

NEARLY ZERO ENERGY HOTELS IN EUROPE

FLAGSHIP PROJECTS AND TOOLS FOR HOTELIERS



FINAL REPORT



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www.nezeh.eu

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A great deal of additional information on the neZEH initiative is available on the web at: www.nezeh.eu

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FOREWORD



In 2015, there were nearly 1,2 billion international tourists travelling the world up from a mere 25 million in 1950. According to UNWTO forecasts this number is expected to reach 1,8 billion by 2030.

Today, tourism represents 10% of the world's GDP, 7% of global exports, and 1 in every 11 jobs worldwide. It is by all accounts one of the largest and fastest-growing economic sectors in the world, progressing above average despite several challenges, and contributing in a decisive manner to economic growth and development.

Yet, with growth comes responsibility. Tourism is estimated to account for 5% of global CO₂ emissions, of which 20% comes from hotels and other types of accommodation. 'Greening' the hospitality industry is crucial for building a more sustainable tourism sector. This requires vision, innovation, correct planning, good management, and sound monitoring by all players.

Europe is the leading region for tourism in the world. In 2015, it registered over 600 million international tourists and 404 billion euros in tourism exports, 83% of which in the 28 European Union (EU) destinations. Tourism has become the third-largest economic sector in the EU, contributing 5% to its GDP and accounting for 5,2% of its labour force, or 9,7 million jobs.

We are pleased to see that Europe is not only a leader in world tourism but is also committed to leading in sustainable development, particularly in energy efficiency. By 2020, all new buildings, including hotels, will need to be Nearly Zero Energy Buildings (NZEB). At the same time, we are seeing EU Member States developing policies and implement measures to adapt existing buildings into NZEBs.

However, the fragmented nature of the hospitality industry in Europe poses important challenges towards advancing this objective. There are around 1,8 million tourism businesses in Europe, 99,5% of which are Small and Medium Enterprises (SMEs), of which 91% are micro enterprises, especially family businesses. According to Eurostat in the hospitality industry alone, there are over 200.000 hotel and similar accommodation establishments in the EU-28.

Accessing adequate information, and understanding and responding to EU energy or building directives can be a very complex task for most of these small accommodation companies. Pre-existing business models, obtaining the required level of technical support, and the financial implications of such directives constitute added difficulties.

The neZEH initiative aims to support the accommodation industry in the EU, providing the capacity to comply with NZEB policies. The recommendations contained in this report can aid companies across all EU-28 countries throughout the process of adjusting existing hotels, thus improving their energy efficiency, increasing their competitiveness while fostering innovation, sustainability, and low-carbon growth.

The neZEH initiative, co-financed by the European Commission in the framework of the Intelligent Energy Europe Programme, builds upon the Hotel Energy Solutions initiative (HES), currently used by over 1.540 hotels in Europe to improve their competitiveness through resource efficiency.

neZEH offers hoteliers practical training and information materials, capacity building activities, and decision support tools such as the neZEH e-toolkit, to assist them in identifying the most appropriate solutions for their specific needs. The example of the 16 pilot neZEH projects will surely serve as an inspiration to all hotels aiming to comply with the NZEB regulations.

I invite all hotels, destinations, and policy makers in the EU-28 to make the most of this report. We trust it will help you save energy, reduce your carbon footprint, and build a more competitive and sustainable European hospitality sector.

Improving energy efficiency in the EU hospitality industry – in particular for SMEs which account for 90% of the total European hospitality market - is a major step in advancing tourism's contribution to the **Sustainable Development Goals** (SDGs), namely Goal 12 on sustainable consumption and production and Goal 13 on climate change.

As the specialized agency of the United Nations for Tourism, UNWTO is fully committed to continue working with all partners to advance the contribution of tourism, one of the leading sectors of our times, in building a better future for people and our planet.

Taleb Rifai

Secretary-General, World Tourism Organization (UNWTO)

EDITORS NOTE



Hotels represent a big challenge, since they are usually complex building systems and at the same time, energy intensive businesses. Hotel industry generally has a low-profit margin so energy accounts for 5% to 10% of total costs, so their challenge is to minimize their energy costs down without compromising the quality of their guest's stay.

According to the European Directive on the Energy Performance of Buildings (EPBD) recast, hotels are buildings with high priority to become nearly Zero Energy Buildings (nZEB), since they are energy intensive. Even though they represent a specific category of buildings, along with restaurants, till today there are limited credible data for this type of buildings, especially taking into account the wide range of different typologies (coastal, mountain, urban, rural).

This publication presents an overview of the results of the European initiative nearly Zero Energy Hotels (neZEH) project from six south European countries (Greece, Croatia, France, Romania, Italy and Spain) plus one north (Sweden). neZEH, involving partners from the tourism and energy efficiency sectors, academia and research and worldwide impact associations like the UN's World Tourism Organisation (UNWTO), is supporting the acceleration of the rate of the refurbishment of existing hotels to become nZEBs.

The 16 pilot projects, in Greece, Croatia, France, Italy, Romania, Spain and Sweden have been audited, gathering a set of technical and qualitative data for each. Per case, the group of experts analyzed each function (hosting and non-hosting). These hotels will stand out as "real life" lighthouse examples in Europe and globally and inspire other hotel owners to invest in high-energy performance refurbishments, including a large share of their energy needs covered by on-site or nearby renewable energy as requested by the EPBD recast and EED European Directives.

Prof. Theocharis Tsoutsos

Technical University of Crete, neZEH coordinator



7 EU countries

16 neZEH hotels

4 neZEH hotels awarded



1,100+ toe/year primary energy savings



300+ toe/year renewable energy production triggered



2,500+ tCO₂e/year reduction in GHG emissions



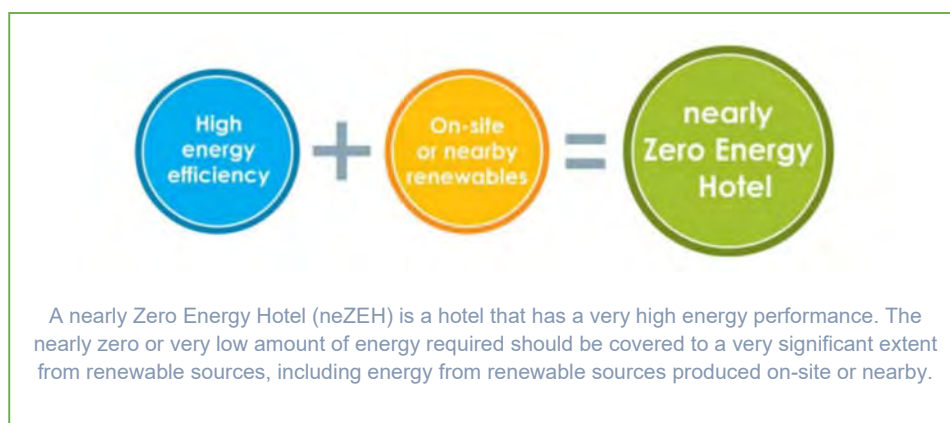
6+ M€ investment in energy efficiency and renewables



1. INTRODUCTION

Buildings account for 40% of total energy consumption and 36% of CO₂ emissions in the European Union (EU)¹, having a large potential for energy saving. Hotels and other accommodation buildings are responsible for 21% of total GHG emissions of the tourism sector².

Large scale building renovations towards nearly Zero Energy (NZEB) are at the forefront of EU's energy policy, in order to reach its 2050 energy efficiency targets. According to the European Directive on the Energy Performance of Buildings (2010/31/EU recast, EPBD)³, Member States shall ensure that: (i) by 31 December 2020, all new buildings are NZEB and (ii) after 31 December 2018, all new public buildings are NZEB. The Member States, following the leading example of the public sector, should develop policies and take measures, such as the setting of targets and funding tools, to stimulate the transformation of buildings into NZEB. Additionally, the Energy Efficiency Directive (2012/27/EU, EED)⁴ stipulates that the Member States shall establish a long-term strategy to trigger investments in the renovation of their existing building stock of both residential and commercial, public or private.



According to the EPBD, a Nearly Zero Energy Buildings (NZEB) is a building that has a very high energy performance; the nearly zero or very low amount of energy required should be covered to a very significant extent by energy from Renewable Energy Sources (RES), including energy from renewable sources produced on-site or nearby. Questions such as "what is the nearly zero amount of energy", "how much should be the RES share" or other numerical indicators and various technical issues, should be answered by the national legislation.

Today the NZEB market is still limited. The concept is not well developed in all EU countries and in most cases, unfamiliar to the building sector. In many countries, there is a lack of successful examples to replicate in the private non-residential sector.

¹ European Commission. <https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings>

² World Tourism Organisation (UNWTO). Tourism & Climate Change, Confronting the Common Challenges. October 2007

³ Directive of the European Parliament and of the Council 2010/31/EU of 19 May 2010 (recast) on the energy performance of buildings, Official Journal L153/13, 18.06.2010

⁴ Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency Official Journal L315/1, 14.11.2012

2. NEARLY ZERO ENERGY HOTELS IN EUROPE

THE neZEH VISION

The EU accommodation sector, one of the fastest growing and most resilient economic sectors numbering more than 200.000 establishments in the EU-28, according to Eurostat, provides a fertile ground for flagship projects to stimulate the transformation of existing buildings to neZEH. However, the sector is mainly made of M-SMEs and fragmented; the size of the companies, the business model, the technical support and financial implications add to the difficulties for accommodation industry SMEs to engage in large renovation projects.

neZEH, co-funded by the Intelligent Energy Europe programme and implemented by a consortium of ten partners from seven European countries (Croatia, France, Greece, Italy, Romania, Spain and Sweden), including two European associations and the World Tourism Organization -the United Nations specialized agency for tourism- addresses this gap through its approach with pilot hotels, aiming to better inform SMEs and help them to understand the challenges that the accommodation industry faces in relation to energy performance measures.

The neZEH worked within the national legal frameworks to increase the nZEBs' number aiming to tackle the main barriers that prevent SME hotel owners from investing in major refurbishment projects towards nZE consumption levels. 16 hotels have been benefit from energy audits, feasibility studies, technical advice on tendering, contracting, monitoring and identification of financing opportunities, hotel staff training and increased market visibility at national and EU/International level. The neZEH best practices demonstrate the advantages of being a nZEB and foster replication of nZEB investments in the hotel sector. Practical tools and informational materials are available to assist hoteliers to identify appropriate solutions and to design feasible and sustainable nZEB projects.

Overall, neZEH's achieved results include:

- ✓ **Sixteen (16) hotels across seven (7) European countries** (Croatia, France, Greece, Italy, Romania, Spain and Sweden) have been engaged as neZEH pilot hotels and **have been committed to medium term large scale renovation plans to accomplish NZEB goals**. neZEH hotels have started the renovation process, to achieve 1.123 toe/year savings in primary energy and 2.556 tCO_{2e}/year reduction of Greenhouse Gases (GHGs) emissions. In total, 6.310.297 € are to be invested and 332 toe/year renewable energy will be triggered by the neZEH renovations. These hotels are inspiring frontrunners as examples of good practice to achieve NZEB performance levels in Europe.
- ✓ **Capacity building activities** engaging more than 1.600 hotel owners and building developers to the neZEH vision; **practical tools are available online**, including training materials and tips, marketing guidelines and promotional tools and **the neZEH e-toolkit** empowering SME hoteliers to assess their energy consumption and to identify solutions for energy efficiency improvement towards NZEB.
- ✓ **56.000+ hotel owners/managers** are informed and gain access to the project results, **490.000+ citizens and stakeholders** have been reached at EU level, due to the targeted dissemination activities and the support of involved hotel associations.

- ✓ **National neZEH networks** have been created, supporting exchanges between the demand (SME hotel owners) and supply (sustainable building sector) sides.
- ✓ **Policy intervention at EU and national level;** the neZEH consortium elaborated position papers with recommendations for policy makers for removing barriers and upscaling renovations towards NZE in the accommodation sector.



Practical tools available for hoteliers

In the long term, the project envisages to assist the European hospitality sector to reduce operational costs, to improve their image and products and thus to enhance their competitiveness, contributing to the EU efforts for the reduction of GHGs emissions from the buildings sector as a fundamental step in order to achieve the 2020 targets and furthermore to reach the goals set in the Energy Roadmap for 2050. The strategic long term objective of the neZEH consortium is to ensure the sustainability of the outcomes of this project fostering replication of NZEB investments in the hotel sector so that the impact is not limited to the neZEH's lifetime, but also after its funding period ends.

