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# Fostering competiveness and sustainability of hotels through nearly Zero Energy strategies

## *The neZEH challenge*

**June 23rd, Brussels**
**EU Sustainable energy Week 23-27 June 2014**

**Dr Theocharis Tsoutsos**
Associate Professor, Head
Renewable and Sustainable Energy Lab (ReSEL)

**Mrs Stavroula Tournaki**
Senior Expert

Co-funded by the Intelligent Energy Europe Programme of the European Union

# I. Background

# Hotels and climate change

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**1%** of total $CO_2$ emissions globally is from hotels

Hotels can save up to

**50%** of their energy consumption

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# Operating costs of an average Spanish hotel

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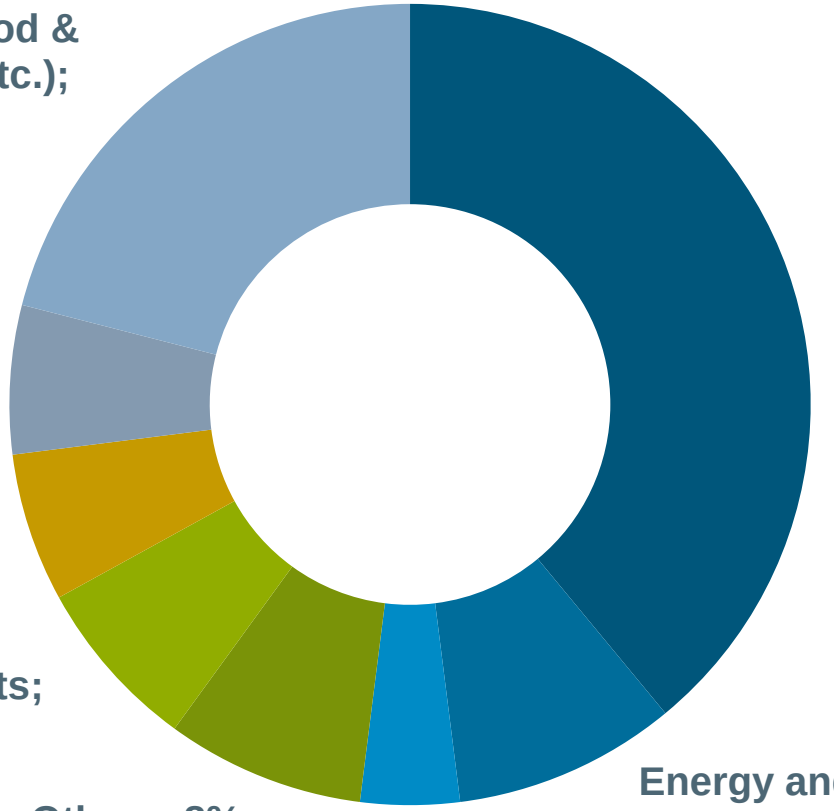


Source: PCW

# Hotel Business challenges

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- Reduction of operational and maintenance cost
- Energy security
- Market and guests expectations
- Regulatory-legislative changes
- Climate change-environmental footprint
- Funding opportunities
- Competitiveness
- Sustainability

# 20-20-20 EU objectives

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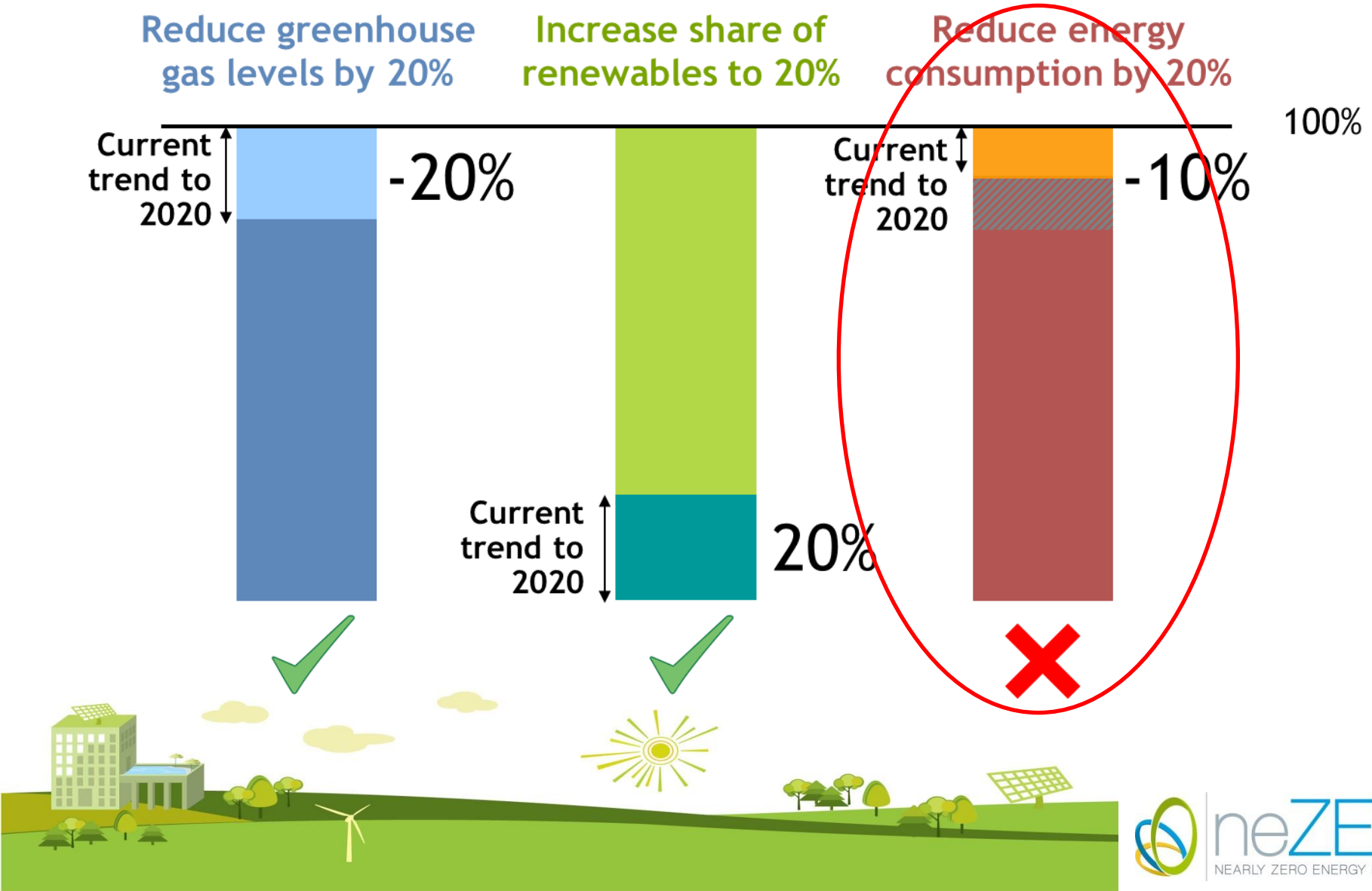


