

# Energy Efficiency Measures in the Spanish Hotel & Tourism Industry

Berlin, February 2016

# MANUAL

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The authors take full responsibility for the contents of this report. The opinions expressed do not necessarily reflect the view of the European Union or the European Investment Bank.

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

































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




































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










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## Overview

Technology	Description	Investment	Saving potential	Payback period
<b>COOLING</b>				
<b>Efficient Air Conditioning</b> 	<i>Use efficient heat pumps for cooling</i>			
<b>HEATING AND HOT WATER</b>				
<b>Fuel substitution from oil to gas</b>	<i>Use natural gas in an oil burner, with no cost-intensive works</i>			
<b>Boiler optimization</b>	<i>Improve boiler efficiency through several simple measures</i>			
<b>Condensing boilers</b>	<i>Replace the boiler through the most efficient technology available</i>			
<b>Biomass combustion</b>	<i>Use wood, wood shavings or wood pellets for heating</i>			
<b>Heat pumps</b>	<i>Electricity-driven technology that works for heating as well as for cooling</i>			
<b>Heat recovery from cooling appliances for hot water generation</b>	<i>Recover waste heat from cooling appliances to produce domestic hot water</i>			
<b>Solar thermal energy for hot water generation</b> 	<i>Use energy from the Sun to produce domestic hot water</i>			
<b>Geothermal energy</b>	<i>A variant of heat pumps that transfers energy from and to the ground instead of outdoor air</i>			
<b>Cogeneration</b>	<i>Produce electricity and heat simultaneously to improve overall energy efficiency</i>			
<b>Ventilation system with heat recovery</b>	<i>Transfer heat from outgoing air to incoming air in winter, and conversely in summer</i>			
<b>Thermostatic radiator valves</b>	<i>Control the temperature of the room using hot water radiators</i>			
<b>Insulation for hot water pipes and tanks</b> 	<i>Basic energy efficiency measure, very low cost</i>			

Technology	Description	Investment	Saving potential	Payback period
<b>Low-flow showerheads and tap aerators</b> 	<i>Save water and energy while maintaining a comfortable feeling for the user</i>			
<b>Solar thermal water heating for swimming pools</b>	<i>The only way to heat outdoor swimming pools according to Spanish law</i>			
<b>LIGHTING</b>				
<b>Efficient lamps</b> 	<i>Several new technologies with high saving potential</i>			
<b>AUTOMATION</b>				
<b>Building Management System (Building Automation System)</b>	<i>Centralized management of all appliances in the building, with regulation and alert systems</i>			
<b>Control and regulation systems for lighting</b> 	<i>Several simple solutions to reduce electricity consumption for lighting</i>			
<b>Automatic control, key card systems or occupancy sensors for electricity, ventilation heating and cooling</b> 	<i>Reduce consumption by switching off all appliances that are not needed</i>			
<b>INSULATION AND BUILDING ENVELOPE</b>				
<b>Thermal insulation and building envelope air tightness</b>	<i>Improve overall insulation and comfort of the building, and reduce heating costs</i>			
<b>Double or triple glazed windows</b>	<i>Avoid the “cold wall sensation” and reduce heating costs</i>			
<b>Solar protection</b>	<i>Reduce energy consumption for cooling by using natural protection against the Sun</i>			
<b>KITCHEN, LAUNDRY AND APPLIANCES</b>				
<b>Kitchen and laundry appliances</b>	<i>Benefit from energy efficiency improvements that took place in the last years</i>			
<b>Cold rooms</b>	<i>Cold rooms are more efficient than fridges and freezers, but it is possible to do even better</i>			
<b>Efficient minibars</b> 	<i>Minibars account for a substantial part of hotel rooms’ energy consumption</i>			

Technology	Description	Investment	Saving potential	Payback period
<b>OTHERS</b>				
<b>Variable frequency drives and efficient drives</b>	<i>Improve motors used for elevators, ventilation and air conditioning for a better efficiency</i>			
<b>Energy consumption monitoring</b>	<i>This is important to know what measures should be taken in priority</i>			
<b>Photovoltaic modules</b>	<i>Produce electricity from the Sun</i>			
<b>Stand-by killers for some appliances</b>	<i>Reduce energy consumption by appliances in stand-by mode</i>			

# 1 Introduction and structure of manual

## 1.1 Background

This manual has been developed as part of the “Expert Support Facility” of the “Private Finance for Energy Efficiency” (“PF4EE”) instrument.

The **PF4EE** is a joint financial instrument of the European Investment Bank and the European Commission under the European Union’s LIFE Programme. It aims to stimulate the supply of private debt financing to complement national energy efficiency (EE) support schemes and to support the priorities set by Member States in their national Energy Efficiency action plans for the period 2014-20. Part of the PF4EE are technical assistance services (i.e. this “Expert Support Facility”) to participating financial intermediaries in order to support them in their energy efficiency lending programmes and/or products.

In the framework of the PF4EE, Banco Santander sets up a loan product targeting EE investments in the hotel and tourism sector.

## 1.2 Purpose of the manual

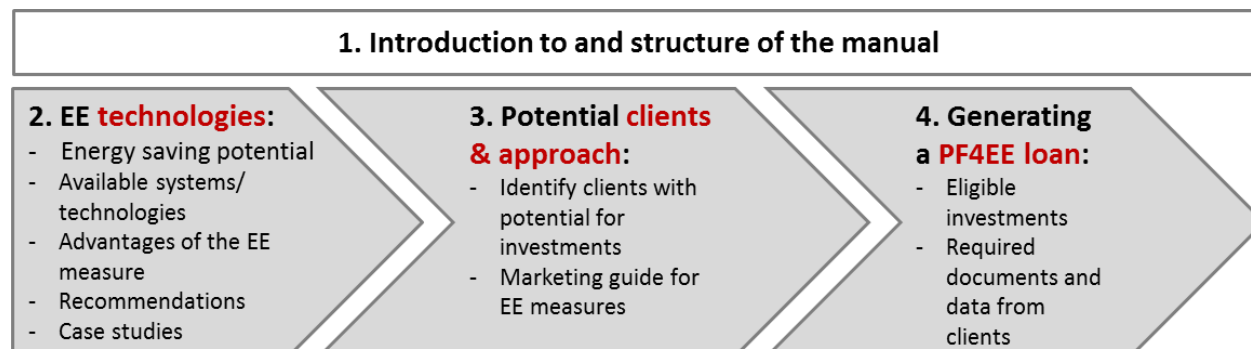
This manual has been developed as part of the technical assistance for branch officers of the Banco Santander for their direct contact with clients. It specifically focuses on **EE investments in the hotel and tourism industry in Spain**.

**The purpose of this manual is:**

- to illustrate typical EE investments in the hotel industry that are in general eligible for funding under PF4EE;
- to provide relevant financial and technical information on EE measures;
- to offer advice on how to identify clients with EE investment potential;
- to give information on how to market PF4EE and how to approach clients.

## 1.3 Structure

As depicted by the graphic below, the manual is structured into three key themes: (i) technologies, (ii) identification and approach of clients, (iii) structuring a PF4EE loan. These are guided by the introductory chapters.





## 2 Technologies

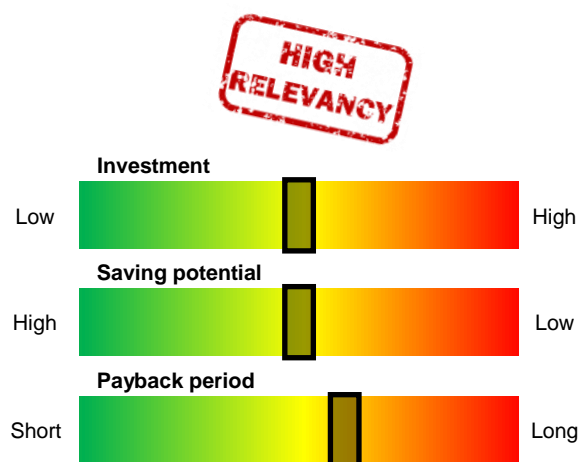
The following chapter presents the most promising energy efficiency technologies and measures eligible under PF4EE. Each technology is described with its energy saving potential, the available systems, advantages and recommendations. The descriptions are illustrated with short and specific case studies.

### 2.1 Cooling

#### 2.1.1 Efficient Air-Conditioning

##### Energy saving potential:

- Cooling purposes account for about 15% to 35% of the total energy consumption in Spanish Hotels in the South, Central and Mediterranean area<sup>1</sup>.
- Achievable monetary savings by installing an efficient air condition (AC) can amount to 200 € per year and hotel room and depend heavily on the annual operating hours.
- The main power consumer in the cooling process is the compressor, but also pumps in central systems consume power to distribute the cooling liquid.



##### Available systems:

- In general one can differentiate between two groups of available AC systems: Room Air Conditioning (RAC) and Central Air Conditioning (CAC). The choice of system depends on the number of rooms, the need to air condition parts of the building separately and the structural conditions of the building.
- Split AC and through-the-wall AC (also: compact or through-the-window AC) belong to the **RACS** and deliver decentral cooling for separate rooms. All components are then packed in one unit.
- **CACs** consist of a central chiller or rooftop system with the refrigeration components located in one unit outside the conditioned environment, a distribution system with pumps and decentral air handling units in the air conditioned areas.

##### Advantages of the measure:

- A development in the regulation and deployment of efficient AC-systems and renovations is expected due to new regulations<sup>2</sup>.
- Central cooling units are easily replaced and allow keeping the existing distribution system and air handling units.
- Modern air handling units improve the overall comfort in the rooms by filtering the air and can often serve a dual purpose as heating devices during the heating period.

<sup>1</sup>Moiá-Pol et al. (2011)

<sup>2</sup>IDAE (2007)

**Recommendations:**

- The most important performance parameter describing the energy efficiency of an AC-unit is the **Coefficient of Performance (COP)**, the ratio of provided useful cooling energy to electric energy required to drive the unit. Today’s best available AC units have an annual average COP of 4,5 to 5, whereas older system often only work with an average COP of 2 to 3.
- Today’s most energy efficient air conditioners are split ACs with a variable speed compressor. The variable speed compressor can provide a variable cooling intensity with high efficiency and are therefore suitable for a varying cooling demand and comfortability requirements.
- CACs can have a very high COP, but need additional pumps and have higher losses in the distribution system. Those losses need to be included in all calculations.
- Many modern AC units available on the market can also serve as a heat pump and heating device in the heating period. The installation of additional heating devices can thereby be omitted.
- Automated AC units are automatically turned off in unoccupied areas and can yield additional savings.
- Before installing a new AC system, consider insulating the building and reducing the air change with the environment, thereby reducing the need for cooling.
- Free cooling during the night may provide energy efficient and cost-free cooling.
- Keep in mind that the refrigerant fluids in older AC systems are potent greenhouse gases and need to be disposed of professionally.



**Location:** Santa Cruz de Tenerife, coastal  
**Facilities:** 307 rooms, 12500 m<sup>2</sup>, spa, restaurant, conference room

Two cooling systems with R22 coolant have been replaced by a cooling system of the newest generation with a screw compressor and a capacity of 800 kW not using R22 as coolant.

