

Experience and results from the implementation of pilot projects

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THE EU INITIATIVE NEARLY ZERO ENERGY HOTELS (neZEH)

neZEH's scope is to accelerate the rate of refurbishment of existing hotels into Nearly Zero Energy Buildings (nZEB), providing technical advice to hoteliers for nZEB renovations, demonstrating the sustainability of such projects, challenging further large scale renovations through capacity building activities, showcasing best practices and promoting the front runners. The project covers seven (7) EU countries: Greece, Spain, Italy, Sweden, Romania, Croatia, France and has a wide EU level impact.

The expected results are:

- An integrated set of decision support tools to assist hoteliers in identifying appropriate solutions and designing feasible and sustainable nZEB projects;
- A dynamic communication channel between the building sector and the hotels industry, which will enable the exchanging between demand and supply side and the endorsement of the nZEB concept;
- Demonstration pilot projects in 7 countries to act as "living" examples; aiming to increase the rate of nZE renovation projects in the participating countries
- Practical training, informational materials and capacity building activities to support nationally the implementation and uptake of nZEB projects;
- Integrated communication campaigns to increase awareness for the nZEB benefits, to promote front runners and to foster replication; challenging much more SMEs to invest in refurbishment projects in order to achieve nZE levels.

In the long term, the project will assist the European hospitality sector to reduce operational costs, to improve their image and products and thus to enhance their competiveness; contributing in parallel to the EU efforts for the reduction of GHGs.

neZEH started at May 2013 and will end at April 2016 and is co-financed by the Intelligent Energy - Europe (IEE) programme.

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Network of European Regions for a Sustainable and Competitive Tourism (NECSTouR)	EU
Federation of European Heating, Ventilation and Air-conditioning Associations (REHVA)	EU
Agency of Braşov for Energy Management and Environment Protection (ABMEE)	Romania
Creara Consultores S.L. (CREARA)	Spain
ENERGIES 2050 (ENERGIES 2050)	France
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1. THE EUROPEAN PERSPECTIVE

The European Initiative Nearly Zero Energy Hotels (neZEH), aims at accelerating the rate of the refurbishment of existing buildings into Nearly Zero Energy Buildings (nZEB), focusing on the European accommodation industry, especially the Small and Medium properties which represent 90% of the European hospitality market.

Buildings consume 40% of the total of energy and emit 36% of greenhouse gases in the EU, so the building sector is a key priority of the EU's energy efficiency related policies. Two key directives target buildings energy efficiency: the Energy Performance of Buildings (EPBD recast) and the Energy Efficiency Directives (EED) that are to be implemented by every EU Member State. 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. Although not fully defined in the final agreement, this is in harmony and within the priorities of the COP21.

Tourism is the third-largest industry sector of the European Union. It contributes 5% to EU GDP and accounts for 5,2% of the total labour force (which equates to some 9,7 million jobs). During the last fifty years, tourism has experienced continued expansion to become amongst the largest and fastest growing economic sectors globally. International tourist arrivals worldwide are expected to increase by 3,3% per year between 2010 and 2030 to reach 1,8 billion by 2030. In Europe, arrivals grew by 3% in 2014 covering 51,4% of the total world tourist arrivals. The tourism sector is composed of several industries and by 1,8 million businesses, 99,5% of which being SMEs and 91% being micro enterprises, especially family business. The sector is very fragmented and not well federated. Hotels and similar accommodation numbered more than 200.000 establishments.

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. Because the sector is mainly made of M-SMEs and fragmented, accessing information for better understanding and/or responding to energy or building directives is rather complex. The size of the companies, the industry business model (own and operate – or operate only), the technical support and financial implications add to the difficulties for accommodation industry SMEs to engage.

The neZEH initiative has been prepared to address this gap through its approach with pilot countries/hotels, aiming to better inform SMEs and help them to understand the challenges that the accommodation industry faces in relation to energy performance measures. neZEH provides an integrated approach to pilot SMEs for responding to the existing challenges. It has specified an acceptable level of energy performance for them to be a nearly zero energy hotel, as well as offering tailored technical assistance for deep energy renovation of the buildings and showcasing best-practice examples. This approach can lead to primary energy savings of 70% or more compared with pre-renovation performance.





2.OBJECTIVE

The neZEH initiative provided sound and adapted guidance for the EU accommodation industry to reach neZEH levels across the EU Member States. The main objective was to deliver a critical mass of pilot projects in the seven neZEH countries with committed hotel management to move forward towards nearly zero energy status through large-scale renovations. The pilot hotels would not only demonstrate the feasibility and profitability of such refurbishment projects for other SME hotels moving towards neZEH status, but also act as inspirational examples to foster replication.

Sixteen hotels committed to become neZEH pilot hotels and act as examples of good practice to achieve nZEB performance levels. These sixteen were spread across the seven countries; 2 pilot hotels in Croatia, France, Italy, Spain, Sweden, 3 hotels in Romania and Greece. Further, the hotels represented four different geographical locations; coastal, urban, rural and mountain. Each country was represented by a regional leader, who was responsible for selecting the pilot hotels, providing technical assistance and promoting the pilot hotels in their region.

In order to achieve project goals, the neZEH project provided a series of strategic activities that were central to get hotels started and moving along the path towards nearly zero energy status. These activities are present briefly in the following chapter.

3. PILOT HOTEL PROCESS

A robust and transparent selection process was prepared, with associated selection criteria. This selection process was applied in each region by regional leaders, and latterly cross the entire project to ensure that the pilot hotels demonstrated a range of different types of hotel in varying geographical locations. Transparency was important in order to justify why a hotel had or had not been selected as a pilot, especially as the selected pilot hotels were offered energy pre-audits and energy audits at the expense of the neZEH project.

As a result of the selection process, 38 candidate hotels were selected to receive energy preaudits - 5 hotels in Croatia, France, Italy, Spain, Sweden, 6 hotels in Romania and 7 hotels in Greece. Based on energy pre-audit results and by applying the project selection criteria, **16 pilot hotels in the seven neZEH project regions were selected to become pilot hotels**, each to receive an energy audit.

The independent and comprehensive energy audits proved to be the catalyst to assist hoteliers to move forward with renovation plans. Based on the challenging benchmark targets provided by the project as national nZEB targets were in embryonic stages in most regions, hoteliers received an understanding of suitable energy saving measures with cost estimates. The next step was for regional leaders to carry out feasibility studies and, with the help of guidelines and cost estimate templates, produce a number of cost scenarios to assist each pilot hotel in identifying best





possible funding sources for the measures selected. This led to a renovation rollout plan for each pilot hotel. Feasibility studies were prepared in the local national language, but an English executive summary and rollout plan were produced for each pilot hotel case study.

The neZEH project provided support and technical assistance with tendering and contracting issues, so that hoteliers could move forward efficiently with their rollout plans. Hoteliers required help not only to write correct specifications for tendering, but also to select the right contractor based on incoming proposals. Regional leaders and the energy audits played a vital role here and it was clear that hoteliers needed and appreciated this support. 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 after the end of the project.

Training of hotel management and staff to understand the neZEH concept and the hotel's ambition to achieve neZEH status was vital in order to get the most out of the energy efficiency and renewable energy sources investments. Training material and booklets providing tips and advice for hotel management and staff were produced, and training activities were organised for each of the pilot hotels on two separate occasions. All material was translated into local languages and training has been carried out at all 16 hotels. Over 200 staff employees across all regions underwent training by regional leaders.

4. PILOT HOTEL CASE STUDIES

In this chapter, each pilot hotel is presented as a case study in order to provide an overview of the effort, challenges and achievements to accomplish nearly zero energy status during the course of the neZEH project (2013-2016).

A brief description of each hotel is followed by a summary of the main planned/implemented energy saving measures to achieve neZEH status according to the hotels rollout plans, key performance indicators (estimated energy savings), greenhouse gases (GHG) emission reductions (tCO₂/y), cost savings (EUR/y) and average payback period of implemented measures (yrs) together with expected date when neZEH status will be achieved. Finally, the case study presents main experiences and lessons learnt by hoteliers during the project, key achievements and the potential for replicability.





4.1. CROATIA

4.1.1. HOTEL VILLA ADRIATICA

Hotel Villa Adriatica - Supetar, Croatia		
Climate Zone	2	
Category	Coastal	
Туре	Hotels B&B	
Beds	46	
Main facilities	Spa/wellness	
Hotel rating	4****	



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

Neva Jelovac, Hotel Owner

Brief description of the Pilot hotel	The Villa is 100 meters away from the main sandy beach. It is the ultimate location in Supetar, in the heart of the island of Brac. Located in a quiet residential area, right next to the tennis courts. Completely refurbished and re-decorated, our small hotel is upscale and sophisticated. You'll enjoy your stay in any of the beautiful areas of the Villa: the restaurant, the garden cafe-bar under the shade of gorgeous palm trees, and the originally designed rooms.
	The hotel consists of the basement area, ground floor, two floors and attic. The total useful area is 978,02 m ² . Energy is used for DHW production, cooling, lighting and equipment (kitchen, laundry) operation.
Planned/Implemented energy saving measures to achieve neZEH status	To achieve neZEH status deep renovation of hotel building has to be implemented. In 2015 partial replacement of glass doors and windows has been achieved. In the following period, energy efficiency and RES measures to be implemented are: - Solar collectors for domestic hot water preparation - Change all lamps with LED lamps - Installation of PV system - Building envelope insulation





Performance Indicators	Energy savings are estimated at 64% of current energy consumption or 34.000 kWh
	(13.500 kWh of electricity).
	Greenhouse gases emission reduction is estimated at 8 tCO ₂ per year.
	Average payback for all proposed measure is around 20 years.
Experiences and lessons	Small hotel owners lack the technical expertise to plan and carry deep renovations
learnt during project	needed to achieve neZEH status. Moreover, hotels that are not open all year round do
	not have economic viability for deep renovations. The introduction of subsidies was
	deemed necessary to stimulate uptake in the implementation of EE and RES measures.
	Technical expertise has to become available to hotel owners.
Key achievements and	Hotel Villa Adriatica represents small hotel in need of deep renovation and it was
replicability	deemed possible to achieve nZEB status. Proposed measures can be implemented in
	most hotels that were built in last century, and most of them would become neZEH.