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# Energy in buildings – policy overview

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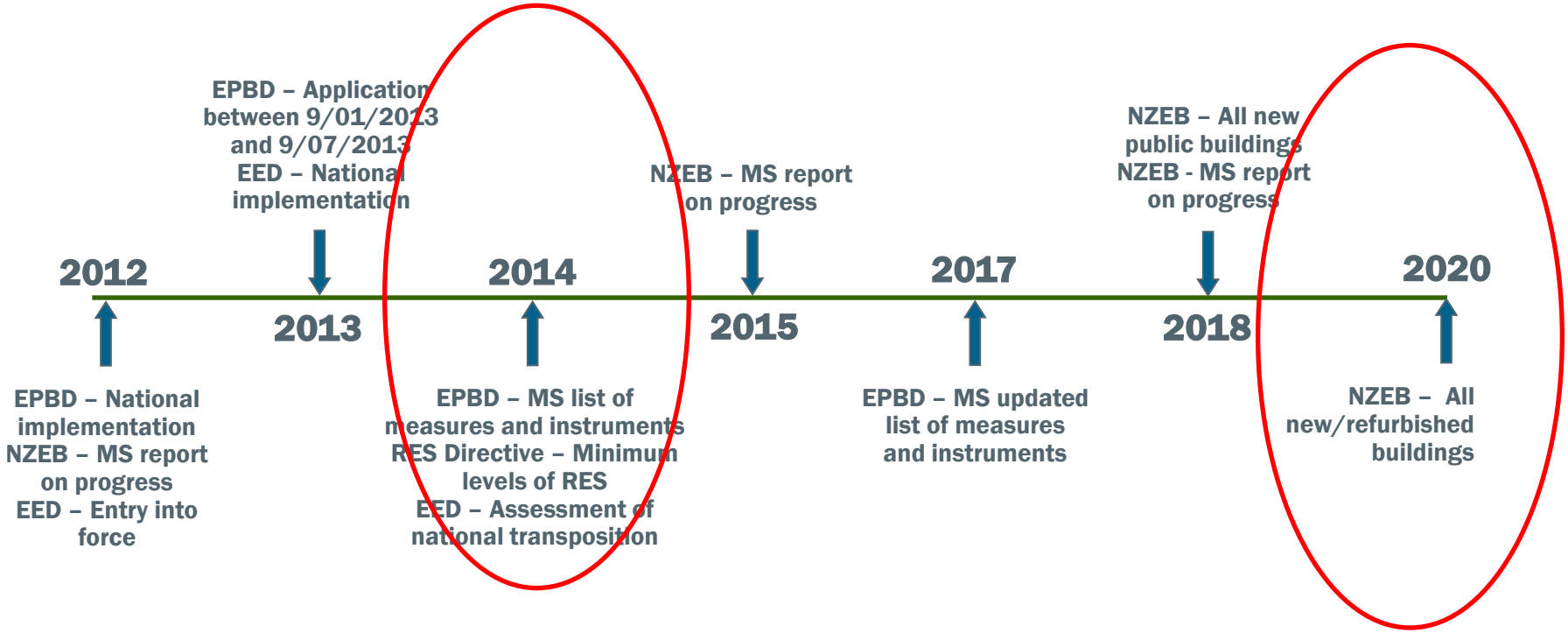


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# nZEB and high energy performance buildings

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- **23 different terms** for **high performance buildings** used in the EU Member States: e.g. passive house, low-energy house, green building, eco-building etc.

- It is **very hard** to establish a reliable **number** of the existing high performance buildings in Europe (< 200 in total) in most countries, with the exception of Austria, Germany, Czech Republic, and Slovenia.

http://www.epbd-ca.eu/archives/495

# What is a Nearly Zero Energy Building

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**High Energy efficiency**

+

**On-site or nearby RES**

→

**nearly Zero Energy Building**

nZEB Building is a building that has a very high energy performance.

The nearly zero or very low amount of energy required to cover the buildings needs should be covered to a very significant extent by RES

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# Hotel building energy flows

