK, national (Wales), regional and local strategies, policies and initiatives, so as to demonstrate the strategic drivers underpinning the proposed HAPS programme and the extent to which this programme is strategically aligned with overall policy direction.

1.2.1 Swansea Bay City Deal

The primary and overarching strategic driver for the HAPS programme is the £1.3 billion Swansea Bay City Deal ‘Internet Coast’ investment programme which was signed in March 2017 by the UK Prime Minister, the First Minister of Wales, the Secretary of State for Wales, the Welsh Government Cabinet Secretary for Finance and Local Government and the leaders of Swansea, Neath Port Talbot, Carmarthenshire and Pembrokeshire Councils.

Over a 15-year investment period, it is anticipated that the SBCD will:⁶

- Secure nearly £1.3 billion in funding for interventions to support economic growth within the SBCR, including over £600 million of direct private sector investment
- Contribute to increasing regional GVA by £1.8 billion and adding over 9,000 gross direct jobs
- Enable the SBCR to develop higher value sectors and employment opportunities to match; increase the number of businesses within these sectors to widen the region's economic base and improve the region's GVA, benchmarked against the UK average.

Interventions within the City Deal programme focus on four themes:⁷

- **The Internet of Economic Acceleration** – identifying the demand for, and potential delivery of, next generation digital infrastructure.
- **The Internet of Energy** – energy innovation and sustainable housing – placing the region at the forefront of energy innovation by creating a smart and efficient “Future Energy System” that will integrate the region's multi-billion asset base in renewable and conventional energy production and the testing and commercialising of integrated Future Energy Systems
- **The Internet of Life Science and Wellbeing** – expanding research and innovation infrastructure and piloting a digitally integrated healthcare environment
- **Smart Manufacturing** – supporting the critically important regional manufacturing economy through the embedding of Industry 4.0 principles and developing leading edge research capability.

The HAPS intervention is identified in the Heads of Terms document as one of the prioritised projects in the City Deal Heads of Terms document under the Internet of Energy theme - see extract below:

The Internet of Energy. *To place the region at the forefront of energy innovation in the areas of sustainable house building to address fuel poverty and in the creation of a centre of excellence to develop and exploit aspects of marine and other energy.*

⁶ Swansea Bay City Region City Deal Heads of Terms

⁷ Ibid, Swansea Bay City Region: A City Deal 2016-2035, The Internet Coast

The Internet of Energy

The Internet of Energy theme seeks to build on the significant and diverse energy asset base within the region. It will align conventional and renewable energy production and storage capabilities, world leading research in areas such as tidal, materials and energy systems with the strategic energy hub at Milford Haven and transformative initiatives such as SPECIFIC.

This alignment will provide significant economic benefits positioning the region as a centre for energy related innovation as well as responding to critical regional issues such as the shortage of affordable homes and fuel poverty.

Identified interventions will complement any existing provision in the region and will be subject to the submission of detailed business cases and implementation plans for approval by Welsh and UK Governments. Under this theme, interventions include:

Homes as Power Stations. *Building on the capabilities of existing organisations and research facilities within the region that are developing new technologies to allow buildings to generate, store and release energy, this initiative seeks to undertake an extensive new house build and retrofit programme which integrates such technologies. Whilst this programme will help to generate sustainable and affordable homes and address fuel poverty, it will also develop and seek to attract new sector supply chains incorporating leading research and high value manufacturing and construction operations. The UK and Welsh Governments expect the Swansea Bay region's proposals to be ambitious and also additional to the existing innovation landscape.*

The City Deal specifically provides that:

'Building on the capabilities of existing organisations and research facilities within the region that are developing new technologies to allow buildings to generate, store and release energy, this initiative seeks to undertake an extensive new house build and retrofit programme which integrates such technologies. Whilst this programme will help to generate sustainable and affordable homes and address fuel poverty, it will also develop and seek to attract new sector supply chains incorporating leading research and high value manufacturing and construction operations. The UK and Welsh Governments expect the Swansea Bay City Region's proposals to be ambitious and additional to the existing innovation landscape.'

Intended outcomes of the City Deal that are of direct relevance to the HAPS programme include:

- Establish Swansea and its hinterland as a ‘City of innovation’
- Establish Swansea Bay as a low carbon economy and international centre for renewable energy production and conservation⁸

1.2.2 UK Government strategies and policy drivers

A range of relevant UK-wide strategies and policies to this project include:

UK level policy drivers	Relevance to this investment
<p>Industrial Strategy: Building a Britain Fit for the Future⁹</p>	<p>The UK Government’s overall vision for the economy, as set out in its 2017 national Industrial Strategy, is to ‘create an economy that boosts productivity and earning power throughout the UK.’</p> <p>To deliver this vision the strategy sets out a range of policies across five ‘foundations’ (ideas, people, infrastructure, business environment and places) and four ‘grand challenges’ (AI & data, clean growth, future mobility and ageing society).</p> <p>The HAPS programme aligns well with each of these foundations, particularly ‘ideas’ – where the goal is to create ‘the world’s most innovative economy’.</p> <p>The HAPS programme has greatest strategic fit with the ‘clean growth’ grand challenge, where the strategy states:</p> <ul style="list-style-type: none"> ▪ ‘[The UK Government’s] long-term goals are to make clean technologies cost less than high carbon alternatives, and for UK businesses to take the lead in supplying them to global markets. ▪ ‘[The UK Government] will increase [its] support for innovation so that the costs of clean technologies, systems and services are reduced across all sectors.’ ▪ ‘The move to cleaner economic growth – through low carbon technologies and the efficient use of resources – is one of the greatest industrial opportunities of our time.’ ▪ ‘We will transform construction techniques to dramatically improve efficiency’ ▪ ‘For the majority of [the UK’s] energy to be clean and affordable, we need much more intelligent systems. Smart

⁸ Swansea Bay City Region: A City Deal 2016-2035, The Internet Coast

⁹ www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future

	<p>systems can link energy supply, storage and use, and join up power, heating and transport to increase efficiency dramatically. By developing these world-leading systems in the UK, we can cut bills while creating high-value jobs for the future.'</p> <p>The Industrial Strategy has committed £170 million for innovation to transform productivity in the construction sector.</p>
<p>Climate Change Act¹⁰</p>	<p>The Climate Change Act established a target for the UK to reduce its emissions by a minimum of 80% from 1990 levels by 2050 with five-yearly interim targets. The first four carbon budgets up to 2027 have been set in law. The current (second) carbon budget period (2013-2017) requires a reduction of 29% over 1990 baseline levels. Meeting the third (2018-2022) and fourth carbon budgets (2023 and 2027) requires emissions to reduce to 35% and 50% respectively.</p> <p>To note, the Welsh Government has set a more ambitious target of reducing emissions in Wales by at least 40% by 2020 from 1990 levels with a target to reduce emissions by 3% per annum, measured against a baseline of average emissions between 2006 and 2010. This includes all 'direct' greenhouse gas emissions in Wales except those from heavy industry and power generation that are covered by the EU Emissions Trading Scheme.¹¹</p>
<p>Industrial Strategy: Grand Challenges - Clean Growth¹²</p>	<p>The Clean Growth Strategy – leading the way to a low carbon future, (October 2017) aims to make the transition to a global low-carbon economy and has two clear areas of alignment - <i>'Improving our homes'</i> and <i>'Delivering Clean Smart, Flexible Power'</i>.</p> <p>The strategy aims to reduce emissions from homes to around 58 million tonnes of CO₂ by 2032, and towards a target of only 6 million tonnes by 2050. The strategy also highlights the need for grid level storage to curb peak demand and the need to improve demand side responsiveness.¹³</p>
<p>Industrial Strategy: Grand Challenges -</p>	<p>This challenge aims to transform the construction sector – enabling it to produce safe, healthy, efficient buildings using the latest digital manufacturing techniques.</p>

¹⁰ <http://www.legislation.gov.uk/ukpga/2008/27/contents>

¹¹ www.legislation.gov.uk/ukpga/2008/27/pdfs/ukpga_20080027_en.pdf

¹² www.gov.uk/government/publications/industrial-strategy-the-grand-challenges/industrial-strategy-the-grand-challenges

¹³ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/651916/BEIS_The_Clean_Growth_online_12.10.17.pdf

<p>Transforming construction¹⁴</p>	<p>The challenge will support industry in adopting technologies and help buildings to be constructed 50% faster, 33% cheaper and with half the lifetime carbon emissions.</p> <p>Government is looking to industry and researchers to innovate in construction, increase productivity across the UK and open up significant global markets for efficient buildings.</p> <p>The HAPS programme will provide the evidence base for transforming the construction sector in this case the housing sector by facilitating the take up and monitoring / evaluating of energy positive homes.</p>
<p>Industrial Strategy: Grand Challenges – Energy revolution challenge¹⁵</p>	<p>Smart energy systems can intelligently link energy supply, storage and use, and power heating and transport in ways that dramatically improve efficiency.</p> <p>The government is enabling the UK to take advantage of this by funding industry and researchers to create new systems. They will provide cleaner, cheaper energy, while creating high value jobs for the UK.</p> <p>The HAPS programme will provide the evidence base for this challenge area by facilitating the take up and monitoring / evaluating of energy positive homes.</p>
<p>Construction Sector Deal¹⁶</p>	<p>The Construction Sector Deal sets out an ambitious partnership between the industry and the government that aims to transform the sector’s productivity through innovative technologies and a more highly skilled workforce.</p> <p>One of the benefits outlined in the Construction Sector Deal states ‘better homes that are cheaper to run’ – the HAPS programme is directly aligned to support this.</p>
<p>Transforming Infrastructure Performance (TIP) Plan¹⁷</p>	<p>The HAPs programme is a demonstration programme and aligns with the Transforming Infrastructure Performance (TIP) plan, which is the UK Government’s plan to increase the effectiveness of investment in infrastructure – both economic infrastructure such as transport and energy networks, by improving productivity in the way we design, build and operate assets.</p>

¹⁴ <https://www.ukri.org/innovation/industrial-strategy-challenge-fund/transforming-construction/>

¹⁵ <https://www.ukri.org/innovation/industrial-strategy-challenge-fund/prospering-from-the-energy-revolution/>

¹⁶ www.gov.uk/government/publications/construction-sector-deal

¹⁷ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/664920/transforming_infrastructure_performance_web.pdf

**Consultation -
The Future
Homes
Standard:
changes to
Part L and
Part F of the
Building
Regulations
for new
dwellings** ¹⁸

This consultation sets out government plans for the Future Homes Standard, including proposed options to increase the energy efficiency requirements for new homes in 2020. The Future Homes Standard will require new build homes to be future-proofed with low carbon heating and world-leading levels of energy efficiency; it will be introduced by 2025.

This document is the first stage of a two-part consultation about proposed changes to the Building Regulations. It also covers the wider impacts of Part L for new homes, including changes to Part F (ventilation), its associated Approved Document guidance, airtightness and improving as-built performance of the constructed home.

The HAPS programme is aligned to these proposed energy efficiency requirements.

¹⁸ <https://www.gov.uk/government/consultations/the-future-homes-standard-changes-to-part-l-and-part-f-of-the-building-regulations-for-new-dwellings>

1.2.3 National (Welsh Government) strategies and policy drivers

At the national (Wales) level there are a number of strategies and policy drivers of direct relevance to this project, including:

National (Wales) policy drivers	Relevance to this investment
<p>Prosperity for All: The national strategy (Taking Wales Forward)</p>	<p>HAPS will contribute to the following priority areas of this strategy:</p> <p>Housing – the HAPS programme will contribute to meeting new-build targets in Wales. There is a current shortage of energy efficient new housing in the region. HAPS will facilitate the adoption of a programme of new-build energy efficient housing, with integrated renewable energy, combined with an energy efficiency retrofit of existing stock to improve their energy efficiency will support meeting this target.</p> <p>Skills and employability – through links with the Skills and Talent programme, the HAPS programme will ensure that people have appropriate skills to take advantage of available employment opportunities linked to renewable technologies in housing. The programme will work with employment initiatives to ensure unemployed (long and short-term) and economically inactive individuals can access appropriate skills training to increase their employment chances.¹⁹</p>
<p>Prosperity for All: A Low Carbon Wales 20</p>	<p>This Plan sets the foundations for Wales to transition to a low carbon nation. Cutting emissions and the moving towards a low carbon economy bring opportunities around clean growth for business, as well as wider benefits for people and our environment. The HAPs programme links directly into the following policy areas of the plan:</p> <p>Policy 32 – Developing Routes to Market for Renewable Technologies - The UK also needs newer and emerging technologies to continue to be developed, to provide a diverse mix of generation, which can also provide economic opportunities in exporting technology and expertise.</p> <p>Policy 33 – Increasing local ownership of energy generation. In 2018 Welsh Government held a call for evidence on the benefits of, and challenges in, increasing locally-owned generation⁴⁸. This demonstrated that increasing ownership of energy generation within Wales is likely to increase prosperity and we are now taking forward the actions indicated by the evidence.</p>

¹⁹ <http://gov.wales/docs/strategies/160920-taking-wales-forward-en.pdf>

²⁰ https://gov.wales/sites/default/files/publications/2019-06/low-carbon-delivery-plan_1.pdf

	<p>This includes developing a policy position on ownership of energy generation.</p> <p>Policy 36 - Market Regulation and Investment. In 2017 UK Government published the ‘Upgrading our Energy System: Smart Systems and Flexibility’ plan. This set out actions government, Ofgem and industry will take to:</p> <ul style="list-style-type: none"> ▪ remove barriers to smart technologies (such as storage and demand-side response); ▪ enable smart homes and businesses; and improve access to energy markets for new technologies and business models.
<p>Wellbeing of Future Generations (Wales) Act 2015</p>	<p>The Well-being of Future Generations Act aims to improve the social, economic, environmental and cultural well-being of Wales through seven well-being goals:</p> <ul style="list-style-type: none"> ▪ Prosperous Wales – HAPS will directly tackle fuel poverty and play a key role in driving economic growth, supporting the growth of green jobs and skills throughout Wales and increasing the competitiveness of businesses ▪ Resilient Wales – HAPS will tackle poverty and the global threat of climate change by addressing the energy trilemma of affordability, sustainability and security of the energy supply and the need for decarbonisation and contributing to meeting the demand for new houses ▪ Healthier Wales – provision of low carbon, energy efficient homes will have a positive effect on health and well-being and address the health inequalities caused by poor energy efficiency ▪ More Equal Wales – HAPS will work with partners and networks to ensure that the opportunities created by the programme will be available and accessible to all; help reduce inequalities within society and address health inequalities caused by poor energy efficiency ▪ Cohesive Community – the programme will contribute to meeting societal needs for efficient and healthy housing with lower energy costs ▪ Vibrant Culture and thriving Welsh Language – Opportunities will be taken to promote the Welsh language in the delivery of the programme ▪ Globally Responsible Wales – the programme will be developed and delivered in line with the sustainable development principles highlighted by the Act. The programme will also contribute to the efficient use of resources through new build and retrofit activities²¹

²¹ <http://gov.wales/topics/people-and-communities/people/future-generations-act/?lang=en>

<p>Innovation Strategy for Wales</p>	<p>HAPS will deliver against the five key themes:</p> <ul style="list-style-type: none"> ▪ improving collaboration ▪ promoting a culture of innovation ▪ providing flexible support and finance for innovation (in partnership with Welsh Government) ▪ innovation in Government ▪ prioritising and creating critical mass²²
<p>The Environment (Wales) Act</p>	<p>The Environment (Wales) Act puts in place legislation needed to plan and manage Wales’ natural resources in a more proactive, sustainable and joined-up way. It seeks to position Wales as a low carbon, green economy, ready to adapt to the impact of climate change.</p> <p>Relevant sections of the Act are:</p> <ul style="list-style-type: none"> ▪ Part 1: Sustainable management of natural resources in a more proactive, sustainable and joined-up way ▪ Part 2: Climate change – provides Welsh Ministers with powers to put in place statutory emission reduction targets, including at least an 80% reduction in emissions by 2050 and carbon budgeting to support their delivery. This is vital within the context of existing UK and EU obligations, sets a clear pathway for decarbonisation and provides certainty and clarity for business and investment²³
<p>Energy Wales: A Low Carbon Transition</p>	<p>The Welsh Government set out its proposals for transitioning to a sustainable, low carbon economy in Energy Wales: A Low Carbon Transition, in 2012. This aims to maximise the long-term economic benefits of the transition, ensuring communities benefit from energy infrastructure developments and careful planning and management of the relationship between energy development and the natural environment.</p> <p>The Welsh Government committed to prioritise efforts on:</p> <ul style="list-style-type: none"> ▪ Leadership providing a clear, consistent framework for investors, regulators and decision-makers and infrastructure, coordination and stability to make Wales a great place to do business ▪ Maximising jobs and wider economic benefits ensuring communities derive long-term benefits ▪ Acting now for Wales’ long-term energy future supporting innovation, research, development and commercialisation in the areas that offer the greatest potential for long-term benefit <p>Delivery proposals include: priorities for action, high level milestones and a summary of deliverables for low carbon energy, energy efficiency, energy intensive industries, marine energy,</p>

²² <http://gov.wales/docs/det/publications/140313innovationstrategyen.pdf>

²³ www.legislation.gov.uk/anaw/2016/3/pdfs/anaw_20160003_en.pdf

	<p>regulatory regimes, infrastructure and other areas. As of April 2017, public services in Wales should use 100% renewable electricity, 50% of which will be generated in Wales.</p> <p>The <i>Programme for Government, Taking Wales Forward 2016-2021</i>, reconfirms the commitment to emissions reductions and support for renewable energy.</p> <p>In a statement in December 2016, the Cabinet Secretary for Climate Change, Environment and Rural Affairs, Lesley Griffiths, outlined energy priorities for the Fifth Assembly, including:</p> <ul style="list-style-type: none"> ▪ Reducing energy consumption ▪ Reduced reliance on energy generated from fossil fuels ▪ An actively managed transition to a low-carbon economy²⁴
<p>Green Growth Wales: Local Energy</p>	<p>Sets out the approach to local energy in support of the strategic energy policy. The energy system is in a period of transition – an opportunity for Wales to take control of its own energy needs. The vision is for communities and businesses to use locally generated electricity and heat, from a range of renewable installations, to supply local demand and minimise dependence on central generation:</p> <ul style="list-style-type: none"> ▪ Creating local energy systems ▪ Tackling poverty for the long term ▪ Positioning Wales at the forefront of carbon reduction²⁵
<p>Smart Living Wales</p>	<p>A range of emerging drivers in Wales and the UK have increased interest in how to intelligently balance, interconnect and integrate smarter solutions to assist the balancing of the energy trilemma - security, affordability and low carbon developments. The vision adopted in the Smart Living Demonstrator Framework is:</p> <p><i>“Wales has the opportunity to influence how we live with energy and resources in the future through demonstrators that will innovatively transform homes, businesses and communities providing multiple benefits for all.”</i></p> <p>‘Smart Living’ is a concept covering a range of policy and practical interventions that drive low carbon solutions that can deliver a range of societal benefits. It is within this context that the HAPS programme will be developed and delivered.²⁶</p>
<p>Independent Review of Affordable Housing Supply</p>	<p>The Independent Review Panel were established in May 2018 by the then Minister for Housing and Regeneration, in relation to the HAPs programme relevance links to the following recommendations of the review:</p> <ol style="list-style-type: none"> 1. Introduction of a requirement for all new affordable homes to be near zero carbon / EPC ‘A’ using a fabric first approach

²⁴ <http://gov.wales/topics/environmentcountryside/energy/energywales/?lang=en>

²⁵ <http://gov.wales/topics/businessandconomy/creating-a-sustainable-economy/green-growth-wales/?lang=en>

²⁶ <http://gov.wales/topics/businessandconomy/creating-a-sustainable-economy/smart-living/?lang=en>

<p>(Wales), Final Report, April 2019²⁷</p>	<p>from 2021, supplemented by technology (renewables) if required</p> <p>2. Continue to support the trialling of Modern Methods of Construction (MMC) to help establish which methods can contribute to the objective of increasing the scale and pace of affordable housing provision with the existing resources available.</p> <p>Develop a strategy to map out how Wales could further use off-site manufacturing (OSM) and MMC to deliver near zero carbon homes along with an appropriate timetable for achieving this.</p>
<p>Smarter Energy Future for Wales (National Assembly for Wales Environment and Sustainability Committee)</p>	<p>The National Assembly for Wales Environment and Sustainability Committee recommends moving to 'near-zero' carbon emissions as the new Welsh Housing Quality standard. It also strongly advocates for local energy systems, with grid level local prioritisation for Welsh customers, based on net positive buildings and homes.</p> <p>The report emphasises the importance of local, sustainable, supply chains for technology development, supply and fitting, increasing Welsh resilience and delivering carbon cuts through the framework laid out in the Wellbeing of Future Generations Act. Finally, the report recommends setting up a not-for-profit, publicly owned energy company, a suggestion that has been endorsed by Ofgem.²⁸</p>

Welsh Government emerging retrofit policy

Welsh Government are currently working on a retrofit policy in Wales to decarbonise existing homes as outlined in 'Prosperity for All: A Low Carbon Wales'²⁹. HAPS has the potential to deliver a number of the recommendations in the report³⁰ for example:

- *Urgently undertake a series of coordinated actions that will create an environment in Wales where decarbonising homes becomes the norm;*
- *Collect data and knowledge about the condition and performance of the housing stock to inform future decisions and check the progress and outcomes of the programme;*

²⁷ https://gov.wales/sites/default/files/publications/2019-04/independent-review-of-affordable-housing-supply-report_0.pdf

²⁸ www.assembly.wales/laid%20documents/cr-ld10610/cr-ld10610-e.pdf

²⁹ https://gov.wales/sites/default/files/publications/2019-06/low-carbon-delivery-plan_1.pdf

³⁰ <http://files.site-fusion.co.uk/6b/76/6b7656b3-8004-428e-a641-5746675404f5.pdf>

- *Pilot and trial new solutions to decarbonise Welsh homes.*

1.2.4 Regional and local strategies and policy drivers

At the regional and local level, there are a number of strategies and policies of direct relevance to this project, including:

Regional and local policy drivers	Relevance to this investment
<p>Swansea Bay City Region Economic Regeneration Strategy³¹</p>	<p>HAPS is one of eleven programmes prioritised to deliver the Swansea Bay City Deal ‘Internet Coast’ strategy, based on the Swansea Bay City Region Economic Regeneration Strategy 2013 – 2030.</p> <p>The Swansea Bay City Deal is supported by the evidence-based Swansea Bay City Region Economic Regeneration Strategy 2013 – 2030. This strategy comprises five strategic aims to deliver the ambitious vision: <i>‘By 2030, South West Wales will be a confident, ambitious and connected City Region, recognised internationally for its emerging knowledge and innovation economy’.</i></p> <p>HAPS is aligned to each of the five strategic aims of this strategy:</p> <ul style="list-style-type: none"> ▪ Business growth, retention and specialisation – supporting the creation of new industry in the region, supporting locally-based business growth and creating a sustainable supply chain ▪ Skilled and ambitious for long-term success – working closely with the Skills and Talent City Deal programme to ensure the region’s workforce has the appropriate skills to maximise the opportunity of HAPS ▪ Maximising job creation for all – supporting diversification of the economy, through the creation of employment opportunities linked to the green growth economy and a sustainable indigenous supply chain ▪ Knowledge economy and innovation – establishing the Swansea Bay City Region as a test bed for smart, low carbon, energy efficient homes and associated product development and commercialisation of innovation ▪ Distinctive places and competitive infrastructure – providing an attractive infrastructure asset for the region³²

1.2.5 Links with other relevant initiatives, projects and programmes

³¹ Swansea Bay City Region Economic Regeneration Strategy, 2013-2030

³² www.swansea.gov.uk/swanseabaycityregioneconomicregenerationstrategy

At the national, regional and local level, there are a number of other relevant initiatives, projects and programmes to which the HAPS programme is aligned and will complement.