4.1.2. HOTEL SPLIT

Hotel Split - Podstrana (Split), Croatia		
Climate Zone	2	
Category	Coastal	
Туре	Hotels B&B	
Beds	80	
Main facilities	Spa, sauna, outdoor pool, gym	
Hotel rating	4****	



"It has taken up to 10 years to achieve the nZEB status of 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 very beach. That meant that all the 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

Brief description of the Pilot hotel Hotel Split is located on the pebble beach on the Podstrana-Split Rivie from downtown Split. The Hotel Split is a unique combination of a mo and pleasant family hotel. We are proud to say that Hotel Split is a "gr friendly hotel. The goal is to offer guests the best service and at the ecologically responsible.	
	The hotel consists of a basement, two basement ground floors and two floors. The building was built in 2012. The total useful area is 2.400 m ² . Energy is used for DHW production, cooling, heating, ventilation, air conditioning, lighting and equipment (kitchen, laundry, spa and wellness) operation.
Planned/Implemented	Maccuras to be implemented to achieve po7EH status:
Plaimed/implemented	Medsures to be implemented to achieve hezen status.
energy saving measures to	- Change halogen lamps with LED lamps
achieve neZEH status	- Installation of PV system





Performance Indicators	Energy savings estimated at 25% of current energy consumption amounting to 22.000
	kWh (all electricity).
	Greenhouse gases emission reduction estimated at 5 tCO ₂ per year.
	Average payback for all proposed measure is around 16 years.
Experiences and lessons	Small hotel owners do not have the technical expertise to plan and carry deep
learnt during project	renovations needed to achieve neZEH status. Moreover, hotels that are not open all
	year round do not have economic viability for deep renovations. The introduction of
	subsidies was deemed necessary to stimulate uptake in the implementation of EE and
	RES measures. Technical expertise has to become available to hotel owners.
Key achievements and	Hotel Split represents modernized small hotel in need of few investments for achieving
replicability	nZEB status. Proposed measures could be implemented in most of the hotels that were
	built in last few years, and most of them would become neZEH.





4.2. FRANCE

4.2.1. BEST WESTERN AJACCIO AMIRAUTÉ

Best Western Hotel Ajaccio Amiraute- Ajaccio, France		
Climate Zone	2	
Category	Coastal	
Туре	Resort	
Beds	129	
Main facilities	Bar-lounge, spa, swimming pool	
Hotel rating	4****	
Environmental labels	European Ecolabel	



"We embarked in the neZEH project as a continuity of an engagement which really began in 2013, when the hotel was awarded the Ecolabel. Today, we wish to take this engagement further."

Angéline Carli Faraud, Hotel Director

Brief description of the	The BEST WESTERN Ajaccio Amirauté is a 4 star hotel located in Ajaccio, Corsica (coastal
Pilot hotel	zone). It is ideally located close to the Congress Center, the seaside, the city center, and
	the airport. Since the opening, 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. This is a guarantee that
	the hotel is doing its best to limit its environmental impact.
	The BEST WESTERN Ajaccio Amirauté has a surface of 2.705m ² with a number of facilities
	(Spa, external swimming pool, restaurant, conference rooms, etc.), 4 floors and a total of
	68 rooms. It was built in 2007 using the national building codes RT2005 (Réglementation
	thermique 2005) and is opened all year round. It has an energy consumption of 302,7
	kWh/m ² , or 356 MWh, and 733 kWh/m ² in primary energy consumption, placing it in G





	category in terms of energy performance certification. Its consumption is divided almost
	equally between gas and electricity. Main energy usage is linked to air-conditioning,
	heating and hot water, along with secondary uses.
Planned/Implemented energy saving measures to achieve neZEH status	 The hotel is planning a set of nine measures to reach neZEH Status, starting with measures 4 – 8, with some contractors already contacted: 1. Installation of double glazed windows PVC performance 2. Wall insulation in unheated corridors 3. External insulation 4. Setting up a recovery Boostherm on the chiller 5. Install a double flow CMV 6. Install balancing valves on the heating system and balance the network 7. Install balancing valves on the DHW system and balance the network 8. Control of indoor units 9. Solar hot water system
Performance Indicators	Total investment is estimated at 606.403€ with possible incentives of 9.742€, and annual savings of 30.649€. Return on Investment period is estimated to be between 14 and 20 years (depending on actualization rates and energy prices). Cumulated benefits over 30 years could reach 292.000€ up to 1.800.000€. Using regulatory approach, the hotel's primary energy consumption falls in this scenario at 100 kWh/m ² , below the nZEB target at 109 kWh/m ² (label BBC renovation).
Experiences and lessons learnt during project	Analysis showed that reaching the nZEB status is technically and economically feasible for this hotel, with an important investment but with a ROI that can be optimized. Nevertheless, it is important for the hotel to integrate certain risks and adopt mitigation measures by raising awareness and train key users on energy efficiency, avoid rebound effect and keep its engagement to become neZEH through the implementation of all measures, even these that are less cost effective. Risks are also related to trust in the company who conducted the energy audit, and thus the audit results used as a basis to trigger investments. Trust in the audit company to achieve expected results was important. In both cases, the involvement of the neZEH partner was very reassuring the hotelier.
Key achievements and replicability	The main achievement was to engage this pilot hotel in a journey to become highly energy efficient. The hotel owners and staff were highly interested in the nZEB concept and in the economic and environmental values of becoming neZEH. Staff training showed that most of the hotel's team was already engaged in sustainability and were keen to participate in the process of becoming highly energy efficient. Promotional campaigns gave strong visibility of this initiative, in TV Channel (France 3) and specialized media. Being part of a chain (BEST WESTERN), the potential for replicability is strong, firstly with other BEST WESTERN hotels in Bastia. It should also be underlined that the hotel benefited from high regional visibility (in Corsica) and was one of the first to be awarded the ecolabel in 2013.





4.2.2. HOTEL & SPA GORGES DU VERDON

Hôtel des Gorges-Du-Verdon - La Palud Sur Verdon, France	
Climate Zone	2
Category	Mountain
Туре	Spa/wellness
Beds	70
Main facilities	Hotel, Restaurant, Spa, pool area, play area
Hotel rating	4****
Environmental labels	Ecolabel européen, Clé Verte, Clé Verte restaurant, Hôtel au naturel, Qualité tourisme, Maître-restaurateur, Collège culinaire de France, Bon pour le Climat



"We are engaged in a process of sustainable development for a long time now and always try to evolve in this field. Through neZEH we wish to reduce further our energy footprint"

Hélène Bogliorio, Hotel Owner

Brief description of the Pilot hotel	The hotel & Spa Gorges du Verdon is a 4-star hotel located in the Gorges du Verdon natural area. It has a surface area of 1.178 m ² with a number of facilities (brand new Spa, external swimming pool, restaurant, etc.), 2 floors and a total of 31 rooms. Its construction started in the 1970s (with several refurbishments since) and is open from April to October only. The hotel is ideally at the heart of a natural area, at the top of a 1000m hill. With its terraces, its swimming pool, it offers a unique view over the nearby village, the mountain, the nature and of Verdon's landscapes. It engaged in a process of sustainability almost from the beginning, and was labelled the Green Key in 2007, then Hotels au naturel, the brand Parc du Verdon and eventually the European Ecolabel in 2011. With neZEH, the hotel takes this engagement further. Energy consumption within the hotel is mostly in the form of electricity (heating and cooling), the gas being only used for hot water. The hotel recently invested in a solar hot water system that cut its gas consumption by half.
Planned/Implemented	A set of 10 measures were proposed after the energy audit. These included:
energy saving measures	- External wall insulation
to achieve neZEH status	- Installation of more efficient windows with aluminium frames





	 Solar protection to reduce heat gains Floor insulation Double flow ventilation with exchanger and cold battery Low consumption lighting bulbs and light sensors Building Management System Radiant heaters Geothermic heat pump Reversible heat pump air-air The hotel already engaged significant efforts in the past (installation of solar hot water for example) and will continue with these measures over the next years.
Performance Indicators	The total cost of investment is estimated at 377.120€ with possible incentives assessed at 6.669€. Energy savings were estimated at 109MWh per year, equivalent to 15.264€. The return on investment is between 15 to 25 years, depending on actualization rates and energy prices. Using regulatory approach, the hotel's primary energy consumption falls in this scenario from 490 kWh/m ² y to 97 kWh/m ² y, below the target nZEB.
Experiences and lessons learnt during project	Analysis showed that reaching the nZEB status is technically and economically feasible for this hotel, with an important investment but which ROI can be optimized. Nevertheless, it is important for the hotel to integrate certain risks and adopt mitigation measures by raising awareness and train key users on energy efficiency, avoid rebound effect and keep its engagement to become neZEH through the implementation of all measures, even these that are less cost effective. The risks are also related to trust to the company who did the energy audit, and therefore to the results of the audit, which are used as a basis to trigger the investments. Trust to the company carrying the work to get the expected results is also important. In both these cases, the involvement of the neZEH partner in the process was useful to reassure the hotelier. As the hotel already engaged in recent refurbishment, the implementation of these measures will finally be conditioned to finding innovative financing solutions. Again, support from neZEH consortium is here important.
Key achievements and replicability	The main achievement was to engage this pilot hotel in a journey to become highly energy efficient. The hotel owners and staff were also highly interested in the nZEB concept and in the economic and environmental values of becoming neZEH. Most of the hotel's team is already engaged in sustainability and keen to participate in the process. The promotional campaign gave strong visibility of this initiative, in TV Channel (France 3) and specialized media. The hotel benefits from strong visibility at the local level and its clients are usually very interested in sustainability. This is due to the hotel specific position at the heart of a natural area, very famous in France. The potential for replicability is strong as there is here a clear relation between branding value and the neZEH experience in this area.





4.3. GREECE

4.3.1. ARKADI HOTEL

Hotel Arkadi- Crete, Greece	
Climate Zone	1
Category	Urban
Туре	Business
Beds	114
Main facilities	Bar, laundry
Hotel rating	3***



"Our main motivation for becoming neZEH is to try to reduce the environmental impact of our business activity. We feel that sustainable development is going to play a major role in the tourism industry in the future, especially in the case of Greece. Moreover, the adoption of environmentally friendly policies in the day to day operations can lead to significant reduction in operational cost. Finally, we are based on an island and also very close to the old Venetian harbour of Chania where the environmental impact is probably more important.

Participating in such an initiative can be beneficial to our hotel because this will give us the option to follow high contemporary environmental standards. The adoption of smart environmental strategies can change the image of the hotel to the potential clients and also educate the management and staff to follow new environmental friendly policies and operations."

