ENERGY EFFICIENCY SERIES

HOTEL ENERGY SOLUTIONS

Key Energy Efficiency Technologies Database for SME Hotels

Hotel Energy Solutions Official Partners

UNWTO · UNEP United Nations Environment Programme · ihra International Hotel & Restaurant Association · ADEME · EREC

Supported by

INTELLIGENT ENERGY EUROPE

KEY ENERGY EFFICIENCY TECHNOLOGIES DATABASE FOR SME HOTELS

Legal Disclaimer

The sole responsibility for the content of this publication lies with the authors (the Hotel Energy Solutions official partners). It does not necessarily reflect the opinion of the European Union. Neither the EACI nor the European Commission are responsible for any use that may be made of the information contained therein.

Please cite this publication as

Hotel Energy Solutions (2011), Key Energy Efficiency Technologies Database for SME Hotels, Hotel Energy Solutions project publications

First edition: 2010
Revised version, July 2011

Hotel Energy Solutions (HES) Project Basics
Full name: Excellence in Energy for the Tourism Industry – Accommodation sector: SME hotels (EETI)
Contract N°: IEE/07/468/S12.499390

Hotel Energy Official Partners

UNWTO UNEP ihra ADEME EREC

Project Supported by

Supported by INTELLIGENT ENERGY EUROPE

KEY ENERGY EFFICIENCY TECHNOLOGIES DATABASE FOR SME HOTELS

Table of Contents

ENERGY EFFICIENCY SOLUTIONS DATABASE 2

Introduction to the database 2

Energy efficiency solutions identified 2
About investment costs and return on investment estimates 3
Assumptions underlying the evaluation of carbon emissions reduction 4

Datasheets of the 20 key energy efficient solutions identified for SME hotels 6

Energy Efficiency solutions database

Introduction to the database

The purpose of this report is to give a detailed description of the 20 energy efficiency solutions that have been identified for application in SME hotels. The resulting 20 datasheets constitute the database of energy efficiency solutions that is to be provided by the HES (Hotel Energy Solutions) project.

Energy efficiency solutions identified

20 key energy efficiency solutions have been identified for application in SME hotels. They are listed below.

- ***Key EE solution n°I*** Energy consumption monitoring
- ***Key EE solution n°II*** Energy audit of the hotel
- ***Key EE solution n°III*** Audit for the EU Eco-label for tourist accommodation service
- ***Key EE solution n°IV*** Staff training
- ***Key EE solution n°V*** Information to guests
- ***Key EE solution n°VI*** Window insulation
- ***Key EE solution n°VII*** Building insulation
- ***Key EE solution n°VIII*** Prevention of air infiltration and of unnecessary outdoor air supply
- ***Key EE solution n°IX*** Installation of sun shading devices
- ***Key EE solution n°X*** Exterior works to improve summer comfort
- ***Key EE solution n°XI*** Key card systems to switch off electricity in guest rooms
- ***Key EE solution n°XII*** Lighting controls
- ***Key EE solution n°XIII*** Energy saving light bulbs
- ***Key EE solution n°XIV*** Energy efficiency rating of electric appliances
- ***Key EE solution n°XV*** Energy efficient motors in HVAC applications
- ***Key EE solution n°XVI*** Regulation of space heating and cooling
- ***Key EE solution n°XVII*** High efficiency boilers
- ***Key EE solution n°XVIII*** Thermal insulation of boilers, water systems, domestic hot water tanks and water pipes
- ***Key EE solution n°XIX*** Efficient solutions for active space cooling
- ***Key EE solution n°XX*** Efficient ventilation systems

Information about:

- the selection criteria of the 20 key energy efficient solutions,
- the structure of the datasheet used to describe the solutions (type of information provided…),
- the principle of the "solution provider" we suggest implementing in the HES (Hotel Energy Solution) project toolkit, based on the information contained in the 20 datasheets,is provided in a separate document called "Assessment of full range of energy efficiency solutions available to SME hotels & overview menu of the key solutions" (WP4 deliverable).

About investment costs and return on investment estimates

Investment costs

Assessing the investment costs of EE and RE solutions is difficult because they depend on many parameters, including the following:

- Equipment **prices** vary among suppliers and among countries, they are not always available (not all suppliers wish to give their prices) and they need to be updated regularly as they evolve quickly.
- **Installation costs** vary greatly between countries (due, for example, to differences in labour costs). Those costs also depend greatly on whether the installation work requires shutting down the hotel or not.
- The **legal framework** also affects investment costs significantly, depending on whether there are any national/local grants, tax credits or subsidy schemes (for example, in France, there are tax credits when implementing RE and EE technologies provided the system is installed by a professional). Legal frameworks are often complex, very different from one country to another, and evolve quickly with time. Also, advantageous incentives may sometimes introduce variation in prices, in particular for non-mature markets.

Return on investment

Return on investment is also difficult to estimate because it depends on the following parameters:

- **investment costs**: as seen previously, investment costs depend very much on the local context,
- **maintenance costs**: like installation costs, maintenance costs vary greatly between countries, due to differences in labour costs.
- **cost savings induced by energy savings**: these cost savings are directly dependent on energy prices. Energy prices fluctuate greatly with time (as shown by the volatility of oil prices since 2007) and are very different from one country to another. Moreover, energy savings are themselves rough estimates – they depend greatly on the hotel's initial situation and on the behaviour of its users.

For all these reasons, it was decided not to focus on presenting ***investment costs*** and ***return on investment***:

- even though some information is provided on these two data (in the form of an approximate cost and an approximate number of years), it is explicitly written for each solution that: *"costs and return on investment may vary greatly depending on the local context and on the hotel's initial situation".*
- in any case, the prices may be considered as closely linked to the ease of implementation ranking from "easy" to "difficult" [equivalent to cheap (*), medium (**), expensive (***)]. We therefore recommend stressing the ***ease of implementation ranking*** in the solution provider that is to be developed.

We also recommend presenting as priority the ***end-use*** the solution relates to (space heating, hot water production, lighting…) as this type of information may be quite relevant to the hotelier for prioritizing the solutions:

- the hotelier can then refer to the information on the ***potential energy savings*** to estimate roughly the costs savings that can be obtained by implementing the solution (based on the energy price that applies to his hotel),

he can also read about the rough estimate of ***carbon emission reduction*** (expressed in teq CO_2) resulting from the solution (this information is provided in order to raise his awareness of the environmental benefits provided by the solution).

Assumptions underlying the evaluation of carbon emissions reduction

Carbon emissions reduction resulting from the implementation of the solutions has been evaluated roughly from the data on energy savings, given some hypotheses on the size of the hotel and certain annual energy consumption and according to French carbon emission factors.

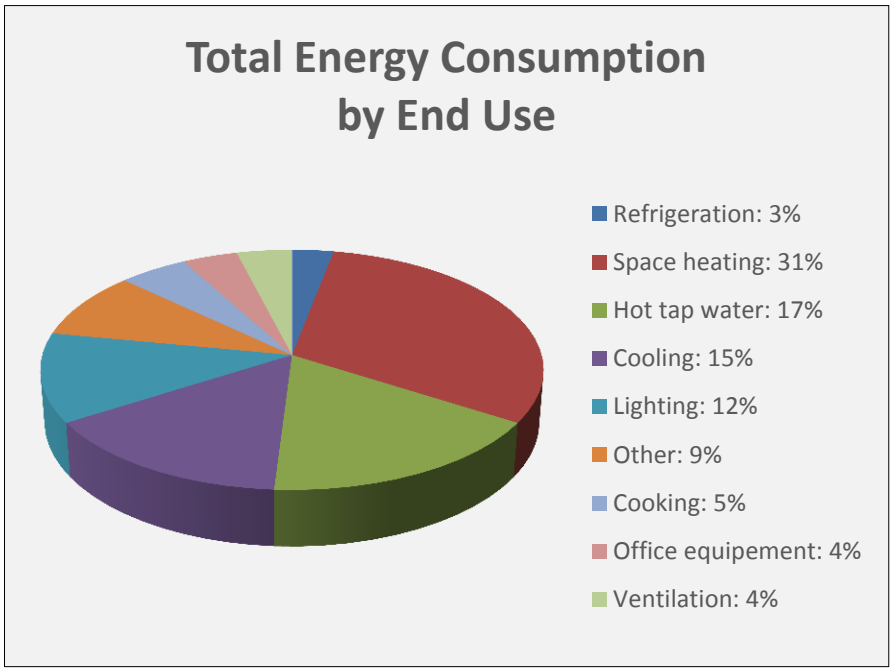
Hypothesis on the hotel size and on its total energy consumption

A hotel with a 1,000 m2 surface and with an annual energy consumption of 250 kWh/m2 has been assumed. This energy consumption is representative of small hotels (<50 bedrooms) in Europe *(IMPIVA, 1994)*.

The hotelier may make a comparison with this "reference case" by converting his annual energy bills (in euros) into annual energy consumption (in kWh) and by comparing this to the reference case (250,000 kWh/year).

Hypothesis on energy consumption by end-use

A typical breakdown of energy consumption by end-use has been assumed (see Figure below).



Typical total energy consumption by end-use in hotels (Leonardo ENERGY, 2008)

The energy carriers considered for the reference case are: electricity (47% of total energy consumption) and gas (53%). The energy carrier considered for each end–use is indicated in the following table:

End-uses involving electricity consumption (assumption)	Percentage of total energy consumption by end-use	Annual energy consumption by end-use (kWh)
Cooling	15%	37 500
Lighting	12%	30 000
Office equipment	4%	10 000
Ventilation	4%	10 000
Refrigeration	3%	7 500
Others	9%	22 500
Total	47%	117 500
End-uses involving gas consumption (assumption)	**Percentage of total energy consumption by end-use**	**Annual energy consumption by end-use**
Space heating	31%	77 500
Hot tap water	17%	42 500
Cooking	5%	12 500
Total	53%	132 0

Percentages of energy savings induced by the solutions on a specific use are then used to calculate annual energy savings (in kWh). The French carbon emission factors for electricity and gas (expressed in teq CO2/kWh) are then applied to annual energy savings (expressed in kWh) to obtain an estimate of carbon emission reduction (in teq CO_2). *Note that French carbon emission factor for electricity may not be representative on the European scale due to the specificities of electricity production in France (dominated by nuclear production). The values of CO_2 savings presented in this report can thus be considered as conservative.*

Datasheets of the 20 key energy efficient solutions identified for SME hotels

Energy Efficiency Solutions n°I

Energy consumption monitoring

General information on the solution

"Targets":

- Hotel area: General
- End-use: All

Related criteria of the EU Eco-label:

Monitoring of energy consumption (electricity, energy used for heating…) & water consumption is a mandatory criterion of the EU Eco-label (#27).

Installation of additional energy and water meters to allow consumption monitoring of different activities or machines counts as an optional criterion of the EU Eco-label.

About its implementation:

- Ease: Easy (*)
- Best moment: can be done at any time.
- Relevant initial situation: the hotel does not monitor its energy use.

Indicative cost:

- Reading energy consumption: 0 €
- Submeters: approx. 40-50 € + workmanship

Indicative return on investment time:

< 1 year. N*ote that costs and return on investment may vary greatly depending on the local context and on the hotel's initial situation*

Description of the solution

Principle

Energy consumption monitoring is highly recommended to establish **fundamental information on energy use in the hotel**. It can help reveal problems (e.g. abnormal changes in energy consumption), identify energy saving opportunities, and verify the effectiveness of the energy conservation measures you have implemented.

Energy bills are generally the main source of data, which is why it is important to keep track of your energy bills and to analyse them regularly.

If you are running a large hotel, it can be useful to determine the energy consumption of some individual areas and departments (e.g. office, kitchen, rooms per floor, apartments…).

The easiest way to access this information is to install **energy sub-meters**. But before deciding to install sub-meters, you should have a scheme in mind so that staff can take simple corrective actions based on the sub-metering information.

Recommendations

How to proceed to analyse your energy consumptions?

- **Data collection**

Gather your monthly energy bills and check that each energy bill contains information on: total amount of energy consumed, cost per unit, total cost. Also gather your energy bills from the two previous years.

- **Data analysis**

Annual consumption assessment: For each year you have data, prepare a table showing the total annual Consumption and cost of each type of energy (electricity, gas, etc.). Also indicate the main end-uses of the different energy sources used. Use this data to calculate the energy performance index (per m^2 of indoor area) and the energy consumption per guest night sold (to compare with other hotels).

How much energy does your hotel use and where does it go?

Energy source	Main end-uses	Annual consumption (KWh) (*)	% of total annual consumption	Cost
Electricity	*Lightin g…*	(…)	(…)	(…)
Natural gas	(…)	(…)	(…)	(…)
Gas oil	(…)	(…)	(…)	(…)
District heating	(…)	(…)	(…)	(…)
(…)	(…)	(…)	(…)	(…)
Total energy consumption & cost		(…)	100%	

- Annual energy consumption per m2: (…)
- Energy consumption per guest night sold: (…)

To help you convert the different energy units into kWh, prepare a conversion table to keep in your records. (see below)

Conversion table (typical conversions are indicated as rough estimates):

Energy source	Unit generally used	Equivalent in KWh
Natural gas	m^3	1 m^3 = 11.9 kWh
Gas oil	Litre	1 litre = 10.9 kWh
Heavy fuel oil	Litre	1 litre = 11.4 kWh
Wood	Kg	1 kg = 4.1 KWh

Note: Ask your energy provider for other conversion factors.

Evolution of energy consumption with time:

See if your energy consumption (total consumption and consumption of each energy source) has changed significantly from one year to another (and then from one month to another). Investigate if there is a correlation between energy consumption and occupancy (i.e. guest nights sold) or weather conditions.

Total energy consumption for the time period considered:

Time period considered (month / year)	Occu pancy	Energy consumption (kWh or other unit)	Cost
(…)	(…)	(…)	(…)

Reproduce the same table for each energy source (electricity, gas, etc.).

How to find out the energy use of individual areas or pieces of equipment:

- The most obvious solution in many cases is to install a sub-meter which can measure the energy use in just one separate circuit. Where many circuits are to be monitored, sophisticated systems which network these meters together and feed data back to a computer can be used.

- For monitoring equipment or sub-circuits which are 'hard-wired', energy monitors with sensors which can be wrapped round the connecting wires can be used. These log energy use over an observation period and store the data for download to a computer for analysis.

Link with other solutions in the database

Solution n°I (energy consumption monitoring) can be followed by a more in-depth energy audit of the hotel (solution n° II)

Benefits for the hotel

Cost reduction

Energy saving

Corrective actions resulting from energy monitoring can lead to 8-10% of energy saving.

Get the right contract from your energy supplier:

Knowing your energy consumption patterns will help you get the best possible energy deal in the future.

Staff involvement

Involving your staff

Informing your staff on hotel energy consumption is a good way to encourage them to take part in energy conservation measures.

Note that some hotels have decided to offer their staff a bonus when energy consumption is decreased.

Benefit for the environment

CO_2

Carbon emissions reduction

For a 1,000 m^2 hotel with an annual energy consumption of 250 kWh/m^2 (47% electricity and 53% of gas), and if French emission factors are applied, a 10% energy saving on electricity and gas represents:

4.05 teq CO2 avoided each year

French emission factor for electricity: 84.3 gCO2 / kWh.
French emission factor for gas: 231 gCO2 / kWh (Source: ADEME).

Market availability

Maturity of the solution: mature.

Manufacturers / suppliers of energy sub-meters :

- Delta Dore www.deltadore.com,
- Schneider Electric www.schneider-electric.com

Energy Efficiency Solutions n°II

Energy audit of the hotel

General information on the solution

"Targets":

- Hotel area: General
- End-use: All (space heating, hot water production, specific usage of electricity, etc.)