Once the HAPS programme is approved, the programme team can formally work with the interventions listed below, limited activity has already taken place to establish links and alignment with the following interventions, however expectations need to be managed in terms of HAPS delivery prior to approval.

There is the potential for the HAPS project to be a regional demonstrator project – this will be developed further post approval and with support from the technical advisory group.

This engagement work is outlined in the Management Case of this business case.

Links with other activity	Relevance to this investment
<p>Active Building Centre³³</p>	<p>Neath Port Talbot CBC works closely with the Active Building Centre and is continuing to explore areas of collaboration, which will be fully realised once a HAPS programme team is established.</p> <p>The Homes as Power Stations regional programme and the Active Building Centre are aligned in a number of ways and will continue to work together to accelerate market adoption of energy positive and net zero homes to provide cleaner, cheaper and more resilient energy.</p> <p>The Active Building Centre strategic objectives are aligned to the HAPS investment objectives, with particular reference to the following ABC strategic objectives: ‘create a critical mass of buildings’ (residential in the case of HAPS), ‘Active Buildings as ‘Energy Positive Agent’ reducing grid impact (the HAPS definition is energy positive over a 12 month period), and ‘Adapt the Active Building Technology portfolio to tackle existing stock’ (the HAPS proposes to facilitate the adoption of energy positive</p>

³³ <https://www.activebuildingcentre.com/>

homes for new build and existing stock through a retrofit programme).

Neath Port Talbot CBC, as lead local authority for the HAPS programme, provided a letter of support to Swansea University for its submission to the Industrial Strategy Challenge Fund to establish an Active Building Centre, and it is proposed that the two programmes will establish a Memorandum of Understanding to facilitate the collaboration. The partners are committed to delivery of Active Buildings at a scale to make the region a UK leader.

There are a number of areas where the two programmes will collaborate, including:

Demonstrators

The Homes as Power Stations programme will provide real life examples of energy positive homes, both new build and retrofit, including at scale developments across the Swansea Bay City Region to demonstrate the benefits, including commercial viability of homes as power stations / active homes at scale by breaking down commercial barriers.

The HAPS developments will provide real life data at a local and regional level to feed in to the Active Building Centre national (UK wide) programme and will go some way to supporting the output of 17 demonstrator projects.

Neath Port Talbot CBC is a partner in the HAPS pathfinder project in Neath, a collaborative project between Neath Port Talbot CBC, Pobl and Swansea University's SPECIFIC project to showcase renewable technologies across a mixed tenure of 16 dwellings (flats and houses).

The aim of the HAPS programme and the Active Building Centre is to progress the rollout and increased scale of these technologies across a number of building typologies and the two programmes will work together to facilitate this. The HAPS programme will promote a flexible design approach and will continually monitor the performance of the technologies adopted.

Neath Port Talbot CBC has already identified up to 5 development schemes within the HAPS programme, totalling up to 150 units across the Swansea Bay City Region, which have the potential to be aligned to the Active Building Centre Active Homes programme.

The HAPS programme has already been identified in the Active Building Centre collaboration activity programme, in particular

	<p>work packages 2,4,6,7,8,9,11 and 12 and the HAPS programme team will work with the ABC programme team to develop a programme of delivery to realise this activity.</p> <p><u>Monitoring and evaluation</u> There is a commonality in the monitoring and evaluation of the HAPS and Active Building Centre programmes, and the programme teams will ensure consistency of approach and baseline data.</p> <p>The HAPS programme proposes a continuous monitoring and evaluation of technologies/ performance management to ensure continuous improvement to feed in to design development and will act as a living test bed (design feedback), this complements the work packages of the Active Building Centre.</p> <p>The HAPS proposes a marketing / education programme to disseminate the findings of the HAPS programme including energy performance, health benefits and social benefits including 'liveability / human interface with the technology which is aligned to the Active Building Centre programme elements on Health and Wellbeing, 'Active on the Inside' and Human interface design which are part of the Swansea University research element of the Active Building Centre.</p> <p>See Annex C for letter of support from the Active Building Centre</p>
<p>Welsh Government Warm Homes Programme³⁴</p> <p>ARBED³⁵</p> <p>NEST³⁶</p>	<p>Welsh Government Warm Homes, which includes the Arbed and Nest schemes, provides funding for energy efficiency improvements (retrofit) to low income households. The programme aims to:</p> <ul style="list-style-type: none"> • help eradicate fuel poverty, • reduce harmful emissions into the environment, • boost economic development and regeneration in Wales by using the skills of local companies installing energy efficiency measures at domestic properties. <p><u>Arbed</u> - has two delivery approaches. One is the EU funded element of the scheme which has been delivered for Welsh Government by procured scheme managers. The other is through the provision of grant funding to local authorities to enable them to manage energy efficiency schemes in their areas. Retro-fitting measures and technologies eligible under Arbed include:</p>

³⁴ <https://gweddill.gov.wales/topics/environmentcountryside/energy/efficiency/warm-homes/?lang=en>

³⁵ <http://arbedambyth.wales/>

³⁶ <https://nest.gov.wales/en/>

- Solid wall insulation
- Loft insulation and draught proofing
- Boiler and heating system upgrades (controls)
- Heat pumps
- The provision of energy saving advice

Nest - provides householders with access to free advice and support to help them reduce their energy bills. Those meeting Nest's eligibility criteria can access a free package of energy efficiency measures. Nest measures are designed for individual properties so there is no standard package. Measures can include:

- New gas boiler
- Central heating system
- Insulation
- Newer technologies such as air source heat pumps

British Gas is the scheme manager for Nest. The Energy Saving Trust is a sub-contractor to British Gas and provides the front-end service. Small and medium sized enterprises across Wales are sub-contracted by Nest to install agreed energy efficiency measures at domestic properties. The Nest scheme does not cold call households and all marketing materials carry the 'Nest' and Welsh Government logos.

Synergy and added value of the HAPS programme

The HAPS programme has synergies to the Warm Homes programme, as Arbed will provide some public sector funding to the HAPS programme and Nest will form part of the HAPS marketing and communications strategy to encourage awareness and the take up of energy efficient measures.

The HAPS team has met with the Arbed team within WG several times to ascertain how HAPS and Arbed can align and add value. Discussions are on-going, and once HAPS is approved an action plan can be developed to deliver synergies.

Innovative Housing Programme (IHP) (Welsh Government)³⁷

The Innovative Housing Programme (IHP) is an annual capital funding programme with the aim of creating quality places to live. The programme will help inform the Welsh Government about the type of homes it should financially support in the future. The IHP is open to local housing authorities including local authority owned companies, registered social landlords, private sector bodies and social landlords. The programme is competitive and seeks to encourage innovation.

The Programme, which is funded by £90 million over three years, seeks to stimulate the design and delivery of new quality, affordable homes to:

³⁷ <https://gov.wales/innovative-housing-programme>

	<ul style="list-style-type: none"> • Increase supply as part of the 20,000 new homes target; • Speed up delivery of homes to the market; • Trial new housing models and methods of delivery that address issues such as pressing housing need; fuel poverty; demographic change; help carbon reduction targets; • Prove the replicability of innovative housing models. • <p><u>Synergy and added value of the HAPS programme</u> The HAPS programme is aligned to the IHP as the IHP goes some way to delivering the aims and objectives of HAPS. The HAPS lead local authority (Neath Port Talbot CBC), as instructed by the City Deal Joint Committee has provided a regional letter of support for those projects submitted under the annual call for innovative projects.</p>
<p>Cardiff University Demonstrators project (ERDF)</p>	<p>Cardiff University secured ERDF to develop 10 demonstrators – both new build and retrofit.</p> <p>The lessons learned from these demonstrators have been fed in to the HAPS programme and the HAPS programme will move away from one off demonstrators to at scale developments.</p>
<p>Local Authority renewal areas 38</p>	<p>Area based renewal schemes enabled local authorities to focus activity and investment on areas that combine a need for assistance with the potential for regeneration. Investment in area based renewal schemes should not only secure improvements to houses themselves but also to environmental, social and economic conditions, leading to a restoration of confidence in the area.</p> <p>These wide ranging benefits of area renewal are also important in tackling the problems many local communities face in terms of social exclusion and sustainability. The Welsh Government provided local authorities with grants for housing renewal areas and Neath Port Talbot CBC implemented this initiative, with the other local authority partners in the region carrying out similar activity. Neath Port Talbot CBC declared a total of three Renewal Areas over a period of thirteen years:</p> <ul style="list-style-type: none"> • Sandfields East and Aberavon Renewal Area 2004 – 2017 • Upper Amman Valley Renewal Area 2007 – 2012 • Neath East Renewal Area 2009 – 2017 <p>Renewal Areas were established to effect the comprehensive revitalisation of an area, bringing about improvements to homes, shops, other commercial premises, the local environment and the infrastructure by working in partnership with the private sector, other public bodies and most importantly, the local community to develop co-ordinated strategies to tackle the</p>

³⁸ <https://www.npt.gov.uk/1203>

	<p>problems identified by the people who live and work in these areas, Renewal Areas ended in March 2017.</p> <p><u>Synergy and added value of the HAPS programme</u> The HAPS programme will review evaluations of the Renewal Areas programme and identify good practice to inform the HAPS programme.</p>
<p>Warm Wales Limited³⁹</p>	<p>Warm Wales Cymru Gynnes deliver a wide range of partnership-based regeneration and sustainable energy measures in the fight against fuel poverty. Established in 2004 by the National Grid, Warm Wales was the first Community Interest Company in Wales. It was set up to meet the National Grid's specific aim to meet its corporate responsibility to Government and deliver benefits to 1 million fuel poor homes. It chose to do this under the banner of the 'Affordable Warmth' Programme. Warm Wales-Cymru Gynnes contributed to towards achieving this target.</p> <p><u>Synergy and added value of the HAPS programme</u> HAPS will engage with the Warm Wales programme and ascertain the role Warm Wales can play in the HAPS awareness raising and educational aspect.</p>
<p>ERDF funded Low Carbon Research Institute (LCRI) Retrofit programme⁴⁰</p>	<p>The LCRI Energy programme was launched in September 2009 and secured more than £15 million of ERDF funding which was matched with £19 million from Welsh universities and industry. The LCRI programme is a research development and innovation programme aiming for long-term economic growth and the creation of employment opportunities for Wales. The programme works with enterprises, including the SME sector in particular, to deliver industry-relevant new knowledge and technologies that will provide both business opportunities and help Wales deliver on its low carbon agenda.</p> <p><u>Synergy and added value of the HAPS programme</u> The HAPS programme has been informed by the research carried out by the LCRI programme and will continue to engage with it.</p>
<p>Energy Company Obligation (ECO)⁴¹</p>	<p>The Energy Company Obligation (ECO) is a government energy efficiency scheme applicable to the whole of the Great Britain to help reduce carbon emissions and tackle fuel poverty. It was first introduced in 2013 and places legal obligations on larger energy suppliers to deliver energy efficiency measures to domestic premises. It focuses on insulation and heating measures and</p>

³⁹ <http://www.warmwales.org.uk/>

⁴⁰ <http://www.lcri.org.uk/>

⁴¹ <https://www.ofgem.gov.uk/environmental-programmes/eco>

	<p>supports vulnerable consumer groups. ECO is intended to assist in reducing carbon emissions, maintaining security of energy supply and reducing fuel poverty</p> <p>The largest tranche of ECO runs until Sept 2018, with another tranche due to run from 2018 to 2022.</p> <p><u>Synergy and added value of the HAPS programme</u> The HAPS programme will engage with ECO to support the aims of the HAPS programme.</p>
<p>WG Regeneration Funding - Vibrant and Viable Places⁴²</p>	<p>The Welsh Government adopted a new approach to delivering regeneration projects within a Regeneration Framework in 2013, which targeted future Welsh Government funding. The targeted funding prioritised town centres serving 21st Century towns, coastal communities and Communities First clusters. A number of regeneration schemes supported included housing to improve the economy of the area.</p> <p>The VVP programme has ended, however the projects are still in delivery phase.</p> <p><u>Synergy and added value of the HAPS programme</u> The HAPS programme will identify areas of good practice from the VVP programme.</p>
<p>WG Targeted Regeneration Investment (TRI) programme⁴³</p>	<p>TRI is the successor to VVP and is a regeneration investment programme over 3 years which commenced in April 2018. It aims to invest WG regeneration funding in a targeted and focused way. The TRI programme is looking to support projects that promote economic regeneration – creating jobs, enhancing skills and employability and creating the right environment for businesses to grow and thrive – with a focus on individuals and areas most in need to ensure prosperity is spread to all parts of Wales.</p> <p><u>Synergy and added value of the HAPS programme</u> The TRI will inform the delivery of the HAPS programme and a number of HAPS schemes have been identified in the TRI programme of activity.</p>

Part 1.3 Strategic context summary

The above review of key strategies and policy documents of relevance to the HAPS programme demonstrates consistent policy support for this intervention.

⁴² <https://gov.wales/vibrant-and-viable-places-framework>

⁴³ <https://gov.wales/regeneration>

The principal strategic driver of investment in the Homes as Power Stations programme is a joint commitment from the UK Government, Welsh Government and four local authorities of the Swansea Bay City Region.

The 'Internet of Energy' is a key theme within the Swansea Bay City Deal Internet Coast Investment Programme. This commitment is underpinned by the availability of funding and a range of national, regional and local strategies which confirm the strength of strategic drive for action in this area, with a focus on the following areas:

- The need to meet the UK's clean energy challenges, while also ensuring that new technologies are sufficiently developed and evaluated to make them not only more efficient than current approaches but cheaper as well
- The importance of developing new construction techniques and techniques to improve the energy efficiency of housing
- The need for clean, affordable and secure energy
- Addressing climate change through delivering carbon neutral alternatives, in line with the decarbonisation agenda
- Improving health and well-being
- Tackling fuel poverty
- Ensuring people have the necessary skills which reflect the broad nature of the renewables sector

Part 2: The case for change

As set out in the HM Treasury and Welsh Government's Better Business Case (BBC) guidance, establishing a robust case for change requires a clear understanding of:

- What the delivery organisation is seeking to achieve (the **investment objectives**)
- What is currently happening (the **existing arrangements**)
- What is required to close the gap between what is happening now (the existing arrangements) and what the delivery organisation is seeking to achieve in the future (the **business needs**)

In this way, the case for change is established on the basis of 'need', rather than simply on the contention that a project is a 'good thing to do'.

These three components of the case for change – the investment objectives, the existing arrangements and the business needs – are examined respectively below in Parts 2.1, 2.2 and 2.3 of this Strategic Case.

Importantly, key stakeholders were engaged and involved throughout this process of shaping the investment objectives, establishing the baseline existing arrangements and identifying future business needs. Details of the workshops held are provided below as part of the discussion on investment objectives.

Part 2.1 Investment Objectives

Investment Objectives form the key starting block of the ‘case for change’ within the Strategic Case. These objectives describe what the delivery organisation, NPTCBC and its partners, are seeking to achieve with this programme in terms of targeted outcomes. They refer to the identifiable and measurable economic, social and environmental outcomes that NPTCBC and its partners wish to realise.

In accordance with best practice, these objectives are:

- Outcome-focused: i.e. focused on what needs to be achieved rather than the potential solution or means of provision
- As ‘SMART’ as possible (i.e. they should be Specific, Measurable, Achievable, Relevant and Time-bound)
- Neither too narrowly defined so as to preclude important options, nor too broadly defined as to cause unrealistic options to be considered at the options appraisal stage
- Limited in number (ideally to no more than five or six)

Investment objectives for a project typically address one or more of the following five generic drivers for intervention and spend:

1. **Effectiveness** – i.e. improving the quality of services in terms of the delivery of agreed outcomes. For example, by meeting new policy changes or operational targets
2. **Efficiency** – i.e. improving the delivery of public services in terms of outputs. For example, by improving the throughput of services whilst reducing unit costs
3. **Economy** – i.e. reducing the cost of public services in terms of the required inputs. For example, through ‘invest to save’ schemes or spend on innovative technologies

4. Compliance – i.e. to meet statutory, regulatory or organisational requirements and accepted best practice. For example, new health and safety legislation or building standards

5. Replacement – i.e. re-procuring services in order to avert service failure. For example, at the end of a service contract or when an enabling asset is no longer fit for purpose

Stakeholder engagement has been undertaken through workshops to develop the Investment Objectives and the long-list to short-list options using the Options Framework (documented in part 1 of the Economic Case).

A stakeholder workshop was held on 17th January 2018 to discuss and agree the Investment Objectives and long-list to short-list options for the investment. The workshop attendees were:

- Gareth Nutt, Director Environment, Neath Port Talbot County Borough Council
- Simon Brennan, Head of Property & Regeneration, Neath Port Talbot County Borough Council
- Lisa Willis, European & Strategic Funding Manager, Neath Port Talbot County Borough Council
- Christopher Jones, Energy Manager, Neath Port Talbot County Borough Council
- David Bratley, City & County of Swansea
- Darrel Barnes, City & County of Swansea
- Rachel Davies, Carmarthenshire County Council
- Steve Keating, Energy Manager, Pembrokeshire County Council
- Kerry MacDermot, Pembrokeshire County Council
- Jan Bell, SPECIFIC
- Keith Palmer, SPECIFIC
- Phil Jones, Cardiff University (Welsh School of Architecture)
- Jane Forshaw, Local Partnerships

The following Investment Objectives were agreed with corresponding baseline suggested measures:

No.	Investment objective	Measures
1	To future proof at least 10,300 properties (7,000 retrofit, 3,300 new build) within five years to increase 'affordable warmth' and reduce fuel poverty	<ul style="list-style-type: none"> a) Assessments of cumulative energy consumption or SAP/EPC ratings b) Customer surveys c) Reductions in fuel poverty

2	To improve health and wellbeing and reduce the burden on health and social services	<ul style="list-style-type: none"> a) Reduced GP / hospital visits for asthma/respiratory conditions b) Improvement of health and wellbeing of household occupants
3	To deliver a sustainable (commercially viable), cost effective and holistic housing programme by: <ul style="list-style-type: none"> I. Taking a 'whole house' approach and developing proven, flexible designs II. Demonstrating the viability of the HAPS concept to the rest of Wales/UK III. Creating skilled jobs, a legacy and mainstreaming the HAPS concept IV. Creating a sustainable regional supply chain that retains the creation of design, construction and maintenance jobs 	<ul style="list-style-type: none"> a) Ratio of jobs to capital investment b) Local GVA uplift from local supply chains c) Number of 'skilled' jobs d) Number of people employed and jobs protected e) Uptake of the HAPS concept outside of Swansea Bay City Region area
4.	To invest in the professional evaluation of the quality and experience of solutions and understanding of the application of new technologies	<ul style="list-style-type: none"> a) To be determined after engagement of evaluators
5.	To promote awareness of how key stakeholders (particularly energy users) optimise their interface with the technology	<ul style="list-style-type: none"> a) Predicted fuel bill reduction vs actual fuel bill b) Customer surveys
6.	To support measures to mitigate climate change by reducing CO ₂ emissions and energy demand. Predicted annual CO ₂ reduction figures: <ul style="list-style-type: none"> • Retrofit - 9,933 tonnes CO₂ annum • New build - 9,165 tonnes CO₂ annum Figures assume 100% rollout.	<ul style="list-style-type: none"> a) Including occupation, supply chain & construction (reduction of CO₂ emissions) b) Additional measures to be determined after engagement of evaluators
7.	To create an energy system that is compatible with future smart developments, maximising benefits to the occupant/owner and reducing pressure on the grid by providing local energy generation and security	<ul style="list-style-type: none"> a) Potential of integrating smart / intelligent platform for user interface and monitoring and evaluation b) Volume of storage utilised, timing of grid demand response

Part 2.2 Existing arrangements

The potential impact of the HAPS programme to address the strategic drivers and deliver the outcomes articulated by the Investment Objectives is wide ranging.

This section 'Existing arrangements' describe the current situation / 'status quo' in the Swansea Bay City Region (SBCR). Given the focus of the strategic drivers in Part 1.2 of this document and the investment objectives established in Part 2.1 this section describes the current situation in the SBCR in terms of:

1. The Swansea Bay City Region economy
2. Homes and housing
3. Fuel poverty in the region
4. Energy production and demand
5. Carbon emissions
6. Existing energy efficiency programmes
7. Supply chain and support networks

As required by the Better Business Case Guidance, this section provides information on current levels of service provision, asset availability, demand and utilisation where possible and appropriate. Please note that any critique of the current situation is reserved for the next section, 'Business Needs', as per guidance requirements.

2.2.1 The Swansea Bay City Region economy

The Swansea Bay City Region has a population of 688,000 supporting 302,000 jobs and containing around 22,000 businesses. The region is a major driver of the Welsh economy and has a core of strong, home grown SMEs and globally important firms, including leading UK universities and major tourism assets.