Ioannis Bitsakis, owner, hotel manager

Brief description of the Pilot hotel	Arkadi 3*** is a city hotel lying in the heart of Chania, very close to the Venetian harbour. The hotel, which operates full year, comprises of 2 buildings and features 64 rooms and 114 beds in total. Built in 1985, it was last renovated in 1999.
Planned/Implemented energy saving measures to achieve neZEH status	 To achieve neZEH, Arkadi Hotel has engaged in a long term process, involving several actions: Installation of central heat pumps for heating, cooling and hot water and subsequent abolition of fossil fuel burner. Installation of photovoltaic panels to cover electricity demand Façade insulation and shading to improve interior environment comfort Installation of ceiling fans, movement sensors in the corridors and shared WC, and sensors in patio doors for turning off air-conditioning when the door is open.



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	The engagement of the hotel towards improved energy efficiency dates back to 2006, when they replaced fan coil with standalone air-conditioning units for cooling and heating. In 2011 they installed a heat pump for hot water, resulting in the abandonment of the oil-fuelled boiler.
	The hotel was engaged in the neZEH project at the end of 2014. In 2015 they installed an automatic system for optimized production and management/distribution of hot water that essentially coordinates electrical with solar power. At the same time, they installed a power capacitor for improving the quality of the electrical voltage, key card systems in the rooms and replaced incandescent lamps with CFL or LED. Moreover, they proceeded to add external insulation to the south side of the hotel building and replacing windows with double-glazing ones.
Performance Indicators	The hotel is engaged in a process that will bring them to the nZEB state by 2020, if all goes according to plan. The estimated savings from all the measures proposed by neZEH have been implemented will be 418.876 kWh/year, this is 70% energy saving compared to their current status, while RES share will reach to 50%.
	Greenhouse gases emission will be reduced by 107,39 tCO ₂ /year.
	The required investment is estimated to €161.000 and will have a payback of 7,9 years, and it will help the hotel save around €20.200 per year.
Experiences and lessons	The measures proposed in the energy audit have very good payback times, apart from building envelope insulation which has a payback of 20 years.
	Under this premise, it is unlikely that the hotel owner will be willing to proceed with the insulation unless they receive some form of financial incentive. On the positive side, these sorts of interventions are eligible within the new structural funds program (ESPA) for hotels. The call (which is the first one in the last three years for tourism businesses) is open for submissions until 17/05/16 and the hotel will submit its business plan for funding with the help of TUC.
	The gradual implementation of measures is the way forward according to the rollout plan of the hotel; low-cost measures will be implemented first and the savings achieved will be used to fund the next bunch of the most expensive measures.
Key achievements and replicability	The energy saving of 70% that can be achieved is very impressive, considering that the hotel implemented energy efficiency measures before neZEH. The hotel received a Silver Award in Tourism Awards 2016 in Greece, along with the other two Greek pilot hotels, an achievement that was widely promoted and gained lots of publicity.
	This is a typical urban hotel for Crete meaning that it can act as an example of good practice for other hotels on the island and inspire them to proceed to similar actions, especially when the hotel owner continues talking about their experience and the benefits gained.





4.3.2. HOTEL IBISCOS GARDEN

Ibiscos Garden Hotel- Rethymno - Crete, Greece	
rban	
esort	
24	
tchen, Restaurant, 3 Pools	

014001:2004, Green Key	



"We feel proud and responsible! Becoming a neZEH is a strong step towards sustainability. Sustainable development is the only way to secure our future for the generations to come. Embarking in this quest, we feel as pioneers working for our goals and at the same time showing to our society that we can take care of the environment and that we are ready to invest this way, for future growth. Also it is interesting and challenging for us and for our guests, to be able to grow with nearly Zero or even Zero emissions!"

Tassos Papadourakis, Hotel Owner and Managing Director

Brief description of the Pilot hotel	Ibiscos Garden 3*** is a Blue Star Club Hotel, located in Rethymnon, Crete, with a capacity to accommodate up to 400 guests. It was built in 1991 and continues to operate since then, in the season May-October. The hotel, which belongs to the category family hotel/resort, incorporates social responsibility actions in all of its operations. They recycle all basic materials, batteries and electric devices and are also sponsoring local sports activities and participate in community events, while they undertook the maintenance of the nearby municipal square and forest.
	The hotel has numerous certifications and awards:
	- The Green Key Ecolabel (2012)
	- ISO 14001:2004 Environmental Management System
	 ISO 22000 Quality and Food Safety Management System
	- TUI Nordic 2010 Blue Spirit Award for excellence in performance
	- ISO 9001 Quality Management and Assurance (since1997)
	- Tjaeborg 2002 Customer Satisfaction Award
	- Play Hotel Award 2013 & 2014 (part of the Blue Star concept)
	- Taste Award 2015





Planned/Implemented energy saving measures to achieve nezeh status	To become a neZEH, Ibiscos Garden Hotel has engaged in a long term process, involving several actions proposed by the energy audit: - Installation of photovoltaic panels to cover electricity demand - Building envelope insulation - Installation of advanced ceiling fans with extremely low noise levels. - Use of control systems for cooling and lighting, especially in corridors and toilets - Energy upgrading of kitchen equipment
	The hotel already has made significant steps towards improving its energy efficiency, being certified with ISO 14001:2004 and Green Key, while all hotel staff participates each year in a training program for sustainability and are informed about qualitative and quantitative targets. The hotel also proceeded to energy efficiency measures, such as replacing old air-conditioning units with central VRV units of very high efficiency, replacing all incandescent light bulbs with CFL or LED bulbs, increasing solar thermal collectors and hot water storage capacity by 50% (2012) and installing of gas consumption meters (2013).
Performance Indicators	The hotel has been engaged in a process to become an environmentally friendly hotel. Deciding to take their targets further, they joined neZEH and by 2020 they are planning to be a nearly zero energy hotel with the interventions proposed.
	The estimated savings after all the measures proposed by neZEH have been implemented will be 410.400 kWh/year for the hosting functions (57% reduction compared to current status) and 130.000 kWh/year for the non-hosting (44% reduction). RES share will reach to 50%.
	Greenhouse gases emissions will be reduced by 259,43 tCO ₂ /year.
	The required investment is estimated to €460.000 and will have a payback of 8,7 years, since it will help the hotel save around €53.000 per year.
Experiences and lessons learnt during project	The measures proposed in the energy audit have excellent payback times, with the exception of insulation that has a payback at 18,7 years and the kitchen equipment replacement at 12,5 years. This is why the most cost-efficient measures, such as ceiling fans and control systems for cooling and lighting are to be implemented first according to the rollout plan of the hotel.
	Other measures, such as the insulation will need to be supported through incentives in order to persuade hotel management to implement in the long term. On the positive side, these sorts of intervention are eligible under the new structural fund's program for hotels, so if the hotel manages to receive the grant they will be able to implement this measure as well.
Key achievements and replicability	The renovation of the hotel not only gives financial benefits by reducing energy costs significantly, but will also contribute towards the green image that the hotel is trying to brand over the last years. This is a demand by the tour operators with whom the hotel is collaborating, which at the end is a demand of the guests themselves. The hotel is committed to communicating their experience and achievements with neZEH to other hotel owners, in order to become an inspiring example. Already the hotel owner has travelled with TUC team in FITUR 2016 that was held in Madrid, and talked about their experience as a panelist. Moreover, the hotel received a Silver Award in Tourism Awards 2016 in Greece, along with the other 2 Greek pilot hotels, an achievement which was widely promoted and gained lots of publicity. Since Ibiscos Garden is a typical hotel in its category, it is expected that the solutions implemented are highly replicable by other similar hotels in the area. The owner is also member of the Hotels Association management board and exchanges often with other hoteliers, which increases the reach that this example may have.





4.3.3. SENTIDO VASIA RESORT & SPA

Sentido Vasia Resort & Spa- Sissi - Crete, Greece	
Climate Zone	1
Category	Coastal
Туре	Resort
Beds	1036
Main facilities	Restaurant, bars, spa, gym, laundry, pools
Hotel rating	5****
Environmental labels	Travelife Gold, ISO 14001:2004



"Being included in neZEH made us pleased and proud of our team. Participating in the neZEH project brings very significant benefits. Aside from the recognition and promotion of our efforts, it helps us improve and inspire other hospitality businesses in Greece and Europe. 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 Hoteis
Brief description of the Pilot hotel	Sentido Vasia Resort & Spa 5***** is located in the quiet picturesque fishing village of Sisi, above a small rocky cove with a beach. The resort with 15 buildings, 300 opulent suites & stylish rooms and 1.036 beds, offers a range of accommodation and services: a 1.500 m ² spa center, 4 restaurants and 6 bars, 7 pools, kids clubs, gym and sport facilities. The buildings of the complex were constructed in different years; first the coastal buildings were built beginning of the 90s; in a next phase, in 2004-5 the central building that houses the main restaurant and the reception were built, while the rest of the buildings were added later.
Planned/Implemented energy saving measures to achieve neZEH status	To become a neZEH, Sentido Vasia Resort & Spa has engaged in a long term process, involving several actions proposed by neZEH: - Installation of central heat pumps for heating, cooling and hot water - Expansion of solar collectors - Installation of photovoltaic panels - Building envelope insulation - Installation of double-glazing windows in the central building - Cover for indoor pool - Outdoor redesign for better microclimate The hotel has engaged in an ambitious strategy for reducing its carbon footprint and is certified by ISO 14001:2004 since December 2005 and Travelife Gold. 25% of its energy





	demand in hot water is already covered by solar thermal collectors, while they also proceeded to the following energy efficiency measures: replacement of fossil fuel boilers with biomass boilers as a back-up for hot water supply, installation of motion sensors and sensors in patio doors to turn-off air-conditioning when doors open, installation of water-saving taps, roof insulation, installation of central digital system to manage refrigeration rooms and gradual replacement of light bulbs and electric appliances with higher efficiency ones. At the same time, they regularly inform guests and staff about energy saving and environmental issues, while they placed recycling bins in many parts of the complex.
Performance Indicators	According to planning and if all the proposed measures proposed by neZEH are implemented, the hotel is expected to reach a neZEH status in 2020. The estimated savings will be 2.334.802 kWh/year in the hosting functions and 659.744 kWh/year in the non-hosting (60% reduction and 62% reduction respectively). RES share will reach to 60% in the hosting functions and 50% in the non-hosting. Greenhouse gases emissions will be reduced by 869,78 tCO ₂ /year.
	The investment is quite high at €995.000, as this is a big hotel comparing to the other two, and it will have a payback of 9,4 years, since it will help the hotel save around €135.700 per year.
Experiences and lessons learnt during project	The measures proposed in the energy audits have excellent payback periods, with the exception of building envelope insulation, which didn't prove to be very cost-effective. For this reason, this measure will be implemented in the long-term according to the rollout plan issued for the hotel. Financial incentives for insulation might be a good way to promote such kind of measures. The expansion of the solar collectors is also at the limit of cost-effectiveness, but if the cost is brought down it could be as well a very applicable solution.
	The installation of low-cost measures at first, as proposed in the rollout plan of the hotel, is a good way to start the renovation. The benefits from a progressive action against a total implementation of the measures at the beginning are:
	 It requires less initial investment. This means disbursing less capital funds from the company and less possibilities to go into debt (lower interest payment).
	 Higher profitability, comparing disbursement to profit made at the end of the project. Although total saving is lower because some measures are implemented, later on, interest costs also decreases. Furthermore, the initial investment is lower compared to a project where all measures are undertaken since the beginning. Profits gained during the first part of the project make it possible to manage a large proportion of the costs from the last package of measures.
Key achievements and replicability	The key achievement is that the hotel not only will it dramatically reduce its energy consumption and increase RES share at a high percentage, but moreover it will expand its sustainability strategy to include the concept of neZEH, thus improving its brand image. The hotel received a Silver Award in Tourism Awards 2016 in Greece, along with the other 2 Greek pilot hotels, an achievement which was widely promoted and gained lots of publicity.
	Vasia Resort & Spa is cooperating with Sentido group of hotels, a chain with hotels in many European countries and North African countries such as Greece, Spain, Cyprus, Croatia, Bulgaria, Turkey, Egypt, Tunisia, Morocco etc. This means that it is easier for the action to be replicated in other hotels in the chain, especially since the chain already incorporates a sustainability strategy.