Related criteria of the EU Eco-label:

Audit of the energy efficiency of the building is an optional criterion of the EU Eco-label.

About its implementation:

- Ease: Easy (*)
- Best moment: can be done at any time. Recommended before undertaking renovation work in the hotel.
- Relevant initial situation: No energy audit of the hotel has been carried out for the last 5 years.

Indicative cost:

- Energy auditing: approx. 10 k€ (possible financial support – see below)

Indicative return on investment time:

- Depends on the actions taken after the audit.

Note that costs and return on investment may vary greatly depending on the local context and on the hotel's initial situation.

Description of the solution

Principle

Having an energy audit made by an energy expert is the best way to get a comprehensive view of the actions that need to be taken in order to improve the energy efficiency of a specific hotel.

It is an essential step if you want to identify the technical solutions that are the most appropriate to your hotel.

Benefits from an energy audit:

An energy audit will:

- reveal problems that can be solved easily through simple, inexpensive actions,
- identify areas of improvement and assess the potential for energy savings,

- help you set priorities, in particular for large investments (building insulation, space heating equipment, etc.) for large investments (building insulation, space heating equipment, etc.).

Steps of an energy audit:

- **On-site survey**: during the on-site survey, the characteristics of hotel buildings and equipment are examined and described in detail (space use, building condition, equipment conditions and use, maintenance, etc). Data of energy consumption are also examined.
- **Data treatment**: calculations are made to interpret data collected on-site. Areas of improvement are identified, costs of each measure and return on investment are calculated.
- **Recommendations delivery:** at the end of the audit, a consolidated list of recommendations is provided to the hotelier, who can then choose which actions to undertake.

Steps of an energy audit

Recommendations

About energy audits

Which organisations may I contact to get information and support for an energy audit?

- A variety of organisations can help you carry out an energy audit, either by providing you with complementary information (list of service providers, etc.) or by providing you with financial support for this. These organisations include: energy agencies, local authorities, chambers of commerce and industry, etc.
- Note also that some service providers (e.g. energy suppliers) have developed a service that includes both the energy audit of the hotel and the financial set-up. These service providers may also provide financial support (in the form of credit at advantageous interest rates, etc).

Note also that an energy audit may be combined with an assessment of carbon emissions resulting from energy consuming activities.

Other possible audits:

Other types of audits are available to hotels: environmental audits, audits for eco-labels (like the EU Eco-label), carbon assessments, etc. Here is some information to help you evaluate which type of audit is the most appropriate for your facilities.

The environmental audit

- An environmental audit has a **wider scope** than an energy audit, as it takes into account all environmental areas (waste, energy, water, environmental management and marketing, etc.).
- The environmental audit is recommended as a first step. It will help you get an overview of your hotel's environmental impact and set up priorities.

The audit for the EU Eco-label

- The audit for the EU Eco-label **(solution n°III)** assesses whether your hotel qualifies for the EU Eco-label. The following issues are considered: energy consumption, water consumption, waste production, use of chemical products and environmental management. *For more information on the EU Eco-label: www.ecolabel-tourism.eu*.

EU Eco-label

The carbon assessment

- Carbon assessment is one type of environmental audit. It assesses the green house gas (GHG) emissions resulting from the hotel's operations and is a first step in order to reduce these emissions**.** The aspects considered may include:
  - energy consuming activities (laundry, space conditioning…)
  - products/supplies transportation,
  - staff transportation,
  - building construction,
  - waste handling and disposal, etc.

The global business impact is usually expressed in terms of carbon equivalent tons and in terms of CO_2 equivalent tons.

- If you have a carbon assessment made by a service provider, you should make sure that they use a methodology that is compatible with ISO 14064 norm, with the GHG protocol initiative and with the Directive n° 2003/87/CE relative to CO2 emissions quotas exchange.

Link with others database

It is recommended that you collect data about your energy consumption (solution n°I) before having an energy audit (solution n°II) in order to get a preliminary view of the energy consumption of your hotel and as preparation for the energy audit

Benefits for the hotel

Prepare an effective action plan

Make informed choices

The energy audit is essential to identify energy saving potentials and to get recommendations specific to your hotel. It will help you make informed choices on future investment and renovation work.

Involve your staff

Audits can be useful for raising staff awareness on the environmental impact of your hotel and for involving your staff in your action plan.

Market availability

Maturity of the solution: mature.

Manufacturers / suppliers of energy sub-meters :

- Delta Dore www.deltadore.com,
- Schneider Electric www.schneider-electric.com

Energy Efficiency Solutions n°III

"Audit" for the European Eco-label for tourist accommodation service

General information on the solution

"Targets":

- Hotel area: General
- End-use: All (space heating, hot water production, specific usage of electricity, etc.)

About its implementation:

- Ease: Easy to moderate (*/**)
- Best moment: can be done at any time. Recommended before undertaking renovation work in the hotel.
- Relevant initial situation: The hotelier is planning to set up an environmental policy for the hotel.

Indicative cost

(*Commission Decision of 9 July 2009*):

- Fees for qualifying for the Eco-label: can be around 1,500 € (75% reduction in the application fee for micro enterprises)
- Annual fee: the minimum annual fee for a micro-enterprise is 100 €.

Indicative return on investment time:

- Depends on the actions taken.
- Market visibility is an important benefit.

Description of the solution

Principle

If you are planning to set up an environmental policy and action plan for your hotel, it may be worth starting by assessing whether your hotel meets the standards of the EU Eco-label, and what actions you would need to take to qualify for the EU Eco-label.

The EU Eco-label is an official certification from the European Union that has gained European-wide recognition and can be effectively integrated into your marketing strategy. Even if you are not planning to obtain the EU Eco-label, reading about it may give you ideas of the actions you can take to improve your hotel's environmental performance, especially as regards energy use and efficiency.

General purpose of the EU Eco-label

- The EU Eco-label for tourist accommodation has been created to identify and highlight tourism companies that respect the environment. The EU-flower logo signals high environmental performance to customers.
- Because a growing number of guests now demand environmentally friendly accommodation, the EU Eco-label can be a strong marketing asset for your hotel.

What are the requirements to qualify for the EU Eco-label?

- **The criteria** of the EU Eco-label relate to the following environmental domains:
  - energy consumption,
  - water consumption,
  - waste production,
  - use of chemical products,
  - environmental management.
- **Some criteria are mandatory** while others are optional – but the hotel needs to satisfy a sufficient number of the optional criteria in order to qualify. *For more information about the EU Eco-label criteria, go to www.ecolabel-tourism.eu.*
- **As a first step**, you can evaluate how far your hotel is from the EU Eco-label by considering all mandatory criteria and assessing if your hotel meets or exceeds them. This will give you a first idea of the efforts you may need to make in order to qualify for the EU Eco-label. Then, you can go further and review the optional criteria.

- *As regards energy aspects, the table provided below shows which criteria (mandatory, optional) deal with the hotel's energy efficiency.*
- *You can find more detailed information about the requirements for each criterion on the www.traintoecolabel.org website. (Please note that this website is based on the "old criteria" for the EU Eco-label that were valid until October 31st, 2009. It had not been updated as of August 2010).*

Energy efficiency aspects of the EU Eco-label (Commission Decision of 9 July 2009)

The table below lists all the criteria that deal directly or indirectly with **energy aspects**. The table specifies whether the criteria are mandatory or optional, and whether they deal with: the type of energy used, equipment efficiency / equipment regulation, building characteristics, management measures.

	Criteria #	Mandatory / Optional	Specific aspect addressed by the criteria
			Type of energy used
	1	M	▪ Use of electricity from renewable sources (at least 50%)
	2	M	▪ No use of coal and heavy oils
	30	O	▪ Generation of electricity through renewable energy sources (at least 20% of annual consumption)
	31	O	▪ Energy from renewable energy sources
	34	O	▪ District heating
	35	O	▪ Combined heat and power
	36	O	▪ Use of heat pump
	48	O	▪ Swimming pool heated with renewable energy sources
			Equipment efficiency / Equipment regulation
	3	M	▪ Efficiency and heat generation
	4	M	▪ Air conditioning (class A)
	7	M	▪ Switching off heating or air conditioning
	8	M	▪ Switching off lights
	9	M	▪ Energy efficient light bulbs
	10	M	▪ Outside heating appliances
	32	O	▪ Boiler energy efficiency
	33	O	▪ Boiler No emissions
	37	O	▪ Heat recovery
	38	O	▪ Thermoregulation
	40	O	▪ Air conditioning (15% more efficient than class A)
	41	O	▪ Automatic switch-off air conditioning and heating systems
	43	O	▪ Energy efficient refrigerators, ovens, dishwashers, washing machines, dryers/tumblers and office equipment
	45	O	▪ Refrigerator positioning
	46	O	▪ Automatic switching off of lights in guest rooms
	47	O	▪ Sauna timer control
	49	O	▪ Automatic switching off of outside lights
			Building characteristics
	5	M	▪ Energy efficiency of buildings
	6	M	▪ Window insulation
	39	O	▪ Energy performance audits for buildings
	42	O	▪ Bioclimatic architecture
			Management measures that have an impact on energy use
	23	M	▪ Maintenance and servicing of boilers and air-conditioning systems
	24	M	▪ Policy setting and environmental programme
	25	M	▪ Staff training
	26	M	▪ Information to guests
	27	M	▪ Energy and water consumption data
	29	M	▪ Information appearing on the eco-label
	89	O	▪ Energy and water meters

Recommendations

How to apply for the EU Eco-label?

- If you think that your hotel qualifies for the EU Eco-label, it is highly recommended to apply for it. **The first step** is to get in contact with your "competent body", which is the national organisation responsible for the application for the EU Eco-label in your country. It will give you information on the application procedure.

- You will then have to provide a **detailed dossier** showing how technical criteria have been met.

- (The "competent body" is responsible for the verification of compliance prior to the awarding of the Eco-label and may make further checks on submitted data).

- If your application is in conformity with the requirements and the application fee is paid, your hotel is **awarded** the Eco-label.

Link with other solutions in the database

The energy audit is another audit that is available to hotels **(solution n°II)**. The energy audit is entirely focused on energy aspects and does not lead to certification.

Benefits for the hotel

Prepare an effective action plan

Make choices that have gained Europe-wide recognition

The EU Eco-label requirements can help you develop a strategy for your hotel and define an environmental action plan, based on criteria that have gained Europe-wide recognition.

Involve your staff

Working on the implementation of the EU Eco-label is a very effective way to raise staff awareness on the environmental impact of your hotel and to involve your staff in your action plan.

Market availability

Maturity of the solution: mature.

Manufacturers / suppliers of energy sub-meters :

- Delta Dore www.deltadore.com,
- Schneider Electric www.schneider-electric.com

Key Energy Efficiency Solutions n°IV

Staff training

General information on the solution

"Targets":

- Hotel area: Guest rooms, conference rooms, general
- End-use: Lighting, space heating, space cooling, specific usage of electricity (TVs…)

Related criteria of the EU Eco-label:

Providing information and training to the staff to ensure application of environmental measures and encourage environmentally friendly behaviour is a mandatory criterion of the EU eco-label (#25).

About its implementation:

- Ease: Easy (*)
- Best moment: can be done at any time.
- Relevant initial situation: the hotel does not have any information strategy on its environmental policy towards its staff, nor does it inform staff about the actions they can take to help save energy.

Cost:

- Time to be spent on the preparation of the information supports, written procedures or manuals, and in meetings
- If the hotel is big enough: hiring a consulting firm specialized in staff training can be considered (optional)

Indicative return on investment time:

Can be <1 year (depends however on the actions taken)

Description of the solution

Principle

Involving your staff in your energy action plan is not only essential for your energy efficiency policy to be successful, it is also a very effective way to motivate them and give a new meaning to the business! Indeed, as long as you explain to your staff that energy efficiency is part of your environmental strategy, most of them will be happy to contribute to your efforts for a more sustainable business.

To actively involve your staff, we highly recommend that you provide your staff with **information** and **training** on the actions they should take to support your efforts. And because **continuous improvement** is an important part of the hotel action plan, you should also invite your staff to provide you with their feedback and ideas to save more energy!

Suggested information/training strategy

Staff information and training is a highly efficient and effective measure to improve the way energy is used in a hotel

- Although it may cost a little time and money to inform and train your staff, the resulting benefits will show up in a very short time because staff behaviour has a direct impact on energy consumption (just like guests' behaviour).

- Remember also that behavioural change does not imply reduction in comfort and does not mean setting restrictions: it is about improving the way energy is used, and avoiding unnecessary energy consumption

Recommendations

What to inform and train the staff about?

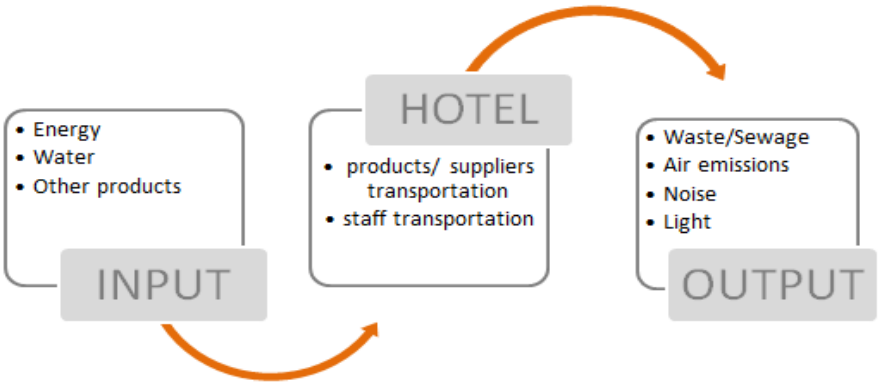
- **Environmental impact of hotels:** information should first be given on the global environmental impact of the hotel industry, in order to raise the staff's awareness. The main point here is to recognize and show that many of the services provided by hotels are resource-intensive, whether they concern energy, water, raw materials – or even natural landscapes; and that different kinds of pollution result from hotel activities, including greenhouse gas emissions from energy use, solid waste, sewage, chemical pollution resulting from massive use of disinfectant and detergents, etc. This results in a significant ecological footprint.

You may tell your staff, for instance, that hotels have been found to have the highest negative impact on the environment of all commercial buildings, with the exception of hospitals.

- **Your hotel's environmental impact:** providing figures (or other indicators) on your hotel's environmental footprint is a very effective way to raise staff's awareness. For instance, you can inform them of the quantity of energy and water used annually, the quantity of solid waste produced, and the quantity of carbon emissions resulting from the hotel's activities (if you have had a carbon assessment made). Most of these figures will be necessary anyway if you intend to set up an environmental action plan, because making a first assessment is the starting point!

- **The hotel environmental action plan:** you should state the environmental objectives that you have adopted for your hotel (if already defined) and provide information on the actions taken (or that you want to take) to reduce its environmental impact.

Environmental aspects involved in running a hotel:



- **energy matters**: first, it is important to explain that a reduction of the hotel's energy consumption is part of your environmental strategy. You may say, for instance:

  "Huge amounts of energy are used by hotel facilities worldwide, most being derived from fossil fuels, thus generating huge amounts of greenhouse gas. By improving the energy efficiency of our hotel and by avoiding waste of energy, our hotel is taking an important step to reduce its greenhouse gas emissions and to contribute to the preservation of the earth's natural resources."

You should then present the **main lines of your energy action plan**, remembering that you can act at three different levels:

1. **evaluation:** assessing the energy situation of the hotel is essential to get a view of the actions your hotel needs to take to improve its energy efficiency; it is usually a first step.