However, economic inactivity remains high across the region with overall productivity (GVA) growth in the region consistently below that of other regions in the UK and Cardiff over the past two decades.⁴⁴ This is illustrated in Figure 1 below:

⁴⁴ <https://www.walesonline.co.uk/business/business-news/shocking-economic-figures-wales-regions-14260311>

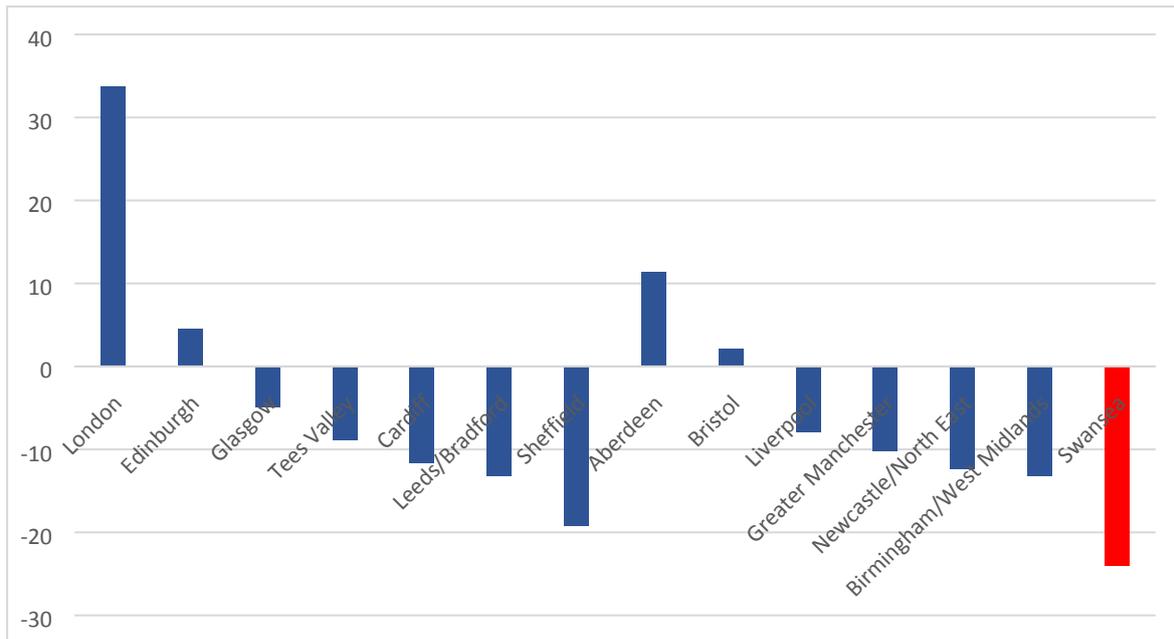


Figure 1 – City region productivity per hour relative to UK average (2016)

The economic landscape is characterised by:

- Gearing of the economy’s sectoral mix towards lower value sectors, compared to the UK, with jobs in these sectors generally lower in value than elsewhere
- Low quality regional commercial and retail property, attracting low rents⁴⁵ (see Figure 2 below)
- Poor broadband capacity and digital connectivity

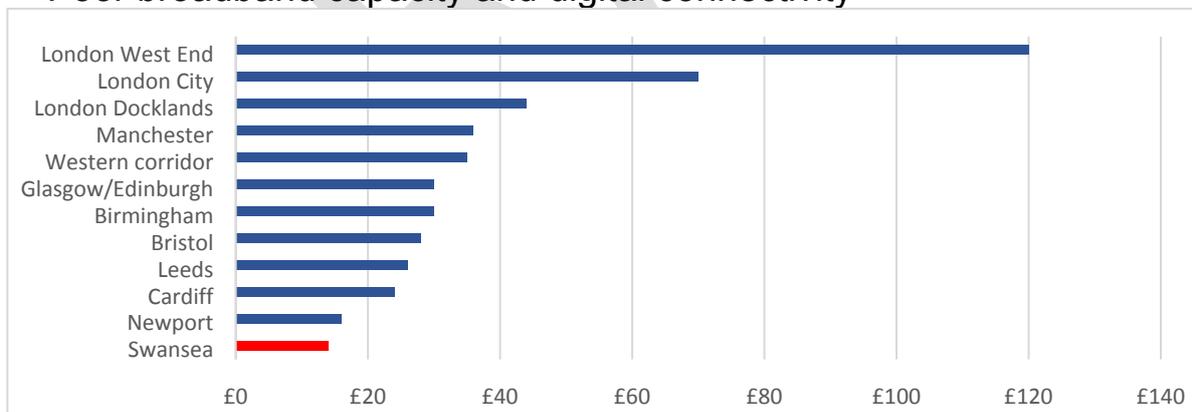


Figure 2 – UK Office rents - £ per square foot (2016)

Increasing productivity is seen as the key to raising economic growth and living standards in the long term. It is only by raising productivity that increases in real incomes can occur. If the aspiration is to improve the performance of the economy and make people better off, there needs to be an overall improvement in productivity.

⁴⁵ www.jll.co.uk/.../South%20Wales%20Report%202016%20web.pdf

2.2.2 Homes and housing

There are 324,835 housing units in the Swansea Bay City Region, of which 28,164 are managed by local authorities and 25,007 by a Registered Social Landlord.⁴⁶ These data show that across the four local authority areas, the percentage of social housing is 16%. These are properties that are under the direct control of local authorities or a Registered Social Landlord.

	Local Authority	Registered Social Landlord	Owner occupied	Privately rented	All tenures
Pembrokeshire	5,668	2,462	45,870	7,811	61,811
Carmarthenshire	9,003	3,099	63,405	11,360	86,867
Swansea	13,493	7,185	71,236	18,978	110,892
Neath Port Talbot	0	12,261	45,471	7,533	65,265
TOTAL	28,164	25,007	225,982	45,682	324,835

Social housing is required to meet the Welsh Housing Quality Standard by 2020. This includes achieving an energy efficiency standard of SAP (Standard Assessment Procedure) 65 or higher (equivalent to an Energy Performance Certificate D rating). In March 2017, 92% of social housing was compliant with the quality standard (or subject to an acceptable fail).⁴⁷ Welsh Government have indicated that they may seek a SAP target of between 80 and 89 to be reached by 2030 across all tenures throughout Wales.

	Stock	Fully compliant stock	Compliant stock subject to acceptable fails	Non-Compliant
Pembrokeshire	5,650	5,076	574	0
Carmarthenshire	9,035	8,053	982	0
Swansea	13,500	1,224	9,138	3,138
NPT Homes*	8,883	5,987	2,896	0
TOTAL	37,068	20,340	13590	3138

⁴⁶ <https://statswales.gov.wales/Catalogue/Housing/Dwelling-Stock-Estimates/dwellingstockestimates-by-localauthority-tenure>

⁴⁷ <http://gov.wales/statistics-and-research/welsh-housing-quality-standard/?lang=en>

*NPT homes is a Registered Social Landlord created by stock transfer from Neath Port Talbot Council in March 2011.

Around 15% of the total CO₂ emissions in Wales are generated from housing. Around 70% of homes that will exist in the 2050s will have been built before 2000 and Wales has some of the oldest and least thermally-efficient building stock in Europe.⁴⁸

New housing

The requirement for new homes varies year on year, as demographics, social dynamics and economic influences are constantly changing. In the Swansea Bay City Region, the requirement for new housing units is estimated at between 3,692 and 3,950 units per year.⁴⁹ The Welsh Government new build target is 20,000 affordable new homes by the end of this term of Government in 2021 - of which, 12,500 would be built by housing associations.⁵⁰ However, the current completion rate is 1,321⁵¹ dwellings per year, which is well short of the housing needs requirement.

2.2.3 Fuel poverty in the region

A household is deemed to be in fuel poverty if it needs to spend more than 10% of household income on fuel. In 2016 it was estimated that across the UK, approximately 291,000 households were living in fuel poverty. The Committee on Climate Change estimates that by 2020, UK consumers will be paying an average energy bill of £500, of which £105 will be supporting investment in low-carbon generation, including the market carbon price. Households in fuel poverty in the Swansea Bay City Region are as follows:⁵²

⁴⁸ <http://gov.wales/about/cabinet/cabinetstatements/2017/energyretrofits/?lang=en>

⁴⁹ See data at Annex B

⁵⁰ <https://www.insidehousing.co.uk/news/news/welsh-sector-pledges-to-double-housebuilding-53239>

⁵¹ <http://gov.wales/docs/statistics/2017/170614-new-house-building-2016-2017-revised-en.pdf>

⁵² <http://lle.gov.wales/map/fuelpoverty>

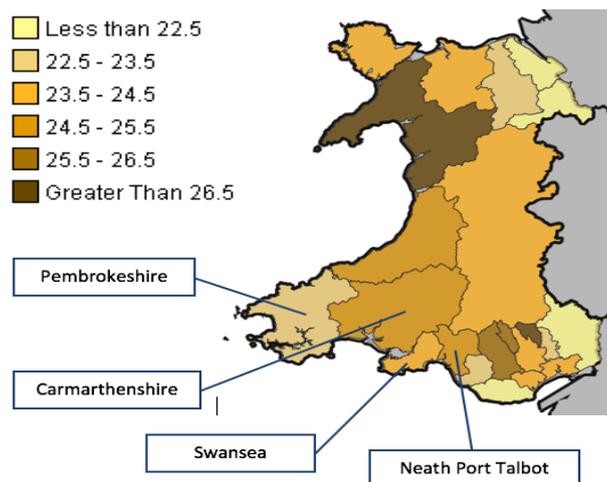


Figure 3 – Map of fuel poverty in Wales

Local authority area	Total households	Fuel poor households	Fuel poor %
Pembrokeshire	51,761	12,083	23%
Carmarthenshire	76,771	18,934	24%
Swansea	100,787	24,394	24%
Neath Port Talbot	58,780	14,450	24%
TOTAL	288,099	69,861	24%

Table 1 – Fuel poor households

By comparison fuel poverty in other areas of the UK is as follows:⁵³

- All Wales: 23%
- All England: 11%
- All Scotland: 35%
- All Northern Ireland: 42%

The Swansea Bay City Region therefore has a slightly higher percentage of fuel poor households than the Welsh average and more than double the English average. This is exacerbated by lower household incomes and higher energy prices in Wales. The existing approaches for addressing fuel poverty within the region are Welsh Government Warm Homes programme (Nest and Arbed), Local Authority Renewal Areas, Warm Wales, Innovative Housing Programme, Energy Company

⁵³ <http://www.nea.org.uk/the-challenge/fuel-poverty-statistics/>

Obligation, Vibrant and Viable Places (Welsh Government Regeneration Programme).⁵⁴

There are direct health impacts from cold housing and fuel poverty:⁵⁵

- Countries which have more energy efficient housing have lower Excess Winter Deaths (EWDs)
- There is a relationship between EWDs, low thermal efficiency of housing and low indoor temperature
- EWDs are almost three times higher in the coldest quarter of housing than in the warmest quarter (21.5% of all EWDs are attributable to the coldest quarter of housing, because of it being colder than other housing)
- Around 40% of EWDs are attributable to cardiovascular diseases and around 33% to respiratory diseases — There is a strong relationship between cold temperatures and cardio-vascular and respiratory diseases
- Children living in cold homes are more than twice as likely to suffer from a variety of respiratory problems than children living in warm homes
- Mental health is negatively affected by fuel poverty and cold housing for any age group — More than 1 in 4 adolescents living in cold housing are at risk of multiple mental health problems compared to 1 in 20 adolescents who have always lived in warm housing

2.2.4 Energy production and demand

Wales is part of an interconnected European electricity network, with flows into and out of the country. The country generated an estimated 38.8 TWh of electricity in 2016 and consumed approximately 16.1 TWh. Wales is, therefore, a net exporter of electricity.

Of the estimated 38.8 TWh of electricity that was generated in Wales in 2016, 6.9 TWh was from renewables. Electricity generation from renewables has increased rapidly in recent years, having doubled in the last five years.

In 2017, the Welsh Government announced a target of meeting 70% of electricity demand from Welsh renewable sources by 2030. Wales has made good progress towards meeting this target, with an estimated 43%

⁵⁴ See Annex C for descriptions of these programmes

⁵⁵ https://friendsoftheearth.uk/sites/default/files/downloads/cold_homes_health.pdf

of electricity consumption in Wales met by renewable generation in 2016. However, considerable network, market and policy challenges remain in closing the gap to the 70% target.⁵⁶

Total energy consumption has been falling since 2005. This downward trend may be due, in part, to the economic downturn. It is also possible that improved energy efficiency measures may have had some impact in more recent years, although it is not possible to separately identify the impact of these factors.⁵⁷

2.2.5 Carbon emissions

When local authority emissions are aggregated across the UK, estimated total CO₂ emissions decreased by around 27 percent since 2005 (the earliest year for which data are available at local authority level) – falling from 531 million tonnes to 387 million tonnes. While emissions have decreased over time there have been periods of fluctuation, with emissions increasing between 2009 and 2010 (largely due to exceptionally cold weather in 2010 and relatively low emissions in 2009 as a consequence of economic factors) and between 2011 and 2012 (largely due to variations in temperature).

Wales' CO₂ per capita emissions are higher compared to other regions due to large CO₂ per capita emissions from the industrial and commercial sector reflecting the high level of industrial emissions compared to the population.⁵⁸ Neath Port Talbot showed a 7% increase in emissions between 2005 and 2015 due to changing activity at large industrial installations.

Carbon emissions from residential properties account for 8% of all carbon emissions in Wales and there has been an overall reduction of 28% in these emissions since the base year (1990), partly due to a change in fuel mix from coal to natural gas and energy efficiency measures.⁵⁹

⁵⁶ <https://www.regensw.co.uk/energy-generation-in-wales>

⁵⁷ <http://gov.wales/docs/statistics/2015/150225-energy-generation-consumption-2013-en.pdf>

⁵⁸

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/623015/2005_to_2015_UK_local_and_regional_CO₂_emissions_statistical_release.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/623015/2005_to_2015_UK_local_and_regional_CO2_emissions_statistical_release.pdf)

⁵⁹ (based on 2014 data):

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/573221/Greenhouse_Gas_Inventory_for_England_Scotland_Wales_and_Northern_Ireland_1990__2014.pdf

2.2.6 Existing energy efficiency programmes

Large scale whole-house retrofit programmes can reduce energy needs and provide affordable warmth which contributes to healthy living and improved wellbeing. However, these must be carried out in a professional way to approved quality assurance standards.

There have been previous attempts to prove and implement homes as power stations and deliver at scale at a regional level which have had limited success due to uncoordinated and sporadic funding, the lack of a professional and coordinated approach and lack of skills development resulting in short-term programmes with potentially poor outcomes.

The following programmes operate in the region and aim to address fuel poverty:

- Welsh Government Warm Homes – Arbed and Nest
- Local authority renewal areas
- Warm Wales Limited
- ERDF funded Low Carbon Research Institute (LCRI) retrofit programme
- WG Innovative Housing Programme (IHP)
- ECO
- WG Vibrant and Viable Places
- WG Targeted Regeneration Investment programme (TRI)

The HAPS programme aims to ensure that all existing energy improvement programmes will be aligned and synchronised to the HAPS programme. This will add value to existing programmes and maximise funding and resources.

2.2.7 Supply chain and support networks

At present, there is no existing coordinated supply chain and skills specifically linked to energy efficient homes. The Department for Business Innovation and Skills published a study⁶⁰ which showed that construction supply chains are highly fragmented, and the level of fragmentation increases in supply chains that are directly involved in the

⁶⁰

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/252026/bis-13-1168-supply-chain-analysis-into-the-construction-industry-report-for-the-construction-industrial-strategy.pdf

delivery of construction work on site. The implications of a fragmented supply chain include relatively high transaction costs, increased requirements for management input and coordination of activities on site and fewer opportunities to drive out waste or reduce cost.

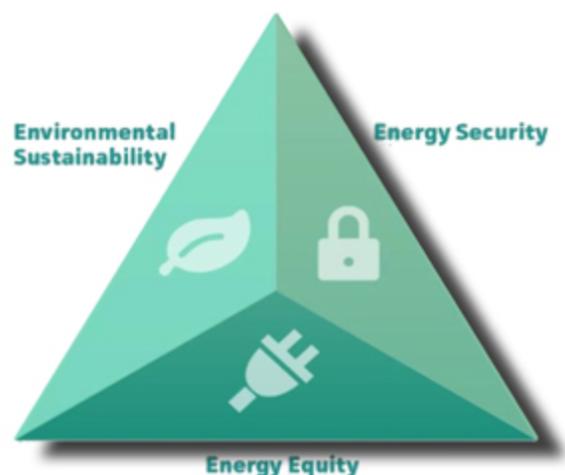
The study also found evidence that challenging trading conditions, very competitive bidding for work and use of tougher commercial terms (related to payment and risk transfer) is contributing to a reduction of levels of cohesion in the industry.

In relation to supply chains for the retrofit market, a recent report indicated that the current supply chain does not have the capacity to deliver domestic retrofit on the scale required to meet 2020 carbon emissions targets and even at current levels of activity there are supply chain constraints.⁶¹

Part 2.3 Business needs

The aim of this Business Needs section is to determine what needs to change in order for the SBCR to transition from where it is now (as set out in the 'Existing Arrangements') to the point where it is able to deliver upon the 'Investment Objectives' outlined in part 2.1.

The Business Needs represent the gap between the desired outcomes as articulated by the Investment Objectives, and the Existing Arrangements, expressed as problems with the *status quo* and opportunities for change, as detailed below.



⁶¹ www.regensw.co.uk/Handlers/Download.ashx?IDMF=d033f3ea-c1c8-442a-8a49-8aa75dd7595f

The ‘energy trilemma’ summarises the business needs and describes three core dimensions of energy sustainability – energy security, energy equity, and environmental sustainability.

These three goals constitute a ‘trilemma’, entailing complex interwoven links between public and private sectors, governments and regulators, economic and social factors, national resources, environmental concerns and individual behaviours.

Delivering policies which simultaneously address energy security, universal access to affordable energy services and environmentally sensitive production and use of energy is a formidable challenge facing government and industry. The ‘Energy Trilemma’ provides a clear framework within which to deliver energy transformation and make sustainable energy systems a reality.⁶²

There is a need to provide safe, efficient and affordable homes and address the energy trilemma which is one of the most pressing universal themes and global challenges of our time and addressing these issues is a key business need and presents the most compelling reason for investment via the following mechanisms:

Trilemma Element	Business need
Security	Self-sufficiency
Sustainability	Enhanced energy/carbon performance with reduced dependency on finite energy sources
Equity	Release of disposable income, alleviation of fuel poverty

The key problems with the *status quo* and opportunities of change relate to the energy trilemma; the unmet need for housing and boosting the regional economy. The business needs for each are shown in the Figure below and discussed further in the following section:

⁶² <https://www.worldenergy.org/work-programme/strategic-insight/assessment-of-energy-climate-change-policy/>

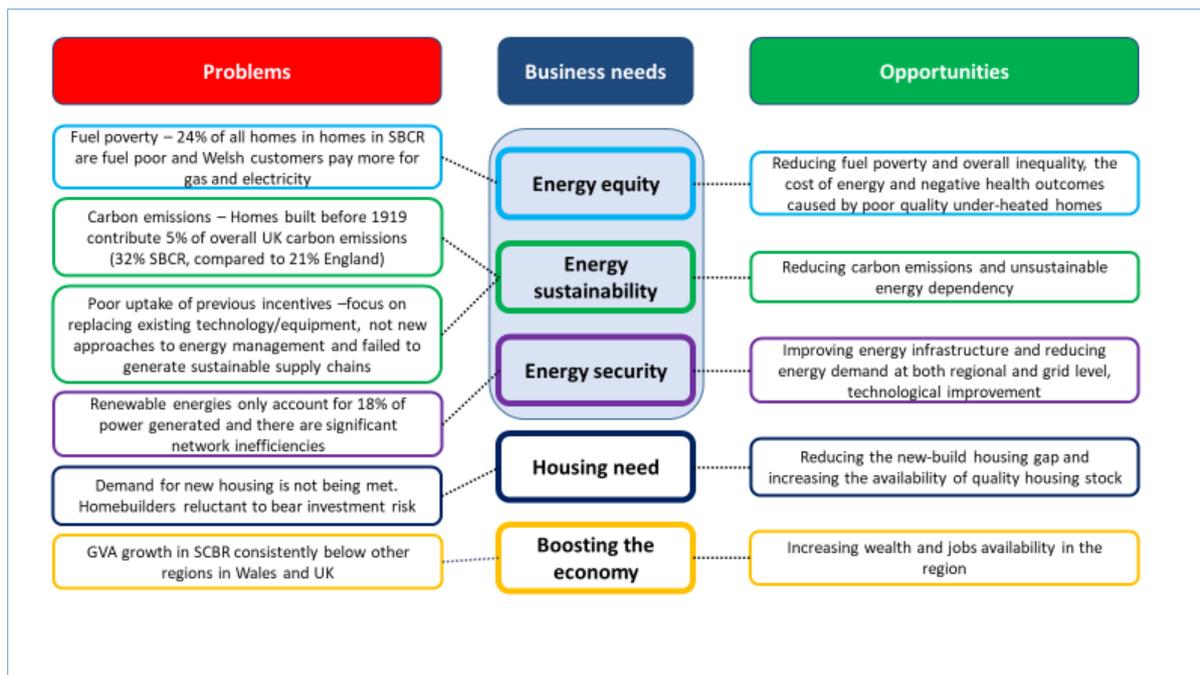


Figure 4 – Business needs

In addition to the energy trilemma, the follow subsections summarise the needs of the existing arrangements:

2.3.1 The Needs of the Swansea Bay City Region Economy

Potential impact of the Swansea Bay City Deal proposal

Swansea University prepared a Swansea Bay City Region ‘City Deal Proposal Impact Appraisal’⁶³ in February 2017, to appraise the potential impact of the ‘Internet Coast’ through the integrated portfolio of programme proposals. It examined the benefits and impacts in the following areas:

- Direct job creation and GVA uplift through development of targeted industries within the region for each project proposal, together with supply chain and wider economic benefits
- Thematic impacts from each ‘*Internet of...*’ theme, including strategic and social impacts
- Ongoing impact of the Internet Coast initiative

The report concluded:

⁶³ Swansea Bay City Region, Internet Coast: Phase 1, City Deal Proposal Impact Appraisal, February 2017

‘A programme investment of £1.3 billion over 15 years would increase regional GVA by £1.8 billion and add 9,000 jobs in the region’.

To avoid double counting of benefits and their impact, the appraisal focused on direct relevant sector employment growth, with further benefits such as skills improvements in the wider sector considered separately.

Sensitivity analysis for each individual project proposal considered:

- A baseline scenario with parameters for additionality and indirect effects suggested from baseline data and prior project experience
- Pessimistic and optimistic scenarios testing lower and higher levels of additionality, catering for uncertainty regarding levels of deadweight, substitution or displacement which may be involved
- Potential delay or advance in benefits delivery factored separately through further sensitivity analysis for theme/combined Internets at the project level

Energy and economy are inextricably linked, and policy-makers often refer to a future ‘low carbon economy’, which has the potential to be a vehicle for economic growth. In 2015, the low carbon and renewable energy sector in Wales provided 11,000 jobs, with an annual turnover of £1.78bn.

