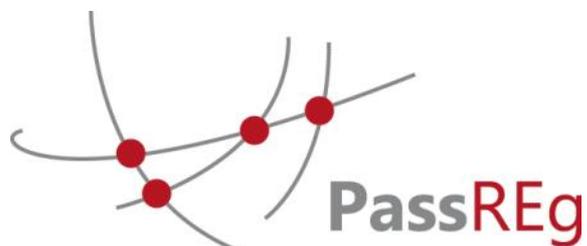




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IEE PassREg

PASSIVE HOUSE REGIONS WITH RENEWABLE ENERGY

Indicative structure of Success Model

Wales (UK)

Designed for use by aspiring regions involved in PassREg project

Structure developed by EnEffect

Contents by BRE

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INTRODUCTION

The **Success Model** is a description of the terms, documents and actions that would ensure accelerated implementation of "nearly zero-energy buildings" ("passive buildings") throughout the municipality. For this purpose, it is accompanied by a clear and measurable **interim and final targets** and timetables for achieving them, which are represented by a **Roadmap** (Schedule). It describes the successive steps to develop patterns of success (Success Model) and timetables for achieving them.

Items included in the Success Model are described in two horizons - today (baseline) and future state. The description of today (baseline) policies and practices presents results achieved by now. The description of future policies and instruments outlines the means by which to achieve predetermined objectives of this project and in a wider scope – the European and national climate and energy efficiency building policy:

from 2019/2021, new buildings will be designed and constructed according to the "nearly zero-energy" standard.

The description of the baseline has to be succinct and precise, and the introduction of new policies and instruments - explained and justified in enough detail. If the description of the baseline for some of the pre-marked points can not specify a particular activity, this must be reported, in order to make it clear what is the starting point of the new Success Model of the region (municipality). The short presentation of the baseline (already prepared on the basis of pre-distributed model structure and content) can be used at this point (see annex 1).

It is strongly recommended for the improvement of existing Success Models and the compilation of new ones that the regions involved in PassREg project actively use the experience of pre-selected pilot Front Runner Regions. The descriptions of their Success Models provide detailed information for all project partners.

Note:

In terms "nearly zero-energy building" and "passive building" used in this text is put the same meaning. PassREg project aims to establish the "passive house" standard of as the basis for the definitions of "nearly zero-energy building", which are currently under development and are to be adopted in any member country of the European Union.

1

ENERGY AND BUILDING POLICY

This section is intended to present the long-term local policy on energy efficiency in buildings and political tools used for its formulation and implementation. On this basis the attitude to the new "nearly zero-energy building" standard is outlined and local policy objectives and standards are compared with the adopted national framework.

National framework (UK level)

If more than one region (municipality) from a country are involved in PassREg project, this point is developed once and is included in the models for all regions (municipalities) of the same country. This way, the base from which each municipality starts building (or upgrading) his Success Model is exposed.

Baseline

Describe **current national policy** on energy efficiency in buildings and the extent to which it is harmonized with EU Energy Performance of Buildings Directive (EPBD) 2010/31 (recast). Identify the main indicators of energy efficiency introduced in the national law.

In 2007, the UK Government issued an Energy White Paper, 'Meeting the Energy Challenge'¹, outlining the Government's strategy for cutting carbon emissions to mitigate climate change and to ensure secure, clean, affordable energy supplies, reducing dependence on imported fuel. Initial targets were set for the reduction of greenhouse gases of 60% (over the 1990 baseline) by 2050. It also included the target that all **new homes would be 'zero carbon', preferably by 2016** and that the energy efficiency of existing homes would be improved.

The 'UK Climate Change Act' (2008)² set in law the UK's ambition to achieve an **80% reduction (over the 1990 baseline) of greenhouse gases by 2050**, increased from the earlier 60% target, which was subsequently deemed too low to mitigate the risks of irreversible climate change. This also set an intermediate target of between 26-32% by 2020.

In 2009, the 'UK Low Carbon Transition Plan'³ set out the actions to be taken to **reduce carbon emissions by a revised 34% (over the 1990 baseline) by 2020**. This included targets to improve the efficiency of existing homes, encourage households to generate their own renewable energy and for 40% of 'grid' electricity to be generated from low carbon sources, amongst other ambitions.

The primary mechanism for delivering the 'zero carbon' target in the UK is the Building Regulations, which set the standards that all developments must adhere to with regard to energy performance, safety, access, etc. (The Regulation specifically relating to the energy performance of buildings is Part L.) Until relatively recently (2012), the UK Building Regulations applied uniformly across both England and Wales. However, in 2007 Welsh Ministers indicated a desire to achieve the 'zero carbon buildings' standard ahead of England, ideally by 2011, rather than 2016. **Welsh Government therefore applied for Building Regulations, to become a devolved power**, i.e. standards could be set by the Welsh Government, independently from the English Government. However, this power was not

¹ www.berr.gov.uk/files/file39387.pdf

² www.legislation.gov.uk/ukpga/2008/27/contents

³ www.ukccsrc.ac.uk/system/files/09D716.pdf

granted until 31st December 2011⁴, which delayed the Welsh Government in implementing its own new targets and revisions to the building energy standards in Wales.

The regulatory framework that enforces energy performance in construction is now effectively separate for England and Wales, although they will ultimately each be obligated to achieve the mandate of the EU Recast Energy Performance of Buildings Directive (EPBD), which will require all new buildings to be 'near zero energy buildings' (NZEB) by 2020. **Both England and Wales will also need to use the established 'National Calculation Method' (NCM)** to assess building performance; the method that is utilised in the Standard Assessment Procedure (SAP) for housing and the Standard Building Energy Model (SBEM) for non-domestic buildings. However, the method by which England and Wales deliver these targets will now differ.

Success Model

Describe the main aspects of the **new national policies** for "nearly zero-energy building" that are established or are to be established in the country in accordance with EU Energy Performance of Buildings Directive (EPBD) 2010/31 (recast). Quote the definition of the new "nearly zero-energy building" standard adopted domestically or share your predictions on this definition (if it is not yet adopted), referring to the studies conducted so far and forecasts.

In order to find the most technically achievable and cost effective way to deliver the Government's zero carbon targets, the Zero Carbon Hub was setup by UK Government and industry as a public/ private partnership in June 2008. The purpose of the ZCH is to carry out necessary research to advise Government on how to deliver zero carbon homes by 2016 and non-domestic buildings by 2019.

The definition of zero carbon homes has itself changed in recent years. Initially it was envisaged that the definition would match the energy requirements set out to achieve Level 6 of the Code for Sustainable Homes – a framework created to assess the overall environmental sustainability of new dwellings. However, this presented difficulties, since the Code considered each home as an individual that must generate all the power and heat that it needs. In practice, this has only been achieved by a very small number of example projects and was considered to be too expensive to achieve on a wider scale, potentially being unachievable on many sites. The ZCH therefore helped the UK Government derive a new definition for zero carbon homes that would be more flexible and practical to deliver. There are therefore three components to meeting the new standard:

- The **Fabric Energy Efficiency Standard (FEES)**⁵, which represents the overall energy demand of the building and reflects its intrinsic energy performance as a result of its insulation levels and airtightness, etc. (Measured as 'primary energy use per m²/ year', similar to the standard used in Passivhaus – kWh/m²y)
- The **Carbon Compliance Standard (CCS)**⁶, which reflects the efficiency of the delivery of heating, hot water and lighting and will include a contribution from on-site renewable energy generation. (Measured as an absolute limit on the as-built CO₂ emissions per m²/ year.)

⁴ www.assemblywales.org/gg12-0003.pdf

⁵ www.zerocarbonhub.org/resourcefiles/FEE_A4_4pp_final_web.pdf

⁶ www.zerocarbonhub.org/resourcefiles/cc_TG_Report_Feb_2011.pdf

- **Allowable Solutions**⁷, which will include a range of potential additional measures, mostly comprising off-site solutions, to deliver any shortfall from the above actions in delivering a net zero carbon dwelling.

The contribution that each of these three factors must make towards achieving the overall zero carbon target is still to be finalised, but the ZCH recommend:

- The FEES limit for the building fabric should be set at 39 kWh/m²y for mid terrace houses and apartments and 46 kWh/m²y for all other housing, including end terrace, semi detached and detached dwellings. This reflects the inherent efficiency of form of each dwelling type and acknowledges that it is more difficult and less cost effective to achieve such low energy use on buildings with more exposed surfaces.
- The CCS limit looks likely to be set at 10 kg CO_{2(eq)}/m²y for detached houses, 11 kg CO_{2(eq)}/m²y for attached houses and 14 kg CO_{2(eq)}/m²y for low rise apartment blocks.
- A consultation on the exact structure of Allowable Solutions, though believed to include options to invest in near- or off-site carbon saving projects, in energy refurbishment, district heating initiatives, or other carbon saving schemes, particularly that will bring a wider community benefit.

Now Wales has devolved control of the energy performance of buildings, the policies and methods to deliver NZEBs over coming years are likely to follow similar principles in some areas to the UK initiatives above, but vary in others, as highlighted in the section below on 'local climate and energy policy'. There is therefore still potential that Welsh Government will aim for a stronger fabric first approach, then subsidised by RES (as proposed in PassREg).

While other regions (Front Runner Regions) have used the Passivhaus standard as a means of steering industry towards NZEBs, the UK and Welsh Governments are reluctant to state that Passivhaus buildings are 'deemed to comply' with UK regulations, as the calculation methods are currently different to the established calculation methods in the UK (NCM) and **these differences are not well understood**. There is also not an approved competent person scheme for the use of PHPP (no quality controls for its general use). It therefore seems likely that, even if 'Passivhaus principles' were adopted in the UK Regulations to deliver NZEBs by 2020, energy calculations via the UK method may be slightly different to those via the Passivhaus method. (Hence, targets likely to be different to PH's 15 kWh/m²y.) An investigation has been carried out to better understand the differences between the two calculation methods and what may be required to harmonise them, but there are no 'quick fixes' and in the short term two calculations would be required (one for Regulatory compliance, one for PHPP Certification).

Political will at the local level (Wales)

Baseline

Describe the degree of **political consensus and commitment** to an ambitious local policy on energy efficiency in buildings. Try to determine whether and how fast the introduction of "nearly zero-energy building" standard can get political support in the region (municipality).

Until recently, it had been the intention in Wales to deliver NZEBs via the Building Regulations sooner than the rest of the UK. Hence there seemed to be strong aspiration within Welsh Government for energy efficiency in buildings. However, when consulting on potential changes and assessing the risks, the Welsh Government established that any

⁷ www.zerocarbonhub.org/resourcefiles/Allowable_Solutions_Oct_2012.pdf

standards set would need to be achievable and affordable, should be delivered with current technologies and the existing workforce and would not need to rely on imported solutions or expertise, so as not to adversely affect the construction and manufacturing industries in Wales and the property markets (i.e. not to make properties unaffordable to buy/ rent).

Hence, Welsh Government has now taken a less ambitious stance in the recent (2013) revision to Building Regulations and have set targets similar to those currently set in England, so as not to unfairly penalise the Welsh construction market⁸. It seems unlikely that any further changes to Regulations in Wales would take place before 2016 (England's target date for 'zero carbon homes', 2019 for public buildings). Welsh Government have recently issued a statement (March 2014)⁹ indicating that **they will not be aspiring to meet the NZEB targets earlier than required by the EPBD**. It requires that all new public buildings will need to be NZEB by 2019 with all other buildings from 2021.

S u c c e s s M o d e l

Specify the **necessary steps** for the formation and strengthening of political consensus and will to the implementation of the "nearly zero-energy" ("passive house") building standards. Describe the political decisions and documents (memoranda, declarations, programs) by which to ensure the stability of this political agreement and to secure the implementation of the commitments to PassREg project.

As seen in the Front Runner Regions (FRRs), strong political leadership by individuals can have a significant impact on the construction industry and that, alongside appropriate financial incentives, it is possible to realise significant benefits by demonstrating viability through pilot projects (government funded/ subsidised initially).