4.4. ITALY

4.4.1. HOTEL RESIDENCIA L'OROLOGIO

Residencia L'Orologio - Turin, Italy		
Climate Zone	3	
Category	Urban	
Туре	B&B (Residence)	
Beds	78	
Main facilities	Gym, kitchen in almost all rooms	



"We are proud to be a neZEH pilot project. Through this initiative we hope to take the right path to become a lighthouse example, able to involve tourists and others hoteliers in sustainability and environmental consciousness. 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 holiday's destination.

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".

Stefania Talaia, Hotel owner

Brief description of the Residence L'Orologio is an urban hotel located in the centre of Turin, in Piedmont Pilot hotel Region. This apartment building, built at the beginning of 20th century, was refurbished and converted into a hotel about 10 years ago. The building has a rectangular plan, with 6 floors above ground and a semi-basement area. L'Orologio offers 20 guestrooms, each fully equipped with appliances such as fridge, dishwasher, electric oven, microwave, electric stove, washing machine and TV. 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. Extra facilities offered by the Residence are a small gym, a kitchen for the staff and a children playroom, all located in the semi-basement. The Residence comprises a traditional structure with load bearing masonry walls and is heated by two natural gas powered condensing boilers that also heat Domestic Hot Water (DHW). A chiller is installed for the cooling system. Two-pipe fan coil units, placed in a false ceiling in each apartment, are the components of the heating and cooling system. For energy management, all rooms are supplied with key-cards and window opening sensors that communicate with the cooling system.



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Planned/Implemented energy saving measures to achieve nezeh status	Considering an on-going retrofit process, different energy efficiency measures will be implemented over a number of years by starting with basic interventions and escalating to higher ones (going up to 50% of primary energy savings). So far, the hotel replaced all old electric stoves with induction plates and installed LED lighting. Further, water saving devices will be installed to reduce standby consumption. These simple interventions will result in annual savings of more than 4.000€. The second step includes connecting to the district heating which would save 36% of actual primary energy consumption. This would enable the installation of photovoltaic panels and finally window replacement and insulation of external walls. In total, these measures would result in an annual saving of about 9.000€, or 46% of primary energy consumption. Because of its historical features, the building is subjected to some constraints that have been considered during the renovation process. In particular, the main façade cannot be insulated on the outside, for aesthetic reasons, nor from the inside, because of minimum standard guestroom dimensions. In addition, the specific location of the building, a densely built and historical part of the city, means that the south-facing roof surface area for solar system installation is limited. Finally, due to the type of building (residence) all rooms are supplied with efficient appliances (fridge, dishwasher, washing machine, microwave, etc.) so electricity consumption is higher than for other typical hotel rooms. With this in mind, it is extremely challenging to reduce primary energy use to the desired neZEH targets.
Performance Indicators	By the end of the retrofit process, it's estimated the Residence will reduce its energy consumption by 46% thanks also to the implementation of renewable energy sources (41% of the total energy consumption covered by RES).
	Greenhouse gases emissions will be reduced by almost 18 tCO ₂ per year.
	The two first stages require a total investment of about € 44.000 where 57% is provided by the property owners and the other 43% is compounded from external financing. This would result in annual savings of 121,350 kWh of primary energy (40% of reduction on current consumption) reducing annual costs by about 6.500€. Stage three measures generate significant savings (more than 140.000 kWh of primary energy per year) but they are very expensive and require almost 67.000€ of investment, so profitability is relatively low. The advantages from this step-by-step approach as opposed to total implementation of all measures at the beginning are less initial investment - (less capital from company funds/less debt likelihood (low interest payment) and higher profitability, comparing disbursement to profit made at the end of the project.
Experiences and lessons learnt during project	Energy audit results indicated that none of the proposed technically feasible and admissible retrofit interventions would enable the neZEH target to be reached, even with a 50% saving in current primary energy consumption. These findings were at first disappointing for the goals of the neZEH project. However, they might provide input for a review of the proposed benchmarks based on "in-field" experience. Also, all interventions proposed were based on the hotelier's needs and plans, which did not include a major renovation at this time. In the case of overall building reinvestment, more invasive interventions could have been proposed, making the neZEH target easier to meet. Economic evaluation of the proposed measures indicated that financial support by national renovation grants or some other financial incentives would be required in order to realize the full energy saving potential. But as verified in the feasibility study, mapping a rollout plan for retrofit measures and distributing the economic efforts over a number of years is a good solution to reach the highest energy performance.





4.4.2. HOTEL ROYAL TERMEDI VALDIERI

Hotel Royal Terme Di Valdieri - Valdieri (CN), Italy		
Climate Zone	3	
Category	Mountain	
Туре	Spa/wellness	
Beds	210	
Main facilities	Spa	
Hotel rating	3***	



"Our hotel is set in the heart of the Natural Park of the Maritime Alps and environmental sustainability has always been at the centre of our policies. For years now we use the thermal spring hot water for the heating of the hotel and we have also installed an hydroelectric plant to produce electricity. We are proud to have been selected as a 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

Brief description Pilot hotel	of	the	The Hotel Royal Terme di Valdieri is a mountain hotel located in a quiet mountain area, in the middle of the Maritime Alps Nature Park. This hotel, built in 1857 by Vittorio Emanuele II, was refurbished over the years and has been the property of the Bonetto family for more than 30 years. The hotel is part of a larger complex of buildings including 2 chalets, a spa and a restaurant/bar. The building has a rectangular plan, with 4 floors above ground and an unheated attic. The hotel offers about 100 guestrooms, and about 210 beds. Each room has a private bathroom but no extra appliances such as frigo-bar or TV. The Hotel Royal is seasonal (open generally from May to September). The road is closed for avalanche hazard in winter months. The main business relies on long-term guest stays and in particular on people staying at the adjacent thermal spa. The hotel offers some common rooms, an internal bar and is directly connected to the restaurant. The Hotel Royal presents a very traditional structure with load bearing masonry walls. The building is heated by exploiting thermal water (renewable energy source) and the same energy vector is used to produce the needed domestic hot water (DHW) thanks to heat exchangers installed. Adjacent to the thermal spa building a small bydroelectric
			The building is heated by exploiting thermal water (renewable energy source) and the same energy vector is used to produce the needed domestic hot water (DHW) thanks to heat exchangers installed. Adjacent to the thermal spa building, a small hydroelectric
			plant has been installed which produces electricity using the water of the Gesso river. Currently, the hotel draws energy from the national grid, using the hydro energy produced only for the thermal spa.



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Planned/Implemented energy saving measures to achieve nezeh status	Reaching the nZEB status was an ambitious target for existing hotels and required significant investments and time; however, by exploiting the opportunities provided by the context, the goal was feasible. Currently, most energy consumption is covered by renewable sources (heat and DHW consumption) but the building could further reduce its consumption by implementing some actions. For the purpose of reaching the neZEH target, a 10 years renovation plan was proposed where measures are done all in one go. Based on the energy audit results, the feasibility study confirmed the most profitable way forward was to implement all of the measures in one go rather than over a series of actions. It is planned that the hotel will concentrate on renovation to reduce electricity consumption by replacing inefficient lamps with LED (both in guestrooms and in common areas) and the by installing occupancy sensors. In addition, thermostatic valves will be installed on radiators and variable-speed drive pumps will be installed in order to improve guests comfort on rooms (results obtained from the energy audit show how rooms are often too hot and guests are obliged to open the windows). Considering the seasonality of the hotel, only some of these measures will have been implemented by the end of the neZEH Project (March 2016), while the remaining ones are planned for the next off-season period.
Performance Indicators	According to the energy audit and feasibility study results the hotel could easily reach the neZEH target by implementing simple energy efficiency measures. Currently, the hotel gets 74% of its energy from RES (using heat from the thermal water), hence the neZEH target requiring 50% of energy consumption to be covered by RES is already satisfied. However, global primary energy consumption is too high and must be reduced by 7%. By applying the measures described above and with an initial investment of about 24.000€ (where 63% is provided by the property and the other 37% is compounded from external financing), the hotel could save 144.016 kWh of primary energy per year corresponding to a saving of 12.500€, Hence, at the end of the retrofit process it is estimated that the hotel will reduce primary energy consumption by about 36% and will easily reach the neZEH benchmark of 93 kWh/m ² y required. The estimated annual CO2 saving is about 31 t.
Experiences and lessons learnt during project	The peculiarity of this hotel demonstrates how important it is to exploit opportunities provided by the context in which structures are placed. The hotel owners have considered over many years to heat the structure and produce the necessary DHW using thermal sources with simple heat exchangers. A similar strategy could be followed many other hotels near thermal sources in order to use renewable energy and reduce CO ₂ emissions. This approach is often used only for isolated buildings with no or limited possibility of grid connection, but this is a wrong approach. As shown by the Hotel Royal itself, thanks to these ideas thousands of euro and CO ₂ emissions can be saved each year.





4.5. ROMANIA

4.5.1. CUBIX HOTEL, BRASOV

Cubix Hotel - Brașov, Romania		
Climate Zone	3	
Category	Urban	
Туре	Business	
Beds	114	
Main facilities	Breakfast restaurant, bistro bar and conference room	
Hotel rating	4****	



«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 the neZEH team in Romania was a crossing point for us. It was then when we actually understood that by using it nonrationally, we, in fact, lose energy. From this moment on, there is a great deal of actions to be taken and important investments to be done. But we actively think about our future and we wish to have, in a very short while, a new brand: CUBIX - a nearly zero energy hotel!»