2. **organisational and behavioural change:** the implementation of an energy action plan requires the establishing of clear objectives and monitoring, which will affect all parts of your hotel; besides, for your energy policy to be successful, it is essential to involve your staff and your guests, so as to induce long-lasting change in behaviours.

3. **technical solutions:** improving the energy efficiency of a hotel also requires investment in energy efficient solutions. These solutions can be either "immediate" solutions (like changing light bulbs) or "more demanding" solutions. Whenever possible, protection of the building from the cold and hot weather should be considered (thermal insulation of the building, etc).

Possible actions that a hotel can take to reduce its energy consumption:

- Make a first assessment
- Involve your guests
- Involve your staff
- Improve efficiency of equipment
- Protect the building from the cold and hot weather

- **Targeted information and training on energy matters**: the information and training provided should be related to the daily activities of staff. If your hotel is large, you may need to provide specific information and training for each department. The table below shows examples of subjects to be addressed:

Subjects to be addressed…

… with all staff

- implications of the energy policy in terms of organisation, responsibilities…
- good housekeeping practices that should be followed:
  - try to keep doors and windows shut when the heating or air-cooling system is on,
  - adjust thermostats to a reasonable temperature in winter (around 20-22°C) and in summer (around 25-26°C),
  - turn off all unnecessary equipment (lights…).

… with staff at the reception desk (front desk)

- information to provide to arriving guests (on the environmental policy of the hotel, on its energy action plan…).

… with the cleaning staff

- good housekeeping practices for guest rooms:
  - adjust thermostats to a reasonable temperature when leaving the room (you may even stop heating and cooling if the room is unoccupied),
  - switch off lights when leaving the room,
  - turn televisions off when leaving the room (avoid sleep mode),
  - close windows when the heating system or air-conditioning system is switched on,
  - inform the maintenance staff in case of water leaks.
- good housekeeping practices for conference and meeting rooms:
  - adjust thermostats to a reasonable temperature (you may even stop heating and cooling if the room is unoccupied),
  - switch off lights if the room is unoccupied.

… with the maintenance/technical staff

- energy consumption monitoring: investigate the possibility of monitoring the energy consumption of specific equipment items (boilers…),
- regulation of heating/cooling/ventilation equipment: make sure the current regulation is appropriate, and take necessary corrective actions if not appropriate;
- maintenance and servicing of heating/cooling/ventilation equipment: make sure maintenance and servicing are as properly and regularly carried out as they should be!
- improvement of the building envelope: check if there is any deterioration of the building envelope; if maintenance work has to be done, evaluate the opportunity to improve the building envelope at the same time (prevention of air infiltration, upgrade of the thermal insulation...),
- improvement of equipment: evaluate opportunities to improve (or even change) technical equipment to gain better energy efficiency and better service.

Invite your staff to let you know if they have suggestions for ways to reduce energy consumption and improve your hotel's environmental friendliness!

How to inform and train staff? Which communication medium to use (oral communication, written procedures…)?

- The main point is to have **an active communication** (written, oral…).

- **Training sessions:** adequate training should be provided to all staff at least once a year. If the hotel is large, there may be one or two annual meetings with all staff to present and discuss the hotel's environmental action plan, and more specialized and more technical training sessions organized for each

- department. If the hotel is small, all the staff may be gathered together for presentation of general and technical information.

- **Written procedures and manuals:** depending on the size of the hotel, specific procedures and manuals may need to be written for each service. For example, for maintenance staff it is useful to have an easy-to-follow, regularly updated manual detailing the operating methods, instructions and standard control settings for HVAC services equipment.

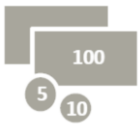
- **Actions for new staff:** because staff turnover is sometimes quite high in hotels, it is important to make sure that all new staff receives training within four weeks of starting their employment

Link with other solutions in the database

- Before providing information and training to all your staff, it is recommended that you make a first assessment of your hotel's environmental impact so that you have relevant information to present. For instance, we suggest you to start by monitoring your energy consumption **(solution n°I)** and by making an energy audit of your hotel **(solution n°II).**

- Because hotel guests also have a direct impact on energy consumption, it is important to invite them to support your efforts **(see solution n°V: information to guests)**.

Benefits for the hotel



Cost reduction

Energy saving

Corrective actions resulting from energy monitoring can lead to 8-10% of energy saving.

Get the right contract from your energy supplier: Knowing your energy consumption patterns will help you get the best possible energy deal in the future.

Staff involvement

Raising staff awareness

Informing your staff on hotel energy consumption is a good way to encourage them to take part in energy conservation measures.

Note that some hotels have decided to offer their staff a bonus when energy consumption is decreased.

Benefits for the environment

CO_2

Carbon emissions reduction

You will get from guest involvement but you can be certain that it won't be negligible.
Just to give an example: for a 1,000 m^2 hotel with an annual energy consumption of 250 kWh/m^2 (47% of electricity and 53% of gas), and if the French emission factors are applied, a 10% energy saving on electricity and gas represents:

4.05 teq CO2 avoided each year

French emission factor for electricity: 84.3 gCO2 / kWh.
French emission factor for gas: 231 gCO2 / kWh (Source: ADEME).

Market availability

Maturity of the solution: mature.

Type of service providers: environmental organisations working in the hotel industry sector and private consulting firms may be able to help you set up your information/training strategy (relevant only if the hotel is large enough).

Key Energy Efficiency Solutions n°V

Information to guests

General information on the solution

"Targets":

- Hotel area: *not applicable*
- End-use: all *(lighting, space heating, space cooling, specific usage of electricity, etc.)*

Related criteria of the EU Eco-label:

Providing information to guests on the hotel's environmental policy, on the EU Eco-label, on the actions taken and on the way the guests can support the environmental objectives is a mandatory criterion of the EU Eco-label (#26).

About its implementation:

- Ease: Easy (*)
- Best moment: can be done at any time.
- Relevant initial situation: the hotel does not have any strategy in its environmental policy for providing environmental information to guests, nor does it inform guests about the simple actions they can take to help save energy.

Cost:

- Time to be spent on the preparation of the information documents and money to be spent on editing (it may cost around 1,000 euros for production of 150 brochures of 15 pages, and much less if you do your own editing and printing).

Indicative return on investment time:

< 1 year

Description of the solution

For your energy efficiency policy to be successful, it is essential to involve your guests. That is why we strongly recommend that you let them know you care for the environment and invite them to take simple actions to support your efforts.
Most of your guests will be happy to know that your hotel is committed to reducing its negative environmental impacts, and they will be keen on learning about the simple actions they can adopt to limit waste of energy and improve the environmental friendliness of their stay.

1. Let your guests know that you care for the environment!

2. Inform your guests that energy conservation actions greatly contribute to limiting the environmental impact of your activity and of their stay.

3. Tell your guests about the simple actions they can take to support your efforts!

Recommendations

What should you say about your environmental policy?

- State the environmental objectives that you have set for your hotel and provide information on the actions you are taking to reduce its environmental impact. It is important to explain that reduction of the hotel's energy consumption is part of your environmental strategy. You may say, for instance:

  "Huge amounts of energy are used by hotel facilities worldwide, most being derived from fossil fuels, thus generating huge amounts of greenhouse gas.

  By improving the energy efficiency of our hotel and by avoiding waste of energy, our hotel is taking an important step to reduce its greenhouse gas emissions and to contribute to the preservation of the earth's natural resources."

- If the energy savings obtained are re-invested in new environmental measures or are used to improve the quality of service delivered to the guests (e.g. increased food quality), it is recommended that you let your guests know!

Which simple actions can you advise your guests to take in order to reduce energy consumption?

- The table below provides examples of the advice you can provide to your guests. But feel free to give it a personal touch, and make sure that the message you deliver is suited to your establishment.

_8_ simple actions you can take to reduce the energy consumption of the hotel, while maintaining your comfort at the same level!

Help us save electricity:

- By avoiding waste of electricity, you will contribute to the preservation of our natural resources and landscapes. That is why we invite you to shut down electrical appliances when not in use:
  1. stop air-conditioning when leaving the room,
  2. switch off lights when leaving the room,
  3. avoid sleep mode for televisions.

Help us reduce energy used for space heating and cooling:

- Did you know that almost half of the energy consumed in hotels is used for space heating and cooling and that an important part of it is just wasted?
  4. close windows when the heating system or air-conditioning system is switched on;
  5. keep the room temperature reasonable in winter (around 20-22°C) and in summer (around 25-26°C).

Help us save water:

- Water is a precious resource for humans. By using water with care, you will contribute to its preservation and you will also reduce the important amount of energy used to heat the water!
  6. take a shower instead of a bath, if possible,
  7. inform the cleaning staff if you are willing to keep your towels more than one day,
  8. inform staff in case of water leaks.

***Thank you for supporting our environmental objectives** & Let the hotel manager know if you have any suggestions to reduce energy consumption and improve the hotel's environmental friendliness!*

Which information medium to use (oral communication, leaflets, brochures, video…)?

- The main point is to have **an active communication** (written, oral or visual).

- If you want to inform your guests about your environmental policy and about the actions they can take to reduce energy consumption, it is recommended that you provide them with a **written document** (eg. a brief notice, leaflet or brochure). You may want to hand out this document at the reception desk or leave it in the guest rooms.

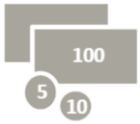
- In addition, to ensure maximum impact of your communication, it is important that the staff at the **reception desk** inform arriving guests that the hotel has an environmental policy.

Finally, you may also consider mentioning your energy policy on your Internet website.

Link with other solutions in the database

Because staff have a key role to play in informing the guests, it is important to involve them in your energy policy too **(see solution n°IV: staff training).**

Benefits for the hotel



Cost reduction

Energy saving

Involving your guests in your energy efficiency action plan is a very cost effective measure: it will help maximise energy savings, and will cost you almost nothing.

Meet today's client expectations

Increasing environmental awareness of clients

Guests are becoming increasingly aware of environmental issues and they are getting more and more sensitive to the environmental policies of hotels. They will therefore appreciate knowing that you are taking actions for a more sustainable business.

Benefits for the environment

CO_2

Carbon emissions reduction

- It is difficult to quantitatively evaluate the reduction in carbon emissions that you will get from guest involvement but you can be certain that it won't be negligible.
- Just to give an example: For a 1,000 m^2 hotel with an annual energy consumption of 250 kWh/m^2 (47% of electricity and 53% of gas), and if the French emission factors are applied, a 10% energy saving on electricity and gas represents:

4.05 teq CO2 avoided each year

French emission factor for electricity: 84.3 gCO2 / kWh.
French emission factor for gas: 231 gCO2 / kWh (Source: ADEME).

Market availability

Maturity of the solution: mature.

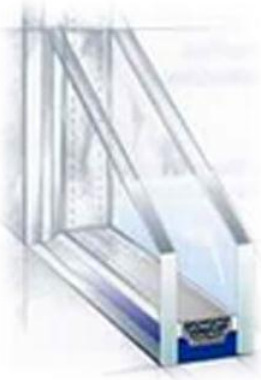
Type of service providers: Pro-environmental organisations working in the hotel industry sector may be able to help you set up your communication strategy.

Energy Efficiency Solutions n°**VI**

Windows insulation

Whether they are relatively small punched openings in the façade or a completely glazed surface, windows are usually a dominant feature of the hotel's exterior appearance. But windows in a hotel also have a true impact on visual comfort, on thermal comfort and on space heating and cooling needs.
The window industry has been quick to develop alternative window technologies to address most of the performance shortcomings of conventional glazing systems. Its efforts over the past decade have been nothing short of revolutionary, and the end-result is high-performance windows.

What are the advantages of energy efficient windows?



- **Energy saving:** Because insulated windows help keep the building warm in winter and cool in summer, they reduce space heating and space cooling needs. Potential energy saving on space heating: 7 to 15%.

- **Improved winter comfort:** A low emissivity glazing eradicates the "cold window" sensation in winter, and thus improves guests' comfort.

- In addition, a well insulated window and a waterproof joinery is the best way to eradicate cold air infiltration in winter.

- **Improved summer comfort:** A closed, well-insulated window will help to keep the building cool when the outside air temperature is higher than the inside temperature (together with sun shading devices).

- **Improved acoustic comfort:** Changing windows is also a great opportunity to increase acoustic comfort in your hotel.

What are the criteria to consider when choosing a glazing?

Windows may cause important heat loss in winter whereas in summer, the glass surfaces may be a source of overheating.

The installation of thermal insulated windows is key to reducing heating and cooling needs (1). The type of glazing is an important aspect to consider, together with the type of frame. Note that even old-fashioned sash windows can be double-glazed! (1) To prevent overheating in summer, it is also recommended to install appropriate sun shading devices (solution n°VIII).

The right choice of glazing will depend on the climatic conditions of the hotel's location, on the orientation of the façade and on its exposure to noise.

The key is to select windows that are as energy-efficient as possible, given your hotel needs and budget.

In most cases, the more efficient unit will probably offer other advantages, such as better comfort and resistance to condensation in very cold climates.

The criteria to consider when choosing the type of glazing are: its thermal insulation (to prevent heat loss), its thermal transmission (to benefit from free solar heating in winter), its ability to transmit natural light (to improve comfort and reduce lighting needs) and the protection it offers against noise. It is recommended you choose glazing that offers the best compromise between these criteria, while taking into account the specific needs of your hotel. Don't forget to consider the advantages and disadvantages of framing materials, as well as the maintenance required and the durability of hardware. Windows are a long-term investment.

Glazing properties	Definition
Light transmission coefficient	A high light transmission coefficient means a good capacity to transmit natural light
Solar heat gain coefficient *(2)*	The solar heat gain coefficient is an indicator of the proportion of incoming energy that will be emitted behind the glazing
Heat transfer coefficient *(3)*	A low heat transfer coefficient indicates good thermal insulating capacity
Emissivity *(4)*	A low emissivity indicates low energy loss through radiation (and thus improved comfort in winter)

(2) A high solar heat gain coefficient is important in winter for the hotel to benefit from solar heating but, ideally, a low solar heat gain coefficient would be needed in summer to avoid overheating.

To solve this problem, it is best to install glazing with a high solar heat gain coefficient and to combine this with sun shading devices to avoid overheating in summer.

(3) The heat transfer coefficient depends on the thickness of the glazing, on the gas used to fill in the space formed by the unit (in the case of a multiple glazed unit) and on the emissivity of the glazing.

(4) A low emissivity glass has a thin coating, often of metal, on the glass that reflects thermal radiation or inhibits its emission, reducing heat loss through the glass.

What are the criteria to consider when choosing joinery for window frames?

Joinery for window frames needs to be chosen with particular care because of its impact on the thermal insulation power of the window, on its waterproofing, and on the ventilation of the room. To ensure good thermal insulation of a window, it is important to choose a window frame with a low heat transfer coefficient.

What are the precautions to take when carrying out window insulation works?

Whenever thermal insulation works are carried out on an existing building, caution must be taken about ventilation within the building. Indeed, a building that is better insulated will have less capacity for natural ventilation: its ventilation system may need to be upgraded.

My hotel is a listed building can we install energy efficient glazing?

Yes, in most cases. However, subject to your hotel listing status, we would recommend liaising with your local conservation officer, who will be able to give you further advice.

What type of glass is best?

The most energy efficient glass for energy efficient windows is low emissivity (Low-E) glass. This often has an unnoticeable coating of metal oxide, normally on one of the internal panes - next to the gap.

It lets sunlight and heat in but cuts the amount of heat that can get out again.

What about condensation?

Condensation can sometimes occur on the outside of new low-e glazing. This is because low-e glass reflects heat back into the hotel and as a result the outside pane remains cool and condensation can build up in cold weather.

