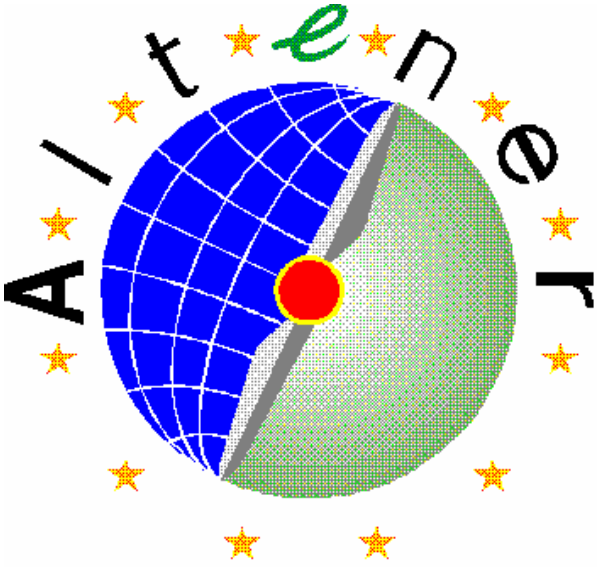
European Commission
**Directorate-General for Energy and Transport**




# PROMISE

## Procurement in Municipalities for Integrated Solutions on Energy

# Guidelines for the Preparation of Technical Specifications for Tenders

**February 2004**

## TABLE OF CONTENTS

# 1 Introduction

This guide provides guidelines and recommendations for technical criteria to be considered when making a decision to procure certain goods, services or overall projects where energy issues play a relevant role.

**What are the objectives?**

- To provide a procurement officer or person dealing with the acquisition of new goods and services with a **reference tool for reducing the environmental impacts, reducing the energy consumption and/or looking at the possibilities to include renewable energy sources** through the technical design and certain technical criteria.
- To acquaint public authority officials with the use of **energy related standards in public procurement** since with the new EU Directive on buildings energy performance, minimal requirements will be applied to all new and large existing buildings.
- To **promote energy and environmental procurement practices** that lie beyond legal compliance and demand more than the minimum requirements.

**Who should read this guide?**

- **Technical departments in local authorities:** officers in charge of preparing tender dossiers, selecting the offers and supervising the works.
- **Delegated companies acting for local authorities:** these can be general planning companies or architects bureaux. They are acting on behalf of the local authority to prepare the tendering procedure, supervise the works and deliver the final product.

**What does the guide provide?**

- **Description of general planning principles to be used:** indicative guidelines that should be considered at an early stage of the project that is going to be tendered.
- **Technical specifications for different energy applications:** concrete advice and recommendations with quantified targets for different applications that could be used when preparing technical specifications for tenders

The following **energy related topics** will be described:

- General remarks on the energy procurement process
- Common principles in planning and design of buildings
- Heating and hot water systems
- Ventilation and air-conditioning
- Windows and glazing
- Electric appliances for office use
- Lighting
- Electricity supply contracts (e.g. green electricity tendering)

# 2 General remarks on the energy procurement process

In the following, primary aspects are described that shall help you find the right approach when starting to think about new projects. These aspects can be generally divided into principles that should be followed ***before*** the procurement stage and such being important ***while*** preparing tenders.

**Note:**
As this section focuses on the technical aspects of procurement, for general regulatory issues please refer to the ***"Guidelines to Public Procurement Regulations"***.

***Principles to be followed before drafting the procurement documents***

- **Preplanning**
  Including energy efficiency and use of renewable sources in any new municipal project should be considered from an early stage, during the identification and preliminary design of a project.

- **Support from experienced professionals**
  It is recommended that experienced professionals like energy agencies and consultants that can provide assistance - through feasibility studies, levels of performance of equipment, drafting of Terms of Reference (TORs), etc - are consulted prior to a procurement in order to achieve the most effective and favourable results. Use experts according to the needs of the owners.

- **Funding possibilities**
  When the project is being identified, possible funding opportunities and initiatives for use of renewable energy, energy efficiency and/or energy reduction should be investigated.

***Principles to be followed while drafting the procurement documents***

- It is necessary to clearly state in the introduction of the tender dossier the **general environmental principles and criteria that are required from the tenders** so as to demonstrate the importance of the environmental strategy of the procurement. Specific principles and criteria for equipment and services should be then described in the documentation specific for each lot. The level of detail in which criteria and specifications will be described in the tender dossier should be considered beforehand.

