

Passive House and EU Support: Past, Present, Future

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Abstractⁱ

Passive building techniques have been in existence for centuries. In more recent times, using a more scientific approach, the principles of Passive House design as developed in Germany were principally applicable to the climate and context of central Europe. In the last few years, as the benefits of Passive House have become apparent, the European Union has recognised the importance of its potential as one of the design principles which could make significant contributions to the EU's energy and climate targets. Grants in the form of research and market uptake projects have been awarded to European consortia made up of key stakeholders from across the Union, to help develop the concept and support wider adoption in the mass market. This paper explores the link between EU funding, in particular the Intelligent Energy Europe (IEE) programme, and the evolution of Passive House, and also the contribution that Passive House has made to transform the market for energy efficiency in buildings.

Passive House and the Intelligent Energy Europe programme: (IEE) 2003-2013

The first Intelligent Energy Europe programme (referred to as IEE-1) ran from 2003 to the end of 2006 and aimed to overcome legal, economic, cultural, and administrative barriers to reduce energy consumption in Europe. With a budget of €250 millionⁱⁱ, it was a policy support measure that accompanied various Directives on energy use as well as the funding for research through the 6th Framework Programme (2002-2006). The IEE-1 programme eventually funded more than 400 European projects involving over 1500 organisations across Europe. A significant part of the IEE funding was spent on grants, via calls for proposals, to European projects whose objectives aligned with the Energy Performance of Buildings Directive (EPBD) which had been adopted in 2002ⁱⁱⁱ. One of the priorities identified for funding in IEE-1 was highly efficient buildings and their components, and Passive House played a prominent part in this regard.

Three projects in particular stand out in the IEE-1 programme in their contribution to research, promotion and dissemination surrounding Passive House design.

PEP : Promotion of European Passive Houses (2005-2007). Coordinator: Energie Onderzoek Centrum Nederland (NL).^{iv}

This project served to disseminate the positive potential and reality of the Passive House concept in order to foster greater awareness. A European network of "Passive House Platforms" was established to help promote the concept in twelve countries, and informative guidebooks were prepared targeting building professionals, municipalities and developers. The project supported improvements to the Passive House Planning Package and created an inventory of barriers to adoption in the market. Among the lessons learned from this project were that the Passive House

design criteria that were then in use were not always applicable to very cold climates such as northern Scandinavia. The project therefore recommended that a more flexible definition of the Passive House concept be developed.

PASSIVE-ON : Marketable Passive homes for Winter and Summer Comfort (2005-2007). Coordinator: Politecnico di Milano - Dipartimento di Energetica (IT).

This project sought to promote the Passive House concept in southern Europe and ensure that it was adapted for design in Mediterranean climates. Design guidelines and software tools were developed for building professionals to empower them to design passive buildings in both heating and cooling load climates. The Passive House Planning Package was further modified to take these advances into account. The project also provided policy recommendations for the targeted countries. The project demonstrated that the basic principles of passive design as originally developed for central Europe (high insulation, minimal cold bridges, heat recovery from ventilation) were also applicable to a significant degree in large parts of southern Europe.

E-RETROFIT-KIT : Tool-kit for "Passive House Retrofit" (2006-2007). Coordinator: Faellesbo Amba (DK).

This project targeted social housing companies in 14 European countries and developed a web-based tool-kit in 11 languages to help them carry out low energy retrofit works. The tool-kit included best practice examples of Passive House design and a methodology for 35 different energy saving measures, aimed at all stakeholders involved in the energy retrofitting of social housing. The project identified gaps in knowledge and available products for the retrofitting of social housing to Passive House standards in southern European climates with issues of overheating.

Towards the end of the IEE-1 programme the European Commission adopted an action plan for energy efficiency^v containing measures to reduce global primary energy use by 20% by 2020, compared with the baseline scenario. This was the precursor of the formal 2020 Energy Strategy^{vi}. The second period of IEE (referred to as IEE-2) ran from 2007 to 2013 with an increased budget of €730 million^{vii}, therefore the EU has provided to date some €1 billion of support for almost 800 IEE projects over the last decade. Shortly after this programme began, the European Commission also published an integrated proposal for Climate Action^{viii} which proposed, among other things, legally enforceable renewable energy targets for each Member State coupled to non-binding targets for energy efficiency. The IEE-2 programme kept up the momentum established during IEE-1 with regards to optimising and promoting wider adoption of Passive House design principles. Selected IEE-2 projects involving Passive House include the following:

PASS-NET : Establishment of a co-operation network of passive house promoters (2007-2010). Coordinator: Österreichische Gesellschaft für Umwelt und Technik (AT).