Currently in Wales, there is a lack of strong political desire to drive targets harder, which likely derives from a lack of financial mechanisms available to support such actions. It has been identified that the existing building stock should be a primary focus for CO₂ savings in the UK and policy and funding mechanisms are largely focussed on 'affordable refurbishment' rather than NZE new buildings. (Refurbishment seen to offer significant employment opportunities relative to monetary spend compared to other activities [Energy Wales].)

A difficulty of setting large CO₂ reduction targets is that political leaders do not want the construction industry to 'stall' if it is deemed too expensive to achieve such targets. The Welsh Government are not convinced that Passivhaus is appropriate to Regulation at this time and hence will not make it a requirement. **Continued demonstration of the benefits of Passivhaus projects in the UK** (rather than necessarily at an EU level) will no doubt help, but **the cost effectiveness of building to the PH standard would need to be demonstrated**. While it is well known that the lifecycle costs of Passivhaus are favourable, there are currently no mechanisms in the UK by which to cover any additional capital cost of such developments.

Innovative financial mechanisms will inevitably need to be introduced to drive political support for Passivhaus with renewable energy systems as a solution for NZEBs, or any other very low energy standard, compared to current building practices. Until that time, it will be very difficult for politicians to 'demand' the Passivhaus (or similar) energy standard with RES. However, if the standard can be shown to be no more costly to deliver, it is much more likely to be considered by the industry.

⁸ <http://wales.gov.uk/about/cabinet/cabinetstatements/2013/homebuilding/?lang=en>

⁹ Welsh Government, 'Energy Wales: A Low Carbon Transition Delivery Plan', March 2014

As demonstrated in Brussels, it was regional (Brussels) political leadership, rather than Federal (Belgium) drivers that brought about advanced regional changes. In theory, Local Authorities (if there was support for Passivhaus with RES at this level) could set their own requirements on land sales and via their Local Development Plans that could drive energy standards further than Building Regulations. This will therefore be investigated further with key personnel within LAs to see what support is needed for them to convince Councillors to adopt NZEB in this way.

Local climate and sustainable energy policy (Wales)

This subsection is intended to outline the general policy of the region (municipality) in relation to climate change and sustainable energy on which specific policies on low-energy and passive building will be further designed. For each region, specify the names of the relevant policy documents in accordance with national and local laws and established practices.

Baseline

Describe the **current local climate and sustainable energy policies** in the region (municipality). Specify the objectives of these policies and how they are integrated in official policy documents of the local government - strategies, plans and programmes for climate change and sustainable development, energy efficiency, renewable energy and more. Specify the role and contribution (shares) of the buildings in these policies.

The Climate Change Strategy for Wales¹⁰ sets aspirations for the reduction of energy usage in new and existing buildings, both in the domestic and non-domestic sectors. The aim by 2020 is to reduce the energy costs and emissions of buildings across Wales, to eradicate fuel poverty and for low carbon energy generation to be common. A major step towards these changes was seen to be the devolution of the Building Regulations, to allow Wales to Regulate for these goals in their own way.

Alongside this, the energy strategy for Wales, 'Energy Wales: A low carbon transition'¹¹, also supports increased energy efficiency and low carbon sources of energy generation, particularly supporting innovation, research, development and commercialisation. An earlier policy document (2010) – A low carbon revolution¹², stated that Wales aims to generate twice as much electricity annually by 2025 as was used at the time (2010) and by 2050 at the latest, be in a position where almost all local energy needs (heat, power, vehicles) can be met by low carbon electricity production.

While Welsh Ministers initially set an ambition that all new dwellings would be zero carbon by 2011¹³, delays in being awarded devolved power for Welsh Government to set their own Building Regulations has delayed this. Having consulted on the proposed standards for Part L of the Building Regulations in 2012, the target set by the 2013 revision to Part L is now 8% improved over the 2010 requirement (rather than 40% as consulted), which is in line with England's current targets¹⁴. This level was chosen following a consultation exercise and risk assessment that indicated that this would be the most viable and affordable standard the industry could be expected to deliver via the building fabric without requiring expensive, unfamiliar technologies. However, it will not necessarily favour a relatively extreme fabric-first/ Passivhaus approach to building.

¹⁰ wales.gov.uk/docs/desh/publications/101006ccstratfinalen.pdf

¹¹ wales.gov.uk/docs/desh/publications/120314energywalesen.pdf

¹² www.mng.org.uk/gh/resources/100315energystatementen.pdf

¹³ www.planningportal.gov.uk/general/news/stories/2007/feb/2007-02-Week-3/welshgovernmentoutlines

¹⁴ <http://wales.gov.uk/about/cabinet/cabinetstatements/2013/homebuilding/?lang=en>

Success Model

Describe the purpose of **future climate and sustainable energy policies** in the region (municipality) in relation to the regional targets and indicators (if any) specified in national strategies and programmes. Indicate the specific policy documents of the region (municipality) defining these policies, and the role (shares) and contribution of the buildings in it.

Wales' current policies already reflect the future ambition for low energy building and renewable energy sources. However, they have not been specific in the delivery of low energy buildings (for instance, they do not specify that any particular standard (e.g. Passivhaus) would be required to deliver their energy efficiency ambitions).

It is the intention that the Welsh Building Regulations will be strengthened further in stages over the coming years in readiness to deliver NZEBs in accordance with the timeframes of the Recast EPBD (by 2020). The Passivhaus community should continue to lobby Welsh Government to demonstrate the benefits of the Passivhaus approach with RES for the delivery of NZEBs in Wales.

A noteworthy point is that the UK Government are looking to introduce a new metric to measure building energy efficiency of 'primary energy use per m²/ year', similar to the standard used in Passivhaus (as mentioned above in National Policy section). However, Wales have not followed this method to demonstrate a Fabric Energy Efficiency Standard (FEES), instead insisting that setting U value limits are sufficient. It would probably be easier for developers to get to grips with the aspirations of the Passivhaus Standard if they had a better understanding of this Fabric Energy Efficiency metric through its introduction into Regulations. It is therefore arguably unfortunate that it has not been assimilated into Regulation in Wales at this time.

Local policy instruments for energy efficiency in buildings (Wales & UK where applicable to Wales)

Baseline

Describe the **main instruments**, which local governments use to form and implement their policy for energy efficiency in buildings (plans, programmes, initiatives, incentives, etc.). Indicate how each instrument works, what is the relationship between them and which indicators serve for measuring the results of various tools' application.

Planning and Building Control policy instruments

New buildings are regulated via the Planning and Building Control processes in both the UK and in Wales. To support the headline energy policies, additional **planning policies** are set to drive energy efficiency, sustainable development and renewable energy, as set out in various Technical Advice Notes for Wales that support planning decisions.

Planning Policy Technical Advice Note (TAN) 22 'Planning for Sustainable Buildings'¹⁵, introduced in 2010, set out the policy framework for the delivery of sustainable buildings in Wales. This encouraged fabric first/ energy efficiency methods to be adopted first, then the installation of on-site renewable/ low carbon energy technologies. The Policy required that higher sustainability standards were achieved in Wales compared to the UK Building Regulations, as measured by the BRE Environmental Assessment Method (BREEAM) and the Code for Sustainable Homes. These are independent assessment methodologies that cover a range of environmental parameters, including energy and water use, occupant health and

¹⁵ <http://wales.gov.uk/docs/desh/publications/100609tan22weben.pdf>

wellbeing, land use and ecology and construction impacts amongst other issues. A BREEAM Very Good level must be achieved in all non-domestic buildings over 1000m² floor area, plus a minimum energy efficiency performance level, depending on the type of building. For housing projects, a Code Level 3 (out of 6) award must be obtained for schemes in Wales, plus a minimum CO₂ emissions reduction of 8% above the Building Regulation minimum standard (2010). (This increase was absorbed into Building Regulations implemented in 2013.) TAN 22 has subsequently been withdrawn (June 2014) as part of the Planning reform carried out to reduce the burden on developers. The aim is to reduce regulatory burden in the construction sector to boost development (following recession). There is therefore no longer a BREEAM or Code requirement on new projects in Wales.

Other measures are also in place in Wales under TAN 12: 'Design'¹⁶ to stipulate how environmental and sustainability impacts have been considered by developments and TAN 8: 'Renewable energy'¹⁷, which sets out policies for Wales' implementation of renewable energy sources.

Energy efficiency in new buildings in Wales is specified by the Building Regulations (Part L), as measured by the National Calculation Method (NCM) and Standard Assessment Procedure (SAP). The overall principle of the Regulations is a measurement against a 'reference building' that is deemed to comply with those regulations. The reference building's performance is expressed as the Target Emission Rate (TER). This is subsequently compared to the actual building's performance, expressed as the Dwelling Emission Rate (DER) or Building Emission rate (BER) for non domestic buildings.

Although the standard that should be achieved has become more onerous over recent years through periodic revisions to the Regulation, it is currently not close to the 'near zero energy' aspiration. At present the Regulation requires that developers must meet a standard (for housing in Wales) 8% improved on 2010 UK Part L. The purpose of the incremental approach has been to allow the construction industry time to adapt to deliver new standards in a cost effective way, so as not to stall the construction market.

Other financial policy instruments

Although economic instruments are discussed in more detail in the following section, a summary of relevant economic policy instruments is given here:

- The Feed in Tariff: A subsidy re-payment for investment in small-scale electricity generating renewables, based on the level of electricity generation
- The Renewable Heat Incentive: A subsidy re-payment to offset the cost of renewable heat-generation systems, such as biomass heaters and solar hot water
- Green Deal loans: Energy efficiency refurbishment measures to existing buildings may be carried out with the cost of the works (plus interest) recuperated via payments made through a customer's utility bill (electricity) payments. The measures must save more energy than the cost of the repayment to be deemed viable and must be repayable within a period of approximately 20 years
- Energy Company Obligation (ECO): An additional subsidy towards Green Deal measures that would not otherwise be viable in their own right, such as expensive solid wall insulation, etc. These are only eligible on hard to treat properties for which 'basic' Green Deal measures are not viable and/ or for vulnerable households

¹⁶ <http://wales.gov.uk/docs/desh/publications/090807tan12en.pdf>

¹⁷ <http://wales.gov.uk/docs/desh/publications/050701technical-advice-note-8-en.pdf>

- Nest grants: In Wales, funding is available via the 'Nest' programme to carry out energy efficiency refurbishment measures for vulnerable households in hard to treat homes.
- The Green Investment Bank: Funding from UK Government to invest in sustainable projects. The bank is separate from the Government and is a commercial entity. The intention is to provide loans to give additional capital to complement private sector finance. Priority sectors include energy efficiency
- Stamp Duty Land Tax Relief on new zero carbon homes: New zero carbon homes (< £500,000 in value) will not be subject to stamp duty land tax payments upon their first sale. Properties of higher value will receive tax relief of £15,000 on the rate of Stamp Duty.

Success Model

Identify the main milestones of the **future policy** of the region (municipality) in terms of "nearly zero-energy buildings" and how they should be reflected in policy documents on sustainable development. Specify (or propose) indicative targets of this policy and timeframe (roadmap / schedule) for their gradual achievement / performance.

Determine what **new national and local policy instruments** (strategies and plans, technical standards and regulations, incentive programmes, etc.) are needed to create (or upgrade) and promote "nearly zero-energy buildings" (passive houses). Specify the nature and functions of each of these tools and how they are expected to contribute to the objectives of the new policy. Indicate the role and contribution of each of the proposed tools and plan their introduction and application on the Roadmap for the implementation of the Success Model for the years before and after 2020.