In Croatia, EIHP was involved in the cost-optimal analysis for buildings stipulated by EPBD. Data obtained from neZEH were used to check the calculations for hotels and results were included in the legal framework, addressing the issue of building codes and the definition of nZEB. In addition, obtained results and meetings with relevant stakeholders (Minister of Tourism) were one of the reasons to introduce subsidies for energy renovation and RES installation in the hotel sector.

3. WHY NEARLY ZERO ENERGY HOTELS

Tourism is the third-largest industry sector of the EU. It contributes 5% to the Gross Domestic Product (GDP) and accounts for 5,2% of the total labour force (some 9,7 million jobs). Considering the multiplier effect of tourism in other economic sectors, these figures become even higher, at 10% of GDP and 12% of total employment. Eurostat highlights that the number of nights spent in tourist accommodation in the EU continued to grow in 2014 by 1.6%, reaching 2.7 billion, hotels being the most popular type of accommodation with 64% of the nights. Hotels and similar accommodation numbered more than 200,000 establishments in the EU-28⁵.

The new 2030 targets agreed between the EU countries include a 40% cut in GHG emissions compared to 1990 levels, at least a 27% share of RES consumption and at least 27% energy savings compared with the business-as-usual scenario⁶. Buildings account for 40% of energy consumption and 36% of CO₂ emissions in the EU; by improving their energy efficiency, the total EU energy consumption could be reduced by 5 to 6%. The long term aim is to transform the European building stock into NZEBs by the deep renovation of the existing building stock and ensuring that all new buildings are NZEB.

Speaking of hotels, one must take into account the complexity of the building as such and also the fact that they are energy intensive businesses. A significant part of their total energy use relates to service functions not taken into account in the NZEB performance calculation methodology. These energy intensive operations (which include kitchen, laundry, swimming pool, spa, sauna, gym etc.) are associated with their customers' comfort and expectations, therefore closely linked with their competitiveness and viability. When planning an energy efficiency renovation in the hotel, these functions – referred to as **non-hosting functions** in the context of neZEH - cannot be overlooked.

What are the benefits of becoming a neZEH

Becoming a neZEH does not mean eliminating energy use or compromising the services that the hotel provides to its guests. It means to optimize the way that energy is being used and minimize energy losses and at the same time maximize the use of on-site or nearby RES. Beyond the economic savings associated with this approach, there is also a positive impact, both in terms of environmental preservation (through mitigation of climate change) and in terms of guests' comfort. Reaching an NZEB status can have different types of positive impacts:

1. **Economic:** reducing the energy consumption will result in economic savings on the hotel's operational costs. Moreover, the hotel might be able to take advantage of funding opportunities that support energy efficiency investments.

2. **Environmental:** as awareness rises every day on the environmental issues that our planet is facing (climate change, overconsumption of natural resources, pollution, waste, etc.) and the multiple impacts they have, we are progressively observing an evolution in citizens' way of life all around the world, and in their consumption choices: according to a publication in 2013, 75% of travellers were going to consider ethical or environmental impact of their main holiday during that year⁷. Moreover, according

⁵ Eurostat, <http://ec.europa.eu/eurostat/web/tourism/data/database>

⁶ European Commission, 2030 Energy Strategy, <http://ec.europa.eu/energy/en/topics/energy-strategy/2030-energy-strategy>

⁷ "The Guide to Sustainable Tourism", Blue and Green Tomorrow, January 2013

to a 2013 TripAdvisor survey, 81% of travelers place importance on properties implementing eco-friendly practices and 88% of U.S. hoteliers indicate that they currently have green practices in place⁸. Reaching an NZEB status represents an important contribution to addressing the environmental challenges, an aspect which can be valorized in the hotel's communication strategy, both as way to improve the hotel's image, and also to attract guests that are sensitive to the environmental issues and that wish to stay in hotels which share the same engagement.

3. **Social:** the social benefits of becoming a neZEH are multiple. First, it is associated with an increase in the guests comfort (better insulation of outside walls also mean a better insulation from noise; improving the ventilation can have positive impacts on health; a more effective heating and cooling system increases comfort; etc.). The neZEH approach will also contribute to raising awareness of guests to environmental issues; how energy performance in buildings is one of the opportunities of action to address them. In addition, the neZEH approach includes actions towards staff (training, raising awareness), which can contribute to a good team spirit, the whole staff having a common goal of being environmentally friendly. Actions towards guests and staff can also have positive impacts outside of the hotel (if the staff applies these behaviors in their homes, etc.)

A hotel business today faces significant challenges, such as: reducing its costs, ensuring energy security, standing up to the expectations of market and guests, being competitive, complying with changing regulations and legislations, taking advantage of emerging funding opportunities, adapting to climate change, reducing environmental footprint, meeting sustainability criteria. nearly Zero Energy is not only the stipulation of EU building policy, but is also a means for existing hotels to meet up with these challenges and gain important benefits.



⁸ "Sustainable and competitive hotels through energy innovation - nearly Zero Energy Hotels 2015", International Conference Highlights, http://www.nezeh.eu/assets/media/PDF/reports/D6.3_Appendix8_Conference%20highlights.pdf, 2015

4. HOW TO BECOME A neZEH HOTEL

Achieving NZEB performance levels in an existing hotel can be a long-term process and above all, it requires motivation and strong commitment from the hotel management and staff. The process consists of four basic steps, starting from an energy audit.

1. Assess the hotel's energy performance and identify the actions needed to achieve NZEB status.

The first step will be to carry out an **energy audit** in order to analyze energy consumptions and identify potential savings.

An energy audit⁹ is a systematic, independent and documented process for obtaining evidence and evaluating it objectively in order to:

- Get reliable knowledge of energy consumption and its associated costs
- Identify and describe the main factors that affect energy consumption
- Detect and evaluate different savings opportunities and diversification of energy and its impact on energy and maintenance costs, as well as other associated benefits and costs.

Once all data collected is analysed, appropriate energy saving measures shall be identified, tackling the aspects of:

- Energy management
- Reduction of heating and cooling demands
- Equipment efficiency
- System efficiency
- Renewable energy.

Based on the experience of the neZEH pilot projects, the energy audits proved to be the determining factor to get hotel owners motivated and to kick-start the renovation process towards NZEB status. The independent, comprehensive energy audit resolved many of the problems confronting hoteliers, who found it hugely difficult to decide what measures to take and in what order. Energy audit results indicated that often there were measures that could be quickly taken to reduce energy consumption, the most common being energy management and the installation of management systems early in the renovation process. Such measures required a relatively low investment, but quickly yielded large savings.

⁹ EN 16247 European standard for energy audits

INVEST IN SUSTAINABILITY ENHANCE YOUR HOTEL'S COMPETITIVENESS!

Adopt measures and good practices towards neZEH



2. Develop the hotel business plan and specify the most suitable energy efficiency solutions and renewable energy technologies for the hotel. Identify financial instruments available at national and EU level.

The second step will be the preparation of a **feasibility study**, considering the main conclusions in the energy audit report, the NZEB targets to be achieved, financing, time plans etc. Based on results from energy audits, the feasibility study examines the feasibility of the proposed technical solutions, alternative cost scenarios and economic indicators for each, funding sources, possible tax reliefs, subsidies or credit facilities for specific solutions and project planning/times scales. The objective of the feasibility study is to serve as decision document for the hotel owner and for possible funding providers, to assist them to identify the best scenario for implementing the renovation.

The search of **funding** will be a key step in the neZEH project. Available financial instruments for supporting energy efficiency improvement in buildings include: grants/subsidies/funds, loans, tax/VAT incentives, white certificates, Energy Performance Contracting (EPC), levies etc¹⁰.

3. Build up the hotel renovation plan and roadmap to achieve NZEB status

Any hotelier who sets off on a course of renovation without a clear idea of where they are going has, by default, not planned at all. Likewise, those who have a plan they do not stick to or do not regularly measure themselves against are likely to fail. A logical, measurable and targeted rollout plan will limit distraction, inform of progress and give a benchmark to measure success. "If you fail to plan, you plan to fail".

At this stage, the hotelier should have a "ready to go" large-scale renovation rollout plan to achieve NZEB status, that will include: energy consumption and RES targets, total cost for the selected scenario, investment economic indicators, time plan for the implementation of the measures, funding sources for each measure and responsible people.

¹⁰ Energy efficiency policies in buildings the use of financial instruments at member state level, BPIE 2012, http://www.bpie.eu/documents/BPIE/publications/BPIE_Financial_Instruments_08.2012.pdf

Next, follows the tendering phase, during which technical companies will make offers or proposals in response to the request of the hotel owners. The tender document will contain the specifications needed for the hotel renovation. The hotel renovation project can be developed in three different ways:

- **Turn-key project:** in this type of project the typical relationship is between the hotelier and an engineering firm. The engineering firm will take the role of the project supervisor.
- **Self-development project:** In this type of project the hotelier takes the role of the project supervisor
- **EPC project:** In this case, the typical relationship is between the hotelier and the EPC provider, which takes the role of the project supervisor.

After deployment, in order to maintain a high energy efficiency, it is necessary to define the operation, maintenance and if necessary recommissioning. A Measurement & Verification (M&V) plan must be applied to validate the energy savings achieved through the measures implemented. To obtain financial returns from investments in improved energy management towards neZEH status, the hotel has to strive continuously to improve their energy performance. Success is based on assessing energy performance regularly and implementing actions to increase energy efficiency. Data about energy use have to be tracked, gathered and analyzed to maintain and even improve energy performance.

A lesson derived from the pilot hotels, is that a major renovation might not be the proper solution in some cases; a step-by-step approach might be preferred. Due to the difficult access to financing for SMEs in some countries, small, but carefully planned renovation steps might achieve a great improvement in energy performance in the long term. As measures are applied gradually, the financial risk is smaller, while the money saved from applying a measure can be used for implementing the next one.

4. Inform the staff and the guests and make them ambassadors of the NZEB experience

User behaviour is a crucial parameter for the success of energy efficiency interventions in buildings, without which, energy measures might be less efficient than originally planned. Active participation of hotel staff and guest engagement is essential in the quest to reduce energy consumption. Everyone associated with the hotel, both employees and suppliers of services and products, needs to be aware of what they can do to reduce the hotel's energy consumption. This is not only fundamental for a successful hotel energy policy; it is inspirational in giving new meaning to the hotel's business. Simply put, how best to carry out daily activities and assist in maintaining low energy consumption levels; or "thinking nearly zero energy" in everyday working life.

The way staff and management carry out daily work will have a huge impact on the hotels energy consumption. Engaging actively in the hotel's operation and maintenance is essential to get the most out of the investments the hotel has made in energy efficiency solutions. To assist this, annual management and staff training are required, perhaps at the beginning of the season. Hotel managers need to be trained on basic technical knowledge related to energy efficiency as well as on monitoring the savings and other benefits, raising awareness among hotel staff, guests and general public, marketing the hotel and communicating. At the same time, staff should be trained on how to best carry out their daily activities and assist in maintaining low energy consumption levels – "thinking nearly zero energy" in everyday working life.

This effort must be extended to hotel guests, who should be made aware that the hotel cares for the environment and that sustainability is important. During their stay, they need to be informed of simple actions they can take to reduce energy consumption in a pleasant and context sensitive way and without any impact on comfort or cost to them. Most guests will be pleased to learn that the hotel is committed to reducing its negative impact on the environment; some may have even chosen the hotel because they value this commitment.

Four steps towards a nearly Zero Energy Hotel!

- 1** Assess your hotel's energy performance and identify actions needed to achieve nearly zero energy status.
Use the neZEH Energy Solutions Toolkit.
- 2** Develop your business plan and specify the most suitable energy efficiency solutions and renewable energy technologies for your hotel. Identify financial instruments available at national and EU level.
Learn from the neZEH methodology and find out existing financial tools for large scale hotels renovation. Benefit from the experience of neZEH pilot hotels.
- 3** Build up your renovation plan and a roadmap to achieve nearly zero energy status.
Follow the example of the neZEH frontrunners. Use the neZEH Training Material.
- 4** Inform your staff and guests, make them ambassadors of the nearly zero energy experience.
Use the neZEH marketing tools and join the neZEH network.