The ‘Internet of Energy’ theme positions the SBCR as a living ‘test bed’ of energy innovation and development to foster the growth of a local supply chain. This could create an estimated 4,500 jobs over a five-year period and provide an opportunity to test the innovative housing and energy solutions technology from the SPECIFIC research programme on a commercial scale. This could be achieved by:

- Incorporating health and digital and smart/intelligent applications where cost effective and affordable
- Addressing the problems the Warm Homes programme faced in terms of delivering whole-house approaches consistently across small variations and large numbers of properties.⁶⁴ Finding the most appropriate combination of retrofit products and solutions for the area, residents and buildings is key to reducing cost variability and overrun, consistent with TSB's Retrofit for the Future guide⁶⁵
- Reducing the average cost of a whole house retrofit from £25,000 (based on LCRI retrofit costs) to below £20,000 (through scaling) and

⁶⁴ Patterson, J.L., 2016, Evaluation of a Regional retrofit Programme to Upgrade Existing housing Stock to Reduce Carbon Emissions, Fuel Poverty and Support the Local Supply Chain, *Sustainability*, 2016 (8), 1261

⁶⁵ Technology Strategy Board, Retrofit for the Future – Reducing Energy Use in Existing Homes - A Guide to Making retrofit work, 2014

although costs for retrofitting properties are declining depending on who carries out the retrofit and how well the price is controlled, this is still a challenging measure⁶⁶

Cost profiling for both new build and retrofitting in Tranche 1 pathfinder developments (with the Pobl Hafod development which is already underway in Neath being the first testing platform) would provide proof of concept for these approaches at a regional level, before follow-on developments across the other three local authority areas.

2.3.2 The need for homes and housing

Increasing availability of quality housing stock

There is a shortage of new housing and the existing new build programme does not meet the new build housing needs and demand across the region. It is estimated that between 3,692 and 3,950 new houses a year are required in the Swansea Bay City region, but the current completion rate is only 1,321 per year.

House builders have been reluctant to integrate leading edge technology into housing developments on the grounds of costs and expected returns on investment and there is a low supply of new housing on the market with leading energy demand management features. Furthermore, there are also low levels of take up on retrofitting in the private sector as was seen with the 'Green Deal'.⁶⁷

There is interest in the development of energy positive houses, with the Chair of Ofgem visiting the SOLCER house in March 2018⁶⁸. The Minister of State for Energy and Clean Growth, Claire Perry and the Secretary of State for Wales, Alun Cairns visited in July 2018. The design is based around reducing energy demand, renewable supply and energy storage. This can be applied to groups of housing and eventually to other building types. This activity can contribute to affordable new build programmes, creating supply chain industries and construction related jobs.

⁶⁶ Jones, P., et al, Preparation for an energy positive community in the UK: modelling-led innovative housing Practice in Wales, Proceedings of the 36th International Conference on Passive and Low Energy Architecture – Cities, Buildings, People: Towards Regenerative4 Environments, Los Angeles, 11-13 July 2016

⁶⁷ <https://publications.parliament.uk/pa/cm201617/cmselect/cmpublic/125/125.pdf>

⁶⁸ <https://www.ofgem.gov.uk/system/files/docs/2018/03/dg14marchspeech-final.pdf>

2.3.3 The need to reduce fuel poverty in the region

At least 24% of all homes in the Swansea Bay City Region are considered to be fuel poor.⁶⁹ With fuel price rises in recent years, an energy efficiency score of at least 81 against the Standard Assessment Procedure (SAP) is necessary to proof homes against fuel poverty. Increasing the SAP score of the housing stock represents a big opportunity to reduce fuel poverty in the region.

Health opportunities

Research shows how home energy efficiency improvements may have a positive impact on health and lower health service use among people who had benefited from the Welsh Government Warm Homes Nest scheme.⁷⁰ The study used NHS data to compare health service use of people who had benefited from Nest home energy improvements and a control group who were eligible for improvements but were still waiting for these to be completed.

The research found GP events for respiratory illness fell by almost 4% for those who had benefitted from Nest improvements, while these rose by almost 10% in the control group over the same period.

A similar pattern was found in relation to asthma events, with a 6.5% decrease in the recipient group and a 12.5% increase in the control group for the same period.

Standard Assessment Procedure (SAP)

The SAP is a government backed measure of the energy performance for dwellings. It provides standardised metrics and adjustments for differing property constructions, materials and layouts, to allow disparate properties' energy consumption to be compared. It outputs an environmental impact factor between 1 and 100, with higher numbers indicating greater performance and energy efficiency.

A SAP65 score is the minimum standard to achieve the Welsh Housing Quality Standard and was originally viewed both in Wales (and nationally) as a route to proofing housing stock against fuel poverty. In March 2017, 92% of social housing was compliant with the quality standard (or subject to an acceptable fail).⁷¹ Welsh Government have indicated that they may

⁶⁹ <http://lle.gov.wales/map/fuelpoverty>

⁷⁰ <http://gov.wales/statistics-and-research/fuel-poverty-data-linking-project/?lang=en>

⁷¹ <http://gov.wales/statistics-and-research/welsh-housing-quality-standard/?lang=en>

seek a SAP target of between 80 and 89 to be reached by 2030 across all tenures throughout Wales to achieve the aims of the Decarbonisation programme. Any significant increase in the SAP score for existing properties is unlikely to be achieved through fabric only improvements, and each property would need a suite of renewable technologies such as the HAPS concept to achieve this target.

As of 1st April 2018 it was illegal for a private landlord to let a property with an energy performance certificate (EPC) rating lower than E to a new tenant and from 1st April 2020 this will apply to all existing tenancies.

SAP65 is an ambitious target (UK average rating was 56.7 in 2011).⁷² Fuel price rises since 2004 mean that a SAP81 rating is likely to be required to achieve the goal of proofing homes against fuel poverty.⁷³

2.3.4 The need to address energy production and demand

Reducing unsustainable energy dependency

The UK's energy system may still be dominated by fossil fuels, but it has never been less reliant on carbon intensive energy at any point in its modern history. In the third quarter of 2016, UK dependency on fossil fuels fell 2% year-on-year to 79%, down from almost 88% at the beginning of 2013.

It is a stark illustration of the radical change that has taken place in the country's energy system over the last few years, with low-carbon energy now making up a record 50% of the UK's electricity mix while the share of coal on the grid has fallen to just 4%.

The latest data suggest the UK government is on track to meet its 2025 target of phasing out unabated coal power from the grid.⁷⁴

The Welsh Government is establishing a regulatory framework for decarbonisation, including five-year carbon budgets and interim targets, in addition to the existing 2020 and 2050 targets. As a result, fossil fuel generation will need to be reduced. Coal generation is expected to further reduce and be phased out of the UK electricity system by 2025. The owners of Aberthaw B power station have switched a small portion of their

⁷²https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/345141/uk_housing_fact_file_2013.pdf

⁷³ HoC Environment Food and Rural Affairs Committee - HC (2007-08) 1099, Ev 19

⁷⁴ <https://www.businessgreen.com/bg/news/3003371/uk-dependency-on-fossil-fuels-hits-record-low>

feedstock to biomass and will only generate electricity when needed, such as in the winter months.⁷⁵

Improving grid Infrastructure

A large and continuing barrier to the expansion of renewable energy sources is the available capacity of grid or regional level storage. Research suggests that providing 2GW of storage in the UK by 2020 could create up to 10,000 jobs. The grid contains around 30GWh of storage, mainly pumped hydro storage (including 9GWh in Dinorwig in Snowdon), against a typical demand range of 40-45GW and peak demand of 60GW (UK wide).

Providing or increasing grid storage reduces the requirement for spinning reserve capacity (spare and unused capacity in existing power stations, held in reserve at power stations across the grid), increasing grid efficiency and resilience and enhancing the effectiveness of renewable sources, which Wales has in increasing capacities.

A HAPS concept property could store its own energy. For example, the SOLCER house has the potential to store up to 6.9Kwh of power.⁷⁶

More recent examples have electrical storage capacities of 14kWh, and larger batteries are being used in retrofits, including Tesla Wall.

Achieving the SBCR target of 3,300 new homes across 5 years would add 22.7Mwh of storage to the grid and would therefore make a marginal contribution to the UK's energy resilience however, importantly, it would demonstrate the concept for scalability.

Welsh Government Building Regulations Part L (Energy Efficiency)

It is likely that the 2019 issue of the Welsh regulations will see building fabric standards, thermal bridging and air permeability set at a level that is unlikely to change in any future revisions. The 2019 issue will likely take fabric standards and air permeability as low as is economically and technically feasible. Thus, once fabric, thermal bridging and air permeability is set at its maximum limits it is logical that the only way to lower CO₂ emissions beyond those levels will be the use of low and zero carbon technologies and renewable sources.

⁷⁵ <http://gov.wales/docs/desh/publications/171207-energy-generation-in-wales-en.pdf>

⁷⁶ <http://www.buildup.eu/en/practices/cases/solcer-house-wales-first-low-cost-positive-energy-house>

To a large extent, this is already the case under Part L 2013 where renewable energy systems are commonly specified to meet that standard (i.e. the Target Emissions Rate under Part L 2013 is difficult to achieve without renewable energy and/or low carbon systems). Therefore, in principle, starting to design and build homes towards the 'Homes as Power Stations' concept would mean that providers are 'ahead of the curve' in terms of the likely regulatory compliance required under the 2019 revision to Part L. As a regulatory minimum standard, the revised Part L is very unlikely to make the HAPS concept mandatory, but the standard will be a step further towards that goal.

The Welsh Government has pledged to implement a landmark EU policy that requires all new public buildings completed after 31 December 2018 to be nearly zero energy buildings (nZEBs), with all new buildings following by the end of 2020, while also setting nZEB targets for refurbishments. The Welsh Government has said that all requirements of Directive 2010/31/EU have been transposed to date and the intention is to continue to do so and a forthcoming review of energy standards is intended to deliver nearly zero energy requirements in line with the directive.⁷⁷

The HAPS concept closely aligns with the aspiration for nZEB's. However how to meet the nZEB standard is largely undefined. To be true zero carbon sites, CO₂ emissions from new buildings must be reduced by 100% (to include offsetting emissions using renewable energy generated in the home – net zero carbon). This may not be possible at all sites. If the Government pursues a nZEB standard, where a reduction of CO₂ from new buildings of 100% is not achievable, it is possible that a combination of efficient design, low carbon measures and other 'allowable solutions' may be an option. For example, a minimum of 70% may be achieved by site measures (energy efficient design and renewables) and up to 30% could be achieved by 'allowable solutions'. Allowable solutions will probably not be a cheap alternative, as they could involve funding zero carbon measures in the local community such as district heating schemes or funding a community energy fund.

It is not clear how accounting for carbon savings under allowable solutions would be achieved and it could be a resource/cost burden. This concept is therefore still subject to definition and refinement; however, the

⁷⁷ <https://passivehouseplus.ie/news/government/exclusive-uk-may-deliver-eu-sustainable-building-targets-in-spite-of-brex-it-while-scotland-wales-commit>

Government's position on nZEBs and the HAPS principle could closely align with future requirements.

2.3.5 To need to reduce carbon emissions

The UK is committed to achieving an 80% reduction in CO₂ emissions by 2050. Housing currently accounts for 29% of the UK's total energy consumption, so the built environment and housing will need to be a key focus to achieve these targets.

Carbon emissions from residential properties account for 8% of all carbon emissions in Wales and there has been an overall reduction of 28% in these emissions since the base year (1990), partly due to a change in fuel mix from coal to natural gas and energy efficiency measures.⁷⁸

The 'Smarter Energy Future for Wales' (March 2016) report recommends urgent revision of Building Regulations to ensure that all new houses are built to 'near zero' energy standards. Experience with the SOLCER house has shown that the key is environmental technologies being integrated into the fabric during construction. The cost is estimated to be £25,000 more expensive, at a total cost of £125,000. However, building at scale UK could bring that down to £100,000, a comparable price to other three-bed new-builds. Once built, there would be an estimated saving of £1,000 per year – for the first 10 to 15 years when the mechanical equipment would probably need to be replaced.⁷⁹

Retrofitting energy efficiency measures into existing housing stock also has a crucial part to play and Welsh Government schemes such as Warm Homes are key to improvements.

Innovation opportunities

Innovation and smart management of domestic energy will be driven by:

- Improving connectivity infrastructure: Internal/external
- Smart metering, appliances, technology and home management systems (including monitoring capabilities)
- Battery storage

⁷⁸ (based on 2014 data):

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/573221/Greenhouse_Gas_Inventory_for_England__Scotland__Wales_and_Northern_Ireland_1990___2014.pdf

⁷⁹ <https://www.ribaj.com/products/solcer-budget-smart-house>

- Use of data from new housing to evaluate and prove HAPS concept – analytical platform

Lack of progress in developing these areas has created barriers to uptake of previous incentives to improve energy sustainability; however, innovative approaches to reduce carbon emissions and dependency on unsustainable energy sources are being developed. One example is the SPECIFIC programme:

SPECIFIC – established in 2011 – is a National Innovation Centre based in the Swansea Bay City Region, developing the concept of buildings as power stations and addressing the challenge of low carbon electricity and heat by enabling buildings to generate, store and release their own energy, in one system, using only the energy from the sun.

SPECIFIC is developing next generation solar technologies, improving performance and enabling manufacture at scale, building full-scale demonstrators using existing technologies to prove the concept works. It brings together industry and government to enable new technologies to progress to the market, acting as a catalyst for change in the construction sector.

SPECIFIC is led by Swansea University, with Strategic Partners Akzo Nobel, NSG Pilkington, Tata Steel and Cardiff University and a wide range of business and academic partners to engage with industry in the application of new technology, developing associated supply chains and homes as power stations demonstration projects.

Phase 2 of the programme began in April 2016 with £26m from the Engineering and Physical Sciences Research Council, Innovate UK and the European Regional Development Fund through the Welsh Government, plus investment from Swansea University, industrial partners and matched funding from Cardiff University.

The programme will create new opportunities for an emergent industry embracing a range of sectors. The programme is currently engaged with 50+ industry partners from small SMEs through to large corporate partners who share an interest in developing solutions in Wales for global export.

The SPECIFIC programme provides technologies to a concept named the Smart Operation for a Low Carbon Energy Region (SOLCER) house – the UK's first energy positive house, designed and constructed by Cardiff University, with a 1.75:1 grid export-to-input ratio, with a 6.9KWh Li-Ion battery; allowing energy storage and returns to the grid at times of higher demand. The design also incorporates lower levels of embodied CO₂ in its build, at 340kgCO₂/m² compared with a standard benchmark of 500kgCO₂/m². This is aligned with Passivhaus design adopted elsewhere in the region, which can reduce energy costs for space heating to around £25 per annum year, based on a SAP equivalence of 88.

2.3.6 The need to learn lessons from existing energy efficiency programmes

There have been previous attempts to prove and implement homes as power stations and deliver at scale at a regional level which have had limited success due to uncoordinated and sporadic funding, the lack of a professional and coordinated approach and lack of skills development resulting in short-term programmes with potentially poor outcomes.

There is a need for a coordinated programme of activity, at scale with associated skills, supply chain and monitoring and evaluation.

2.3.7 The need to create supply chain and support networks

Until now, the difficulties of applying consistent quality control across regional and national programmes has been a barrier to establishing robust supply chains and achieving consistent performance, which is why there is currently no coordinated supply chain and skills linked to energy efficient homes.

Summary of business needs

The table below summarises the gap between the existing arrangements and the Investment Objectives:

Existing arrangements (where we are now)	Investment Objectives (where we want to be)	Business needs (the 'gap')
<ul style="list-style-type: none"> ▪ Fragmented and variable quality retrofitting of existing properties ▪ Limited uptake of passive or energy positive homes in private sector ▪ Insufficient new properties being built 	<p>To future proof at least 10,300 properties (7,000 retrofit, 3,300 new build) within five years to increase 'affordable warmth' and reduce fuel poverty</p>	<ul style="list-style-type: none"> ▪ Extensively surveyed and quality-controlled retrofit programme that considers property and local variances. ▪ Proof of concept for new-build housing with cutting-edge energy reduction and storage principles
<ul style="list-style-type: none"> ▪ Relationship between early winter deaths and cold housing/fuel poverty ▪ Around 40% of early winter deaths are attributable to cardiovascular diseases and around 33% to respiratory diseases — There is a strong relationship between cold temperatures and cardiovascular and respiratory diseases 	<p>To improve health and wellbeing and reduce the burden on health and social services</p>	<ul style="list-style-type: none"> ▪ Combination of retrofit energy saving measures, fuel switching and new build housing to minimise fuel poverty, and warmer homes in winter
<ul style="list-style-type: none"> ▪ Variety of initiatives and projects which are inconsistent and with varying degrees of success 	<p>To deliver a sustainable (commercially viable), cost effective and holistic housing programme</p>	<ul style="list-style-type: none"> ▪ Increase certainty and reduce commercial risk for private sector new-builds by demonstrating technology at scale in the public and RSL sectors
<ul style="list-style-type: none"> ▪ Variety of initiatives and projects with inconsistent measures and evaluation of success criteria 	<p>To invest in the professional evaluation of the quality and experience of solutions and understanding of the application of new technologies</p>	<ul style="list-style-type: none"> ▪ Increase certainty and reduce commercial risk through proven programme management methodology accompanied by professional evaluation and review
<ul style="list-style-type: none"> ▪ Uptake poor of energy efficiency improvements and initiatives by homeowners in retrofit accommodation 	<p>To promote awareness of how key stakeholders (particularly energy users) optimise their</p>	<ul style="list-style-type: none"> ▪ Improve marketing and communication to promote the benefits of energy efficient housing and highlight benefits of

<ul style="list-style-type: none"> Benefits and savings not fully realised 	<p>interface with the technology</p>	<p>compliance with Government standards</p>
<ul style="list-style-type: none"> Housing and built environment accounts for 29% of UK emissions Housing accounts for 15% of emissions in Wales 	<p>To support measures to mitigate climate change by reducing CO₂ emissions and energy consumption</p> <p>Predicted annual CO₂ reduction figures:</p> <ul style="list-style-type: none"> Retrofit - 9,933 tonnes CO₂ annum New build - 9,165 tonnes CO₂ annum <p>Figures assume 100% rollout</p>	<ul style="list-style-type: none"> Substantially reduce energy demand through passive and energy-positive homes Make better use of Wales' considerable renewable resources through distributed grid level storage
<ul style="list-style-type: none"> Insufficient grid level storage to curb peak demand and demand side responsiveness 	<p>To create an energy system that is compatible with future smart developments, maximising benefits to the occupant/owner and reducing pressure on the grid by providing local energy generation and security</p>	<ul style="list-style-type: none"> The need for better storage to curb peak demand The need to improve demand side responsiveness

Part 3: Potential business scope and key service requirements

Part 3.1 Potential Scope

Part 3 of this Strategic Case starts the process of considering the potential scope of the HAPS programme based on the changes required to satisfy the identified business needs, in particular:

- The need to facilitate the take up of renewable technologies and associated design aspects in new housing developments and retrofit programmes carried out by the public, private and third sector
- The need to develop and seek to attract new sector supply chains incorporating leading research and high value manufacturing and construction operations
- The need to address fuel poverty

- The need to monitor and evaluate a coordinated programme of activity
- The need to ensure the region has an appropriately skilled workforce in renewable technologies

The scope of this work is defined by the Swansea Bay City Deal and the geographic area of the four local authorities that have signed the joint agreement.

HAPS overview

The HAPS programme is a pioneering programme of activity which aims to facilitate the adoption of energy positive, low carbon and renewable technologies in new build and retrofit developments.

The programme aims to demonstrate the benefits of adopting the ‘homes as power stations’ approach i.e. energy positive homes, through a combination of design approaches and flexible technology solutions.

The HAPS programme is an **approach** to energy positive homes not a specific technology. The technologies used in the design solutions are already known – the innovative aspect to this programme will be the coordinated approach to combining design and technologies at scale, with ongoing monitoring and evaluation to maximise the benefits of the approach.

The proposed scope of **activity** of the HAPS programme is as follows:

HAPS scope	Activity
<p>Facilitate the adoption of the HAPS approach in new build developments</p>	<p>Facilitate the adoption of energy positive, low carbon and renewable technologies and design in new build developments.</p> <p>To develop a cost effective, flexible design approach.</p> <p>The aim is to demonstrate the benefits in the public sector and Regional Social Landlord sector and then facilitate the adoption of the homes as power stations approach with private sector housebuilders.</p>
<p>Facilitate the adoption of the HAPS</p>	<p>Facilitate the adoption of energy positive, low carbon and renewable technologies and design in retrofit developments.</p>

<p>approach in retrofit developments</p>	<p>To develop a cost effective, flexible design approach.</p> <p>The aim is to demonstrate the benefits in the public sector and Regional Social Landlord sector and then facilitate the adoption of the homes as power stations approach with private sector housebuilders.</p>
<p>Develop an indigenous sustainable supply chain</p>	<p>The HAPS programme includes funding for developing a sustainable supply chain in line with State aid guidelines.</p> <p>The programme team will work with key partners, including Welsh Government, to develop a sustainable indigenous supply chain by identifying local companies with the capability to be developed to be part of a renewable supply chain and be best placed to deliver community benefits and economic outcomes.</p>
<p>Establish a regional targeted financial incentives fund</p>	<p>The targeted financial incentives fund will provide approximately £1k per property gap funding depending on the scheme – and will be determined to optimise investment. The financial incentives will not act as a subsidy for every development. It will be an incentive scheme at the start of the programme to incentivise the adoption of the HAPS approach (similar to IHP). The fund will be State aid compliant.</p>
<p>Development of a skilled workforce</p>	<p>The HAPS programme has already established links with FE and HE, together with the Skills and Talent City Deal project.</p> <p>The Renewable Energy Skills Forum (Wales) is currently mapping the skills and experience currently available in renewable technologies to develop a competency and skills matrix, for a qualification routeway in Wales. It is looking at existing work through SPECIFIC and RSLs, in particular, as well as taking account of UK and local companies, developing an expertise in renewables. This would allow the Skills Matrix, to reflect the broad nature of the renewables sector.</p>

<p>Programme monitoring and evaluation</p>	<p>The HAPS programme includes funding to properly monitor and evaluate the programme.</p> <p>Through its monitoring and evaluation, the HAPS programme will provide the evidence for using a variety of renewable technologies and to demonstrate the viability of adopting the homes as power stations approach at scale, moving away from one off demonstrators in both new build and retrofit programmes.</p> <p>The monitoring and evaluation will focus on three key areas:</p> <ul style="list-style-type: none"> ▪ Energy efficiency (to provide evidence of costs and benefits of a range of design solutions for a range of tenure and site location) ▪ Health and wellbeing (in partnership with Public Health Wales) ▪ Social science (in partnership with academia to consider how people interact with the technologies across a wide demographic)
<p>Develop a flexible design approach</p>	<p>The aim of the regional HAPS programme is to coordinate the approach to delivering smart, low carbon, energy efficient homes by encouraging the use of a range of renewable technologies incorporated with a design approach appropriate to local circumstances e.g. site location, tenure etc. It is not a 'one size fits all' technology solution, it is a flexible and adaptable design strategy offering a range of technology and design solutions based on a number of factors including site location and tenure.</p> <p>The design and technology solutions will be tested and refined during the 5 year programme, allowing the design solutions to adapt to technological advances. The flexible design strategy will be developed to allow the HAPS approach to be adapted to a variety of challenges and constraints associated with sites and tenure across the region.</p>

A few examples of this flexible, design approach are detailed below:

Hafod site, Neath – this is an example of solar alignment where the topography of the site has determined the use of technologies

Another example is of homes which have been installed with east and west facing photovoltaic panels (PVs) to capture the morning and evening sun

The HAPs regional programme shares the same ambition as the Active Building Centre focus i.e. to accelerate market adoption of energy positive homes to provide cleaner, cheaper and more resilient energy supply.