New policy measures that could be introduced to help contribute to the NZEB targets include:

- Strong fabric first approach to zero carbon targets (as far as Passivhaus) Set lower air infiltration (air pressure testing) standards.
- Set higher requirements on public buildings as a role model for the industry (like when higher Code and BREEAM requirements were set on WG land etc.) It may be necessary to subsidy extra costs or justify on lifecycle costs if retaining the asset.
- Setting regions aside that require higher energy standards in Local Authority Local Development Plans (LDP). However, plans will need to be consulted upon and agreed and the process may take a number of years.
- Strengthen ventilation requirements via regulation: set up a competent person scheme for installation of ventilation and MVHR
- Conditions on sale of LA land (done to some extent now with Code and BREEAM etc, could push for higher standards). Cost of land is reduced to compensate for the increased cost of building to higher standard, hence no more expensive to build than typical Building Regs compliant development.
- PPPs selling buildings with share of renewable energy (bit like allowable solutions). Capital investment paid back via FIT.
- Could follow example of Brussels and set new requirements to assess overheating risk in 'low energy buildings'

Summary of renewable energy context (Wales & UK where applicable to Wales)

As already highlighted in earlier sections, there are various policies and drivers to support the contribution of renewable energy systems (RES) in buildings. RES is recognised as being a key requirement to deliver 'net' zero energy buildings and will be supported at both building and off-site levels. The proposed structure of the zero carbon requirement for new buildings uses the Fabric Energy Efficiency Standard (FEES) to set minimum performance standards for the building fabric. This will serve to ensure that consideration has been given to reducing energy demand in the first instance before RES are sought. This prevents renewable energy from being used 'wastefully' to compensate for inefficient thermal performance of building fabric. If the Passivhaus fabric standard were adopted at the FEES level, this would help make it easier for RES to offset remaining CO₂ emissions from buildings.

In addition, Welsh Government Technical Advice Note (TAN) 8¹⁸ sets out planning guidance for renewable energy systems in Wales, supplemented by more recent Practice Guidance¹⁹. It is the ambition of Welsh Government to produce 7TWh of renewable energy in Wales by 2020.

In the UK (and Wales) the most successfully implemented RES technology to date is **photovoltaics (PV)**, thanks to the introduction of the Feed in tariff subsidy in 2010 and also, in part, amendments to Planning laws to allow roof mounted PV as a 'permitted development' in most cases (i.e. no planning permission needed). The FIT served to rapidly drive down the capital price of PV as a result of huge increased demand due to generous initial FIT rates. The rates have subsequently been reduced to redress the change in market price for PV. Since it does not need to integrate with other systems (e.g. heating etc) PV is seen as an easy 'bolt on' solution with few limitations apart from roof surface area and orientation. It is very likely that PV will make a major contribution to the delivery of NZEB towards 2020, particularly for housing. The advantage of driving energy demand down to Passivhaus Standard levels is that a smaller PV array (therefore less costly) may be required to achieve net zero energy/ carbon buildings.

Solar Hot Water (SHW) systems have found moderate use to date and their popularity will no doubt increase once the Renewable Heat Incentive launches fully. When the FIT was introduced in 2010, this skewed the viability of 'roof mounted renewables' towards PV and away from SHW, as the FIT subsidy made PV more financially viable. While improved thermal fabric performance will help drive down heating demand in homes, the hot water demand will remain, as it is linked to occupancy rates more than the heating season. The use of SHW is therefore likely to receive renewed interest in the approach to delivering NZEBs.

Some forms of **heat pump** are already eligible for RHI subsidy, though issues prevented the introduction of some types initially due to concerns over the accuracy of quoted coefficient of performance (COP) rates and how the 'renewable' energy component would be metered for subsidy payments. Since heat pumps still rely on electricity (which is both an expensive and CO₂ intensive fuel), their use in the UK is currently mostly focussed/ most viable in areas not served by the mains gas network. In these cases, their introduction can be cost effective even without the RHI subsidy when compared with other potential fuel sources (oil, LPG, electric room heaters). It is inevitable that once air source heat pumps (which are generally a cheaper option than ground source heat pumps) become accepted under the RHI payment

¹⁸ Welsh Government, 'Technical Advice Note (TAN) 8: Planning for Renewable Energy' 2005

¹⁹ Welsh Government, 'Practice Guidance: Planning implications of renewable and low carbon energy developments', February 2011

programme, their popularity will increase and unit costs will likely reduce. To be considered a true 'zero carbon' building however, the remaining electricity usage will need to be offset by some other means – typically PV. (It should be noted that this will offer a 'net' CO₂ balance rather than instantaneous balance, since the highest demand for heating and hot water from a heat pump will be in winter, which will not coincide with the highest rates of electricity generation from PV, which will be in the summer months.)

Other sources of renewable heat eligible for RHI payments will be **biomass heating systems**. Around 2008/09 there was an initial rush of interest in biomass boiler systems, particularly in larger buildings (e.g. schools, commercial buildings) to capitalise on the 'low CO₂' image (often to help gain higher award levels under BREEAM assessments). However, they have been implemented with varied success, often with backup systems in place (gas) due to a lack of confidence in the technology and concern about reliability of sourcing/ deliveries. They also carry a maintenance burden that is less common with current mainstream systems, due to the residues from burning wood that will need to be cleaned out to ensure a biomass boiler can continue to run efficiently. They therefore tend to be best suited to larger buildings or communal systems that employ a maintenance manager able to deal with such issues. In the domestic situation, many households have moved away from coal (for example) as a fuel source over the years due to the burden of requiring fuel deliveries and storage, plus the need to clean out ash – generally householders want simple, efficient systems that require little to no maintenance or intervention. Unfortunately, biomass reintroduces these burdens, which will inevitably discourage many potential small-scale users.

Biomass fuel processing (into chips or pellets) and transport will mitigate some of the carbon benefit of biomass fuel, while pricing is usually not especially 'cheap' (relative to other fuels) unless clients have a dedicated resource (i.e. their own managed woodland). Uptake in biomass systems is therefore likely to increase thanks to the RHI subsidy – particularly in larger scale, maintained facilities, but not at the rate that other technologies that are simpler to implement with less maintenance issues are likely to gain in popularity.

Wind and hydro power, while established and successful renewable systems, will generally only find use at relatively large scale. Building integrated wind systems have been largely discredited due to lifecycle carbon impacts (embodied impact does not justify operational benefits at a small scale with unfavourable conditions of sheltering and turbulence). However, stand alone wind turbines are usually readily viable, though their capital cost can often be restrictive for smaller scale investors (farmers, community groups, etc). Investment in wind 'farms' is likely to become an established 'allowable solution' – i.e. an accepted off-site investment in RES to help achieve a net zero carbon development. The UK Renewable Energy Strategy (2009) set a scenario where wind power would provide over two thirds of the UK's renewable energy supply by 2020. Welsh Government's 'Low Carbon Revolution' energy policy statement indicates Wales' onshore wind potential at 2GW by 2015/16. Wind power is therefore set to make a substantial contribution to the UK energy mix, alongside NZEBs by 2020.

There may also be 'utility scale' hydro power developments, such as the Swansea Tidal Lagoon or some form of tidal energy in the river Severn (tidal lagoon(s) or a much discussed but strongly lobbied barrage) that would offer off-site solutions to renewable energy provision that may fall under 'allowable solutions' for the delivery of zero carbon buildings.

2

ECONOMICS AND FINANCE

This section presents the economic indicators and existing tools to promote energy efficiency before the formulation of the model and highlights economic goals and indicators of the already established Success Model of the region (municipality). Financing instruments in use are shown and guidelines for new forms of financing are outlined to accelerate the entry of “nearly zero-energy buildings” in the community.

Economic objectives and indicators

Baseline

Describe the main **economic indicators** of the current (baseline) level of energy efficiency in buildings in the region (municipality).

Indicators are presented in Annexe A at end of document.

Success Model

On the basis of these data, outline the economic aspects of the **new regional (municipal) building policy**. Indicate the expected economic results from an increase of the share of low-energy (passive) buildings in the region (municipality). Determine methods for calculating the economic efficiency (profitability) of passive buildings, which are to be designed and built before and after 2020.

The key aim of the zero carbon policies of the Welsh Government is the CO₂ emissions reductions. They have not set specific targets for household energy bills, apart from a desire to eradicate fuel poverty (i.e. to reduce fuel bills to below 10% of net household incomes). There is also a desire to prompt a strong economy via green industries and businesses in the delivery of the Government’s carbon reduction targets.

When setting energy targets for buildings, a prime consideration is that the cost of construction and subsequently the cost of buying/ renting these buildings needs to be affordable to buyers. If the price premium for such developments is too high, there is concern that the construction market will stall, leading to employment uncertainties etc. Appropriate financial support and economic policy instruments will be required to complement the policy targets that are set.

Economic levers

Baseline

Describe the **existing economic instruments** to promote energy efficiency in buildings and the results of their application in local practice. Indicate the share of contribution of each of them (tax breaks, incentive programmes, etc.) and the extent of their effectiveness.

There are various economic policy instruments already in place, at a UK or Wales level, to support energy efficiency in buildings and renewable energy installations. However, most schemes have a very narrow or specific focus. In particular, a lot of emphasis has been placed on improving the existing building stock, with various financial incentives and schemes to tackle the hardest to treat buildings. However, funds are generally not set-up to allow subsidy to the extent required to achieve the Passivhaus or Enerphit standards or to contribute to the achievement of Passivhaus in new build developments (instead aiming to

deliver 'cost optimal' solutions, i.e. many properties to a 'good' standard, rather than fewer properties to an excellent standard).

In general, grants are no longer available towards the upfront purchase cost of renewable energy systems in the UK. A level of subsidy is/will be available for renewable technologies via the Feed in Tariff (for electricity producing technologies such as PV) and the Renewable Heat Incentive (for heat producing technologies, such as biomass and heat pumps), which will offer a repayment for the amount of renewable energy generated.

- **The Feed in Tariff (UK wide):** This was introduced in April 2010 to replace the UK Government grants as the main incentive to encourage uptake of renewable electricity-generating technologies (up to 5MW). The Department of Energy and Climate Change (DECC)²⁰ set policies and decisions regarding the FIT (e.g. the terms of the FIT payments and the rate that is re-paid per kWh generated). However, the payments are actually made to customers via their utility/ energy company, with the funding provided by levies placed on the energy bills of their customers. The FIT is broken down into two payments: a 'Generation tariff', where an amount is paid to generators based on the amount of electricity generated, regardless of whether this is used on site or fed into the electricity grid and the 'Export tariff', which is an additional, lower payment for every kWh fed back into the grid. Payments will continue over a period of 20 years and is index linked. The intention is that these repayments will cover the capital costs of the system over time, plus a small but meaningful return on investment. However, the capital will need to be paid by the investor up front.
- **The Renewable Heat Incentive (UK wide):** This was launched in November 2011 as a financial support programme for renewable heat. The Department of Energy and Climate Change (DECC)²¹ set policies and decisions regarding the RHI (e.g. the terms of the RHI payments and the rate that is re-paid per kWh generated) and payments are made from the Treasury (i.e. funded from central Government → taxpayers). The non-domestic sector payments were initiated first, with the domestic scheme due to launch in Spring 2014. In advance of this, the '**Renewable Heat Premium Payment**' scheme was put in place to give a subsidy to prime the renewable heat technology industry, offering householders a one-off payment/ subsidy towards the cost of their system on the understanding they provide data and information to assist DECC in the future roll out of the RHI scheme. The RHI will offer a re-payment to users per kWh of renewable heat produced for up to 7 years. This scheme is an 'incentive' and is not intended to necessarily fully re-pay the capital cost of the installed system, only to make a contribution to the uplift cost of a renewable heating system compared to a traditional heating system (i.e. gas or oil). It will be available for existing buildings but not new-build properties.
- **Green Deal loans (UK wide):** Initiated in January 2013, the Green Deal provides energy efficiency refurbishment measures to existing buildings with the cost of the works (plus interest) recuperated via payments made through a customer's utility bill (electricity) payments. The measures *must save more energy than the cost of the repayment* to be deemed viable and must be repayable within a period of approximately 20 years. Various financial institutions may offer Green Deal loans, but, in particular, the UK Government set up the Green Investment Bank to offer

²⁰ www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies/supporting-pages/feed-in-tariffs-scheme

²¹ www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies/supporting-pages/renewable-heat-incentive-rhi

these loans at competitive rates. Eligible improvement measures include insulation, heating and hot water systems, glazing and microgeneration technologies.

