

# Agenda – Climate Change, Environment and Rural Affairs Committee

---

Meeting Venue:

Committee Room 1 – Senedd

Meeting date: 28 February 2018

Meeting time: 09.30

For further information contact:

Marc Wyn Jones

Committee Clerk

0300 200 6363

[SeneddCCERA@assembly.wales](mailto:SeneddCCERA@assembly.wales)

---

## 1 Introductions, apologies, substitutions and declarations of interest

## 2 Inquiry into 'Low carbon housing: the challenge' – fourth evidence session

(09.30 – 10.30)

(Pages 1 – 23)

James Williams, Director – Sero Homes Limited

Jon Bootland, Chief Executive – Passivhaus Trust

### Attached Documents:

Research Brief

Consultation response from Sero Homes

Consultation response from Passivhaus Trust

## Break

(10.30–10.40)



**3 Inquiry into 'Low carbon housing: the challenge' – fifth evidence session**

(10.40 – 11.40)

Alex Rathmell, Head of UK Market Development – National Energy Foundation

**4 Paper(s) to note**

**4.1 Letter from Wales Environment Link on environmental governance post-Brexit**

(Pages 24 – 25)

**Attached Documents:**

Letter from Wales Environment Link

**5 Motion under Standing Order 17.42(ix) to resolve to exclude the public from Item 6 of this meeting.**

**6 Discussion of evidence**

(11.40 – 11.50)

Document is Restricted

## **RE: Low Carbon Housing: the Challenge**

This response has been submitted in an official capacity on behalf of Sero Homes Ltd.

### **Introduction**

Sero Homes is a new venture dedicated to the development, delivery and professional management of energy positive homes. Sero Homes has a long-standing history in renewable energy through our successful company Eco2 Limited with over 300MW of renewable energy projects delivered in the UK.

### **What role can housing can play in Wales' low carbon transition, including the potential positive impacts on greenhouse gas emissions?**

Housing can have a positive impact going forward in three key areas;

- **Reduce** – The building fabric including lighting and some electrical loads can be improved such that overall consumption of energy is reduced.
- **Balance** – Energy storage systems can help alter the demand profile to avoid the network peaks, this can be achieved through thermal mass, heat and electricity storage systems.
- **Generate** – Where feasible, energy can be generated using technology embedded into the building fabric such as solar thermal, PV and other cladding systems.

The domestic sector is responsible for 23% of carbon emissions and there is considerable scope for reductions within the housing sector, particularly in new build. Switching to an electrified form of heat, such as a heat pump with a Coefficient of Performance (CoP) of ~2.5+ whilst generating electricity through roof mounted photovoltaics (PV) could save upwards of 2 tonnes of CO2 per house before building fabric improvements are considered. In addition to this, electrification of heat will also decarbonise further as the national grid reduces in carbon intensity in years come.

Low energy and self-generating homes (“Energy Positive homes”) will require less energy, use less and generate a surplus to offset the need for other forms of centralised generation. The ability to balance out intermittent generation on the grid will enable more renewable energy in the system. Wales has set ambitions for 70% of electricity to be generated by renewable sources by 2030, homes can play important part in the reduction, balancing and generation of electricity.

With energy policy set by the UK government, Welsh Government has more control of CO2 in the energy sector in Wales under a decentralised energy model.

## **The development and availability of technology needed for highly energy efficient housing;**

Established technology is widely available;

- Heat pumps are mature markets in many European countries but account for around 2% of the UK domestic heating market.
- PV is also established with more than 800,000 rooftop installations in the UK, an established supply chain and a network of installers.
- Battery technologies for the home are being installed around the world with a large number of companies including automotive companies entering the market.

The technologies must be considered as part of a full system with seamless integration, a simple user interface and an energy efficient building fabric. This systematic approach has been well demonstrated at a small scale in the UK over many years with the SOLCER project offering an up to date demonstration. Sero Homes promotes the systematic approach being adopted at a site level rather than a house by house basis, the community generates energy that is shared and optimised within the development.