<b>Total investment costs</b>	€ 254 000 excl. VAT
<b>Annual energy saving</b>	35% or an equivalent of 800 240 kWh, 200 t CO <sub>2</sub> emissions
<b>Annual energy cost savings</b>	€ 106 400
<b>Payback period</b>	2,4 years

## 2.2 Heating and hot water

### 2.2.1 Efficient heating and domestic hot water generation

#### Energy saving potential

Hot water generation represents 20 to 25% of the overall energy consumption of hotels, and heating represents a similar proportion for hotels that are open all year round. Hence energy efficiency improvements are very important here.

Moreover, since several available technologies use renewable energies, reconsidering heating and hot water generation processes can be an opportunity to project a more eco-friendly image of the establishment.

#### Available technologies

A great variety of technologies is available; the most important ones are listed thereafter. Main choice factors are pre-existing technologies in the buildings (e.g. oil heating, hot water radiators), the investment cost (that can be reduced in certain cases by public aids), and specific constraints (e.g. no gas distribution network).

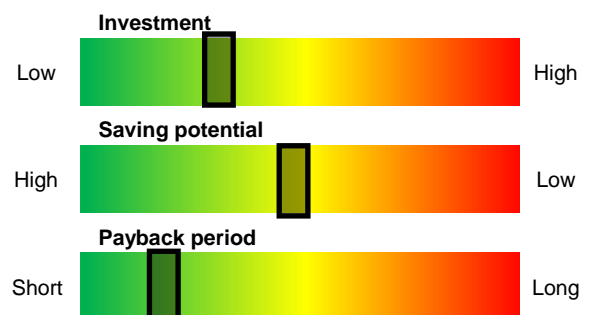
#### 2.2.1.1 Fuel substitution from oil to gas

Fuel substitution from oil to gas is perhaps the simplest way to improve heating and domestic hot water generation. There is no need to replace the boiler, only the burner and the fuel supply system have to be replaced.

**Advantages:** no cost-intensive and complicated works needed, gas is more eco-friendly than oil (less emissions of CO<sub>2</sub> per kWh useful heat and less emissions of SO<sub>2</sub> that causes acid rain).

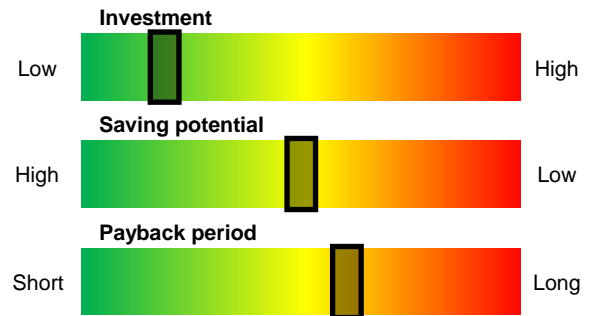
#### **Recommendations:**

- Check whether the entire boiler should not be replaced, for example by a more efficient condensing boiler.
- Regulations affecting the boiler room can imply extra costs in order to cope with safety requirements set by RITE (Reglamento Técnico de distribución y utilización de combustibles gaseosos y su instrucción técnica complementaria)



### 2.2.1.2 Boiler optimization

Boiler optimization in general can help achieve significant energy efficiency gains. Most frequent problems include oversized boilers, standby losses through improper control, problems in the transmission system to the hot water radiators, and problems with the evacuation of gases. Finally, old boiler burners can be replaced through a modern one.



**Advantages:** these are generally relatively low-cost measures.

**Recommendation:**

- Proper periodic maintenance is essential for security as well as to ensure that the boiler always work at its best energy efficiency level.
- Consider combining this measure with measure 2.2.1.1 *Fuel substitution from oil to gas*.



**Location:** Santa Susanna, Barcelona, coastal  
**Facilities:** 308 rooms, outdoor pool, outdoor bar, cafeteria and bar, 2 Restaurants

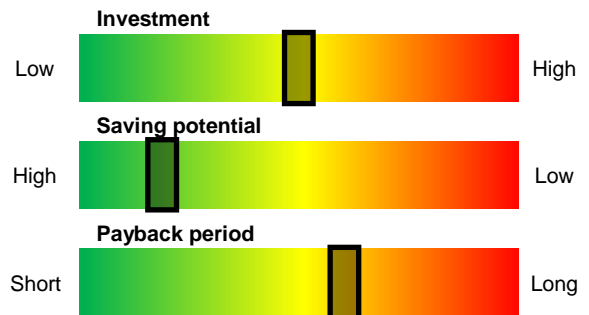
Current steam boiler has a two stage burner which generates more energy than needed in response to small variations. On top of that, it causes the boiler to start and stop repeatedly, which further increases its energy demand. The measure proposed consists in replacing the existing two stage oil burner for a natural gas burner (modulating type).

<b>Total investment costs</b>	€ 5 175
<b>Annual energy savings</b>	4 428 kWh
<b>Annual CO<sub>2</sub>emission reduction</b>	1,9 t CO <sub>2</sub>
<b>Payback period</b>	1,0 years
<b>Annual energy cost savings</b>	€ 5 414



### 2.2.1.3 Condensing boilers

Condensing boilers are high efficiency boilers that recover residual heat in the flue gases and condense the exhaust water vapour. Their efficiency is usually higher than 90%, compared to 70% to 80% for conventional designs. Condensing boilers can be used with oil as well as with gas.




**Advantages:** the most efficient boiler technology available.

**Recommendations:** the boiler and its control system must be appropriately adapted to the building's heating system (especially regarding the temperature of the return water from the heating system).

## NH Eurobuilding, Madrid

★ ★ ★ ★




**Location:** Madrid, urban  
**Facilities:** 427 rooms, 27 multifunctional rooms, 7800m<sup>2</sup>, Spa, Gym, 3 restaurants

6 oil boilers have been replaced by 6 high-efficiency condensing gas boilers with 628 kW power and an automatic control system.

The annual energy consumption before the investment was 4.259.000 kWh.

<b>Total investment costs</b>	€ 650 000
<b>Annual energy savings</b>	30% or 1 123 000 kWh 40% CO <sub>2</sub> emissions
<b>Payback period</b>	4 years
<b>Energy cost savings</b>	Between € 100 000 and € 130 000

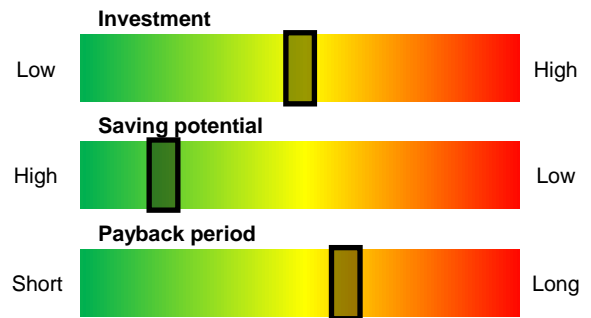


Source: NH Hotels, UCLM

### 2.2.1.4 Biomass combustion



Biomass combustion is the use of biomass sources such as wood, wood shavings or wood pellets to generate heat that can be distributed using conventional hot water radiators. The furnace can be fed automatically.



**Advantages:** renewable energy source, possible public aids, useful especially where natural gas is not an option and biomass supply is secured, e.g. in rural areas.

**Recommendations:** the effective power depends on the used combustible, wood pellets are the most efficient.

## Playa Senator, Huelva

★ ★ ★ ★

**Location:** Huelva, coastal  
**Facilities:** 306 rooms, 18.386m<sup>2</sup>, Spa, 1 restaurant, lounge bar, pool

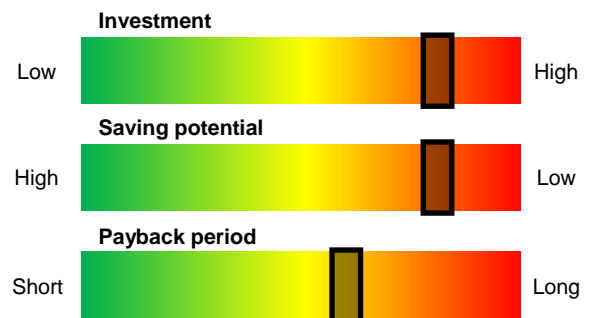
The old technology of 4 oil boilers was oversized for the need of the hotel. The annual energy consumption before the investment was 1 319 831 kWh. A biomass boiler of 500 kW with automatic regulation was installed and additionally a biomass silo was built.

<b>Total investment costs</b>	€ 318 500
<b>CO<sub>2</sub> emission reduction through fuel switching</b>	312 t CO <sub>2</sub>
<b>Payback period</b>	4,6 years
<b>Annual energy cost savings</b>	68 677 €

Source: Herz Energie

### 2.2.1.5 Heat pumps

Heat pumps are most commonly electricity-driven and use a working fluid to drive heat from an outdoor device that collects heat from outdoor air to an indoor device that transfers heat to indoor air. There is no need for hot water radiators here; another fluid distribution network has to be put in place. Heat pumps can be reversed and used for heating as well as for cooling. They can also be used for domestic hot water generation, although with quite low efficiency due to the higher temperature level.



**Advantages:** well-known technology, requires little space, low maintenance costs

**Recommendations:** check the primary energy source used for electricity production: if it mainly relies on fossil sources, CO<sub>2</sub> emissions may not be lower than with efficient oil or gas heating. Check the Coefficient of Performance (COP) of the heat pump: efficient heat pumps have a COP higher than 3. Check electricity prices and their evolution.



**Corona del Mar, Alicante**  
★ ★ ★ ★

Source: Hotel RH Corona del Mar

**Location:** Benidorm, Alicante, coastal  
**Facilities:** 129 rooms, Gym and Sauna, 1 restaurant, lounge bar, pool

Currently, six stand-alone air conditioning units heat or cool the terrace of the restaurant. They work with a constant volume of refrigerant system, which is not perfectly efficient due to the fact that the compressor only has one function mode and it is starting and stopping continuously to keep the comfort temperature.

With a variable refrigerant volume, the compressor regulates his speed according to the needs of cooling or heating. With this, the number of starts and stops decreases and consumption is lower.

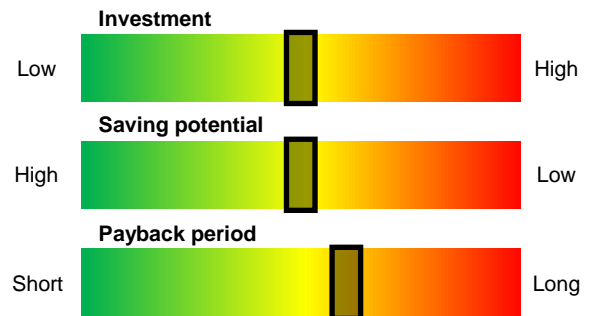
<b>Total investment costs</b>	€ 17 000
<b>Annual energy savings</b>	13 324 kWh
<b>Annual CO<sub>2</sub>emission reduction</b>	4,8 t CO <sub>2</sub>
<b>Payback period</b>	14,8 years
<b>Annual energy cost savings</b>	€ 1 148




Source: Creara

### 2.2.1.6 Heat recovery systems from cooling appliances for hot water generation

Heat recovery from air conditioning allows using waste heat generated by air conditioning units or other cooling equipment's such as in cold rooms. Those cooling systems use a working fluid to transfer heat from indoor air to outdoor air. The aim of heat recovery units is to recover the working fluid's heat before it would normally be rejected into the environment. The heat can be used to warm domestic hot water; however, since the temperature attained is usually too low to meet sanitary regulations against legionella, an additional conventional heat source is needed for domestic hot water.