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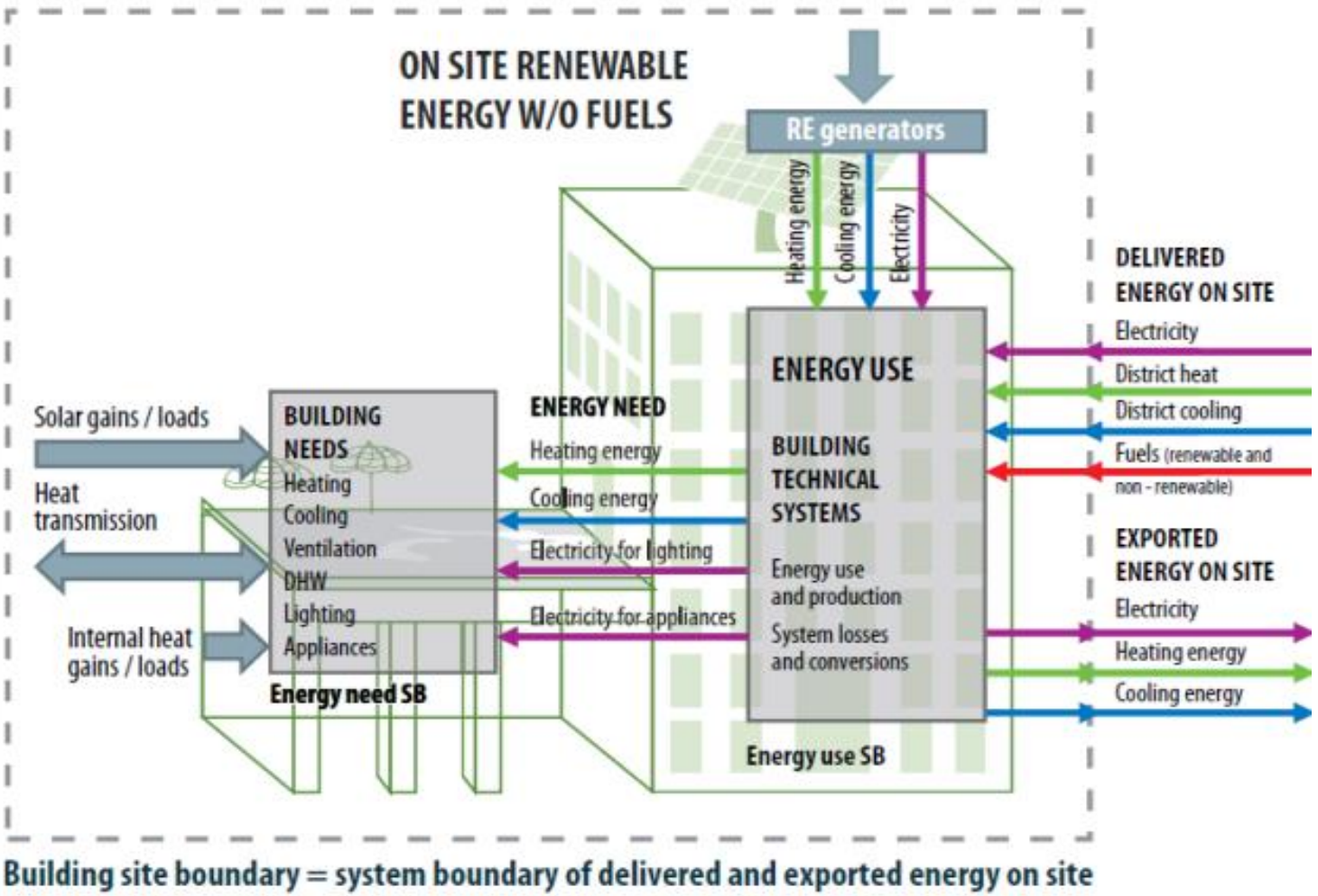

# Energy saving measures

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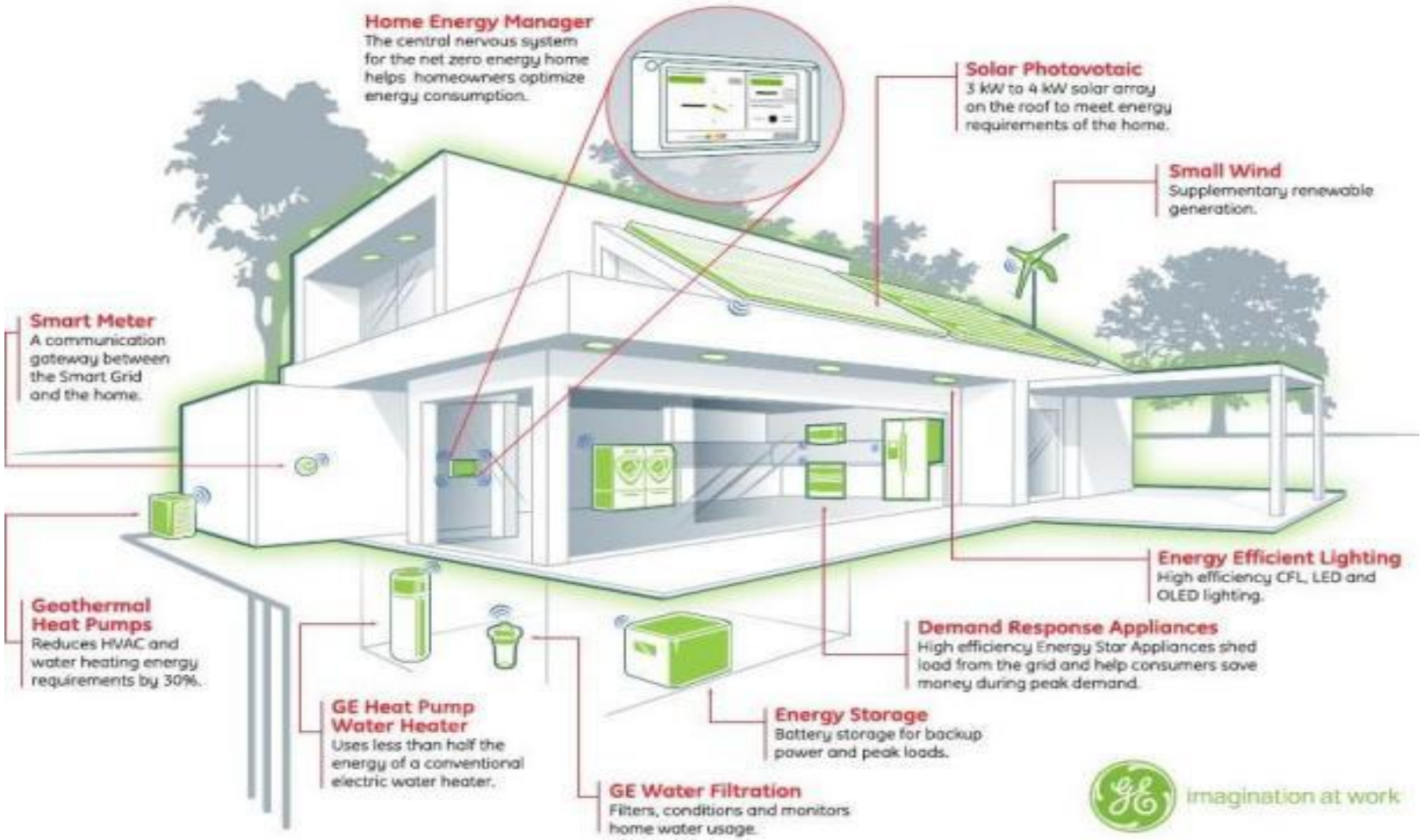


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# Classification of different energy solutions
## in terms of impact, simplicity and profitability