- Specifications represent a **concrete description of the needs that have to be satisfied** by the procurement of external resources. In other words, it defines what the purchaser wishes to buy and, consequently, what the supplier is expected to provide.[1]

[1] Source: IDeA: Guidance on Implementing Sustainable Procurement in Local Government, 2002

- **Technical requirements** can be related to various aspects and translated into criteria allowing you to choose between comparable products and equipment. In addition to conventional criteria such as technical characteristics, life period and maintenance requirements can also include performance levels, limitation of packaging, absence of hazardous materials, use of re/usable or recyclable products, as well as characteristics related to standards or labels (e.g. for wood products coming from sustainable forests).

***Specification principles***

- **Define your priorities and objectives and compare them with your specifications.** Will you manage to reach the targets if you purchase the products described in your specifications?
- **Minimum levels of performance.** State the minimum levels of performance for the equipment/services you want to purchase.
- **Environmental requirements during work execution.** Environmental requirements can be introduced for the work carried out during execution, as for example energy use requirements on and around the construction site.
- **Selection of suitable and environmental friendly product and material.** The product or material should fulfil all those functions that you expect, for all potential users. Choose long-life, recycled or reused products and materials with high quality, maximum reparability and upgradability. Go for energy and resource efficient equipment. Consider labelled products (Energy labels, Eco labels).
- **Use of renewable sources.** Choose equipment that use renewable sources rather than fossil ones. Take into consideration the whole life cycle costs of these products, since although they may require higher initial investments, they will cause lower operation and maintenance costs during operation.
- **Integrated Management.** Management of equipment/services such as energy and water should be integrated in order to lower maintenance and operation costs.
- **Monitoring during operation.** Include metering and monitoring equipment, together with the specified equipment, in order to constantly identify the level of operation and possible inefficiencies during the utilisation period.
- **Candidate selection criteria.** Describe specific conditions that should be fulfilled by the candidates, as for example the minimum level of equipment and facilities, so as to guarantee the proper execution of the contract. EMAS, for example, could be considered as a standard for environmental performance.
- **Selection criteria.** Objective criteria for the selection of offers such as price, operation costs, cost-efficiency, etc, have to be clearly defined in the tender dossier.
- **Use of variants.** Since products and services that are less damaging for the environment can be more expensive, through the use of variants you can evaluate which option meets both the financial criteria and the objectives of greening the purchases.

# 3 Common principles in planning and design of buildings

One of the most comprehensive aspects of municipal decision-making is the part of "purchasing" new buildings or, even more often, retrofitting existing ones. As a general rule, building projects should develop according to ***"sustainable design principles"*** that look at the overall quality of buildings, e.g. from the point of view of the general design, the surrounding location, the materials and equipment used. These design principles shall be considered when the construction project is being designed and managed by the municipality itself (e.g. by the building department), and needs to be ensured as well when the local authority is appointing an external consultant or general planner to do the work for her.

A list of some sustainable design principles is shown in the box below.

**Sustainable design principles**

***Design of buildings***
- Design an energy efficient building ⇨ go for low-energy or passive house standard through increased insulation
- Design buildings to use renewable energy ⇨ think of incorporating e.g. solar, biomass systems
- Ensure thermal comfort over the whole year ⇨ go for controlled air ventilation and increased insulation
- Use daylight wherever possible ⇨ see chapter 8
- Integrate users into the planning process ⇨ take into consideration their needs during the planning stage
- Optimise energy as service product ⇨ by e.g. facility management, energy contracting
- Architectural design versus performance ⇨ go for energy performance design

***Equipment installed***
- Install high-efficiency heating and avoid air conditioning ⇨ *see chapters 4 and 5*
- Install energy efficient lights and appliance ⇨ *see chapter 7*

***Construction site and materials***
- Choose the construction site and the materials to be used that have the least adverse environmental, social and economic impacts ⇨ by e.g. preferring to locate a new facility in an area where its implementation can create the least additional pollution and nuisances, or where transport, energy and water infrastructures already exist.

These principles described above shall be considered in all phases of construction, being the **planning stage, the construction procurement, and the management of building assets** over their lifetime.