5. 16 FLAGSHIP EXAMPLES OF NEZEH IN EUROPE



The 16 neZE hotels across 7 EU countries committed to become a nearly Zero Energy Hotel, demonstrating in this way the feasibility and sustainability of NZEB refurbishments in SME hotels, are the main legacy of neZEH. Each hotel has its own unique characteristics, but they all share the passion for a more sustainable future for their business and for tourism. The pilot hotels belong to different **categories** and **types** and are spread out across different **climatic zones**, making them a representative sample of European hotels (**Annex I** Hotel classification). This heterogeneity ensures that the methodology applied for the development of the pilot hotels is replicable and that these hotels can become inspiring examples for other hoteliers across Europe.

neZEH methodology

A robust methodology was applied for the development of the pilot projects, the value proposition towards hoteliers consisted of:

- i) An **energy audit**: the energy audits benchmarked the initial status of the hotels, outlined recommendations specific to each of them in terms of suitable energy efficiency measures and RES solutions in order to reach the neZEH targets. The independent and comprehensive energy audits proved to be the catalyst to assist hoteliers to move forward with renovation plans.
- ii) A **feasibility study** and **rollout plan**: a number of cost scenarios were produced for each hotel, including economic indicators and possible funding sources for each, to assist pilot hotel owners to identify the best possible scenario for implementing the renovation, leading to a renovation rollout plan for each pilot hotel.
- iii) **Tendering, contracting** and **monitoring**: neZEH provided support and technical assistance, so that hoteliers could move forward with tendering and selection of contractors for implementing the measures included in the rollout plan. Monitoring the renovation project and other suitable structures were put in place to ensure that pilot hotels continued with the same degree of drive and motivation to reach neZEH status.
- iv) **Training of management and staff**: the target was to help pilot hotel owners get the most out of their investment by providing additional motivation and practical support; by identifying and reinforcing marketing opportunities; by building a communication strategy to present the rigorous energy policy adopted and its environmental benefits; by raising awareness among all hotel staff groups and educate them on how to apply best practices for energy saving in their daily activities and how to provide information to guests. Training material and booklets providing tips and advice were delivered, and training activities were organised in the pilot hotels.

The neZEH targets

An initial hurdle in the process was the lack of legally set NZEB numerical definitions in the target countries and thus a difficulty in establishing primary energy use and RES targets for the pilot hotels. This was countered by introducing **benchmarks for NZEB hotels**, based on already existing indicators in other countries.

The benchmarks concerned only the **hosting functions** of hotels i.e. the standard zones of a hotel where standard indoor environmental conditions need to be met, including the reception hall, guests' rooms, all common areas (restaurant, bar, sitting rooms, meeting rooms) and offices. **Non-hosting functions** are additional facilities which may be provided by the hotel, including kitchen, laundry, swimming pool, spa, sauna, gym. In any of the cases, technical rooms, garages or similar places not heated, cooled or ventilated are not included. For this reason, the energy consumption and RES share of both hosting and non-hosting functions were calculated separately, where possible.

Hosting functions	Non-hosting functions
<ul style="list-style-type: none"> • Guests' rooms • Reception hall • Offices • Bar • Restaurant • Meeting rooms 	<ul style="list-style-type: none"> • Spa • Swimming pools • Saunas • Gym • Kitchen • Laundry etc.

Results from the energy renovations towards neZEH

The studies in the pilot projects have revealed that great energy savings and significant increase of RES use can be achieved by applying the measures and solutions included in the rollout plans.

The aggregated results for the 16 hotels show that **primary energy use for the hosting functions can decrease dramatically – from an average of 277 kWh/m²/y to an average of 102 kWh/m²/y**, as shown in Figure 5.1; an average reduction of 63%. At the same time, **RES share for the hosting functions can be increased by an average of 18% to an average of 46%** (Figure 5.2). The non-hosting functions have been proven to be much more energy intensive, therefore extremely important for the overall energy performance of the hotels. The primary energy use for the non-hosting functions can decrease from an average of 727 kWh/m²/y to an average of 374 kWh/m²/y; an average reduction of 49%. As for the whole building (that includes both hosting and non-hosting functions), an average 63% energy reduction can be achieved: from 337 to 126 kWh/m²/y, while RES share can increase from an average of 15% to an average of 40%.

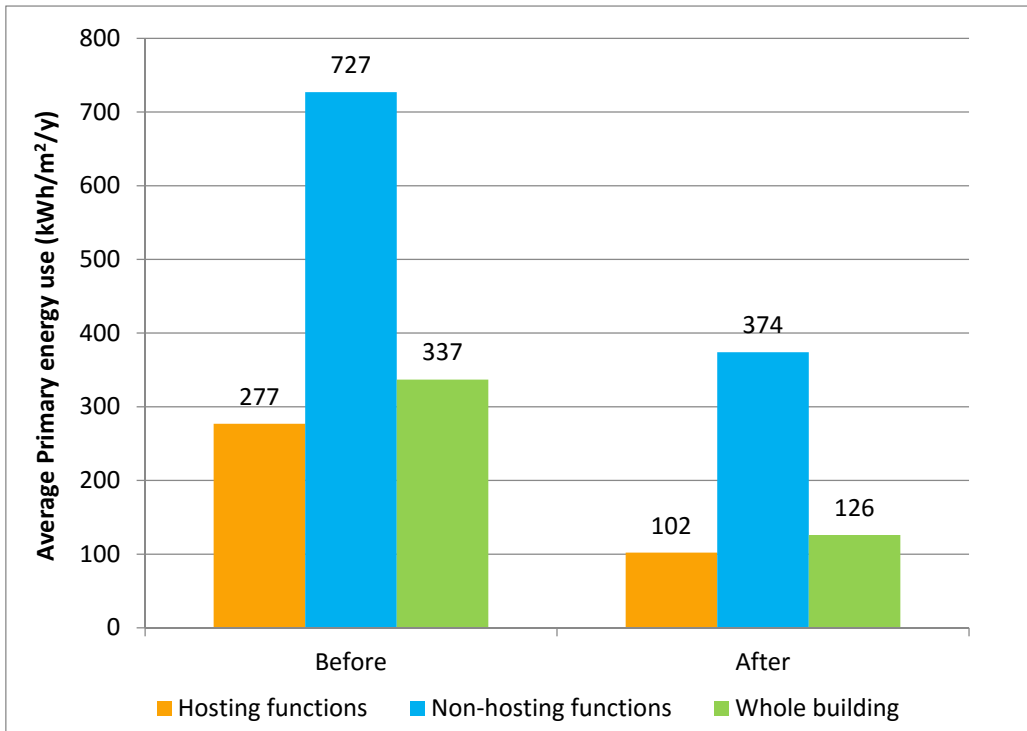


Figure 5.1 Average primary energy use for the 16 pilot hotels before and after the neZEh renovations

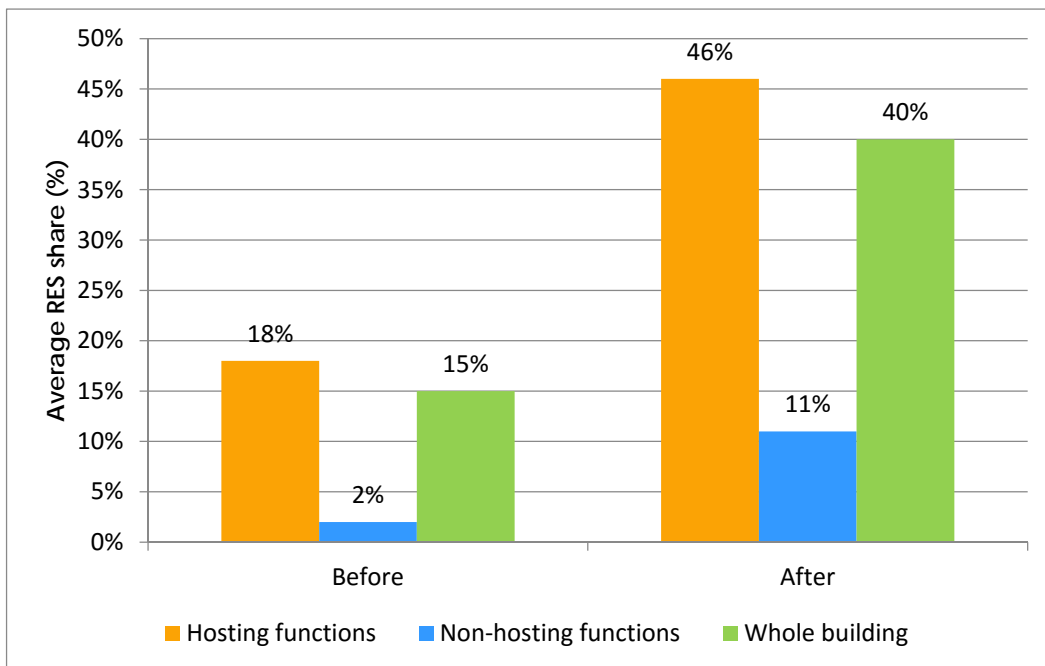


Figure 5.2 Average RES share for the 16 pilot hotels before and after the neZEh renovations

The overwhelming majority of pilot hotels are able to achieve savings higher than 50% of their initial consumption (Figure 5.3).

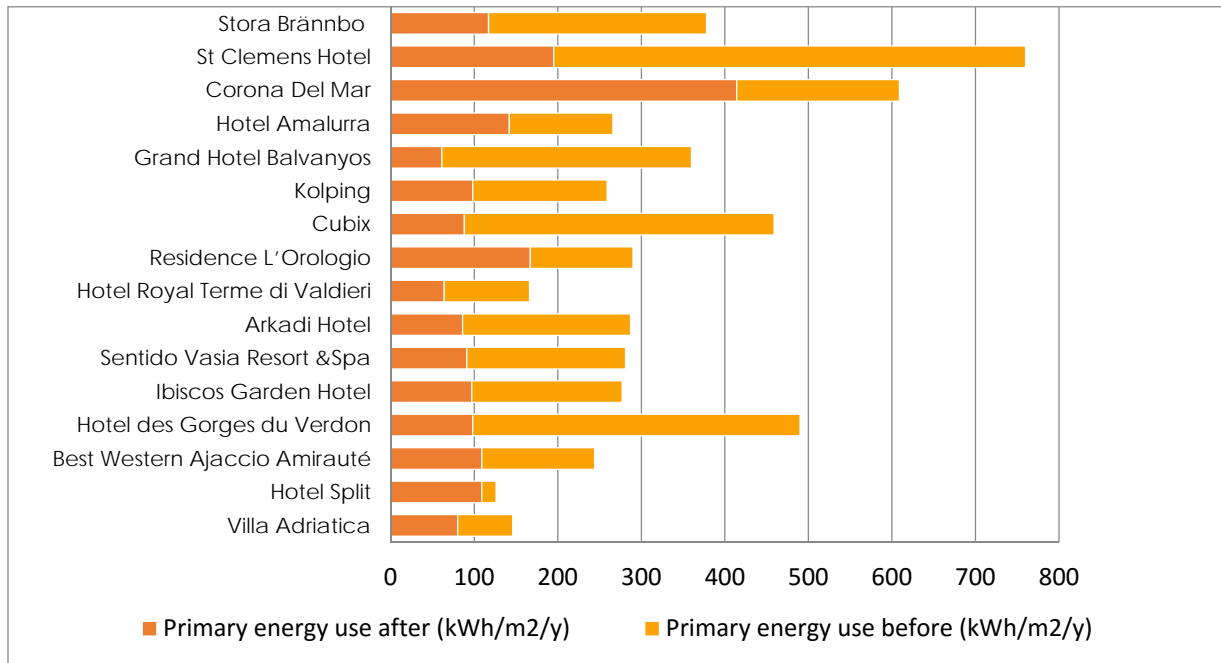


Figure 5.3 Reduction in primary energy use (for the whole building) for each pilot hotel

The reduction of GHG emissions for each hotel can be seen in Figure 5..