Link with other solutions in the database

Solution n°IX (installation of sun shading devices) should be considered together with solution n°VI (window insulation) for solar control issues.

If the hotel is undertaking a façade renovation, it might be appropriate to consider solution n°VII (building insulation) together with solution n°VI (window insulation).

When replacing poorly insulated windows by well insulated ones, it is important to check that the ventilation of the building is still sufficient. If it is not, solution n°XX (renovation of the ventilation system) should be considered.

Energy Efficiency Solutions n°**VII**

Building insulation

Improving the thermal insulation of the hotel building is the most cost-effective way of saving energy and reducing heating and cooling bills.

Which benefits can my hotel gain from insulating?

- Improves comfort
- Provides a healthier environment
- Provides added sound control
- Helps lower energy bills
- Provides a lifetime of energy saving

Where to insulate in a hotel?

There are many areas of a hotel that should be insulated to improve the energy efficiency and overall comfort. In addition to the walls and attic, fiber glass, rock wool, and slag wool insulation is installed above ceilings with unheated spaces, basement walls, floors above vented crawl spaces, cathedral ceilings, floors over unheated garages or porches, knee walls, and in between interior walls (especially bathrooms), ceilings or floors

What are the materials when choosing a proper insulation?

There are a variety of insulations to choose from including fiber glass, mineral wool, expanded or extruded polystyrene, cellulose, urethane or phenolic foam boards and cotton.

The two most common types of insulation for hotel applications are expanded polysterene (EPS) for external insulation and fibre glass and urethane or phenolic foam boards for internal insulation. There are several things to consider before making an insulation decision like thermal performance, lifetime performance, fire safety, moisture and condensation, air infiltration and environmental benefits.

Which are the different techniques used for building insulation?

Exterior walls can be insulated either internally or externally. Insulation is best placed on the exterior of the wall (when it is feasible) as it enables the building to benefit from the thermal mass of the walls and eliminates the thermal bridges resulting from construction or improper workmanship (these are responsible for heat losses).

- Internal insulation typically consists of either dry lining in the form of flexible thermal linings, laminated insulating plasterboard, or a built-up system using fibrous insulation such as mineral wool held in place using studwork.

- External insulation systems are comprised of an insulation layer fixed to the existing wall, plus a protective render or decorative cladding. Dry cladding offers a wide range of finish materials that can be used – timber panels, stone or clay tiles, brick slips or aluminium panels.

How do I insulate my hotel if it has cavity walls?

In some countries, the exterior walls may be cavity walls (i.e. two 'skins' separated by a hollow space). The skins are usually masonry such as brick or concrete block. Cavity wall insulation is a cost effective way to reduce the amount of heat (as much as 35%) lost from convection through walls. It consists of a continuous layer of insulation filling the wall cavity. This solution is a first step and has a low payback time. Treatment of thermal bridging in cavity wall openings may also be considered.

When is the best time to insulate my hotel building?

The best moment to insulate the building is when the façade or the roof is being renovated. If your external walls and your roof need work anyway, it is an ideal time to have insulation added. Much of the labour costs are being paid already and you will only need to pay the extra cost for the insulation materials and the extra hours of work.

Which specifications should I take into account when investing in building insulation materials?

- Thermal bridges need to be treated with care (typically in floor-wall connections, in window and door installations, around balconies…).

- When exterior walls are insulated internally, caution must be taken to avoid condensation in the insulation.

- Whenever thermal insulation works are carried out on an existing building, caution must be taken about ventilation within the building. Indeed, a building that is better insulated will have a lower degree of natural ventilation: its ventilation system may need to be upgraded.

- Thermal insulation of the building needs to be considered before the replacement of space heating equipment. Indeed, there's not much point putting in an energy efficient boiler if all the heat goes straight out of the hotel again.

- In winter, major heat loss occur through the building's roof and exterior walls. That is why the insulation of the roof and of the exterior walls is particularly recommended.

- Thermal insulation can also help reduce the cooling needs of the hotel in summer

- Improving the thermal insulation of the building is also a way to save on cooling because it is a barrier to solar radiation. But to be really efficient, cooling strategies need to be associated (e.g. sun protection, cooling ventilation and air-cooling) and the building needs to have an appropriate thermal mass (1).

(1): the thermal mass comes from the materials used for the walls and the other construction elements. It provides 'inertia' against temperature fluctuations. It keeps heat (in winter) and coolness (in summer) inside the hotel for longer.

Which precautions need to be taken when insulating a building?

It is important to understand how thermal heat transfers and humidity transfers occur through the building before deciding to insulate it, and you will need professional advice on this. Most walls need to "breathe" and it is essential to allow for this.

How much does it cost to insulate my hotel building?

- Internal insulation of exterior walls: approx. 20 to 50 € per m2 Indicative cost (French prices 2009)
- External insulation of exterior walls: approx. 50 to 80 € per m2 Indicative cost (French prices 2009)

Which is the return on investment time?

- Cavity wall insulation: <2-6 years
- External wall insulation: <5-10 years
- Loft insulation: <5-7 years
- Floor insulation: <5-7 years

Note that costs and return on investment may vary greatly depending on the local context and on the hotel's initial situation.

What is lifetime performance?

In order to ensure the expected energy savings, it is important that the insulation does not deteriorate, or settle, over time. Fiber glass batts and rolls do not settle. Fiber glass and rock and slag wool loose-fill insulations may settle approximately 1-3% resulting in virtually no impact on the thermal performance of the insulation.

In contrast, cellulose insulation not only settles to a much greater degree (approx. 20%), but also at a higher rate. If cellulose insulation is being considered, make sure the installer understands that most cellulose insulations settle in attic loose-fill applications - that's a significant loss of insulating effectiveness. In fact, it is recommends that an additional 25% of thickness be added for cellulose insulation to compensate for this extreme loss of R-value.

Link with other technologies?

- If the hotel is undertaking a façade renovation, it might be appropriate to consider solution n°VI (window insulation) together with solution n°VII (building insulation).

- When upgrading the thermal insulation of the building, it is important to check that the ventilation within the building is still sufficient. If it is not, solution n°XX (efficient ventilation systems) should be considered.

Energy Efficiency Solutions n°VIII

Prevention of air infiltration and of unnecessary outdoor air supply

What is infiltration?

Air infiltration is driven by wind, temperature differences, or HVAC appliance induced pressures. Infiltration is the uncontrolled flow of air into your hotel through adventitious or unintentional gaps and cracks in the hotel building envelope. Other air losses include duct leakage, which is the leakage of air from the seams and joints of ventilation, heating and air conditioning circulation ducts. Unfortunately, there are hundreds of penetrations through a typical hotel's exterior. These gaps and holes are often incurred during framing, and from penetrations for wiring, plumbing, and ducts. Air sealing the hotel's envelope combined with proper ventilation, can reduce your energy bills and eliminate unwanted drafts and pollutants.

What can a tighter building offer your hotel?

- Improved comfort — reduces drafts, noise, and moisture.
- Improved indoor air quality — keeps dust, pollen, car exhaust, and insects out of the hotel.
- Lower costs — reduces escape of conditioned air.

What are the consequences of air infiltration?

The consequences are inferior performance, excessive energy consumption, an inability to provide adequate heating (or cooling) and drastically impaired performance from heat recovery devices.

Did you know that almost half of the energy consumed in hotels is used for space heating and cooling and that an important part of it is just wasted? One solution to avoid this waste is to make sure that there is no air infiltration at doors and windows, and that entrance doors are not a big source of energy loss.

Eliminating air infiltration at doors and windows (draught proofing)

- Badly fitting windows and doors are a big contributor to large heating and cooling bills and could account for up to 20% of your heating/cooling costs!

- Solutions are relatively easy and cheap to install. Products including brush seals, foams, sealants, strips and shaped rubber and plastics are cost effective ways of dealing with the problem.

- Avoiding energy loss at entrance door

- Entrance doors are usually a big source of energy loss in hotels as many people are coming and going throughout the day. If you have noticed that your front door is left open while the heating or cooling system is on, you may consider having an automatic device installed for closing the door.

- Automatic doors may be an appropriate solution to reduce energy loss at the entrance door.

- Automatic door closer may also be an interesting option.

- Installation of an air curtain may also be an interesting option if you intend to leave your entrance door open.

- An air curtain does not act as a physical barrier, but conditions incoming air and reduces the amount of warm air escaping from the building, thus improving comfort and saving energy.

- With air curtains, warm or cold air stays inside.

Recommendations about draught proofing

- To make sure that draught proofing is installed appropriately and to ensure quality of fit, it is generally best to hire a professional contractor. Draught proofing associations can help you find a qualified professional.

- You may also do the work by yourself, as long as you follow the necessary advice.

- Preferably choose products with quality standard (e.g. the BS 7386 standard in the UK):

- their performance and durability will be better.
- Be careful not to block air vents designed to ventilate the building!

Recommendations about air curtains

- To guarantee optimum energy-efficiency of the air curtain, you should make sure that the 'jet' of air reaches the floor and covers the entire door width.

How much energy can my hotel save by making it draught proof?

- Because prevention of air infiltration and of unnecessary outdoor air supply helps keep the building warm in winter and cool in summer, it reduces space heating and space cooling needs.

- Potential energy saving on space heating and cooling really depends on the situation, but may be up to 20% in some cases

Link with other solutions in the database

- Besides being a source of air infiltration, your doors and windows may have poor thermal insulation. That is why we recommend that you evaluate the opportunity to change your doors and windows (solution n°VI) before undertaking draught proofing (solution n°VIII).

- Adequate ventilation is as important as draught proofing. So it is necessary to check that the ventilation within the building is still sufficient after elimination of air infiltration. If it is not, solution n°XX (efficient ventilation systems) should be considered.

Energy Efficiency Solutions n°**IX**

Installation of sun shading devices

General information on the solution

"Targets":

- Hotel area: General
- End-use: Space cooling

Related criteria of the EU Eco-label:

No criterion directly related to this solution

About its implementation:

- Ease: Moderate (**).
- Best moment: during façade renovation.
- Relevant initial situation: the hotel has space cooling needs in summer.

Indicative cost:

- Varies.

Indicative return on investment time:

- May be <5 years.

Note that costs and return on investment may vary greatly depending on the local context and on the hotel's initial situation.

Description of the solution

Principle

Installation of external movable sun-shading devices is highly recommended in hotels that are exposed to the summer sun. Well-designed sun shading devices will help keep the building cool and comfortable and limit the space-conditioning needs of the hotel.

- A sun shading device acts as a barrier to solar radiation.
- This "barrier" is most efficient when placed outside the window, because in this case some of the solar radiation is reflected back to the outside before reaching the window. When the protection is placed inside, only a small part of the incoming solar radiation is reflected back to the outside.

Note that some solar shading systems can be used to produce electricity! (In this case, they contain photovoltaic modules).

Recommendations

Outside sun shading devices (e.g. shutters) are recommended because they are **more efficient** than inside sun shading devices (curtains…) in terms of heat protection.

Sun shading devices can be **fixed** (e.g. sunshades) or **movable** (e.g. shutters). For rooms exposed to the East or the West, it is better to install movable sun shading devices, because they can be removed in winter to let the sun come in and heat the air. For rooms exposed to the South, either movable or fixed shading devices can be installed, because even with fixed shading devices sufficient winter sun will be allowed into the room (provided the shading device is well designed).

Room exposure	Type of sun shading devices recommended
North	No sun shading device
East & West	Movable, exterior sun shading device
South	Exterior sun shading device (either movable or fixed)

A fixed sun shading device on the southern façade can protect the hotel from the summer sun while letting the sun get inside in winter.

Which rooms should be protected as a priority?

- For guests' comfort, it is recommended that sun shading devices are installed on rooms exposed to the West, East and South.
- Office rooms exposed to the West and to the South should also be protected.

What are the criteria to consider when choosing a sun shading device?

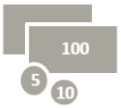
- Exposure of the room: the geometric angle between the sun and the window (i.e. exposure of the room) needs to be taken into account to choose an appropriate sun-shading device. To the South, the summer sun is high in the sky: it is best to have a horizontal sun shading device. To the East and West, the sun is lower: it is then generally best to have a vertical sun shading device.
- Type of window: the type of glazing and the size of the window should be considered.
- Compatibility with summer ventilation: if the hotel opens windows in summer to ventilate and cool down the hotel, you need to make sure the sun-shading device does not reduce ventilation capacity by too much.
- Colour of the sun shading device: it is best to choose shading devices with light colours, as these are better at reflecting back solar radiation.
- Durability: it is recommended to check maintenance requirements, wind resistance, etc.
- Ease of use: you may consider equipping movable sun shading devices with a centralised control system.

Link with others database

- Because the installation of **sun shading devices** (solution n°IX) involves renovation works on the exterior walls of the building, it should be considered together with **window insulation** (solution n°VI), **building insulation** (solution n°VII) and **prevention of air infiltration** (solution n°VIII).

- If summer comfort is a problem in your hotel, you should also consider undertaking some **outside work** or landscaping (solution n°X). If this is not enough, you may consider installing an **efficient solution for active space cooling** (solution n°*XX*).

Benefits for the hotel



Cost reduction

Energy saving

- Because sun shading devices help keep the building cool in summer, they reduce space-conditioning needs.

- In addition, some sun shading devices can limit heat loss in winter and thus decrease space-heating needs. (For instance, outside shutters that are kept closed at night limit heat loss.)

Staff involvement

Improved summer comfort

Sun shading devices improve summer comfort by helping to keep the building cool in summer and by reducing the use of active air conditioning systems (which may not provide the best comfort).

Benefits for the environment

CO_2

Carbon emissions reduction

- For a 1,000 m^2 hotel with an annual electricity consumption of 37.5 kWh/m^2 for space cooling, and if the French emission factors are applied, a 20% energy saving on space cooling represents:

0.63 teq CO2 avoided each year

French emission factor for electricity: 84.3 gCO2 / kWh.
French emission factor for gas: 231 gCO2 / kWh (Source: ADEME).

Market availability

Maturity of the solution: mature.

Manufacturers of solar shading systems

- Somfy *www.somfy.com/group* (shutters and awnings, automated blinds and curtains),
- Colt International *www.coltgroup.com* (fixed and movable solar shading systems),
- Tryba *http://en.tryba.com* (roller shutters, shutter blinds),
- Bubendorff *www.bubendorff.com* (automated blinds – France),
- Autogyre *www.autogyre.net* (vertical and horizontal solar shading systems – France),
- Roto Franck *www.roto-frank.fr* (interior and exterior shutters – France).

Energy Efficiency Solutions n°X

Exterior work to improve summer comfort

Well-designed landscaping can minimize summer heat gain in your hotel, reducing your cooling needs by between 20% and 100%. Planting a deciduous shade tree on the southwest or southeast side of your hotel, for instance, will help reduce your cooling needs and help maintain a comfortable indoor air temperature. Well-placed deciduous trees can help keep your hotel cool in summer by providing the building with shade from the sun. You may also consider planting indigenous shrubs, or installing open pools or fountains for evaporative cooling. Choosing the right ground cover for the surrounding area also plays an important role in summer comfort. Green walls and roofs act as an exterior thermal insulation material (for summer and for winter)

Ground cover

- The ground cover of the surrounding area of the hotel influences heat radiation and reflection onto windows and walls.
- It is better to choose ground cover that minimises ground reflection and keeps the ground surface cooler, thereby preventing re-radiation.
- If you are paving along the south side of the hotel, for example, it is recommended to use only permeable pavement or permeable light-coloured concrete.
- You may also use bushes and plants to shade pavements, or cover pavements with wood.

