



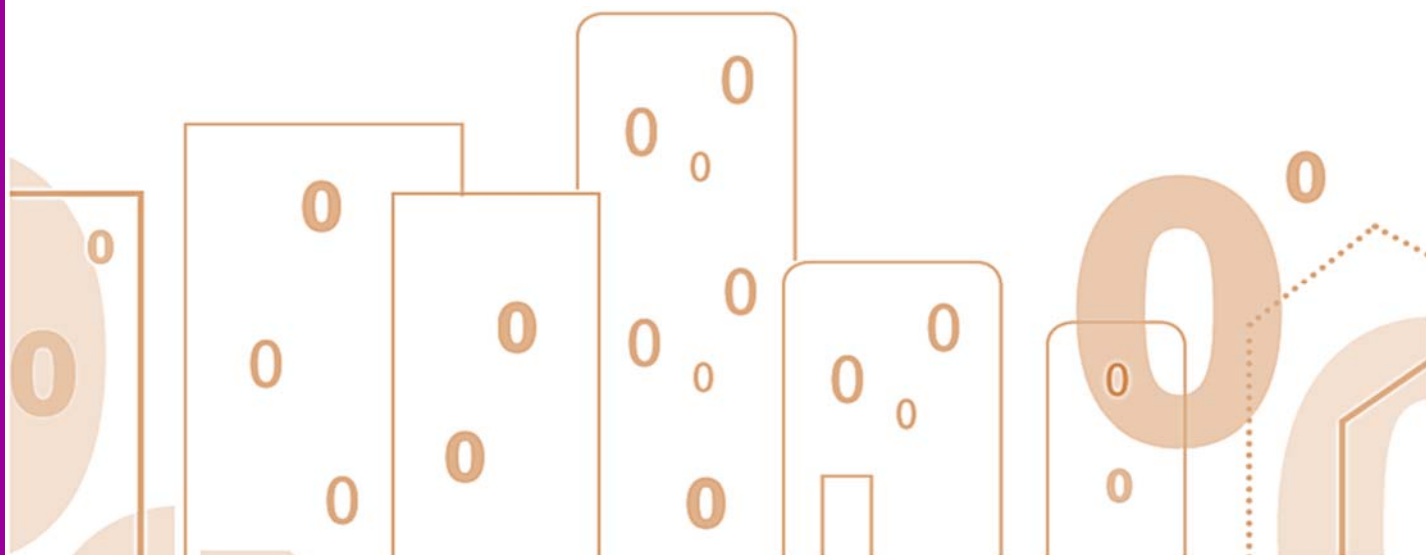
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**NEARLY
ZERO
ENERGY**
HOUSING FOR
WARM/MEDITERRANEAN
CLIMATE ZONES

THE NEARLY-ZERO ENERGY CHALLENGE IN WARM AND MEDITERRANEAN CLIMATES

nZEB in Warm / Mediterranean Climates:
TaskForce Findings, Conclusions and Recommendations