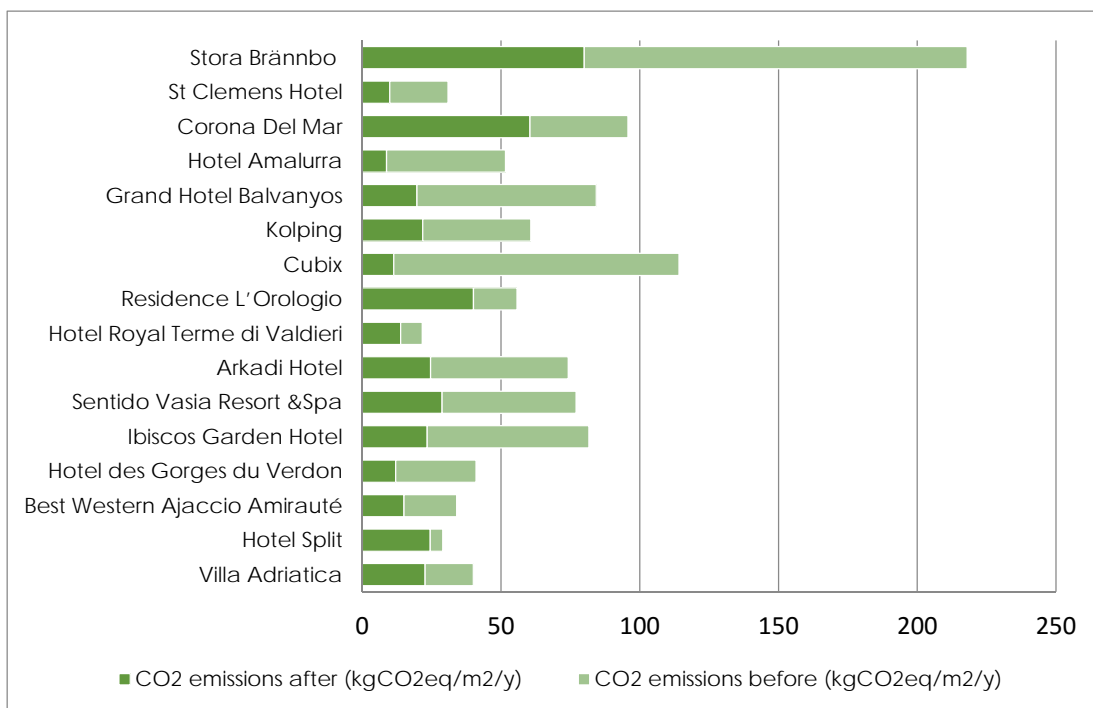


Figure 5.4 Reduction of GHG emissions (for the whole building) for each pilot hotel

Error! Reference source not found. shows the average savings obtained from different measures proposed in the energy audits from all pilot hotels.

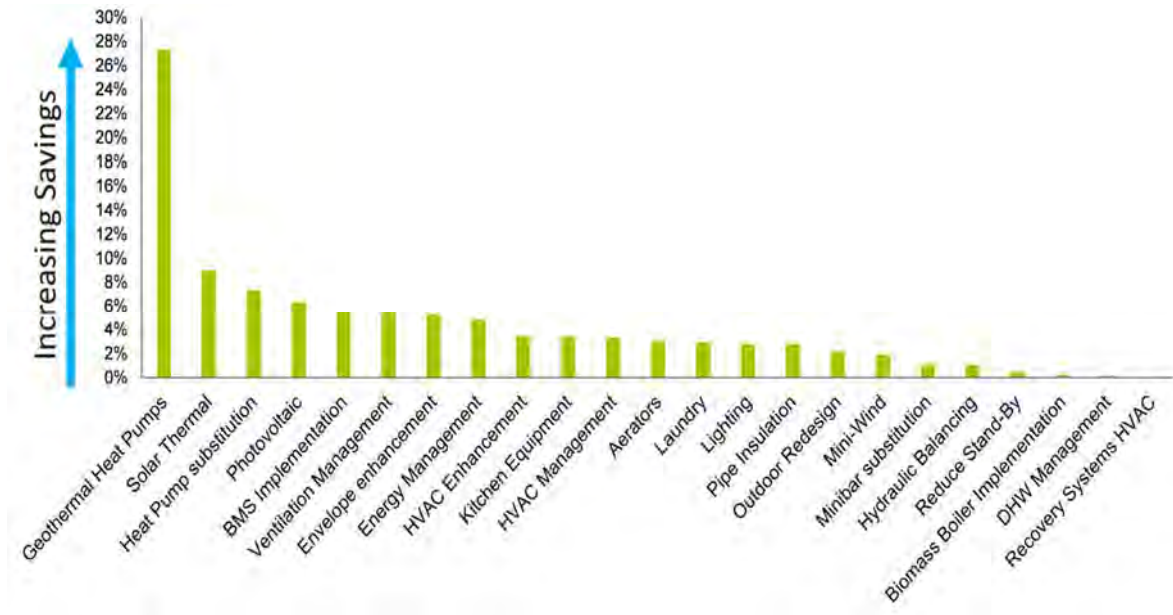


Figure 5.5 Energy efficiency measures proposed in the pilot hotels, ranked by average savings

In Figure 5,6 energy efficiency measures have been clustered into six groups: RES, DHW, HVAC, BMS & Management, lighting and appliances. The group providing the greatest savings is the one corresponding to DHW – 25%. BMS can have a great impact on energy savings as well. HVAC is in third place, where big savings can be achieved due to several different measures, such as cooling and heating generation equipment, building envelope enhancement, hot water pipes insulation.

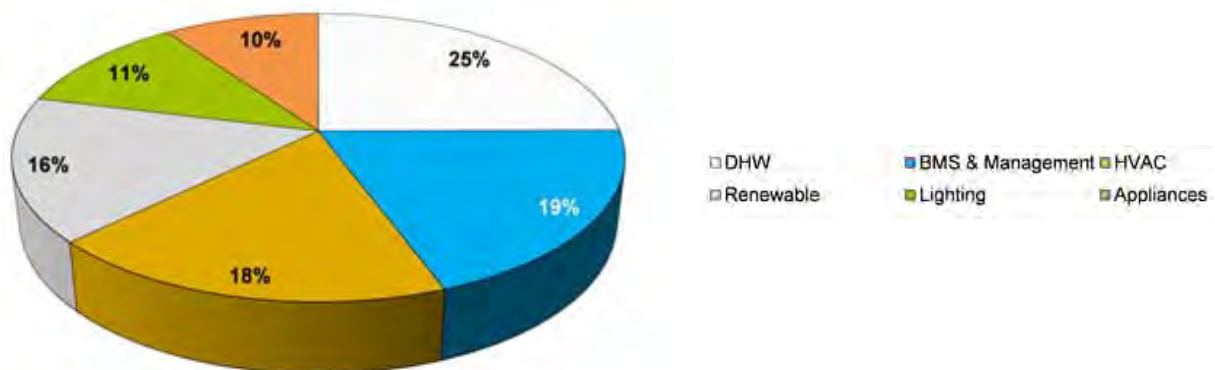


Figure 5.6 Sharing of average savings for each measure group

More detailed information for each pilot hotel can be found in Annex II.

Realizing the renovations

While neZEH has provided technical assistance to the pilot hotels, it is up to them to proceed with the necessary investment to realize the renovation. Possible options for funding have been identified and evaluated within the context of the project and the hotels have been engaged in a medium-term process in order to reach the neZEH target. Most of them opted for the step-by-step approach, where the low-cost measures will be implemented first, so that the energy cost savings achieved can be invested in the next measures. This option lowers the investment risk for them, while at the same time allowing them to reach neZEH status by 2020 approximately, depending on the case.

Investment costs and payback times varied from hotel to hotel and between regions, but the results provide a good indication as to what similar SME hotels can expect to invest and over what period in order to reach neZEH status.

The cumulative investment required is more 6+ M€. The average investment across all 16 pilot hotels was about 390.000€, with a range from 24.000€ to 1.400.000€. Average payback time for the 16 pilot hotels was 9,5 years, ranging from 4-20 years.

The majority of pilot hotels selected a combination of own funding or structural/state funds together with (bank) loans to fund their refurbishment. Some hotels, for example in Greece and Spain, were dependent on structural funds to launch the rollout plans. Few pilot hotels used EPC.

6. TOOLS FOR HOTELIERS

Capacity building: Training material on NZEB renovations

The implementation of energy performance measures by the accommodation industry presents opportunities to boost its competitiveness, but this is not always well understood and the capacity to engage is sometimes limited.

neZEH offers **training material for hoteliers** so that they acquire basic technical knowledge related to energy efficiency as well as on the economic and environmental advantages of investing in ambitious refurbishment projects, as well as **training material for building professionals** on NZEB renovations in hotels¹¹.

Training/Capacity Building materials

- ✓ **Training material for hoteliers**¹² - "Towards neZEH hotels - Benefits, Steps, and Guidelines" available in EN, ES, FR, GR, HR, IT, RO, SE.
- ✓ **Training material for building professionals**¹³ - "Designing a nearly Zero Energy renovation project in hotels", available in EN, ES, FR, GR, HR, IT, RO, SE.
- ✓ **Marketing Guidelines for hoteliers**¹⁴ to help them integrate and promote their neZEH characteristics in their communication strategy and marketing portfolio; can be used by any hotel who wishes to promote their green profile.
- ✓ **Practical guide for SME hotel owners**¹⁵, to help hotel owners get the most out of their investment on energy efficiency. It includes tips on how to raise awareness among all hotel staff, guests and general public, how to identify and reinforce marketing opportunities. Available in EN, ES, FR, GR, HR, IT, RO, SE.
- ✓ **Booklet with practical tips for hotel staff**¹⁶, on how to operate in their daily activities to help reaching the low energy consumption levels. Available in EN, ES, FR, GR, HR, IT, RO, SE.

Informational/Showcasing materials

- ✓ **Information about the 16 the neZEH pilot hotels**, factsheets¹⁷ for featuring the experience of the pilot hotel owners and key data for the renovation projects, including custom made leaflets and videos¹⁸ for each pilot hotel, for promoting the hotels vision to guests and to inspire other hotels to imitate

¹¹ neZEH training material, neZEH, 2015, http://www.nezeh.eu/main_menu/library/training/index.html

¹² Towards neZEH hotels - Benefits, Steps, and Guidelines. neZEH Training material for hoteliers, http://www.nezeh.eu/main_menu/library/training/index.html

¹³ Designing a nearly Zero Energy renovation project in hotels, neZEH Training material for building professionals, http://www.nezeh.eu/main_menu/library/training/index.html

¹⁴ Marketing Guidelines for neZEH pilot hotels, http://www.nezeh.eu/assets/media/PDF/reports/neZEH_FRONT_RUNNERS_MARKETING_GUIDELINES.pdf

¹⁵ Practical guide for SME hotel owners, http://www.nezeh.eu/main_menu/library/nezeh_reports/index.html

¹⁶ Booklet with practical tips for hotel staff, http://www.nezeh.eu/main_menu/library/nezeh_reports/index.html

¹⁷ Pilot cases, http://www.nezeh.eu/main_menu/pilot_cases/index.html

¹⁸ neZEH pilot hotels videos and leaflets, Available for each pilot hotel at http://www.nezeh.eu/main_menu/pilot_cases/index.html

- ✓ Factsheets on identified lighthouse examples¹⁹ in the hotels sector, to showcase successful examples towards nearly Zero Energy in existing hotels.
- ✓ "Inspirational" information leaflet and postcards²⁰ available in EN, ES, FR, GR, HR, IT, RO, SE.



Figure 6.1 neZEH Policy event in EU Parliament, COP21 neZEH events, neZEH 2015 and neZEH 2016 Int. conferences

¹⁹ Towards Nearly Zero Energy - Lighthouse examples in the hotels sector, http://www.nezeh.eu/main_menu/library/nezeh_reports/index.html

²⁰ http://www.nezeh.eu/main_menu/library/nezeh_info/index.html

Finding the right funding: Information papers on financial tools

Securing funding is a basic step in realizing any plans for energy efficiency in a hotel. Especially when speaking for SME hotels, access to financing is not always straightforward and moreover, financing mechanisms available can be complex for non-professionals to understand at an adequate level for decision-making.

To help hoteliers, neZEH identified available financial instruments that can support energy renovations of buildings in the 7 target countries, published in its report **Information papers on financial tools**²¹. It has to be noted that in none of the countries, NZEB specific financial mechanisms were identified. Nevertheless, as mentioned before, Member States are obliged to draw up national schemes for the support of NZEB that will include financial measures.

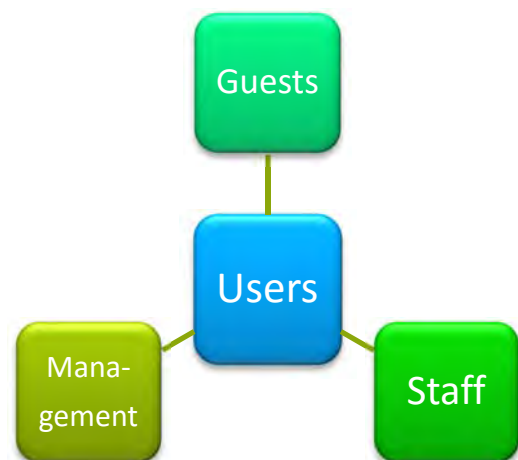


Change of user behaviour: Training booklet for staff and Guide for hoteliers

Behavioural change is the most cost-effective way to reduce energy consumption, and it is essential for implementing a successful energy efficiency or renewable energy project. Behavioural change does not imply a reduction in comfort and does not mean setting restrictions. It is about optimizing the way energy is used to avoiding energy loss. The user groups of a hotel building are the Management, the Staff and the Guests.