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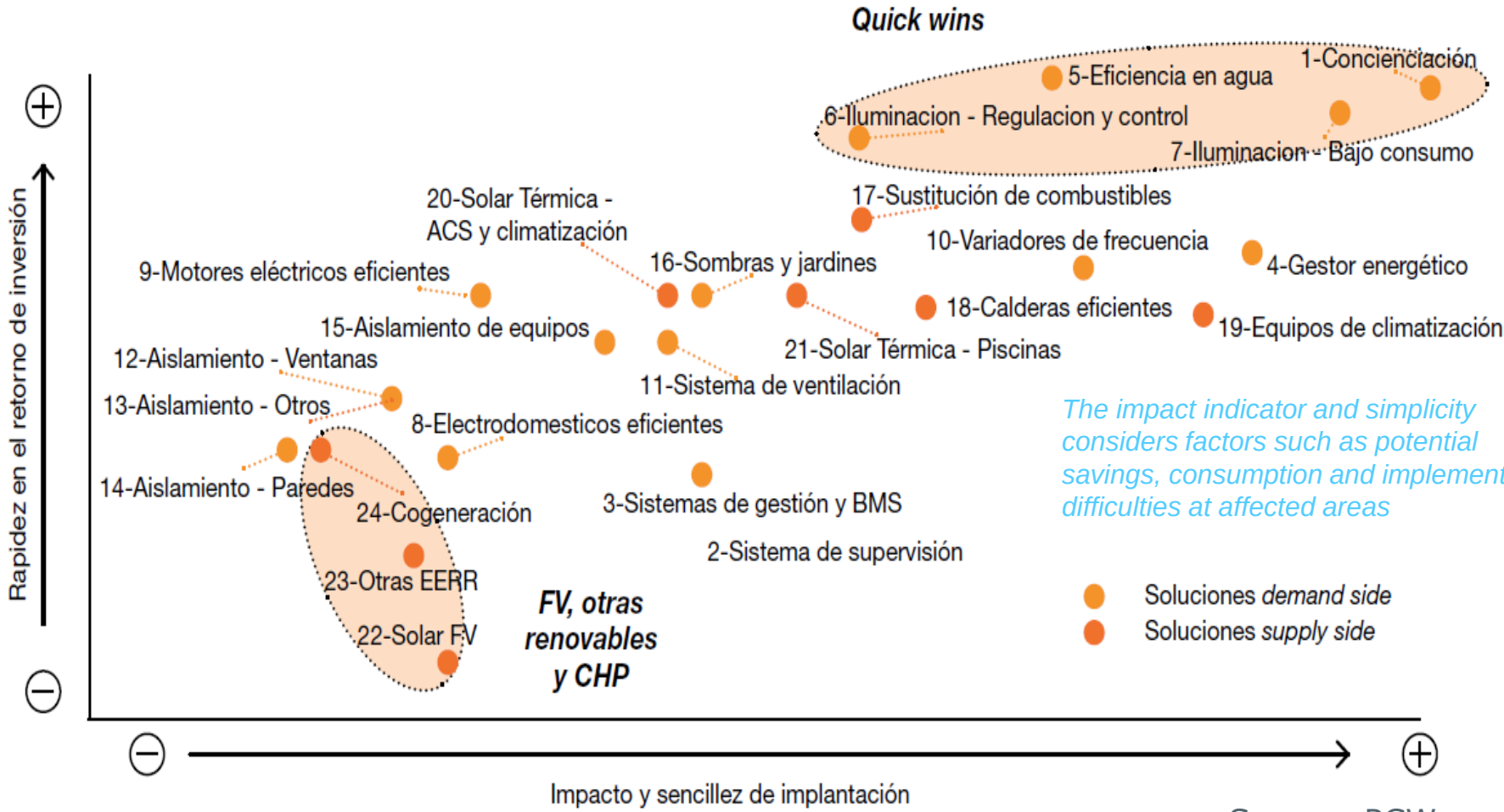


*The impact indicator and simplicity considers factors such as potential savings, consumption and implementation difficulties at affected areas*

Source: PCW

# Bottlenecks in achieving high number of nZEHs

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- Lack of national nZEB definitions (numeric values)
- Extremely limited cases that could be considered as nZEH examples
- nZEB action plans or National Renovation Roadmaps still under development
- Funding / supporting measures for nZEB not available in most cases
- Hotel building vs other building types

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# II. nearly Zero Energy Hotels

## *The IEE project neZEH*

**Contract: IEE/12/829/SI2.644758**

**Project duration: 01/04/2013 - 31/03/2016**

Co-funded by the Intelligent Energy Europe Programme of the European Union

# NEZEH Consortium

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| PARTNER | COUNTRY/AREA |
|---|---|
| Technical University of Crete, Renewable and Sustainable Energy Systems Lab (ENV/TUC) , project coordinator | Greece |
| United Nations World Tourism Organization (UNWTO) | EU/Int |
| Network of European Region 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 |
| Energy Institute Hrvoje Požar (EIHP) | Croatia |
| Istituto Superiore sui Sistemi Territoriali per l'Innovazione (SITI) | Italy |
| Sustainable Innovation (SUST) | Sweden |

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# The neZEH Scope

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To accelerate the rate of refurbishment of existing hotels into Nearly Zero Energy Buildings (nZEBs):

- providing technical advice to hoteliers for nZEB renovations
- demonstrating the competitive advantages and sustainability of nZEB projects
- challenging further large scale renovations through capacity building activities
- showcasing best practices and promoting front runners.

Area of implementation: **Greece, Spain, Italy, Sweden, Romania, Croatia, France, EU level intervention**

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# Expected results 1/2

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**An EU level neZEH network,** facilitating exchanges between the supply (building professionals) and the demand side (SME hotel owners)

HOTEL ENERGY SOLUTIONS e-toolkit

**A practical e-tool,** to empower SME hoteliers to assess their energy profile and to choose best technical solutions in order to reach an nZE level. ***Consortium will upgrade the HES tool*.**

**10-14 pilot projects,** in 7 countries, to act as "living examples" challenging much more SMEs to invest in neZEH projects

**15.000+ hotel owners informed** and gained access to the project results in EU level

Tailor made **marketing guidelines and a set of promotional tools** to help front runners to communicate efficiently and to widely promote their business to potential customers and tour operators.

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# Expected Results 2/2

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Long term neZEH will:

**Benefit the European hospitality sector, helping hoteliers to reduce operational costs, to improve their image and services and so as to enhance their competiveness**


**Help Member States to reduce $CO_2$ emissions by 2020:**

- **Primary energy savings: 8.977 toe/year**
- **Reduction of GHG emissions: 17.787 $tCO_2e$/year**

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# III. Developing nZEH approach

# nZEH benchmarking methodology ½

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- nZEH requirements (primary energy and RES%) for 5 European climatic zones (Ecofys) were calculated

- Energy use data of existing building stock from available EU level sources (ENTRANZE, BPIE, HES) were analysed; values of residential buildings are more proper to describe the hosting function of hotels than generic non-residential building values (correction factors applied)

- nZEH benchmarks for each country were calculated (using national primary energy factors) which were limited to hotel's hosting function because of potential use in national nZEB regulation.