The issues around technology is not capability or reliability, the local supply chain needs to establish a presence in Wales and consumer understanding of technologies needs to improve. For the mass housebuilding sector, it is also considered that traditional cavity wall construction has a future in the short term for Energy Positive homes as a transition to modern methods of construction with lower levels of embodied Carbon.

Wales has some of the oldest housing stock in Europe, It must be considered that a home will generate energy in a number of ways in its lifetime (>100 years) and as a priority it must be a comfortable and desirable place to live.

### **What changes are needed to ensure that existing housing stock is as energy efficient as it can be?**

Sero Homes targets new build developments however the same approach can be taken with renewable technologies. Many of the technologies can be retrofitted to existing buildings but the capital costs will inevitably higher as in a new build the technologies typically offset cost that would have been spent anyway (such as gas boilers, roof coverings, high temperature heating systems).

The extra/over cost in retrofit is at least double that of new build, before building fabric upgrades are factored in.

### **Whether it is possible and feasible to deliver low carbon, Energy Positive, affordable housing at scale in Wales and, if so, how this can be achieved;**

Yes, it is feasible and with initial market support and new business models it is definitely possible.

Firstly, Energy efficiency and affordability go hand in hand, a significant reduction in the energy bill (~70% reduction) is equivalent to a 10% annual saving over the equivalent 'business as usual' new

build home. Comparing this to affordable homes policy, for example; 40% of properties on a site with a 20% saving is equivalent to a net 8% saving overall. Therefore building energy efficient homes will represent an improvement to affordability provided the properties are not sold or rented for a premium, more on this point later in the document.

There is little need for further demonstration at a single or small multiple (<10) scale, the biggest need for the industry is development at large scale (50+). Scale can achieve the following;

- Reduction in technology prices,
- An increase of skilled workers and supply chain establishment,
- Stimulation of market desire for “green” homes, and
- Increase in green financing incentives such as institutional investment in build to rent or green mortgages.

The social housing sector is tuned in to the benefits of energy efficient housing and the long term view in business models will help the transition. Sero Homes believes that the private rental sector will be fundamental in giving the market momentum for Energy Positive homes. Professional build to rent models will attract low cost capital and institutional investors with a different view on technology risk. Rental properties will also address the construction sector concerns that ‘nobody will buy them’, it is important whilst technology prices are high that rentals are competitive with the existing market. Capital grant schemes provided by the Welsh Government such as the The Innovative Housing Programme will reduce the risk for developers attempting large projects. Consumers could be the true beneficiary of the grant by paying a market equivalent rental and gaining a saving in energy.

With a pipeline of developments in Wales it is envisaged that a £20k premium on a £170k property could reduce by around 40% within a three year period, this would bring it within reach of a green mortgage product. In this period new business models in decentralised energy generation will emerge which will help offset the additional capital cost.

Affordability is considered in one dimension which is rental cost. Energy Positive homes have the potential to be affordable in energy and transport with integration of Electrical Vehicle charging and innovative car leasing models. Changing the definition of Affordable Rent to include fuel costs would allow developers to consider increasing rents with lower fuel bills to reach an equivalent position.

Other market incentives for Energy Positive homes could include taxation relief in Land Tax and lower cost of borrowing. Planning policy for affordable homes can recognise the affordability of market value Energy Positive homes as explained above.

### **What are the barriers to delivering transformative change in house building in Wales?**

**Construction Sector** – The biggest barrier is the resistance to change in the construction sector particularly amongst the national housebuilders.

**Capital Cost** – The cost of ‘greening’ a home is not location dependant, in our estimates its £20k on average across the UK. Wales has lower house values which makes the premium more significant when compared to an average house price of £225k in the UK.

**Consumer Awareness** – The population is becoming more climate aware and supportive of renewable energy however the understanding of Energy Positive homes is low.

**Supply Chain & Skills** – The supply chain required to deliver transformative chain is not yet apparent but Wales has opportunities to drive growth in this area.