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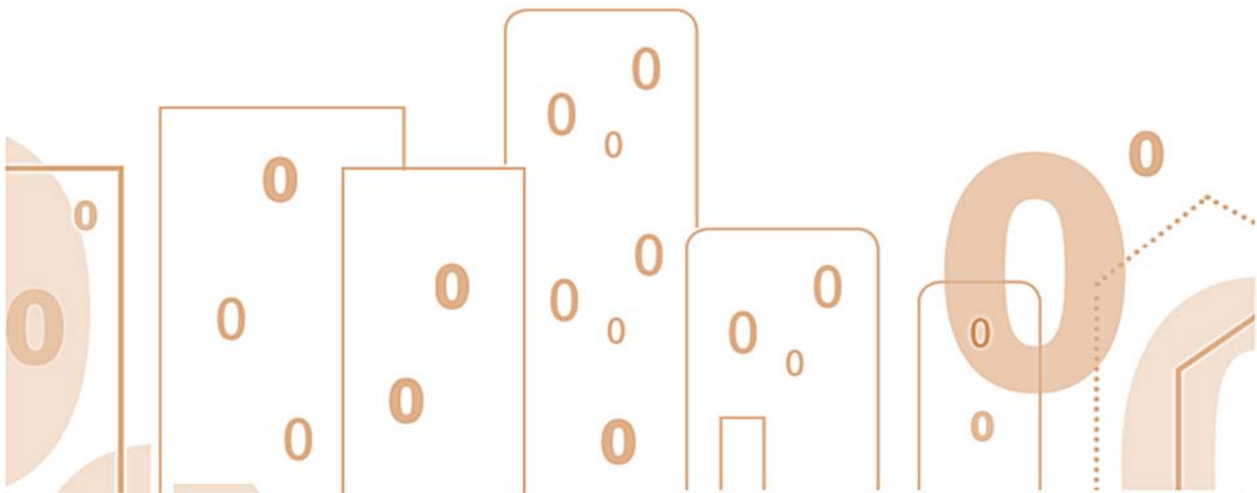
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1 INTRODUCTION

The objective of this final report is to collect all the lessons learned in the analysis of study cases, developed in the framework of the European Project POWER HOUSE nZEC co-financed by the Intelligent Energy-Europe programme.



The study developed is intended to help in defining the concept of building nearly zero energy (NZEB), in response to the requirements of Article 9 of Directive 2010/31 / EU on the energy efficiency of buildings and to provide guidance to Member States for the development of regulatory and financial frameworks, in order to ensure that the energy transition is inclusive and socially, economically and environmentally sustainable.

Partners of this initiative decided to work together according to the climate zones they are operating in, also by taking into account the different types of tenure and an issue of common interest... how to finance energy retrofitting and new-build!

The work is therefore carried out in 4 thematic inter-European Taskforces:

- nearly-Zero energy housing experiences in Warm/Mediterranean climates;
- nearly-Zero energy housing experiences in Cold/Continental climates;
- nearly-Zero energy housing in regions characterised by Divided/Cooperative ownership;
- financing of nearly-Zero energy housing renovation and new-build.

Each Taskforce, co-led by forerunners Housing Federations, identified obstacles and challenges that local housing organisations are facing in reaching nZEB targets for existing housing stock and new build and implemented a tailor-made Work Programme with the aim of paving the way for a fair and inclusive energy transition.

The TaskForce was coordinated by **Federcasa**, the Italian Federation of Public Housing Companies, together with the Consorzio Nazionale CasaQualità and AVS, the Spanish Association of Public Social Housing and Land Providers. The overall aim of the TaskForce

was to help local housing companies to adapt nearly-Zero Energy principles to their climate conditions. The French Federation of Social Housing Providers, USH, also joined the TaskForce, given the interest of its members based in southern France, and contributed to the exchange on very low energy house technologies with a focus on construction and management costs, quality assurance, maintenance issues and monitoring of energy consumption. Moreover, **CECODHAS Portugal**, the Portuguese Association of National and Regional Social Housing Umbrella Organisations was invited to all meetings and kept informed of the TaskForce's activities and findings.

Description and objective of project

✓ General objectives

Bringing about change within any sector is a challenge; transforming energy use in European homes to adapt to the new energy landscape is a particularly complex one.

To address these challenges, Housing Europe, by leading the 'POWER HOUSE nearly-Zero Energy Challenge!' initiative, is providing a structure for a pan-EU knowledge exchange between housing practitioners to learn from each other about the practical implications and costs of ambitious energy performance codes and to inform policy makers of the outcomes of this exchange.

Last but not least, to get actual and reliable data to work on and feed the debate on cost-optimality and rational use of financial resources, some thirty test cases of low and nearly-Zero Energy Buildings in different climate zones and types of tenure are being monitored in order to determine the real energy performance, rather than the values estimated by designers in the planning phase.