# nZEH benchmarking methodology 2/2

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- Additional energy uses of non-hosting functions as spas, swimming pools, saunas etc are **case sensitive**, so are to be taken into account in compliance assessment.

- **Recommendations to Policy makers** collected from the real market and to be discussed in the national workshops and meetings

- To estimate potential energy savings of deep renovation, results of COHERENO project were used (75% decrease in primary energy use)

# Calculated primary energy and RES% values

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## EP requirements for nZEH in partner countries

| No. | Country | Primary energy factor for electricity [-] | Primary energy indicator without appliances [kWh/m$^2$·a)] | Primary energy indicator with all energy end uses [kWh/m$^2$·a)] |
|---|---|---|---|---|
| 1 | Croatia | 3 | 56 | 77 |
| 2 | France | 2,58 | 97 | 115 |
| 3 | Greece | 2,9 | 56 | 76 |
| 4 | Italy | 2,18 | 56 | 71 |
| 5 | Romania | 2,8 | 60 | 80 |
| 6 | Spain | 2,35 | 56 | 72 |
| 7 | Sweden | 2,7 | 115 | 134 |

## RES % for nZEH in the 5 climatic zones

| | EP [kWh/(m2·a)] | Energy flows | RES [%] |
|---|---|---|---|
| Zone 1 | 56 | Heating, cooling, domestic hot water, HVAC aux, lighting | 50 |
| Zone 2 | 56 | | 50 |
| Zone 3 | 60 | | 35 |
| Zone 4 | 110 | | 35 |
| Zone 5 | 115 | | 25 |

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# Development of neZEH benchmarks

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## nZEH country specific primary energy indicators

| Country | Hotels primary energy indicator 2008 level (kWh/m²·a) | Energy reduction percentage (%) | Primary energy indicator without appliances (kWh/m²·a) | Primary energy indicator with all energy end uses (kWh/m²·a) |
|---|---|---|---|---|
| Croatia | 397,76 | 80,64 | 56 | 77 |
| France | 356,61 | 67,75 | 97 | 115 |
| Greece | 412,61 | 81,58 | 56 | 76 |
| Italy | 221,53 | 67,95 | 56 | 71 |
| Romania | 394,68 | 79,73 | 60 | 80 |
| Spain | 239,99 | 70,00 | 56 | 72 |
| Sweden | 519,75 | 74,22 | 115 | 134 |

# Development of neZEH benchmarks

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## nZEH requirements by European (ECOFYS) climatic zones - new buildings

| European climate zone | Primary energy indicator (kWh/m²·a) | Energy uses/ flows | RES [%] |
|---|---|---|---|
| Zone 1 | 56 | Heating, cooling, domestic hot water, HVAC auxiliaries & lighting | 50 |
| Zone 2 | 56 | | 50 |
| Zone 3 | 60 | | 35 |
| Zone 4 | 97 | | 35 |
| Zone 5 | 115 | | 25 |

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# Include nZEH to Hotel Energy Solutions e-Toolkit

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  - Overview
  - Features
  - Methodology
  - Benefits
- Components
  - Benchmarking tool
  - Energy Solutions
  - CO2 Footprint Calculator
  - ROI Calculator
  - Technological fact sheets
  - Case studies
- Resources
  - Documents
  - Contact

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# Ranking of technology solutions for hotels

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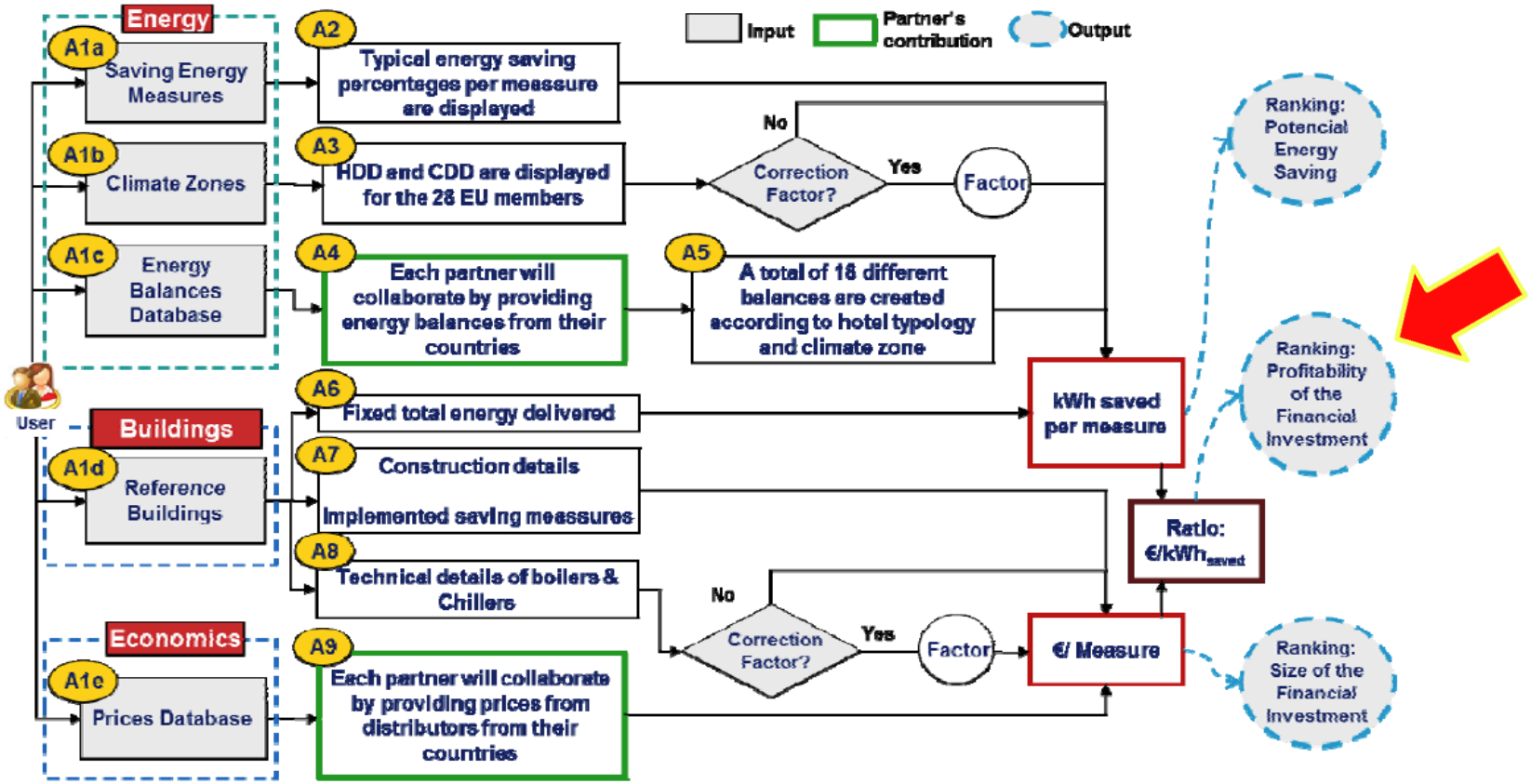