Design approach

The fundamental design principles underpinning the HAPS approach are:

- Whole house approach
- Fabric first approach
- Passive design where feasible
- Electrical and heat generation
- Storage (electrical and heat)
- Optimisation of energy performance

Overview of current technologies

The following technologies will be incorporated into the flexible design solutions:

- SIPs panels (Structural Insulated Panels)
- Solar PVs
- Transpired Solar Collector (TSC) cladding
- Integrated photovoltaic roof covering
- Air source heat pumps
- Ground water source heat pumps
- Mechanical Ventilation with Heat Recovery (MVHR)
- High levels of Insulation
- PV / Solar water heating
- Voltage optimisation

	<ul style="list-style-type: none"> • Battery storage (allowing the solar energy to be collected, stored and released to meet the energy demands of the dwellings and their occupants)
Adoption of renewable technologies at scale and affordable	<p>One of the aims of the HAPS programme is to reduce the cost of the technologies by delivering at scale and thus creating demand by incentivising others in the public and private sector to adopt the approach.</p> <p>One of the Investment Objectives is to <i>'deliver a sustainable (commercially viable), cost effective and holistic housing programme'</i></p>

Please refer to the Management Case for more details on how the programme will be implemented.

Part 3.2 Main Programme Benefits

There are 3 main areas which illustrate the benefit, and added value of the HAPS programme:

Energy

- Energy savings and decreasing energy demand
- Local security of energy supply
- Reduce stress on the national grid

Health and well-being

- Reduction in respiratory conditions (working with Public Health Wales to develop this further and monitor the benefits)
- Warmer homes
- Improved air quality in homes via combined heating and mechanical ventilation – ensuring good air quality all year round.
- Job creation (large scale adoption of energy positive new build and retrofit homes will create major job opportunities and supply chain activity, which will deliver socio-economic benefits to the region)

Social science

- Behaviour
- Mainstream energy positive homes

Possible benefits that could arise from the successful delivery of this programme were identified in stakeholder workshops to develop this business case, and include:

Benefit no.	Benefit description	Benefit type ⁸⁰
1	Reduced energy spend through reducing energy consumption for residents	NCRB
2	Reduced CO ₂ emissions through reduced energy consumption and improved renewables mix	NCRB
3	Uplift in property value from retrofit	NCRB
4	Reduction in fuel poverty	NCRB
5	Improve health and wellbeing through a reduction in respiratory and cardiovascular disease	NCRB
6	Additional gross jobs created	NCRB
7	Businesses created through development of an integrated and sustainable local supply chain	NCRB
8	Overall improvement in domestic SAP/EPC ratings	Qual
9	Increased security of supply through demand side response management	Qual
10	Increase in energy contribution to national grid ⁸¹	NCRB
11	Increase in skills due to requirement for staff and training scheme	Qual

Table 5 - main benefits criteria and type

Part 3.3 Main Programme Risks

A number of business and service delivery risks were discussed during the workshop. For each risk we have included a mitigation action together with how this risk presents a potential opportunity. The risk register will be revised during programme delivery.

The main business and service risks associated with the potential scope for this programme are shown below:

⁸⁰ The benefits were assessed against the following criteria: CRB – Cash releasing benefit, NCRB – Non cash releasing benefit, Qual - Qualitative

⁸¹ Discussions with the National Grid are ongoing

Risk area	Mitigation	Opportunity
Development risks		
Resource and capacity of the programme team especially during the definition stage	Establish an experienced programme team to work with the region.	Job creation / safeguarding.
Implementation risks		
Being unable to develop a sustainable, indigenous supply chain	Work with key partners including Welsh Government	Local companies have the opportunity to develop and diversify
Programme slippage including delays in procurement	Robust programme management system in place. Regular review of Risk Register	
Sufficient volume and scale of products and services are unavailable	Programme Team to maintain regular communication with renewables supply chain	
Design risks		
Failure of technology	National grid as back up	An opportunity to learn lessons and adapt future technologies Continuous improvement – design feedback
Technological advancements	Steering Group and key partners to discuss	

	technological advancements	
Change management/programme management risks		
Failure to achieve agreed outputs/results	Robust programme management system in place. Regular review of Risk Register	
Complex nature of retrofit leads to failure to achieve programme outcomes	Robust programme management system in place. Regular review of Risk Register	
Lack of interest from the Private Sector	Dissemination programme to demonstrate benefits of homes as power stations	Create demand / reduce cost of renewables Growing supply chain with associated skills Opportunity to break down commercial barriers to building energy positive homes Opportunity to embed design and manufacture in close proximity to the Active Building Centre. (Jon Wood to facilitate conversation with Sam Stacey)

Operational risks		
Land costs and availability	Local Authorities to facilitate where applicable LDPs provide reference points.	
Financial risks		
Capital costs affect scheme viability	Robust programme management system in place. Regular review of Risk Register	
Any large changes in the funding package, including public and private match funding/leverage	Robust programme management system in place. On-going engagement with match funding partners.	HAPS is aligned to government policy, and will add value to funding sources.
Short term WG funding sources e.g. Affordable Homes Guarantees Programme (AHG), Innovative Housing Programme (IHP)	Robust programme management system in place. On-going engagement with match funding partners.	HAPS is aligned to government policy, and will add value to funding sources.
Complexity of solutions exaggerates cost	To develop a cost effective, flexible design approach.	To develop innovative solutions within specified cost envelopes
Homeowners unable to borrow	Regional lenders to develop a lending model To consider long term costs and extra	Education programme targeted at regional lenders

	disposable income due to less energy bills RSL model to be provided as an example of borrowing	Promote energy positive home as an 'energy asset to live in' / static energy store
Non – financial risks		
Lack of understanding of the technology	Education programme Ensure end user has an induction and understands the technology to 'demystify the technology'	Creates a culture change and more people will want to incorporate homes as power stations approach through retrofit or new build
	The technologies used in the HAPS approach are not new and are therefore tried and tested. The industry is aware of maintenance requirements etc. Therefore there is no issue with the certainty of the long term supply of technologies and maintenance.	
Designs do not comply with approved standards, or planning and building control	Programme team to work with key partners to ensure a compliant design approach	Opportunity to develop industry standards for renewable technologies flexible design approach
Homeowners lack skills and knowledge to maximise benefits from designs	Education programme	Change in attitude to renewable technologies in the home

Skills to generate a viable supply chain are not available	Work with key partners in FE and HE to develop a sustainable skilled workforce	Diversification of the economy Job creation / safeguarding
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Part 3.4 Possible Programme Constraints

The programme could be subject to the following possible constraints/limitations:

Constraints
Availability of development sites
Large scale/national house builders
Capacity of installers/suppliers
Physical constraints – site topography
Industry standards
Mortgage limitations
Planning/building control
Public engagement with energy efficiency schemes
Private sector engagement
RSL engagement
Complex nature of retrofit projects
Electrical grid connections
Funding – Social Housing Grant (SHG) restrictions, Acceptable Cost Guidance, short term funding sources

Part 3.5 Possible Programme Dependencies

Possible dependencies, upon which the ultimate success of this programme may be dependent, might include:

- The timely provision of CapEx funding from the Swansea Bay City Deal
- The successful deployment of new and existing techniques, designs and materials that would allow the programme to meet its energy positive objectives

Risks, constraints and dependencies will be managed through comprehensive programme governance arrangements.

There is a synergy between the HAPS programme and the other City Deal projects within the Swansea Bay City Deal programme. The HAPS

programme will also carefully monitor the following projects throughout the lifespan of the scheme from design to delivery to ensure synergies are established:

- Skills and Talent – it will work with the Skills and Talent programme to develop a skills base and associated training within the region which can be replicated across the rest of Wales and the UK. These skills would ensure a stable and sustainable supply chain with the necessary skills to support the sector
- Pembroke Marine – Energy Cluster will regenerate an area of Pembroke Dock to create a dedicated site which will be used as a base by marine energy developers to progress their devices from an idea to a commercial product. The site will allow developers to test, manufacture and maintain offshore renewable energy devices and will be supported by the development of a Marine Energy Test Area – a series of areas along the waterway where developers can test devices at an early stage of development
- The Pembrokeshire Wave Energy Demonstration Zone – a large offshore wave energy site which can be used by developers to test more developed devices in open sea conditions
- The Marine Energy Engineering Centre of Excellence – to coordinate and share knowledge, resource, experience and capacity between existing and future developers
- Digital Infrastructure and Test Beds – Homes as Power Stations would benefit from an innovative digital infrastructure. Investment Objective 7 relates to the development of a smart, intelligent metering and data collection aspect. The effective use of smart metering is integral to the programme as it will allow users to manage their own energy consumption and assist in the measurement of outcomes from this programme
- National Steel Innovation Centre - the use of steel coatings in the construction process. The Steel Science project, together with project SPECIFIC are integral to the development of these materials in terms of efficiency, commercialisation and scalability

Economic case

Introduction

The purpose of the Economic Case is to identify and appraise a range of possible options for the delivery of the project and to recommend a 'preferred option' that is most likely to offer best Value for Money (VfM). This process comprises two parts:

Part 1 – developing a long-list and winnowing this to a short-list using the 'options framework' which examines a range of less ambitious through to more ambitious options (one of which should be the 'counterfactual' / 'status quo' as the benchmark for value for money). This section is structured to provide a detailed description of how the agreed short-list has been developed, which concludes with a summary of the remaining potential options in each category of choice and the subsequent short-list proposed to be taken forward for detailed cost benefit analysis in part 2

Part 2 – undertaking a cost benefit analysis (CBA) on the short-listed options to determine the preferred option.

This is illustrated in the Figure below:

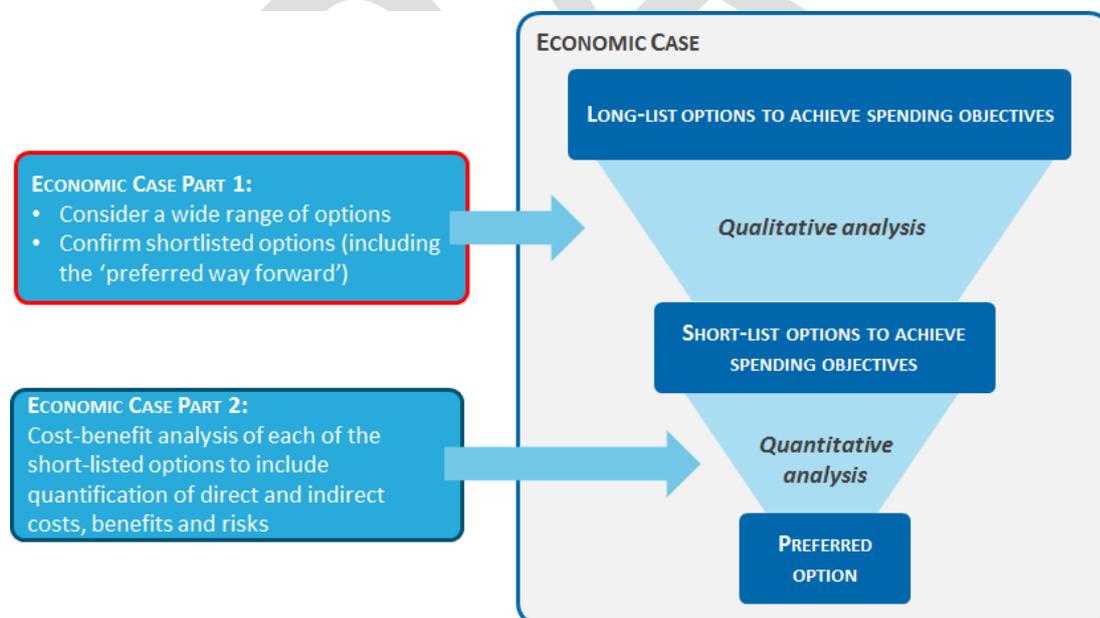


Figure 5 - overview of the Economic Case

Economic Case Part 1: The Options Framework

Introduction to the Options Framework

The 'options framework' demonstrates consideration of a wide range of options (the 'long-list') that could potentially deliver the agreed Investment Objectives over five categories of choice:

- service scope (the 'what' in terms of services and coverage)
- service solution (the practical approach to 'how' services will be delivered)
- service delivery ('who' will deliver the preferred scope and required services)
- service implementation (the 'when' in terms of timing and phasing of delivery)
- funding of the investment (sources of funding)

Options should be considered in this order, because the options arising from consideration of each category of choice inform the categories of choice that follow. At each stage, options should be specified in the context of choices already made.

For example, service delivery options (who delivers services) will depend on the service solutions considered in the previous step. Further, at each stage, the framework outlined is used to encourage development of a wide range of options. These typically cover a range from less to more ambitious, within each category; however, sometimes options within each category are simply discrete and cannot easily be described as 'less' or 'more' ambitious. It is also often appropriate to split the categories of choice into sub-categories, for example, where there are multiple service streams and/or providers.

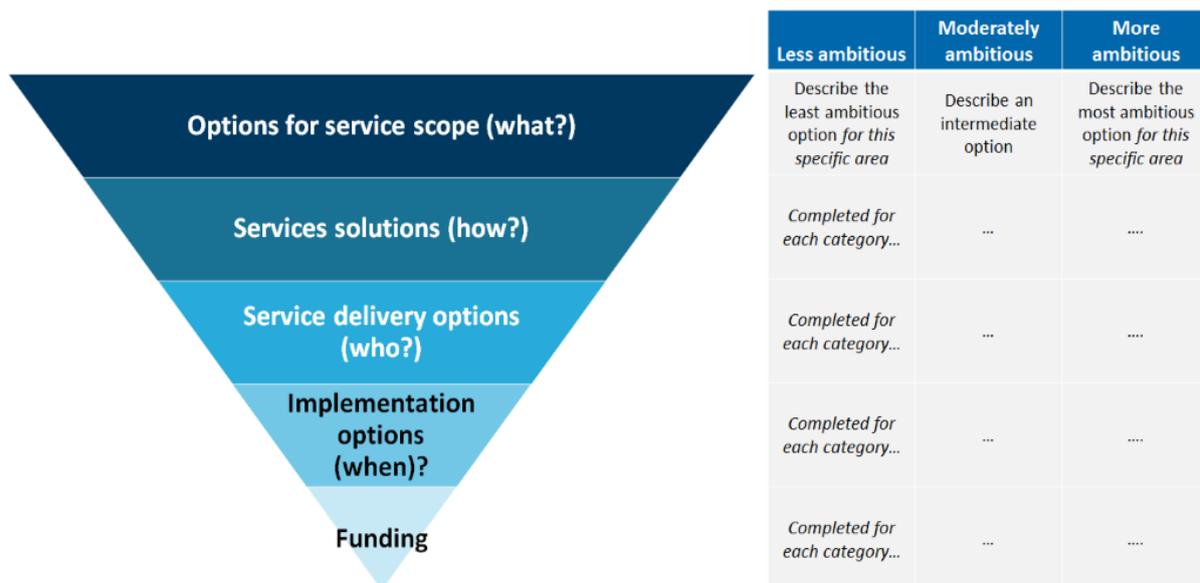


Figure 6 - the options framework categories of choice

The options framework generates a structured list of potential options over a range of dimensions (the 'long-list'), which can then be qualitatively assessed in the first part of the Economic Case against the agreed Investment Objectives and Critical Success Factors. HM Treasury's best practice guidance suggests using the following list of standard Critical Success Factors:

Part 1.1 Critical Success Factors

No.	Critical Success Factor	Questions – How well does the option..?/Is the option...?
1	Strategic fit	satisfy the Investment Objectives and business needs? optimise the identified benefits? align with and support the national, regional and local strategies?
2	Value for money	optimise available resources and provide value for money?
3	Potential achievability	acceptable to key stakeholders? politically acceptable? operationally and physically achievable?
4	Supply side capacity and capability	attractive to potential suppliers to deliver the requirements?
5	Potential affordability	affordable within the forecasted capital and revenue of the organisation?

Table 6 – Critical Success Factors (CSFs)

This process results in an assessment of each option in terms of how well it could deliver each Investment Objective and the CSFs and is assessed as either:

DISCOUNT Does not meet the Investment Objectives and CSFs	CARRY FORWARD Weakly meets the Investment Objectives and CSFs	CARRY FORWARD Broadly meets the Investment Objectives and CSFs	PREFERRED Strongly meets the Investment Objectives and CSFs
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This enables some options to be ‘discounted’ (not taken forward for further consideration); ‘carried forward’ or ‘preferred’ and a short-list of viable options to be constructed. The short-list always includes the ‘*status quo*’ as the benchmark for value for money against which all proactive options should be measured in part 2 of the Economic Case (cost benefit analysis and impact assessment).

Long-list options were generated using the options framework and reduced to a short-list through a workshop (held 19/01/2018) involving the following key stakeholders:

- Gareth Nutt, Director Environment, Neath Port Talbot County Borough Council
- Simon Brennan, Head of Property & Regeneration, Neath Port Talbot County Borough Council
- Lisa Willis, European & Strategic Funding Manager, Neath Port Talbot County Borough Council
- Christopher Jones, Energy Manager, Neath Port Talbot County Borough Council
- David Bratley, City & County of Swansea
- Darrel Barnes, City & County of Swansea
- Jonathan Morgan, Carmarthenshire County Council
- Steve Keating, Energy Manager, Pembrokeshire County Council
- Kerry MacDermot, Pembrokeshire County Council
- Keith Palmer, SPECIFIC

Part 1.2 Scope options

Stakeholders agreed to consider the following two elements of scope separately:

- **Service scope** – the coverage of the proposed service(s)
- **Target housing scope** – the categories of housing that can be targeted through HAPS

Service scope

The following service scope (coverage) options were identified from least to most ambitious:

- **The *status quo*** – continuing to deliver existing government and local initiatives
- **Less ambitious:** more effective coordination of existing initiatives – in addition to the *status quo*:
 - providing more education to promote smart meters and the use of smart appliances
 - influencing Local Authorities to consider energy efficient building
 - demonstrating proof of concept through pilot schemes and *ad-hoc* programmes, including partial refits and small-scale demonstrators
- **Intermediate 1:** extensive roll out of proven technologies – in addition to previous options, including a programme of new build and taking opportunities to retrofit with existing programmes
- **Intermediate 2:** targeted builds following HAPS concept – in addition to previous options:
 - implement a definitive coordinated retrofit and new build programme across the region
 - produce supplementary planning guidance to encourage new builds to be carbon positive
- **More ambitious:** ensuring every new build follows HAPS concept – in addition to previous options: prohibiting development of buildings which are not carbon positive by modifying planning regulations

These options were considered by stakeholders and assessed as follows:

Service scope		Options			
Status quo		Less ambitious	Intermediate	More ambitious	
Continue to deliver existing initiatives		More effective coordination of existing initiatives	Extensive roll out of proven technologies	Targeted builds following HAPS concept	Every new build follows HAPS concept
Investment Objectives					
1	To future proof at least 10,300 properties (7,000 retrofit, 3,300 new build) within five years to increase 'affordable warmth' and reduce fuel poverty	Weakly meets	Broadly meets	Broadly meets	Strongly meets
2	To improve health and wellbeing and reduce the burden on health and social services	Weakly meets	Broadly meets	Broadly meets	Strongly meets
3	To deliver a sustainable (commercially viable), cost effective and holistic housing programme	Does not meet	Weakly meets	Broadly meets	Strongly meets
4	To invest in the professional evaluation of the quality and experience of solutions and understanding of the application of new technologies	Weakly meets	Broadly meets	Broadly meets	Strongly meets
5	To promote awareness of how key stakeholders (particularly energy users) optimise their interface with the technology	Strongly meets	Strongly meets	Strongly meets	Strongly meets
6	To support measures to mitigate climate change by reducing CO ₂ emissions and energy consumption Predicted annual CO ₂ reduction figures: • Retrofit - 9,933 tonnes CO ₂ annum • New build - 9,165 tonnes CO ₂ annum Figures assume 100% rollout	Weakly meets	Broadly meets	Broadly meets	Strongly meets
7	To create an energy system that is compatible with future smart developments, maximising benefits to the occupant/owner and reducing pressure on the grid by providing local energy generation and security	Does not meet	Weakly meets	Broadly meets	Strongly meets
Critical Success Factors					
1	Strategic fit	Weakly meets	Broadly meets	Broadly meets	Strongly meets
2	Value for money	Weakly meets	Weakly meets	Strongly meets	Broadly meets
3	Potential achievability	Strongly meets	Broadly meets	Broadly meets	Does not meet
4	Supply side capacity and capability	Strongly meets	Strongly meets	Broadly meets	Does not meet
5	Potential affordability	Strongly meets	Strongly meets	Broadly meets	Does not meet
Conclusion >>		DISCOUNT	CARRY FORWARD	PREFERRED	DISCOUNT

Stakeholders agreed that although the options at the extremes (least and most ambitious), did not sufficiently fulfil the Investment Objectives and/or the Critical Success Factors, they represented the realistic, expected progression of activity after the programme over a period of time, as follows:



In the short-term (years 0-2), the least ambitious option should be achievable and with sufficient time (10 years+) the delivery of the most ambitious option, requiring all new build properties to follow HAPS principles, should be achievable. From this perspective, stakeholders felt it was important to keep these options on the table as time related milestones; however, from the narrower perspective of the HAPS programme (to be delivered over five years), intermediate option 2 provided the best balance of strategic fit, value for money, achievability and affordability.

Intermediate option 1 was also considered to provide many benefits, with the advantage of being more achievable and was therefore carried forward.