Tatu Nicolae Dragos, Hotel Owner

Brief description of the Pilot hotel	A 4* modern hotel, built from the ground and opened in April, 2008. CUBIX has 57 rooms, a restaurant, conference halls and the best location, being positioned within the business and commerce area of the city. The energy supplies of Cubix Hotel are electric power and natural gas. Electric power is consumed mainly in installed equipment, such as ventilation, pumps, air conditioning units (HVAC), lighting, cooking, laundry. Natural gas is consumed by the kitchen equipment and SHW boilers. The main energy consumed is natural gas (72,5%) and electricity (27,5%). The main facilities: - 24 hour reception - Rooms with TV, air conditioning, balcony and bathroom -1 coffee-bar - 1 restaurant - 1 large conference room - 2 small conference rooms - Elevator - Laundry facility - Offices.
Planned/Implemented	Implemented energy saving measures to achieve the neZEH status:





energy saving measures to achieve neZEH status	 A disconnecting system from the e The heat/air conditioning automat Smart sensors on lightning circuits All the room minibars were remove The incandescent lamps were replated and a management system for the externation of the towels are changed only upon Planned energy saving measures to The building envelope will be improved a 60% reduction compared to the cursion of smart thermostats. Use preheated water for the wash Installation in the parking space element of the ones offered by the hote start with two electric cars, electric 	electricity supply during the room's vacancy. ically disable when the windows are opened. were installed. ed, in favour of room service. aced with LED sources. erior lighting is used. request. achieve the neZEH status: oved and stop the air leaks. This measure will bring urrent consumption. nt System that would bring a 12% reduction. hing machines. ar collectors on the roof terrace, on a surface of ectricity rechargers, both for the cars of the guests el for an ECO Tour. The manager has decided to bikes and electric scooters.
Performance Indicators	Estimated saving:	
	Electricity:	417.595 [kWh/y]
	Natural gas/thermal:	412.545 [kWh/y]
	CO2 emission:	253,89 [tCO ₂ eq/y]
	Cost savings:	31.369 [Euro/y]
	Total primary energy reduction:	81%
	Average payback period of	13,2 [yrs]
	implemented measures	
	Expected neZEH status date	2022
Experiences and lessons learnt during project	For the technical analyses and identification of optimal solutions, an interdisciplinary team is needed: an architect specialized in green buildings, building auditors, industry auditors, ESCOs experienced in guaranteeing the results after implementation.	
	played by communication and front-runners marketing.	
Key achievements and replicability	The identified measures can be replicated to any hotel. It is, however, necessary to reconsider the importance of the hotel sector in the building stock evaluations, made at national level, and its support with financial instruments. Without the financial support, it is hard to conceive major rehabilitations towards neZEH in this sector.	





4.5.2. HOTEL KOPLING BRAŞOV

Kolping Hotel - Brașov, Romania		
Climate Zone	3	
Category	Urban	
Туре	Business	
Beds	57	
Main facilities	Restaurant and conference room	
Hotel rating	3***	



«Being a Pilot Hotel in the neZEH European Project -Kolping goes through an extension and renovation process, in order to become a low energy building, hence contributing to protect the environment. Our goal is to protect the environment and the resources. Therefore, from now on we will introduce ourselves using these words: Kolping - a nearly Zero Energy Hotel.»

Elena Onu, Hotel Manager

Brief description of the Pilot hotel	A 3* modern hotel, built from the ground and opened in 2007, Kolping has 43 rooms and 4 conference halls, a restaurant, a café, a parking area, 4 terraces and many green spaces. Kolping Hotel lies at the foothills of the Tâmpa mountain, surrounded by the green nature. Located at 800 metres from the Black Church, it is the ideal place for business meetings, workshops, conferences and leisure. The energy supplies of Kolping Hotel are the electric power, natural gas and some solar panels. The electric power is consumed mainly in the installed equipment such as lighting, elevators, kitchen equipment, ventilation, pumps, air conditioning units. The natural gas is consumed mainly for heating and hot water, for kitchen equipment and SHW boilers. The main energy source is from natural gas (51,1%), electricity (39,8%) and solar panels (9,1%). The main facilities are: - 24 hour reception - Rooms with TV, partially air conditioned, balcony and bathroom - 1 coffee-bar - 1 restaurant - 2 large conference room - 2 small conference rooms - Elevators - Offices.





Planned/Implemented energy saving measures to achieve nezeh status	 Implemented energy saving measures to achieve the neZEH status taken so far helped the hotel to reduce the electricity consumption by 40% and the heat consumption by 35%: Taps with two power stages, to avoid excessive water consumption. Presence detecting sensors on the common hallways Electricity disconnecting systems, for the rooms' vacancy period. VDS models instead of the existing pumps. Planned energy saving measures to achieve the neZEH status: Change the existing lighting to LED sources. Extend the renewable source - solar collectors; the measure will bring 11,6% reduction compared to the current gas consumption. The building envelope will be improved to stop the air leaks. This measure will bring a 19,5% reduction compared to the current consumption. Install photovoltaic panels on the roof terrace. The measure will bring 8,40% reduction compared to the current electric consumption. 	
Performance Indicators	Estimated saving: Electricity: Natural gas/thermal: CO ₂ emission: Cost savings: Total primary energy reduction: Average payback period of implemented measures Expected neZEH status date	42.199 [kWh/y] 134.435 [kWh/y] 58,33 [tCO ₂ eq/y] 9.107 [Euro/y] 60,4% 12,3 [yrs] 2020
Experiences and lessons learnt during project	For the technical analyses and identification of optimal solutions, an interdisciplinary team is needed: an architect specialized in green buildings, building auditors, industry auditors, ESCOs experienced in guaranteeing the results after implementation. An essential role for neZEH major rehabilitation in the existing hotel infrastructure is played by the front-runners promotion and the explanation of long term benefits in an accessible language. The hotel started promoting the "green hotel" concept among their guests and they are glad to receive their full support in this matter.	
Key achievements and replicability	The identified measures can be replicated to any hotel. It is, however, necessary to reconsider the importance of the hotel sector in the building stock evaluations, made at national level, and its support with financial instruments. Without the financial support, it is hard to conceive major rehabilitations towards neZEH in this sector.	





4.5.3. GRAND HOTEL BALVANYOS, TURIA

Balvanyos Grand Hotel - Târgu Secuiesc, România		
Climate Zone	3	
Category	Mountain	
Туре	Resort	
Beds	220	
Main facilities	Restaurant, fitness centre, conference rooms	
Hotel rating	4****	



«The responsibility of a healthy and sustainable environment, under the "nearly Zero Energy" concept, is one of the Balvanyos Grand Hotel management objectives 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. We need to produce comfort based on low energy consumptions, to use sustainably our resources and to manage them efficiently. »

Szarvadi Lorand, Hotel Director

Brief description of the Pilot hotel	Located in the middle of the forests surrounding St. Ana Lake, developed and renovated in a contemporary and innovative style, Balvanyos Resort offers an elegant and friendly setting for events and conferences, as well as for rest and relaxation. A 4* modern hotel, major renovated in 2008, has 110 rooms, a conference centre consists of 4 conference rooms of different sizes, located inside the hotel, but also in the annexed buildings having all the necessary equipment
	The electric power is consumed mainly by the air conditioning units (HVAC), lighting, elevators, cooking, wastewater treatment plant, offices equipment's. The natural gas is consumed mainly by heating, hot water and by the kitchen equipment, too. The main energy consumption is due to natural gas, which means 79% out of the total. The share of electricity is 21%. The main facilities are: - 24 hour reception
	 Rooms with TV, air conditioning, balcony and bathroom 1 coffee-bar 1 restaurant Conference rooms
	- Kitchen - Elevators





	- Laundry facility - Offices.	
Planned/Implemented energy saving measures to achieve nezeh status	Implemented energy saving measures - Disconnecting system from the experiment - The incandescent lamps were represent - A gas cogeneration system was sub- - The thermal insulation of boiler pro- - The installation of a capacitor bar power loses, is undergoing.	ures to achieve the neZEH status: lectricity supply during the room's vacancy. blaced with LED sources. et up, an action that will be completed shortly. bipes is almost finalized. nk at the pumping station, for reducing reactive
	Planned energy saving measures t -The building envelope will be imp 15.6% reduction compared to the - An integrated Building Managem - Install smart sensors on lighting o - Install photovoltaic panels and so 47,1% reduction compared to the	o achieve the neZEH status: roved to stop the air leaks. This measure will bring a current consumption. ent System that would bring a 17,2% reduction. circuits. olar collectors on the roof. The measures will bring current consumption.
Performance Indicators	Estimated savings:	
	Electricity: Natural gas/thermal: CO2 emission: Cost savings: Total primary energy reduction: Average payback period of implemented measures Expected neZEH status date	203.404 [kWh/y] 1.212.371 [kWh/y] 431,40 [tCO ₂ eq/y] 50.561 [Euro/y] 84,3% 9,7 [yrs] 2020
Experiences and lessons learnt during project	For the technical analyses and ide team is needed: an architect speci auditors, ESCOs experienced in gu	ntification of optimal solutions, an interdisciplinary alized in green buildings, building auditors, industry aranteeing the results after implementation.
	A crucial role for promoting the co played by communication and from	ncept to building specialists and hotel sector is nt-runners marketing.
Key achievements and replicability	The identified measures can be re reconsider the importance of the at national level, and its support w support, it is hard to conceive maj The care for the environment and the sustainability of the botel	plicated to any hotel. It is, however, necessary to notel sector in the building stock evaluations, made with financial instruments. Without the financial or rehabilitations towards neZEH in this sector. a responsible behaviour represent key elements for





4.6. SPAIN

4.6.1. HOTEL VILLA AMALURRA

Hotel Amalurra - Bizkaia, Spain	
Climate Zone	4
Category	Rural
Туре	Resort
Beds	60
Main facilities	Restaurant, outdoor swimming pool, spa and Sauna, coffee- bar, meditation room, meeting room, events salon, outdoor activities facilities
Hotel rating	1*
Environmental labels	Q of tourist quality



"We thought this initiative can help us to open gates to a new international market to clients, to establish ourselves with a peculiar attribute which is a trend and a global need and also to the realisation of a desire of expansion as a collective."