- **Energy Company Obligation (ECO) (UK wide):** ECO is an additional subsidy towards Green Deal measures that would not otherwise be viable in their own right, such as expensive solid wall insulation, etc. These are only eligible on hard to treat properties for which 'basic' Green Deal measures are not viable and/ or for vulnerable households. Funding for ECO is provided by a levy placed on the UK's six major energy suppliers.
- **The Green Investment Bank (UK wide):** The GIB²² was set up with funding from UK Government (i.e. from taxpayers) to invest in sustainable projects. The bank is separate from the Government and is a commercial entity. The intention is to provide loans to give additional capital to complement private sector finance. Priority sectors (to receive 80% of the bank's capital) include energy efficiency (particularly intending to finance Green Deal loans), along with offshore wind and waste management. Other 'non-priority' sectors include bioenergy, carbon capture and storage, marine energy and renewable heat.
- **National Empty Homes Loans (England)/ Houses into Homes (Wales):** There are many empty homes in a state of disrepair across the UK that are not of sufficient quality for people to live in. Funding is being provided via Government and partners to offer interest free loans to bring empty houses (and commercial buildings) back into use as homes for sale or rent. Loans will need to be paid back within 2-3 years (with funds raised through the sale or rental revenue). It is expected that funding will be used to achieve at least the Decent Homes Standard (England) or Welsh Housing Quality Standard respectively. Funds are not likely to be sufficient to provide very low energy refurbishment (i.e. Enerphit/ Passivhaus).
- **Nest grants (Wales):** In Wales, funding is available via the 'Nest' programme to carry out energy efficiency refurbishment measures for vulnerable households in hard to treat homes. Funding is provided from the Welsh Government and is administered by a major utility company, British Gas, in partnership with the Energy Saving Trust (EST) (determined by a competitive tender process). The scheme will provide energy saving advice and information on energy tariffs and switching energy providers, but will also offer central heating systems, boilers, insulation and air source heat pumps to eligible households (those receiving Government benefits). Grants will aim to bring dwellings up to an 'acceptable' standard, but would likely not pay for advanced measures.
- **Arbed grants (Wales):** The Arbed grant fund is similar in principle to the 'Nest' fund (above) but is intended to apply to regions or clusters of eligible dwellings, offering energy saving refurbishment measures to households to reduce CO₂ emissions and prevent the risk of fuel poverty in low income households. The Arbed programme is intended to allow continuity of employment to installers of energy measures during the transition between old and new schemes that place obligations on utility companies (transition from the Community Energy Savings Programme (CESP) to ECO (above), both with similar ultimate aims). This funding was also used to fund 'Green Deal Demonstration Homes' in Wales, to prime the industry for the delivery of Green Deal measures. Arbed was funded via the Welsh Government (i.e. taxpayers) plus European Regional Development Fund (ERDF) funding.

²² www.greeninvestmentbank.com

- **Stamp Duty Tax relief on zero carbon homes:** In 2007, the UK Government introduced a tax relief on the first sale of all new zero carbon homes. The purpose was to prompt the industry in building such houses in advance of the requirement becoming legislation in 2016. However, a relatively limited number of properties have been built to this standard and thus have sought this tax exemption²³.

S u c c e s s M o d e l

Outline the future role, functions and expected contribution of each of the previously **existing economic leverages** to promote the “nearly zero-energy” (“passive house”) building standard in the future policy of the regions (municipality).

Evaluate the need to develop **new economic levers** to accelerate the deployment of low-energy buildings in the region (municipality). Describe each of these new economic instruments, their function and expected contribution and necessary actions and resources for their introduction and further implementation.

None of the existing economic policy levers are set up to deliver the Passivhaus (or equivalent) energy standard. It is expected that ‘zero carbon’ buildings, however they are finally defined and implemented, would need to be viable in a competitive market and not reliant on subsidy.

Effective mechanisms that have been implemented in other regions (e.g. Hannover, Brussels, Tyrol) to help drive the implementation of very low energy/ passive buildings have been emulated in the UK, but applied to other priority areas, e.g. the obligation placed on electricity companies to subsidise a National fund, or levies placed on customers via their utility companies have been used to support the Green Deal refurbishment initiative and the Feed in Tariff respectively in the UK.

It therefore appears that ‘new’ policy instruments would be required if there was a desire to set up initiatives similar to those in other successful EU regions to support very low energy/ Passivhaus buildings with renewable energy sources (RES).

Other initiatives that have been used in European cities that could potentially be emulated in the UK (if funds could be allocated) potentially include:

- Funding allocated (from LA budgets, from National taxation, from EU grants?) to carry out very low energy efficiency refurbishments to government and public buildings (i.e. schools, hospitals, etc) to lead by example and help build skills in the industry.
- Local Authorities could set higher development standards during the sale of their land and discount the ‘uplift’ to achieve the higher standard (e.g. NZEB) off the sale price of the land. This would also help develop expertise in the new build sector, hopefully making practices and technologies (and therefore costs) more mainstream, so they can be more readily applied at scale in due course. (Similar to Brussels ‘BatEx’ trials or Tyrol ‘Buildings of Tomorrow’ trials.)

A recent study by the NHBC Foundation²⁴ into the attitudes of house builders and the general public towards energy efficient homes suggested that mechanisms such as **lower council tax, stamp duty reduction or an income tax refund** for such homes would

²³ www.hmrc.gov.uk/manuals/sdlmanual/SDLTM20700.htm

²⁴ NHBC Foundation, ‘Today’s attitudes to low and zero carbon homes: views of occupiers, house builders and housing associations’, (NF40i) IHS BRE Press, February 2012. Available at: www.nhbcfoundation.org/Portals/0/NF_Pubs1/NF_40.pdf

encourage increased interest and higher uptake. Hence, these economic levers could prove popular to encourage NZEBs.

Other forms of funding

Baseline

Describe briefly the **existing forms of financing** for energy efficiency in buildings - operational programmes, governmental or regional/municipal programmes, specialized funds, commercial and "soft" loans, targeted credit lines, third-party financing / performance contracting (ESCO) and others. Evaluate the effectiveness of each of these forms and their suitability for promotion of "nearly zero-energy buildings" in the region (municipality).

There are no specific funding initiatives in place to fund new, low energy buildings in the UK. They will be required to seek funding via the same sources and mechanisms as mainstream construction/ buildings.

As discussed in the section above, there are various economic levers instigated by the Government in place, mostly supporting refurbishment of existing buildings, such as Green Deal loans. Other current initiatives (not led by Government) include:

- **Energy Efficiency Financing** (for small businesses), via Siemens Financial Services and the Carbon Trust, providing loans for energy saving measures (including mechanical systems and equipment), where the capital is paid back via the savings made (similar principle to Green Deal loans)
- **ESCOs for refurbishment.** ESCOs may be set up by public bodies, private companies or public private partnerships. There are existing examples in the UK of Energy Service Companies providing refurbishment measures to public and commercial buildings that are again paid back through the savings made to ongoing running costs. Future energy bills are guaranteed by the ESCO.
- **The Ecology Building Society** specialise in mortgages for projects that minimise environmental impacts or help promote sustainable living. They offer loans on energy efficiency refurbishment as well as new buildings. Interest rate discounts are offered depending on the energy standard achieved. Currently, a discount of 1.25% is given on interest rates for buildings achieving the Passivhaus or EnerPHit standard.

Success Model

Determine the disposition of the **existing financing instruments** in the future policies and practices in the region (municipality) and the need for their further improvement and expansion.

Specify the need to introduce **new specialized financing instruments** to promote "nearly zero-energy buildings". Differentiate financial instruments with universal effects (e.g. commercial loans, leases, etc.) against the specialized tools for energy efficiency (ESCO schemes, specialized funds and credit lines, targeted operational programs, etc.).

Differentiate financial instruments of **national importance** (national funds, credit lines and other operational programmes) against those of **regional (local) importance**, created and operated with the participation of local authorities (local funds, public-private partnerships, etc.).

Identify **partnerships** crucial to the functioning of certain financial instruments - with the government, financial institutions, businesses, NGOs and others. Suggest measures to

encourage and strengthen them and enroll them in the Roadmap for the development and implementation of the Success Model.

- **ESCOs to fund new build:** Fixed energy contract pricing that is lower than 'traditional' build, but an uplift on actual energy costs, so as to recover up front capital expenditure for low energy measures/ NZEBs. ESCOs will want to be very confident in the in-use running costs of a building to back such contracts. At present, there is significant discrepancy between modelled energy forecasts from building design to actual in-use performance, which would no doubt raise concerns with financial arrangements of this nature.
- **Using FIT payments to subsidise additional low energy measures (for housing?):** The Feed in Tariff is a funding mechanism intended to repay the cost of installing electricity generating equipment, plus offer a reasonable return on investment to purchasers. When renewable energy sources are installed, this supplementary funding over time may offer sufficient funds in some circumstances to cover additional up-front costs for further improved energy performance. This could effectively be offered at no additional cost to potential buyers if the FIT is paid back to the developer/ financier directly over the 20 year period. It requires a long term view from investors, whereas most financiers may expect to recoup the return on their investment in shorter time periods. (Although the RHI is similar for renewable heat generating systems, this fund is intended to be in 'incentive' (i.e. offer partial subsidy for the purchase of applicable systems), not offer a return on investment, hence it may be less viable to use the RHI mechanism as a similar funding option.)

3

KEY ACTORS

This section introduces stakeholders (individuals and institutions) engaged in the development and implementation of policies to promote “nearly zero-energy” / “passive” buildings.

Departments of regional and local administrations

Baseline

Specify existing regional and local (municipal) **administrative departments and professionals** who are directly involved in shaping and implementing energy efficiency in buildings and briefly describe their functions. Rate the effectiveness of these structures and experts and try to identify the main difficulties in their work.

For Wales, energy standards are implemented via Part L of the Building Regulations, as discussed in Section 1 on Policy. They need to balance the requirement for new, affordable buildings and the capabilities of the construction market with the desire for elevated levels of performance. There is also competition between different issues, including safety (fire sprinklers), etc.

Difficulties: Government representatives change periodically, particularly with changes in political leadership. This is likely to lead to gaps in knowledge and understanding, particularly if staff frequently move between different teams and priority areas. Retaining an up to date knowledge of the industry usually requires additional consultant advisors.

The Welsh Government have undergone a Planning Reform, with the aim of consolidating existing planning legislation to help drive economic renewal. The reform will bring about changes to future roles and responsibilities in the planning system. Planning Policy Wales, supported by Technical Advice Notes, provide guidance to Local Authorities on how they should view development in their area.

Local Authorities are responsible for the implementation of the relevant Building Regulations, enforced by local Planning officers and Building Control departments. Each LA in Wales is responsible for drawing up a Local Development Plan, which sets out their proposals and policies for future development and use of land in its area, in live with Planning Policy Wales guidance. LAs could recommend higher standards in key development areas within their LDPs if desired and if it could be justified.

Difficulties: While Local Authorities may wish to set higher energy performance standards in their regions, they will still need to be mindful of the financial viability of such schemes. The standards would need to be consulted upon and this process often takes considerable time (5 years).

Effectiveness of the existing structure: It is logical that headline guidance is set at a Wales-wide level, with further detail and elaboration, particularly relating to key development areas within Local Authority boundaries, being set at the LA level.

Success Model

Share your views on how **existing administrative structures and professionals** will improve operations to increase their efficiency. Point out whether changes are needed in their functions and specify them.

Describe the necessary **new administrative departments and professionals**, which should be provided (if necessary) for the implementation of policies on climate change and “passive” buildings. Describe their functions and effects of their activities.

Pay special attention to the place, role and functions of regional (local, municipal) **energy managers**. Plan the necessary actions for their consolidation (or introduction) and include them in the Roadmap for building the Success Model of the region.

As seen in Hannover, Planning Department representatives offer guidance to designers on the implementation of low energy buildings (i.e. low energy appears to be a very high priority for the Planning Department). However, in Wales (and the UK), Planners are not as proactive and are not encouraged to place such specific importance on the delivery of NZEBs. It is instead considered as a minor contributing factor along with many other potentially conflicting aspects. If there was a true drive to deliver NZEBs, Planners would need to be made to give low energy design features, such as orientation, glazing sizes, shading devices, etc, a higher priority over other aspects of a more qualitative nature (e.g. preserving local vernacular, continuity of ‘street scene’, etc). *This may prove to be politically unpopular and therefore may not be a priority for politicians.*

Many Local Authorities will no longer have dedicated Energy Managers, although someone will be responsible for the management of LA assets, which may form part of a wider role on delivering environmental objectives for the LA. The role of the Energy Manager will be to ensure that running costs of LA and Government buildings are acceptable and will aim to reduce CO2 emissions as far as possible. Since Energy Managers will ultimately be responsible for the ongoing running costs of an asset, they are best placed to form successful arguments for the life cycle costs of a Passivhaus fabric first approach, i.e. potentially higher up-front construction/ refurbishment costs to the PH or equivalent NZEB standard will be readily repaid via the running cost savings compared to less efficient buildings.