*depending on climate zone, potential savings, hotel typology and investment cost*

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# Ranking of technologies per hotel type

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**Appendix 3 Selection of relevant technologies and solutions, from the energy efficiency group, for achieving nZEH primary energy indicator levels by hotel category**

| No. | Technologies and solutions group | Technology and solution | Urban | | | | Rural | | | | Coastal | | | | Mountain | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Business | Spa/ Wellness | Resort | Hotel B&B | Business | Spa/ Wellness | Resort | Hotel B&B | Business | Spa/ Wellness | Resort | Hotel B&B | Business | Spa/ Wellness | Resort | Hotel B&B |
| 1 | Equipment efficiency | Energy saving light bulbs | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2 | | Energy efficiency rating of electrical appliances | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 3 | | Energy efficient motors in HVAC applications | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4 | | High efficiency boilers | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5 | | Efficient solutions for active space cooling | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | |
| 6 | | Micro CHP | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | ✓ | ✓ | ✓ | ✓ |
| 7 | | Efficient ventilation system (min. 70% energy recovery) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 8 | | Water saving taps (to reduce water and DHW consumption) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Categories of hotels defined, reflecting climate regions and different customer requirements

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# III. Showcases

# Showcasing existing best practices

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*1° step*

## long list of «green» hotels
## 35 hotels

collected through:
web research,
literature review,
partners' suggestions

*2° step*

### showcases

fulfilling the neZEH requirements,
have to prove, in different contexts,
**the economical convenience**
**of a refurbishment toward neZEH**

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## SELECTED SHOWCASES:

- **Boutiquehotel Stadthalle**
  Vienna, Austria
- **Hotel Split**
  Podstrana, Croatia
- **Saint Josep Building**
  Queralbs, Spain

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# Boutiquehotel Stadthalle

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- Offered facilities: **lounge**
- Room rate **before**/**after** refurbisment: **88**/**92 €**
- Occupancy rate **before**/**after** refurbishment: **76**/**83 %**
- Staff number **before**/**after** refurbishment: **16**/**33 people**
- Investment: **1.000.000 + 4.200.000 €**
- Installed RES: **groundwater heatpump, PV panels (13 kWp), solar thermal panels (130 m$^2$)**
- Installed HVAC systems: **(passive building) concrete core activation for heating and cooling, active ventilation system, (old building) district heating**

Interviews by

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# Boutiquehotel Stadthalle analysis

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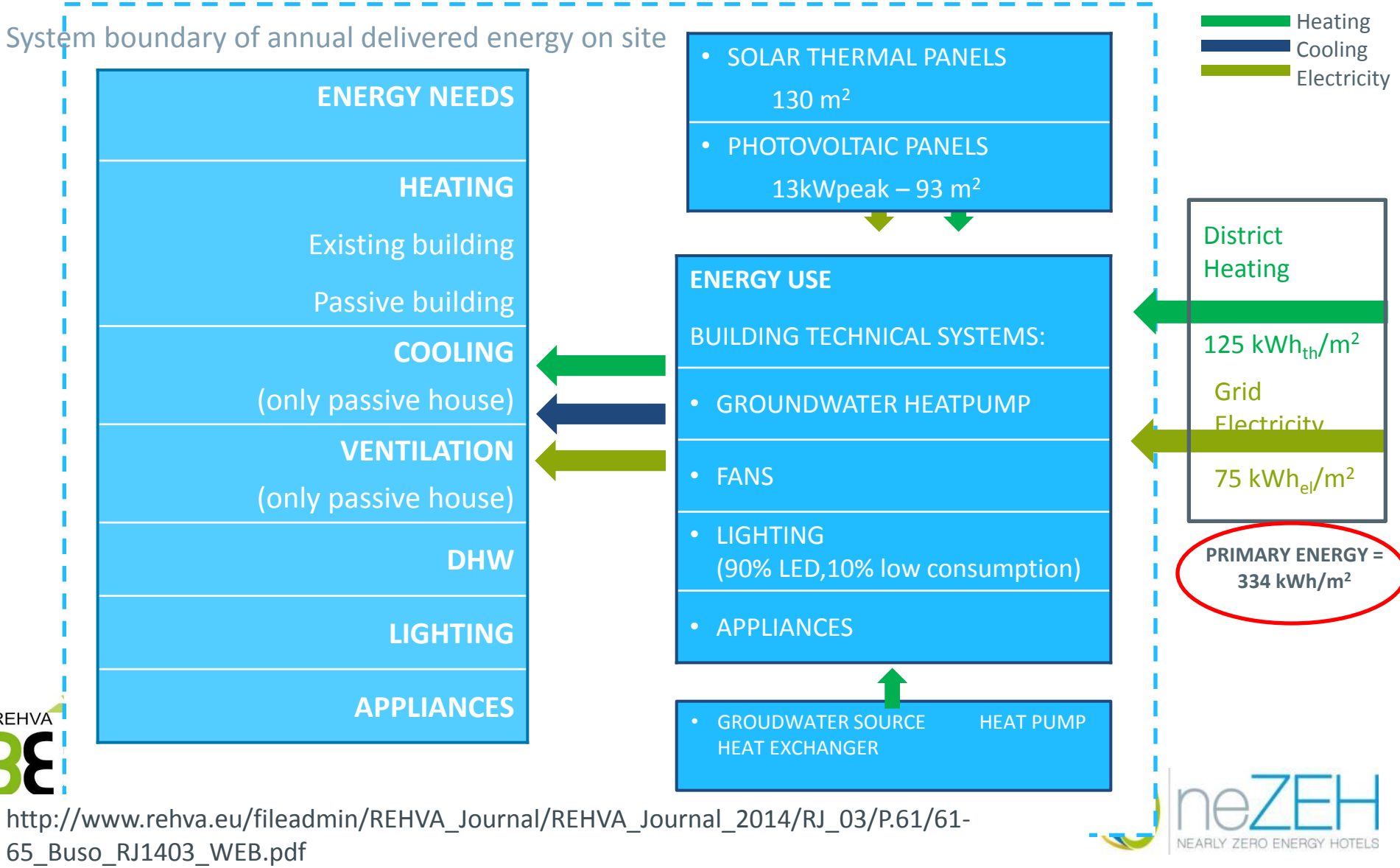