The PASS-NET project aimed to increase knowledge sharing and cooperation regarding Passive House between different European countries, with a particular focus on transferring knowledge from well-established Passive House markets to Eastern Europe. The project offered information and training on financing, construction and planning matters and created a European database of best practice examples in 14 languages. International Passive House Open Days were established in each country.

The project found that awareness and adoption of Passive House was dependent on a variety of policy measures, and that a Europe-wide calculation method and definition would be beneficial.

CEPH : Certified European Passive House Designer (2008-2011). Coordinator: WIP Renewable Energies (DE).

Project CEPH created the first training course for Passive House Designers on the European level, enabling participants to obtain a European Certificate of passive house design. The project developed the 10-day training course with a set of training material tailored to 9 European countries where the first phase of training was implemented, resulting in over 300 passive house designers being formally certified. The fact that a further 7 countries subsequently obtained the right to use the CEPH training material, and that 20 training providers were accredited by the Passive House Institute to provide CEPH training during the project lifetime, means that the project delivered on its main goal of creating a long-term well-known and officially recognised certification system in Europe to train professionals on Passive House design.

NORTHPASS : Promotion of the Passive House Concept to the North European Building Market (2009-2012). Coordinator: VTT Technical research centre of Finland (FI).

This project built on the lessons learned from the previous IEE project PEP, which had highlighted the difficulty of achieving the Passive House energy demand defined for Central European countries, namely 15 kWh/m²/annum, without substantially increasing the construction costs. NORTHPASS therefore set itself the task of developing new criteria applicable to cold climates and raising awareness of this in northern European countries. It also aimed to remove market barriers that were hampering more widespread adoption of Passive House in these countries, with a particular focus on new residential buildings.

Taken together, the combined effects of these, and other IEE projects, has been to contribute to the decoupling of EU primary energy consumption from economic growth. Over the period 1997-2009 the energy used per square metre for space heating in dwellings decreased steadily by around 1.4% per year, representing a total decrease of almost 15%^{ix}. This reduction can be explained in part by more energy efficient construction, as new dwellings consume on average 40% less energy for space heating than dwellings built in 1990. Nevertheless there remains significant unrealised potential for reducing energy consumption in buildings, especially relating to the renovation of existing buildings. The European Commission recognised this by recasting the Energy Performance of Buildings Directive (2010) and adopting the Energy Efficiency Directive, which both featured measures to accelerate the rate of renovation for the European building stock. The recast EPBD also introduced the concept of "nearly Zero Energy Building" (nZEB).

Passive House and current IEE projects

In 2010 the European Commission adopted a Recast of the Energy Performance of Buildings Directive^x and in 2012 it adopted a new Energy Efficiency Directive^{xi}. Both of these pieces of legislation represented a concerted drive to improve the energy performance of Europe's buildings in an effort to reach the 2020 targets. Both directives feature articles that focus on increasing the rate of renovation of existing buildings, including deep renovation as well as step-by-step refurbishment. Both directives also aim to facilitate adoption of energy efficient buildings in the mass market, such

that every new building in Europe is to achieve "nearly Zero Energy" performance levels by 2020. With this in mind, a further two Passive House projects were funded under IEE-2 that directly tackled these issues.

PassREg : Passive House Regions with Renewable Energies (2012-2015). Coordinator: Passive House Institute (DE).

PassREg aims to encourage European regional authorities to facilitate Passive House developments as a way of increasing the implementation of nearly Zero Energy Buildings in their area. Some EU regions have already implemented successful, cost-effective strategies that facilitate Passive House developments. These are the so-called Passive House Regions or PassREgs. The key elements of PassREg success models are being adapted for implementation in other regions that aspire to achieve similar results. Best practice case studies or "beacon projects" serve to inspire and feed into an open source "set of solutions" that makes best practice accessible across the EU. The project focuses on empowering local authorities and increasing awareness among key decision makers to drive the political message of nZEB using Passive House design alongside renewable energy sources. By encouraging regional authorities to create the ideal environment for Passive House development, the PassREg project aims to accelerate the uptake of nZEB for both new buildings and refurbishments.