Target housing scope

The following target housing scope/coverage options were identified and considered from least to most ambitious:

- **Less ambitious:** directly controlled properties only:
 - Only those properties under LA control (*circa* 28k)
 - Delivering 1,000 new build HAPS properties
 - Retrofitting 1,200 properties to improve energy efficiency through a range of interventions (depending on site specific factors)
- **Intermediate:** targeted market penetration – in addition to the *status quo*:
 - Covering LA and RSL properties (*circa* 53k)
 - Social and more extensive coverage of private sector housing based on targeted priorities
 - Delivering 3300 new build HAPS properties
 - Retrofitting 7000 (out of the c13k properties that were non-compliant or ‘acceptable failures’) properties to improve energy

efficiency through a range of interventions, subject to site specific factors

- Stimulating the market for energy efficient housing
- **More ambitious:** all housing developments in the Swansea Bay City Region – in addition to the previous option:
 - Covering all housing developments in the region (both public and private)
 - Creating a market for energy efficient housing across the region

These options were considered by stakeholders and assessed as follows:

Target housing scope		Options		
		Less ambitious	Intermediate	More ambitious
<i>Status quo</i>				
n/a		Covers directly controlled properties only	Covers targeted penetration of the market	Covers all housing developments in the Swansea Bay City Region
Investment Objectives				
1	To future proof at least 10,300 properties (7,000 retrofit, 3,300 new build) within five years to increase 'affordable warmth' and reduce fuel poverty	Weakly meets	Broadly meets	Strongly meets
2	To improve health and wellbeing and reduce the burden on health and social services	Broadly meets	Broadly meets	Strongly meets
3	To deliver a sustainable (commercially viable), cost effective and holistic housing programme	Broadly meets	Broadly meets	Strongly meets
4	To invest in the professional evaluation of the quality and experience of solutions and understanding of the application of new technologies	Weakly meets	Broadly meets	Strongly meets
5	To promote awareness of how key stakeholders (particularly energy users) optimise their interface with the technology	Broadly meets	Broadly meets	Strongly meets
6	To support measures to mitigate climate change by reducing CO ₂ emissions and energy consumption Predicted annual CO ₂ reduction figures: • Retrofit - 9,933 tonnes CO ₂ annum • New build - 9,165 tonnes CO ₂ annum Figures assume 100% rollout	Broadly meets	Broadly meets	Strongly meets
7	To create an energy system that is compatible with future smart developments, maximising benefits to the occupant/owner and reducing pressure on the grid by providing local energy generation and security	Broadly meets	Broadly meets	Strongly meets
Critical Success Factors				
1	Strategic fit	Weakly meets	Broadly meets	Strongly meets
2	Value for money	Broadly meets	Strongly meets	Strongly meets
3	Potential achievability	Strongly meets	Broadly meets	Does not meet
4	Supply side capacity and capability	Strongly meets	Broadly meets	Does not meet

5	Potential affordability	Strongly meets	Broadly meets	Does not meet
Conclusion >>		CARRY FORWARD	PREFERRED	DISCOUNT

Targeting directly controlled properties (and the private sector where evidence suggests that the concept will be adopted) facilitates establishment of the programme and is a good starting point. However, directly controlled properties and very limited private sector properties currently only account for less than 20% of existing units. Therefore, to achieve the stated Investment Objectives requires a wider coverage of properties to be within scope, which is why extending the scope of private sector property coverage is preferred. The intermediate option is also considered to be achievable and affordable within the period of the initiative. For this reason, it is the preferred option.

The most ambitious option – to cover all housing developments across the region – is a positive aspiration in the longer-term (and would align with the previous more ambitious scope option to ensure every new build in the region is a HAPS), but it is not achievable, affordable or within the capacity and capability of the supply side within the time frame for the programme. For these reasons, it is discounted as an option for further consideration in this business case but is retained for future consideration.

Service solution

Stakeholders agreed to consider the following three elements of service solution separately:

- **Volume of activity** – options around the numbers of energy efficiency upgrades to be delivered
- **Incentives** – the key mechanism available to stimulate the market and deliver a shift in market demand
- **Governance/oversight of delivery** – potential governance/oversight machinery to successfully deliver the housing programme

Volume of activity

The options relating to the volume of activity to improve housing energy efficiency are as follows:

- **Less ambitious: limited development:**
 - 1000 new units in the Swansea Bay City Region
 - 1200 partial retrofits
- **Intermediate development:**
 - 3300 new units in the Swansea Bay City Region

- 7000 retrofits
- **More ambitious:** all housing and extensive retrofits:
 - new homes
 - Retrofitting of 33,000 existing homes

These options were considered by stakeholders and assessed as follows:

Service solution – volume of activity		Options		
		Less ambitious	Intermediate	More ambitious
<i>Status quo</i>				
n/a		Limited development	Intermediate development	All housing and extensive retrofits
Investment Objectives				
1	To future proof at least 10,300 properties (7,000 retrofit, 3,300 new build) within five years to increase 'affordable warmth' and reduce fuel poverty	Does not meet	Broadly meets	Strongly meets
2	To improve health and wellbeing and reduce the burden on health and social services	Weakly meets	Broadly meets	Strongly meets
3	To deliver a sustainable (commercially viable), cost effective and holistic housing programme	Does not meet	Broadly meets	Does not meet
4	To invest in the professional evaluation of the quality and experience of solutions and understanding of the application of new technologies	Weakly meets	Broadly meets	Strongly meets
5	To promote awareness of how key stakeholders (particularly energy users) optimise their interface with the technology	Weakly meets	Broadly meets	Strongly meets
6	To support measures to mitigate climate change by reducing CO ₂ emissions and energy consumption Predicted annual CO ₂ reduction figures: <ul style="list-style-type: none"> • Retrofit - 9,933 tonnes CO₂ annum • New build - 9,165 tonnes CO₂ annum Figures assume 100% rollout	Weakly meets	Broadly meets	Strongly meets
7	To create an energy system that is compatible with future smart developments, maximising benefits to the occupant/owner and reducing pressure on the grid by providing local energy generation and security	Weakly meets	Broadly meets	Strongly meets
Critical Success Factors				
1	Strategic fit	Does not meet	Broadly meets	Strongly meets
2	Value for money	Weakly meets	Strongly meets	Does not meet
3	Potential achievability	Strongly meets	Broadly meets	Does not meet
4	Supply side capacity and capability	Strongly meets	Broadly meets	Does not meet
5	Potential affordability	Strongly meets	Broadly meets	Does not meet
Conclusion >>		DISCOUNT	PREFERRED	DISCOUNT

Stakeholders agreed that retrofitting properties encompassed a range of solutions, depending on the circumstances and local need (i.e. not necessarily a 'whole house' retrofit for every dwelling).

The least ambitious option is the most achievable and affordable; however, it has poor strategic fit as it will not change the *status quo* and deliver a sustainable and commercially viable and cost-effective housing programme by stimulating the market for energy efficient houses. For this reason, stakeholders agreed it should be discounted.

The intermediate option is considerably more ambitious and seeks to deliver 3300 new builds and 7000 retrofits of existing units. While the new units would include an increase in RSL and local authority housing, such an increase in units would require considerable private sector take up. When balanced with broad achievability and affordability, this option was considered to add considerable value by providing a stimulus to the housing market. For these reasons this option was preferred.

The most ambitious option has the strongest strategic fit but is clearly undeliverable within the five year investment period. While it is retained for future consideration, for the purposes of this business case, it is discounted.

Incentives

The options relating to the incentives to successfully deliver this initiative are as follows:

- **Provide financial incentives** – to stimulate delivery of energy efficiency measures
- **Do not provide any financial incentives** – to stimulate delivery of energy efficiency measures

These options were considered by stakeholders and assessed as follows:

Service solution – incentives		Options	
		Less ambitious	More ambitious
<i>Status quo</i>			
All existing programmes do to some extent, but not co-ordinated – see Annex C		Do not provide financial incentives	Provide financial incentives
Investment Objectives			
1	To future proof at least 10,300 properties (7,000 retrofit, 3,300 new build) within five years to increase ‘affordable warmth’ and reduce fuel poverty	n/a	n/a
2	To improve health and wellbeing and reduce the burden on health and social services	n/a	n/a
3	To deliver a sustainable (commercially viable), cost effective and holistic housing programme	Does not meet	Strongly meets
4	To invest in the professional evaluation of the quality and experience of solutions and understanding of the application of new technologies	n/a	n/a
5	To promote awareness of how key stakeholders (particularly energy users) optimise their interface with the technology	n/a	n/a
6	To support measures to mitigate climate change by reducing CO ₂ emissions and energy consumption Predicted annual CO ₂ reduction figures: <ul style="list-style-type: none"> Retrofit - 9,933 tonnes CO₂ annum New build - 9,165 tonnes CO₂ annum Figures assume 100% rollout	n/a	n/a
7	To create an energy system that is compatible with future smart developments, maximising benefits to the occupant/owner and reducing pressure on the grid by providing local energy generation and security	n/a	n/a
Critical Success Factors			
1	Strategic fit	Strongly meets	Strongly meets
2	Value for money	Weakly meets	Strongly meets
3	Potential achievability	Strongly meets	Broadly meets
4	Supply side capacity and capability	n/a	n/a
5	Potential affordability	Strongly meets	Weakly meets
Conclusion >>		DISCOUNT	PREFERRED

Stakeholders felt it was necessary to provide financial incentives to encourage home owners and wider stakeholders (landlords, RSLs, lenders, etc) to invest in energy efficient homes – either new or retrofitted, at least in the early stages of delivery as the demand and market for energy efficient property is stimulated. As the initiative progresses towards the end of the programme, it was felt that any financial incentives could be tapered off as the market becomes more established and energy efficient homes become the ‘norm’. For this reason, while over time this

will move to a position of not providing financial incentives, developing a suitable strategy to provide and taper financial support was considered essential, so this option was preferred.

Governance/oversight of delivery

The options in terms of governance/oversight of delivery relate to the range of tools that could be used to deliver energy efficient housing, including:

- **LA direct build programmes** – local authorities directly control the build and retrofit programmes for premises under their direct control
- **100% public sector owned housing companies** – local authorities develop new build and retrofit programmes through arms' length public sector owned housing companies
- **Registered Social Landlords** - influenced through the Social Housing Grant
- **Land banks** – publicly owned land is used for new build programmes, contributing to the programme delivery
- **Private housing** – direct influence is limited. However, the intention is through the proof of concept and targeted marketing activity to influence owners to take up energy efficient solutions

These options were considered by stakeholders and it was agreed that they represented a selection of levers to deliver the service solution, depending on individual site circumstances and it was not therefore appropriate to discount any options at this stage.

Service delivery

The service delivery options relate to 'who' can deliver the required services. Options considered were as follows:

- **Less ambitious:** new build and upgrade programmes delivered by UK-wide companies
- **Intermediate:** investment in local companies – to upskill the supply chain and develop production, design, construction and maintenance expertise
- **More ambitious:** local authority led production design, construction and maintenance

These options were considered by stakeholders and assessed as follows:

Service delivery		Options		
Status quo		Less ambitious	Intermediate	More ambitious
n/a		New build and upgrade programmes delivered by UK-wide companies	Investment in local companies	LA led production design, construction and maintenance
Investment Objectives				
1	To future proof at least 10,300 properties (7,000 retrofit, 3,300 new build) within five years to increase 'affordable warmth' and reduce fuel poverty	Strongly meets	Weakly meets	Weakly meets
2	To improve health and wellbeing and reduce the burden on health and social services	n/a	n/a	n/a
3	To deliver a sustainable (commercially viable), cost effective and holistic housing programme	Broadly meets	Strongly meets	Broadly meets
4	To invest in the professional evaluation of the quality and experience of solutions and understanding of the application of new technologies	n/a	n/a	n/a
5	To promote awareness of how key stakeholders (particularly energy users) optimise their interface with the technology	n/a	n/a	n/a
6	To support measures to mitigate climate change by reducing CO ₂ emissions and energy consumption Predicted annual CO ₂ reduction figures: <ul style="list-style-type: none"> Retrofit - 9,933 tonnes CO₂ annum New build - 9,165 tonnes CO₂ annum Figures assume 100% rollout	n/a	n/a	n/a
7	To create an energy system that is compatible with future smart developments, maximising benefits to the occupant/owner and reducing pressure on the grid by providing local energy generation and security	n/a	n/a	n/a
Critical Success Factors				
1	Strategic fit	Broadly meets	Strongly meets	Weakly meets
2	Value for money	Broadly meets	Strongly meets	Weakly meets
3	Potential achievability	Strongly meet	Weakly meets	Weakly meets
4	Supply side capacity and capability	Broadly meets	Weakly meets	Weakly meets
5	Potential affordability	Broadly meets	Broadly meets	Weakly meets
Conclusion >>		CARRY FORWARD	CARRY FORWARD	CARRY FORWARD

Stakeholder discussion of these options clarified the key issue and a common theme throughout this options analysis – that the market for energy efficient homes needs to be developed – so it may not be immediately possible (even if desirable) to expect the private sector to drive this. It is much more likely to require public sector leadership in the short-term until the market develops. Realistically, this means the

intermediate and most ambitious options of local authority led development in the early stages, transitioning to a private sector-led market over the period of investment. All options are therefore carried forward at this stage.

Implementation

The Swansea Bay City Region 'Internet Coast' deal has determined that HAPS will be a five year programme. Stakeholders agreed that the delivery profile of the investment was dependent on the 'proof of concept' i.e. monitoring and evaluation of the pilot scheme and developing the HAPS concept in line with the findings, so robust programme management and tracking of benefits is essential.

It was considered that while a five year delivery period for the programme was likely to be ambitious (in terms of developing the supply chain and taking account of lead times), it was important to build and maintain momentum.

Funding

The following options for the implementation of the investment were discussed:

- All public funding
- Mixed funding – including public and private sector funding
- All private sector funding

These options were considered by stakeholders and assessed as follows:

Service delivery		Options		
		Less ambitious	Intermediate	More ambitious
<i>Status quo</i>				
n/a		All public funding	Mixed funding	All private funding
Investment Objectives				
1	To future proof at least 10,300 properties (7,000 retrofit, 3,300 new build) within five years to increase 'affordable warmth' and reduce fuel poverty	n/a	n/a	n/a
2	To improve health and wellbeing and reduce the burden on health and social services	n/a	n/a	n/a
3	To deliver a sustainable (commercially viable), cost effective and holistic housing programme	Weakly meets	Strongly meets	Does not meet
4	To invest in the professional evaluation of the quality and experience of solutions and understanding of the application of new technologies	n/a	n/a	n/a
5	To promote awareness of how key stakeholders (particularly energy users) optimise their interface with the technology	n/a	n/a	n/a
6	To support measures to mitigate climate change by reducing CO ₂ emissions and energy consumption Predicted annual CO ₂ reduction figures: <ul style="list-style-type: none"> Retrofit - 9,933 tonnes CO₂ annum New build - 9,165 tonnes CO₂ annum Figures assume 100% rollout	n/a	n/a	n/a
7	To create an energy system that is compatible with future smart developments, maximising benefits to the occupant/owner and reducing pressure on the grid by providing local energy generation and security	n/a	n/a	n/a
Critical Success Factors				
1	Strategic fit	Does not meet	Strongly meets	Does not meet
2	Value for money	Does not meet	Strongly meets	Weakly meets
3	Potential achievability	Does not meet	Broadly meets	Does not meet
4	Supply side capacity and capability	n/a	n/a	Does not meet
5	Potential affordability	Does not meet	Broadly meets	Strongly meets
Conclusion >>		DISCOUNT	PREFERRED	DISCOUNT

The funding mechanism is closely linked to stimulating the market for energy efficient homes – early in the delivery of this initiative, more public funding will be required to stimulate the market; however, as it becomes established and the supply chain develops, less subsidy should be required. Therefore, the less ambitious and most ambitious options are discounted and the intermediate 'mixed economy' approach is preferred, particularly as considerable investment will be required from the private sector to build energy efficient homes for sale.

Short-listed options summary

The above analysis of each of the elements of choice clearly demonstrates a direction of travel for the Homes as Power Stations (HAPS) programme. Some key issues remain unresolved, although these will be determined in due course as the proof of concept develops and the initial findings of the monitoring and evaluation are presented.

The complete direction of travel is presented in the Options Framework summary below:

		Options			
		Less ambitious	Intermediate	More ambitious	
Scope	Service scope	More effective coordination of existing initiatives	Extensive roll out of proven technologies	Targeted builds following HAPS concept	Every new build follows HAPS concept
	>>>	DISCOUNT	CARRY FORWARD	PREFERRED	DISCOUNT
	Target housing scope	Covers directly controlled properties only	Covers targeted penetration of the market	Covers all housing developments in the Swansea Bay City Region	
	>>>	CARRY FORWARD	PREFERRED	DISCOUNT	
Service Solution	Volume of activity	Limited development	Intermediate development	All housing and extensive retrofits	
	>>>	DISCOUNT	PREFERRED	DISCOUNT	
	Incentives	Do not provide financial incentives		Provide financial incentives	
	>>>	DISCOUNT		PREFERRED	
	Governance/oversight of delivery	Range of mechanisms			
	>>>	CARRY FORWARD			
Service Delivery		New build and upgrade programmes delivered by UK-wide companies	Investment in local companies	LA led production design, construction and maintenance	
	>>>	CARRY FORWARD	CARRY FORWARD	CARRY FORWARD	
Implementation	Delivery over five years				
>>>	PREFERRED				
Funding	All public funding	Mixed funding	All private funding		
>>>	DISCOUNT	PREFERRED	DISCOUNT		

This enables a direction of travel to be described from the remaining options as follows (short-list):

	Option			
	1: the status quo	Alternative: 2	Alternative: 3	4: preferred way forward
Scope		Coordinated roll out of proven technologies (smaller new build programme and opportunistic retrofitting) Covers directly controlled properties only (LA)	Extensive roll out of proven technologies (smaller new build programme and opportunistic retrofitting) Covers targeted penetration of the market (LA direct control + RSL only)	Targeted builds following HAPS concept (coordinated retro fit and new build programme) Covers targeted penetration of the market (direct control, RSL + targeted private sector)
Service Solution		Pathfinder development (1000 new units, 1200 retrofits) Provide financial incentives to stimulate the market. Use range of delivery mechanisms depending on individual circumstances	Intermediate development (3300 new units, 7000 retrofits) Provide financial incentives to stimulate the market. Use range of delivery mechanisms depending on individual circumstances	Intermediate development (3300 new units, 7000 retrofits) Provide financial incentives to stimulate the market. Use range of delivery mechanisms depending on individual circumstances
Service Delivery		Depends on individual circumstances. Mechanisms include: new build and upgrade programmes delivered by UK-wide companies; investment in local companies; LA led production, design, construction and maintenance	Depends on individual circumstances. Mechanisms include: new build and upgrade programmes delivered by UK-wide companies; investment in local companies; LA led production, design, construction and maintenance	Depends on individual circumstances. Mechanisms include: new build and upgrade programmes delivered by UK-wide companies; investment in local companies; LA led production, design, construction and maintenance
Implementation		Delivery over five years	Delivery over five years	Delivery over five years
Funding		Mixed funding	Mixed funding	Mixed funding

Text in red indicates where the alternative options differ from the preferred way forward.

This short-list represents the conclusions of the qualitative options analysis and has been constructed by combining preferred way forward (green) options from each category of choice and carry forward options (yellow).

Economic Case part 2 – cost benefit analysis

Key principles

The key assumptions relating to the costs of each of the short-listed options are as follows:

- A programme life of 5 years is assumed (aligned with the agreed programme period, although it is entirely possible to extend past this period and continue to deliver value). Direct costs associated with the programme are recorded for the 5 year period with NPV calculations shown at 5, 15 and 30 years
- **Annual GVA benefits** – the main benefits are energy savings for householders, energy surplus (contribution to the grid) and new jobs:
 - **Energy saving** data is based on research undertaken by the Welsh School of Architecture, Cardiff University⁸² for both new build and retrofit houses. The annual saving is multiplied with the expected number of each type of property for each option to provide quantified benefit
 - **Energy surplus** – while it is theoretically possible for energy positive housing to provide electricity back into the grid, for prudence, this has not been assumed to be a significant benefit
 - **New jobs** – the principal benefit for this proposal, the benefits of increased performance have been calculated by multiplying the expected number of new construction jobs per year (c19 per £1million invested) by the additional expected GVA added per job, to give total GVA expected per year. The assumption is that created jobs will have a degree of permanency and therefore each year, new jobs are added the duration of the programme, which has a cumulative effect on the GVA for 5 years. This is a conservative estimate and jobs are likely to be created for a longer period than the 5 year programme. This approach is used to model cumulative benefits throughout the programme period, after which time the number of created jobs is considered to be static and the benefit fixed for the remainder of the appraisal period

⁸² Preparation for an Energy Positive Community in the UK Modelling-led innovative housing practice in Wales
Phil Jones, Xiaojun Li, Jo Patterson, Ester Coma, Simon Lannon

- The **costs of the programme** – include staffing costs, new housing costs (the difference between a new build HAPS house and a comparable standard build, which is c£25k), retrofit housing costs and associated project costs (supply chain development and monitoring and evaluation)
- **Risk** – of higher costs or lower benefits delivery is incorporated into the expected ranges used in the calculations and is therefore part of the analysis

Assumptions, benefits and costs that apply to all options

- The programme will be entirely funded by the Swansea Bay City Deal. £15million has been allocated to the HAPS programme, however the HAPS programme will lever in public and private sector funding to add value to the City Deal funds – see Financial Case.
- The benefit claimed for new job GVA is the difference between the average Welsh job GVA and a ‘construction of buildings’ GVA value (£23,572) to take account of displacement, in accordance with Green Book principles

Costs and benefits have been estimated by using ranges representing the ‘least’ expected cost/benefit; the ‘expected’ cost/benefit and the ‘maximum’ cost/benefit. Rather than using a single point estimate, the use of ranges and probabilistic Monte Carlo analysis provides output ranges. This allows a richer view of the potential value of each option and the expected costs of the preferred option and options’ sensitivity to change⁸³.

Option 1 – the status quo – costs and benefits

While the status quo undoubtedly delivers benefits, to simplify the analysis, no benefits or costs are recorded for the status quo as it represents the baseline or ‘counterfactual’ – all benefits and costs for ‘do something’ options are considered to be additional to this baseline.

