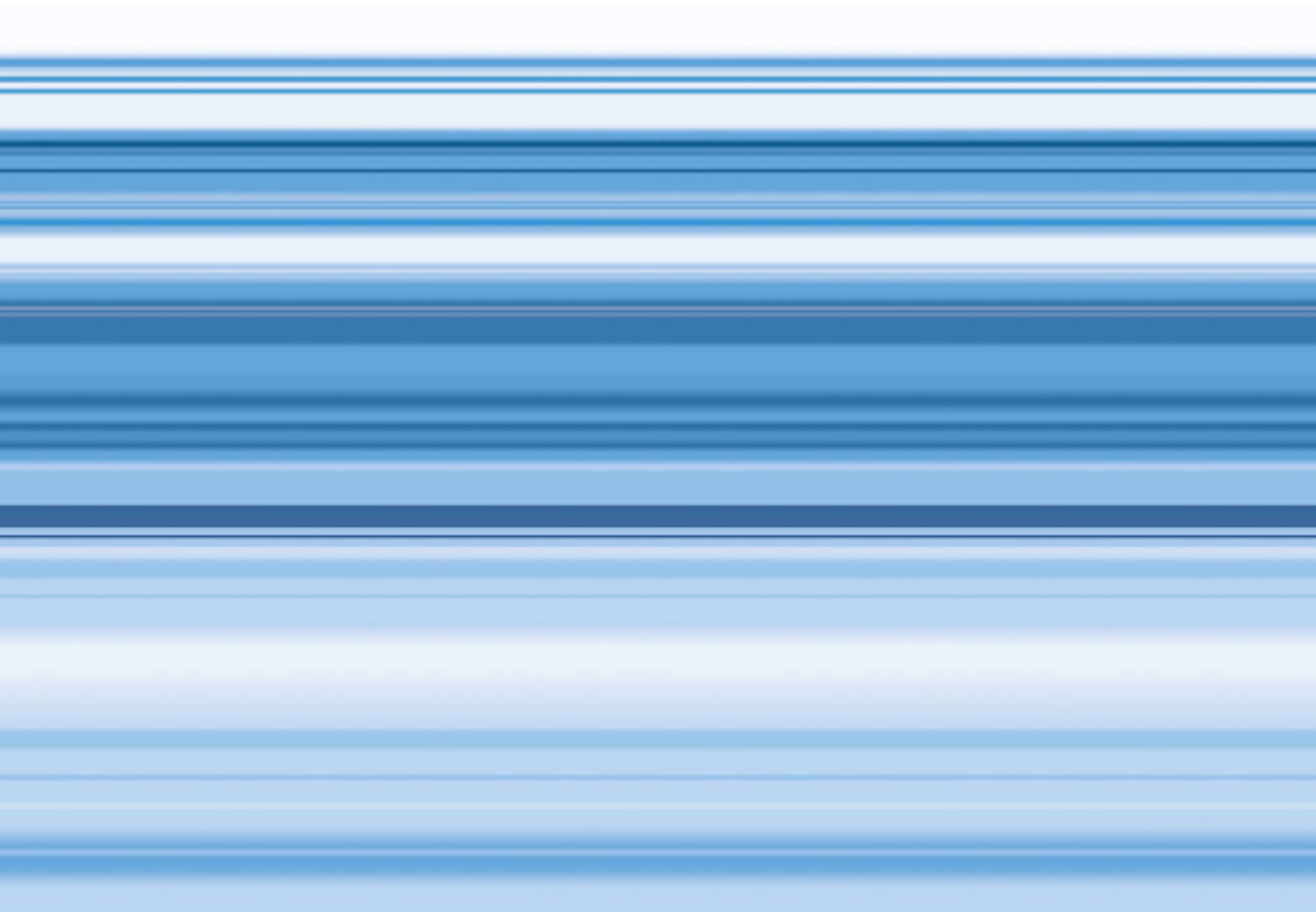


Considering Energy Efficiency in Procurement Guidance Notes



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1.0 Executive Summary

The Government is committed to protecting the environment and working to limit the effects of climate change. All government departments have a significant contribution to make to sustainable development. An important part of this is for all public sector bodies to consider energy efficiency when making buying decisions, both to protect the environment and to make the most effective and efficient use of taxpayers' money.

1.1 *Actions you can take throughout the procurement process*

Identifying the need

- This is where there is most scope for taking energy efficiency into account.
- Consider which environmental aims could potentially be met through the procurement.
- There is most scope for addressing energy efficiency when buying construction works or energy-using products. In some cases it may be relevant to services contracts, but this should be considered on a case by case basis.
- When developing the business case, take account of costs and benefits to the whole of society over the whole life of the contract – at purchase, in use and at disposal. For products, you should also think about impacts during the production stage.

Specification

- Environmental considerations can be included in the specification where relevant to the subject matter of the contract. Where the product being bought uses energy, energy efficiency will always be relevant.
- The specification should define the minimum level of energy efficiency required, and at least meet the standards laid out in the 'Buy Sustainable - Quick Wins' list.
- Procurers can also offer the option to submit 'variant' bids.