This life cycle cost argument could justify additional capital funding to be leveraged and is a strong argument for Local Authority or Government buildings (or any development) where the client funding the scheme will also be responsible for the ongoing maintenance and running costs of the building(s).

While private building Energy Managers/ Facility Managers may be usefully targeted to make such decisions, Local Authority Energy Managers should be a high target for awareness raising with regard to PH and the potential for NZEBs since they will have control over a very large number of public buildings.

Other stakeholders

Baseline

Describe the functions of **participants outside the regional (municipal) authorities**, which contribute to the development and implementation of policies in the field of “nearly zero-energy” (“passive”) buildings and assess their contribution.

Specify the **interactions and conflicts** (if any) between external actors and between them and the departments and experts of regional (municipal) administration. Specify untapped opportunities for interaction and cooperation between actors.

Zero Carbon Hub (UK)

The Zero Carbon Hub was setup by UK Government and industry as a public/ private partnership in June 2008. The purpose of the ZCH is to carry out necessary research to advise Government on how to deliver zero carbon homes by 2016 and non-domestic buildings by 2019. They have presented much of the guidance on setting targets for fabric performance, renewable energy incorporation and wider low carbon solutions for developments that will inform future changes to the English Building Regulations

Wales Low/Zero Carbon Hub

Wales established a similar group in 2009 to advise Welsh Government on how to achieve a zero carbon standard. The Hub is formed of individuals and firms in the construction industry who are committed to identifying and sharing information on constraints and issues to ensure low carbon requirements are met. The Hub works with and supports the Design Commission for Wales, the Sustainable Futures Commission and Constructing Excellence in Wales.

AECB – Association for Environment Conscious Building

Established in 1989, the AECB is an independent, member-run, non-profit organisation that promote excellence in design and construction to promote sustainable building. Members include architects, builders, manufacturers, etc. A key aim is to make available information and guidance about products, methods and projects. They are strong advocates of the Passivhaus standard and run various training courses, including Passivhaus Designer and Tradesperson courses amongst others.

Passivhaus Trust

The Passivhaus Trust is an independent, non-profit organisation that promotes Passivhaus in the UK. It is a member organisation and raises awareness of Passivhaus projects and available training to industry and government. It holds technical panel working groups and produces high level briefing papers to inform policy. It also holds annual conferences in association with BRE to disseminate recent project experiences.

BRE (Passivhaus UK)

BRE is a private company owned by a charity – the BRE Trust – with all profits from the business passed to the Trust to conduct research into the built environment. BRE (Passivhaus UK) specialise in Passivhaus building certification, consultancy, research and training with the aim of promoting highly sustainable, low energy buildings across the UK. BRE also provide guidance to government on sustainability standards and the BRE Environmental Assessment Method (BREEAM) is widely used (internationally) to demonstrate the environmental credentials of buildings.

S u c c e s s M o d e l

Specify **future roles** of current participants and opportunities to increase their contributions, including on the base of their closer interaction.

Justify the need to attract **new players** and describe their roles (functions) and expected contributions.

Pay **special attention** in attracting:

- Regional and local energy agencies
- Industry organizations (professional chambers, unions and associations)
- Local legal entities liable to contribute to energy savings targets under the national legislation, including energy companies

- Municipal and private companies
- Civil associations
- Educational institutions (kindergartens, schools, universities, training centers)
- Banks and other local financial institutions
- Regional and local media and others.

Plan participation of designated stakeholders in the Roadmap for building the Success Model for the region (municipality).

4

CAPACITY FOR PLANNING, DESIGN AND CONSTRUCTION

This section is dedicated to preparedness (knowledge and skills) of specialists on planning, design and construction for the introduction of “nearly zero-energy buildings”. It includes experts from the municipal administration, planners, developers and other interested community groups involved in the various stages of the process of creating “nearly zero-energy buildings”.

Training of local authorities

Baseline

Describe what part of the local administration is now **prepared (capable)** to apply the principles of passive building (“nearly zero-energy buildings”) in sustainable development planning, urban planning and building design. Are there specialists in the region (municipality) who have certificates for passive house designers or have undergone specialized training?

To what extent the principles and requirements of passive house planning are leading in the design and development of settlements and buildings in the region and are they **observed and evaluated**? To what extent these principles are respected when approving projects for new construction or for renovation of existing buildings and neighbourhoods?

Were there **training courses** conducted in the region addressed to the local administration and how many employees have gone through? How many passive buildings are actually planned and promoted by the municipal administration and how many of them are implemented, monitored, evaluated and certified by municipal participation or under its supervision?

The local administration in the UK and Wales is simply a mechanism for implementing National standards and policies. At present, these standards do not include Passivhaus/ NZEB, hence there is no requirement for them to be aware of, or trained in the standard. Some individuals will be familiar with the concept of Passivhaus from taking a personal interest. However, there will be many additional factors that influence overall Master planning/ urban planning and it will be difficult for individuals to elevate the priority for NZEB when it is not currently a requirement of Regulation.

As such, Passivhaus principles applied with RES do not play a significant role in the design and development of settlements in Wales. Low energy building features, such as orientation, etc. are not prioritised as part of planning approvals for projects. It is very difficult to offer training to Local Authorities in a non-priority area, as it will not be seen to be relevant.

Despite this lack of high level interest and support for passive/ NZE building, there is potential for enthusiastic individuals to drive forward such developments, as demonstrated in the Carmarthenshire County Council PassREg Beacon project – Burry Port Primary School. Here, the motivation to build to the Passivhaus standard was not set at the Planning level, but was instigated by in-house architecture teams who were seeking ways of reducing ongoing running costs of Local Authority buildings for the future. The overall lifecycle cost argument was the most important factor in this case and increased up-front build cost was

justified on the basis of longer term savings. As a means of supporting this and future schemes, an in-house LA architect will be undergoing Passivhaus Designer training, with the hope of incorporating Passivhaus principles into future LA schemes.

Success Model

Indicate the **need for targeted training** of specialists in municipal administration - define target groups, the scope of the curriculum and the number of trained local leaders and experts.

What **other steps** are necessary to prepare the employees of local administration - development of training materials and specialized software, exchange of experience with advanced regions of the country or from other European countries and others. Describe the scope and content of these activities in accordance with the needs of the region (municipality).

Suggest how capacity building actions to promote passive buildings might be included in the **Roadmap** for building the Success Model of the region (municipality).

It seems likely that if more individuals had a deeper awareness of the principles of Passivhaus/ NZEBs it would find a higher priority in all levels of policy development and implementation, including planning and project design – whether formally a requirement or not. This will be particularly useful where developers will also be the owners of the building and responsible for the ongoing running costs, such as with LA or government buildings.

Training in the principles and concepts of Passivhaus/ NZEB could be offered to **Planning Departments** within Local Authorities (high level, urban planning as well as planning approval officers). An improved understanding will help drive aspirational planning principles at a regional level (master planning, etc.), while at the level of awarding permissions will offer a better understanding of the design decisions taken by potential projects to capture passive energy principles, hopefully leading to some leniency against the many other factors that contribute to planning decisions.

Further to this, **Building Control** personnel would also require training in the high level principles and method of delivery of Passivhaus/ NZEB to ensure that the principles are correctly implemented on site (e.g. air tightness and thermal performance detailing correctly carried out).

It is inevitable that no funds would be made available to offer or carry out this training while the standard was not a requirement of the Regulations that Planners and Building Control Officers enforce. Mechanisms to offer 'free' training are therefore likely to be required. Even if training was free, justifying the time out to attend such training would again be problematic, as it would not be deemed an essential/ necessary requirement of the function they are currently having to perform.

It will also be beneficial for **Local Authority designers/ architects** to undertake Passivhaus Designer training so they can incorporate the concepts and principles into designs for LA buildings. The cost and 'time out' required for such training is likely to be prohibitive, though it may be deemed a valuable means of Continual Professional Development (CPD). Options to attend the training as a number of shorter sessions rather than a single, long course may be beneficial. However, this would inevitably require more localised training centres. The alternative route to PH Designer Qualification that requires designers to complete a PH building themselves may be an option, though initial training on the principles of PH and the use of the PHPP design tool would likely be required. Each of these options would require a fundamental change to the training offering in Wales (and across the UK) with a stronger

focus on distance learning, which may be difficult for existing training organisations to justify unless there is a much higher demand of delegates requiring such training.

Training of designers and builders

Baseline

Are there **training courses for passive house design** conducted in the region and how many designers have passed through them? How many current designers in the region are prepared to apply the principles of passive building in urban planning and building design?

How many local designers have **certificates for passive house designers**? What part of the buildings, designed by trained / certified (or untrained and non-certified) designers meet the requirements of Class A or the "passive house" standard?

How many **construction companies and professionals** employed with them, are familiar with the specifics of the construction of passive houses, are they prepared to carry out such projects and to what extent?

Passivhaus Designer courses are available from 3 organisations across the UK: BRE, the AECB (the Association for Environmentally Conscious Builders) and Strathclyde University in Scotland. The training course is long and quite expensive, so a relatively limited number of practitioners currently have this qualification, though numbers are gradually growing.

Passivhaus Tradesperson training courses are offered by BRE and the AECB. Only a relatively small number of individuals have attended these courses so far. Experience within construction companies in relation to low energy buildings has mainly been gathered by working on live Passivhaus projects, usually overseen by Qualified PH Designers to advise on key parts of the construction. Therefore, there are relatively few construction companies that would have first hand experience of the specifics of the construction technique.

Success Model

Indicate the need for targeted **training of local designers** from the region (municipality), specify the range of educational programmes and the number of trainees. Identify measurable indicators of the effectiveness of these trainings, e.g. issued certificates for passive house designers, number and quality of passive buildings designed by trained professionals and others.

Indicate the need for targeted **training of managers and professionals from local construction companies** - specify the range of educational programmes and the number of trainees. Identify measurable indicators of the effectiveness of this training, e.g. number of issued diplomas and certificates to builders of passive buildings, number and quality of passive buildings built by companies with trained specialists, etc.

What **other actions** are necessary for the preparation of local designers and builders - development of training materials and specialized software, exchange of experience with advanced regions of the country or with other European countries, etc.? Describe the scope and content of these activities in accordance with the needs of the region (municipality).

Suggest how the necessary actions to build capacity for the design and construction of passive buildings will be included in the **Roadmap** for building the Success Model of the region (municipality).

It is very difficult to determine how many professionals would need to be trained, either designers or construction company professionals, for Passivhaus with RES to become more common in the UK and Wales. It seems inevitable that training would need to be instigated at varying levels and from a wider range of providers, e.g. universities as part of architecture

degrees, local colleges training tradespeople. The nature of the training may also need to be re-examined, as discussed above, to consider distance learning qualifications and/ or evening classes, etc.

Other measures for education and training

Baseline

Describe what other educational programmes and initiatives **have been conducted** in the municipality, e.g. for students, children from kindergarten or specialists in heating units of municipal and other buildings. Describe the scope and content of these programs and initiatives and the degree of their effectiveness.

Low energy design principles will be incorporated into education programmes for architects and engineers, but may not specifically refer to Passivhaus or the integration of renewable energy systems in the most effective/ efficient way. Although specific training courses are available from organisations such as the Passivhaus Trust that may relate to Passivhaus, such as dealing with issues of thermal bridging etc. such courses will typically be attended by interested individuals who are already bought into the Passivhaus concept, not general practitioners or the wider public.

There is currently relatively little demand for specific training in Passivhaus/ low energy design. It is common in the UK that industry will not take part in initiatives (voluntarily) until it becomes necessary (mandatory) for them to do so. Hence, without stronger Regulation towards Passivhaus/ NZEBs low demand is likely to remain.