**What is the role of Ofgem and the national grid in enabling grid evolution to accommodate new types of housing, and what are the challenges presented by decentralised energy supply?**

The Ofgem argument that self-generation increases system costs for other users is right if every home uses the technologies to reduce grid consumption only.

Energy Positive homes have the ability to reduce system costs with smart management, leading to less reinforcement of the network. The homes in aggregation have the ability to offer demand side response services, respond to system changes in the distribution and transmission network and use surplus in an effective manner. Also, building houses with the ability to store and release energy will reduce the system peak when compared to building ‘traditional homes’.

Ofgem and National Grid has already recognised the potential in this area and launched reforms to enable Energy Positive homes to access balancing markets.

**Whether Wales has the requisite skills to facilitate and enable change in the housing sector;**

Wales has the opportunity to attract the necessary skills and increase jobs, Energy Positive homes at scale are in their infancy in the UK. Sero Homes is aware that suppliers in the UK and Europe would consider locating manufacturing or assembly plant close to the demand. Wales has the potential to be a ‘first mover’ as a nation and attracting new companies and jobs to the region.

**What changes are needed to Building Regulations in Wales to accelerate progress towards ‘near zero’ energy standards and beyond?**

Sero Homes does not believe that a change to Building Regulations is required to enable the increase of Energy Positive homes. The need for construction of new homes is great and regulatory change will force developers and housebuilders into England which could lead to failure in achieving housing targets.

Regulatory changes if required should focus on the ‘reduction’ (see Q1) of energy demand through improvements in building fabric.

The market has the potential to drive the change with the correct incentives, such as;

- Capital grants for extra over cost.

- Planning policy incentives.
- Recognition of fuel affordability in policy
- Promoting Build to Rent and attracting long term institutional investment.

**How communities can be planned and shaped to be more energy efficient and low carbon (including examples of good practice in Wales and further afield).**

Local Authorities should be considering energy strategy at the outset and enforcing the strategy through the planning process, typically district heating presents the most efficient low carbon solution.

James Williams  
Director

-

## 1. Introduction

This response from the Passivhaus Trust highlights how housing built to the Passivhaus standard can play an important role in Wales' low carbon transition. The skills and technologies used to achieve this level of performance are already well established and proven in the UK and across the world

## 2. The role of housing (and Passivhaus!) in Wales' low carbon transition

Housing has a key role to play in any low carbon transition. Obviously, the performance of the existing stock is the most important factor, as it is responsible for approximately 25% of CO2 emissions across the UK. However, improving new homes is also important, so that they no longer contribute to the problem and future retrofitting will no longer be needed.

Passivhaus is one way of achieving these highly efficient homes in Wales. Passivhaus buildings use very little energy for heating and cooling, while providing a high level of occupant comfort. They are built with meticulous attention to detail and rigorous design and construction according to principles developed by the Passivhaus Institute in Germany, and can be certified through an exacting quality assurance process.

The Passivhaus New Build standard is set at 15 kWh/m<sup>2</sup>.a for heating energy demand and Passivhaus buildings typically achieve this performance in reality. New homes built to current Building Regulations i.e. Part L 2013 might typically achieve heating energy demand of approximately 60-80 kWh/m<sup>2</sup>.a in practice. Passivhaus homes will therefore consume less than 25% of the heat energy for a typical new build home or, looked at the other way, will use 75% less heat energy than a typical new build home. This can make an important contribution to Wales' low carbon transition.

## 3. The development and availability of skills and technology for highly efficient housing

There are two major challenges presently facing the Welsh housing industry:

1. The Welsh Government's commitment that all new buildings be 'Nearly Zero Energy' by 2020 (1).

2. Evidence that many new low energy buildings are not performing as well as they are designed to (2) in terms of three importance aspects:
  - energy use
  - ventilation and indoor air quality
  - thermal comfort and overheating

It is no longer enough to use a standard building design and construction process, with bolted-on energy supply solutions. Research into the real performance of buildings has revealed serious problems with this approach. A significant 'performance gap' has been identified with many new buildings, relating to evidence that they are using more energy than expected, whilst also experiencing problems with both indoor air quality and overheating (3).