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# Split Hotel

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Interviews by EIHP

- Offered facilities: **lounge, restaurant, fitness gym, laundry, outdoor swimming pool**
- Occupancy rate: **Jan-Mar >25-50%, Apr-Jun 25-50%, Jul-Sept <75%, Oct-Dec 50-75%**
- Staff number: **25 people**
- Investment: **+2/4% with respect to a standard new hotel**
- Installed RES: **aerothermal heatpumps, solar thermal panels (36 panels)**
- Installed HVAC systems: **Variable Refrigerant Volume system for heating cooling and ventilation**

# Split Hotel analysis

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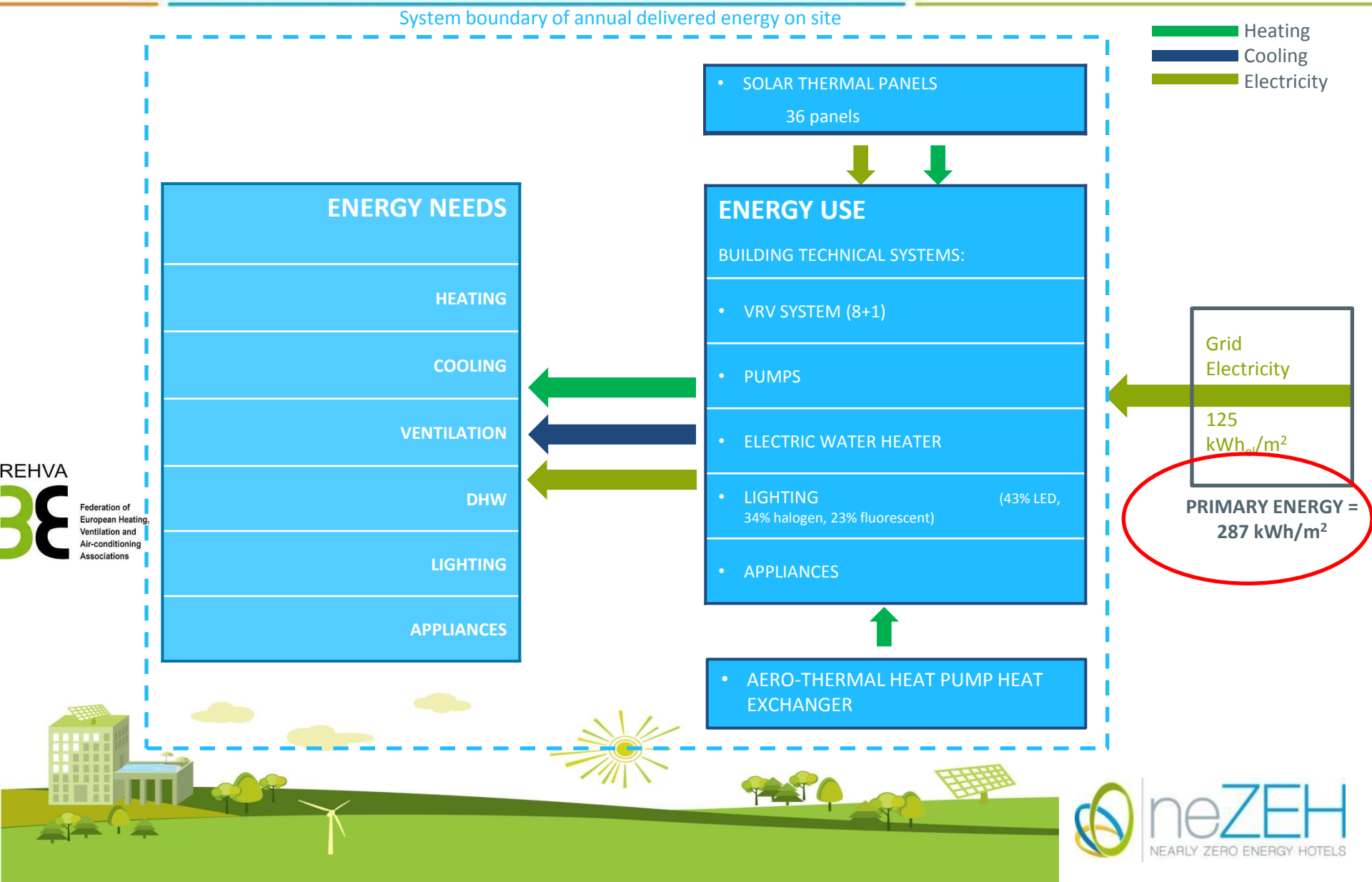


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# Advantages of being a neZEH

- Reduced energy, O&M costs
- Provides a competitive advantage over competitors
- Access to new market segment - the sustainability market
- The hotel commitment is rewarded by guests, which are willing to pay more for staying in the hotel
- Reduced independence from energy suppliers

# Lessons learned

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**1**

For hoteliers engaded in sustainability issues, reducing energy consumption to **the nZE is just part of a wider management perspective** (also **waste recycling, water savings, biological food, ecological cleaning products, local products promotion, bike friendly policy, etc.)**

# Lessons learned

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**2**

In the interviewed showcases, **the intervention was not facilitated by incentives or deductions**. On the opposite, too innovative solutions were not allowed by the local administrations.

**Nevertheless, the hoteliers** decided to go for it, pushed by green believes and forward-looking management strategies, and **proved the economical sustainability of the intervention**.