Success Model

Explain whether it is necessary to implement **specialized educational programs** related to passive buildings in the future, and to whom they should address. For example:

- Students and children from kindergartens and schools
- Managers at final energy consumption - directors of municipal buildings (schools, kindergartens)
- Specialists involved in the maintenance of heating systems - engineers, stokers
- Traders and distributors of building materials, products and technologies for passive buildings
- Journalists from local media
- NGO activists and others.

Describe what should be the scope and content of these educational programs and how to measure their **effectiveness**.

Since MVHR systems are relatively new in the UK, particularly in domestic buildings, there is some concern that they are not being specified and installed correctly, since there is no recognised 'competent person scheme' to validate installers' skills²⁵. Development of a training scheme/ competent person course for mechanical ventilation systems would provide reassurance to the industry that installed systems would be appropriate.

²⁵ Taylor. M, Morgan. L, 'Ventilation and good indoor air quality in low energy homes', Good Homes Alliance, November 2011. Available at: www.goodhomes.org.uk/downloads/news/VIAQ%20final%20120220%20-%20PUBLICATION.pdf

5

MARKET FOR PASSIVE BUILDINGS

This section shows the extent to which building materials, products and technologies for passive buildings are known and available in the local market, and to what extent they apply to the construction. Prerequisites to the creation of demand and market for passive buildings in the region (municipality) are considered.

Baseline

Describe the state of the **market for passive buildings** (number of designed and built passive buildings, availability of design and construction services, etc.). Identify the main obstacles to the development of this market - scant customers' awareness, insufficient preparedness of planners/designers, distrust to the quality of construction execution, supposedly more expensive initial investment, lack (or scarcity) of real examples of passive buildings, etc.

There are a limited number of Passivhaus Certified buildings in the UK, although numbers are continually increasing and projects are growing in scale from one or two 'pilot' dwellings to multiple dwellings and larger, non domestic projects. The perception is that it is too expensive to build houses to standards much in excess of the Regulatory minimum, as increased up front costs cannot be recovered through increased sale or rental prices. (Market prices are driven by other factors than energy efficiency, such as location and nearby amenities.)

For public buildings there is more interest in lifecycle costs as energy prices rise, as the Authority responsible for them will also have to manage their running costs and any ongoing maintenance issues. However, in commercial buildings there is more emphasis on capital costs and potential rental incomes, which will be led by the location and available facilities, and what the managing agent believes the income per m² could be. In reality, little focus is placed on service contracts and energy bills.

To some extent, the increased costs will result from contractors' concern about the risk and difficulty associated with delivering the required building performance, i.e. airtightness, thermal bridging, etc. Hence, they will price works higher to account for 'learning time' on site and the risk of re-work to deliver the necessary standards. As site professionals become more accustomed to delivering elevated levels of performance on site, costs should reduce.

Briefly characterize the **current local market** of building materials, products and technologies. Indicate the presence and accessibility of those that are related to passive buildings - insulation, windows, shading devices, ventilation systems, renewable energy facilities, household appliances, lighting and more. Evaluate whether these materials, products and technologies are known to the investors and how their prices are affordable for them. Describe what are the main obstacles to the expansion of these new materials, products and technologies – insufficient knowledge of the specific materials, products and technologies, lack (or shortage) of basic materials and products, high initial cost of the necessary materials and products, and others.

General building products such as insulation, household appliances, lighting, etc. are widely available throughout Wales and the UK. However, there are a limited number of products manufactured in the UK that have certification from the Passivhaus Institute. When building Passivhauses, some specialist equipment often needs to be imported from Europe. (In particular, MVHR equipment, air tightness sealing products). Some window manufacturers

are now able to supply appropriate triple glazed windows regionally. However, since there is currently a relatively small number of Passivhauses being built in Wales (and the rest of the UK) and there are no requirements from Government to do so, there are not sufficient drivers to encourage manufacturers to meet the need locally. As a result, such imported products will continue to only be available at a premium.

Unfamiliarity with imported products and concern over lead times present concerns to developers. Locally available products, or at least local distributors and stockists would inevitably be preferred by the industry.

MVHR systems (not PHI certified) are actually becoming more common in new housing in the UK. This is because they are beneficial to the calculations for energy use, generally indicating reductions in heat losses via ventilation and subsequent CO₂ emissions reductions. However, studies indicate that there are concerns about inappropriate specifications and poor installation and operational practices that may be undermining the benefit of such ventilation systems (Zero Carbon Hub/ NHBC Foundation report^{25, 26}). This would need to be addressed to give confidence to the industry and building users that these systems were beneficial.

Specify whether and in what areas **research and experiments** are held in the region for the development and introduction of innovative materials, devices and technologies for the construction of passive buildings. What were the results of these studies and to what extent they affect local practice. What is the participation of local universities, research and development centers.

Ebbw Vale Passivhaus competition: A design competition was held as a collaboration between Blaenau Gwent County Council, United Welsh Housing Association and BRE to develop a number of low energy and Passivhaus buildings on the Future Welsh Homes site at The Works in Ebbw Vale. The Works is a large scale redevelopment of an industrial area, which was the site of a former steel works. The redevelopment will see the building of new schools, a hospital, offices, housing and other buildings. The purpose of the design competition was to encourage ideas of the future of low energy homes and open these as demonstration homes to the general public. Two of the homes were designed to the Passivhaus standard with additional PV for electricity (one as a net zero CO₂ home (not considering energy for appliances), one as a true zero CO₂ home (including an allowance for appliances). The homes were then occupied by tenants of United Welsh Housing Association, where their energy use and comfort factors will be monitored in use by the architects that designed the buildings (bere:architects) and Cardiff University.

These pilot buildings have demonstrated that low energy housing can be built using local supply chains and they have been shown to offer significantly reduced running costs to occupants. They created a great deal of interest during the time they were open as show-homes. The main issue to overcome to offer viable mainstream development is the up-front build cost of the houses. While there are various things that would make equivalent dwellings more affordable going forward (e.g. economies of scale rather than one off dwellings) costs of delivering mainstream Building Regulations compliant housing has also fallen, maintaining the cost differential between typical house construction and the Passivhaus standard.

S u c c e s s M o d e l

²⁶ Zero Carbon Hub/ NHBC Foundation, 'Mechanical ventilation with heat recovery in new homes – Interim report', Ventilation and Indoor air quality task group, January 2012. Available via: http://www.zerocarbonhub.org/resourcefiles/viaqreport_web.pdf

Describe the proposed actions and measures for the **development of markets** for:

- Passive buildings (new construction and renovation of existing buildings)
- Building materials, products and technologies for passive buildings.

Describe the proposed **actions and measures** for the development of these markets, despite the fact that they (or some of them) are presented in other sections of this description of the Success Model. Systematize them according to their type in reference to the sections of the description of the Success Model - political, economic, financial, technical, communicational, etc.

Pay **special attention** to:

- The regulatory conditions for market promotion
- Economic and financial incentives
- Raising awareness and involvement of all key stakeholders.
- Explore some **specific opportunities**, such as:
 - Public-Private Partnerships
 - Third Party Financing (ESCO companies) and performance contracting in particular
 - More efficient use of EU and national funds to promote market for “nearly zero-energy buildings”.

Describe and reflect in the Roadmap the **additional actions** you recommend to promote the market of passive buildings and related construction materials, products and technologies in the region (municipality), such as (but not limited to):

- Targeted **research, experiments and demonstrations** at national and regional level in the field of building materials, products and technologies for passive buildings
- Organization and performance of specialized **construction fairs**
- Organization of **conferences**, seminars and more.

6

SUCCESSFUL PRACTICES

This section presents successful examples of passive buildings, already built in the region. It aims to show how the PassREg project aided and accelerated the process of their creation. It describes programmes to build passive buildings in this project and offers similar programs for future years.

Baseline

Describe whether the municipality has successfully built single **passive buildings** and other examples of buildings with high-energy performance.

Specify **how many passive buildings** have been actually designed and built in the community and how many of them have been proved “passive” after prolonged monitoring and/or with “passive house” certificate.

Note whether single examples of passive buildings are **encouraged by local authorities**. Do they represent products of local building policy or they are rather sporadic initiatives of private investors? Does the availability of such examples have an impact on the local design and construction practice?

If such models are available, briefly describe and illustrate them.

Success Model

Explain whether and how the **creation of such successful examples** of passive buildings can positively influence the design and construction practice and the passive buildings market.

Describe the **new successful examples** of passive buildings created with direct or indirect support of the PassREg project. Assess their impact on the design and construction practice and suggest whether they become elements of the Success Model for the region (municipality). Suggest how they can get involved in the Roadmap for implementation of the Success Model.

7

PUBLICITY AND PUBLIC SUPPORT

This section should demonstrate the commitment of local authorities to follow a consistent communication policy and their willingness to implement “nearly zero-energy” (“passive”) building standard in the design and construction practice through active public support and participation of all interested groups of local society. The outlined framework to develop a local communication strategy in relation to the “passive house” concept can be used in future community programmes and strategic documents dedicated to sustainable energy development.

Communication Strategy

Baseline

There are no existing communication strategies for the implementation of NZEBs that we are aware of in the region.

National (UK wide) campaigns have been run to raise awareness of energy efficient products (DIY or installer applied) and/ or reducing energy use throughout the home, often by utility companies/ energy suppliers or the suppliers of energy efficiency products. A recent study by the NHBC Foundation²⁷ on the change in attitude of the general public towards energy efficient homes between 2008 and 2012 indicated that while overall the cost of energy bills was important to householders, concern for climate change was relatively low. There was evidence of a ‘carbon rebound’ effect from savings made to energy bills, with most respondents saying they would spend the money saved on things such as new TVs or foreign holidays, which would actually increase their carbon footprint. Overall, the study recommended that the **communications and language relating to zero carbon homes needs to be simplified** for consumers to better understand and appreciate the issues.

Success Model

It will be necessary to communicate the aspirations and outcomes from PassREg to a wide range of sectors. Potential sectors and the relevant key messages are as follows:

Politicians and Local Authorities: It will be important for policy makers to understand that Passivhaus with RES is a successful and viable (‘cost optimal’) way of delivering the required NZEB targets of the EPBD. Many departments within Local Authorities will be involved in some way with the delivery of the NZEB targets; from in-house designers working on public buildings to ensure low long-term running costs, through to Planning and Building Control officers who will be required to ensure that all proposed public and private developments meet the necessary Regulatory standards (hence they will need to understand the principles and implementation of low energy design). Local Authorities also generally lead by example, through housing provision and by building schools and hospitals etc, usually with large-budget contracts. They therefore have the power to drive for higher standards on construction projects if they are well-informed.

²⁷ NHBC Foundation, ‘Today’s attitudes to low and zero carbon homes: views of occupiers, house builders and housing associations’, (NF40i) IHS BRE Press, February 2012. Available at: www.nhbcfoundation.org/Portals/0/NF_Pubs1/NF_40.pdf

Important methods of communication for this sector will be through events and awareness-raising sessions held specifically for Local Authority members (at their own premises to ensure convenience). It will also be important for policy makers to see successful projects in action to ensure the concepts are tangible and achievable rather than simply theoretical.

Communications will be tailored to various groups within the Local Authority and to coincide with other relevant activities where possible (e.g. regular General Meetings of departments). Word of mouth will also be a strong mechanism within Local Authorities to help build support for the concepts. Hence, starting small (with individuals or small groups) and working up to bigger groups/ departments once key individuals have bought into the concept can help raise the profile for such events internally.

Architects and Engineers: This group will be fundamental to the successful implementation of NZEB in the region. They will require knowledge of options to meet low energy targets and will need to be persuaded that Passivhaus with RES is a logical, cost effective solution. Due to requirements for continuing professional development (CPD) training to maintain professional standing/ chartership, this sector is probably the best informed about the Passivhaus concept, but they may not necessarily have the skills to design a Passivhaus standard building with RES yet.

Routes of communication will include offering CPD training modules and raising awareness of training courses (Passivhaus Designer, PHPP) through their chartered institutions/ membership organisations, such as the Royal Institute of British Architects - RIBA (or the Royal Society of Architects in Wales - RSAW regionally) or the Chartered Institution of Building Services Engineers – CIBSE. Such professionals also attend many regional and national events to keep up to date with trends, techniques and products, so representation of PassREg at national conferences and building exhibitions should raise the profile, along with promoting site visits of completed projects to see techniques first hand.