Passivhaus offers a cost-effective, quality assured alternative to the standard approach, and it has been shown to deliver the required levels of performance on a consistent basis (4).

Passivhaus is a very low energy standard, that offers the skills and technology necessary to deliver highly energy efficient homes. It was developed to close the performance gap and ensure the delivery of good indoor air quality and consistent thermal comfort throughout the year by using an advanced calculation tool (PHPP) and providing an approach that is quality assured throughout. This ensures that Passivhaus buildings really deliver reduced greatly energy use, good indoor air quality and comfortable temperatures throughout the year.

Recent research carried out by Bath University demonstrated that there is 'no evidence of a performance gap in certified Passivhaus homes in the UK' (5). Space heating and overheating were monitored in Passivhaus dwellings.

*'the homes are, on average, performing better than the design prediction of 15 kWh/m<sup>2</sup>/year and the performance gap seen in other dwellings, where more energy is being used for space heating, is not being seen in these certified Passivhaus dwellings.'*(5)

By considering improved performance in terms of the whole building and the processes throughout, and bringing these together into a design tool – the Passivhaus Planning Package (PHPP) – the Passivhaus approach simplifies the work needed to deliver a real high quality, healthy, comfortable, low energy building. In addition, a Passivhaus building that is designed to respond to the climate, and is well insulated and ventilated, provides protection from summer overheating as well as winter cold. All these factors ensure that a Passivhaus building will deliver a high quality internal environment that will support and enhance the health and well-being of the building's occupants, while using very little energy.

With the first Passivhaus building built in 1991, over 65,000 buildings have been designed, built and tested to this standard worldwide (6). In the UK more than 150 projects, encompassing over 800 units, have been certified Passivhaus, some of which are in Wales (7).

The Passivhaus Trust is the official organisation for Passivhaus in the UK. The Passivhaus Trust members map (8) shows the location of many practitioners with a range of expertise and experience in Passivhaus design and construction, around the UK. These include architects, designers, consultants, builders, engineers, product suppliers and manufacturers, clients and academics. There is also an active programme of education and training events throughout the year,

culminating in an Annual Conference. There is therefore a sufficient supply chain for the delivery of Passivhaus homes in Wales.

#### 4. Improving the energy efficiency of the existing housing stock

, Passivhaus also has a role to play in improving the efficiency of the existing housing stock. The Passive House Institute has developed the EnerPHit – ‘Quality-Approved Energy Retrofit with Passive House Components’ Certificate. This involves the same measures of improved insulation, thermal bridges and airtightness, as well as use of high quality windows and whole house ventilation with heat recovery. These measures can achieve energy savings of 75 to 90% (9).

Application of this standard in the UK is at an early stage, with three large tower-block projects (Manchester, Glasgow and Portsmouth) and about 10 small-scale (individual home) projects. Experience so far suggests that Passivhaus retrofit might be useful and cost-effective on the large-scale schemes, but too onerous on individual dwellings, unless a complete refurbishment is being undertaken anyway.

#### 5. Delivering affordable energy efficient housing at scale

Passivhaus can provide one option for delivering affordable, energy efficient housing at scale. Results from some of the first Passivhaus social housing units built in the UK have demonstrated some interesting results, both in terms of capital costs (10) and in terms of running costs (11). However the capital costs of these early projects include additional costs for innovation, which should reduce over time. This research is currently being updated, and the interim findings are presented below, although the report won't be available for at least six months:

- a. Capital Costs – there can be an additional capital cost for Passivhaus homes, if everything else (design standards) is kept the same. If however, the design is adjusted to be more efficient for Passivhaus (orientation, windows etc) then it is possible to achieve the Passivhaus standard at no extra cost. This has been achieved by Exeter City Council on their latest two schemes, because they set their brief to achieve this, and adjusted the designs accordingly.
- b. Operational costs – there will be a significant saving in energy costs for occupants of a Passivhaus home. Average annual heating bills can be approximately £150 for a typical 2 bed terrace, although this obviously depends on the lifestyle and behavior of the occupants. In Exeter, they have found that some tenants have not needed to use their heating at all for several years. Additionally, the experience of Hastoe Housing is that they achieve lower voids and lower rent areas (almost zero in both cases) for Passivhaus homes because the comfort and cost benefits are so great that tenants don't want to risk losing their property.