A **Guide for hotel owners**²² has been developed to help them make the most out of their investment in energy efficiency in their hotel. The Guide provides management guidelines on how to monitor the project and the associated savings, how to raise awareness among hotel staff, guests and general public and moreover how to identify and reinforce marketing opportunities, by building a communication strategy to present the rigorous energy policy adopted and its environmental benefits. The Guide for hotel owner includes also ideas on how to provide information to guests about simple actions they can take every day to limit energy waste and to improve the environmental-friendliness of their stay.

neZEH also developed a **Booklet with practical tips for hotel staff**²³ for different staff categories to use easily when carrying out daily activities.



²¹ Information papers on financing tools and funding opportunities for large scale refurbishment projects in the hotels sector, neZEH, 2016, http://www.nezeh.eu/main_menu/library/nezeh_reports/index.html

²² Guide for hotel owners, neZEH, 2016, http://www.nezeh.eu/main_menu/library/nezeh_reports/index.html

²³ Booklet with practical tips for hotel staff, neZEH, 2016, http://www.nezeh.eu/main_menu/library/nezeh_reports/index.html

Marketing your neZEH hotel: Marketing tools

A neZEH hotel has implemented a set of refurbishment actions to reach the NZEB status. Beyond the economic savings associated with this approach, there is also a positive impact, both in terms of environmental preservation (through mitigation of climate change) and in terms of guests' comfort. These last two items must be valorized within the hotel's communication strategy.

neZEH produced **Front runners marketing Guidelines**²⁴, to help them identify and reinforce marketing opportunities, build a communication strategy to bring forward the rigorous energy policy adopted and its environmental benefits and raise awareness among guests and general public. The Marketing plan proposed by neZEH includes:



Inviting hotel owners to assess their energy profile: The neZEH e-toolkit

The neZEH e-toolkit is based on the UNWTO Hotel Energy Solutions toolkit (also co-funded by the Intelligent Energy Programme), which -since 2011- has engaged 20.000 users worldwide and 1.500 hotels in Europe in better understanding how to become energy efficient and more competitive. The neZEH e-toolkit, an easy-to-use web platform, is designed to encourage hotel owners and managers to start energy renovation projects towards zero energy targets. It helps them benchmark their energy consumption and identify suitable energy measures for improving their energy profile in order to turn their hotels into nearly Zero Energy Hotels.

The easy-to-use e-toolkit requires answers to a short questionnaire and consequently provides hoteliers with a report assessing their current energy profile, indicating how close the hotel is to from achieving the nearly zero energy levels and providing an indicative set of appropriate renewable energy and energy efficiency measures.

The neZEH e-tool includes three main pillars:

- I. Assessment of the hotel's energy performance using a questionnaire in order to build an "energy use profile" of the hotel;
- II. Identification of opportunities for energy efficiency improvement on the basis of three main fields:
 - Elimination of energy use;
 - Reduction of energy consumption;
 - Substitution of non-renewable energy sources with renewable ones;
- III. Awareness and knowledge sharing, including inspirational examples by showcasing neZEH pilot hotels results and experiences.

²⁴ Front runners Marketing Guidelines, neZEH, 2015, http://www.nezeh.eu/main_menu/library/nezeh_reports/index.html

What the neZEH e-Toolkit delivers?



Nearly Zero Energy Hotel (neZEH) report

Evaluation of your hotels' current energy consumption and use of renewables energies compared to regional and national neZEH level

- The hotel's current primary energy consumption (kWh per m² per year)
- The hotel's current renewable energy share (% of renewable energy to total energy used)
- The goals to achieve to become a nearly Zero Energy Hotel (neZEH)
- Your hotel's current energy mix



Energy measures towards neZEH report

- All energy measures identified within the neZEH e-toolkit and which can reduce energy consumption and increase use of renewable energy.
- The most suitable energy measures to be implemented in your hotel, based on your hotel's specific characteristics and energy profile.
- The priority energy measures according to the hotel characteristics, current energy consumption and current use of renewable energy in order to reach your region's Nearly Zero Energy targets.



Carbon footprint report

The current carbon footprint of your hotel (kgCO₂ per m² heated area per year).

The calculation of CO₂ emissions due to electricity consumptions is specific to the national energetic mix.



Return on investment calculator

Helps the hotelier calculate an indicative Return on Investment for each measure and supports its decision-making.

Figure 1.2 The neZEH e-toolkit generated reports



Figure 6.3 Screenshot of the neZEH e-toolkit

7. HOW TO TRIGGER MORE NEZEH RENOVATIONS

The implementation of energy performance measures by the accommodation industry presents opportunities to boost its competitiveness, but this is not always well understood and the capacity to engage is limited. Such measures require the attention and support from related policy makers at the local level.

The neZEH consortium is proposing to bridge this gap, by presenting possible avenues to policy makers, through the key findings stemming from the work carried out in seven neZEH target countries. Local, regional and national authorities were consulted in the field of tourism, energy and building regulatory bodies, as well as SME Hotels championing to become neZEH. The recommendations provide guidance to policy makers to adapt EU and National policies to foster SME hotels' competitiveness by engaging in sustainable practices and green innovation, leading to low carbon growth. The policy paper recommends to policy actors:

At EU level, to:

- > Strengthen the dialogue between EU policy makers
- > Coordinate support mechanisms for SME hotels competitiveness
- > Harmonize the NZEB concept so as to enable neZEH



At National and Regional level to:

- > Stimulate the dialogue between tourism, energy and buildings policy makers
- > Scale up refurbishment of SME hotels to meet NZEB targets
- > Secure support instruments and investment for SME hotels to meet NZEB national targets

RECOMMENDATION 1: *Member States policy makers do not differentiate the specificities of the accommodation sectors - which are primarily buildings and SMEs- while preparing their National NZEB policies.* EU Policy makers should coordinate a dialogue between DG Energy and DG Growth to: (i) Identify the specificities of the accommodation industry and address these features in NZEB approach and targets in national levels); ii) Define better guidance for NZEB for refurbished buildings – SME Hotels.

RECOMMENDATION 2: *National Policy Makers lack of interaction between the policy sectors related to energy efficiency of hotel buildings.* At National and Regional levels, stimulate a better dialogue between tourism, energy and building policy makers to facilitate SME Hotels engagement towards NZEB regulations at local, regional, national and EU levels.

RECOMMENDATION 3: *In order to reach NZEB and neZEH energy performance, SME Hotels require technical assistance for deep renovation with tailored support from policies and incentives.* At National and Regional level: (i) Policy makers need to engage for scaling up refurbishment of the EU accommodation industry to meet NZEB performance, and reach neZEH status – the use of European Structural and Investment Funds (ESIF) is a possible option; (ii) Information, technical and financial support could be provided by an innovative approach and the creation of a “One Stop Shop” for SME hotels. At EU level, DG Growth, DG Energy and DG REGIO should coordinate their support to sustain European SME hotels' competitiveness through policies and appropriate mechanisms supporting deep renovation projects in SME hotels.

RECOMMENDATION 4: *Important terminology details needs to be addressed for NZEB definition. According to the Recast EPBD, the definition of NZEBs is left to each Member State and there is no unique and harmonized NZEB definition throughout the EU. At National and Regional level: policy makers need to work together to create the NZEB national targets, especially as concerns Renewable Energy Sources (RES). Also to work on methodologies commonly accepted (i.e. in line with European Committee for Standardisation – CEN). At EU level, there is a need for further guidance and assistance for correct transposition and compliant implementation of EPBD and EED, as well as for promoting harmonised adaptation of the NZEB related EU standards at the national level while considering also the national specificities. The specificities of the hotel building type shall be taken into account when developing energy performance calculation methodologies and defining numerical values.*

RECOMMENDATION 5: *Moving towards a low carbon growth, requires a holistic resources management approach for SME Hotels; should be more resource efficient (energy and water consumption, combined with minimization of waste production, sustainable mobility etc.). At National and Regional and EU level: Adapted policies, related to regulations, resource efficiency management, advocacy campaigns and staff training can help SME Hotels to engage in green innovation, thus building a vibrant and competitive tourism sector contributing to EU low carbon growth.*

neZEH managed to make a policy intervention with the elaboration of its EU position paper, which constituted the basis of discussion during the neZEH High Level Event "Nearly Zero Energy Hotels for Achieving Low Carbon Growth in Europe" hosted by MEP Mrs. Maria Grapini (S&D Romania) at the European Parliament in Brussels on March 17th, 2016. More than 65 participants took part. The distinguished panellists, composed of MEPs from Romania, Hungary and Croatia, DG ENER and GROWTH, EASME, the Region of Île-de-France in France, the Croatian Ministry of Tourism, UNWTO, HOTREC and NECSTouR, shared their reflections and proposed suggestions on how to scale up neZEH results and move from 16 pilot projects to a critical mass of hotels achieving neZEH status in Europe.

MEP Mrs. Maria Grapini, proposed neZEH as an example of low carbon measures for the European tourism within the Opinion of the Committee on the Internal Market and Consumer Protection for the Committee on Transport and Tourism on new challenges and concepts for the promotion of tourism in Europe (2014/2241(INI) for which she is Rapporteur. In addition, on 4th April 2016, MEP Grapini sent a Written Question to the European Commission on neZEH, mentioning the following "Given the position of Europe on the tourist industry and the duties undertaken by the EU within the scope of COP21 on carbon emission reduction, does the Commission intend to set up a budget line with the aim of funding the renovation of the hotels to turn them into nearly zero energy buildings?"

The neZEH consortium recommendations may be found at the neZEH EU position paper- Nearly Zero Energy Hotels towards a low carbon growth in Europe.

CONCLUSIONS

Today, retrofitting of existing hotels into nZEBs is technically and economically feasible. Step by step approach of investment and construction works is recommended due to the complexity of the interventions and the operational aspects of hotels. The economic benefits of such investments become more apparent for hotel owners once the indirect benefits are realized: branding as a green hotel and increasing its occupancy rates, added value in reducing carbon footprint and meeting corporate and social responsibility targets as well as increasing living comfort for guests and customers' loyalty.

The 16 pilot hotels of the European initiative neZEH pave the way towards such investments, by implementing ambitious refurbishment plans that will lead them to becoming NZEBs and reducing their primary energy use for hosting functions from an average of 277 to an average of 102 kWh/m²/y -an average reduction percentage of 63%- and increasing their RES share from an average of 18% to an average of 46%.

Practical tools are available online, including training materials and tips, marketing guidelines and promotional tools. Based on the experience and lessons gained, neZEH upgraded and adapted the e-tool developed by Hotel Energy Solutions project by offering the neZEH online e-tool for hotel owners to assess their current energy performance and receive guidance on energy measures and interventions that can bring them closer to NZEB.

In order to address challenges and barriers faced by SME hotels in the path towards improved energy efficiency²⁵ the neZEH Consortium suggested specific policy solutions and measures,.

Improved European, national and regional policies: In most MS, numerical NZEB definitions concern only new buildings, whereas in some cases the indicators for both new and refurbished buildings are the same. Refurbished buildings cannot easily comply with these values; there is a need for realistic NZEB criteria for them. Hotels represent a specific building type due to their business operation; a high ratio of the delivered energy is used for non-hosting functions. The NZEB calculation methodology is usually based on the standard use of non-residential buildings in general, which does not include hotel specific uses.

Tailored financial support schemes and incentives could be provided in order to help SME hotels to overcome the problem of high initial investment costs of ambitious NZEB renovations. For example, these policies could group the needs and capabilities of different market segments of the accommodation industry to reach also SME hotels more effectively.

Coordination between support policies targeting to the tourism sector development and the ones focusing on buildings energy efficiency could be enforced. Policies should also facilitate the development of regional/local financial schemes (e.g. revolving funds, guaranteed or supported loan programmes, EPC schemes) which are able to mobilize private financing. The ongoing programming of the European Structural and Investment Funds (ESIF, 2014-2020)²⁶ is a huge opportunity to mainstream buildings energy efficiency policies and achieve large scale improvements in the MS.

Credible and independent technical assistance: A common barrier faced in energy refurbishments is the complexity of the renovation decision-making process, requiring insights and decisions not only of

²⁵ Nearly Zero Energy Hotels – towards low carbon growth in the European Union, neZEH position paper, 2016, http://www.nezeh.eu/assets/media/PDF/neZEH_EU_policy_paper_v2_final375.pdf

²⁶ DG Regio. Financing the energy renovation of buildings with Cohesion Policy funding. Technical guide. 2014. https://ec.europa.eu/energy/sites/ener/files/documents/2014_guidance_energy_renovation_buildings.pdf

financial but also of technical, organisational and legal nature²⁷. The set-up of “one-stop-shop” consultancy services or energy help-desks for the non-residential building sector (similar to the examples in France available for the residential sector) could be an answer, in order to guide hotel owners through the whole renovation process.