Contractors/ Construction companies: This group will be critical to the successful implementation of NZEBs. Previously there has been concern about the quality of construction practices and whether there was adequate skill in the UK contracting sector to deliver the Passivhaus standard. However, whether achieved by Passivhaus with RES or by some other mechanism (likely to involve a higher proportion of RES) contractors are aware that the attention to detail and quality of delivery on site will need to improve, but they may not be aware of the new skills needed yet. It will be necessary to communicate the main differences and enhancements of Passivhaus construction compared with traditional practices.

Routes of communication will therefore include offering training for Tradespeople and communicating this through their chartered institutions/ membership organisations such as the Chartered Institute of Building – CIOB and the Federation of Master Builders (FMB). Awareness raising communications via Constructing Excellence Wales (CEW) are likely to be well received by this group, covering the forthcoming NZEB regulations and Passivhaus & RES as a mechanism of delivering these targets. Such professionals also attend many regional and national events to keep up to date with trends, techniques and products, so representation of PassREg at national conferences and building exhibitions should raise the profile, along with promoting site visits of completed projects to see techniques first hand.

Housing Associations: After large-scale house builders, Housing Associations/ Social Landlords will be responsible for a considerable amount of new and refurbished housing.

Since such organisations have various social obligations placed upon them, a key message will be the added user benefits of a Passivhaus with RES, such as healthy, comfortable indoor environment and low running costs. While cost will obviously continue to be an important factor, it is relatively common for Social Housing to be required to meet higher standards than mainstream housebuilding. They may therefore be more open minded to the adoption of Passivhaus with RES.

One-to-one communication with development managers will be an important route, plus via the overarching member consortia to which each individual organisation generally belong. Short, targeted events with clear benefits demonstrated may also be appealing to this group.

Developers: This group is not necessarily difficult to reach, but is perhaps the most difficult to persuade towards a given route to meeting NZEB regulations. In order to ensure profits, it is in their interest to find the cheapest cost options for the delivery of necessary standards, since they will only be concerned about the sale price of a development and the in-use and lifecycle costs will be of little relevance for them. Mainstream developers are usually reactive to changes in regulation rather than proactive and will generally lobby Governments to keep Regulation as limited as possible to ensure development can be as cheap as possible.

Developers would need to be convinced that any additional capital expense could be recouped via increased sales values. While there is currently some evidence that high EPC rated dwellings demand a slightly higher sales price, this is difficult to persuade at this time as there are limited NZEB examples in Wales and the UK and they usually carry a capital cost uplift.

Communication and lobbying will become most important when NZEB is actually implemented into Regulation (though not due until 2020!) to persuade developers that the strong 'fabric first' approach with limited RES is more cost effective than poorer fabric performance with more RES. Cost examples will be extremely important. Routes of communication will include awareness raising via membership organisations (e.g. FMB), one-to-one meetings with development managers and attendance at regional and national events to raise the profile of Passivhaus with RES as a means of delivering NZEB requirements compared to other possible solutions.

Manufacturers: This group will inevitably be supportive of any initiative that promotes the use of their products. However, the need (or preference) for officially Certified products for Passivhaus will be a barrier. Companies will need to be convinced that provision of a Passivhaus-spec product and Certification will generate more guaranteed sales and give them a competitive edge. Currently, there is not adequate demand for Passivhaus in Wales or the UK for many companies (particularly SMEs) to justify such measures.

However, there will always be those that wish to innovate to gain an advance over their competitors and communication via trade fairs/ building exhibitions promoting the required specification for products for Passivhaus (and NZEBs in general) may be of interest.

Finance companies: Organisations such as banks, building societies and finance corporations will need to be confident that they will get a good return on their investment. Key messages will therefore be that a Passivhaus with RES will be a desirable building due to low running costs and high occupant comfort and hence should be easy to sell/ let. The reduced ongoing running costs should also free up income in the longer term to help repay finance/ pay rent, thus making more 'reliable' payments. Companies interested in 'ethical' investment options will also be interested in the environmental credentials of a

Passivhaus with RES. Routes of communication to this group will need to be explored further.

Educational institutions: There are obviously various levels of education, ranging from the youngest nursery pupils to university graduates and continuing professional development (in-work education). Educating future generations from an early age in energy concepts is obviously important. However, the real demand in education for Passivhaus and RES is with the designers, engineers, technicians and construction workers so they have the technical skills to design and construct buildings to the necessary standard. While currently courses are available to existing professionals (i.e. Passivhaus Designer, Passivhaus Tradesperson training) it is not necessarily mainstream. The courses are time consuming and costly and many professionals will not volunteer to take this additional training. It would be more logical if the principles of Passivhaus with RES were incorporated into standard vocational training courses, such as via universities and construction colleges. In this way, all new professionals would have the information and it would become less of a niche subject.

In order to achieve this, it will be necessary to communicate with colleges and universities and encourage them to adopt the training principles from the PHI-approved training. In the short term, linking with such institutions to deliver the PH Designer and Tradesperson courses locally will give them an introduction to the subjects. The colleges will then hopefully look to update their own teaching courses to include these subjects.

General public: Currently there is a relatively limited market for Passivhaus in the UK, hence there is limited value in a large scale public awareness raising campaign, as there would not be such dwellings available for people if they were interested in them. In the short term, the self-build market (households building their own homes) would get value from understanding Passivhaus and they are most likely to find this information from architects as they seek technical support for their projects. They may also attend national events to find out about modern techniques and products, so representation of PassREg at national conferences and building exhibitions should raise the profile, along with promoting site visits of completed projects to see techniques first hand.

In areas where Passivhaus is being promoted, local marketing will be valuable for prospective owners/ occupants so they may appreciate the value of the building (and hence may consider paying more for it). Literature for potential consumers should be developed for dissemination when promoting new Passivhaus building projects (for buyers and users).

Communication activities within the project

Baseline

Describe current or previously implemented **activities within the PassREg project**. Try to estimate their efficiency and achieved outcomes.

A range of communication activities will take place in the region under the PassREg project:

Regional Local Authority delegates were invited to Workshop sessions plus site visits held in the Front Runner Regions as part of the PassREg project. These proved to be valuable opportunities to see the implementation of Passivhaus with RES first hand. Unfortunately it was difficult for some delegates to find approval for the time necessary for such visits, so more local, regional activities will be valuable to reach a wider audience.

A number of info sessions/ awareness raising sessions are to be held. The info sessions will be targeted to the Beacon project with the aim of raising awareness of the Passivhaus

principles amongst designers, local authority departments (planning, building control), contractors and suppliers in order to facilitate the project. Further, wider awareness sessions will also be scheduled for the Local Authority Building Control (LABC) General meeting (all Welsh Local Authorities) and with the CLAW (Consortium of Local Authorities in Wales) Energy sector if possible. These will serve to raise wider awareness with key Local Authority personnel beyond the Beacon project.

The PassREg project will also be represented at major conferences/ exhibitions. These will include the UK Passivhaus conference, the EcoBuild International conference and the GreenBuild Expo. These will raise the profile of PassREg and for Passivhaus with RES with a wide ranging audience. PassREg presentations will be uploaded onto the BRE Slideshare portal (www.slideshare.net/BREGroup/) for viewing after events. If budget is available via the project, we will explore whether it is possible to arrange a trip for key Welsh personnel related to the Beacon project, Local Authority members and politicians to attend the UK Passivhaus conference in 2015. This would be a 'fact finding' mission to better understand how PH with RES would be a viable option for meeting the NZEB targets.

To strengthen the training capacity in the region, Passivhaus Designer and Tradesperson courses will be held. These will help to identify if there is a market for such training at a local level. Hopefully if this is demonstrated it will become viable to hold further training courses in the future. We will work closely with the regional construction training college in Carmarthen to hold the Tradesperson course. It is hoped that following this the college will investigate with them the potential to implement such training as part of their ongoing courses and also to deliver it as a suite of evening classes, which may be more practical for tradespeople to attend.

In addition to these activities, a range of press releases will be issued to spread news of key project activities. In particular, the BRE 'Building 4 Change' (B4C) network will be used to disseminate project activities, including the Passivhaus Award winners. News stories from B4C are circulated to approximately 4000 email members every week.

8

QUALITY CONTROL

This section should clarify whether the municipality has a quality control system for projects and buildings and what tools and methods are used to evaluate the quality.

Baseline

Describe the system of **quality control** of projects and completed buildings and evaluate its effectiveness. Specify the methods and tools to carry out such checks and the degree of reliability:

- The extent to which **current standards** for energy efficiency in buildings are respected in the design and construction
- What **quality control** is implemented in the approval of design and construction products and the acceptance of completed buildings
- Is there **monitoring** of the energy performance of new and renovated buildings, which methods and tools are in use
- How the **results of monitoring** are utilized and reflected in current policy and practice
- Determine the effectiveness of the introduction of energy **certificates and passports** of buildings.

Energy performance in buildings is overseen by the Local Authority Planning and Building Control departments. Forecast building energy performance is calculated using the National Calculation Method (NCM) using SAP (domestic) or SBEM (non-domestic) tools to output an Energy Performance Certificate (EPC). Individuals that carry out this modelling are required to undertake a training course and exam, after which they are deemed a 'competent person' to carry out such calculations. Planners/ Building Control officers will generally not carry out further verification of these calculations, simply check that the assumptions made are reasonable.

At this design stage, the procedure is largely acceptable and well established. However, **conversion of the energy aspects of design into construction does not have particularly thorough quality control applied**. The role of Building Control officers is to ensure that the standards of the Building Regulations are delivered in practice during construction. However, priority is given to the fundamentals of safety issues and services provision (e.g. drainage, power). There is obviously a limit to the number of visits a Building Control Officer can make to construction sites and they will not necessarily be able to check every aspect of the construction (e.g. detailing etc.). Safety certificates will be presented by developers to Building Control to confirm (via competent person schemes) that key aspects have been verified. However, the energy certificates submitted at the design stage are not further reviewed and there are not established 'as-built' or 'in-use' performance tests or monitoring standards to be followed.

It is not particularly common for energy consumption to be formally monitored in newly constructed or refurbished buildings. Monitoring is occasionally carried out by interested building owners who wish to verify whether the investments they have made in energy efficiency has paid off. However, there is no standardised form for such monitoring and no established forum for publishing or comparing such data. In fact, it is quite likely that owners

may not want to publish such data if they fear it may reflect poorly on their environmental image.

Various systems exist to indicate performance levels of construction products. For instance, windows are assessed against the BFRC energy efficiency label, which rates a window's energy performance on a scale of A to G. Most mechanical systems will have accepted testing to acquire a 'rated performance'. However, this performance may not represent actual in-use conditions. Recent studies have indicated concern about a lack of confidence in the specification and installation of domestic ventilation systems, i.e. MVHR. This is a relatively new area of the UK construction industry and there are currently no accepted schemes to demonstrate competency in such systems and verify they have been installed correctly.

An overall environmental performance rating is given to buildings by assessing against the BRE Environmental Assessment Method (BREEAM) or the Code for Sustainable Homes for housing. This process requires evidence to be gathered to demonstrate that a range of environmental features have been appropriately implemented in a building. The assessment is carried out by someone independent of the construction project team and is separately QA checked by the BRE. However, to demonstrate energy performance, this procedure also relies on the output of building energy models using SBEM and SAP respectively as it is very difficult to establish accurate intrinsic usage of buildings. BREEAM encourages building managers to monitor energy use but it cannot be formally enforced beyond requiring appropriate monitoring equipment to be installed.

The introduction of Energy Performance Certificates for buildings has gone some way towards raising awareness amongst building owners and occupants of energy issues. However, there are many other factors that influence a building's 'asset value', hence its sale or rental price, including local amenities and the desirability of an area. Across the UK, there is evidence to suggest that house buyers are prepared to pay a relative uplift for homes with higher EPC ratings, but this is not replicated in the commercial sector²⁸.

S u c c e s s M o d e l

Indicate how do you propose **to improve the quality control system** for building projects and finished buildings - regulations, control and executive authorities, methods and procedures.

How do you propose to improve the **monitoring** on finished buildings in the operation process? Describe the necessary legal, organizational and technical measures related.