# Lessons learned

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**3**

Reaching very low energy consumption allowed the hotel to reach a **leading position in new market sectors**, ready to pay more for sustainability, such as **Corporate Responability business companies and environmental friendly tourism**.

# IV. neZEH pilot hotels

# 14 hotels to be energy and sustainability front runners in Europe

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**neZEH** encourages and proposes concrete solutions to EU hotel owners willing to become a nearly Zero Energy Hotel.

**14 Hotels** in Europe to benefit of **technical assistance** on how to become neZEH and enjoy more than **50% reduction of their energy related operation costs** using best solutions: energy efficiency measures; renewable energy sources and behavioral changes of staff and clients.

*Commitment to the environment and sustainability is a key prerequisite for hoteliers to achieve nearly zero status.*

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# Pilot hotels – the neZEH offer

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- Technical advice by experts
- Energy audits, suggesting tailor-made solutions
- Feasibility study and support for finding the right funding tools
- Staff training on energy efficiency and best practices in the daily hotel operations, to ensure the best use of suggested solutions and maximum savings
- Promotion of the front runners in a highly competitive market and marketing tools for the national and EU market

# Application process open

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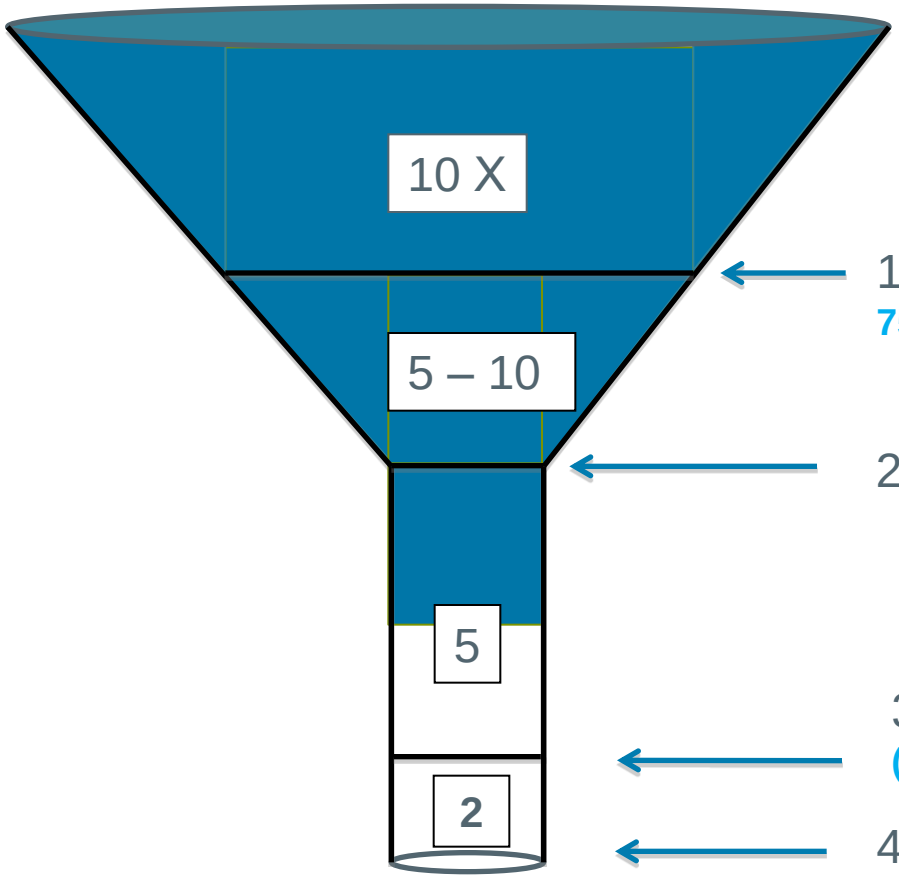


0. Public call
More than **2.000 hotels** reached so far

1. Application form
**75** applicants so far

2. Meetings/workshops

3. Energy pre-audits
**(35** pre-audits to be conducted)

4. Energy audit- MOU Signing
**(14 pilot cases, 2 front runners** per country**)**

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http://www.nezeh.eu/pilot_cases/index.html


**Φόρμα εκδήλωσης ενδιαφέροντος**

* Required

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Με τη συγχρηματοδότηση του προγράμματος της Ευρωπαϊκής Ένωσης «Ευφυής ενέργεια για την Ευρώπη»

Εαν θέλετε το ξενοδοχείο σας να είναι ένα από τα πιλοτικά έργα που θα επιλεχθούν στο πλαίσιο της Ευρωπαϊκής πρωτοβουλίας neZEH και θα λάβουν τεχνική βοήθεια ώστε να αναβαθμιστούν σε κτίρια σχεδόν Μηδενικής Ενεργειακής Κατανάλωσης, παρακαλούμε συμπληρώστε την παρακάτω φόρμα. Η επιλογή των πιλοτικών ξενοδοχείων θα ολοκληρωθεί τους επόμενους μήνες μετά από συνεργασία με τους ενδιαφερόμενους ξενοδόχους.

Οι πληροφορίες που δίνετε είναι απολύτως εμπιστευτικές, δεν κοινοποιούνται σε τρίτους και θα χρησιμοποιηθούν αποκλειστικά στο πλαίσιο της πρωτοβουλίας neZEH. Συμπληρώνοντας αυτή τη φόρμα δεν είστε με κανένα τρόπο υποχρεωμένοι να συμμετάσχετε στο έργο εφόσον δεν το επιθυμείτε. Μπορείτε ανα πάσα στιγμή να αποχωρήσετε από τη διαδικασία εφόσον αλλάξετε γνώμη για τη συμμετοχή σας.

*τα πεδία με αστερίσκο ειναι υποχρεωτικά

**Στοιχεία Επικοινωνίας (Σελ. 1/6)**

# Becoming a neZEH will lead to great benefits for your business

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SCHOOL OF ENVIRONMENTAL ENGINEERING
RENEWABLE AND SUSTAINABLE ENERGY
SYSTEMS LABORATORY

- **Energy savings and reduction of operational costs**
- **Unique positioning in a highly competitive market**
- **Improved image and service for guests**
- **Access to a new "sustainability" market segment, both individuals and companies**
- **Increased living comfort as an added-value for hotels' guests**
- **Corporate Social Responsibility targets met; environmental, social and economic sustainability.**

Co-funded by the Intelligent Energy Europe Programme of the European Union

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www.nezeh.eu

# Thank you for your attention!

For more information contact the project coordinator:


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