When **planning** a "sustainable construction", it is important to distinguish between those areas where you have direct control over (e.g. through their different executing departments, and e.g. through legal action), and those which you can only influence indirectly (e.g. external consultants, awareness raising activities). On own construction projects, there is the opportunity to demonstrate best practice, and the benefits to the local authority of becoming more sustainable (e.g. through reduced life-cycle costs, better quality of buildings, etc.). But across all these areas it is essential that thought and action on improving the sustainable approach should begin at the earliest point possible.

There are generally two possibilities to achieve high energy quality standards in construction:[2]

Either through

- **Purchase specifications:** they define the minimum requirements to apply when purchasing components and systems for installations in buildings. For example, the purchase of fluorescent lamps.

Or through

- **Building performance standards:** they identify the goal of efficient building design for those who are in charge of commissioning and designing buildings. They are helpful to provide a clear measure of building energy performance and some freedom of choice in optimising the design of new or refurbished by applying certain technologies and/or passive solutions. For example specific energy consumption requirements.

[2] Source: Final Report of the PROST Study on energy efficiency in the public sector ("Harnessing the Power of Public Purse", SAVE Programme, 2002

# 4 Heating and hot water systems

## *4.1 Planning principles*

The main criteria for planning a new heating system, regardless whether the planning will be done by the local authority itself or by an external planner are[3]:

- ***Dimensioning the heating system to fit expected consumption:*** In general, there are standardised calculations (available through norms) to determine the *heat load* of a building. The size of the boiler capacity is in general depending on the overall thermal quality of a building and the possibility of realising other gains, e.g. through passive solar heating and design, to prevent over dimensioning.

- ***Selection of appropriate supply temperature:*** It is an important criterion that influences the energy consumption of the heating system.

- ***Definition of the heat-emitting system:*** When designing the building, the selection of the appropriate system to distribute the heat is a very important aspect for a comfortable space climate. Generally, a system with a *big heating surface* (e.g. floor and wall heating systems) creates a more comfortable feeling for the user, compared to *convection heating* (e.g. radiators) that also requires a higher heating capacity, which in turn increases the energy consumption.

- ***Heat control and regulation:*** An important criterion when defining the appropriate heating system is the response time that the system needs to fulfil when the heating conditions are changing. If the conditions are changing rather fast the regulation and control system also needs to react quickly.

- ***Heat insulation:*** Insulation measures have to be considered not only on the outside structure of the building (walls, ceilings), but also for heating installations, in order to prevent heat losses at heating, hot water and ventilation pipes and prevent condensation at cold water and refrigerant pipes.

[3] Source: Check it! – Guidebook for green public procurement

### *4.2 Recommendations*

**Heating System**

- ***Decentralised / Central heating*** ⇨ for small / medium-sized applications (e.g. municipal buildings, housing, etc)

  Priority:

  - Focus on use of RES for space heating
    - Biomass – use of wood chips, pellets, log wood
    - Heat pumps
    - Solar panels
  - Focus on RES for hot water preparation
    - Solar panels

  Alternative (if the above options are not available or possible):

  - High efficiency gas / oil boilers (condensing boilers)

- ***Combined Heat and Power (CHP)*** ⇨ to be preferred for larger applications

  A CHP is an installation involving simultaneous generation of heat and electricity in a single process. CHP plants can achieve overall fuel efficiencies of up to 90% by generating electricity and recovering heat. In buildings, the recovered heat can be used for space heating and Domestic Hot Water (DHW). Due to the high fuel efficiency, cogeneration will significantly reduce operational energy costs.

**Example: Recommendation on the purchase of boilers, taken from the Eco Procurement Programme of the City of Vienna**[4]

- In general, boilers shall be used only in those cases, where a connection to the local district heating system is not possible (or not existing).
- If the building is located in an area with a natural gas network, a very efficient boiler (gas condensing boiler) shall be chosen. Condensing boilers are more efficient as they have secondary heat exchangers that recover latent heat from flue gases. By using modular systems, boilers operate closer to their full output, which improves the overall system's efficiency.
- In those areas where none of these options are available, the purchase of a biomass boiler (for burning of wood chips or pellets) shall be considered
- Oil boilers shall be only acquired in exceptional cases (use also condensing boilers only), electric heating under no circumstances.