Awareness raising, capacity building and certification schemes: Hotel owners have to gain a general understanding of sustainable buildings and the available support schemes for them. Training sources on basic technical knowledge related to energy efficiency/NZEB as well as on the potential of investing in ambitious refurbishment projects and public support schemes for capacity building can contribute to that direction. At the same time, building professionals need to be ready to respond to the new era of NZEB; there should be requirements for training leading to qualified professionals and companies in high energy efficiency, and especially to energy retrofits towards NZEB.

Tailored awareness raising activities targeting the accommodation industry can help to convince hotel owners about the feasibility of becoming a neZEH. It is easier to engage hotel owners that are already committed to sustainability in the discussion about investing in deep energy retrofit. Synergies with the existing engagement of hotels in different eco/green hotel certification schemes can be exploited.

neZEH also recommends the set-up of “one-stop-shop” services in the public or private domains, or energy help desks also for the non-residential building sector (similar to the examples in France available for the residential sector), in order to guide hotel owners through the whole renovation process. These services should provide independent, credible and evidence-based information on the available technical solutions.

²⁷ European Commission, Directorate-General for Energy. Public Consultation on the Evaluation of Directive 2010/31/EU, Final synthesis report. November 2015

ABBREVIATIONS

BEMS	Building Energy Management System
DHW	Domestic Hot Water
COP	Conference of the Parties
EED	Energy Efficiency Directive
EPBD	Energy Performance of Buildings Directive
EPC	Energy Performance Contracting
ESIF	European Structural and Investment Funds
EU	European Union
GDP	Gross Domestic Product
GHG	Green House Gases
M&V	Measurement and Verification
MEP	Member of the European Parliament
NZE	Nearly Zero Energy
NZEB	Nearly Zero Energy Building
RES	Renewable Energy Sources
SME	Small and Medium Enterprises

ANNEX I: Hotels typology and classification

Hotel categories

The 4 main categories based on geographical area, where the hotel is situated, are:

- **Urban:** hotels in an urban environment, available in all 5 climate zones;
- **Rural:** hotels in remote, countryside areas, available in all 5 climate zones;
- **Coastal:** hotels on sea shores, available in all 5 climate zones;
- **Mountain:** hotels in the mountains, available in all 5 climate zones, however due to the high altitude this is a category, where the cold climatic aspects can be taken into account.

Hotel types

The 4 hotel types according to customer needs and main activities characteristic for a hotel (available in each geographical category), are:

- **Business hotels:** focus on attracting business by satisfying all the requirements of business trips and are usually located in the centre or business district of urban or rural settlements. They typically have conference rooms, auditoriums, several meeting rooms, kitchen and restaurant. They also offer facilities such as business centre with access to personal computers, Wi-Fi, phone & fax, scanners and printers.
- **Spa/Wellness hotels** guarantee relaxation, recreation and healthcare for guests. Hotels from this category offer a wide range of recreation and healthcare services e.g. hydro massage baths, bath with mineral water, sauna, massage, therapeutic muds, wrapping in leaves of herbs, acupuncture, peeling, special diets, aromatherapy, yoga. They usually have large public areas, indoor/ outdoor swimming pools, fitness room, spa complex, kitchen and restaurant.
- **Resort hotels** are found located near the sea, mountain and other areas having an attractive landscape and healthy climatic condition. They target holiday makers, tourists and those who need a change in the atmosphere by offering all-inclusive properties. These hotels provide enjoyable and memorable guest experiences through entertainment and recreational facilities, scenery, golf, tennis, sailing, skiing and swimming. They have a comprehensive infrastructure for all types of activities that might characterise them as mini cities. They have large public areas, indoor sports, kitchen and restaurant, conference and meeting rooms, lounges, shopping arcade and entertainment areas.
- **Hotels B&B** usually have limited public areas than the categories mentioned before and no offered facilities, except maybe kitchen and restaurant and sometimes outdoor swimming pool, thus they satisfy the basic needs of the guests.

ANNEX II: THE neZEH PILOT HOTELS



HOTEL VILLA ADRIATICA

Hotel Villa Adriatica
Supetar, Croatia

Climate Zone	2
Category	Coastal
Type	Hotels B&B
Beds	46
Opening period	May - October
Main facilities	Spa / wellness
Hotel rating	4****



The hotel

Villa Adriatica is small boutique family hotel 100 meters away from the main sandy beach, in Supetar, in the heart of the island of Brač. The building consists of the basement area, ground floor, two floors and attic and features a restaurant and a garden cafe-bar.

Measures towards neZEH

Priority measures:

Priority measures:	Savings (%)	Payback (years)
Laundry schedule operation during the night hours	-	Immediately
Replacement of part of glass door and windows	23,0	-
Installation of solar collectors for domestic hot water preparation	40,0	4,0
Change all lamps with LED lamps	14,0	4,0
Reactive power compensation	-	5,0
Installation of photovoltaic system	5,0	20,0
Water consumption reduction	-	3,0
Building envelope insulation	18,0	-

€ Estimated refurbishment cost: 84,9 €/m²

neZEH targets and performance	Hosting	Non-hosting
Primary energy use after renovation	64 kWh/m ² /year	16 kWh/m ² /year
Energy saved per year	60.400 kWh (51% energy savings)	-
Average RES share % in the total energy mix	47%	-
Greenhouse gas emissions avoided per year	17 tCO ₂ eq/year	



"For a small family-run hotel built in the seventies and refurbished in the nineties, the need for energy renovation has emerged. One of the main reasons is the appreciation of guests for the environmental protection and the need to preserve the natural beauties on the island of Brač. Being part of the neZEH project has corresponded nicely with our long time desires in becoming a green hotel."

Neva Jelovac, Hotel Owner



HOTEL SPLIT

Hotel Split
Podstrana (Split), Croatia

Climate Zone	2
Category	Coastal
Type	Hotels B&B
Beds	80
Opening period	All year
Main facilities	Spa, sauna, outdoor swimming pool, gym
Hotel rating	4****



The hotel

Hotel Split, built in 2012, is a combination of a business and family eco-friendly hotel and it is located on the pebble beach on the Podstrana-Split Riviera, only 9 km from downtown Split.

Measures towards neZEH

Priority measures:	Savings (%)	Payback (years)
Replacement of washing machines with more efficient	3,0	24,7
Replacement of rotary ironer with more efficient	4,0	13,5
Replacement of halogen lamps with LED lamps	5,0	11,0
Installation of photovoltaic system	4,0	28,7

€ Estimated refurbishment cost: 33,1 €/m²

neZEH targets and performance	Hosting	Non-hosting
Primary energy use after renovation	57 kWh/m ² /year	53 kWh/m ² /year
Energy saved per year	17.600 kWh (14% energy savings)	13.700 kWh (14% energy savings)
Average RES share % in the total energy mix	68%	-
Greenhouse gas emissions avoided per year	9 tCO ₂ eq/year	



"It has taken many years to achieve nZEB status in Hotel Split. The process started back in 2001 when it was decided to consider all the environmental impacts of building a hotel situated on the beach. That meant that all processes of planning, projecting and constructing should have been reviewed and adjusted. Stubbornness in finding the best solutions has resulted in more time needed. Remember to be truly green and environmental friendly; it is not just energy efficiency and renewable energy sources. Most of the waste produced by the hotel is recycled and reused by local artists that make artworks."

Mladen Tomic, Hotel Owner



Best Western Hotel Ajaccio Amirauté Ajaccio, France

Climate Zone	2
Category	Coastal
Type	Resort
Beds	129
Opening period	All year
Main facilities	Bar-lounge, spa, swimming pool
Hotel rating	4****
Environmental labels	EU Ecolabel

The hotel

Since its opening, the founders of the Best Western Ajaccio Amirauté have asserted their motivation to create a hotel respectful of the environment. In 2013 it became the first hotel in Corsica to be awarded the EU Ecolabel. The hotel, built in 2007 using the national building codes RT200, consists of 4 floors and 68 rooms and features spa, heated pool, conference rooms, restaurant and other services.

Measures towards neZEH

Priority measures:	Savings (%)	Payback (years)
Installation of a double flow controlled mechanical ventilation	12,0	10,0
Installation of balancing valves on the heating system	1,0	5,0
Installation of balancing valve on the domestic hot water system	1,0	6,0
Regulation of internal units	4,0	6,0
Wall insulation in unheated corridors	2,0	9,0
External insulation	3,0	31,0
Installation of solar thermal system and a heat recovery system on grey water	6,0	10,0

€ Estimated refurbishment cost: 224,0 €/m²

Additional measures

- Change of inefficient lighting with LED
- Installation of BEMS
- Pressure regulators to taps and showers
- Setting up a recovery Boosterm on the chiller
- Installation of double glazed windows PVC performance

neZEH targets and performance	Hosting
Primary energy use after renovation	109 kWh/m ² /year
Energy saved per year	691.000 kWh (55% energy savings)
Average RES share % in the total energy mix	20%
Greenhouse gas emissions avoided per year	34,7 tCO ₂ eq/year



"We embarked in the neZEH project as a continuity of an engagement which began in 2013, when the hotel was awarded the Ecolabel. Today, we wish to take this engagement further. neZEH energy audit, was the starting point by identifying the problems, analysing them and proposing adapted solutions. Pursuing our environmental engagement is also, for some clients, another motivation to choose our hotel."

Bernard Faraud, Co-founder



Hôtel des Gorges-Du-Verdon La Palud Sur Verdon, France

Climate Zone	2
Category	Mountain
Type	Spa/wellness
Beds	70
Opening period	April - October
Main facilities	restaurant, spa, outdoor swimming pool, play area
Hotel rating	4****
Environmental labels	EU Ecolabel, Green Key, Green Key restaurant, Hôtel au naturel, Bon pour le Climat

The hotel

The Hotel & Spa des Gorges du Verdon is located at the heart of the Gorges du Verdon natural area, at an altitude of 938 m. It was labelled the Green Key in 2007, then Hotels au Naturel, the brand Parc du Verdon and the EU Ecolabel in 2011. The hotel, which consists of 2 floors and 31 rooms, was built in the 1970s and had several refurbishments since then.

Measures towards neZEH

Priority measures:	Savings (%)	Payback (years)
External wall insulation	12,0	21,0
Installation of more efficient aluminium frame windows	10,0	28,0
Solar protection to reduce heat gains	6,0	3,0
Low consumption lighting bulbs and light sensors	4,0	8,0
Floor insulation	11,0	13,0
Double flow ventilation with exchanger and cold battery	6,0	5,0
Building Management System	9,0	5,0
Geothermal Heat Pump	10,0	8,0
Radiant heater	1,0	10,0

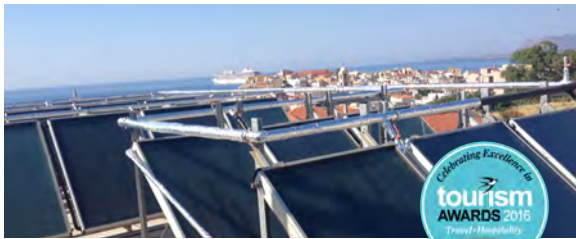
€ Estimated refurbishment cost: 320,0 €/m²

neZEH targets and performance	Hosting
Primary energy use after renovation	98 kWh/m ² /year
Energy saved per year	749.000 kWh (80% energy savings)
Average RES share % in the total energy mix	20%
Greenhouse gas emissions avoided per year	30 tCO ₂ eq/year



"We were always engaged in sustainability and constantly looking to adapt our actions in this field. Being a neZEH pilot allows us to reduce our energy footprint and to be an inspiration for a sustainable regional development."

Héléne Bogliorio, Hotel Owner



Arkadi Hotel
Chania - Crete, Greece

Climate Zone	1
Category	Urban
Type	Business
Beds	114
Opening period	All year
Main facilities	Bar, laundry
Hotel rating	3***



The hotel

Arkadi lies in the heart of Chania town, only 200 meters away from the Old Venetian Harbour. The historic centre, the city attractions, shopping and nightlife highlights, are all a short walk away. Comprising of 2 buildings and 64 rooms, it was built in 1985 and renovated in 1999.