Delivery of Passivhaus at scale is already happening on a number of large-scale housing projects such as Camden Council's [Agar Grove](#) (400+ units) and [multiple sites in Norwich](#) (400+ units)

#### 6. Barriers to delivering transformative change

We have been doing some work to find out how to encourage Local Authorities and Housing Associations to adopt Passivhaus on their own housing schemes.

[http://www.passivhaustrust.org.uk/competitions\\_and\\_campaigns/passivhaus-for-local-authorities/](http://www.passivhaustrust.org.uk/competitions_and_campaigns/passivhaus-for-local-authorities/)

Current barriers that they have identified include:

1. Increased capital costs compared to existing building regulations & no facility for sharing cost savings from operational/ asset management budgets to cover uplift in capital cost budgets
2. Lack of expertise about procurement of high performance homes in the client organisations
3. Risk aversion (and hence risk pricing) among contractors when bidding to build higher performance homes

Introducing tighter regulations would remove most of these barriers, as there would be a level playing field set at a higher standard, so clients and contractors would both come up to speed and there would no longer be a cost differential.

#### 7. Does Wales have the requisite skills to facilitate the change required

Not at the moment. In particular, housing clients will need additional support in order to make the transition to procurement of higher-performing homes such as Passivhaus, either by seeking specialist advice from the representative UK organisations – such as the Passivhaus Trust – and/or by provision of a dedicated procurement support hub/ facility to assist them.

Once the Regulations change, then the supply chain should be able to quickly bring itself up to speed about the changes needed to achieve successful delivery, and there are plenty of facilities to support them in the delivery of Passivhaus, although similar facilities may not exist for other approaches.

#### 8. What changes are needed to Building Regulations to achieve NZEB and beyond.

We particularly support the following changes:

1. Higher standards of fabric energy efficiency – ideally including an absolute target in kWh/m<sup>2</sup>/yr
2. A flexible carbon reduction target but with a minimum fabric energy efficiency backstop
3. Qualitative risk assessment for overheating, followed by quantitative risk assessment where needed
4. Measured ventilation rates as a proxy for good indoor air quality
5. EITHER Performance in-use data for a percentage of projects OR External review of predicted performance

#### 9. Examples of good practice in Wales (and beyond).

There are numerous examples of Passivhaus homes in the UK (see [here](#)) and many more across Europe and worldwide.

Several of these projects are in Wales – for example in [Ebbw Vale](#) and [Swansea](#). Indeed the UK's first ever Passivhaus building was built in Wales see [here](#). There are also several other Passivhaus trial schemes being developed through the Welsh Housing Innovation Programme.