Open pools and fountains: evaporative cooling

- Open pools and fountains can improve summer comfort in the area surrounding the building. For cooling to occur, it is best if the fountain or pool is active, with water and air mixing to encourage evaporation.
- A fountain's potential to cool an area also depends on ambient conditions. Fountains installed on the North side of buildings and walls are sheltered from the sun and thus provide better cooling.

Plants and trees

- Plants and trees do not only provide shade, they also cool by evapotranspiration, which is heat removal due to the evaporation of water from the leaves.

- Green surfaces help to reduce urban “heat island” effects and improve air quality.

- Plants and trees are important carbon sinks, helping to remove carbon dioxide, a ‘greenhouse gas’, from the atmosphere.

- Planting trees and shrubs to shade the outdoor parts of your hotel’s air conditioner could increase its efficiency by as much as 10%, but be careful not to obstruct airflow around the unit.

- Planting trees improves summer comfort by helping to keep the building cool in summer and by reducing the use of active air conditioning systems (which may not provide the best comfort).

- In addition, your guests will appreciate walking under the trees in summer. They will be happy to stay outside just to sit and relax.

How to choose plants and trees?

- Plants vary in the care they require. Select varieties that require minimal care and water, and can withstand local weather extremes. Ask at your local garden shop or landscaping company for plants and trees that grow well in your region, but do not require great amounts of additional water and other resources.

Where to plant trees?

- Remember that using vegetation to reduce cooling needs requires a different approach for the roof and the East and West walls!

- Plant trees far enough away from buildings so that their roots won’t affect the buildings’ foundations.

- Do not plant trees directly to the south of the hotel. Instead, plant trees on the southwest or southeast exposures. In the winter, even the bare branches of mature deciduous trees can reduce the amount of sun reaching your south-facing windows, limiting natural heat and light gain.

- Shading your roof, or using a green roof, will increase cooling effects even more than shading windows. Place trees that grow tall, with widespread branches, on the southwest or southeast sides of the hotel to shade the roof when they reach full height. Trees with branches that spread closer to the ground are best on western exposures to provide shade from the lower angle afternoon sun.

- It can be helpful to have a professional determine the best location for your trees to maximize energy efficiency.

Green walls

- A green wall is a vertical surface filled with living, growing plant matter.

- Green walls conserve energy by insulating the hotel building envelope, reducing the need for heating in the winter and cooling in the summer (a green wall can reduce the temperature of walls by as much as 10°C in summer thus lowering cooling needs inside the building).

- Green walls also filter air particulates, improving air quality.

- Interior green walls clean the air and also add humidity to the air when your hotel heating system is turned on in winter.

Can green walls be built indoors?

Green walls can be built indoors and outdoors. Obviously, depending on where the wall will be built, different factors will affect the construction and maintenance of the wall.

Can any plants grow on green walls?

No, not all plants can be grown successfully on green walls. Some plants are disqualified because they require a great deal of depth for their extensive root systems. Other plants have needs that are not compatible with the conditions of indoor environments. Other factors that will affect your choices are your climate zone, irrigation supply, budget, exposure, and load bearing capacity. However, this still leaves a very long list of beautiful plants of all colors, shapes and sizes that work well in green walls.

How to choose plants for green walls?

Plants used for green walls should not act as a barrier to sun heat in winter time: that is why it is recommended to choose plants with late leafing in the spring and early fall in autumn.

As the efficiency of green walls depends on local weather and on the sun exposure of the walls, it is recommended that you ask a professional for some advice.

How can plants grow on a green wall without any soil in it?

Plants require water and they require nutrients, but amazingly, they are able to grow very well even if they are not potted in soil, as long as they are provided with a steady stream of water and nutrients.

Can a green wall survive through European winters?

A green wall is no different from a horizontal, or conventional, garden in this respect. Some plants will lose their bright colors and turn to dull hues. Other plants will lose leaves and only regenerate in the springtime.

- For outdoor applications only this depends on your geographical location, climate and the plants selected. Some species are evergreen and will turn a shade of maroon in the winter but will then return to their green color as soon as spring appears. In some of the warmer climates the plants survive all year round.

- For indoor use they are just beautiful all year round.

How are green walls irrigated?

- A special mixture of natural nutrients is dissolved into the water that runs down from the top of the green wall. As long as the automatic irrigation system functions, the plants will remain healthy.

How much water do the walls need?

- The amount of water required is plant and climate dependent.

How much does a green wall cost to install?

- The cost of installing a green wall varies based on a number of factors. One determinant is obviously the size of the wall, another is its location, indoors or outdoors. A third factor is the varieties of plants chosen for the wall.

Does agreen wall require much maintenance?

With carefully selected plants and proper irrigation they take care of themselves.

The only thing that may need to be done is the odd trimming of dead leaves or fertilizing, or adding plants as necessary if replacements are needed. It is very similar to hotel or garden plants in that way. Once a green wall has been installed, there is next to no work that needs to be done. A green wall pretty much takes care of itself.

Are there costs associated with the maintenance of green walls?

Just like all gardens, vertical gardens require regular irrigation and the occasional replacing of plants. In addition to these costs, the artificial lighting systems of indoor green walls can generate some electricity costs, and require the replacing of special light bulbs.

Green roofs

- Green roofs act as an exterior thermal insulation material (for summer and for winter) and have a greater cooling power than green walls in summer.
- Their insulating efficiency increases as moisture content increases.
- Extend a roof's life and create biodiversity conservation opportunities.
- Absorb and filter rain water
- Filter air particulates, improving air quality and help to reduce the urban heat island effect (UHI).
- Protects your roof from damaging UV rays as well as the constant heating and cooling cycles which cause expansion and contraction leading to cracks in normal roofs
- Provides cushioning against hail that could otherwise damage your normal roof.

Is my hotel roof more likely to leak with a green roof on it?

This is one of the most misunderstood issues surrounding green roofing. A green roof must be installed over a roof that has a waterproofing membrane that is in excellent condition. Green roofs are not meant to fix a leaky roof. In effect your green roof actually lives about an inch above the roof allowing water to drain off normally.

What happens to my green roof in the winter?

This depends on your location and the plants selected.

The majority of plants are evergreen and will turn a shade of maroon in the winter but will then return to their green color as soon as spring appears.

Some grasses will look brown all winter but then will regenerate from the centre of the plant, turning green again after the first few warm spring rains.

How is a green roof affected by wind uplift?

Each roof is unique presenting different wind uplift problems in different locations. With a wind analysis of the building high wind uplift areas can be found and a fastening plan can be designed. This may be as simple as additional ballast in the form of stones around the perimeter.

How to choose the type of green roof?

There are two basic types of green roofs: intensive and extensive. Extensive green roofs are simpler: they require less substrate and less maintenance. They are therefore more suitable for hotels. Given the complexity of this solution, it is recommended that you ask a professional for some advice.

Link with other solutions

If summer comfort is a problem in your hotel, you should also consider installing sun shading devices (solution n°IX). You may also study the opportunity to practise over-ventilating at night when the outside temperature is lower than the inside temperature: either by opening windows, or with a mechanical ventilation system (solution n°XX). If this is not enough, you may consider installing an efficient solution for active space cooling (solution n°XiX).

Energy Efficiency Solutions n°**XI**

Key card systems to switch off electricity in guestrooms

The use of metal keys for opening hotel rooms is a thing of the past already. Today, most hotels now offer high-tech hotel key cards, which allow their guests easy access to their rooms. Key card systems switch off electricity automatically when guest rooms are vacated, and thus avoid useless consumption of electricity (TV, lights…).

How do keycards help my hotel reduce energy consumption?

The principle of the key card system is the following: when the client inserts the key card in the energy saving device on entering his room, electricity is switched on; when the client leaves the room and retrieves the key card, electricity is switched off.

Related criteria of the EU Eco-label:

- Automatic switching off of lights in guest rooms counts as an optional criterion of the EU Eco-label (criterion #46).

Will the lights turn off immediately after the key card is removed?

Through a delayed switch-off, guests can comfortably leave the room before the lights go off.

What can I do if the hotel guests need to charge electrical equipment such as laptop computers, digital cameras or mobile phones?

By installing a key card system you can decide what you should be turn off in the room. You should consider leaving a socket live and clearly labelling it for charging purposes only! Please note that if you have a minibar in the room it should have a high efficiency rating and normally you should power this continuously.

Is it possible to leave the minibar turned on even if the keycard has been removed?

Yes. It is possible to keep some electric appliances (like minibars) on even when the room is vacated. To do so, specific care must be taken when installing the key card system (different circuits will be needed for those specific appliances).

What other advantages can hotel keycards bring to my hotel?

- The plastic hotel keycards can also utilized as vital marketing tools for the hotel by displaying messages or advertisements.
- For hotel guests, these keycards are also handy and lightweight.
- In the event that hotel guests lose the card during their stay, they can still access their room with a new keycard which will be issued to them.
- Automatic control of electricity in guest rooms makes the employees' lives easier: they no longer have to worry about electrical appliances (TV, lights…) being left on.

How can I install a key card system in my hotel?

- To do so, the relevant electrical circuits of the guest room need to be connected to the key card system. This has to be done by a professional electrician.

When is it best to install a key card system?

- Due to the wiring requirements for interfacing the key card system to the relevant electrical circuits of the guest room, it is best to install a key card system when those electrical circuits are being renovated.

How much energy can my hotel save by installing a keycard system?

Hotels that have installed key card systems report that they have reduced the electricity consumption in guest rooms by 20 to 30%.

Link with other solutions in the database

Solution n°XII (lighting control) is a specific automatic room control system based on occupancy control and therefore should be considered together with solution n°XVI (regulation of space heating and cooling) which may also involve automatic room control systems.

Energy Efficiency Solutions n°**XII**

Lighting control

The principle of lighting control is to light only those areas that are occupied or truly need light in your hotel. This can be achieved with technical measures, such as automatic devices. Lighting controls allow your hotel to vary the level of artificial light output but they can be also used to alter the mood or ambiance of the lighting to suit different times of the day.

Which lighting control systems are most suitable for my hotel?

Control of lighting systems ranges from the most basic manual wall switch to sophisticated computer control lighting management systems. Modern advances on occupant sensing and daylighting add additional cost-effective options for managing lighting systems.

Different automatic devices are available that make switching off easier:

Products available	Principle	Applications
Time control	Can switch lights on and off at pre-set times, each day	May be used in areas of regular usage
Occupancy sensor	Can switch on lights when movement is detected and switch them off after pre-set period of inactivity	May be used in areas of infrequent use by staff and public (such as washrooms in public areas, or sections of the property that are not much used during times of low occupancy)
Photocell control	Can switch off or dim lights when there is adequate daylight available	May be used in rooms with natural light
Automatic control with key card	Turns off all electrical appliances in guest rooms (except the minibar) when the guest rooms are unoccupied	For guest rooms

Note:

- Lighting control can also be integrated into the hotel's Building Energy Management System (BEMS) if one is installed.
- Where applicable, it is recommended to adopt lighting zone control to optimize electricity use.

Where does it make more sense to install these lightning control systems?

Studies show that hotel guest bathrooms offer one of the largest energy saving opportunities – eliminating unnecessary extended operation of the lighting. The studies also conclude that when the control solution includes provisions for nightlighting energy waste is prevented and guest satisfaction is improved.

Do the lifetime of lights decrease because of sensors constantly switching them on and off?

Occupancy sensor
Source: Alliance to Save Energy website.

Even though lamp running life may be somewhat shortened by increased switching due to occupancy sensors, the overall chronological life of lamps is usually extended by the reduced daily burn hours.

How expensive and complicated are lighting control systems to build?

Like most technology, lighting control systems have become more affordable while their capability and features have dramatically improved. Today's products are also easier to install and simpler to use. Many functions can be used either manually with one touch control or programmed to happen automatically and require no user operation.

The cost of an occupancy sensor may vary from 75€ (automatic sensor for an incandescent lamp) to 125€ (for a fluorescent lamp and/or a more complex system).

Can my hotel update the lighting control systems as the need change?

Today's lighting control systems are very scalable. This provides you with the ability to select a system that is tailored to the size and use of your hotel. Additionally, smaller systems typically have the built-in ability to grow, so expanding later is usually an option.

Which is the return on investment time for lightning control systems?

Note that costs and return on investment may vary greatly depending on the local context and on the hotel's initial situation but for lightning control systems a return of investment between 1-8 years can be assumed.

How to proceed?

The first step is to review existing lamps and bulbs in use in the different areas of the hotel (rooms, floor, restaurant, outdoor area, kitchen, back office, etc.).

For each of these areas, try to evaluate if it is preferable to install energy saving light bulbs and/or lighting controls (solution n°XI). Should you plan to install an energy saving lamp together with a lighting control, make sure that you choose an energy-efficient lamp that works with the lighting control you plan to use and that lifetime of the lamp is not influenced by extensive switching, e.g. manufacturers' information.

Link with other solutions in the database?

Solution n°XII (lighting control) is to be considered together with solution n°XI (key card systems) and solution n°XIII (energy saving light bulbs).

Which other lightning improvements can I implement in my hotel?

Paint your hotel with light colors: optimize available light. Ensure all light colored surfaces are regularly cleaned and paint dark walls and ceilings with lighter colors to reflect and maximize available light.

Re-wire central lighting: when small sections of lighting are required, central lighting is not the most efficient solution. By re-wiring, localised lights can be switched on when and if required, saving energy and money.

Dust lights: Establish a cleaning schedule of lights to ensure that all lights operate at an optimum level. lighting. Replacing yellowed diffusers or fitting reflectors can also increase light output. Clean windows and skylights regularly.

Use the sunlight: is free and the most energy efficient lighting source. Remove objects that are blocking windows to ensure you maximise optimal lighting. Encourage staff to keep lights off where there is sufficient daylight.

Exchange exit sign lighting: Replace incandescent exit lighting with light emitting diode LED lamps. LED models use less energy than conventional units and can provide significant energy and cost savings.

Outdoor lightning: for your hotel outdoor garden lighting, try solar-powered lights.

Prepare a 'good housekeeping' list: your hotel can save a lot of energy with easy actions such as turning off lights when not needed, keeping windows and light fittings clean and labeling light switches.

Look for improvements: identify old, failing or inefficient systems and plan for their replacement. Replace dim, flickering or failed lamps, preferably with more efficient alternatives. Update yellowing fittings and controls.

Raise awareness: motivate staff and hotel guests to take simple actions to save on lighting costs and reduce environmental damage.

Market availability

Maturity of the solution: mature.

Manufacturers

- Philips Lighting *www.lighting.philips.com* (movement detectors, daylight linking, lighting management systems, luminaire-based products, etc.),
- OSRAM *www.osram.com* (lighting management systems),
- ZUMTOBEL *www.zumtobel.com* (lighting management systems),
- THEBEN *www.theben.de/?L=1* (occupancy sensors, time controls),
- Legrand (/WattStopper) *www.wattstopper.com* (lighting control panels, daylight sensors and controls, occupancy sensors, etc.)
- Hager Group *www.hagergroup.net* (occupancy sensors, time controls),
- Sarlam *www.sarlam.com* (occupancy sensors – France),
- Schneider Electric *www.schneider-electric.com* (dimming systems, guest room controls),
- Siemens *www2.sea.siemens.com/?languagecode=en* (lighting control panels).

Energy Efficiency Solutions n°**XIII**

Energy saving light bulbs

Installing energy saving light bulbs in your hotel is generally one of the easiest ways to reduce energy bills, as lighting accounts for a large portion of energy use. The use of energy saving light bulbs will reduce your hotel's electricity consumption.

What types of energy efficiency lightning exists?

Several types of energy efficiency lighting technology exist, such as compact fluorescent lamps CFL and light-emitting diodes LED in order to replace old incandescent lamps. Your hotel may also consider the installation of high pressure sodium vapour HPSV lamps for use where colour rendering is not critical (for instance, on the outside).