[4] Source: Ökokauf Wien – Eco Procurement Programme of the City of Vienna

# 5 Ventilation and air-conditioning

## *5.1 Planning Principles*

The most important factor influencing the energy consumption of ventilation and cooling systems is the actual cooling load of a room/object. Therefore, reducing the average cooling load by certain measures will help reducing the size of the additional technical system that needs to be installed to ventilate or cool/dehumidify the air.

In general the following aspects should be considered ***before*** installing a ventilation/air-conditioning system:

- Allow enough ***airing*** for all rooms
- Foresee sufficient ***sun protection and/or shadowing*** of windows
- Use the full ***heat storage capacity*** of a building (therefore do not use e.g. suspended ceilings)
- Buy and install ***energy efficient equipment***. This will reduce the amount of waste heat generated by them, and as a result also the cooling load.
- ***Use as much daylight as possible!*** Reduce the amount of artificial lighting and use only energy efficient lighting systems.
- ***Heat insulation****:* An optimum insulation of walls, roofs and windows reduces the amount of excess heat to be reduced by additional (cooling) systems, and will therefore also reduce the size and cost of ventilation or air-conditioning system to be installed. Furthermore, thermal insulation is necessary to prevent condensation at water and cooling pipes, which could lead to a malfunction of air-conditioners.

**Note:**

- Ventilation is necessary:
  - if a natural circulation of air (mainly through windows) cannot be guaranteed
  - if specific requirements of objects, e.g. kitchen, workshops, meeting rooms, laboratories, hospitals, etc. make a technical ventilation system for air exchange necessary.
  - Other reasons for a ventilation system are rooms without windows, noisy or congested surroundings of buildings, skyscrapers or high density of people in a room.

- Air-conditioning:
  - Try to avoid air-conditioning in the first place!

  It would be necessary only:
  - if the heat load (coming from waste heat from persons, lighting and office equipment) of a room/building exceeds certain amounts. This means, that in general the special geometry of a room/building does not guarantee a sufficient removal of heat. This can be for instance caused by a weak thermal insulation of a building (warming-up the interior of the building), or by insufficient sun protection.

### *5.2 Recommendations*

**Air-conditioning**

| | |
|---|---|
| ***Room air-conditioners (< 12 kW):*** | Select packaged water cooled models with an Energy Efficiency Ratio (EER)>4,4<br>If water is not technically possible then split or multi split air cooled models should be preferred with an Energy Efficiency Ratio (EER)>3,2 |
| ***< 19 kW:*** | air sourced split or single package with EER>3,81 |
| ***from 19 kW –40 kW:*** | air sourced split or single package with EER>3,22 |
| ***from 19 kW – 73 kW:*** | air sourced split or single package with EER>3,17[1] |

*(Source: Final Report of the PROST Study on energy efficiency in the public sector "Harnessing the Power of Public Purse", SAVE Programme, 2002)*

# 6 Windows and glazing

## *6.1 Planning principles*

Windows can provide a net energy gain by allowing the sun's rays to fall on the glass during the winter (when the sun is lower) and blocking them with shading in the summer (when the sun is higher). Meaning, solar heat gains result from solar energy transmission through the window. Non solar losses and gains result from the temperature difference between indoors and outdoors and are measured using the U-factor. As much as possible:

- **Reduce the area of windows on east and west** sides to avoid summer heat gain.
- Properly **shade windows** with overhangs, awnings, or vegetation.
- **Exterior shading devices are more effective** than interior devices in reducing solar heat gain because they block radiation before it passes through a window.
- **South-facing windows:** horizontally oriented adjustable shading devices are appropriate.
- **East and west orientations** vertically oriented adjustable shading devices are more effective.
- **Limit the use of skylights**, which almost always add more heat in the summer and less in the winter.
- **Integrate Photovoltaic (PV) for shading**, as additionally electricity can be generated

The performance goals for improved energy efficiency in glazing and windows depend strongly on the respective climatic conditions and also on the type of building.

### *6.2 Recommendations*

**Recommendations for selecting window U factors**

- Close attention must be given to whether the **U-factor** listed by the manufacturer applies to the glazing only or to the entire unit. If referred to the glazing only, keep in mind that the overall U-factor of the entire unit may be considerably higher. The **whole-window U-factor** includes the effects of the glazing, the frame, and, if present, the insulating glass spacer.

- Select windows with **long warranty periods** that indicate sound window design and construction and a reduced probability of insulating glass seal failure or gas leakage.