Options 2, 3 & 4 – costs and benefits

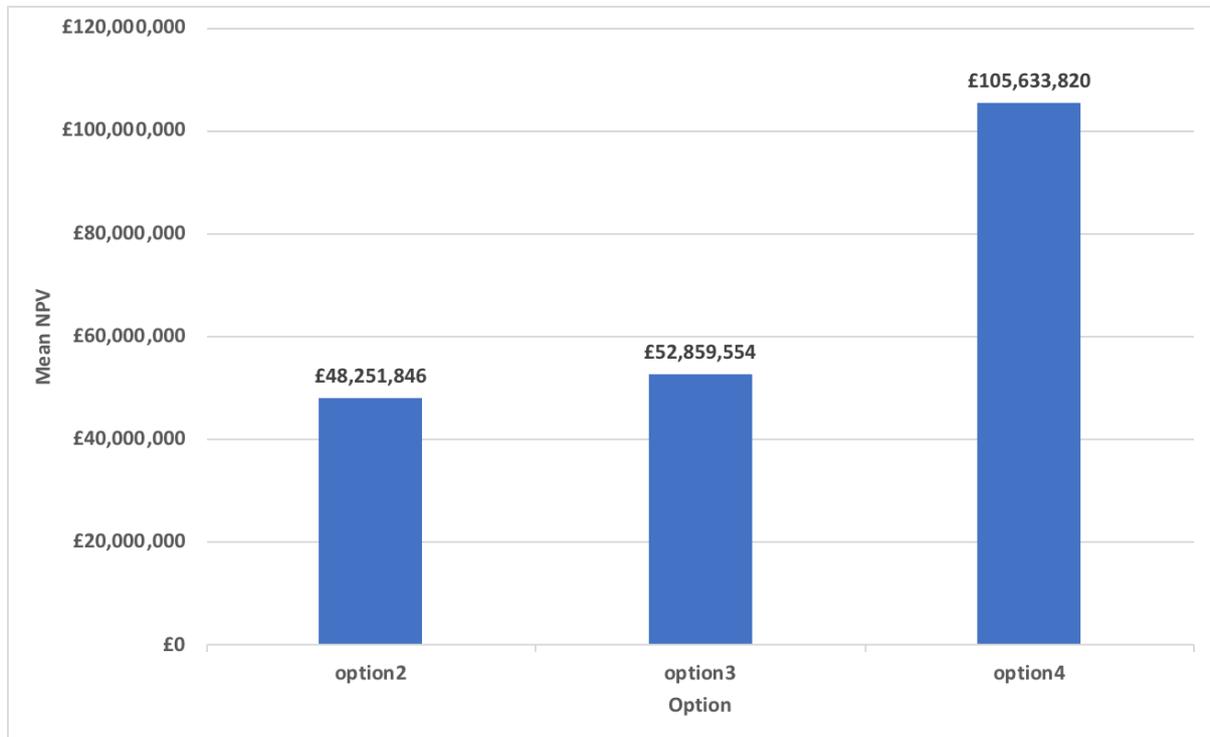
- **Costs** – have been estimated based on NPTCBC estimates for the programme team and research from the Welsh School of Architecture for HAPS and retrofits
- **Benefits** – all benefits are linked to the expected number of new build HAPS and retrofitted houses. The less ambitious options assume fewer units and therefore deliver less benefit. The most ambitious

⁸³ See Microsoft Excel cost model for further details

option assumes more units (and consequently more investment), which delivers more benefit, but takes longer to do so

Results

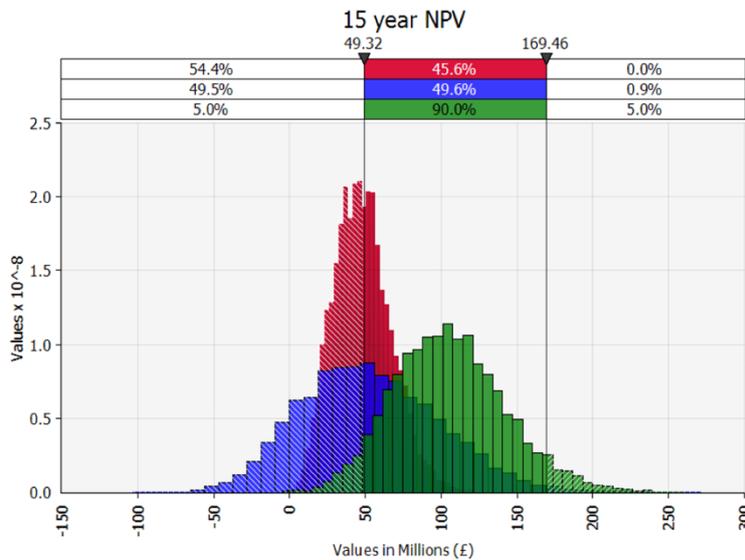
The costs and benefits of each option have been assessed to calculate the mean 15 year NPV as shown below:



This shows:

- All 'do something' options will deliver greater value than the status quo
- The option with the highest NPV is option 4

The calculated NPV distributions for options 2-4 are shown below:



	15 year NPV	15 year NPV	15 year NPV
Cell	Option 2!\$84	Option 3!\$84	Option 4!\$82
Minimum	-£1,452,893.76	-£102,893,969..	-£4,374,701.26
Maximum	£121,629,211...	£271,442,004...	£259,224,504...
Mean	£48,251,846.30	£52,859,553.57	£105,633,819...
90% CI	± £306,833.93	± £746,049.48	± £600,822.49
Mode	£44,156,647.13	£48,184,405.92	£104,224,762...
Median	£47,195,466.48	£49,906,626.36	£103,806,562...
Std Dev	£18,652,450.47	£45,352,386.13	£36,524,030.03
Skewness	0.3591	0.3373	0.3402
Kurtosis	2.9464	3.0610	3.1462
Values	10000	10000	10000
Errors	0	0	0
Filtered	0	0	0
Left X	£49,318,601.81	£49,318,601.81	£49,318,601.81
Left P	54.4%	49.5%	5.0%
Right X	£169,455,932...	£169,455,932...	£169,455,932...
Right P	100.0%	99.1%	95.0%
Dif. X	£120,137,330...	£120,137,330...	£120,137,330...
Dif. P	45.6%	49.6%	90.0%

These show that:

- option 2 (red distribution) has quite a narrow NPV range
- option 3 (blue) has a much wider distribution range and a probability of delivering both a higher and lower mean NPV than option 1
- option 4 (green) has a similarly wide distribution range to option 2 but with, overall, a significantly greater chance of delivering a higher NPV than both alternatives

Economic Case conclusion

Based on this analysis, option 4 is the preferred option.

The programme has concluded that option 4 should be progressed. The remainder of this business case (Commercial, Financial and Management cases) focus on option 4 as the preferred solution.

Commercial Case

This section of the Full Business Case outlines the proposed deal in relation to the preferred way forward described in the Economic Case. This includes procurement activity and agreements with other parts of the organisation/other organisations.

Procurement strategy

As lead local authority for the HAPS programme, Neath Port Talbot County Borough Council will ensure compliance with public procurement policy i.e. directives, regulations, policies and guidance relating to the procurement of supplies, services and works for the public sector.

Each local authority has its own contracts procedure rules for the procurement of goods, services and works, addressing the requirements of best value. The rules are aligned to the Public Contracts Regulations 2015. The rules ensure a system of openness, transparency and non-discrimination where the accountability and probity of the procurement process will be beyond reproach.

Required services

The preferred way forward described in the Economic Case proposes a programme of activity across the Swansea Bay City Region focused on the following elements:

- New build project
- Retrofit project
- Supply chain development fund
- Monitoring and evaluation

New build and retrofit projects

Under the direction of a Programme Manager (to be appointed by the lead local authority) two project managers will be appointed to the HAPS programme, one for the new build project and the other for retrofits. Their main role will be to ensure the adoption of the HAPS approach in the public and private housing sectors.

A limited financial incentives fund will be established to fund the gap between standard build and energy positive to 'kick start' the adoption of the HAPS approach. The programme team will align and add value to existing programmes such as the Welsh Government Innovative Housing Programme (IHP).

Supply chain development fund

Funding has been identified within the HAPS programme to support the development of a sustainable and skilled regional supply chain to deliver the HAPS approach during the life of the programme and beyond.

The first stage will be to map out renewable technology supply chain companies – this will be carried out in conjunction with the advisory group with industry partners.

The 'Supply Chain Development Fund' will be established and scheme guidance will be developed in line with State aid guidelines.

The aim of the fund is to assist suppliers to grow, develop and diversify into renewable technologies. It will be managed by the HAPS programme team, overseen by the SRO and will report to the HAPS Steering Group.

The HAPS project will work with the Skills and Talent project to identify the skill requirements for decarbonisation and the workforce is appropriately skilled or upskilled to take advantage of this growing industry.

The HAPS Supply Chain Investment Fund will be advertised across the region, and a series of engagement events will be held with potential suppliers from across the industry. These activities will be linked to other support programmes such as Business Wales.

There will be an application process based on the existing Neath Port Talbot County Borough Council discretionary SME funding scheme. The process will be:

1. Initial enquiry
2. Application form to be completed and assessed
3. Application to be assessed by the HAPS Programme Board
4. Client notified of outcome
5. Monitoring of funding

The funding will be awarded in line with State aid rules.

The intention is to ensure that the legacy of the HAPS programme is a co-ordinated, robust and sustainable supply chain, capable of delivering and maintaining HAPS technologies across the region and beyond.

Cardiff University's Welsh School of Architecture is carrying out a supply chain development exercise with the City and County of Swansea. The HAPS programme will review this and identify good practice/lessons learned with a view to developing the regional HAPS supply chain.

The HAPS programme team will continue to liaise with key partners in relation to skills including but not solely, the City Deal Skills and Talent Programme, FE, HE and the Renewable Energy Skills Forum (Wales) to ensure the workforce is suitably skilled to take advantage of the opportunity of the HAPS programme.

Market distortion

In terms of market distortion, the energy market is currently distorted through subsidies - fossil fuel is heavily subsidised at the moment and climate change is not adequately costed in relation to the cost of carbon. In addition, renewables and energy efficiency measures receive subsidies, although this is decreasing.

The HAPS programme is a pioneering programme to prove the 'homes as power stations' concept at scale in both new build and retrofit developments – moving away from one off demonstrators. It will provide evidence of the benefits of incorporating renewable technologies and design into new build developments and retrofit programmes to deliver smart, low carbon, energy efficient homes – leading to a reduction in fuel poverty and its impact on health and well-being, and contributing to carbon emission reduction targets in line with UK and Welsh Government policies.

The HAPS programme aims to prove the concept that incorporating renewable technologies and design in housebuilding and retrofit programmes will produce energy positive homes / 'homes as power stations' i.e. homes which produce more energy than they use over a 12 month period.

Private sector house builders do not currently have to build energy positive homes and the current cost model does not make it a commercially attractive option, therefore the current demand is not there and the supply is not mature. However this is changing due to Welsh Government Building Regulations Part L requiring an uplift in energy efficiency standards for new build domestic buildings.

The aim of the HAPS programme is to demonstrate initially through the public sector that by developing energy positive homes at scale, and carrying out retrofit programmes at scale will reduce the cost differential between a standard build and energy positive build or retrofit. The HAPS programme will facilitate the take up of renewable technologies in the public sector and demonstrate the benefits to encourage the private sector to adopt the concept. There is market failure within the private sector due to the current cost differential and lack of evidence of the benefits of developing homes as power stations i.e. energy positive homes. HAPS will prove that developments at scale will reduce the cost differential and encourage the private sector to integrate design and technologies in new build developments, and retrofit programmes.

The HAPS programme will be monitored and evaluated to provide evidence that the benefits will outweigh the additional cost. The monitoring and evaluation will cover three areas:

- Energy efficiency (including reduction in carbon emissions)
- Health and well-being (including tackling fuel poverty)
- Social science

The multiple benefits of energy positive housing and energy efficiency are not costed in the provision of affordable warmth and reducing fuel poverty. This has major health and well-being benefits, which have a positive impact on health services. Large scale adoption of homes as power stations type new build and retrofits will create major job opportunities and supply chain activity, which will deliver socio-economic benefits to the region including developing a sustainable indigenous supply chain.

The HAPS programme will include an education / dissemination programme to identify good practice, lessons learned in terms of design and technologies permutations in relation to site location, tenure etc.

The HAPS programme will therefore not distort the market:

- The programme is key to delivering government policy in particular Prosperity for All: A Low Carbon Wales and Industrial Strategy Transforming Construction challenge area.
- The market is currently not delivering energy positive homes at scale.
- It will lead to a more mature and balanced supply and demand relationship.
- It will improve awareness of what technology can deliver.
- It will also identify and quantify multiple benefits.

- It will test financial models for new build and (more importantly) for retrofit.
- The technologies already exist - the innovation is in how the technologies are integrated and moving away from one off demonstrators to developments at scale.
- It will stimulate the growth in the innovation and technology market in line with government policy.
- The demand is currently not there at scale, and the supply is not mature enough

The HAPS programme will deliver any incentives in line with State aid regulations e.g. supply chain development

Monitoring and Evaluation

The HAPS programme will procure the services of an organisation to monitor and evaluate its activities. As the programme budget for monitoring and evaluation is £250,000 and NPTCBC's and the OJEU threshold for local authorities is £181,302, the contract will be procured via OJEU or a suitable framework. The programme manager will scope the tender specification based on the HAPS Investment Objectives.

Monitoring and evaluation will be in three phases across the five years of the programme, including the social aspect and health and wellbeing benefits of HAPS:

- **Phase 1** – at the beginning of the programme baseline data will be collated
- **Phase 2** – at the end of Tranche 1 (see outline programme plan) an interim evaluation will be carried out. By this time, it is expected that the first 200 new build and 250 retrofit HAPS homes will have been completed
- **Phase 3** – toward the end of the programme a full and final evaluation will be undertaken to inform decisions about future rollout of HAPS technologies

It is highly likely that the procurement exercise will be split into two separate tenders 1) CO₂ emissions 2) Health and wellbeing aspect of HAPS. Requirements for the specification are already being discussed with Public Health Wales and a working group has been established to develop these.

The programme team will record examples of good practice, risks, costs and benefits on an ongoing basis which will serve the dual purposes of ensuring that the HAPS programme remains on track and delivering the anticipated benefits, as well as informing the more substantial interim and final evaluations. Recent research has found that investments in energy efficiency improvements in housing provide a wide range of benefits to the lives and wellbeing of residents and that, *“it is not unlikely that this may produce value in terms of benefits to the NHS and social services in the longer term.”*⁸⁴ It is intended that the evaluation will seek to define these additional health benefits more clearly.

Good practice examples of monitoring and evaluation specifications and exercises are currently being collated. In addition, the Welsh School of Architecture (Cardiff University) are currently undertaking a research project with Carmarthenshire County Council and findings from this will inform the monitoring and evaluation procurement for the HAPS programme.

The HAPS path finder/pilot scheme is due on site in summer 2018. This is a collaborative project between Pobl (Registered Social Landlord), SPECIFIC (Swansea University) and Neath Port Talbot CBC. The monitoring and evaluation of this project is funded by UK Government (BEIS), with Welsh Government carrying out its own monitoring exercise as the development is part funded by the Welsh Government Innovation Housing Programme 2017/18.

Personnel implications (including TUPE)

It is anticipated that TUPE (Transfer of Undertakings (Protection of Employment) Regulations 1981) – will not apply to this investment because the programme will not have any impact on the employment of existing staff. The proposed operating model for the programme is outlined in the Management Case and does not include the transfer of any staff.

FRS 5 Accountancy treatment

Neath Port Talbot CBC will not create any assets through the HAPS programme. The City Deal funding will not be used to create assets, the City Deal funding will be used to fund the programme management arrangements, provide financial incentives, develop the supply chain, marketing and fund the monitoring and evaluation.

⁸⁴ Public Health Research 2018, Vol 6, No 5, page 77

For completeness, if any partners create assets, these will be logged on a HAPS programme asset register and submitted with monitoring reports.

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Financial Case

Introduction

The Financial Case provides assurance that the short-listed options, with particular focus on the preferred way forward, are affordable, taking into account all potential funding sources. It should be noted that the costs are evidence based projections based on previous programmes and projects and will be refined during the implementation of the HAPS programme. The City Deal funding envelope of £15 million is to establish the required infrastructure and develop the delivery model with a view to delivering the HAPS programme over five years.

All of the costs will be finalised as part of programme definition arrangements. The nature of the HAPS programme is to scale up activity and therefore increase the affordability of the HAPS concept by refining the cost envelope. This will be reflected in regular financial forecast updates during the life of the programme.

Financial Case – summary / overview

The HAPS programme is requesting £15m (capital funding) from the City Deal to support delivery of the following activities:

1. Establish a programme team (£1m)
 - a. To manage the regional programme of activity
 - b. Manage the regional supply chain development fund
 - c. Manage the regional financial incentives fund

2. Establish a regional targeted financial incentives fund (£10.5m)

This is approx. £1k per property gap funding depending on the scheme – and will be determined to optimise investment. The financial incentives will not act as a subsidy for every development. It will be an incentive scheme at the start of the programme to incentivise the adoption of the HAPS approach (similar to IHP). The fund will be State aid compliant.

3. Establish a supply chain development fund (£3m)
 - a. To support local companies to develop and diversify.

4. Marketing / education / dissemination activity (£250k)
 - a. Promoting the benefits of the HAPS approach

- b. To develop and communicate a tested, quality assured flexible design approach
 - c. Private sector engagement
5. Carry out an ongoing monitoring and evaluation programme (£250k)
- a. Energy efficiency
 - b. Health and wellbeing (in partnership with Public Health Wales)
 - c. Social science (in partnership with academia)

Overall affordability

The HAPS programme has been prioritised as one of the eleven projects identified as necessary to deliver the Swansea Bay City Deal investment programme. The region has allocated £15 million from its £241 million City Deal fund to the HAPS programme, subject to the submission and approval of a business case.

The £15 million will finance the following main activities: to establish a programme team which will manage the new build and retrofit projects (including financial incentives); manage the supply chain development fund (including a business grant process); associated marketing activity; and procure an organisation to undertake monitoring and evaluation at key stages of the programme.

The inflation⁸⁵ adjusted revenue requirement for this programme will be funded through the City Deal as follows (note – only five years’ appraisals are shown, consistent with the proposed programme duration) and the HAPS Programme Board will be responsible for ensuring that the programme delivers within its agreed boundaries.⁸⁶

Yr	Programme team	Financial incentives	Supply chain development	Marketing	Monitoring & evaluation	Total	Inflation Factor	Total
0	£200,000	£1,450,000	£250,000	£50,000	£50,000	£2,000,000	1	£2,000,000
1	£200,000	£2,950,000	£750,000	£50,000	£50,000	£4,000,000	1.028	£4,112,000
2	£200,000	£3,700,000	£1,000,000	£50,000	£50,000	£5,000,000	1.0609	£5,304,500
3	£200,000	£2,450,000	£1,000,000	£50,000	£50,000	£3,750,000	1.1087	£4,157,625
4	£200,000	-	-	£50,000	£50,000	£250,000	1.1475	£286,875
	£1,000,000	£10,500,000	£3,000,000	£250,000	£250,000	£15,000,000		£15,861,000

⁸⁵ The HAPS Programme Board will manage the programme within the £15 million City Deal funding allocation.

⁸⁶ Managing Successful Programmes best practice states that the Programme Board is responsible for ensuring that the programme delivers within its agreed boundaries (e.g. cost, impact, rate/scale of adoption, expected/actual benefits etc).

Other sources of funding

The HAPS Programme Board have a budget of £15 million which will be to recruit a programme manager and project managers, oversee the development of a supply chain investment fund and procure the services of a professional organisation to undertake the monitoring and evaluation of the programme. A substantial part of the funding will be used to 'pump prime' the adoption of the HAPS concept through funding elements of technology products in new build and retrofit properties.

The HAPS programme will be working closely with a range of other publicly funded programmes and projects which are already delivering energy efficient properties. HAPS funding will be used to add value to these initiatives and ensure that HAPS technologies are deployed to maximise the benefits of other energy efficient programmes to ensure the best use of public funds.

The investment in programme/project management will be used to ensure that there is a greater level of co-ordination and engagement across the region, enabling public funds to be used to the greatest effect. Local authorities are aiming to encourage the adoption of the HAPS concept for all new build developments and retrofit programmes through the targeted use of the HAPS financial incentives to plug the current gap between a 'standard build' and a 'HAPS build'.

The ultimate aim of the HAPS programme is to fully engage the private housing sector in adopting the HAPS concept in all future housing developments and retrofit programmes. Previous programmes have found that it can be difficult to engage the private sector due to commercial and operational barriers. As well as substantial marketing activity to engage the private sector, the benefits from HAPS technologies will be evidenced in the prototype and first tranche developments, together with reductions in costs through economies of scale working towards a cost neutral scenario, meaning that utilising HAPS technologies will be much more attractive to the private sector.

Engagement with the private sector has already started, and will increase over the 5 years of the programme. The HAPS concept will be 'proved' during the first few years and the cost envelope of the technology will be reduced, the concept 'de risked' and the substantial benefits such as improvements in health and wellbeing and reductions in fuel poverty will

be demonstrated making it an attractive offer for the private sector to adopt. The private sector will be encouraged to adopt the HAPS concept and take advantage of the HAPS financial incentives, to bridge the current technology cost gap between a standard build and a HAPS build, will be an additional driver of change.

With financial incentives and land availability (not subsidised land) it would not be unreasonable to expect to see induced funding at the levels indicated in the following table:

	2018/19	2019/20	2020/21	2021/22	2022/23	Total
City Deal	£2,000,000	£4,000,000	£5,000,000	£3,750,000	£250,000	£15,000,000
Private	£23,075,000	£47,675,000	£73,050,000	£102,600,000	£129,500,000	£375,900,000
Other programmes	£6,425,000	£14,075,000	£22,200,000	£31,400,000	£40,500,000	£114,600,000
Total	£31,500,000	£65,750,000	£100,250,000	£137,750,000	£170,250,000	£505,500,000

It **needs to be noted that** the HAPS programme will not develop a stand-alone private sector house building programme, it will encourage the private sector to adopt the HAPS concept for planned developments. RSLs have private trading arms, and use private financial borrowing to fund developments, this is another way in which private sector funding will add value to the HAPS programme.

See below table of identified public and private funding sources:

Funding source	Status
Public Funding	
WG Innovation Housing Programme (IHP)	Individual schemes to apply for IHP. IHP is a competitive annual programme to fund innovation in house building.
Social Housing Grant (SHG)	SHG will fund up to 58% of RSL housing build costs. The 4 local authorities agree a SHG programme for current and future years and will encourage RSLs to adopt the HAPS concept in their SHG new build programmes.
Housing Revenue Account (HRA)	C&C Swansea, Carmarthenshire CC and Pembrokeshire CC are local housing authorities with access to HRA, and the HAPS concept will be adopted for new build programmes where practicable.
Affordable Homes Guarantees Programme (AHG)	This is a financial mechanism available to deliver the HAPS programme.
Arbed	HAPS programme team to discuss maximising Arbed to deliver aims and objectives of HAPS project. The City Deal and HAPS programme will add value to the Arbed programme.
Energy Company Obligation (ECO)	HAPS programme to discuss maximising ECO to deliver aims and objectives of HAPS project.
Local Authority land banks	Local authorities will make land available on a case by case basis to encourage housing developments to adopt the HAPS concept.
Private Sector funding	
Private sector finance	RSL borrowing will contribute to the private sector leverage in the HAPS programme.
Private sector developer build costs	Linked to individual scheme funding packages.
Grant incentives	Private sector funding leverage into the HAPS programme
Private sector contribution to retrofits (home owners / private rented sector)	Private sector funding leverage into the HAPS programme.
Supply chain development	Sustainable supply chain development to increase private sector leverage into the HAPS programme

Sustainability/exit strategy

The Homes as Power Stations exit strategy will be refined during the early stages of the programme. There will be no financial incentives or business grants in the final year as it is anticipated that by year five the programme will have developed and established a structured, well-coordinated, scaled up approach to ensure the long-term sustainability of the HAPS concept incorporating the following elements:

- Quality assured/building regulation compliant design and construction processes
- Proven and established affordable cost model
- Sustainable and skilled supply chain

Assessing affordability

The City Deal has determined that sufficient funds are affordable for the programme and these are available subject to approval by the Swansea Bay City Deal Joint Committee.