Here are some examples of standard upgrades:

Initial situation	Possible upgrade
Incandescent lamps	Compact fluorescent lamps (CFL) (same light output but with lower Wattage)
T8 fluorescent tubes T8	More energy-efficient T5 fluorescent tubes
Incandescent exit signs	LED exit signs

What are incandescent lamps?

Incandescent lamps are standard electric light bulbs that were introduced for hotel use more than 100 years ago. They have the lowest initial cost and good color rendering but they have a short life span and use significantly more electricity than other energy saving light bulbs to produce the same light output. Incandescent technology produces light by heating up a metal filament enclosed within the lamp's glass. More than ninety percent of the energy used by an incandescent light bulb escapes as heat, with less than 10% producing light. The EU has passed measures to phase out incandescent light bulbs for general lighting with the aim to encourage the use and technological development of more energy-efficient lighting alternatives.

Are CFLs slow to start?

While CFLs don't start at full intensity like incandescent bulbs, nearly all CFLs nowadays turn on instantly and reach full illumination very quickly. Some CFLs are marketed as 'instant on' and have no noticeable warm-up period.

Do CFLs flicker when they first light?

That happened in earlier CFLs with magnetic ballasts. New CFLs use electronic ballasts, which are faster and provide better comfort for guests and employees compared to conventional old magnetic ballasts.

What is a ballast?

A ballast is a device that serves to control the flow of power to a fluorescent lamp. Advanced electronic ballasts have replaced many magnetic ballasts of the past in new CFL bulbs and fixtures. Electronic ballasts improve fluorescent energy efficiency even further, eliminate the visible flickering found in older fluorescent technology.

Are CFLs always cold-feeling and remind hotel guests of office lighting?

Older, standard CFLs do emit a cool light, but today there are CFLs in a complete range of hues, and many CFLs are available that produce exactly the same warm white light as traditional incandescent bulbs. Warm white CFLs, similar in appearance to an incandescent light globe are available for use in hotels guestrooms for example. Cool white CFLs are available for use in areas where a brighter light is required such as hotels bathrooms.

Is it possible to make a CFL that looks like a normal incandescent lamp?

Yes. CFLs now come in a variety of shapes, sizes and functions.

CFLs are now available with a glass cover that give them a similar appearance to incandescent light globes.

Will CFLs fit in my hotels light fixtures, candelabra, or recessed lights?

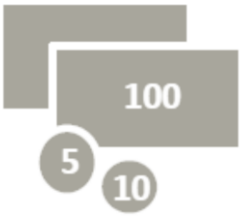
This can still be a problem in certain situations. A CFL is often not an exact size substitute for an existing incandescent bulb, but a far greater range of sizes is available than is generally realized.

Do CFLs contain mercury?

Yes, all CFLs contain a very small amount of mercury.

Doesn't disposal of mercury-based products harm the environment?

Yes, mercury is classified as a hazardous material and CFLs should be recycled instead of being thrown out with the normal trash.



How expensive are CFLs?

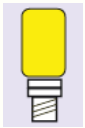
A typical CFL uses around 75-80 percent less electricity and lasts between eight and fifteen times longer than an incandescent light globe.

So, even though CFLs are more expensive than incandescent globes, they will last a lot longer and their lifecycle costs work out more cost effective.

Which is the indicative return on investment time for CFLs?

Efficient lighting is a high-return, low-risk investment. The typical return on investment ranges from 1 year to 3 years. Since CFLs last much longer than traditional bulbs, labour costs associated with changing light bulbs are reduced. Note that costs and return on investment may vary greatly depending on the local context and on the hotel's initial situation.

Examples of energy savings are provided below (the effective savings will depend on the equipment efficiency and the hours of operation).

Standard Incandescent 	CFL Replacement 	% load savings
25 Watt	7-9 Watt	64 – 72 %
40 Watt	11-13 Watt	67 – 73 %
60 Watt	15 Watt	75 %
75 Watt	18-20 Watt	73 – 81 %
100 Watt	28-30 Watt	70 – 72 %

incandescent bulbs with CFLs (Source: U.S. Environmental Protection Agency)

What is a LED?

LED stands for Light Emitting Diode. LEDs have recently become commercially available as a lighting source. They have extremely long life spans, are energy efficient, and come in a variety of colors. As research continues, LEDs continue to improve and be used in new applications. An increasingly popular hotel use is decorative light. LEDs are now commonly used by hotels in exit signs.

The right investment in the right lighting technology can brighten the hotel industry's bottom line considerably in the long run, because for each venue the savings per bulb are multiplied by hundreds or thousands of rooms, corridors, public spaces, restaurants and shops. Hotels are rethinking their approach to energy savings, and LEDs are about to become a prudent solution for many.

What is the cost of LED?

Currently, LED lights cost more than incandescent and fluorescent lights. The good news is that the cost is dropping as the technology is improving.

How does LED differ from Incandescent bulbs and CFL?

LED is a semiconductor device and produces light by a process known as Electroluminescence. The conventional bulb produces light by Incandescence of Filament and CFL produce light by a process called Fluorescence.

Why should my hotel change to LED Lights when other energy saving lights are available at much lower prices ?

LEDs do cost much more compared to other energy saving lights. However, your hotel can save up to 70 to 80% on your energy bills by installing LED lightning. Moreover, the life of LEDs is 7 to 10 times more compared to other lights and you save on replacement and maintenance costs. LEDs do not contain any toxic substance like mercury, which is found in CFLs. Further LEDs generate much lesser heat compared to other lightning systems.

Which is the indicative return on investment time for LEDs?

Even with the relatively high initial investment, even LEDs are now able to show paybacks in the two-to-eight-year range, depending on the application and energy costs. Adding in labor savings, such as not having to replace bulbs and ballasts, can further reduce the payback period. Note that costs and return on investment may vary greatly depending on the local context and on the hotel's initial situation.

What about halogen lighting?

Halogen Lamps are somewhat more efficient than incandescent lamps, but operate at an even higher lamp temperature. These are mainly used as downlights in hotels. Halogen lights are also a type of incandescent light. Halogens are also known a 'low voltage' lights as they have transformers fitted to convert from the standard 240 volts to 12 volts, but this does not mean that they are low energy users. Halogens are considered an energy intensive lighting option because several halogen lights are often needed in the place of one incandescent or fluorescent light bulb to achieve even lighting levels in a guestroom.

Does my hotel needs to install energy saving light bulbs in order to obtain the EU Eco-label?

Yes. The use of energy saving light bulbs is a mandatory criterion of the EU Eco-label (criterion #9).

Who can help me choose the right lightning?

When doing lighting changes, identify opportunities with an electrician or lighting specialist.

The first step is to review existing lamps and bulbs in use in the different areas of the hotel (rooms, floor, restaurant, outdoor area, kitchen, back office, etc.) For each of these areas, try to evaluate if it is preferable to install energy saving light bulbs and/or lighting controls (solution n°XI). In case you plan to install an energy saving lamp together with a lighting control, make sure that you choose an energy-efficient lamp that works with the lighting control you plan to use (timing device or motion detector, for instance).

What are the criteria to consider when choosing an energy-saving light?

Choose equipment that suits your needs: the needs and characteristics of the different hotel areas need to be taken into account. For instance, importance of colour rendering may vary from one place to another. Remember also that lighting levels necessary for each zone are established in the lighting regulations of each country. Attention should also be paid to the switching cycles when you want to install the bulb in frequently used rooms such as bathrooms. When changing from a conventional system to an energy efficient one, be careful that the bulbs match your devices. Prior to undertaking projects, ensure that all lightning changes are in line with your hotel staff workplace guidelines.

How can I guarantee to buying good quality and efficiency new bulbs?

Choose energy certified products: in some countries, there are product certifications that indicate quality and energy savings, such as the Energy label in Europe (as defined in Commission Directive 98/11/EC). Buying labelled products (e.g. lamps with class A of the EU Energy label) is a good way to be sure of investing in high-performance new equipment.

Topten is a consumer-oriented online search tool, which presents the best appliances in various categories of products: www.topten.info/

Benefits for the hotel

Improved image

The use of efficient lighting will improve your environmental image.

Benefit for the environment

CO_2

Carbon emissions reduction

For a 1,000 m^2 hotel with an annual energy consumption of 30 kWh/m^2 of electricity for lighting, and if the French emission factors are applied, a 75% energy saving represents:

1.90 teq CO2 avoided each year

French emission factor for electricity: 84.3 gCO2 / kWh.
French emission factor for gas: 231 gCO2 / kWh (Source: ADEME).

Market availability

Maturity of the solution: mature.

Market trends

- Energy saving light bulbs are increasingly available on the market and in retail stores.
- Note that incandescent lights will be progressively removed from the European market to be replaced by CFL.

Manufacturers

- Main manufacturers of energy saving lamps and ballasts:
- Philips Lighting *www.lighting.philips.com*,
- OSRAM *www.osram.com*,
- UMTOBEL *www.zumtobel.com*,
- GE Lighting *www.gelighting.com*.
- ELC (European Lamp Companies Federation) is the European federation of manufacturers. *For more information: www.elcfed.org*.

Energy Efficiency Solutions n°XIV

Electric appliances with high energy efficiency rating

General information on the solution

"Targets":

- Hotel area: General
- End-use: Laundry, kitchen and office applications.

Related criteria of the EU Eco-label:

The use of energy efficient refrigerators, ovens, dishwashers, washing machines, dryers/tumblers and office equipment is an optional criterion of the EU Eco-label (criterion #43).

About its implementation:

- Ease: Easy (*).
- Best moment: when replacing electric appliances.
- Relevant initial situation: some of the electric appliances that the hotel uses (for catering, laundry, office…) do not have a high energy efficiency rating.

Indicative cost:

- Varies.

Indicative return on investment time:

- <1-8 years

Note that costs and return on investment may vary greatly depending on the local context and on the hotel's initial situation.

Description of the solution

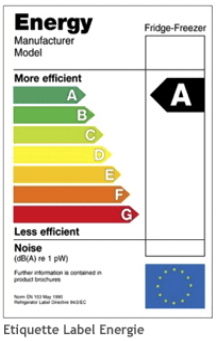
Principle

If you want to replace or upgrade your old appliances and electronic products in your hotel, make sure that you choose a product with a high energy efficiency rating.

European energy labelling (introduced by the Council Directive 92/75/EEC) is available for most household electric appliances, in particular for:

- catering equipment (refrigerators and freezers, mini-bars, dishwashers),
- laundry equipment (washing machines, dryers…).

Energy efficiency is expressed in terms of energy class, ranging **from A to G**. Class A corresponds to the optimal level of efficiency, while class G is the less efficient class.



Etiquette Label Energie

Using **catering and laundry equipment** with a high energy efficient rating (class A, A+ or A++) is particularly important considering that these services account for a considerable share of energy consumption in hotels (catering may represent as much as 15% of energy consumptions, for instance).

For **office equipment** (computers, faxes, printers, scanners, photocopying machines), the Energy Star label can be used as a reference.

Other **energy labels** may be used. In the U.K., for instance, you can look out for the Energy Saving Recommended logo. This logo is awarded to products that meet strict criteria on energy efficiency. It endorses over 3,000 different products – such as washing machines, dishwashers, lighting, televisions and DAB (digital) radios.

Recommendations

How to proceed?

- **A first step** is to identify all household equipment in the hotel. It is recommended to list and document them. This information should include information about the energy label, brand, year of purchase, load and operating hours.
- **In a second step**, the hotel should identify which equipment is to be replaced, and make sure that new equipment purchased has a good energy rating.

Caution

- Be aware that if you are replacing a piece of equipment by a more efficient one while upgrading the associated service (for instance, if you switch to a fridge with a larger capacity), the energy savings may be a little compromised.

What else can my hotel do to reduce the electricity consumption of electric appliances?

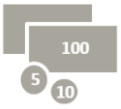
- You need to check that your electric appliances are correctly used, and that they are switched off when not in use (TV, DVD, Hi-fi…).
  - Stand-by modes can be responsible for up to 70% of the consumption of an electric appliance. That is a waste of energy which you can limit by encouraging your staff and your guests to adopt good housekeeping practices.
  - You may also introduce a towel and sheet policy in your hotel to limit the use of laundry equipment (which is a big energy consumer).

Also, remember that most equipment needs to be maintained regularly to work properly (refrigerators, freezers, washing machines, etc.), otherwise energy can be wasted. For instance, a washing machine that is not maintained can use 10% to 20% more than a well-maintained one.

Link with others database

While solution n°XIV (**electric appliances with high energy efficienvy rating**) is focused on laundry, kitchen and office applications, it is also important to consider the energy efficiency rating of other types of equipment, in particular: **lights** (solution n°XIII), **boilers** (solution n°XVII) and **space cooling equipment** (solution n°XIX).

Benefits for the hotel



Cost reduction

Energy saving

Electric appliances with a high energy efficiency rating are usually a high-return, low-risk investment.

Potential energy saving associated with the use of electric appliances: up to 50%.

Benefits for the environment

CO_2

Carbon emissions reduction

For a 1,000 m^2 hotel with an annual energy consumption of 40 kWh/m^2 for electric appliances, and if the French emission factors are applied, a 50% energy saving represents:

1.69 teq CO2 avoided each year

French emission factor for electricity: 84.3 gCO2 / kWh.
French emission factor for gas: 231 gCO2 / kWh (Source: ADEME).

Market availability

Maturity of the solution

- European energy labelling was introduced in the 90s and is now a well-established label.

Manufacturers and suppliers

No specific manufacturer or supplier to mention (all products that are in the scope of the European energy label must display their energy rating).

Main labels

EU energy label:
www.energy.eu/focus/energy-label

Energy Star:
www.energystar.gov

Energy Saving Trust:
www.energysavingtrust.org.uk

Energy Efficiency Solutions n°XV

Energy efficient motors in Heating Ventilation Air-Conditioning applications

You probably have noticed that space heating and cooling is one of the largest energy consuming activities within your hotel. What you probably do not know is that the motors of the ventilators, compressors and pumps involved in your HVAC applications are responsible for a large share of your electricity consumption because they generally work at full load all the time!

In fact, motors do not need to work continuously at full load. Energy efficient solutions like variable frequency drive (VFDs) are available to adjust the speed of the motors to the actual needs of your hotel and can help reduce the electricity consumption of your HVAC applications.

Why will I save on electricity by adjusting the speed of motors?

Variable speed drive for asynchronous motors

Most systems that involve flow rates (like pumps, ventilators and compressors) are used without any regulation of the motors' speed. Most of the time, the flow rate is adjusted conventionally by modifying the flow section, using valves or air shutters. The problem with this type of regulation is that motors keep running at full load, while HVAC systems rarely require maximum flow rate, thus resulting in a waste of electricity.

Adjustment of the speed of motors with an electronic device may save up to 70% on electricity compared to on-off systems. Indeed, the electricity consumption is proportional to the motor's speed cubed!

Which types of equipment are involved?

Most HVAC equipment (i.e. equipment used for heating, ventilation, air conditioning) is involved. For instance, water circulation pumps used in water heating systems may use a variable speed motor.

Water circulation pump of a water heating system

How can variable frequency drive been used to adjust the speed of motors?

Most electric motors used in HVAC applications and hydraulics applications are asynchronous motors. To modify the speed of such motors, it is necessary to modify the frequency of the alternating current at its entrance. Variable frequency drives are electronic devices that are able to progressively adjust the speed of such motors.

Related criteria of the EU Eco-label:

- *Not explicitly treated by the EU Eco-label criteria.*

Which are the benefits of variable frequency drives?