  - **Whole-window U-factor** : It should be 1.3 or lower for maximum energy savings
  - **Frame materials**: Wood, vinyl, and fiberglass for maximum insulating value. Avoid aluminium-frame windows without thermal breaks Aluminium-frame windows with properly designed thermal breaks can be used in moderate climates.
    Prefer wood instead of aluminium and PVC.
  - **Glazing:** In most climates, glazings with low- E coatings and gas fills will be a choice that provides significant energy savings in a cost-effective product.

Indicative example of whole-window U-values for different types of windows:

| | |
|---|---|
| VERY POOR (U<3) | = double glazing, wood frame |
| POOR (U<2) | = double glazing, wood frame, argon gas fill |
| BETTER (U<1,3) | = two glass layers plus two film with low-e, argon gas-filled |

# 7 Electric appliances for office use

## *7.1 Planning Principles*

The main electrical appliances required for an office usually comprise of:

- Computer
- Monitor
- Copying machine
- Inkjet printer
- Laser printer
- Fax machine
- Scanner
- Multifunctional equipment

***Is new equipment really necessary?***

If some appliances are not used intensely, due to the respective service (printing, copying, faxing) only being used by few people or only rarely needed, you should consider ways of optimising appliance use together with the users before purchasing new equipment. When the average physical life of an appliance is less than 3 years you should consider possibilities to increase its use by way of upgrading, repair, further use/ re-use in other fields.

The following criteria shall be considered during the ecological purchasing of electric appliances for office use:

- **Long-life products**: go for products and spare parts with a long warranty after the purchase that can be upgraded and enhanced. Re-acceptance of disused appliances by the producer in order to refurbish, remanufacture or recycle them reduces the problem of disposal. If warranties or re-acceptance are only available for a fee, these costs have to be included into the calculation of the items' total cost-effectiveness.
- **Selection of recyclable material**: the material from which the appliances are made should be easy to recycle; halogenated plastics like PVC should be avoided in casings and cables (insulation and tubes) and for flame retardant in casings and printed circuit boards.
- **Packaging and information**: go for packaging that is re-usable, without halogenated plastics like PVC, and re-accepted by retailer/producer. Instruction manuals should contain information on ecological use.
- **Energy consumption**: energy consumption, not only in stand-by mode but also when "off", must be taken into consideration.

### *7.2 Recommendations*

The following are examples of criteria obtained from the '*Energy' label* valid for the year 2004:

| | |
|---|---|
| **All monitors** | ⇨ The power consumption in the **off mode** is **1 W** or less |
| Monitors without USB | ⇨ The power consumption in the **deep sleep mode** is **2 W** or less |
| Monitors with USB | ⇨ The power consumption in the deep sleep mode is 3 W or less |
| **All printers and Printer-fax combinations** | ⇨ The power consumption in the **off mode** is **1 W** or less |

**Further information can be obtained:**

- ***Up to date values for office electric appliances can be obtained from different labelling programmes:***
  - the 'Energy Star' program http://www.energystar.gov/products
  - the 'Energy' label http://www.gealabel.org
  - the EU Eco-label scheme http://europa.eu.int/ecolabel/
  - the Austrian Ecolabel http://www.umweltzeichen.at/
  - the Nordic Swan http://www.svanen.nu/Eng/ecolabel.htm
- ***For emissions requirements up to date limits can be obtained from:***
  - the Blue Angel http://www.blauer-engel.de

# 8 Lighting

## *8.1 Planning Principles*

### *Daylight*

The lighting of a building should be considered early in the design stage, because at this stage major decisions affecting switch controls or the daylighting are made e.g. whether the building is deep or shallow plan, whether it is single storey, allowing the use of rooflights, or multi-store. The major factors affecting the dayligting of an interior are the depth of the room, the size and location of windows and rooflights, the glazing system and any external obstructions.

**Solar accessibility** should be a part of the **site analysis**. Careful site selection and building placement will provide opportunities for optimal daylight and solar utilisation.

- Orienting the building on an east-west axis will **increase the potential use of daylighting**.
- An elongated building that has its major axis running east-west will allow for capturing **winter solar gain and reducing unwanted summer sun** that strikes the east- and west-facing surfaces.
- Exposed **east- and west- facing glass should be avoided** wherever possible because it will cause excessive summer cooling loads.
- **South glass should incorporate properly sized overhangs** that limit radiation in warmer months.
- Studies have shown that there is considerable potential for improving energy efficiency using the **passive solar** approach to building design exploiting daylight to displace electric light. This potential clearly depends on the local climate.