Luis de Carrera, Hotel owner

The Amalurra Hotel is located in the Basque country and was built on a once arid and flooded 100.000 m ² piece of land with two derelict buildings, located in a rural and underdeveloped environment, with the lack of transportation and communication means and primarily engaged in activities related to agriculture and forestry. The hotel grounds have many copses, gardens, orchards and a build area of around 4.500 m ² distributed across eight buildings of one or two floors.
Amalurra applies energy measures and building renovations aimed to the use of renewable energy sources (solar and biomass), improvement of the energy efficiency and introduction of recycling solutions. Finally, committed to the reduction of polluting emissions, 3.500 native trees have been planted and bioclimatic buildings have been erected.
Nearly Zero Energy Status is achieved when the hotel reaches 94 kWh/m ² y and to a renewable coverage of 35%. To achieve this the following measures will be implemented:





	- Creation of indigenous forests by planting more than 3,500 fruit trees and local
	species to maintain biodiversity.
	- Use of biomass (tree pruning) for energy production.
	- Telemetric tracking of production facilities and energy consumption.
	- Isolation of DHW channelling and heating pipes.
	- Installation of thermal solar panels.
	- Improving lighting efficiency with the renovation of energy saving lamps and LFD.
	- Information about measures implemented to staff visitors and customers
Performance Indicators	Besides of install a biomass boiler, other energy efficiency measures have been
	proposed. Some of them have been summarised below:
	- Install a photovoltaic energy system: an investment of 40,000 with an annual
	generation ear to 75 000 kWh and savings of 8 500 \pounds per year and 27 000 kg CO ₂
	- Placing flow reducers are expected to save up to 30% in water consumption, energy
	solvings of 27,000 kWh and oconomic solvings of about 2,750 f. ner year, as well as
	amings of 57.000 kwill and economic savings of about 2.750 € per year, as well as
	Emissions will be reduced in 8.500 kg CO_2 .
	- Substituting lighting with LED lamps can generate savings of 14.200 kwn, 2.100 € and
	5.000 kg CO_2 .
	- Improving the isolation of the building to increase the customer comfort and get
	savings in HVAC system.
	In summary after reportion. Amalurra Hetel would have a final consumption of 75
	$kW/h/m^2$ of primary operator reducing its operator consumption from EQO 000 kW/h/war to
	200 000 k/M/h (very with a reduction of amission of 71% which stands for 0.2 E tans of
	Solution with year with a reduction of emission of 71% which stands for 93,5 tons of
Experiences and lessons	neZEH is a complete project, which encompasses different interventions in the hotel
learnt during project	heginning with an energy analysis and finishing with an economic plan to develop the
icum dump project	renovation. Some lessons learnt are:
	- Work iteratively with boteliers to know which measures they are more interested in
	Many management measures can be implemented at low cost to generate good
	- Many management measures can be implemented at low cost to generate good
	Savings and quickly for further renovation actions.
	Communicating the success due to the implementation of measures and achievements
	neips improve the image of the pilot notel, and also helps other notels to become
	aware of energy efficiency.
Koy achievements and	The experience of this project may be replicated by to other projects, both patienal and
replicability	international that are in the early stages. The basis for continuing sustainable growth
τερπασπητγ	including aconomic and cocial is the most relevant aller to support development
	Most of the proposed measures could be implemented by any batel. For instance, the
	wost of the proposed measures could be implemented by any notel. For instance, the
	photovoitaic system could generate more electricity in areas situated in southern Spain,
	the investment being the same. A lot of measures like replacement of lighting, presence
	detectors, flow reducers or improvement of building isolation could also be applied in
	most hotels regardless the region or country in which the hotel is placed.





4.6.2. HOTEL CORONA DEL MAR

Corona Del Mar - Benidorm, Spain	
Climate Zone	1
Category	Coastal
Туре	Resort
Beds	214
Main facilities	Outdoor swimming pool with jacuzzi and slide, indoor swimming pool with Jacuzzi, cafeteria, restaurant, gym and sauna
Hotel rating	4****
Environmental labels	2 or more from EMAS



"This year we performed calculations of CO2 emissions and we have just had an energy audit. We share a philosophy of respect to the environment, seeking reductions in greenhouse gas emissions. That is the reason why we decided to participate in the neZEH project."

Marta Gómez, Hotel Manager of Corona del Mar

Brief description of the Pilot hotel	Corona del Mar Hotel is placed in Benidorm (Alicante), it was built near to the coast in a nine floor single building. This hotel has the following facilities: 24 hour reception; 129 rooms with TV, minibar, air conditioning, balcony and bathroom; one outside swimming pool with Jacuzzi and slide, one inside swimming pool with Jacuzzi, cafeteria with performances area, restaurant, gym and sauna. It has a usable area is around 5.537 m ² .
	Nowadays, the hotel has placed gas boilers and a solar thermal energy to heat water for the laundry, kitchen and domestic use, a centralized system of heat pumps for HVAC
	and several presence detectors to manage the lighting in some areas.
Planned/Implemented energy saving measures to achieve nezeh status	In terms of energy efficiency and renewable energies, the Nearly Zero Energy Status is achieved when the hotel reaches 94 kWh/m ² /y (for Spain) and with a renewable coverage of 35%. Activities to achieve these objectives consist of the following actions. Renewable energy measures: - Install a photovoltaic solar system
	- Implementation of a mini wind power system to generate electricity
	- Replace current gas boilers by heat pumps to heat water using air energy





	Energy efficiency measures:
	- Replacement of current heat pumps with more efficient ones.
	- Substitution of efficiency distribution pumps for conventional ones.
	- Placement of VRV system to acclimatize the terrace of the restaurant.
	- Replacement of traditional lighting with LED lamps.
	- Presence detectors in hallways, mezzanines and bathrooms.
	- Turn off electrical resistance of the air curtains.
	- Adjust pumping schedule of the swimming pools.
	- Adjust place warmers schedule of the restaurant.
	- Laundry with ozone.
	- Heated pool management and thermal blanket.
	- Installation of shower head diffusers.
	- Isolate heat exchangers
	- Replacing the minihars
	- Elevator management
Performance Indicators	Proposed energy efficiency measures generating higher energy savings are:
	- Replacing the current boilers with heat numps requires an investment of 105 000 \neq
	with an annual energy savings of 167 429 kWh (9.9% over total building consumption)
	economical savings of 12 551 \notin per year and emissions will be reduced in 32 kg CO ₂
	\sim Laundry using ozone in the wash cycle to reduce the temperature of the washing
	water entails an annual energy saving of 92 862 kWh an economical saving of 7 203 f
	and the emissions decrease in 24 kg CO
	and the emissions decrease in 24 kg CO_2 .
	- Installation of shower head diffusers generates a reduction of not water consumption
	with a saving of 83.047 kwn, 6.435 \in and 19 kg CO ₂ .
	In summary after reportion. Corona del Mar Hetel will have a final consumption of
	2 204 E60 kWh of primary operative reducing its primary operation on
	1.078.060 kWh of primary energy soving obtained by installing overy measure amounts
	1.078.009 kWn. The final energy saving obtained by instaining every measure amounts
	to 623.310 kWh/year, around 37% off the whole energy consumption in the hotel. This
	implies annual economic savings of 51.830€, with a required investment of 577.639€
Experiences and lessons	ne7EH is a complete project, which encircles different interventions in the hotels
learnt during project	heginning with an energy analysis and finishing with an economic plan to develop the
learnt during project	improvement plan. Some lessons learnt are:
	no7EH targets are very ambitious. All consumptions, not only big ones, are important
	- nezeri targets are very ambitious. An consumptions, not only big ones, are important.
	A complete and accurate audit talls us shout the aparation have of accurate and
	- A complete and accurate addit tens us about the operation nours of equipment and
	The energy behaviour of facilities.
	- iviany management measures can be developed at low cost to generate good savings
	and quickly.
	- Communicating the success of the measures implemented and other achievements
	helps to improve the image of the pilot hotel, and also helps other hotels to pay
	attention to energy efficiency.





Key achievements and	The experience of this project may be transferred to other projects, both national and
replicability	international, that are in their early stages. The basis for continuing sustainable growth,
	including economic and social, is the most relevant pillar to support development.
	Corona del Mar is a typical Mediterranean coast hotel; its typology is very frequent in
	the south of Europe, so its replicability is really high. Most of the proposed measures
	could be implemented on any hotel. For instance, a lot of measures like replacement of
	lighting, presence detectors, ozone for laundry, flow reducers or improvement of
	building isolation could be also applied in most hotels regardless the region or country
	in which the hotel is placed.





4.7. SWEDEN

4.7.1. HOTEL ST CLEMENS

Hotell St Clemens - Visby, Sweden	
Climate Zone	5
Category	Urban
Туре	Business / Hotel B&B
Beds	84
Main facilities	Kitchen, breakfast restaurant, sauna in two rooms
Hotel rating	3***
Environmental labels	Svanen



"The project has become a catalyst towards reaching our ambitious targets within sustainability and energy efficiency"

Carl von Schulman, owner

Brief description of the Pilot hotel	St Clemens hotel is located in the heart of Visby, and is the largest city in Gotland. The city is considered to be the best-preserved medieval city in Scandinavia and is more or less sustained by tourism. The city is also known as "the city of roses and ruins".
	As many of the buildings in the centre of Visby, St Clemens has historical roots and the oldest buildings in the hotel can be dated as far back as the 16 th century. Because of this, some of the buildings are listed as historical buildings and therefore protected. The 84 beds in the hotel is spread out on 32 rooms and 700 square meters. The hotel has a small restaurant were breakfast is served. The hotel's reception has open 06-21 every day. All rooms have its own TV, minibar and bathroom and two of the hotel rooms have private saunas that can be used if the customer would like so. Energy is used for DHW, heating and lighting.





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Planned/Implemented energy saving measures to achieve neZEH status	To achieve neZEH status, deep renovation of hotel building has to be implemented. In 2015 partial conversion from direct electricity heating to water based heating began. In the following period, energy efficiency and RES measures to be implemented are: - Balancing of heating system, lower supply heat temperature. - Replace all lamps with LED. - Install geothermal heat pump. - Convert remaining electricity heated areas to water based heating.
Performance Indicators	Energy savings are estimated at 74 % of current energy consumption amounting to 197.000 kWh with electricity as only energy source. Greenhouse gases emission reduction was estimated at 14,6 tCO ₂ per year.
Experiences and lessons learnt during project	As assumed small hotel owners do not have the technical expertise to plan and carry deep renovations needed to achieve neZEH status. The hotel has always strived to be as sustainable as possible but the needed energy renovations have been postponed several times due to lack of knowledge. The energy audit as provided by the neZEH-project became a key factor for the hotel to prioritize to invest in energy measures.
Key achievements and replicability	Technical knowledge and interest were available to the staff, but not at expert level. Hotel St Clemens represents small Nordic hotels in need of energy efficiency and will almost achieve NZEH status, as defined by the project. Proposed measures can be implemented in most historical hotels, and most of them would become neZEH. However, the hotel is too small to be able to implement/buy regular EPC-system energy auditors often offer. Therefore, targeted incentives towards smaller hotels/businesses in Sweden would be needed to reach better impact in the future.