Measures towards neZEH

Priority measures:





	Savings (%)	Payback (years)
Installation of central heat pumps for heating, cooling and hot water and subsequent abolition of fossil fuel burner	14,0	10,0
Installation of ceiling fans	9,0	3,0
Installation of photovoltaic panels for electricity production	23,0	6,4
Façade insulation and shading	7,0	20,0



Estimated refurbishment cost: 77,2 €/m²

Additional measures

- Double glazing windows
- Installation of automatic system to coordinate electricity with solar energy for optimal production and distribution of hot water
- Replacement of fan coil units with autonomous air conditioning units
- Installation of ballasts and power capacitor for improving the quality of the electrical voltage
- Installation of key-card system
- Replacement of incandescent light bulbs with energy saving ones or LED
- Installation of movement sensors for turning off air-conditioning when door is open

neZEH targets and performance	Hosting
 Primary energy use after renovation	86 kWh/m ² /year
 Energy saved per year	418.900 kWh (70% energy savings)
 Average RES share % in the total energy mix	50%
 Greenhouse gas emissions avoided per year	107 tCO ₂ eq/year

"We feel that sustainable development is going to play a major role in the tourism industry in the future, especially in Greece. Our main motivation for becoming neZEH is to reduce the environmental impact of our business activity. Participating in this initiative, our hotel gained the opportunity to follow high environmental standards. The adoption of environmental friendly practices in the day to day operations led to significant reduction in operational cost and improved our image to potential clients."

Ioannis Bitsakis, owner - hotel manager



Ibiscos Garden Hotel
Rethymnon - Crete, Greece

Climate Zone	1
Category	Urban
Type	Resort
Beds	324
Opening period	May - October
Main facilities	Kitchen, Restaurant, 3 Pools
Hotel rating	3***
Environmental labels	ISO 14001:2004, Green Key

The hotel

Ibiscos Garden is a Blue Star Club hotel that incorporates social responsibility actions in all of its operations. The hotel also holds ISO 9001 and ISO 22000 certifications and many awards, such as TUI Nordic 2010 Blue Spirit Award for excellence in performance and Silver Award in Tourism Awards 2016 for Environmental protection.

Measures towards neZEH

Priority measures:

	Savings (%)	Payback (years)
Installation of advanced ceiling fans with extremely low noise levels	17,1	5,0
Use of control systems for cooling and lighting, especially in corridors and toilets	12,0	5,8
Energy upgrading of kitchen equipment	17,4	12,5
Installation of photovoltaic panels for electricity production	20,5	4,1
Building envelope insulation	3,4	18,7

€ Estimated refurbishment cost: 103,4 €/m²

Additional measures

- Replacement of old air-conditioning units with central Variable Refrigerant Flow units of very high efficiency
- Replacement of all incandescent light bulbs with energy saving or LED bulbs
- Increase of solar thermal collectors and hot water storage capacity by 50%
- Installation of gas consumption meters
- Installation of water flow reducers

neZEH targets and performance	Hosting	Non-hosting
Primary energy use after renovation	100 kWh/m ² /year	250 kWh/m ² /year
Energy saved per year	410.400 kWh (57% energy savings)	130.000 kWh (44% energy savings)
Average RES share % in the total energy mix	50%	50%
Greenhouse gas emissions avoided per year	259 tCO ₂ eq/year	



"Sustainable growth by protecting the environment is the only way, for our own future and for the generations to come. Becoming a nearly Zero Energy Hotel is a strong step towards sustainability; to be able to grow with nearly Zero or even Zero emissions, this is extremely challenging for us and for our guests! We feel proud and responsible!"

Tassos Papadourakis, Hotel Owner and Managing Director



The hotel

Sentido Vasia Resort & Spa is located above a small rocky cove with a beach. The hotel complex consists of 15 buildings and offers 300 suites and stylish rooms, a nightclub and a 1.500 m² spa centre. The first buildings were constructed in the 90s and further buildings were added in 2004 and later. The hotel actively complies with the principles of green entrepreneurship and international quality standards and has received a Silver Award for Environmental protection in Tourism Awards 2016.



Sentido Vasia Resort & Spa
Sissi - Crete, Greece

Climate Zone	1
Category	Coastal
Type	Resort
Beds	1.036
Opening period	April - October
Main facilities	4 restaurants, 6 bars, spa, gym, laundry, swimming pools
Hotel rating	5*****
Environmental labels	Travelife Gold, ISO 14001:2004



Measures towards neZEH

Priority measures:

	Savings (%)	Payback (years)
Expansion of solar collectors and cover for indoor swimming pool	5,0	10,0
Outdoor redesign for better microclimate	4,0	4,1
Installation of central heat pumps for cooling and hot water	36,0	5,4
Installation of photovoltaic panels for electricity production	13,0	6,0
Building envelope insulation and double-glazing windows	8,0	19,2

€ Estimated refurbishment cost: 60,0 €/m²

Additional measures

- Replacement of fossil fuel boilers with biomass boilers, as a back-up for DHW hot water supply
- Installation of presence detectors and magnetic door traps in rooms
- Installation of water flow limiters
- Replacement of conventional lamps with energy saving ones or LED
- Gradual replacement of electric appliances with higher efficiency ones

neZEH targets and performance	Hosting	Non-hosting
Primary energy use after renovation	99 kWh/m ² /year	110 kWh/m ² /year
Energy saved per year	2.334.800 kWh (60% energy savings)	659.700 kWh (62% energy savings)
Average RES share % in the total energy mix	60%	50%
Greenhouse gas emissions avoided per year	870 tCO ₂ eq/year	

"Being included in neZEH made us pleased and proud of our team. Participating in the neZEH project is helping us to improve and brings significant benefits. Our goal is to undertake our environmental responsibility, involving not only installations and operations, but also people and community, forming a network that multiplies positive impact. The neZEH project invites us to a larger network that raises the standards for the future of hospitality businesses."

George Chondrakis, Director Vasia Hotels



Residencia L' Orologio Turin, Italy

Climate Zone	3
Category	Urban
Type	Hotels B&B
Beds	78
Opening period	All year
Main facilities	Gym, kitchen in almost all rooms



The hotel

Residence L' Orologio is located few minutes from the city centre, the main museums and monuments, in an Art Nouveau building constructed at the beginning of the 20th century. It was refurbished and converted into a hotel about 10 years ago; it has 6 floors and a semi-basement area, offering 20 guestrooms. The business relies mainly on guest long-term stays, which requires rooms to be very similar to small apartments in terms of internal layout and equipment.

Measures towards neZEH

Priority measures:	Savings (%)	Payback (years)
Installation of water saving devices	12,0	1,5
Reduction of stand-by power consumption		
Replacement of light bulbs with LED		
Replacement of electric stove with induction cook-tops		
Connection to district heating network	37,00	5,8
Installation of photovoltaic panels		
Insulation of the wall (23 cm)	42,0	7,5
Substitution of windows		

€ Estimated refurbishment cost: 97,5 €/m²

neZEH targets and performance	Hosting	Non-hosting
Primary energy use after renovation	143 kWh/m ² /year	24 kWh/m ² /year
Energy saved per year	139.900 kWh (46% energy savings)	-
Average RES share % in the total energy mix	41%	-
Greenhouse gas emissions avoided per year	18 tCO ₂ eq/year	



"We decided to undertake this initiative because we believe that the Italian hotel sector has to rise to European standards and look to the future by adopting smart strategies of integrated sustainability. We believe eco-sustainability is a very distinctive parameter for the expanding niche of "responsible tourists", careful in their daily choices, as well as in the choice of their holidays destination."

Stefania Talaia, Hotel owner



Hotel Royal Terme Di Valdieri Valdieri (CN), Italy Greece



Climate Zone	3
Category	Mountain
Type	Spa/wellness
Beds	210
Opening period	May - September
Main facilities	Spa
Hotel rating	3***



The hotel

Royal Terme di Valdieri is a XIXth century building located 1368 m above the sea level in a quiet mountain area, in the middle of the Maritime Alps Nature Park. Built in 1857, it has been refurbished over the years and is part of a larger complex of buildings including 2 chalets and an unheated attic. The hotel is directly connected to the spa and has a solarium with a private thermal swimming pool (34°). It uses the thermal spring hot water for heating and a hydroelectric plant to produce electricity.

Measures towards neZEH

Priority measures:	Savings (%)	Payback (years)
Replacement of conventional light bulbs with LED lights (50% of rooms and common spaces)	36,0	1,9
Installation of occupancy sensors in common spaces		
Installation of thermostatic valves		
Replacement of traditional pool circulation pumps with variable speed drive pumps		

€ Estimated refurbishment cost: 5,9 €/m²

neZEH targets and performance	Hosting	Non-hosting
Primary energy use after renovation	64 kWh/m ² /year	66 kWh/m ² /year
Energy saved per year	143.600 kWh (36% energy savings)	-
Average RES share % in the total energy mix	81%	-
Greenhouse gas emissions avoided per year	31 tCO ₂ eq/year	



"We are proud to have been selected as pilot project in neZEH also because finally our efforts made so far have been appreciated and we feel supported and guided in the path towards the nearly zero energy hotel target."

Daniela Bonetto, Hotel owner



BALVANYOS
RESORT

Balvanyos Grand Hotel
Târgu Secuiesc, Romania



Climate Zone	3
Category	Mountain
Type	Resort
Beds	220
Opening period	All year
Main facilities	Restaurant, fitness centre, conference centre
Hotel rating	4****

The hotel

Located in the middle of the forests surrounding St. Ana Lake, Balvanyos Resort offers an elegant and friendly setting for events and conferences, as well as for rest and relaxation. The hotel was developed and renovated in 2008 in a contemporary and innovative style. It has 110 guest rooms and 4 conference rooms.

Measures towards neZEH





Priority measures:

	Savings (%)	Payback (years)
Replacement of inefficient lighting with LED	3,7	7,9
Installation of smart sensors on lighting circuits	1,1	1,4
Installation of Variable Speed Drive on water pumps	0,3	8,8
Thermal insulation of boiler pipes	5,2	3,8
Implementation of a Building Energy Management System	17,2	10,4
Building envelope improvements to avoid air leaks	15,6	7,9
Installation of solar collectors for hot water	35,1	9,6
Installation of photovoltaic panels	12,0	11,3

€ Estimated refurbishment cost: 78,7 €/m²

Additional measures

- Key-card system in the guest rooms for disconnecting electricity during vacancy periods
- Set-up of a high efficiency gas cogeneration system

neZEH targets and performance	Hosting	Non-hosting
 Primary energy use after renovation	104 kWh/m ² /year	1.460 kWh/m ² /year
 Energy saved per year	998.200 kWh (62% energy savings)	-
 Average RES share % in the total energy mix	43%	-
 Greenhouse gas emissions avoided per year	431 tCO ₂ eq/year	



"If we want to maintain a healthy living standard, we must adopt decisive measures to protect the natural environment, to allow it to regenerate in order to furtherly provide us the resources on which we depend. Turning our hotel into an nZEB is not only energy savings and reducing operating costs; our visitors will appreciate even more our services, which we hope will significantly increase our occupancy rate."

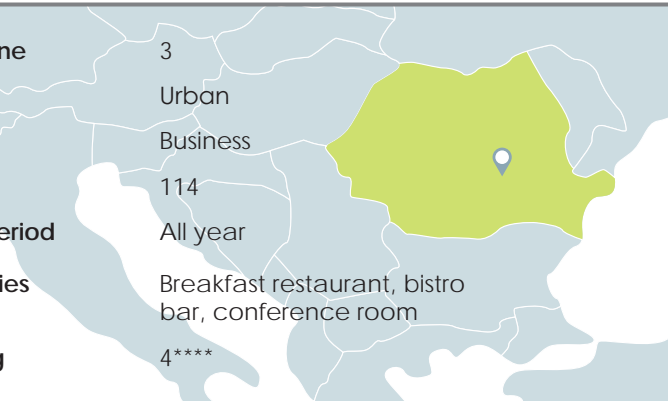
Olimpia Gaszpar, Operation Manager



Cubix Hotel
Braşov, Romania



Climate Zone	3
Category	Urban
Type	Business
Beds	114
Opening period	All year
Main facilities	Breakfast restaurant, bistro bar, conference room
Hotel rating	4****



The hotel

Cubix is a modern hotel, opened in April, 2008. It has 57 rooms, a restaurant, conference halls and the best location, being positioned within the business and commerce area of Braşov.