**Advantages:** lower domestic hot water generation energy demand and costs, using waste heat from the air conditioning systems.

**Recommendations:** check if the size of the air conditioning installation is sufficient to ensure profitability. Using a recovery unit of type “desuperheater” helps to avoid problems due to excessive subcooling (that leads to too low pressure and liquid slugging in the compressor).

## IFA Continental, Gran Canaria

★ ★ ★

Source: Lopesan Hotel Group

**Location:** Gran Canaria, coastal  
**Facilities:** 383 rooms, tropical garden, solarium, Massage room, sauna

Replacing the current chiller for a new cooling with heat recovery is proposed. This heat is used to heat the pools and to support the domestic hot water.

The proposed measure consists in replacing the current chiller for a new one with a heat recovery system. This heat will be used for the pools as an additional heat source to sanitary hot water.

<b>Total investment costs</b>	€ 42 900
<b>Annual energy savings</b>	114 452 kWh
<b>Annual CO<sub>2</sub>emission reduction</b>	45 t CO <sub>2</sub>
<b>Payback period</b>	6,2 years
<b>Annual energy cost savings</b>	€ 6 867

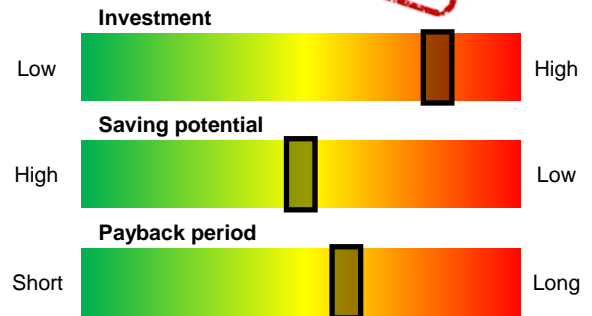


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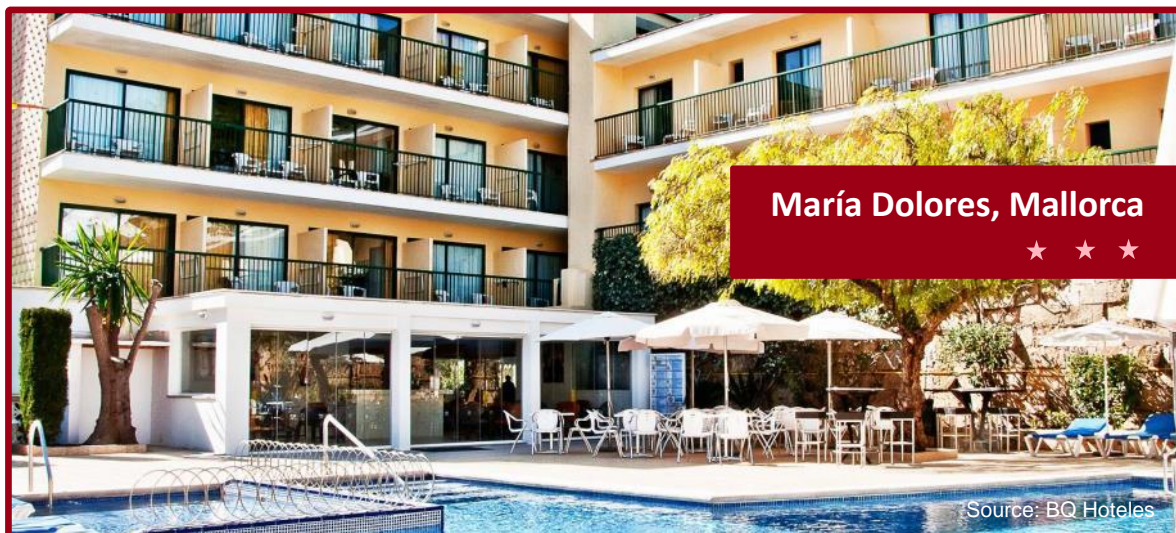
### 2.2.1.7 Solar thermal energy for hot water generation

Solar thermal energy uses heat from the sun collected using rooftop panels to produce hot water. A solar thermal energy system also includes hot water storage and an additional conventional heating system. The temperature of the water is usually around 60°C and therefore well adapted to domestic hot water generation. However, it is usually less well suited for space heating purposes since heat supply and demand do not coincide in this case and higher temperatures would be needed in that case (up to 90°C).



**Advantages:** very well adapted to the large, continuous needs for hot water in hotels

**Recommendations:** look for public aids available to overcome the relatively high cost of this technology, need for adapted surfaces for collectors (rooftop or terrace)



María Dolores, Mallorca



Source: BQ Hoteles

**Location:** Mallorca, Balearic Islands, coastal  
**Facilities:** 70 rooms, pool, garden, cafeteria, lounge bar

The proposed measure consists in installing a solar thermal energy system at the building rooftop. The hotel is an optimal building to host a solar thermal infrastructure.

A low temperature solar captures solar heating to produce hot water. For this particular building, based on SHW consumption, 28 solar panels (2m<sup>2</sup> each) were recommended.

<b>Total investment costs</b>	€ 42 210
<b>Annual energy savings</b>	47 572 kWh
<b>Annual CO<sub>2</sub>emission reduction</b>	5,4 t CO <sub>2</sub>
<b>Payback period</b>	15,3 years
<b>Annual energy cost savings</b>	€ 2 766



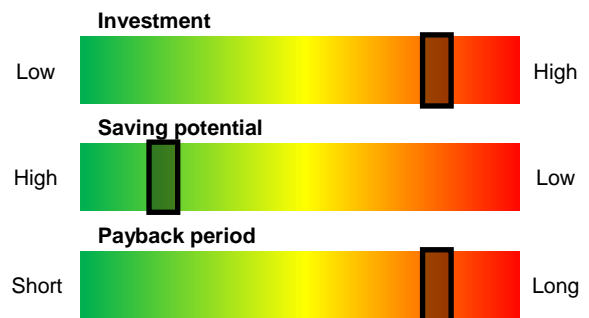
Source: Creara

### 2.2.1.8 Geothermal energy



Source: adelphi

Geothermal heating uses the same principle as conventional heat pumps, but exchanges heat with the ground instead of outdoor air. It is more energy-efficient than conventional heat pumps since the ground temperature is more stable than the outdoor air temperature. This technology can serve for heating and cooling.

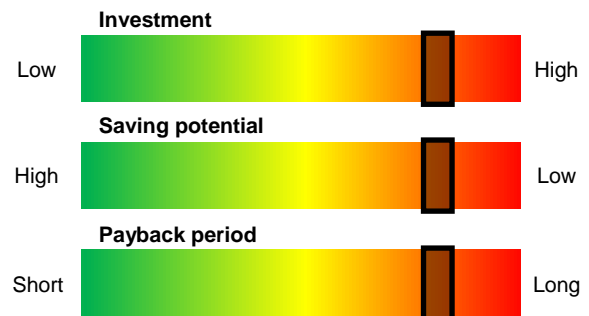


**Advantages:** more energy-efficient than conventional heat pumps.

**Recommendations:** check electricity prices and their evolution.

### 2.2.1.9 Cogeneration

Cogeneration is the combined production of electricity and heat. Electricity is produced in an oil or gas engine or turbine, and can be used for own consumption or sold to the electricity supplier. Heat is used for the building's heating system or to produce domestic hot water. Cogeneration units are adapted for relatively constant, year-long need: they can be used for domestic hot water production in summer and part of heating in winter.



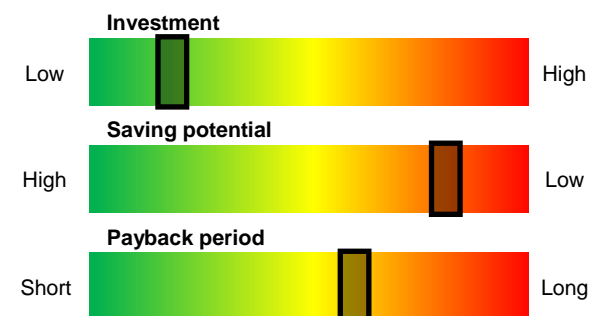
**Advantages:** overall energy cost savings at the cost of a relatively important initial investment.

**Recommendations:** do not oversize the cogeneration unit (excess heat would need to be rejected), check for public aids available and their evolution. Cogeneration is only in rare cases profitable.

### 2.2.2 Ventilation system with heat recovery

Ventilation systems can be responsible for up to 50% of thermal losses, and thereby heating and cooling energy demands. The inlet air from the outside needs to be cooled in summer and heated in winter to satisfy the comfortability requirements.

A ventilation system with heat recovery uses the exhaust air to preheat or precool the inlet air before entering the building. Usually around 50% of the energy can be recovered. The system also ensures an appropriate level of humidity for incoming air.

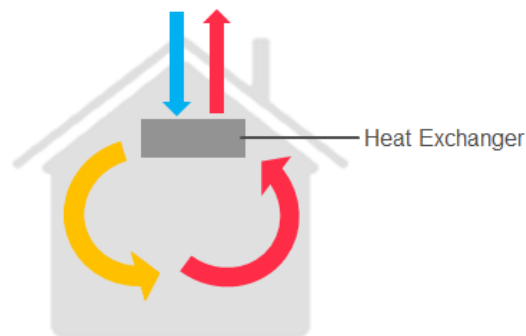


**Advantages**

- Proven efficiency to reduce thermal losses and heating/cooling needs
- Guarantees a good quality of the inside air

**Recommendations**

- This technology cannot be used along with free cooling ventilation
- Depending on the pre-existing heating, ventilation and air conditioning system, elaborate works can be needed

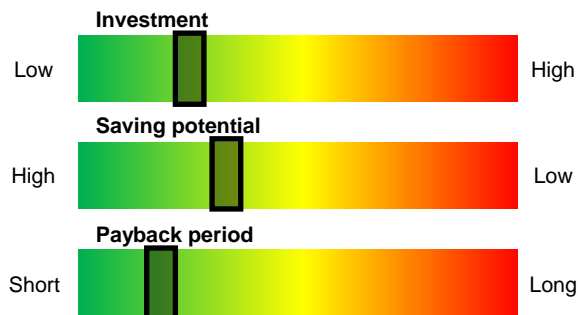


Source: adelphi

**2.2.3 Thermostatic radiator valve**

**Energy saving potential**

Thermostatic radiator valves control the temperature of the room by adapting the flow of hot water into the radiator. They are a simple and efficient way to avoid overheating, improve the energy efficiency of heating and allow for an individual temperature control when there is no other temperature regulation system in place.



**Technology description**

Thermostatic valves replace the manual radiator tap and are fitted directly on hot water radiators.

**Advantages**

- Regulating heating according to room temperature belongs to the basics of energy efficiency of heating
- Thermostatic valves simply replace the manual radiator tap: no important works needed
- It is possible to change the reference temperature



Source: Sascha Preussner - Shutterstock

**Recommendations**

- The thermostatic valve works using the temperature around it: it will not work well if placed under curtains for example

### 2.2.4 Insulation for hot water pipes and tanks

#### Energy saving potential

Insulating hot water pipes helps limiting heat losses between the hot water generation unit and the tap. It improves energy efficiency in two different ways: first, insulating hot water pipes results in an increased hot water temperature at the water outlet, which allows lowering the water temperature setting at the boiler and save energy. Second, water in the pipes holds heat longer and one does not need any more to wait for hot water when turning on the tap, thus saving water and energy again.