Selection

- Procurers should ask for relevant evidence of technical capability to deliver the environmental elements of the contract.
- The evidence requested must only relate to the specific contract itself – not to the operation of the supplier's whole business.

Award

- Contracts should be awarded on the basis of value for money ('the best mix of quality and effectiveness for the least outlay'¹ on a whole life basis).
- Award criteria must be linked to the subject matter of the contract.
- If the product uses energy it is important to include this cost when calculating whole life costs.

Contract conditions

- Contract conditions should ensure that the contract is carried out in line with the contracting authority's needs (including environmental requirements).
- Conditions should be linked to contract management mechanisms, including, where relevant, requirements around monitoring and reporting on energy savings.
- Where relevant to the performance of the contract, contract conditions can be used to require the winning bidder to set up an accredited Environmental Management System (EMS) to cover the performance of the contract, where the contract is for works or services.

¹ Chapter 4.2.3 – Managing Public Money – HM Treasury

Relationship management

- Once a supplier has been awarded a contract, there are often opportunities to work co-operatively with them to promote environmental objectives.
- Facilities management contractors should be encouraged to assign staff to regularly check and analyse energy consumption and follow up as required.
- However, it is important to note that measures that do not relate to the subject matter or performance of the contract must be voluntary on the part of the service provider and must not have any bearing on the award of future contracts.

1.2 Sources of help and advice

To help departments fulfil an exemplary role on energy efficiency, support is available from the following bodies:

- **The Carbon Trust** provides free tailored support to develop carbon reduction strategies through its Carbon Management Programme.
- **Salix Finance** provides interest free loans to invest in energy efficiency. It provides match funding to establish revolving loan funds that are paid off by the energy savings generated. Departments are able to access this funding, with Defra completing a successful pilot in 2008 establishing a £1.6m fund.
- **Energy Saving Trust** provides support on managing vehicle fleets.

Contracting authorities can often secure better deals on energy saving assets by participating in collaborative arrangements. The Energy Category Team at OGC provide advice, contacts, tools and recommendations on the best deals available. The team can be contacted by email at energy@ogc.gsi.gov.uk or by calling the OGC Service Desk on 0845 000 4999.

OGC's Centre of Expertise in Sustainable Procurement (CESP) supports departments in their progress towards achievement of the SOGE targets and government's sustainable procurement commitments. CESP can be contacted through the OGC Service Desk on 0845 000 4999 or at service.desk@ogc.gsi.gov.uk

2.0 Introduction

The UK Government is committed to protecting the environment and working to limit the effects of climate change. We should all be taking action to improve our quality of life now in a way that safeguards the environment for future generations. All government departments have a significant contribution to make to sustainable development, not just through their policies and services, but also through all the support activities that go on every day.

By thinking about the environment when deciding what to buy, managing ongoing contracts and carrying out operations on the government estate, departments can all make a contribution and set a good example.

It is important for all public sector bodies to consider energy efficiency when making buying decisions, because of our responsibility to both protect the environment and make the most effective and efficient use of taxpayers' money. More energy-efficient buildings and products will require less energy to run – so reducing carbon emissions and potentially whole life costs. Buying in this way also sets an example for consumers and businesses to follow and may help to create markets for innovative energy-efficient solutions.

In addition, all public sector bodies are bound by the Energy End-Use Efficiency and Energy Services Directive² to act as exemplars of energy efficiency in all their activities.

2.1 Purpose of this guide

This guide is intended to help central government procurers and decision makers to consider energy efficiency in purchasing decisions in order to:

- meet the requirements placed on the UK government and all public sector bodies by article 5 of the Energy Services Directive;
- help them contribute to the UK's ambition to become an EU leader in sustainable public procurement by 2009; and
- help them meet the Sustainable Operations on the Government Estate (SOGE) targets relating to carbon emissions.

In this, as in all public procurement activity, contracting authorities must achieve value for money and comply with the EU Procurement Directives.

It also includes an annex setting out a list of actions departments should consider taking on order to increase the energy-efficiency of their estates. The list includes information on the typical energy savings, costs and payback periods for the different actions.

It may also be useful for wider public sector organisations. **The guide also refers throughout to more detailed tools and guidance. Hyperlinks to these are listed in section 6.0**

² Directive 2006/32/EC of the European Parliament and of the Council on energy end-use and energy services and repealing Council Directive 93/73/EEC

2.2 Energy End-Use Efficiency and Energy Services Directive

The UK implemented the Energy End-Use Efficiency and Energy Services Directive into law in May 2008. The purpose of the Directive is to enhance the cost effective improvement of energy end-use efficiency in Member States.