### *Artificial lighting*

The design of lighting systems shall allow lighting levels to be adjusted automatically for different zones, according to the time of day, daylight levels and occupants' activities.

- **Automatic time and / or daylight controls** should be specified for exterior and multi-storey car park lighting to prevent lights remaining on when daylight levels are adequate or when car parks are closed.
- **Occupancy sensors** should be fitted to lights in storerooms, office meeting rooms and other areas. When no presence is detected, lighting levels as well as lights' energy consumption can be automatically reduced to 10% of their conventional operating level / power. Controls shall allow lights to be switched no and off manually.

- On those sites where solar conditions are deemed suitable, external lights (such as street lamps) shall be fitted with photovoltaic kits, including photovoltaic panels, batteries, daylight sensors, etc. **Photovoltaic systems** will store electricity during daytime and power lamps during darker hours of the day and at night.

### *8.2 Recommendations*

**LAMP TYPE**

- **Incandescent** AVOID
  - Standard
  - Halogen ✪
- **Fluorescent**
  - Tubular
    T12 (38mm),
    T8 (26mm) ✪ ✪,
    T5 (16mm) ✪ ✪
  - Compact ✪ ✪
  - Induction ✪ ✪
- **High Intensity Discharge**
  - High Pressure Mercury AVOID
  - Metal Halide ✪ ✪
  - High Pressure Sodium ✪ ✪
- **Low Pressure Sodium** ✪ ✪
- **Solid State Lighting** ✪ ✪

| **LUMINAIRE TYPE** | **RECOMMENDED LUMINAIRE EFFICACY RATING (LER)** |
|---|---|
| **Compact Fluorescent** | |
| Open Optics | 29 or higher |
| Baffled Optics | 21 or higher |
| Lensed Optics | 24 or higher |
| **Metal Halide** | |
| Open Optics | 35 or higher |
| Lensed Optics | 30 or higher |

**BALLAST TYPE**

- Magnetic
- Hybrid ✪
- Electronic ✪ ✪

✪ Efficient
✪ ✪ Very Efficient

- **Proof the potential for using photovoltaics!**

PV-modules function by converting the solar radiation into electricity. Solar power generation is available in multiple scales, from independent one-house systems up to centralised photovoltaic power plants.

**Detailed criteria can be obtained from the European Greenlight Programme**
http://www.eu-greenlight.org

# 9 Electricity supply contracts (green electricity purchase)

## *9.1 Objectives and benefits of buying green electricity*

**'Green electricity'** is electricity produced from sources which do not cause impacts upon the environment. The cleanest energy sources are those which utilise the natural energy flows of the Earth, the renewable energy sources (biomass, hydropower, wave power, wind power, tidal power, and solar power). Natural gas-fired co-generation, although not a renewable source, is an improved and efficient use of resources. Therefore, it may be included as part of the green electricity mix offered by a green electricity tariff.

Buying green electricity provides a number of benefits to you. It can:

- Meet environmental targets for the reduction of $CO_2$ emissions from local authority-owned properties.
- Publicly demonstrate the local authority's commitment to sustainability.
- Aid local employment by promoting the renewable energy industry.
- Put Local Agenda 21 (LA21) and sustainable development objectives into practice.

## *9.2 Recommendations*

**Necessary steps that should be considered for a tender procedure:**

- Specify information about your electricity use profile: Collect past bills (your current utility will provide this information upon request)
- Based on your policy and electricity profile, develop a list of items to include in your tender:
  - Identify the quantity and type of renewable electricity preferred e.g. 50% of consumption from renewable resources.
  - Consider including options like energy efficiency, peak load management
  - Consider various pricing options and price guarantees
  - Consider the location of the renewable generation
  - Consider options for installing small-scale on-site renewable generation, such as PV panels or a small wind turbine.
  - Be as flexible as possible to allow suppliers to put together a package of services that meet your needs at the lowest cost.
- Specify green electricity label certification of both sources and offerings as a minimum to ensure your bids are comparable and meet established, respected standards. State where you want suppliers to exceed the label guideline.

**More information on green electricity can be obtained from the European Green Electricity Network: http://www.greenelectricitynetwork.org/**