Monitoring covers heating and cooling, the production of hot water and technical services such as ventilation and lighting as well as the production of *in-situ* renewable energy systems. All data are publicly accessible and **available online on the HIVE Project Database!**

✓ Specific Objectives for MED climate areas

The specific objectives are:

- to contribute to the definition of the concept NZEB in the Mediterranean climate, keeping in mind the technical solutions, the cultural characteristics, traditions, climatic conditions ... In line with the document *Climate Change: Implications for Buildings* (BPIE, 2014).

- to Identify the obstacles and challenges faced by promoters of social housing to achieve the objectives NZEB, in new construction and in recovery. Both in Italy and in Spain there are still few examples of social housing in class A and A +, which can be associated with this concept.
- to identify, analyse them as study cases, to gather also the direct experience of the promoters and building managers, in order to identify the barriers making difficult their development and to extract the lessons that can be deduced, as a support for defining this MED approach in definition of this concept and its implementation in legislation.
- Starting from the above mentioned real-life experiences, to prepare guideline and recommendations for the implementation of NZEB concept in MED area 2020. On this idea the Platform Mediterranean climate has developed a document as a manifesto for homes near-zero emissions in the Mediterranean.
- Finally, to organise training courses on line on this matter, specifically for operators of social housing in the “Mediterranean area”.

2 LESSONS LEARNT

In this section, the main conclusions that have been reached since NEARLY ZERO ENERGY POWER HOUSE CHALLENGE project, from the development of the relevant documents are reported.

Therefore, this section is divided into three, matching each with deliverables as detailed below:

- Quality assurance, Maintenance, Operating Costs
- Usability
- Cost effectiveness

Operating Costs, Quality assurance

Quality assurance

Regarding refurbished buildings, a quality control system for the intervention is recommended (especially when innovative solutions are implemented) by enlisting an accredited expert to ensure proper execution. This is a necessary step in quality assurance since installers are often not the manufacturers and they do not have the experience necessary for their implementation, which could lead to subsequent system failures. Similarly, it is necessary to develop training courses that will enable construction workers to acquire knowledge and skills regarding innovative solutions in the field of energy retrofitting.

Maintenance

Systems maintenance in tertiary buildings such as offices, shops and hospitals is usually handled by companies offering specialised maintenance services within a certain price range. This type of service would also benefit residential buildings, particularly low energy buildings or nZEBs, as they may have specific devices or installations that require special handling or care. In the social housing sector, there is a need to develop specific maintenance programmes for nZEBs. Clear guidelines should be produced to aid technicians in the proper maintenance/management operations of nZEBs as well as establish preventive maintenance measures and procedures to avoid damage to devices, over-consumption of energy or even total system failure.

Operating costs

The analysis of operating costs is useful for setting the range of maintenance costs of innovative projects. Therefore, the Warm/Mediterranean climates TaskForce proposes to set up «Regional Observatories for the nZEB» for collecting data on operational costs of nZEBs based on the criteria established within the POWER HOUSE nZEC. This database can help create a common reference and basis for defining standardised costs as part of the reference building calculation.

Usability

Building Technology: External insulation poses problems for use by tenants. In fact, the walls, especially those at loggias and balconies, are subject to installation of objects of various kinds with tiling going to compromise the thermal resistance of the insulation. Furthermore, the high tightness of the outer casing, in the absence of a correct use of the plant as shown below, creates problems of condensation on the walls at the corners of the building more exposed.

Technical installations: the controlled mechanical ventilation system definitely improves the environmental comfort and prevents definitely the effects of heat on the condensation coat. Unfortunately, the particular type of tenants not properly uses this ventilation system that is normally held off.

Relations with clients: some interventions, either of repression of abuses that of training in the proper use of the facilities, have produced a greater awareness on the correct use of the dwelling and in some cases have produced significant reductions in energy bills of users.