Measures towards neZEH

Priority measures:	Savings (%)	Payback (years)
Smart sensors on lightning circuits	0,1	7,3
Exchange of energy source in the laundry facility	-	0,8
Replacement of inefficient lighting with LED	3,7	6,2
Integration of Building Energy Management System	2,6	8,9
Envelope improvements to avoid air leaks	35,0	9,5
Installation of solar collectors	17,6	16,3
Installation of photovoltaic panels	12,0	13,7

€ Estimated refurbishment cost: 172,2 €/m²

neZEH targets and performance	Hosting	Non-hosting
Primary energy use after renovation	81 kWh/m ² /year	144 kWh/m ² /year
Energy saved per year	534.600 kWh (77% energy savings)	295.600 kWh (90% energy savings)
Average RES share % in the total energy mix	37%	-
Greenhouse gas emissions avoided per year	230 tCO ₂ eq/year	



"We believe the rational use of resources -especially energy- within our hotel, represents a bet we have to win for the environment, and not against it. The partnership we have with neZEH made us realise that by using it non-rationally, we in fact lose energy. There is a great deal of actions to be taken and necessary investments to be done. We wish to have very shortly a new brand: CUBIX - a nearly zero energy hotel!"

Dan Chivu, Hotel Owner



Kolping Kolping Hotel Braşov, Romania

Climate Zone	3
Category	Urban
Type	Business
Beds	57
Opening period	All year
Main facilities	Restaurant, conference room
Hotel rating	3***







The hotel

Kolping Hotel lies at the foothills of the Tâmpa mountain, surrounded by the green nature. Built from the ground and opened in 2007, it has 43 rooms and 4 conference halls, a restaurant, a café, a parking area, 4 terraces and many green spaces. Located at 800 metres from the Black Church, it is the ideal place for business meetings, workshops, conferences and leisure.

Measures towards neZEH

Priority measures:	Savings (%)	Payback (years)
Replacement of existing pumps with variable speed drive models	0,1	7,3
Extension of solar collectors	-	0,8
Replacement of lighting with LED	3,7	6,2
Improvement of the envelope insulation	2,6	8,9
Implementation and active use of an energy management system	35,0	9,5
Installation of photovoltaic panels	17,6	16,3

 Estimated refurbishment cost: 45,3 €/m²

neZEH targets and performance	Hosting	Non-hosting
 Primary energy use after renovation	104 kWh/m ² /year	63 kWh/m ² /year
 Energy saved per year	167.600 kWh (54% energy savings)	70.300 kWh (89% energy savings)
 Average RES share % in the total energy mix	35%	-
 Greenhouse gas emissions avoided per year	58 tCO ₂ eq/year	



"We have already started promoting the nearly Zero Energy concept among our guests and we are glad to receive their appreciation and full support in this effort. Sustainability is one of our main objectives, a reason for which we committed to become a neZEH. Our goal is to protect the environment and the local resources. We must invest in our future!"

Elena Ciurilă, Manager



Hotel Amalurra Bizkaia, Spain

Climate Zone	4
Category	Rural
Type	Resort
Beds	60
Opening period	All year
Main facilities	Restaurant, swimming pool, spa and sauna, coffee-bar, meditation room, meeting room, events salon
Hotel rating	1*
Environmental labels	Q for tourist quality



The hotel

Lying in the heart of Encartaciones - Bizkaia, in a 10 hectares farm, Amalurra Natural Resort is an example of an environmental respectful hotel. It has a rural hotel of 16 rooms, a 2-storey house and 2 apartments. Amalurra was awarded with the first edition of the SOHO awards for implementing innovative measures, including economic and environmental criteria, and was included as a successful case of Good Environmental Practices at the World Summit of Sustainable Tourism TS20.

Measures towards neZEH

Priority measures:	Savings (%)	Payback (years)
Biomass District Heating	0,7	5,1
Water aerators	5,4	0,3
Installation of photovoltaic panels	25,3	4,7
Substitution of halogen lamps with LED	1,6	5,0
Substitution of incandescent lamps with LED	0,9	2,7
Substitution of energy saving (CFL) lamps with LED	1,5	6,9
Substitution of fluorescent lamps with LED	0,3	7,3
Occupancy detectors in corridors, hallways and bathrooms	0,6	10,5

€ Estimated refurbishment cost: 118,0 €/m²

Additional measures

• Pump isolation • Heat system pipes isolation • Heat exchanger isolation • Dehumidify spa • Lower temperature set point in spa's accumulator • Facade insulation • Hotel roof insulation

neZEH targets and performance	Hosting	Non-hosting
Primary energy use after renovation	96 kWh/m ² /year	193 kWh/m ² /year
Energy saved per year	244.800 kWh (65% energy savings)	232.900 kWh (24% energy savings)
Average RES share % in the total energy mix	61%	-
Greenhouse gas emissions avoided per year	109 tCO ₂ eq/year	



"We have been gradually developing this energy converse goal with lighting systems, solar panels, bioconstruction, etc. This initiative can also help us to open gates to a new international market to clients, to emerge ourselves with an attribute which is a trend and a global need and also to realise our vision of expansion as a collective."

Luis Carrera González, Hotel owner



RH |
CORONA DEL MAR
Beach Hotel *****

Corona Del Mar
Benidorm, Spain

Climate Zone	1
Category	Coastal
Type	Resort
Beds	214
Opening period	All year
Main facilities	Outdoor swimming pool with jacuzzi and slide, indoor swimming pool with jacuzzi, cafeteria, restaurant, gym, sauna
Hotel rating	4****
Environmental labels	ISO 14001:2004, EMAS



The hotel

RH Corona del Mar, a nine-floor hotel, is located in front of the Poniente Beach. In 2015, it was the first hotel in Valencia Community and the fourth in Spain to receive a verification of carbon footprint in accordance with ISO 14064-1.

Measures towards neZEH

Priority measures:

	Savings (%)	Payback (years)
Installation of shower head diffusers	2,5	0,3
Adjusting pumping schedule of the swimming pools	2,0	0,3
Presence detectors in hallways, mezzanines and bathrooms	2,5	0,4
Ozone system in the laundry	3,7	1,0
Replacement of lighting with LED	3,5	3,9
Replacement of boilers with heat pumps	3,0	8,4
Replacement of the minibars	2,4	10,7
Replacement of current heat pumps with more efficient ones	4,9	11,8

€ Estimated refurbishment cost: 78,0 €/m²

Additional measures

- Replacement of pool pumps with more efficient ones
- Isolation of heat exchangers
- Placement of VRV system for the terrace of the restaurant
- Installation of photovoltaic solar system and wind power system

neZEH targets and performance	Hosting	Non-hosting
Primary energy use after renovation	200 kWh/m ² /year	1.860 kWh/m ² /year
Energy saved per year	783.600 kWh (45% energy savings)	294.500 kWh (18% energy savings)
Average RES share % in the total energy mix	61%	-
Greenhouse gas emissions avoided per year	196 tCO ₂ eq/year	



"This year we performed calculations of CO₂ emissions and we have just been audited. We share a philosophy of respect to the environment, always searching for greenhouse gases emissions reductions. That is the reason why we decided to participate in neZEH."

Marta Gómez, Hotel Manager of Corona del Mar



Hotel S:t Clemens Visby, Sweden

Climate Zone	5
Category	Urban
Type	Business
Beds	84
Opening period	All year
Main facilities	Kitchen, breakfast restaurant, sauna in two rooms
Hotel rating	3***
Environmental labels	Svanen



The hotel

S:t Clemens is a family-run hotel located in the heart of Visby within the medieval city walls. The botanic garden is just around the corner. It consists of five historical buildings, converted into a hotel in the 1980s, surrounding two enclosed gardens and right next door to the ruins of the medieval St Clemens Church. It features 32 rooms with a rustique and romantic design. It is Gotland's first environmental labelled hotel.

Measures towards neZEH

Priority measures	Savings (%)	Payback(years)
Reduction of the speed of extraction air fans during winter season	1,0	-
Regulation of supply heat dependent of outside temperature	0,8	-
Balancing of the energy system	4,1	2,3
Installation of geothermal heat pump	58,0	6,3
Installation of temperature limited radiator thermostats	0,8	5,7
Replacement of existing pumps to pressure controlled pumps	0,8	-
Conversion from heating by electricity to water based heating	0,8	13,3

€ Estimated refurbishment cost: 107,0 €/m²

neZEH targets and performance	Hosting	Non-hosting
Primary energy use after renovation	187 kWh/m ² /year	n/a
Energy saved per year	355.700 kWh (74% energy savings)	39.500 kWh
Average RES share % in the total energy mix	58%	-
Greenhouse gas emissions avoided per year	15 tCO ₂ eq/year	



"To be a part of this project is a catalyst for our work within sustainability that will help us reach our targets much more early than we thought possible before."

Carl von Schulman, Owner



Stora Brännbo Konferens Och Hotell Sigtuna, Sweden

Climate Zone	5
Category	Rural
Type	Business
Beds	150
Opening period	All year
Main facilities	Kitchen, restaurant, sauna, conference, gym
Hotel rating	5*****
Environmental labels	Svanen



The hotel

Stora Brännbo is located within walking distance from Sigtuna city and close to the third largest lake in Sweden, Mälaren. The hotel, comprising of 8 buildings, has a modern and sustainable Scandinavian design. It features a restaurant and spa facilities, which include fitness centre, sauna and Jacuzzi.

Measures towards neZEH

Priority measures	Savings (%)	Payback (years)
Replacement of light bulbs by LED	2,0	7,4
Optimization of air handling units	5,7	7,9
Optimization of energy system	10,0	2,0
Installation of geothermal heat pump	43,5	7,1
Installation of a Building Energy Management System	5,0	6,8
Installation of solar panels	2,0	18,3
Replacement of existing 2-glass windows by 3-glass windows	7,8	44,5

€ Estimated refurbishment cost: 198,4 €/m²

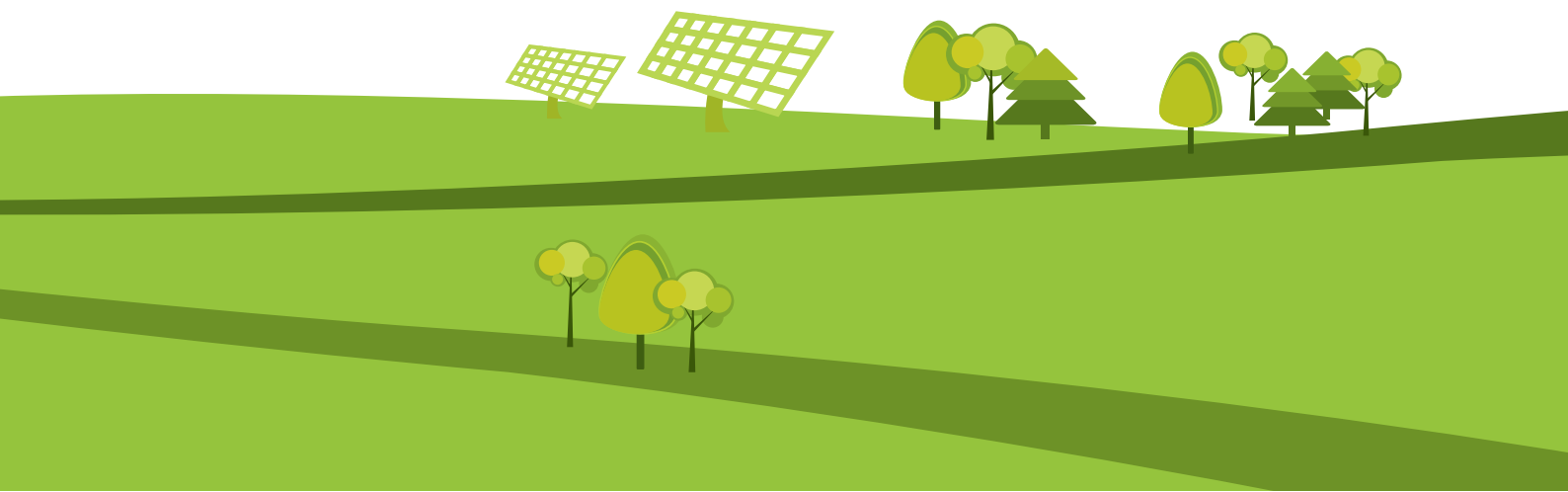
neZEH targets and performance	Hosting	Non-hosting
Primary energy use after renovation	37 kWh/m ² /year	437
Energy saved per year	659.500 kWh (75% energy savings)	1.224.900 kWh
Average RES share % in the total energy mix	23%	23%
Greenhouse gas emissions avoided per year	140 tCO ₂ eq/year	



"neZEH gives us a unique possibility to achieve new knowledge and at the same time reduce the energy usage in our hotel drastically. For us it is important both from the environmental and marketing point of view to be at the forefront when it comes to energy efficiency."

Björn Jonzon, Owner

www.nezeh.eu



The neZEH Consortium



Project Coordinator

TECHNICAL UNIVERSITY OF CRETE (TUC)
SCHOOL OF ENVIRONMENTAL ENGINEERING
RENEWABLE AND SUSTAINABLE ENERGY
SYSTEMS LABORATORY