Similarly, insulating old water tanks that do not have a sufficient level of insulation using insulating blankets is a very simple way to avoid energy wastage.

#### Technology description

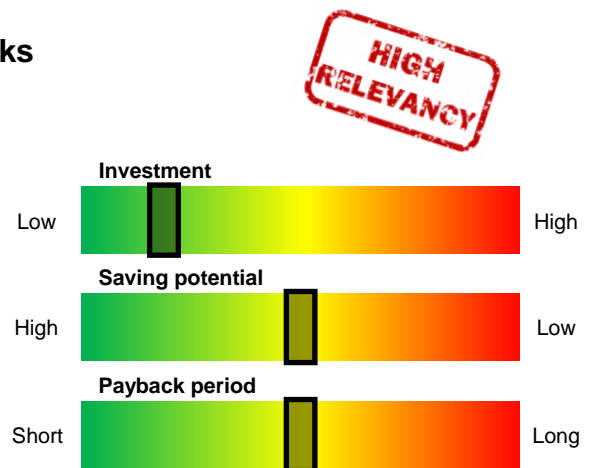
Insulation material is simply slipped around pipes and water tanks.

#### Advantages

- One of the basics of energy efficiency
- No important works needed: insulation is simply slipped around tubes

#### Recommendations

- Attention should be paid to labour costs for this operation: since insulation material by itself is very cheap, it represents the main cost factor
- The reference temperature for the domestic hot water generation system should be appropriately adapted after having insulated pipes.



Source: Stack Exchange

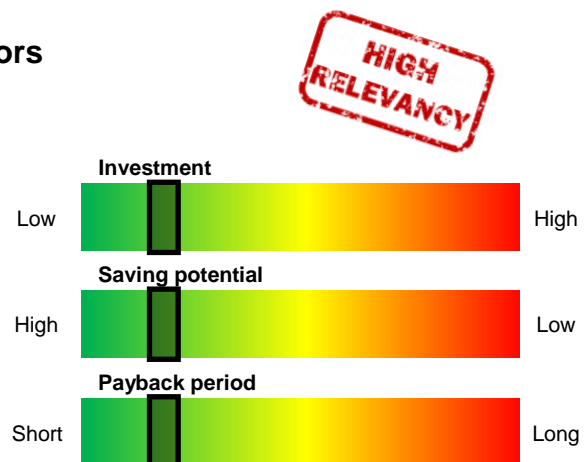
### 2.2.5 Low-flow showerheads and tap aerators

#### Energy saving potential

Water wastage not only causes energy wastage in case of hot water, but is also of public concern by itself especially in arid countries like Spain. Low-flow showerheads and tap aerators allow reducing the water flow by up to 50% while maintaining a comfortable feeling for the user.

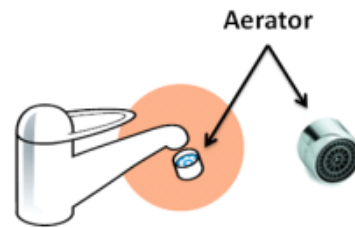
#### Technology description

Tap aerators mix water with air bubbles, while low-flow showerheads appropriately spread the water flow. Tap aerators are simply screwed on the tap, and low-flow showerheads replace the previous one.



**Advantages**

- Very short payback period
- Comfort improvement: no need to wait for hot water anymore
- Installation is very simple



Source: adelphi

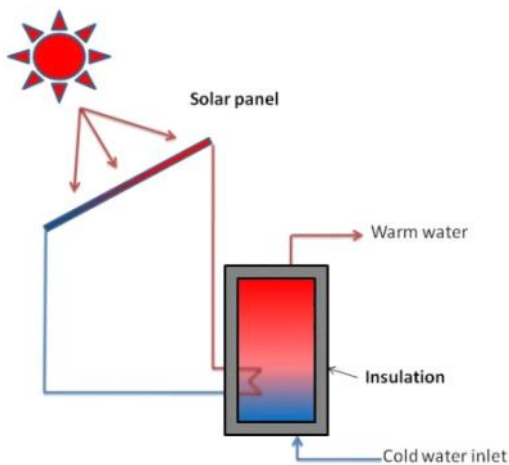
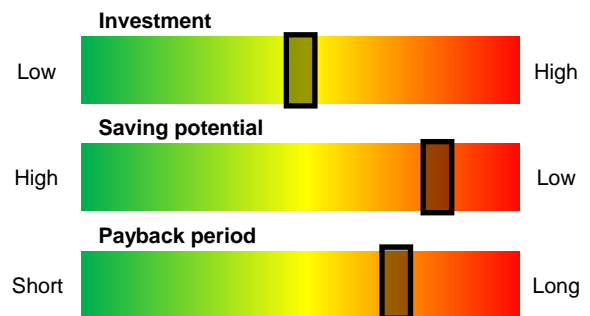
**Recommendations**

- Pay attention to the quality of the equipment to ensure effective water consumption reduction
- Consider installing a theft-proof system, since the equipment is often stolen

**2.2.6 Solar thermal water heating for swimming pools**

**Energy saving potential**

It is forbidden by Spanish law to use conventional energy sources (other than renewable energies or waste energy) to heat outdoor swimming pools, since it is regarded as energy wastage. Solar thermal water heating for swimming pools is an efficient way to cope with this regulation. This technology can cover the entire heating needs for outdoor pools that are used in summer. The system can be used for indoor pools too.



Source: adelphi



**Technology description**

Solar thermal water heating works in a similar way to domestic hot water heating through solar thermal panels.

**Advantages**

- One of the simplest ways to heat outdoor swimming pools given the regulation that prohibits the use of conventional energy sources.

**Recommendations**

- Installing a thermal blanket that is pulled over the swimming pool over the night also limits thermal losses
- Check if enough space is available on a rooftop close to the swimming pool to install the solar thermal panels

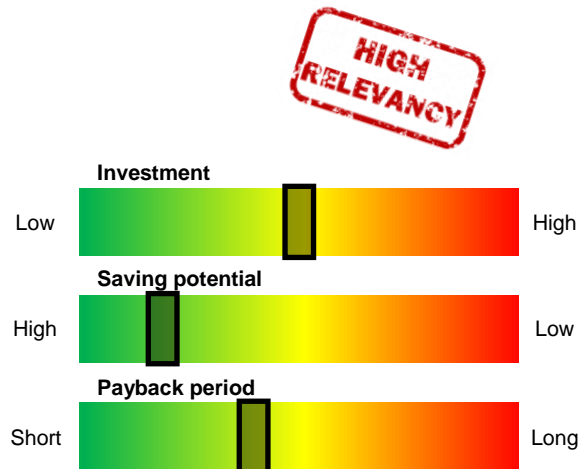
## 2.3 Lighting

### 2.3.1 Efficient lamps

#### Energy saving potential

Light bulbs are one of the fields where potential gains in energy efficiency can be the most important (up to 50%). Energy efficiency standards for lighting are set at the European level (implementation of the Ecodesign directive), and incandescent bulbs were phased out in 2012. Replacement solutions are all more energy-efficient than incandescent bulbs, although there is still a great variation in energy efficiency between technologies. The efficiency of lamps can be determined using the European energy label, A++ being the most energy efficient class.

Along with energy efficiency, quality of service and comfort also play a high role when modifying lighting.



#### Available types

**LED lamps** are the most efficient lamps (energy class up to A++) and have a very long lifetime (more than 15.000 hours). They can be sold as interchangeable lamps or directly integrated in the luminaire. The technology is still developing towards a better energy efficiency, a better colour rendering and design innovations.

**Compact fluorescent light bulbs** are in energy classes A to C. Their working life (about 10.000 hours) is shorter than that of most of LED lamps, but still longer than that of incandescent light bulbs (about 1.000 hours). They also contain mercury and need to be disposed of very carefully.



**Halogen lamps** are in energy classes B to D: they are only a bit more efficient than incandescent bulbs, and their lifetime is about 2.000 hours. Class D lamps will be phased out by 1<sup>st</sup> September 2018.

Source: UNWTO

The efficiency of **fluorescent tubes** is comparable to or better than that of compact fluorescent light bulbs, and can be improved by using **high frequency electronic ballasts**: the latter can be 20 to 30% more efficient than electromagnetic ballasts with starters.

Finally, **low-pressure sodium lamps** (yellow light for outdoor use) and **high-pressure discharge lamps** are more energy-efficient than fluorescent tubes and have a very long lifetime.

#### Advantages

- No need for heavy works – changing the light bulbs or sometimes the luminaires is enough
- Low investment and very short payback
- Opportunity to rethink the inner design of the hotel
- The longer durability of modern lamps also reduces the amount of maintenance required

#### Recommendations

- Use the EU energy label and statements of a high luminous efficiency in lumen/Watt as an indication for energy efficiency
- Specific recommendations for disposing of compact fluorescent light bulbs and LEDs apply
- Keep in mind that the least energy-efficient halogen lamps are going to be phased out
- Pay attention to the color temperature (warm white or cold white) and to the color rendering

## Hotel A Quinta da Auga, Galicia

★ ★ ★ ★

Source: A Quinta da Auga



**Location:** Santiago de Compostela, La Coruña, rural  
**Facilities:** 45 rooms, 3000m<sup>2</sup>, spa, restaurant, conference center, restored antique paper factory from the 18th century

The new technology installed in the hotel covered 15 solar thermal collectors with a surface of 2.33 m<sup>2</sup> as well as two micro cogeneration units and an internal combustion engine fired with natural gas. Furthermore, high efficient lighting was installed in rooms and public areas which are now illuminated by LED lighting with motion detection.

<b>Investment costs</b>	€ 80 000
<b>Annual energy savings</b>	167 000 kWh
<b>Annual CO<sub>2</sub> emission reduction</b>	43 t CO <sub>2</sub>
<b>Payback period</b>	7 years
<b>Annual energy cost savings</b>	€ 12 000



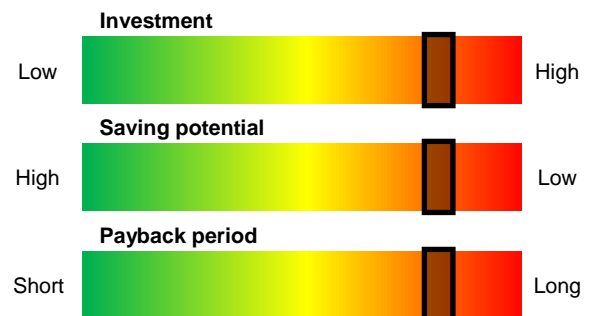
Source: A Quinta da Auga

## 2.4 Automation

### 2.4.1 Building Management System (Building Automation System)

#### Energy saving potential

In large buildings, it can be useful to have an overview and a centralized control on lighting, heating, cooling, ventilation and other electric appliances, combined with data such as temperature, daylight and presence detection in each room. This can lead to additional saving potential in comparison to decentralized control and regulation systems. It also has other advantages related to comfort or providing notifications per phone or SMS.