The **maintenance costs** for the user are greater when compared to individual heating boilers, while they are lower than traditional centralized systems, also thanks to the technology of remote reading of consumption and tele-diagnosis system.

The analysis conducted on the case study highlighted the limited usefulness of handbooks for the tenants; then, following this experience is suggested the preparation and automation of several scenarios for the internal environment in relation to the external conditions of the

building and the householder profile, and is recommended to install devices user friendly, in order to limit the manual use of the plants from the tenants.

Cost effectiveness

As a general conclusion we found the difficulty of applying the methodology of the optimal cost, given that some of the data on costs, necessary to apply this methodology, are difficult to quantify and should not have been considered or has had to resort to some hypotheses, as in the case of maintenance costs.

The evaluation of cost optimal parameters related to the heating supply system are much more sensitive than those relating to the improvement of the thermal envelope. In general, it is difficult to assess the impact of user behaviour, a variable not included in the calculation method. The experience of the TaskForce has shown that tenants' incorrect use or misuse of installed devices or systems may lead to differences in energy consumption compared to cost optimal values calculated between 10 and 30%.

Finally, it is concluded that a building designed following long term economic profitability criteria will be always more energy efficient that if it is only designed following the Construction Code actual requirements. The knowledge generated can be useful to define the NZEB concept and can have very important political implications, because it challenges the idea that high energy efficiency regulations are prohibited due to the elevated cost that it requires.

3 RECOMMENDATIONS FROM THE MEDITERRANEAN PLATFORM FOR NEARLY-ZERO EMISSION HOUSING

Introduction

The residential sector consumes 27% of the energy used annually in Europe and it contributes proportionally to the emission of CO₂. The efforts done in these years with the application of the Directives on the energetic efficiency of the European union have improved the energetic performances on new constructions (above all for the winter phase) and partially of the stock of existing buildings, but a potential of unexpressed amelioration still exists (in MED countries especially for the summer phase), important space of job for the future realization of the directive NZBE, to decline otherwise according to the different categories of use.

The realization of the European Directives has pushed to the introduction in MED countries of north-European constructive models: strong isolation and control of the ventilation (with the purpose of controlling the dispersions to this connected). It's the idea of Passivhouse.

Such strategy nevertheless introduces some problems:

- it risks, for the countries characterized by conditions of middle to high radiation and for which the energetic consumptions are prevailing for the climatization of the buildings, to inhibit the potential of obtainable energetic saving in summer phase from buildings with materials and constructive technologies with ability of accumulation, moving therefore part of the obtainable energetic consumptions potentially on the useful energy to produce the insulator used for the isolation.
- it has the tendency to create meaningful housing comfort problems for some typology of users (elderly population), for several years in strong growth;
- it has the tendency to create health problems inside the environments, forcing to the use of devices whose installation results not suitable for weak typologies of users.

It is necessary in this new phase to start to conjugate the themes of the energetic saving with the themes of living and the environmental sustainability of the buildings not only guaranteeing saving, but also comfort, health and sustainability in relationship to the different typologies of users. The social and demographic evolution of the population living in the Mediterranean basin has determined in fact the rise up of new more sensitive and careful social and cultural appeals to the environmental themes. The distinctive elements that testify

this change of identity foresee new formalities of use of the urban and housing spaces able to answer to criteria of architectural quality and environmental compatibility.

It is important to combine in different ways the concept of Passivhouse and adapt it to:

- our social, cultural and geographical context;
- specific typologies of users;
- the most sustainable concept of a nearly zero emission Mediterranean House.

Manifesto for Mediterranean House: Efficiency, Quality, Health and Comfort

A house realized:

- to contain the energetic consumptions both in wintertime and summertime;
- to reduce to the minimum or to eliminate the endowments of machinery;
- to guarantee suitable comfort to all the typologies of users;
- to guarantee good living conditions and health in the buildings.