- Variable frequency drives usually provide regulation functions, so the regulation of the whole system is improved. Moreover, they can also provide protection to other components of the system.

- Mechanical overload and peak pressures implied by on-off systems are avoided, thus resulting in an improved system lifetime.

What should I take into account before installing a variable frequency drive?

- Before deciding to install a variable frequency drive, it is recommended to have a HVAC design company evaluate the energy saving that could result from this system, because this may fluctuate depending on your installation.

- More generally, the opportunity to have variable frequency drives installed on your HVAC motors really depends on the configuration of your system. Given the complexity of this evaluation, we advise you to consult a qualified HVAC design company or installer.

Can all existing equipment work with a variable frequency drive?

Some equipment may not be able to work with a variable frequency drive – or only after motor replacement. That is why we advise you to consult a qualified HVAC design company or installer before making a decision.

How much will my hotel save when installing a variable frequency drive?

- Cost reduction: Adjustment of the speed of motors can save up to 70% on electricity compared to on-off systems.

- Energy savings achieved result in important cost saving over a pump (or ventilator) lifetime: When looking at the lifetime of a pump (or ventilator), one can see that the initial cost of a pump (or a ventilator) is about 5% of its lifetime cost, maintenance is also about 5%, while energy consumption is about 90%! Energy saving thus results in important cost savings.

Link with other solutions in the database

- Installation of efficient heating and cooling equipment (solutions n°XVII and XIX), and regulation of space heating and cooling (solution n°XVI) should also be considered in order to reduce energy consumption for space heating and cooling.

Energy Efficiency Solutions n°**XVI**

Regulation of space heating and cooling

Space heating and cooling is generally the largest energy consuming activity within a hotel. To keep energy consumption reasonable, it is necessary to regulate temperatures according to the actual needs and occupancy of the different zones of the hotel. In particular, having close control for individual rooms is very important.

The table below gives recommended temperatures according to occupancy:

Heating/cooling regime	Temperature setting	Application
Normal heating	20-22°C	Occupied spaces
Low heating	16-18°C	Unoccupied for a short period
Stand-by heating	12-14°C	Unoccupied for a long period
Normal cooling	25-26°C	Occupied spaces
Low cooling	27-29°C	Unoccupied for a short period
Stand-by cooling	30-32°C	Unoccupied for a long period

Related criteria of the EU Eco-label:

- Installation of control systems in the bedrooms to regulate the temperature individually counts as an optional criterion of the EU Eco-label (criterion #38).
- Automatic switching off of air conditioning systems when windows are open counts as an optional criterion of the EU Eco-label (criterion #41).

Which technical solutions can help ensure appropriate regulation of temperatures in my hotel?

- Individual temperature control systems (e.g. thermostatic radiator valves) enable guests to regulate the temperature according to their individual needs in the rooms.

- Automatic control systems may also be used to switch heating and air-conditioning on and off in guest rooms:
  - Occupancy linked controls can be used to isolate guest rooms or heat them to a “set-back” temperature automatically, as guests enter or leave their rooms, or when they check in at the reception.
  - Automatic devices can be used to turn off heating and air conditioning when windows are open.

- Timers or programmers are quite suitable for areas such as function rooms and eating areas, where temperatures rarely need to be kept at full comfort level.

- Programmable set-back thermostats (a combination of thermostat and timer) make it possible to have two or more temperature settings for times of lower demand, for instance during the night or when rooms are unoccupied. They can be used in conjunction with occupancy sensors, so when an area is unoccupied, the thermostat setting is allowed to slip back a few degrees.

Digital room thermostat

- Good housekeeping practices are also key for an appropriate temperature regulation. They include:

  - Manual temperature setting according to the actual occupancy of the different zones (when there is no automatic temperature control),

  - Appropriate allocation of rooms (in winter, heated zones should be grouped).

How difficult is to install new temperature regulation systems?

Should the accommodation have a heating system with individual radiators, thermostatic radiator valves can easily be installed by a technician. Automatic control can be done either with an independent regulation system in each room or with a central (computer) system. It can thus be integrated into the hotel's Building Energy Management System (BEMS) if there is one. In this latter case, it is recommended to adopt heating zone control, where applicable, to optimize heating and cooling use.

How do themostats work?

For an appropriate temperature regulation, it is important to ensure: accuracy of the thermostat, good positioning of the thermostat in the room, and correct temperature setting for the upper and lower limits of the thermostats.

What is the accuracy of a thermostat?

The temperature indicated on the thermostat dial should relate accurately to the temperature the thermostat is trying to achieve. The thermostat setting may drift with time and a temperature of 20°C might be as low as 18°C or as high as 22°C. That is why it's worth checking your thermostat by finding out the position at which it clicks and comparing this with a thermometer.

Switching accuracy (temperature difference of when the thermostat switches the heating system on and off) is also important. If this is too wide the temperature in the building will fluctuate and energy will be wasted.

Generally speaking, modern thermostats use an electronic sensor and are very accurate. Older thermostats rely on bimetallic strips and are less accurate.

Where should the thermostats be installed?

For good temperature control, it's better not to install thermostats right next to the door. Also, make sure their position is obvious to clients, and give them simple instructions on how to set them.

What are thermostatic radiator valves?

Thermostatic radiator valves are not very accurate and need to be adjusted quite regularly to give the best temperature.

For more accurate control, groups of radiators on the same circuit can be controlled by one motorised valve which is linked to an electronic air thermostat.

Make sure valves are easily accessible for guests and are working properly. Give some guidance notes in the room's information pack. Also instruct cleaning staff to reset radiators to a pre-set level ready for new guests.

What are timers and programmers?

Remember to use timers and programmers and to set them correctly. Take great care to set systems regularly, particularly during weekends, bank holidays and spring and summer hour changes.

How much energy can my hotel save by installing new temperature regulation systems?

Autonomous control systems in guest rooms can save up to 20-30% of energy on space heating.

Note that a 10% saving in energy can be achieved for each degree you reduce your thermostat setting.

How can my hotel guest benefit from installing new temperature regulation systems?

Appropriate temperature regulation improves guest comfort.

Autonomous control systems enable guests to regulate temperature according to their needs.

Link with other solutions in the database

- Solution n°XVI (regulation of space heating and cooling) may involve automatic room control systems and therefore should be considered together with solution n°XI (key card systems) and solution n°XII (lighting control).

- Installation of efficient heating and cooling equipment (solutions n°XVII and XIX) should also be considered to reduce energy consumption for space heating and cooling.

Energy Efficiency Solutions n° **XVII**

High efficiency boilers

The energy efficiency of boilers available on the present market is much better than it used to be. If your boiler is old (>15 years old) or needs to be replaced, it is highly recommended to switch to a high efficiency boiler: A-rated boiler, condensing boiler, or low-temperature boiler.

What makes a boiler efficient?

When choosing a new boiler for your hotel, efficiency is important. An efficient boiler is one that turns as much of its fuel into useful energy with as little as possible wasted. Overall system efficiency is dictated by many different factors, which including the type of boiler, radiator size, system controls (pumps, programmers, thermostats), regular servicing, and so on.

Condensing boiler

Related criteria of the EU Eco-label:

- The energy efficiency of heat generating capacity is considered in criterion #3 (mandatory) and in criterion #32 (optional).
- NO_x emissions of boilers are considered by criterion #33 (optional).
- Maintenance and servicing of boilers are considered in criterion #23 (mandatory).

How difficult is it to change an old boiler for a new more efficient one?

High Efficiency boilers are designed to fit as easily onto an existing system as a standard efficiency boiler, with no changes to radiators.

What is an A-rated boiler?

Energy labelling, usually lettered from A to G, is available for boilers. This labelling indicates the energy efficiency of the boiler: an A-rated boiler is more efficient than a B rated boiler so if you change your boiler, make sure that it is an A-rated one. Energy labelling is not yet mandatory but it is used in some countries as a voluntary action.

Labelling schemes available for boilers

- The main energy label used in Europe was introduced by Council Directive 92/42/EEC. It is applicable to hot water boilers fired with liquid or gaseous fuels. Make sure your new boiler has a 90% or even 95% energy efficiency according to this Directive.
- In the UK, the presence of the 'energy saving recommended' logo *(labelling scheme managed by the Energy Saving Trust)* indicates an A-rated boiler.
- In the UK, many new boilers carry a SEDBUK rating *(SEDBUCK=Seasonal Efficiency of a Domestic Boiler in the UK)*. The SEDBUCK label looks like the European energy label you find on domestic appliances. It has lettered ratings from A to G.

What is a condensing boiler?

Condensing Boilers are high efficiency boilers, recapturing heat that would otherwise be lost. This boiler is a been used more and more by hotels in order to save on their monthly bills and protect the environment. Although condensing boilers are slightly more expensive, you will end up saving more money in the long run.

Condensing boilers are similar to non-condensing boilers, except that they extract more heat from the hot flue gases because they have a larger heat exchanger.

Because of their larger heat exchanger, condensing boilers are more efficient than non-condensing boilers.

Typical models offer efficiency of around 90%, so most brands of condensing gas boiler are in the highest categories for energy efficiency (i.e. they are usually A-rated boilers).

A newer generation of condensing boilers are called 'modulated control' boilers. They are more efficient than non-modulated control units.

What is a low-temperature boiler?

A low-temperature boiler is designed to work with a water temperature lower than 40°C (whereas standard boilers work with a water temperature between 70°C and 80°C). Low temperature heating systems give a lower heat loss in the distribution system, lower standby losses in the boiler, and a higher efficiency.

Low-temperature boilers can only be installed if the water distribution system and the heat emitters (radiators…) are changed because they need to be sized accordingly. That is why they can only be installed during extensive renovation of the hotel.

Are there any other interesting alternative boiler systems to be considered?

Solar-assisted systems and biomass-fired boilers can be interesting alternatives to conventional boiler systems.

Installing a "staged" multiple-boiler system instead of one large boiler may also be an interesting option. Indeed, one large boiler that is frequently operating at less than its peak load will certainly be less efficient, while a staged boiler gives the hotel the option of running only some of its boilers at a time, thus reducing the amount of time a given boiler is running at less than peak load.

How should I proceed to choose and install a new boiler?

Given the technical complexity of this solution, we advise you to consult a qualified heat installer to choose the right boiler for the specific needs of your hotel.

How should I proceed to choose a heating installer?

In many countries, certification schemes are available to certify qualification of installers. You should contact energy agencies or professional associations in your country to get information on the existing certification schemes.

In the case of the UK, gas heating systems must be installed and serviced by a heating engineer registered with the Council for Registered Gas Installers (CORGI). Oil and solid fuel systems should be installed and commissioned by a member of the Oil-Firing Technical association (OFTEC) or Heating Equipment Testing and Approval Scheme (HETAS) respectively.

What else should I care about to ensure that my hotel's heating system is efficient?

If you have a condensing boiler installed, it is important that the heating installer makes sure that the rest of the heating system is designed and implemented to return temperatures to the boiler that are not too warm. Indeed, the actual operating efficiency of a condensing boiler depends on the temperature of the return water stream: if it is too warm, there will be little condensation.

Boiler heating controls are also key to system efficiency. A good control package for a boiler system should include:

- a programmer capable of timing the space heating and hot water separately.
- room and hot water thermostats (see solution n°XV),
- motorised valves to provide independent control of heating and hot water,
- controls so that the boiler only operates when required.

If your hotel has grown over time with extensions and conversions to add new rooms, it means the heating and hot water connection pipes have got longer and longer and heat loss has increased. To avoid this it is often best to consider a number of separate smaller boilers for each zone, sized to provide the precise requirement of each.

How is the maintenance for new efficient boilers?

It is highly recommended that your boiler receive proper maintenance on a regular basis in order to make sure that it operates with both efficiency and conservation. Have your boiler serviced at least once a year.

How much energy can my hotel save by installing high efficienty boilers?

The extra cost of an A-rated boiler, compared to a B-rated one, is usually very small and energy savings are important.

Condensing boilers are more expensive than non–condensing boilers but their enhanced efficiency saves money from the day you start to use them. Overall, extra costs should be recovered in 2-5 years.

Switching to a high efficiency boiler can save energy up to 25-35% on heating.

Link with other solutions in the database

Regulation of space heating (solution n°XVI) and thermal insulation of boilers and water systems (solution n°XVIII) should also be considered to reduce energy consumption for space heating and hot water production.

If you are planning to upgrade the thermal insulation of your building (solution n°VII), it makes more sense economically and technically to choose and replace your boiler (solution n°XVII) after the insulation work is done. Indeed, the insulation work will reduce your energy needs for space heating and you will certainly need a lower power boiler!

Energy Efficiency Solutions n°XVIII

Thermal insulation of boilers, water systems, domestic hot water tanks and water pipes

Insulation of boilers, hot water storage tanks and water distribution systems is a very efficient way to keep your water hotter for longer, especially if the equipment is exposed to cold conditions in winter.

By reducing heat loss, insulation allows for a lower water temperature setting and thus provides energy and money savings for your hotel. In addition, insulation of water distribution systems results in a shorter time for your guests to get hot water when they turn on a faucet or showerhead, which helps conserve water.

Why should my hotel invest in insulating the boilers and hot water tanks?

Insulation of boilers and hot water tanks should be considered, especially if they are made of a material with poor thermal insulation properties (in which case they will be hot to the touch).

Note that this is not the case of new hot water tanks that come with foam insulation already fitted: they do not need additional insulation.

Pre-cut jackets or blankets are commonly used to insulate hot water cylinders. They are ready made and fit a variety of standard sizes. Their insulation power depends on the type of material and their thickness.

Hot water jacket

As regards boilers: insulation can be applied to various parts, like valves and condensate receiver tanks. Insulation is sometimes referred as “boiler lagging”.

Related criteria of the EU Eco-label:

Thermal insulation of boilers and water systems is not explicitly dealt with by the EU Eco-label criteria.

Should I also invest in insulating the water pipes?

Adding insulation to your hot water pipes is also a low cost, energy efficient solution for pipes that are not located in heated rooms.

There are two main materials available for insulating water pipes: a mineral wool wrap and the more modern pre-formed insulation foam. Their insulation power depends on the type of material and on their thickness.

Besides stopping heat loss, insulation of water pipes also reduces the risk of pipes freezing in winter.

Thermally insulated copper pipes.

Insulation of pipes.

How to choose the insulating products?

Make sure to choose quality insulating products, preferably with a quality standard (e.g. the British Standard for boiler “jackets”).

Can I do the job by myself?

Fitting a jacket to a hot water cylinder can be easy to do but it’s better to have a qualified plumbing and heating contractor to insulate. Make sure to leave the thermostat access panel uncovered and to keep the jacket or blanket away from the drain at the bottom and the flue at the top (in the case of a gas water heater tank).

Fitting insulation to pipes can be easy to do if the pipes are accessible but if the pipes are hard to reach, some professional help is probably required.

If you insulate pipes by yourself, make sure there are no exposed gaps and don’t forget to cover any stop-cocks, valves, taps or overflows too. If you are using a pipe sleeve, match the sleeve’s inside diameter to the pipe’s outside diameter for a snug fit. Keep insulation away from the flue if you have a gas water heater.

How much energy can my hotel save by installing proper insulation?

Adding insulation to your water heater’s storage tank can reduce stand-by heat losses by 25-45% and save around 4-9% on water heating costs.

Link with other solutions in the database

Renovation of the heating system (solution n°XVII) and regulation of space heating (solution n°XVI) should also be considered to reduce energy consumptions for space heating and hot water production.

If you are considering renovating your heating system in the near future (solution n°XVII), it is recommended that you change your system first and thermally insulate the equipment afterwards.