4.7.2. STORA BRÄNNBO CONFERENCE AND HOTEL

Stora Brännbo Konferens Och Hotell - Sigtuna, Sweden			
Climate Zone	5		
Category	Rural		
Туре	Business		
Beds	150		
Main facilities	Kitchen, restaurant, sauna, conference, gym		
Hotel rating	5****		
Environmental labels	Svanen		



"This project 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

Brief description of the	Stora Brännbo hotel is located within walking distance from Sigtuna, a city considered			
Pilot hotel	to be the oldest city in Sweden. The hotel is also located close to the third largest lake			
	in Sweden, called Mälaren. The 124 beds in the hotel are spread out in 101 rooms, 8			
	buildings and 7.225 square meters. The hotel has a restaurant where breakfast, lunch			
	and dinner are served. The hotel's reception has open 24 hours every day. All rooms			
	have its own TV and bathroom. Guests may use the hotel's Spa facilities, which			
	include fitness centre, sauna and Jacuzzi. Energy sources are currently electric power			
	for all building electricity and district heating for all heating demands.			
Planned/Implemented	To achieve neZEH status deep renovation of hotel building has to be implemented. In			
energy saving measures to	2015 large parts of the ventilation system were changed or adjusted to reduce the			
achieve nezeh status	energy consumption. Huge results have already been achieved in the hotel. In the			
	following period, energy efficiency and RES measures to be implemented are:			
	- Solar panels will be installed			
	- Change all lighting to LED			
	- Install geothermal heat pumps			
	- Install BMS system in all buildings			
	- In time replace all windows to triple glazing			





	- Optimize air handling units (install heat recovery)				
	- Replace non-pressure controlled pumps				
	- Continue to balance the heating system				
Performance Indicators	Energy savings are estimated at 76 % of current energy consumption amounting to				
	248.000 kWh (electricity and district heating today).				
	Greenhouse gases emission reduction was estimated at 140 t CO ₂ per year.				
	Average payback for all proposed measure is around 12,5 years.				
Experiences and lessons	Stora Brännbo is a relatively large hotel focusing on conferences, which is common in				
learnt during project	Sweden at this point in time. Their incentives to strive towards Nearly Zero Energy				
	might be even bigger than normal tourist oriented hotels since more and more				
	companies choose environmentally aware partners. The hotel has a good economy				
	and will be able to carry out the proposed measures and the hotel is also big enough				
	to involve EPC-model when continuing the renovations. Even though the hotel did				
	have good technical staff, their knowledge was not as broad in the field as the project				
	domanded All staff is after the aducation/training activity more aware of the situation				
	demanded. An stall is after the education training activity more aware of the situation				
	and targets for the notel, which already is showing on energy bills.				
Kay achievements and	Store Brännho is a relatively large hotel in several huildings where energy efficiency				
Key achievements and	Stora Brannbo is a relatively large noter in several buildings where energy eniciency				
replicability	has not been a priority. The work done within the framework of the project will				
	transform the hotel and they will reach neZEH-status. Proposed measures can be				
	implemented in most Swedish hotels, which were built in last century, and many of				
	them could become neZEH.				





5. CONCLUSIONS FROM PILOT HOTELS

5.1. IMPACT ON ENERGY SAVINGS AND THE ENVIRONMENT

The results from each pilot hotel rollout plan indicated considerable achievements in relation to the original performance indicator targets. The table below presents the results from each pilot hotel. The energy savings benefits to each hotel as a result of the investment made is significant as is the level of renewable energy triggered. The data in the columns regarding renewable energy triggered and primary energy savings are absolute values and do not take hotel size/area into consideration.

Project region	Pilot hotel	Investment (€)	Renewable Energy triggered (toe/year)	Primary energy savings (toe/year)	Reduction GHG emissions (tCO₂e/year)
Croatia	Hotel Adriatica (Podstrana)	83.000	1,20	5,19	17,00
	Hotel Split	64.650	0,83	2,67	9,00
France	Hotel Ajaccio Amiraute	703.003	4,99	59,41	34,70
	Hotel des Gorges du Verdon	377.120	4,30	64,40	30,20
Greece	Ibiscos Garden Hotel	460.000	22,96	69,26	259,43
	Sentido Vasia Resort and Spa	995.000	72,23	294,35	869,78
	Arkadi Hotel	161.000	12,18	36,02	107,39
Italy	Hotel Royal – Terme di Valdieri	23.760	0,00	12,38	31,14
	Residence L'Orologio	110.962	0,49	12,05	17,87
Romania	Hotel Cubix	385.685	26,91	71,39	230,26
	Hotel Kolping	67.723	7,83	20,46	58,32
	Grand Hotel Balvanyos	488.435	58,47	159,24	431,41
Spain	Hotel Amalurra	298.913	15,54	27,17	109,23
	Corona del Mar Hotel	576.576	8,16	92,70	196,00
Sweden	St Clemens Hotel	81.350	7,83	33,99	14,66
	Hotel Stora Brännbo	1.433.120	88,48	162,03	140,00

 Table 1
 Summary of common performance indicators by pilot hotel according to individual rollout plans

The reduction in primary energy use, the renewable energy triggered, the reduction in GHG emissions and the required investment in each pilot hotel are presented in Diagrams 1-4 respectively.







Diagram 1 Reduction of primary energy use in each neZEH pilot hotel after the renovation



Diagram 2 Renewable energy triggered by each neZEH pilot hotel after the renovation







Diagram 3 Reduction in GHG emissions achieved by each neZEH pilot hotel after the renovation









Collectively, the pilot hotels met the renewable energy triggered targets (Table 2). This was mainly due to the huge investment in photovoltaic solution by the pilot hotels on the Greek island of Crete, and investments in geothermal solutions by both the Sweden pilots.

Primary energy savings fell short of the planned target of 2.246 toe/year, mainly due to the hotels not having the financial strength to afford the very high investments costs needed to accomplish this ambitious level, indicating that there is still a need to support this SME hotel sector with financial and funding initiatives.

The targets for GHG emission reductions were dependant on the primary energy savings, therefore less than the planned energy savings means also less GHG emission reductions. We notice that a great proportion of the GHG reductions come from Greece, mainly due to the very high CO_2 factor in Crete and the significant reduction in the need to generate electricity using diesel due to the planned investments in photovoltaic solutions.

Table 2 Collective results of Common Performance Indicator targets and achieved levels of all the pilot hotels according to current data from individual rollout plans

Common Performance indicators	Planned target	Actual achievement
Cumulative investment (Euro)	21.621.000	6.310.297
Renewable Energy triggered (toe/year)	165	332
Primary energy savings (toe/year)	2.246	1.123
Reduction GHG emissions (t CO ₂ e/year)	4.400	2.556

5.2. INVESTMENT COSTS FOR PILOT HOTELS

According to the sixteen rollout plans, the cumulative investment was 6.310.297€ in total. Although lower than the target of 21.621.000€, it presents a more realistic view of what similar hotels might expect to have to invest to achieve neZEH status. The average investment across all 16 pilot hotels was about 394.000€, with a range from 23.760€ to 1.433.120€. Average payback time for all 16 pilot hotels was 9,5 years, ranging from 4-20 years.

The majority of pilot hotels selected a combination of own funding together with (bank) loans to fund the renovation rollout plans. Some hotels, for example, those in Greece and Spain, were dependant on structural funds to launch the rollout plans. Few pilot hotels used EPC or ESCO support, one reason being that the size individual renovation plans was not economically viable for this.

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 strive towards neZEH status. A clearer understanding can be obtained by selecting one or more of the pilot hotels that conform to the reader's hotel and understanding the energy efficiency measures taken as well as the investments made in renewable energy.





Project region	Pilot hotel	Investment (€)	Payback (yrs)	Available/identified funding sources
Croatia	Hotel Adriatica (Podstrana)	83.000	20	- State funds - Loan
	Hotel Split	64.650	16	- State funds - Loan
France	Hotel Ajaccio Amiraute	703.003	14-20	- Own funding - EPC - Loan (soft Ioan) - State funds
	Hotel des Gorges du Verdon	377.120	15-25	- EPC - Loan (soft loan) - State funds
Greece	Ibiscos Garden Hotel	460.000	8,7	- Own funding - Loan - Structural/state funds
	Sentido Vasia Resort and Spa	- Loan (sort roall) - State funds 460.000 8,7 - Own funding - Loan - Structural/state funds 995.000 9,4 - Own funding - Loan - Structural/state funds 995.000 9,4 - Own funding - Loan - Structural/state funds 161.000 7,9 - Own funding - Loan - Structural/state funds 23.760 2 - Own funding - Loan - Structural/state funds 110.962 12,5 - Own funding - Loan - Structural/state funds 110.962 12,5 - Own funding - Loan - Structural/state funds	- Own funding - Loan - Structural/state funds	
	Arkadi Hotel	161.000	7,9	- Own funding - Loan - Structural/state funds
Italy	Hotel Royal – Terme di Valdieri	23.760	2	- Own funding - Loan - Structural/state funds
	Residence L'Orologio	110.962	12,5	- Own funding - Loan - Structural/state funds
Romania	Hotel Cubix	385.685	10,41	- Own funding - Loan
	Hotel Kolping	67.723	6,31	- Own funding
	Grand Hotel Balvanyos	488.435	11,03	- Own funding - Loan
Spain	Hotel Amalurra	298.913	8,2	- Structural/state funds - Loan
	Corona del Mar Hotel	576.576	8,9	- Structural/state funds - Loan
Sweden	St Clemens Hotel	81.350	4	- Own funding - Loan
	Hotel Stora Brännbo	1.433.120	12,5	- Own funding - Loan - EPC

Table 3 Summary of funding sources used by pilot hotels across the seven regions



6. RECOMMENDATIONS

6.1. REPLICABILITY

Experience from pilot hotels indicates that the proposed measures for most of the pilot hotels could be relevant for and be implemented from the majority of hotels built over the last 30-40 years, and that most of them would accomplish neZEH status. This was certainly the case in Croatia, Romania and Sweden. Some hotels such as those in France were part of a chain of hotels – Best Western - and the potential for replicability here was strong. Firstly with other Best Western hotels in the area but also for other similar Best Western hotels, and also other similar hotels on the island of Corsica.