#### Technology description

Main features of a building management system include:

- Integrated management of lighting, heating, cooling and ventilation, as well as related technical equipment (such as rooftop air conditioning module)
- Differentiated management of different building areas (for example occupied or unoccupied guest rooms, lobby, restaurant)
- Switch between several operating modes throughout the day, such as Unoccupied, Occupancy or Morning Warmup; operating modes can also be quickly changed throughout seasons
- Notification through alarm, phone call or SMS in case of problem (e.g. equipment failure), abnormal high consumption or potential hazard

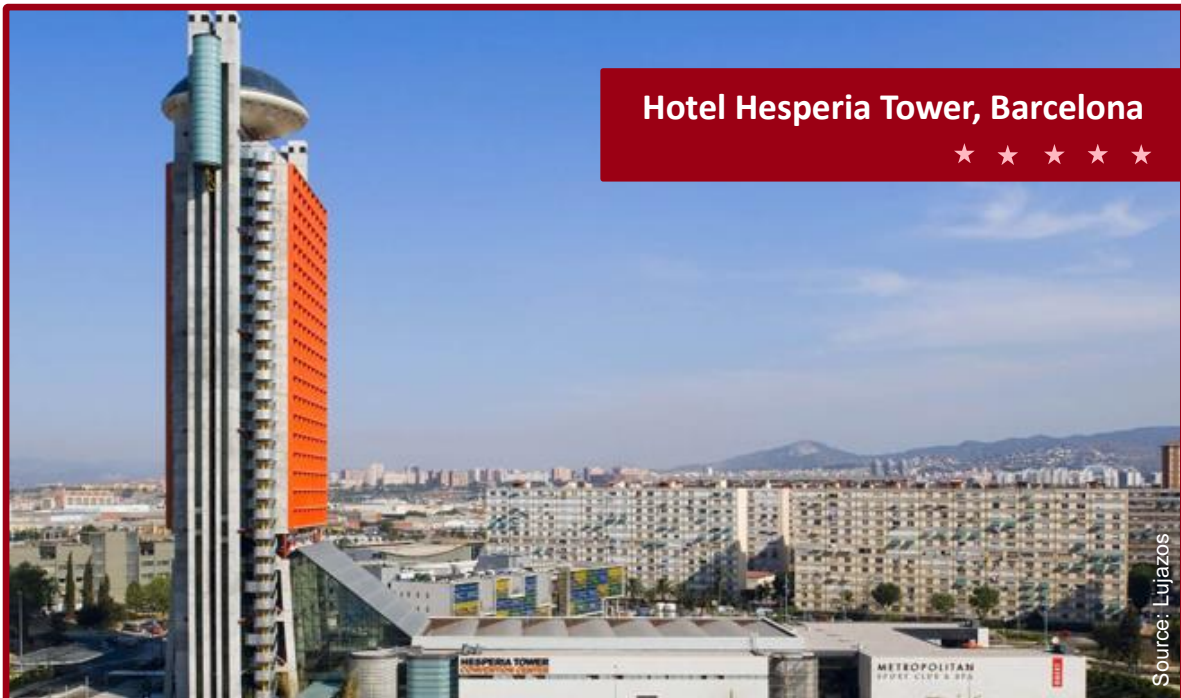
#### Advantages

- Increased staff productivity, especially in large buildings
- Quick response to problems through notifications and alarms from technical equipment
- Integrated control of systems such as lighting, cooling and heating

#### Recommendations

- Simpler room management systems or control and regulation systems can be sufficient in certain cases (see pages 25 and 26).





### Hotel Hesperia Tower, Barcelona

★ ★ ★ ★ ★

Source: Lujazos

**Location:** Barcelona, urban

**Facilities:** 280 rooms, 14000m<sup>2</sup>, spa, restaurant, auditorium with 500 seats

10% energy savings were achieved by the implementation of a Building Management System including the management of lighting and cooling.

<b>Investment costs</b>	€ 20 000
<b>Annual energy savings</b>	10%
<b>Payback period</b>	1,7 years



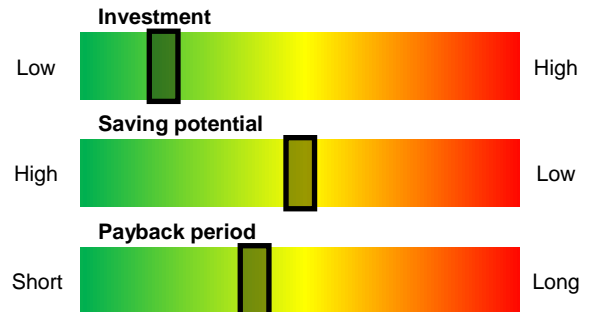
Source: NH Hotels

## 2.4.2 Control and regulation systems for lighting



### Energy saving potential

Control and regulation systems can help adapting lighting according to daylight, presence detection, time of the day and other factors. This can lead to significant energy efficiency improvements from 10% to more than 50% in certain situations, e.g. transit areas).



### Available technologies

There is a great variety of devices that can be used to locally adapt lighting in a given area:

- **Multiple switches** to turn the light on or off in small parts of a given area (for example, a swimming pool) instead of relying on one main switch
- **Light regulators** to manually adjust the luminous intensity (for example in conference rooms)
- **Timers** that switch the light off after a certain amount of time (for example in staircases),
- **Motion sensors** that detect the presence of persons,
- **Programmable switches** that adjust lighting according to time of day,
- **Daylight sensors** that can adapt the light to the actual needs.

It is possible to **centralize** and optimize the management of the lighting of a whole building or area, using a “Programmable Logic Controller”. This can help attaining even greater energy efficiency.

### Advantages

- No heavy works are generally required; certain devices (such as timers, regulators and motion sensors for bathrooms) simply replace pre-existing switches
- Enhanced guest experience by using motion sensors
- The control and regulation system can be used not only for lighting, but also for other electric appliances (see page 26).

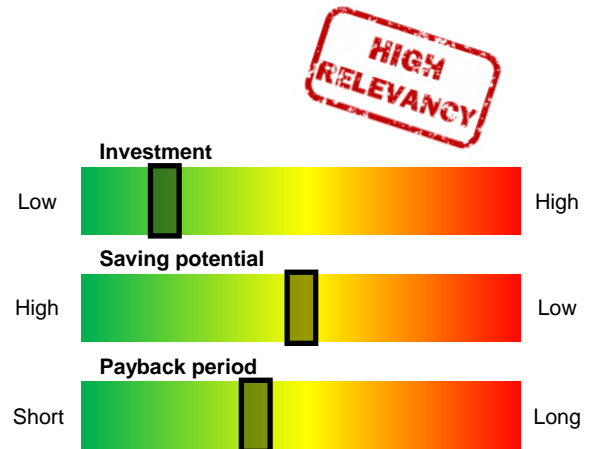
### Recommendations

- Even the simplest devices - such as timers - can lead to significant electricity savings.

### 2.4.3 Automatic control, key card systems or occupancy sensors for electricity, ventilation, heating and cooling

#### Energy saving potential

A large number of appliances do not need to stay turned on in hotel guest rooms when there is no guest: this regards electric appliance such as TV set in stand-by mode, lighting, and in certain cases ventilation, cooling and heating. Proper control of electric appliance according to room presence can lead to very significant energy efficiency improvements.



#### Available technologies

- Key cards can be used to centralize electricity supply in guest rooms, and turn electricity on only when a card is inserted. They can be combined with a timer so that the light does not turn off immediately when the key card is removed, allowing time for the guest to get out of the room.
- Presence detectors can play a similar role, especially for lighting
- Ventilation in the bathroom can be adapted to be activated only when the light is turned on in the bathroom



Source: adelphi

#### Advantages

- Significant energy efficiency improvements for hotel guest rooms that are not occupied all the time
- Security improvement: no electric appliance left alone working in guest rooms

#### Recommendations

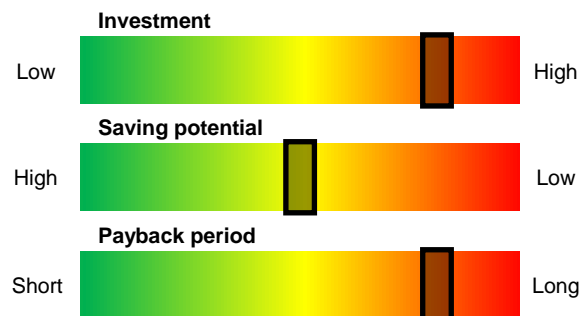
- One electrical socket can be left on to allow guests to charge their mobile devices such as cell phones even in their absence.

## 2.5 Insulation and building envelope

### 2.5.1 Thermal insulation and building envelope air tightness

#### Energy saving potential and other benefits

**Thermal insulation** is, in side of heating system improvements, the main way to reduce heating costs, which can amount up to 25% of the overall energy consumption of hotels that are open all year round. While the most modern insulation technologies in new building can lead to near zero energy consumption for heating, better insulation of existing building can help achieve very significant energy savings. Solar protections such as shutters also allow reducing air conditioning costs in summer (see page 29), along with a proper insulation of the rooftop.



Thermal insulation is also intrinsically linked with the question of **airflow and moisture flow control**. Improper air tightness greatly increases thermal losses when the air can flow through cracks around doors and windows and in the rooftop. A poorly waterproofed façade, floor or rooftop also leads to excess moisture in the building. This in turn leads to condensation that causes damages to the walls and windows or peeling paint, especially when associated to a poor thermal insulation.

Finally, **Building ventilation** should also be considered along with insulation: insufficient ventilation leads to discomfort, excess moisture and condensation, while excessive or inadequate ventilation can be a source of major energy losses. Specific technologies exist to further reduce energy losses through ventilation (see page 17).

#### Technical aspects

**Thermal insulation** can be achieved using a variety of materials that differ in performance, thickness and price. Common materials include polystyrene, glass wool and rock wool, or more innovative materials such as wood or hemp wool. Roof and floor should be handled as well as walls. Insulation materials can be applied on the exterior or on the interior side of the wall, along with a **moisture barrier**.

Attention should be given to **thermal bridges** that are specific areas such as the junction between the floor and the walls where thermal conductivity is higher than in the surroundings areas. They represent a significant share of overall thermal losses and can be detected using for example infrared cameras.



Source: Ingo Bartussek - fotolia.com

**Doors and windows** are a particular case of thermal bridges since they often allow a significant airflow to enter or leave the building. In some cases it is necessary to replace them (see page 29), in other cases cracks and thermal bridges around the frame should be handled.

#### Advantages

- Thermal insulation improvement works allow handling moisture and air tightness problems as well.
- High potential energy savings

**Recommendations**

- Insulation materials should be fitted appropriately in order to avoid damages through moisture that lead to performance losses.
- Thermal bridges should be handled appropriately; an energy audit can help to identify them.
- Specific solutions such as double entrance doors can also be used.



Source: Luis Bernardo de Carrera

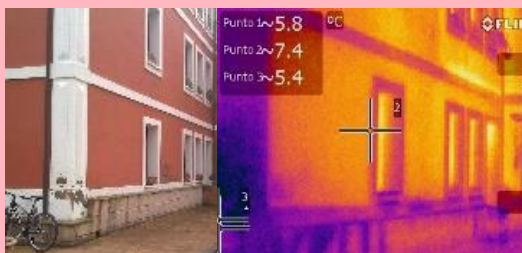
**Location:** Vizcaya, rural

**Facilities:** 34 rooms, Spa and sauna, 1 restaurant, lounge bar, pool

<b>Total investment costs</b>	€ 142 689
<b>Annual energy savings</b>	41 560 kWh
<b>Annual CO<sub>2</sub> emission reduction</b>	9,6 t CO <sub>2</sub>
<b>Payback period</b>	45,6 years
<b>Annual energy cost savings</b>	€ 3 131

Facades are one of the main causes of heat losses. To compensate for thermal wastage the boiler works longer than needed.