Energy Efficiency Solutions n°**XIX**

Efficient solutions for active space cooling

Preventive measures (installation of sun protectors, etc.) are sometimes enough to keep a hotel cool and comfortable in summer. But the installation of an active space cooling solution may be necessary if your hotel still has cooling needs in summer.
Because air-cooling systems may have a strong impact on guests' comfort and on your electricity bill, it is necessary to choose them carefully.

What types of air-cooling systems exist?

- Air conditioners (AC): these systems aim to provide a building indoor environment that remains relatively constant despite changes in external weather conditions or in internal heat loads. Some systems are air-cooling systems only, while others can be used to heat space, stabilize humidity and ventilate in addition to space cooling.

- Reversible heat pump systems: heat pumps systems are primarily used for space heating but reversible ones can also be used to cool indoor spaces. Contrary to air-conditioners, they can reduce the inside temperature by only a few degrees.

Related criteria of the EU Eco-label:

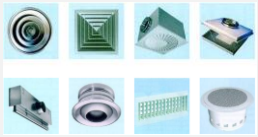
- The energy efficiency of air conditioning systems is dealt with in criterion #4 (mandatory) and in criterion #40 (optional).

- General maintenance and servicing of air conditioning systems is dealt with in criterion #23 (mandatory).

- Use of heat pump is dealt with in criterion #36 (optional)

Indoor unit of a split air-conditioner

What are the main solutions available?

Solution type	Main solutions available	Advantages / drawbacks
Individual AC systems (the air of the room is cooled by passing through an evaporator located in the room: they are called "direct expansion" systems)	▪ Standalone systems (include the condenser and the evaporator in the same box),  ▪ Split systems (the evaporative units are placed in the rooms to be cooled; the condenser is placed outside the building) 	*Drawbacks* ▪ Must be installed in each room that needs to be cooled ▪ Produce cool air jets (not so comfortable) ▪ Tendency to air-drying *Advantages* ▪ Easy to install (generally) ▪ VRV (*) split systems offer good comfort (varying cooling power) but require suspended ceiling *(* Variable Refrigerant Volume)*
Central AC with a water network used for cooling	Cold water is produced in a water chiller plant (or may come partially from a naturally cold source like ground water, lake) and is distributed by a water network. Possible emitters include: - terminal units functioning at low temperature (7-12 °C): fan coil units, air processing units, - emitters functioning at moderate temperature (15-18 °C): ceiling panels, radiant floors… NB/ A separate air network provides fresh air.	*Advantages* ▪ Offer good comfort (generally) ▪ Thermal and ventilation functions are separated (provides good flexibility) ▪ Guest rooms can adjust cooling on their own (with fan coil units) *Drawbacks* ▪ May be difficult to retrofit ▪ Radiant panels have limited cooling power & are not adapted to guest rooms ▪
Central AC with an air network used for cooling	Air is treated in a central plant and is distributed by air ducts. ▪ Constant air volume systems: pulsed air flow is constant and temperature of the blown air can be adjusted, ▪ Variable Air Volume (VAV) systems: temperature of blown air is constant but pulsed airflow can be adjusted. 	*Advantages* ▪ Produce temperate air jets (blown air mixed with new air coming from outside and air from inside the rooms) ▪ Provides new fresh air (but the airflow can be adjusted only with VAV systems) *Drawbacks* ▪ Difficult to retrofit (bulky air ducts and air-handling unit) ▪ The ventilators may consume a lot of electricity *these drawbacks are reduced quite a bit with VAV systems*
Heating/ cooling machines: the case of heat pumps	The heat is extracted from the air (air source heat pumps) or from the ground (geothermal heat pumps) and transferred to air or water. ▪ Main available systems: water-water, air-water, ground-water, air-air, ground-air, water-air.	*Advantages* ▪ Use of renewable energies ▪ Possibility of free-cooling with geothermal systems ("geocooling") *Drawbacks* ▪ Geothermal systems are difficult to retrofit

General recommendations about space-cooling systems

Central systems that use a water network for cooling are well suited to zoned heating/cooling and they generally provide good comfort. In addition, they offer good flexibility as regards ventilation and heating/cooling and may be not too difficult to install in an existing building.

“All-air” central systems generally offer good comfort since the difference in temperature between the blown air and the air inside the rooms is limited and air diffusion can be very comfortable. In addition, it allows energy savings: heat recovery can be used in the air handling unit, and free-cooling can be (and should be) practised when the outside air temperature is lower than the inside temperature (typically, at mid-season and at night in summer). But:

- they may be difficult to install in an existing building,
- ventilators may be large electricity consumers depending on the installation design,
- the quantity of fresh air provided by the system exceeds the needs of most hotel rooms (only permanently occupied office rooms require such air renewal).

VAV systems are the most recommended: operating costs are about 20% less than with constant air volume systems, due to better energy efficiency.

If you decide to install a split system, we recommend that you choose a DC inverter system (Digital Courant), because it allows you to adjust the cooling power to the actual needs of the rooms and thus to reduce the electricity consumption.

Standalone systems and window air-conditioners are not recommended because they are not energy efficient and tend to be noisy.

How should I proceed to choose and install a new space cooling system?

The application of a particular type of system depends on a number of factors such as the area to be cooled, the heat loads of the different areas, etc. Given the technical complexity of this solution, we advise you to consult a qualified HVAC design company or installer to choose the right equipment for the specific needs of your hotel.

Whatever the solution, we recommend you pay particular attention to the Energy Efficiency Ratio (EER) of the cooling machine: this ratio describes the energy performance of the system. The Seasonal Energy Efficiency Ratio (SEER) may also be used. The higher the rating the greater the efficiency.

How much maintenance and servicing do a space cooling system require?

Maintenance and servicing of the space cooling system is essential to maintain the energy efficiency of the equipment over time.

Remember, before installing a space cooling system, that reduction of space cooling needs is a top priority for guests’ comfort and to keep operating costs reasonable. That is why we recommend the following actions:

- Protect the building from outside heat by upgrading the thermal insulation of the building (loft and wall insulation) and by installing sun protectors on the outside.
- Also, in hot conditions, remember to keep windows, doors and blinds shut.

What alternative solutions to active space cooling are also available?

Fans and ceiling mill-type ventilators can help to keep your guests comfortable when the temperature is high. They may be used as an alternative to air conditioning systems, or as a complementary solution (especially in rooms not equipped with AC systems).

Ventilation on cool nights and evenings can also be a very effective measure to reduce space heating needs. It may be done manually (by opening windows) or through a mechanical system (please refer to solution n°XX).

Finally, it is important to avoid heat coming from electric appliances and lights. So, remember to switch off any unnecessary equipment.

©eprofeel.com

How much energy can my hotel save by switching to a high efficiency cooling system?

Switching to a high efficiency cooling system can result in as much as 50% in annual savings on space cooling.

Annual Savings
The chart above illustrates annual savings when upgrading from an 8 SEER system to a more efficient one.

Source: Department of Energy, USA.

Link with other solutions in the database

The best way to ensure that buildings are pleasant for guests in summer is to ensure that they have an energy efficient design in the first place. That is why building insulation (solution n°VII), installation of sun protectors (solution n°IX) and outside works to improve summer comfort (solution n°X) should be considered as priority.

As you may want to install a cooling system that ventilates and/or heats space in addition to space cooling, it is recommended to take into account your cooling-ventilation-heating needs all together when you think about replacing your heating equipment (solution n°XVII), ventilation equipment (solution n°XX) or cooling equipment (solution n°XIX).

Energy Efficiency Solutions n°XX

Efficient ventilation systems

Air quality is an important part of a guest's stay in any type of hotel. Guests can immediately recognize a poor ventilation system by the stagnant, polluted smell of the air in their rooms and common hotel areas. You should design a hotel's ventilation system so that it maximizes air flow and circulates oxygen.

Why is it highly recommended for my hotel to have a controlled ventilation?

Air quality: the quantity of fresh air needed depends on room occupancy and on activities within the rooms (for instance, bathrooms require important air renewal); therefore air renewal should be adjusted accordingly.

Reduction of heat loss: excessive ventilation should be avoided in cold conditions because it will result in important heat loss (ventilation may be responsible for up to 15% of heat loss in winter).

Need for cooling in hot conditions: over-ventilation may be very useful at mid-season or at night during summer in order to keep the hotel cool and comfortable.

Related criteria of the EU Eco-label:

- Heat recovery systems are dealt with by criterion # 37 (optional).

Which areas of my hotel should I ventilate?

Hotel Kitchen Ventilation

Kitchen Ventilation is important to remove heat, smoke, grease, steam, and combustion products. It helps to keep fresh air in the kitchen. Your hotel has the following advantages with kitchen ventilation systems.

- Keep your kitchen clean and safe
- Keep your kitchen staff in better environment
- Prevent food contamination from air borne sources
- Improve indoor air quality in your kitchen
- Prevent corrosion of kitchen equipment
- Control heating and cooling costs

Hotel indoor pool ventilation

Water evaporates no matter what temperature or what condition it is in, it will evaporate if left exposed. You can reduce the amount of evaporation by covering the pool when not in use but you can not eliminate it. If left uncovered the evaporation would produce high humidity's in the pool hall and promote mould and corrosion of the hotel building structure.

Hotel bathrooms

Hotel bathrooms are one of the dampest rooms in your hotel. Without proper ventilation, you put them at risk of developing mold and mildew which can then spread and enter your hotel's air supply. Ensure that the bathroom ventilation system is operational while the bathroom is in use and that it remains on only for a few minutes after the light has been switched off. A time-delay relay is used to prevent the extractor from switching off immediately and to ensure that it remains on during an adjustable time-delay period.

Which solutions exist for efficient ventilation?

Various solutions exist for efficient ventilation; the most reliable ones (as of today) are demand-controlled mechanical systems (*). But these systems are worth considering only if air infiltrations at doors and windows are controlled in the first place! (*) Natural and hybrid ventilation (which is partly mechanical, partly natural) may also be considered but this generally does not offer the same control over ventilation.

What is mechanical ventilation?

Mechanical Ventilation draws air from the exterior of the building through ducting and fans to the space, the 'old' air is extracted from another area within the space to be released to the atmosphere.

What are the main existing types of mechanical systems?

Exhaust-only or supply-only ventilation systems: in this case, only the air exhaust (or supply) is operated mechanically. Airflow can either be constant (without any possibility of adjustment) or adjusted with the technical solutions cited below.

- In guest rooms, for instance, air can be extracted mechanically from the bathrooms and supplied by openings in the façade.

Supply and exhaust ventilation systems: in this case, two fans are used: one brings fresh air in and another sends the indoor air out. This system gives you better control over the ventilation rate as the air supply is controlled. In addition, this type of configuration allows pre-heating of the incoming fresh air in winter if a heat recovery unit is placed on the exhaust air network. This improves indoor comfort and contributes to the reduction of space heating needs.

- Although this system requires additional electricity consumption for the second fan, energy savings resulting from the heat recovery generally exceed the additional electricity consumption.

- This system allows you to over-ventilate at mid-season and at night during summer (if designed for high air flows), thus lowering the needs for active space cooling.

A thermodynamic machine (a small reversible heat pump) may be coupled with the ventilation system to provide enhanced air heating and cooling.

- This system is well suited to noisy environments (contrary to natural ventilation or exhaust-only or supply-only ventilation systems).

How much energy can my hotel save by installing a mechanical ventilation system?

- Use of a heat exchanger can save up to 50% of heat loss resulting from ventilation.

- If ventilation is responsible for 15% of the building heat loss, this results in a 7% saving on space heating.

- A study by CETIAT (Centre Technique des Industries Aérauliques et Thermiques, France) has also shown that you could save 50% on space heating in meeting rooms that are occupied 10% of the time by adjusting the ventilation airflow to the occupancy.

Advantages Mechanical Ventilation

- Fresh air can be supplied with ease deeper within the building.
- Not dependant on outdoor weather conditions
- Air flow rate is easily controllable
- Air can be directed to allow the output to be passed through a passive heat exchanger

What are the solutions available to adjust airflows to actual needs?

- Humidity control: air inlets and air extract units can incorporate humidity sensitive technologies (humidity being an indicator of a room's occupancy and pollution); when the air humidity of a room is high, the airflow is increased,

- Time programmers: they can be used to switch a ventilation system on and off according to room occupancy.

- Presence detectors: Presence detectors such as CO2 detectors or movement sensors.

Which are general recommendations for the regulation of mechanical ventilation systems?

- Supply and exhaust ventilation systems provide better comfort and give better control over the ventilation rate, but they are also more expensive. The choice between the two types of systems must be made according to consideration of the specific needs of the hotel in terms of ventilation, acoustic comfort, etc.

  Also, it is recommended to take into account your cooling-ventilation-heating needs because the choices of ventilation/heating/cooling systems depend on one another.

- Independent ventilation systems should be used for zones with very different activities and sources of pollution.

Room type	Possible air flow controls
Guest rooms	▪ A presence detector is particularly recommended: either an on-off presence detector or a CO2 based detector ▪ A humidity control can also be used
Large restaurants	▪ A CO2 detector can be used
Kitchen	▪ A humidity or temperature control is particularly recommended ▪ A presence detector can also be used

Note that ventilation control can be done either with an independent regulation system in each room or with a central (computer) system. It can thus be integrated in the Building Energy Management System (BEMS) of the hotel, together with space heating and cooling control. In this case, it is recommended to adopt zone control.

How should my hotel proceed to choose and install a new mechanical ventilation system?

The application of a particular type of ventilation system depends on a number of factors such as occupancy and activities of rooms, etc.

Given the technical complexity of this solution, we advise you to consult a qualified HVAC design company or installer to choose the right equipment for the specific needs of your hotel.

If you want to upgrade your exhaust-only ventilation system to a supply and exhaust ventilation system, it may be possible to reuse the exhaust air network but a suspended ceiling needs to be added for the air supply network.

If you decide to install a new ventilator, make sure that its electricity consumption is as low as possible.

Depending on the system configuration, it may be necessary to thermally insulate the air ducts and the heat exchanger – in particular if located in a non-heated part of the hotel.

How much maintenance will my hotel mechanical ventilation system need?

Maintenance and servicing of a mechanical ventilation system is essential to maintain good hygiene and the energy efficiency of the equipment over time.

When a new system is installed, particular attention should be paid to providing an easy access to the system to enable servicing.

Air quality is also affected by the age and cleanliness of the ventilation devices in a hotel room. Clean air vents and fans with a duster to avoid blowing dusty air in the room.

What is natural ventilation?

- Natural ventilation uses passive processes and makes use of the local micro climate to facilitate the air movement within the building.

Advantages Natural Ventilation

- No noise produced in the operation of the system
- Completely passive so no energy required
- Minimal maintenance required
- Decreased capital costs

Link with other solutions in the database

- Installation of an efficient ventilation system (solution n°XX) should be considered when upgrading the thermal insulation of the building (solution n°VII) or the windows (solution n°VI).

- To take advantage of all the benefits of an efficient ventilation system, it is important to prevent air infiltration and unnecessary outdoor air supply (solution n°VIII) and to upgrade the thermal insulation of the building (solution n°VII).

- Because you may want to install a cooling system that ventilates (and/or heats space) in addition to space cooling, it is recommended to consider your cooling-ventilation-heating needs all together when you think about replacing your heating equipment (solution n°XVII), ventilation equipment (solution n°XX) or cooling equipment (solution n°XIX).

- Note that ventilation can be operated together with space heating and space cooling with “all-air” central air-conditioning systems (see solution n°XIX).

Contact
World Tourism Organization
ICR-HES@unwto.org

42, Capitan Haya
28020 Madrid SPAIN
Tel: +34 91 5679 305
www.unwto.org

Hotel Energy Solutions Official Partners

Supported by