Clarify the relationship between quality control and **certification system** of buildings, as well as guarantees to achieve the desired quality characteristics of building projects and finished buildings.

Indicate the presence (or absence) of links between the energy characteristics of building projects and finished buildings on the one hand and their **environmental characteristics** on the other.

Introduction of competent person scheme for the specification and installation of domestic MVHR systems.

Introduce requirement for on site balancing/ commissioning of MVHR with results submitted to Building Control.

²⁸ [www.gov.uk/government/uploads/system/uploads/attachment_data/file/207196/20130613 - Hedonic Pricing study - DECC template 2 .pdf](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/207196/20130613_-_Hedonic_Pricing_study_-_DECC_template_2_.pdf), <http://centaur.reading.ac.uk/26977/1/0111.pdf>

Set requirements for as-built testing data to be submitted to Building Control to help prove performance, e.g. air pressure tests, MVHR commissioning tests, photographic evidence of build process, including detailing for thermal bridging etc.

While independent third party verification of Passivhaus buildings is beneficial, it would be costly to carry out this process in addition to standard regulatory approval procedures. It may be necessary to adapt existing calculations and the certification approach of PH to gain acceptance in UK/ Wales. As with Brussels and Tyrol etc, it is likely to need to be integrated into existing verification tools, hence formal PH certification may be problematic (will be seen as duplication of effort and differing performance figures (if based on different assumptions) may lead to industry confusion).

9

ROADMAP

This final section summarizes the results of the SWOT analysis of the Success Model for the Wales region by addressing and assessing main strengths and opportunities that the model reveals, and its vulnerabilities and risks (threats). Based on the results of this analysis a Roadmap for developing and implementing the Success Model for the region (municipality) by 2020 is proposed.

SWOT Analysis

Consistently identify, describe and evaluate the strengths and opportunities that this Success Model suggests on the one hand and describe identified weaknesses and potential threats and risks to its successful implementation on the other. On the basis of the so described and evaluated performance of the developed model, identify appropriate measures and actions to reinforce strengths and opportunities and those that may limit the impact of the weaknesses and risks (threats).

<p>Key strengths of the Success Model</p> <p>Interest at a Local Authority level in setting higher requirements (fabric first NZEB via Passivhaus) than at Wales Gov level</p>	<p>Weaknesses of the Success Model</p> <p>Limited number of regional suppliers/ manufacturers of suitable products</p> <p>Few financial incentives to promote the drive for Passivhaus/ NZEB (fabric first)</p> <p>Training courses (particularly PH Designer) too long and expensive – limited uptake</p>
<p>Favourable opportunities</p> <p>Some evidence that real estate market (for domestic at least) starting to consider EPC energy rating in sales prices</p> <p>Recast EPBC requires consideration of lifecycle cost. As energy prices rise, up-front costs to improve energy efficiency will become more viable</p> <p>Incentive for public buildings (where Local Authority responsible for ongoing running costs) to consider lifecycle optimisation to reduce their financial burden in the long run</p>	<p>Threats and risks</p> <p>Future Regulations do not promote fabric first approach strongly; market finds it ‘cheaper’ to bolt on technologies</p> <p>Lack of support for PH/NZEB via fabric first approach from mainstream developers – perceived extra cost and complexity, likely to lobby Government to keep minimum standards lower and more easily achieved</p> <p>Failing to meet the required standards during construction – undermine good intentions (lack of quality control)</p> <p>Uncertified buildings perform poorly (e.g. badly installed MVHR, poor detailing) and give bad reputation to genuine Passivhauses</p>

It is recommended that while developing the new Success Model, project partners should carefully analyze the descriptions of front-runners' Success Models (the "front-runner" regions of Hanover, Brussels and Tyrol) and in particular the specific actions and tools used in their successful implementation.

Roadmap

Measures and actions to support the implementation of the proposed Wales Success Model (Short term – to end of PassREg project and into the mid-term, Long term – on the approach to 2020 EPBD target):

Short term

- Regional Building Forms – to encourage industry to back the concept of PH + RES as means of delivering NZEB in Wales (use as support for position paper to BRAC towards Building Regulations revisions).
- Lobby Welsh Government to consider the PH + RES approach to delivering NZEB via building regulations by 2020. Also raise the importance of on site quality control and look at mechanisms to achieve this, particularly for ventilation installations.
- One more information session is proposed for the Planning department of the Beacon Local Authority to assess obstacles in the planning process when considering PH + RES.
- A further general awareness session (beyond the Beacon region) is intended to for members of the CLAW Energy Group – for energy managers within Local Authority – since the lifecycle cost argument of fabric first will resonate strongly with this group.
- Offer immediate training for Designers and Tradespeople in Beacon regions. Explore longer term potential for training (adapted for more practical, cost effective delivery) with regional training organisations/ colleges/ universities/ etc.
- Represent PassREg (PH + RES) at national conferences, such as UK Passivhaus conference, EcoBuild etc.
- Explore whether possible to get PHPP closer to use for Regulatory compliance (or SAP to better acknowledge PH performance). This would help to reduce certification/ compliance burden. Will also need to consider overheating calculations – investigate how this has been dealt with via PHPP in other regions.
- Delivery of the school Beacon project as a case study for industry – dissemination of important design and implementation aspects and lessons learned.
- Continue to lobby Local Authorities to consider higher standards on their developments. Offer any necessary training or awareness raising to allow 'informed' decisions to be made to choose PH + RES. More projects will help develop supply chains and markets for the delivery of the standard and set an example for the wider industry to follow.
- Continue to promote any new (or refurbished) PH + RES buildings to the industry (and general public so far as possible), to show that it is viable (based on lifecycle cost, etc) – promote any financial mechanisms that have been used to aid delivery.

Longer term

- Lobby housebuilders to consider PH + RES as the solution to meet NZEB requirements, rather than higher proportion of RES (via allowable solutions). Present lifecycle cost benefit/ cost effectiveness of the PH + RES approach.

- Simultaneously promote low running costs and hence increased ‘value’ of such properties to potential purchasers within marketing information. (In association with housebuilders and via independent channels to give credibility.)
- Work with relevant regional product manufacturers to consider obtaining Passivhaus certification for their products/ components to increase product availability as approaching ‘mandatory’ NZEB date.

Annexes:

A: Economic objectives and indicators for Wales region

1. Template for the description of the baseline of aspiring regions involved in PassREg project (available on Alfresco)
2. Indicative scenario for the preparing and performing of Regional Building Forums in aspiring regions involved in PassREg project (available on Alfresco)

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Annexe A -

Economic objectives and indicators

Baseline

Describe the main **economic indicators** of the current (baseline) level of energy efficiency in buildings in the region (municipality), such as:

- Total volume of electricity consumed in buildings & Average relative annual energy consumption per m² gross floor area

The following tables show the average domestic and non domestic use of electricity and gas in Cardiff and Wales as a whole. If it is assumed from the data above that the average dwelling floor area is 92m², then the typical domestic gas consumption in Wales would be approximately 160 kWh/m²a (for heating, hot water and often cooking), with domestic electricity contributing a further ~40 kWh/m²a (delivered, not primary energy). Hence, overall the typical domestic delivered energy demand is approximately **200 kWh/m²a**. By comparison, ‘good’ performing modern dwellings would be expected to require approximately **85-100 kWh/m²a** for heating and hot water.

Table 1: Domestic gas consumption - 2010²⁹

Location	Consumption, kWh	No. meters	Average consumption, kWh
Cardiff	1,914,582,262	134,728	14,211
Wales	16,141,776,804	1,100,023	14,724

²⁹ http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/mlsoa_llsoa/mlsoa_2010/mlsoa_2010.aspx

Table 2: Non-domestic gas consumption - 2010

Location	Consumption, kWh	No. meters	Average consumption, kWh
Cardiff	1,374,347,809	1,568	876,497
Wales	10,327,310,939	11,242	617,289

Table 3: Domestic electricity consumption - 2010

Location	Standard meters total consumption	Economy 7 meters total consumption	No. Standard MPANs	No Economy 7 MPANs	Standard meter Average consumption	Economy 7 meter average consumption
Cardiff	476,525,253	69,171,268	136,673	12,065	3,487	5,733
Wales	4,526,079,194	835,063,426	1,253,927	115,202	3,674	6,733

NB: Economy 7 meters provide a cheaper rate of electricity during off peak hours, i.e. for 7 hours overnight. Storage heating systems are generally used in association with such meters.

Table 4: Non-domestic electricity consumption - 2010

Location	Standard meters total consumption	No. Standard MPANs	Standard meter Average consumption
Cardiff	1,039,048,372	7,118	145,975
Wales	10,456,675,702	123,688	95,780

- Average energy bills by an average home (or household)

A typical price for gas in the UK would be approximately 3.4p/kWh, while the typical price of electricity would be approximately 12.9p/kWh. Applying these figures to the estimates above (160 kWh/m² gas @ 3.4p and 40 kWh/m² electric @ 12.9p, over 92m²) gives an annual energy bill of around £975.

- The share of energy in the annual budgets of consumers (including households)

A study in 2012 by an independent energy switching company (uSwitch) found that the average proportion of energy costs in the UK was 3.2% of household incomes³⁰. Across the UK and Wales, families are considered to be in 'fuel poverty' if they are required to spend over 10% of their net income (after tax) on energy bills and in 'severe fuel poverty' if they have to spend 20% or more. In 2012, 30% of households in Wales were estimated to be in fuel poverty³¹.

- The approximate relative and overall potential for energy efficiency in buildings
- Share of passive buildings of (i) total new construction and (ii) renovated existing buildings in the region; recorded annual growth rate in both categories (if any)

There are only a small number of Passivhaus examples in Wales at present, including four individual new build dwelling projects and a Local Authority owned Training Centre in

³⁰ www.telegraph.co.uk/finance/personalfinance/consumertips/household-bills/9273867/The-cost-of-energy-bills-soar-by-140pc-in-eight-years.html

³¹ <http://wales.gov.uk/topics/environmentcountryside/energy/fuelpoverty/researchreports/?lang=en>

Powys. Most, if not all of these have been built in the last 4 or 5 years. There are more Passivhaus buildings across the rest of the UK covering a wider range of building types, including offices and care homes. It is not known what extent of renewable energy systems is present in the Passivhaus buildings, although some of them are known to have incorporated solar hot water systems and PV panels (Ebbw Vales, Heads of the Valleys).

- Share of renewables used in new and renovated buildings, particularly in passive buildings

The renewable energy contribution to the overall energy supply mix within Wales is relatively small, but has been steadily increasing in recent years, as shown in **Error! Reference source not found.** (Share of Passive buildings too small to account for.)

Table 5: % energy supply from renewables for Wales (Stats Wales website)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Renewable sources %	2.8	2.4	2.4	2.6	2.9	3.5	3.9	4.2	4.3	5.0	5.1

- Level of appreciation (cost raising) (percentage) of passive buildings against traditional buildings (for new construction and for renovation of existing buildings).

Across the UK and Wales, property prices are dictated by many other factors rather than just energy efficiency, particularly location and nearby amenities. A recent study carried out by the Department for Energy and Climate Change (DECC)³² suggested that the housing market was beginning to show a slight cost premium for houses with the highest EPC energy ratings, compared to those with the lowest ratings. (14% price increase for A and B rating over a G rating in equivalent properties. Average UK dwelling rating = C-D). While this is a positive step that reflects that the market values energy efficiency, it does not attract a sufficient price differential compared to modern 'typical' dwelling standards to cover the increased capital of building to the Passivhaus standard. Similar studies for commercial properties suggest that there is not a strong relationship between environmental performance and rental or capital value.

It is desirable to distinguish the energy performance indicators of municipal buildings against those of residential and all other buildings (commercial, industrial, etc.).

- Total volume of CO₂ emissions generated as a result of energy produced (and consumed) in municipal buildings

NB: Specific data for non-domestic buildings is not available. Specific data for refurbishment is not available.

³² [www.gov.uk/government/uploads/system/uploads/attachment_data/file/207196/20130613 - Hedonic Pricing study - DECC template 2 .pdf](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/207196/20130613_-_Hedonic_Pricing_study_-_DECC_template_2_.pdf)