The proposed measure consists in deploying 1.838 m<sup>2</sup> of composite Thermal Insulation System on the outside, when renovating the facade. This system removes the thermal bridge breakage and allows complying with the Spanish Technical Building Code, reducing heating consumption between 40% and 60%.



Source: Creara

## 2.5.2 Double or triple glazed windows

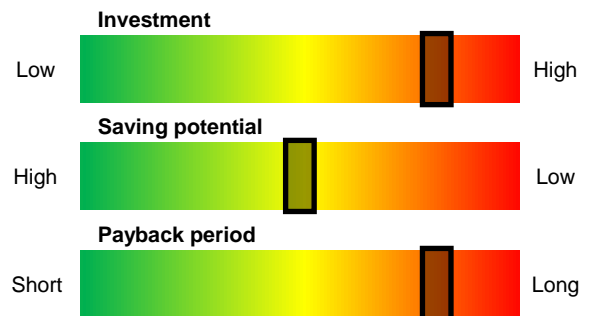
### Energy saving potential and other benefits

Double or triple glazed windows provide a much better thermal insulation than single glazed windows.

Double or triple glazed windows also provide a much better acoustic insulation than single glazed windows.

### Technology description

Double or triple glazed windows include a single or double air layer between glass layers. The insulation can be further improved by filling the air layer with a rare gas (Argon) or using low emissivity glasses.



### Advantages

- Double or triple glazed windows are very useful to avoid the “cold wall sensation” one can feel when being close to (especially large) windows with poor insulating qualities
- Double or triple glazed windows combine thermal and acoustic insulation.

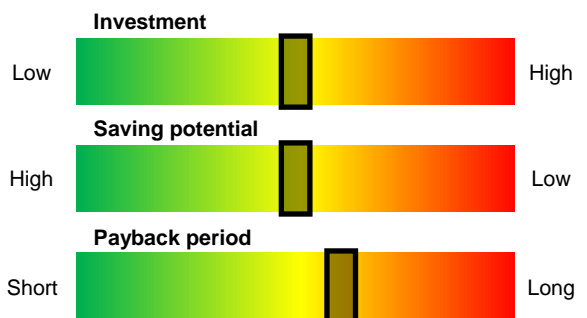
### Recommendations

- There is no need to have windows that ensure excellent thermal insulation if walls, floor and roof top are poorly insulated or if there are thermal bridges (see page 27).

## 2.5.3 Solar protection

### Energy saving potential

Solar protection solutions help reducing direct heat radiation entering the building especially through windows in the summer and thus reducing the need for air conditioning. There are various possible solutions that improve comfort and can be adapted to the user’s preference. Due to the increasing use of AC systems, this measure gains all the more relevancy.



### Available solutions

**Window films** can be simply applied on existing windows and prevent infrared radiation from direct sunlight to enter the building. This is a very efficient way to reduce air conditioning costs, especially for large windows.

**Shutters for solar protection or folding arm awnings** are generally mobile and allow reducing radiation during hottest hours while giving the possibility to benefit from sunlight at other moments.

There is also a great variety of architectural solutions such as **overhangs** that play the same role as awnings.

**Advantages**

- No heavy works needed for shutters, folding arm awnings and window films.
- Adaptation to sunshine and user’s preference for shutters, folding arm awnings and window films.

**Recommendations**

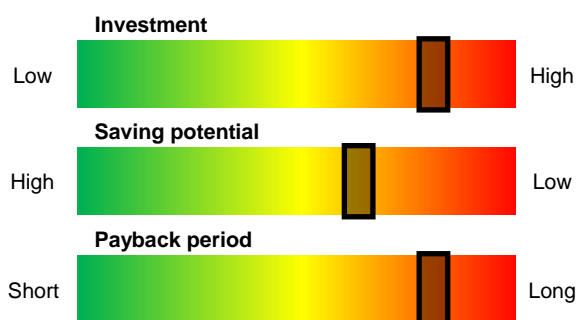
Southern facades are very well adapted to fixed solutions such as overhangs because of the solar intensity, while mobile solutions such as shutters should be used especially for Northern and Western facades.

**2.6 Kitchen, laundry and appliances**

**2.6.1 Kitchen and laundry appliances**

**Energy saving potential and other benefits**

Kitchen and laundry appliance, such as refrigerators and freezers, microwaves, ovens, dishwashers, washing machines and dryers, are responsible for an important part of the energy consumption of a hotel (10% to 20%). There are opportunities not only for energy savings, but also for water savings in the case of dishwashers and washing machines.



**Available options**

The energy efficiency of kitchen and laundry appliances improves continuously. Some new technologies are particularly energy-efficient:

- Induction hobs are 50% more efficient than conventional electric hobs
- Microwave ovens are more than 50% more energy-efficient than conventional convection ovens
- Forced convection ovens are also more energy-efficient than conventional convection ovens
- Gas ovens also allow for energy cost reduction
- There have been important progresses in energy efficiency regarding fridges and freezers too
- Dryers that use heat pumps to generate hot air can be more than 50% more efficient than conventional dryers with electric resistances
- Steam irons are more efficient than electric irons

**Advantages**

- Combine energy and water savings

**Recommendations**

- The EU energy label is a very good reference to determine the energy efficiency for small (non-professional) fridges, freezers, dishwashers, washing machines and dryers

- Dishwashers and washing machines should be connected to the building’s hot water network instead of using the built-in electric resistance for heating: this can be done at a very low cost and significantly reduces electricity consumption for hot water generation in the appliances
- Rational use of the equipment is also important: preheating time of convection ovens should be limited to what is really necessary, dishwashers and washing machines should be used at full load, lag time should be avoided for ironing



Source: Hotel RH Corona del Mar

**Corona del Mar, Alicante**  
★ ★ ★ ★

**Location:** Benidorm, Alicante, coastal  
**Facilities:** 129 rooms, Gym and Sauna, 1 restaurant, lounge bar, pool

The hotel has two washing machines serving the laundry, which operates with hot water. The hot water is generated by boilers or, when possible with solar energy.

Traditional system needs to heat the water to heat the water to high temperatures (60-80 °C) to remove stains properly. The proposed measure consists in using ozone washing system which does not need hot water.

<b>Total investment costs</b>	€ 7 080
<b>Annual energy savings</b>	92 862 kWh
<b>Annual CO<sub>2</sub> emission reduction</b>	24 t CO <sub>2</sub>
<b>Payback period</b>	1,0 years
<b>Annual energy cost savings</b>	€ 7 393



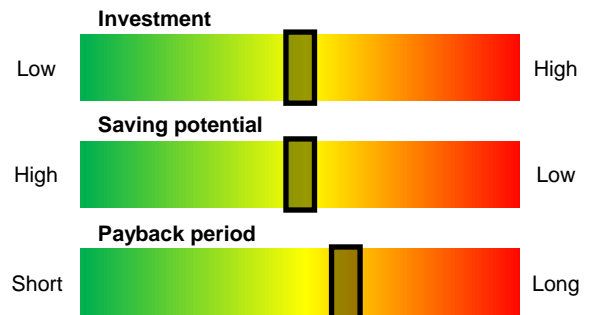
Source: Creara



## 2.6.2 Cold rooms

### Energy saving potential

Cold rooms are much more energy-efficient than fridges since they are better insulated and the cooling equipment typically is more efficient. However, there are still ways to reduce energy costs of these equipment.



### Available options

There are several ways to reduce the energy consumption of cold rooms:

- Improve the energy efficiency of the cooling equipment (e.g. through replacement, or addition of timer or variable speed drive)
- Improve insulation of the walls and doors or installing strip curtains to limit the airflow.
- If there are several cold rooms, put the working fluid network in common and connect it to a single condenser (external device) that will work more efficiently. Residual heat from the working fluid can also be recovered (see page 15).
- Replace old heat radiating incandescent and halogen light bulbs with LED to reduce the heat produced in the rooms.

### Advantages

- Certain measures for example regarding the cooling equipment can help achieve very significant energy consumption reductions

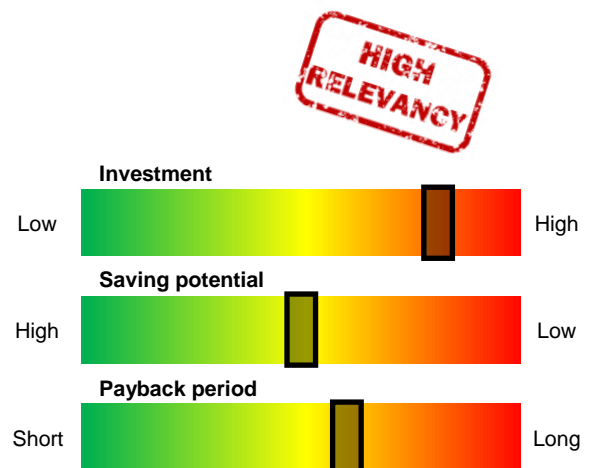
### Recommendations

- There are some basics of energy efficiency in cold rooms: check if temperature is properly adjusted, maintain the cooling equipment properly (cleaning and defrost)

## 2.6.3 Efficient minibars

### Energy saving potential

Minibars are in every hotel room and can need up to 300 kWh per year for inefficient models, which corresponds to several tens of Euros per year and per unit. The EU energy label applies to minibars since 2011, which makes it much easier to compare the energy efficiency of the various models: some of them (class A+++ ) can save up to 80% of the energy needed in old and inefficient models.



### Technology description

Several technologies exist for minibars:

- Absorption minibars use heat as primary energy source and were the first to have been used in hotels. They are completely silent since they do not need an electrically driven compressor unit.

- Compressor minibars use the same technology as conventional fridges. They include a timer or a presence detector that switches them off when guests are in the room to avoid unnecessary noise, combined with an eutectic plate that keeps temperature constant over the night.
- Thermoelectric minibars use another silent technology. Their energy efficiency varies greatly with the temperature difference between the room and the minibar.

In some appliances, a remote control allows switching them off when the room is not used

**Advantages**

- Significant energy savings can be achieved when shifting from inefficient to very efficient minibars

**Recommendations**

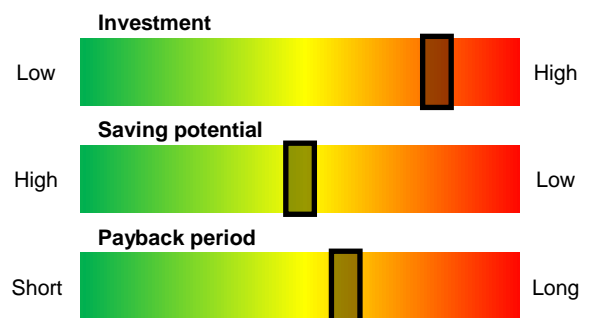
- The European energy label is a very good reference to determine the energy efficiency of minibars

**2.7 Others**

**2.7.1 Variable frequency drives and efficient drives**

**Energy saving potential**

Many appliances in hotels use electric drives: this is in particular the case for elevators, ventilation, air conditioning (especially the outdoor compressor’s fan and pumps for the working fluid) and all water pumps (for example the ones that are used in the domestic hot water system and for hot water radiators). Thanks to significant technological progress the last years, these electric drives can be adapted or replaced to save electricity.