## References

1. Written Response by the Welsh Government to the report of the Environment and Sustainability Committee entitled A Smarter Energy Future for Wales  
<http://senedd.assembly.wales/documents/s57872/Welsh%20Government%20Response.pdf>
2. Zero Carbon Hub work on the performance gap  
<http://www.zerocarbonhub.org/current-projects/performance-gap>
3. Zero Carbon Hub, Carbon Compliance for Tomorrow's New Homes: a review of the modeling tool and assumptions – Topic 4 Closing the gap between designed and built performance, NHBC Foundation, Aug 2010
4. Feist W, Peper S, Gorg M, CEPHEUS Final Technical Report, Passivhaus Institut, Enercity & Energieinstitut Vorarlberg, July 2001
5. The Passivhaus Trust - *The performance of Passivhaus in new construction: Post occupancy evaluation of certified Passivhaus dwellings in the UK: Early Results (July 2017)*  
[http://www.howtopassivhaus.org.uk/sites/default/files/The%20performance%20of%20Passivhaus%20in%20new%20construction\\_July%202017%20V2\\_0.pdf?](http://www.howtopassivhaus.org.uk/sites/default/files/The%20performance%20of%20Passivhaus%20in%20new%20construction_July%202017%20V2_0.pdf?)
6. The Passivhaus Trust website  
<http://www.passivhaustrust.org.uk>
7. Passivhaus Trust Project Gallery  
<http://www.passivhaustrust.org.uk/projects/>
8. Map of Passivhaus Trust members (<http://www.passivhaustrust.org.uk/members/map/>)
9. Passipedia -Details of the Enerphit standard  
<https://passipedia.org/certification/enerphit>
10. Passivhaus Trust & AECOM Passivhaus capital cost research project (January 2015)  
<http://www.passivhaustrust.org.uk/UserFiles/File/Passivhaus%20Capital%20Cost%20Research%20Project%20-%20Passivhaus%20Trust,%20January%202015.pdf>
11. Encraft Technical Insight: Whole-life costs of a Passivhaus:  
Sensitivities of whole-life cost analysis for domestic Passivhaus buildings (February 2014)  
<http://www.ecraft.co.uk/wp-content/uploads/2014/02/Technical-Insight-February-2014-Whole-life-Costs-of-a-Passivhaus.pdf>

Lesley Griffiths AM  
Cabinet Secretary for Energy, Planning & Rural Affairs  
National Assembly for Wales  
Cardiff Bay  
CF99 1NA

9 February 2018

Dear Cabinet Secretary,

**RE: Joint Ministerial Committee**

Wales Environment Link and Greener UK would like to draw your attention to the subject of intra-UK environmental governance post-Brexit.

We believe the environment will be best served if the UK and devolved governments work collaboratively together to address the UK-wide governance gap that could emerge post-Brexit and to embed the EU environmental principles in domestic law. We are therefore grateful for your undertaking at the recent roundtable meeting to raise this issue at the next environment Joint Ministerial Committee.

Greener UK has written to the UK Government's Environment Secretary, Michael Gove, MP, the Scottish Government's Cabinet Secretary for Environment, Climate Change & Land Reform, Roseanna Cunningham, MSP, and the Permanent Secretary for Northern Ireland's Department of Agriculture, Environment and Rural Affairs, highlighting the view that the best way of addressing these issues would be via a joint consultation developed in partnership with the devolved governments, rather than via an England-only approach.

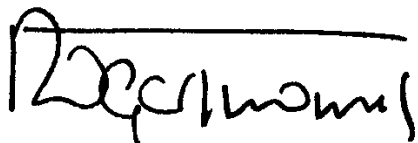
Our view is that a new joint body, set up by all four governments, could help replicate some of the unique functions of the European Commission and European Court of Justice (ECJ) that have supported the robust implementation and enforcement of EU law across the UK's four countries. Given the devolved nature of environmental policy, combined with the transboundary aspects of most environmental issues, we need effective governance mechanisms to scrutinise and enforce the implementation of environmental laws and policies of all four governments post-Brexit, including initiating investigations into possible breaches and responding to complaints from citizens and civil society organisations.

Respecting the devolution settlements and the legal frameworks already in place in the four countries, such as Wales' own sustainable development and environment legislation, such a body would need to be co-created and co-owned by the four UK governments. This would ensure that all UK citizens had equal opportunity to hold their governments to account on environmental matters.

During Day 2 of the Committee Stage of the Withdrawal Bill, Michael Gove indicated he was considering bringing forward a bill to establish both a new environmental watchdog and a new policy statement on environmental principles. As stated above, we urge you to work with your counterparts to address these issues jointly.

We are keen for you and your counterparts on the environment JMC to prioritise the matters discussed above, so that a joint consultation can be published soon and new arrangements put in place before exit day.

Yours sincerely,



Roger Thomas  
Chair, Wales Environment Link



Shaun Spiers  
Chair, Greener UK Board