EuroPHit : Improving the energy performance of step-by-step refurbishment and integration of renewable energies (2013-2016). Coordinator: Passive House Institute (DE).

The EuroPHit project takes on the huge task of accelerating the energy renovation of the EU's building stock, in particular using step-by-step refurbishment. In cases where deep renovation of a building is expensive or impractical a stepped renovation approach can be useful, however there is a danger that inadequate and poorly planned renovation works discourage later investment and effectively lock in sub-optimal energy performance. EuroPHit aims to overcome this problem and increase the quality and energy efficiency of step-by-step refurbishments by developing an integrated methodology. Quality assurance, certification, training material and 10 case studies across 8 countries form the practical backbone of this project. Scientifically validated guidelines for Passive House building components also form part of the project outputs.

Despite the success of the projects outlined above, where over 170 IEE projects in total supported the market uptake of energy efficient buildings and use of renewable energies in that sector, many challenges remain if Europe is to achieve the 2020 targets. There is a gap between the predicted energy performance of buildings during the design phase and the actual energy performance as built. This is partly explained by a lack of the required construction and design skills. The role of the consumer as end user is becoming more important as buildings become more sophisticated in their energy use. There also remain significant financial barriers to achieving large scale renovation, not only in terms of absolute cost but also in terms of access to finance and incentives to carry out the work.

Looking forward, the new EU's new Horizon 2020 programme that takes over from IEE seeks to tackle these ongoing issues. The H2020 work programmes for 2014 and 2015 have already featured a number of calls for proposals aimed at increasing the rates of renovation, facilitating the development of highly energy performing buildings, and improving construction skills. These efforts are likely to continue in the future and Passive House principles can but remain in the picture as we

move from the 2020 targets to the more stringent 2030 targets^{xii}. Passive House remains an important element in the drive to improve the energy performance of the EU's building stock and, ultimately, to achieve our targets for energy consumption and climate change.

ⁱ The sole responsibility for the content of this article lies with the author. It does not necessarily reflect the opinion of the European Commission or EASME, which are not responsible for any use that may be made of the information contained therein.

ⁱⁱ ECOTEC Research and Consulting Limited: "Mid-Term Evaluation of the Multiannual Programme for Action in the Field of Energy "Intelligent Energy Europe, 2003-2006". Birmingham, UK. Downloadable from http://ec.europa.eu/energy/intelligent/files/doc/reports/energie/no52_eie_midterm_final_report_en.pdf

ⁱⁱⁱ European Commission. Directive 2002/91/EC on the energy performance of buildings. Available at <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32002L0091>

^{iv} Project data retrieved from the IEE database, available at <http://ec.europa.eu/energy/intelligent/projects/?/page/Page.jsp>

^v European Commission, Communication COM(2006) 545, "Action Plan for Energy Efficiency: Realising the Potential". Available from <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52006DC0545>

^{vi} European Commission, Communication COM(2010)639: "Energy 2020: A strategy for competitive, secure, and sustainable energy". Available at <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1409650806265&uri=CELEX:52010DC0639>

^{vii} European Commission, Intelligent Energy – Europe II Performance Report 2007-2012, downloadable from <http://ec.europa.eu/energy/intelligent/files/library/reports/iee-2-performance-report-2007-2012.pdf>

^{viii} European Commission, Communication COM(2008) 30, "20 20 by 2020 – Europe's climate change opportunity."

^{ix} Enerdata, 2013: "Energy Efficiency Trends in the EU: Lessons from the Odyssey-Mure Project", accessible at <http://www.indicators.odyssee-mure.eu/energy-efficiency-database.html>

^x Directive 2010/31/EU Energy Performance of Buildings (recast), available at http://eur-lex.europa.eu/legal-content/EN/ALL;/ELX_SESSIONID=FZMjThLLzfxmmMCQGp2Y1s2d3Tjwtd8QS3pqdkhXZbwqGwlgY9KN!2064651424?uri=CELEX:32010L0031

^{xi} Directive 2012/27/EU on Energy Efficiency, available at <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX:32012L0027>

^{xii} European Commission COM/2014/015 final. "A policy framework for climate and energy in the period from 2020 to 2030". Available at <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52014DC0015>