For this, the following strategies are proposed:

1. Attention to the climatic factors

The Mediterranean House must hold in consideration the local climatic factors, to build a model of housing system suitable for the winter (heating) climatic conditions, but above for the summer (heat reduction), having the tendency to contain away the requirement of technological devices for heating and ventilation. The Mediterranean House lives on air, sun and water and the climatic factors become authentic allies for its sustainability.

2. Attention to the orientation

The orientation of the building is a fundamental factor to guarantee a good functioning of the building, intending not only a good disposition towards the sun, but also the evaluation of the dominant winds, the influence on the microclimate of the external environmental factors: green areas, sun or shadow brought from other buildings or from natural elements.

3. Use of natural and local materials

The choice of natural and particularly local materials must be privileged, through a careful study and adaptation of the traditional techniques that have often produced a house building with better characteristics than the "modern one". The materials that compete to the construction of the residence must be sustainable from the production to the disposal. It is not, therefore, a return to old times, but of a revaluation in a modern key of materials already broadly experimented.

4. Correct mix of active and passive systems, and of renewable energies

The objective of a nearly zero consumption Mediterranean house must be achieved through a mix of solutions, to be evaluated in every single case, among passive bioclimatic solutions (choosing natural and local materials, using thermal inertia and natural ventilation) active solutions through machinery and the most effective use of the renewable energies (not only solar, but also micro-eolic, geothermic etc.).

5. Involvement of the inhabitants and attention to the models of use

The inhabitants' involvement in the choices is also for our regions a key element for the success of the initiatives of containment of the consumptions, but it also needs to conceive some housing systems that are suited for the models of use, to the ways of life and the level of awareness of the inhabitants, avoiding, if necessary, solutions that ask for a too complex direct intervention from the inhabitants (systems of shadowing furniture, systems of ventilation mechanics etc.).

Inhabitants must be informed about their consumption in order to develop well-aware models of use.

6. To promote the Culture of sustainability

Creation of a system, continuous and open to the operators, able to spread the culture and to promote the principles / criterions of the Mediterranean house. To involve, approach and reach the different targets of professionals, operators and consumers and to sensitize them to the theme, moments of comparison and debate will be organized for the development of a movement that finds its centre of reference in the Mediterranean area. Particular attention will be set to the formation of children as vehicle of an echo-sensitive culture towards the families.

7. Technology and formation

Create not only a cultural movement but also a platform able to promote technical solutions, methodologies and materials. Considering the new addresses of Europe it will be fundamental to develop procedures and forms to correctly build, to form the workers on a correct use of materials and to form the ability to know how to choose the best technology. The intent is that to facilitate the meeting between question and offer of qualification / retraining of specific professional figures, through systematic formative actions, uniform and continuous. The proposal foresees the definition of formative runs.

8. Integration and monitoring of the systems

Use of technological devices and ICT of simple use and maintenance, integrated in a system of easy understanding for the consumer, implementable according to the necessities (safety, communication etc.) to be used for a constant monitoring of consumptions and correct functioning.

9. Housing typologies and models of bio-climatic urban development

The organization of the district and the housing typology can positively or negatively affect on the climatic factors and contribute to avoid the creation of tides of air around the buildings, of overheated or too shady zones. An accurate use of both green areas and water, of the materials for covering and flooring can also contribute to the comfort of the inhabitants in winter and summer, inside and outside the residences. Particularly the resource water must be appraised with attention as it regards the rationality in the use and re-use, without forgetting that a newly disciplined urbanism on the permeability of the grounds must be founded also for the improvement of the microclimate and the reduction of the "island of heat" effect in urban areas

10. Appropriate funding

The characteristics of the climate of the south bring to the fore the summer period, which is longer and temperature always warmer, while the winter is shorter than in northern countries. This makes it more difficult to use systems of financing via third parties (Third Part Financing in English) and ESCOs, due the long-time of investment recovering. Should be adapted the financial plans and the financing systems to climate data and should be find viable solutions.



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