Stakeholder/commissioner support

The HAPS programme has been prioritised as one of the eleven projects within the Swansea Bay City Deal investment programme. The Welsh Government and UK Government will review the business case and advise the City Deal regional office when money can be released.

Management case

Introduction

The Management Case addresses the achievability of the proposal and planning arrangements required to both ensure successful delivery and to manage programme risks.

Programme and Project Management (PPM) arrangements

Programme management is a vital component in the delivery of change; whether change to public or customer services, or change within organisations. In the government context, Programme management is what the best policy makers have always done, though they may not have called it that; thinking through the end-to-end process to translate policy into delivery plans and into desired outcomes.⁸⁷ See Annex A for the benefits of programme and project management.

Programme plan

A phased introduction of the programme is envisaged over the first year with a programme team to be appointed following approval.

Over the course of the programme, the strategic intention is to scale up, from proof of concept in the public sector to a targeted roll out of the HAPS concept to the private sector. Through this scaling up of activity it is anticipated that the costs associated with HAPS innovation will move to a more affordable cost envelope and the concept will be de-risked. Therefore, the HAPS programme is an evolving 'live' activity and the programme plan will be updated on a regular basis, with individual projects moving from proof of concept, to design, to funding secured.

Critical timeline

The critical timeline is as follows:

- Gareth Nutt appointed as Senior Responsible Officer (complete)
- SBCD Joint Committee agreement of NPTCBC as lead authority (complete)
- Financial/legal considerations
- Complete Full Business Case
- Business case review process (see Annex F)

⁸⁷ <https://www.gov.uk/government/publications/best-management-practice-portfolio/about-the-office-of-government-commerce>

- SBCD Joint Committee approval of Full Business Case
- Recruitment of programme team
- Programme definition commences

Programme Management and Programme Initiation

Defining a programme in accordance with MSP involves the following activities, which now need to be undertaken:

1. Establish the infrastructure for defining a programme
2. Establish the team to define the programme
3. Identify and analyse the stakeholders (see Annex D for outline)
4. Refine the vision statement
5. Develop blueprint
6. Develop benefit profiles
7. Model the benefits and refine the profiles
8. Validate the benefits
9. Design the project dossier
10. Identify tranches
11. Design the programme organisation
12. Develop the governance arrangements
13. Develop the programme plan
14. Develop and confirm the business case
15. Consolidate programme definition
16. Prepare for the first tranche
17. Approval to proceed

Each stage will be briefly described:

1. Establish the infrastructure for defining a programme

Following review by the SRO, Neath Port Talbot CBC will submit this Full Business Case for approval to the Joint Committee and following the release of funds will establish a programme office for the HAPS Programme.

2. Establish the team to define the programme

The SRO for the HAPS Programme will be Gareth Nutt, Director of Environment. A Programme Manager will be recruited, followed by the recruitment of two Project Managers (new build and retrofits). An Administrative Officer will also be recruited to support the programme. The programme team will have access to specialist advisers and subject matter experts.

3. Identify and analyse the stakeholders

An outline stakeholder plan has already been prepared, see Annex D.

4. Refine the vision statement

The City Deal have provided a vision for the HAPS Programme:

‘By 2030, South West Wales will be a confident, ambitious and connected City Region, recognised internationally for its emerging knowledge and innovation economy’

5. Develop blueprint

The City Deal have also set out a blueprint ‘Building on the capabilities of existing organisations and research facilities within the region that are developing new technologies to allow buildings to generate, store and release energy, this initiative seeks to undertake an extensive new house build and retrofit programme which integrates such technologies. Whilst this programme will help to generate sustainable and affordable homes and address fuel poverty, it will also develop and seek to attract new sector supply chains incorporating leading research and high value manufacturing and construction operations. The UK and Welsh Governments expect the Swansea Bay City Region’s proposals to be ambitious and additional to the existing innovation landscape.’

6. Develop benefit profiles

High level benefits are described in the Strategic Case and the programme team will develop benefit profiles during the programme definition stage.

7. Model the benefits and refine the profiles

The programme team will model the benefits from stage 6 and refine the profiles to ensure that the optimal level of benefit is delivered as the programme progresses.

8. Validate the benefits

As the programme progresses and the benefits start to be delivered, the process will be validated, measures tested, and the HAPS Programme Board advised if the programme is delivering the expected level of benefit, so that remedial action can be taken if necessary.

9. Design the project dossier

At this stage it is envisaged that there will be four projects in the dossier:

- New build project
- Retrofit project
- Supply chain development fund
- Monitoring and evaluation project

These projects will be supported by a branding, marketing and communications strategy.

10. Identify tranches

At this stage it is envisaged that there will be three tranches within the five year programme:

Tranche 1 – establish the programme infrastructure, procure the independent organisation that will undertake the monitoring and evaluation, baseline the programme, integrate existing/related project activity, ensure the development of 200 new builds and 250 retrofits in line with the HAPS specifications (see Annex E).

It is important to note that the allocation of public housing in line with ‘nomination rights’ is the responsibility of the local authorities and housing associations and these organisations will be consulted by the project managers.

Tranche 2 – undertake an interim evaluation and ensure that any recommendations are integrated into the programme, continue with new builds and retrofits (supported by financial incentives), initiate the supply chain development fund (including the business grant scheme) supported by business teams from the participating local authorities.

Tranche 3 – continue with new builds and retrofits through to the end of the programme, ensure that the supply chain is robust and sustainable for the future, showcase the programme to Welsh and UK interests, commence the final monitoring and evaluation and implement the exit strategy.

Throughout the programme it is envisaged that there will be a co-ordinated approach to branding, communications and marketing to ensure:

- Stakeholder engagement, especially to encourage engagement from the private sector
- Industry awareness
- Public interest is raised to counter poor up take as described in Strategic Case
- The programme is promoted regionally, nationally and internationally

11. Design the programme organisation

The programme will be organised as shown in the following Figure and integrated with the Swansea Bay City Deal governance arrangements:

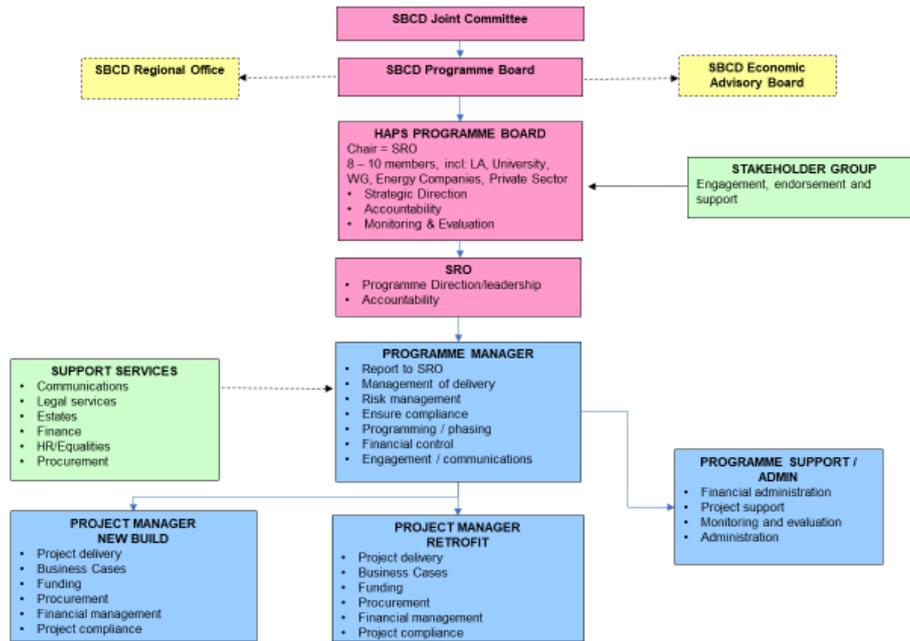


Figure 7 – HAPS Programme organisation

12. Develop the governance arrangements

See also Figure 7 above. Corporate governance for this scheme will be provided by a HAPS Programme Board which will meet monthly. The programme board will manage the investment fund and provide overall programme management, co-ordination and links to other Swansea Bay City Deal programmes, particularly the Skills and Talent programme.

13. Develop the programme plan

The outline programme plan is shown in the following Figure:

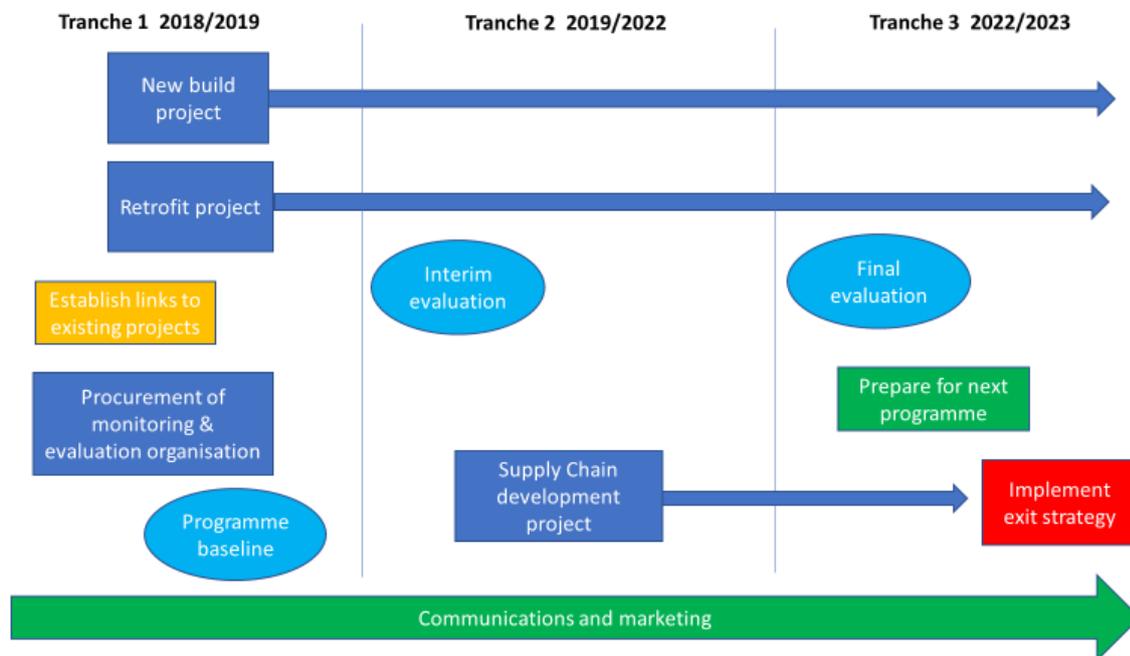


Figure 8 – outline programme plan

14. Develop and confirm the business case

Constantly reviewing the business case and ensuring that the programme is on track to deliver the expected benefits and value for money is a key task for the programme team.

15. Consolidate programme definition

The programme team will generate appropriate logs, plans and policies.

16. Prepare for the first tranche

Prior to seeking approval of the HAPS Programme Board to proceed, the programme team will ensure that all the key elements to deliver a successful programme are in place. Choices will be made by the SRO in consultation with the SBCD Programme Board and the Programme Manager to assess which combination of people, processes and technology (and locations) are most likely to realise the vision and achieve the outcomes described in the blueprint.

17. Approval to proceed

The HAPS Programme Board will authorise the programme to commence when it is satisfied that the programme is ready and organised to initiate a series of activities that will deliver transformational change and the expected benefits.

Benefits realisation strategy

The benefits for this scheme were identified in the Strategic Case and were assessed in the Economic Case. These are the core benefits and form the initial benefits register. The focus and importance of benefits will change and will be actively managed as the programme develops and is delivered.

The HAPS Programme Board will be responsible for owning benefits up to the point of completion of the programme or until the formation of a new governance structure.

The benefits register will be maintained and owned by the HAPS Programme Board and reviewed and updated monthly.

Communication Strategy

Once the HAPS programme team is in place, the benefits of adopting the HAPS concept will be disseminated across the region and wider.

This will lead to increased confidence with the public, private and third sector together with residents.

The aim of the HAPS project is to identify the optimum mix of technologies and design.

There is the potential for the HAPS project to become a Centre of Excellence for energy efficient homes, as the innovative aspect of the HAPS project is how the technologies are integrated and presented to the occupant and ease of use of technologies.

The programme team in consultation with partners and key stakeholders will agree an official name for the project post approval.

Communicating the benefits of the HAPS programme

The HAPS programme will deliver a number of significant benefits, which will be communicated through the communication plan, including:

- Vehicle to mainstream energy positive homes across all sectors
- Reduce energy spend through reducing energy consumption for residents

- Reduced CO2 emissions through reduced energy consumption and improved renewables mix
- Uplift in property value from retrofit
- Reduction in fuel poverty
- Improve health and wellbeing through a reduction in respiratory and cardiovascular disease
- Reduction in costs for NHS
- Additional gross jobs created
- Businesses created through development of an integrated and sustainable local supply chain
- Overall improvement in domestic SAP/EPC ratings
- Increased security of supply through demand side response management
- Increase in energy contribution to national grid (on-going discussions)
- Increase in skills due to requirement for staff and training scheme

Communicating the commercial advantage of the HAPS approach

- The aim of the HAPS programme is to demonstrate the commercial advantage of adopting the HAPS approach which is an incremental staged approach for the delivery of nearly and zero energy homes ultimately leading to the decarbonisation of the domestic housing sector.
- The HAPS programme will develop a model to create a sustainable market for this approach future proofing as best as possible subject to the advancement of renewable and low carbon technologies.
- The HAPS programme will develop different models for different tenures, e.g. Social housing, high income private home owners, low income private home owners and will demonstrate a range of models and design approaches
- The HAPS programme will test a range of building models applicable to different types of tenure. This particularly applies to retrofit. There are also options for combining retrofit and new build in combination for various social groups, especially relating to downsizing for the elderly. It will provide a one stop shop approach to the technology within this range of tenure related business models.

- The HAPS programme will go some way to develop an understanding and cost model of the lifetime payback of the homes as power stations (energy positive homes) approach. The affordability will also depend on the energy market

Building confidence in renewable technologies

There will be a linked education programme to build confidence in renewable technologies.

Key areas to be covered include:

- Building confidence via an education programme including ‘myth busting’
- The HAPS project will seek to encourage behavioural change with a focus on occupants and suppliers

Risk management strategy

High level risks associated with this scheme were identified in the Strategic Case. These are the core risks and form the initial risk register. The focus and importance of risks will change and will therefore receive active management as the scheme develops.

The approach will be to ensure that risks are:

- **Identified** – includes risks being considered that could affect the achievement of the programme’s objectives, and then described to ensure that there is common understanding of these risks
- **Assessed** – includes ensuring that each risk can be ranked in terms of estimated likelihood, impact and immediacy, and understanding the overall level of risk associated with the programme
- **Controlled** – includes identifying appropriate responses to risks, assigning risk owners, and then executing, monitoring and controlling these responses

The HAPS Programme Board will be responsible for managing and mitigating risks up to the point of completion of the programme or until the formation of a new governance structure.

The risk register will be maintained and owned by the HAPS Programme Board which will be reviewed and updated as required monthly.

Reviews

Gateway Reviews will be undertaken for the City Deal Investment Fund as a whole, which will include the HAPS Programme.

At the end of each tranche of the HAPS programme there should be a full review to assess the ongoing viability of the programme and ensure that the delivery options and strategy remain optimal. The programme's business case, benefits and benefits management approach must be reviewed at the end of each tranche.

The end of tranche review provides a go/no-go decision point for the programme: it should only be allowed to continue to the next tranche if it is still viable. The SRO is accountable for ensuring that this review is undertaken formally, but it will need the authorisation of the SBCE Joint Committee to support the recommendations.⁸⁸

Use of special advisors

Specialist advice has been sought for the development and production of this FBC from Value People Limited, in partnership with the Lead Authority Neath Port Talbot CBC on behalf of SBCR, to ensure that Neath Port Talbot CBC and SBCR maintains control and ownership of the scheme.

Technical input has been provided by Professor Phil Jones, Cardiff University.

Regional advisory / technical steering group

A regional advisory / technical steering group will be established to provide impartial advice to the project team and partner local authorities.

⁸⁸ Managing Successful Programmes, 2011, page 207

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Annex A: The benefits of Programme and Project Management

All organisations have business strategies that set out plans to deliver changes that will drive business objectives e.g. growth and performance.

By breaking a business plan into programmes and projects, senior management ensure a rigorous approach through a standard methodology and a set of techniques that ensure visibility through reporting, control mechanisms, management of risk, cost, quality and change.

A strategy is broken into a portfolio of programmes which deliver outcomes, the programmes are further broken down into projects which deliver outputs. The outputs from projects enable benefits or outcomes to be realised by programme management.

Why are programmes and projects so effective? OGC states that the successful management of change involves several activities which include:

The establishment of a formal programme to deliver the business change:

- Ensuring that key individuals have explicit roles and responsibilities within the programme
- The adoption of a structured project management approach
- Assurance that there are clear communication channels
- Assurance that projects are continually driven by the business case

Each of these activities are assured by programme and project management, because in using programmes and projects to deliver change organisations get access to widely recognised tools, methods, and techniques delivered by recognised and certified experts. For example:

- Establishment of roles and responsibilities is built into project management lifecycles and supported by tools like the RACI Chart
- Project managers work to a structured approach be that a waterfall method like Prince2 or an agile method like Scrum
- These approaches are supported by guidance a body of knowledge, tools and templates. Alignment with the Business Case or strategic goals is built into project and programme methodologies.

- Business case alignment is a prerequisite to prevent white elephant and pet projects

OGC identify several factors for successful business change including: leadership, clear accountability, robust risk management, effective measurement and management of benefits, effective interaction with stakeholders, realistic timescales and sharing of lessons learned. All of these form the founding principles of effective programme and project management and it is not surprising that OGC also list "excellence in programme and project management skills" as a key factor in successfully delivering change.⁸⁹

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⁸⁹ Advantages of Project and Program management <https://www.stakeholdermap.com/project-management/advantages-projects-and-programs.html>

Annex B – Housing need and demand

Housing need and demand in Wales 2006 - 2026					
http://gov.wales/docs/caecd/research/100707-housing-demand-need-2006-en.pdf					
	Market	Non Market		20 years	3.95 - thousand units per year
Swansea	13.1	9.7	22.8		3950 units per year
NPT	10	7.7	17.7		
Pembrokeshire	9.8	4.6	14.4		
Carmarthen	16	8.1	24.1		
			79 (thousands)		
Estimates of housing demand from Local Authority Development Plans					
https://swansea.jdi-consult.net/ldp/readdoc.php?docid=260&chapter=6&docelemid=d39841#d39841					
https://www.npt.gov.uk/media/7321/ldp_written_statement_jan16.pdf					
https://www.pembrokeshire.gov.uk/adopted-local-development-plan					
http://www.cartogold.co.uk/CarmarthenshireLDP/english/text/06_Specific-Policies.html#Ch6_2					
	No of units	Time	Years	no per year	
Swansea	20106	2010 - 2025	15	1340	3692 units per year
NPT	8760	2011 - 2026	15	584	
Pembrokeshire	5724	2013 - 2021	8	716	
Carmarthen	15778	2006 - 2021	15	1052	
				3692	

Annex C – Letters of support

Active Building Centre – see attached

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Annex D – Outline Stakeholder Plan

There are many partners and stakeholders within the HAPS programme, with varying degrees of involvement and responsibility. The following table lists and categorises the various organisations and notes whether they are partners or key stakeholders. There are other potential stakeholders such as community groups and the media and these will be managed within the plan.

Programme Partner	Key Stakeholder
SBCR Local Authorities	Home owners
Registered social landlords (RSLs)	Mortgage lenders
SPECIFIC	Private sector house builders
Active Building Centre	Public sector house builders
Local Partnerships	Western Power Distribution (WPD)
Low carbon design consultants	Wales & Welsh Utilities
Flexis	Communications companies
Welsh School of Architecture (WSA)	Energy Catapult
Health Boards & Trusts	Welsh Government
Other City Deal interventions	Welsh Building Regulations
Public Health Wales	Planning Departments
	Building Control Departments
	Welsh Water
	Energy Suppliers
	National Grid
	Energy Saving Trust
	Resource Efficient Wales
	Battery providers
	Low carbon and renewable technology providers
	Tata Steel
	UK Government
	Innovate UK

It is essential to formulate an effective and robust communication and engagement strategy to ensure that all partners and stakeholders are informed of progress and developments of the HAPS programme.

An engagement event will be held to update key stakeholders on developments and provide an opportunity to assess industry engagement. The partners and main stakeholders have been engaged in this programme

since its inception. This demonstrates industry awareness of this proposal and the programmes integration with the wider landscape. This is key to the successful delivery and sustainability of this programme. Detailed attention is required to ensure the further and ongoing engagement of mortgage providers, to ensure that there is adequate understanding of, and financial support for homeowners in, the HAPS programme.

Table of stakeholder events

Stakeholder	Activity
Smart low carbon study project	Questionnaire
Smart low carbon study project	Workshop
Solcer House	Proof of concept demonstration project
NPT RSLs (19/05/17)	Innovation Funding
Regional Regeneration Directors	On-going engagement
Regional HAPS working group	Monthly meetings since 14.07.2017
Local Partnerships	On-going engagement
WPD	On-going engagement
Utilities companies incl. Wales and West	Ad-hoc when required
Private Sector construction companies	On-going engagement
Welsh Government	On-going engagement
Welsh Building Regulations	On-going engagement
Registered Social Landlords (RSLs)	On-going engagement
Private sector house builders	On-going engagement
TATA	On-going engagement
Planning departments	On-going engagement
Flexis	On-going engagement
Welsh School of Architecture	On-going engagement

Welsh Water	Discussions to take place how to integrate water efficient services and devices into the HAPS programme
Wider Public	An effective and structured engagement strategy will be formulated and implemented

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Annex E - HAPS specifications

New Build

For new build there are two levels:

1. Intermediate 'elemental' approach. This focusses on particular aspects of the design, for example, specifying passive house standards (no renewables), or adding technology to an existing house type (for example, solar PV). This might be regarded as an intermediate step towards a higher standard, and something housing providers might feel more comfortable with as part of the transition to a higher standard.
2. Energy positive whole system approach. This will aim for SOLCER level of energy efficiency, combined with the integration of renewable energy and energy storage into the design. This has the potential to achieve an energy positive performance.

Retrofit

For retrofit there are two levels:

1. Elemental 'shallow' retrofits: One, or a few measures applied, for example, EWI, solar panels, etc. Typical of current (e.g. Arbed) programmes – costs around £10,000 per house.
2. Whole-house 'deep' retrofits: Integrating a multiple package of measures appropriate to specific house types. Typically includes fabric, renewables and energy storage, plus replacing heating system where appropriate – costs around £25,000 to £30,000.

Flexible design strategy

The HAPS approach will be tested and refined during the pilot/pathfinders developments and through the duration of the programme.

A flexible design strategy will be established to ensure the HAPS approach can be adapted to the variety of challenges and constraints associated with the mix of tenure and geography in the region.

Annex F – Business case approval process