**Available options**

Motors for elevators, ventilation and pumps are generally fixed-speed drives, whose rotation speed is determined by the frequency of the alternating electric current. **Variable frequency drives** are small and relatively cheap appliances that allow changing the frequency of the electric current, and thus the rotation speed of the motors. Depending on the situation, they can be adapted to existing motors, or the motor can be replaced through an **efficient motor** that includes this technology. This allows adapting to real needs:

- The speed of **ventilator fans** can be adapted to current needs
- The speed of **elevator** drives can be adapted at each point of the course of the elevator. Thus a greater precision can be reached and electricity is saved.
- The same applies to **working fluid pumps** and **outdoor compressor** in air conditioning, as well as to **water pumps**.

Modern **regenerative drives** for elevators go a step further: when the cabin goes down with a heavy load they work as a generator instead of dissipating energy in the form of heat and pump current back into the building's electric network. This reduces overall electricity needs of the building.

**Advantages**

- Variable frequency drives for elevators combine better energy efficiency with better accuracy

**Recommendations**

- Sometimes it is not necessary to replace the motor: the variable frequency drive can be simply added to the electric circuit.



**Indalo Park, Barcelona**

★ ★ ★

**Location:** Santa Susanna, Barcelona, coastal  
**Facilities:** 308 rooms, outdoor pool, outdoor bar, cafeteria and bar, 2 Restaurants

A system of pumping with a fixed (constant) volume represents an inefficiency. Pump consumption is higher than needed and it also increases the heat losses when compared to a variable volume. The suggested measure consisted in installing a variable speed motor driving the pump that serves the fancoils circuit.

<b>Total investment costs</b>	€ 42 304
<b>Annual energy savings</b>	26 677 kWh
<b>Annual CO<sub>2</sub> emission reduction</b>	8.0 t CO <sub>2</sub>
<b>Payback period</b>	15,1 years
<b>Annual energy cost savings</b>	€ 2 799

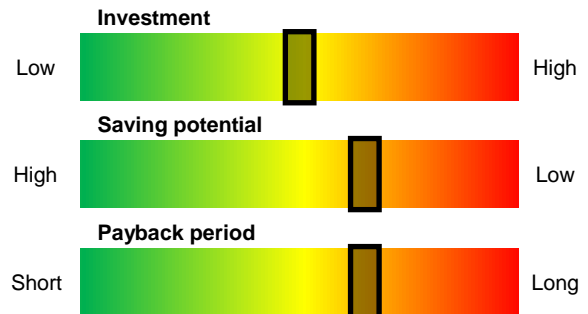


Source: Creara

## 2.7.2 Energy consumption monitoring

### Importance of monitoring

Apart from some obvious measures such as replacing old incandescent lamps through more efficient ones or replacing the boiler, it is not always easy to determine what the largest items of energy consumption. The most obvious example is electricity: the only source of information for the whole building is the electricity meter. It is impossible to distinguish between heating, air conditioning, lighting, elevators and other specific appliances.



The other reason why monitoring is important is that it allows to identify abnormal energy consumption by a specific equipment very quickly.

### Modus operandi

An efficient energy monitoring system consists of several energy sub-metering systems for specific parts of the building (such as offices, guest rooms, technical rooms), categories of applications (such as lighting or air conditioning for electricity) and energy sources (such as electricity and gas). The value indicated by sub-metering systems should be read regularly, for example every two weeks.



Source: Tetra Images

Gathered data can then be compared to other information such as room occupancy (to determine energy consumption per room occupied) or weather and time of year.

- Important consumption items can then be identified and energy efficiency measures can be planned
- Abnormal changes (by comparison to the previous period or to the same period the year before) can be detected: they mean that an equipment failure should be fixed or that an equipment should be replaced

### Advantages

- The system makes it possible to identify priority measures and monitor their impact
- View the impact not only of important and costly measures, but also of on-the-run behavioral changes, for example regarding lighting or the way unoccupied rooms are managed

### Recommendations

- In certain cases available metering equipment is sufficient: for example the utility gas meter if only the boiler is connected to the gas network

## Hotel de las Letras, Madrid

★ ★ ★ ★



Source: Hotel de las Letras

**Location:** Madrid, urban

**Facilities:** 109 rooms, 7 500 m<sup>2</sup>, Gym, meeting and multi-function rooms, two restaurants, terrace café, building from 1917 included in Madrid's heritage register

An Energy Management System with real time energy consumption monitoring was implemented.

**Investment costs** € 20 000

**CO<sub>2</sub> emission reduction** 15%

**Payback period** 1,7 years

**Annual energy cost savings** € 12 000 or an equivalent of 10% of total annual energy bill

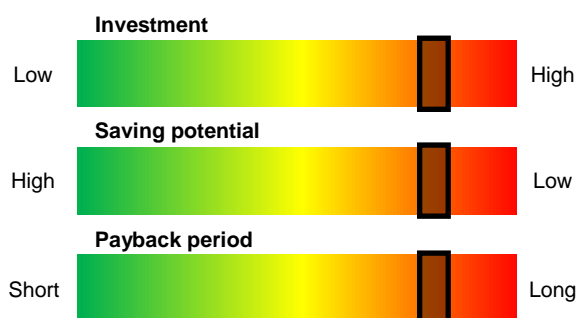


Source: Hotel de las Letras

### 2.7.3 Photovoltaic modules

#### Energy saving potential

Photovoltaic (PV) modules produce electricity from solar radiation. They are generally on the rooftop of buildings, even though it is also possible to build “PV farms” with PV panels on the ground. The electricity produced can then be used for own consumption, or sold to the power company. The latter option is only profitable if the power company would have to buy electricity from PV panels at a profitable feed-in tariff, which is currently not the case.



#### Technology description

Following elements are needed to produce electricity from sunlight:

- PV panels or PV modules are made from PV cells. They convert energy from sunlight to electric energy. Their efficiency depends on their orientation (they should be at a right angle with the sunlight) and the absence of shadows (for example through vegetation).
- The inverter converts direct current produced by PV panels into alternative current that can be used for own consumption or sold to the power company.
- An electricity meter should be used especially when selling electricity to a power company.

#### Advantages

- Useful to produce electricity when there is no electricity network

#### Recommendations

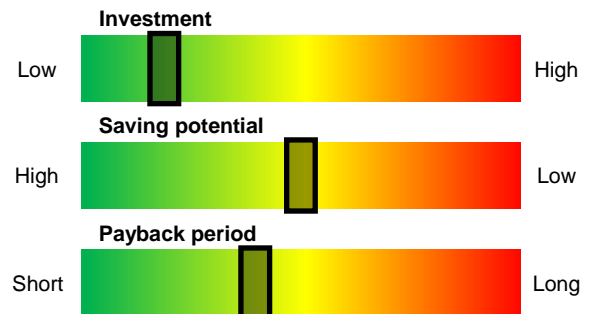
- Check for public aids available and their evolution
- The energy production of PV panels greatly varies with the way they have been installed
- If PV panels are used for own consumption where there is no electricity network, another electricity source is needed since the amount of electricity produced by PV panels depends on the intensity of sunlight. One possibility is to store the electricity produced by PV panels in batteries that release electricity when it is needed.

## 2.7.4 Stand-by killers installation for some appliances

### Energy saving potential

Modern devices such as computers, printers and TV sets do not generally provide a power switch to shut them completely down. They stay in stand-by mode and consume electricity all day round, even if they are not used.

This can lead to expenses amounting from a few Euros to a few tens Euros per year and per device. Stand-by killers cost approximately as much and can lead to short payback periods, especially if several devices are plugged into the same stand-by killer.



### Technology description

Stand-by killers generally detect the stand-by mode by measuring current intensity in the socket. They include a switch or an IR receptor that detects signal from the device’s remote control to switch devices on again.

There are several sorts of stand-by killers. For example, Master-slave devices take the form of a multi-socket. All the sockets are switched off when the device plugged on the “master” socket enters the stand-by mode.

### Advantages

- Useful for relatively old electric appliances such as TV sets in guest rooms

### Recommendations

- New appliances have a much lower stand-by consumption and stand-by killers may not be relevant for them

## 3 Identification and Targeting of Potential Clients

### 3.1 How to identify clients with potentials for EE investments?

In 2014, a total of 65 million foreign tourists visited Spain. 41.1 million stayed in hotels. A total of € 63.1 billion was spent in the tourism sector, which is making up almost 12% of the Spanish GDP.<sup>3</sup> Thus, the sector is an important pillar of the Spanish economy and remained highly profitable during the economic crisis that hit Spain in the last years.

The number of possible clients for a PF4EE loan is as high as the touristic offer in Spain. Big hotel chains have already started to invest in EE measures at the turn of the millennium. Many of them are by now pursuing entire sustainability strategies (e.g. NH, Meliá Hotels International, Iberostar). Overall, 525 million Euros have been invested in the year 2013 in direct or indirect EE measures in Spanish hotels. These investments are spread across the whole sector: Two surveys conducted in the Spanish hotel industry in 2013 and 2014 showed that 75% and respectively 90% out of the surveyed facilities have already implemented some kind of EE measure in the past. But what determines whether a hotel is interested in investing or not?

In the following, we will discuss some parameters which might affect the decision of a hotel manager to take action and thus increase business opportunities for your bank. These include:

- age of the hotel,
- last refurbishment,
- total energy consumption,
- share of energy costs in total costs,
- location,
- hotel chains vs. independent hotels,
- occupancy.

#### Age of the hotel



As of 2014, from a building stock of nearly 8000 hotels operating in Spain, 50% were older than 30 years and only 20% of all hotels were built during the last 10 years.<sup>4</sup> In the tourism sector, Spain competes with other Mediterranean countries like Greece or Turkey, which have a newer hotel building stock. To remain an attractive tourist destination and offer the same comfort to clients, modernization of old hotel buildings and furniture is vital.

Integrating energy efficiency considerations in modernization and renovation measures is often only slightly more expensive but has a decisive impact on future energy bills. And: the older a hotel, the more it can save in implementing EE measures.

Search your client database, find out how old the hotels are and provide them information on the possibilities of the PF4EE.

Or: Propose an additional PF4EE loan to clients who are looking for financing possibilities to refurbish their facilities.

<sup>3</sup>GTAI (2015)

<sup>4</sup>PWC (2013)

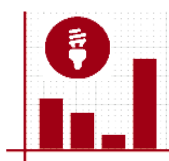


### Last refurbishment

It is not enough to just check how old a hotel is – if it just went through major modernization and renovation measures it will unlikely invest again in EE. After the construction boom at the turn of the millennium in Spain, works have shifted to refurbishment to a differing extent over the last years. Also check which kind of investments were done.

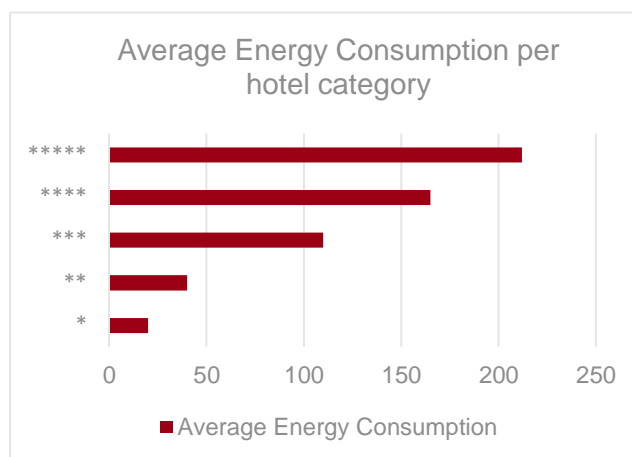


Before approaching your client with an offer for an EE loan, check whether a major investment was registered in the last months for refurbishment for that client and what has been done.