The pilot hotels in Greece on the island of Crete, were typical hotels in their category meaning that they could act as examples of good practice for other hotels on the island and inspire them to proceed to similar actions, especially when the hotel owners are prepared to talk about their experience and the benefits gained. This was also the case for Sweden where a strong interest is developing to learn more about the neZEH experience for the pilot hotels. One of the Greek pilot hotels, Vasia Resort & Spa cooperates with the Sentido hotel chain and would be able to influence hotels in many European and North African countries such as Greece, Spain, Cyprus, Croatia, Bulgaria, Turkey, Egypt, Tunisia, Morocco etc. This means that it is easier for the action to be replicated in other hotels in the chain, especially since the chain already incorporates a sustainability strategy. 2 of the 3 hotels have applied to a relevant call of the "Competitiveness, Entrepreneurship and Innovation" Operational Programme (EPAnEK) of PA 2014 – 2020, to access funding for their nZEB investment.

In Spain too replicability was high and the experience of this project could be transferred to other similar projects, both nationally and internationally. For example, the Corona del Mar is a typical Mediterranean coast hotel and its typology is common in the south of Europe, so its replicability is really high. Most of the proposed measures could be implemented on any hotel, for example, replacement of lighting, presence detectors, flow reducers or improvement of building isolation.

In Romania, the measures identified could be replicated to any similar hotel type although it is necessary to reconsider the importance of the hotel sector and the support available from financial instruments. Without financial support, it is hard to conceive major large-scale renovations towards neZEH status. Similar experiences were expressed in Sweden where many similar small historic hotels in need of energy efficiency would achieve NZEH status as defined by the project although some would be too small to implement/buy regular EPC-systems energy auditors often offer. Therefore, targeted incentives towards smaller hotels/businesses in Sweden would be needed to achieve a better impact in the future.





6.2. PRAGMATICS OF RENOVATION PROCESS

The highest priority for SME hotels is to reduce their operational costs and boost their competitiveness. However, in the majority of the neZEH countries, reducing energy-related operational costs required significant investment in energy efficiency renovation. It was clear that many of the pilot hoteliers lacked technical knowledge and awareness of buildings energy efficiency issues, in particular, the neZEH targets, and did not have skilled personnel to deal with technical building maintenance or energy management issues. Further, they lacked information on how to plan and implement energy efficiency investments.

The majority of the pilot hotels could not prepare their own rollout refurbishment plans, required help with tendering and contracting issues, and were lost when it came to look for national or international incentives related to energy measures. Many did do not have access to private loans in the current economic environment. They had difficulties in understanding the full economic benefit of investing in energy retrofit in cooperation with private energy consultancy companies, if this alternative was available to them. Although not addressed in the neZEH project, it became clear that hotels, in general, had business models that could make it difficult to achieve neZEH status as not all owned the buildings in which they operate.

The robust and pragmatic approach applied by the neZEH project addressed a number of these challenges, such as independent energy audits focused on neZEH targets, feasibility studies, cost scenarios and associated roll-out plans, support with tendering/contracting issues and staff training. These were the key technical elements that provided a structure to nurture the motivation/drive/passion required by hoteliers to achieve neZEH status.

6.3. CREDIBLE AND INDEPENDENT ENERGY AUDITS

The energy audits proved to be the determining factor to get hoteliers motivated and to kick-start the renovation process towards nearly zero energy 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. The audits proved to be strategically vital for the continued process of feasibility studies and rollout plans as part of a road map forward for individual large scale renovation plans. The neZEH specified energy audits were based on neZEH targets and were very proactive in character and not necessarily synonymous with more traditional energy audits.

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. neZEH targets were ambitious and challenging, and it was important to identify all consumers of energy, not just the largest ones. The audits supported this by providing input to the rollout plan, another key element in the renovation.





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".

6.4. FUNDING AND FINANCING (CHALLENGE OR BARRIER)

The pilot hotel experience has demonstrated the need for need reliable technical assistance supported by financial incentives to design energy refurbishments and plan the investment financially. This is a major barrier for the up-take of available financing mechanisms for energy efficiency in buildings (where available), and the complexity of the renovation decision is such that not only financial insights are required but also technical, organizational and legal. Financing mechanisms available are also complex for non-professionals to understand at an adequate level for decision-making.

SME hotels with less financial capacity should receive technical assistance to develop individual deep renovation roadmaps, required to achieve the nZEB status in a certain time frame. The roll out plans should specify the individual cost-optimal renovation steps, plan their logical timeline and consider the financial feasibility at the same time. EU funding will be critical for enabling such successful approach; the pool of competencies of the neZEH consortium has been instrumental in providing tailored made technical assistance.

6.5. BEHAVIOURAL CHANGE ESSENTIAL

Focus on energy efficiency measures and renewable energy sources alone are not enough for pilot hotels to achieve nearly zero energy status. 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.







Energy efficiency is a key element in the hotel's environmental policy and all staff members must contribute actively to the hotel's efforts for a more sustainable environment and business. The way staff and management carry out daily work will have a huge impact on the hotel's 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 and the hotel personnel need to be trained on basic technical knowledge related to energy efficiency as well as on the economic and environmental advantages of investing in ambitious refurbishment projects. Hotel owners have to gain a general understanding of sustainable buildings and the available public support schemes for them. The training materials produced in booklet form by the neZEH project can assist with this, providing basic guides and practical tips that can be easily applied when carrying out daily activities at the hotel.

This effort must be extended to hotel guests, who also must be inspired to support the hotel's quest for nearly zero energy status and sustainability. During their stay, guests should be made aware 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.

6.6. RAISING AWARENESS (WHEN YOU'VE GOT IT, FLAUNT IT!)

Tailored awareness raising campaigns targeting the hospitality industry can help to convince hotel owners about the economic viability of becoming a neZEH. Insufficient awareness about the benefits of investing in energy efficiency and RES, as a result of lack of information and advertising, is clearly a huge barrier. 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 when promoting buildings energy efficiency among hoteliers (i.e. by using the EMAS following hotels).

Training sources on basic technical knowledge related to energy efficiency/nZEB as well as on the potential of investing in ambitious refurbishment projects15 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. Sharing existing successful examples of hotels engaging to become nZEB is also important in order to inspire and scale up. In the seven neZEH countries, the pilot hotels are already paving the way towards such investments. Awareness raising and capacity building activities should definitely include the study of best practice examples. Moreover, the creation of national or European open-source databases with nZEB buildings, including energy and cost data where available, would very much contribute towards this objective.

The project has demonstrated that the use of film/videos to increase awareness and to tell the stories behind each of the pilot hotels is a strong way forward to inspire other hotels. Not only the





project video, but also the individual hotel videos have commanded audience attention at project conferences and workshops, both nationally and internationally.

6.7. NATIONAL neZEH TARGETS AND DEFINITIONS

National nZEB definitions do not sufficiently recognize the specificities of the accommodation industry. They should address the particular building features, uses and operating models, since hotels cannot be considered as typical non-residential buildings; their business models usually include a number of energy intensive operations associated with their customers' comfort and expectations, which are therefore closely linked with their competitiveness and viability.

In order to develop viable scenarios for hotels, a "modular" benchmarking could be considered to include the non-hosting functions. Furthermore, different targets should be set for new and renovated buildings. Different measures could be promoted in different climate zones within a particular country; data at a national and regional level should be evaluated to prioritize the available measures, according to their cost-efficiency depending on the climate zone.

6.8. EUROPEAN SUPPORT CENTRE NETWORK

The results from the pilot experience indicate the need to set-up "one-stop-shop" services in the public or private domains, or energy help desks, in order to guide hotel owners through the whole renovation process. These services could be developed around the concept of an EU neZEH support centre network or cluster activity to provide independent, credible and evidence-based information on the available technical solutions; have knowledge of the available public and private financial support schemes as well as technical expertise in the design and implementation of hotel refurbishment projects. The fundamental role of local authorities in providing energy advice, due to their involvement in planning and building permits, is to be emphasized here.





APPENDIX – LIST OF THE neZEH PILOT HOTELS

No	Country/ Region/Town	Name of hotel	No. of beds	Hotel Class (stars)	Climate Zone	Hotel category
1	Croatia/Dalmatia/Supetar	Villa Adriatica	46+4	4	2	Coastal
2	Croatia/Dalmatia/Split (Podstrana)	Hotel Split	80+8	4	2	Coastal
3	France/Corse du Sud/Ajaccio	Best Western Ajaccio Amirauté	129 (72 rooms, 57 suites, 51 apts)	4	2	Coastal
4	France/Provence-Alpes-Côte d'Azur/La Palud sur Verdon	Hotel des Gorges du Verdon	70	4	2	Mountain
5	Greece/Crete/Rethymnon	<u>Ibiscos Garden</u> <u>Hotel</u>	324	3	1	Urban
6	Greece/Crete/Lasithi,Sisi	<u>Sentido Vasia</u> <u>Resort & Spa</u>	1.036	5	1	Coastal
7	Greece/Crete/Chania	Arkadi Hotel	114	3	1	Urban
8	Italy/Piemonte/Valdieri (CN)	<u>Hotel Royal Terme</u> <u>di Valdieri</u>	210 (100 rooms)	3	3	Mountain
9	Italy/Piemonte/Torino (TO)	Residence L'Orologio	78 (20 apts.)	-	3	Urban
10	Romania/Brasov county/Brasov city	<u>Cubix</u>	114	4	3	Urban
11	Romania/Brasov county/Brasov city	Kolping	57 (28 rooms)	3	3	Urban
12	Romania/Covasna county/Turia commune	<u>Grand Hotel</u> <u>Balvanyos</u>	220 (112 rooms)	4	3	Mountain
13	Spain/Vizcaya/Artzentales	Hotel Amalurra	60 (30 rooms)	1	4	Rural
14	Spain/Alicante/Benidorm	Corona Del Mar	214 (126 rooms)	4	1	Coastal
15	Sweden/Gotland/Visby	St Clemens Hotel	84	3	5	Urban
16	Sweden/Uppland/Sigtuna	<u>Stora Brännbo</u> Konferens och <u>Hotell AB</u>	124	5	5	Urban





neZEH TEAM



World Tourism Organization





Federation of European Heating, Ventilation and Air-conditioning Associations



Agency of Braşov for Energy Management and Environment Protection, Romania



Creara Consultores S.L., Spain



ENERGIES 2050, France



Energy Institute Hrvoje Požar, Croatia



Istituto Superiore sui Sistemi Territoriali per l'Innovazione, Italy



Sustainable Innovation, Sweden

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