### Total energy consumption

Energy consumption increases considerably with the amount of stars (“\*\*”) a hotel has.<sup>5</sup>In Spain, almost 60 % are three-star (“\*\*\*”) or four-star (“\*\*\*\*”) hotels with an average annual energy consumption of 110 and 165 tons of oil equivalent:



Search your client database for hotels with more than \*\*\*. Their potential to save energy and thus costs is bigger than for \* or \*\* hotels.

### Share of energy costs in total costs

The average cost share of energy costs in Spanish hotels is 9%. However, this cost share varies significantly, from only 4% in hotels with very basic facilities to 25% in luxurious resorts with heated pools, spas and several restaurants operating simultaneously.<sup>6</sup>



Naturally, a higher amount spent in energy also means a higher amount of money that can be saved through EE measures. Attaining the share of a hotel’s energy cost compared to other expenditures is a good starting point to show your client the cost saving potential inherent in EE measures.

<sup>5</sup>PWC (2013)

<sup>6</sup>PWC (2013)

Ask your clients in the hotel sector about their energy cost share. If they know, point out the cost savings through EE. If they don't, propose an initial assessment to see how much they actually spend on energy and how much they can save.



### Location

Spain's most popular tourist destinations are the regions of Catalonia, the Canary Islands, the Balearic Islands, Andalusia, Valencia and Madrid. 85% of all tourists spend their vacations there.<sup>7</sup> At the same time, the overwhelming majority of Spain's oldest tourist accommodations are located in the coastal areas and due to spatial limitations there is not much room left for the construction of new facilities.

As they experience the highest demand, they are also under the most pressure of taking into account the big competition in the tourism sector. At the same time, the overwhelming majority of Spain's oldest tourist accommodations are located in the coastal areas.

Search your client database for hotels in the most popular regions of Catalonia, the Canary Islands, the Balearic Islands, Andalusia, Valencia and Madrid. Convince them of the advantage they will reach over their competitors with state-of-the-art energy facilities.



### Hotel chains vs. independent hotels

There are different considerations to be taken into account here. Hotel chains have in most cases already invested in EE measures and are aware of the potentials. They are reliable clients with good solvency. But they have a tendency to choose small measures with a payback period of less than 2 years.

Independent hotels, on the other hand, have to be made aware of the benefits of EE measures. They are more likely to consider long-term benefits as well and decision making is faster compared to hotel chains.

When addressing hotel chains take into account that they might have already invested in EE and know what you are talking about.

*Or:* When addressing independent hotels point out the benefits of EE at first before also suggesting more comprehensive measures.

### Occupancy

The occupancy rate of a hotel is a good indication for its solvency. Frequently visited hotels have higher revenues and are therefore more likely to plan big investments.



As your clients about their annual occupancy rates. If they are high, suggest an EE investment. Particularly point to the rise in comfort for clients as well (see next section).

<sup>7</sup>AHK (2014)

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## 3.2 Marketing guide for EE measures

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Here are some **arguments** to convince clients of the benefits of EE measures:

### 1. Cost Savings

Saving energy means saving costs. In EU wide comparison, gas and electricity prices are among the highest in Spain and lie considerably above EU average. Therefore, the cost saving potential through energy savings is comparatively high. All the technologies presented in this manual are economically viable and can be recommended to your clients as measures to optimise costs in their hotel business.

### 2. Increase the level of comfort for hotel guest

In many cases, EE measures bring along significant benefits for hotel guests: they do not have to switch off lights any more or control the temperature of their rooms as this is done automatically. Efficient bulbs create a warm and welcoming atmosphere for the guests.

### 3. Increase the level of comfort for hotel staff

Not only guests will benefit from many of the measures introduced in this manual. Also, hotel staff will be alleviated in everyday work process e.g. through automation.

### 4. Improve your image

Sustainable tourism has become the topic of the day and can be used as a unique selling point in today's tout for customers. Most hotel chains have already announced sustainability strategies – they can market financed EE measures under these headlines to increase their credibility. Independent hotels can gain a new client segment through a “green” image. And low-energy buildings can even get a certificate: the so called “certificación verde” issued by the Green Building Council España can be obtained for all buildings whose impact on the environment is smaller than a reference case.

### 5. Achieve a competitive advantage

The money freed through savings in energy expenditure can be invested in other measures to increase the quality of the hotel and make it more competitive.

### 6. Reduce adverse effects on the environment

The tourism industry leaves a significant impact on the environment. Using less energy will reduce that impact and contribute to fighting climatic change.

### 7. Comply with national regulations

The Technical Building Code (Código Técnico de la Edificación) issued by Royal Decree 316/2006 lays down a number of regulations to ensure a sound use of energy in buildings. It entails requirements for a minimum use of renewable energy in electricity and heat generation as well as energy efficiency standards for buildings and appliances (esp. efficient lighting or automation systems). In many cases, refurbishment is needed to comply with national legislation.

### 8. Couple investments with a public support scheme

Some autonomous regions provide subsidies for the implementation of EE or RE measures. Clients can couple their investments with a public subsidy and thereby reduce their investment costs. Check regional energy agencies for more information.

**Marketing tools**

- use your standard marketing channels to communicate the new PF4EE credit line;
- spread the news, for example, via an e-mail campaign to inform existing or potential clients;
- get in touch with tourist associations (e.g., Instituto Tecnológico Hotelero, Turismo Sostenible Media) and inform them about the new EE financing possibility;
- take part in events and meetings of the touristic industry (e.g. Congreso de Eficiencia y Sostenibilidad en el Sector Turístico, FITUR);
- place an advertisement in specialized journals (e.g. Hosteltur).

## 4 How to generate a PF4EE loan

### 4.1 Eligible investments

The eligibility of investments according to the PF4EE requirements depends on different aspects:

1. The **eligibility of the recipient** mainly considers different exclusion criteria regarding activities and sectors of the client but also its creditability and status.
2. In terms of **loan eligibility**, there are defined requirements considering loan amount, maturity and related issues.
3. **Eligible investments** are defined by technical requirements for different technologies but also with regard to EU directives and economic justifications.

In the following, the main aspects of these three eligibility areas are listed. The detailed criteria are stated in the loan documentation between Santander and EIB.

For practical use, MACS and adelphi have developed an eligibility checking tool which helps bank staff to verify the eligibility of potential loans.

An **eligible recipient** must:

Be a Small and medium-sized enterprises (SME), middle capitalization enterprise or a large enterprise according to EU regulations



Have a credit ranking of at least 6- or equivalent if the internal credit rating procedure is amended



Not be a “firm in difficulty”



Not be active as a financial institution or financial holding company



Not be active in excluded sectors or performing certain activities as defined in the Loan Agreement



Be established and operating in Spain



The main requirements for the **loan eligibility** are:

EE loans shall not be below EUR 40 000 & not exceed EUR 5 million for SMEs or EE measures in buildings; in all over cases, the maximum loan amount is EUR 1.125 million



The loan amount can cover up to 75% of investment costs; in non-convergence region total EU community financing shall not exceed 70%



The loan maturity shall not be shorter than 3 years



The loan shall be disbursed latest on March 31, 2020



For **eligible investments** different requirements are defined:

The investment has to be carried out by owners or operators of hotels or by ESCOs contracted by the owners



The project must be motivated by energy efficiency which shall be identified and defined on the basis of an energy efficiency certification in compliance with the Real Decreto 235/2013



Investments in renewable energy must not be stand-alone projects meaning that the generation of energy by RE investments have to directly benefit the location or building where the project is located. This is called "predominant captive use".



The investment shall not have been completed by more than 50% by 7<sup>th</sup> October 2015 and shall be completed latest on March 31, 2020



Projects must be commercially profitable. The main economic criterion is that the discounted value of the benefits of energy savings over the project lifetime covers at least 50% of investment costs. The verification of the economic justification can be done with the eligibility checking tool.



- Additional requirements are defined for specific measures like:
  - EE in buildings
  - High efficiency co-generation
  - Use of biomass
  - Geothermal
  - Solar energy (PV and solar thermal)
- Besides the technical equipment itself, studies and engineering, civil works, installation, technical and price contingencies can also be covered by PF4EE financing
- Recoverable costs such as VAT are not included in PF4EE financing.

Exemplarily for two measures in the hotel sector, “EE in buildings” and “solar energy”, the detailed requirements are listed as follows:

**EE in buildings:**

- Only renovations - not the construction of new buildings - are financed under PF4EE.
- The renovation measures<sup>8</sup> must be consistent with national building energy efficiency standards and must be indicated by an energy audit<sup>9</sup> or by an Energy Performance Certificate.<sup>10</sup>
- After completion of the project, a building energy performance certificate must be issued.

**Solar thermal system:**

- The solar thermal system should dominantly support the energy supply of the respective building.
- An independent and qualified feasibility study or energy audit should have been done for the project.
- Implementation and operations should be conducted by qualified specialists with proven experience.
- The technical system to be installed should be a proven technological solution from certified suppliers.
- The heat generation should demonstrate economic competitiveness with conventional alternatives.

**Not eligible** for financing under the PF4EE facility are:



<sup>8</sup> Renovation measures are any technical measures which increase the energy efficiency of the building or a part of it. The measures can be related to the building itself (e.g. building envelope, walls and windows) or equipment in the building which leads to energy consumption (e.g. lighting, cooling but also Building Management Systems).

<sup>9</sup> in accordance with EN 16247

<sup>10</sup> in line with the Energy Performance Buildings Directive (EPBD)

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## 4.2 Documentation required for loan eligibility approval and documentation

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The PF4EE facility requires certain documentation for reporting. Some information can be taken from the bank's Management Information System (MIS), other has to be delivered by the client. Information provided by the client should be, as far as possible, based on written documents or reports.

Depending on the specific investment project the additional information can consist of:

- Documentation of energy efficiency in line with Real Decreto 235/2013;
- Building energy performance certificates according to Energy Performance of Buildings Directive (EPDB);
- Environmental and social impact assessment reports;

For a project related to "EE in buildings" the relevant energy audit or Energy Performance Certificate should be provided by the client. Also, as part of the energy audit, the client has to deliver information about the energy consumption before and after the implementation of the project.

For solar thermal systems the client has to deliver several documents and information. These include: a feasibility study or an energy audit report of the project, calculation if the project is competitive against fossil fuel alternatives including the capacity and expected annual heat generation as well as evidence if the project uses certified technologies and suppliers.

For satisfying the detailed requirements, the bank's staff can use the eligibility checking tool. The tool leads the bank staff through the specific questions and requirements and helps to document the information needed.

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## 4.3 Partnerships with ESCO companies, specialized engineering firms etc.

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We strongly recommend the establishment of alliances (either partnerships, joint ventures etc) to develop EE projects in buildings. The bank can leverage on the ESCOs expertise and, in some cases, the ESCO may have a financial arm able to cover the audit or pre-feasibility study costs. On the other hand, ESCOs may be interested in the Santander support to tackle the project, and the trust worthy image that the bank may have among its clients.



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