Article five of the Directive requires the public sector to fulfil an exemplary role on energy efficiency. It also requires Member States to choose two options from an annex on energy efficient procurement. The UK has chosen the following two options:

- (b) Requirements to purchase equipment and vehicles based on lists of energy-efficient product specifications of different categories of equipment and vehicles;
- (c) Requirements to purchase equipment that has efficient energy consumption in all modes, including in standby mode;

To help public sector bodies to implement these measures in their procurement, Defra has drawn up the list of product standards referred to in point (b) above, available in the 'Buy Sustainable – Quick Wins' list which can be found on the Defra website. The list is evidence based, applies whole life costing principles to ensure cost-effectiveness and covers energy efficiency in all modes, including standby. All public sector bodies are required to buy products that – at a minimum – meet these standards. Where possible, departments should buy products that meet higher standards of energy-efficiency. The Defra standards will be updated over time, to ensure continuous improvement.

2.3 Key considerations

- Central government departments and agencies are required to buy products that meet or exceed the minimum environmental standards set out in the '**Buy Sustainable - Quick Wins**' list. All public sector bodies are required by the Energy Services Directive to buy to these standards when buying energy-using products.
- Central government departments and agencies are also required to meet the **Sustainable Operations on the Government Estate (SOGE) targets**, which include targets for the government estate to reduce carbon emissions from offices by 15% by 2010 and 30% by 2020 (relative to 1999-00 levels) and to reduce carbon emissions from road vehicles by 15% by 2010-11 (relative to 2005-06 levels). Buying energy efficient products can help government departments to meet the SOGE targets.
- For **construction** projects, contracting authorities should use the 'Achieving Excellence' (AE) suite of guidance, particularly 'AE11: Sustainability' and 'AE7: Whole-life Costing' to ensure that energy efficiency during construction and in use is considered. Mandatory requirements for central government construction projects are set out in the 'Common Minimum Standards'. New builds are required to meet BREEAM excellent standards and major refurbishments are required to meet BREEAM very good standards under the SOGE targets.
- The Carbon Trust can **audit** buildings and give advice on how to reduce energy use. All central government departments and agencies are required to undertake Carbon Trust audits, under the SOGE targets. Regular energy auditing is an important way of identifying improvements and is essential in order to proactively identify opportunities that would not otherwise be recognised. Energy audits can cover buildings, equipment, vehicles or all three. Organisations can also conduct self-assessments, using tools such as the ICLEI SASETO (Self-Assessment Energy Audit Tool).
- Departments have most scope to consider energy efficiency when the whole **organisation is committed** to reducing its energy use. Make sure that energy efficiency is covered in the organisation's estates strategy and commercial strategy - and that as many people as possible know about it and support its aims. It is particularly important to involve decision

makers in the estates and IT teams. It is useful to run occasional energy efficiency training and awareness sessions for interested parties across the organisation and its suppliers to ensure that energy efficiency is remembered when planning and procurement decisions are made.

- Contracting authorities can often secure better deals on energy saving assets by participating in **collaborative arrangements**. The Energy Category Team at OGC provides advice, contacts and tools and recommends the best deals available. The team can be contacted at energy@ogc.gsi.gov.uk or through the OGC Service Desk on 0845 000 4999. Its guidance (on energy-related subjects including sustainability) is published on the Pan Government Energy Project pages of the OGC website.
- Consider energy use when **outsourcing** services such as facilities management or letting **PFI** contracts. It is important that the contractor is required to help the organisation to meet commitments such as the SOGE targets by, for example, building the requirements into the specification, and/or contract conditions. Departments must also ensure that PFI contracts are sufficiently flexible to take account of any new targets or monitoring requirements that may arise during the lifetime of the contract. Contract management is crucial to PFI contracts, to ensure the long-term effectiveness of the contract. Performance against environmental requirements can be incorporated into key performance indicators and linked to payment mechanisms. See the OGC guidance 'Green Public Private Partnerships'. Where a contract is already in place and does not contain such requirements, the contracting authority can still work with the contractor to save energy, whether on a voluntary basis or through contract changes - see OGC's guidance on contract management for advice on making changes to existing contracts.
- Buying energy-efficient products is a good start, but departments can do more. Look at the **operation of the buildings** to identify areas for potential improvement. For example, adjustments can often be made to existing equipment to reduce its energy use. Staff awareness campaigns can encourage people to turn off equipment when it is not in use. Where existing equipment is inefficient, replacing it with new, more efficient equipment can make energy savings. Equally, alterations to the building fabric – such as installing insulation – can sometimes allow departments to adjust energy-using equipment to make savings. Ensuring that meters are in place can give the true picture of energy consumption and help departments to pinpoint and remedy any problem areas. See the OGC guidance 'Automatic Metering'. Energy managers should also consider reducing energy consumption through power factor correction and capacity matching. See the OGC guidance 'Power Factor Correction and Capacity Matching'.
- The measures introduced by the **Energy Performance of Buildings Directive (EPBD)** include requirements for all commercial buildings to have Energy Performance Certificates (which rate the energy efficiency of a building's design) on the point of construction, sale or rent. All public sector offices with a total useful area greater than 1000m² providing public services and visited by members of the public are also required to show Display Energy Certificates (which rate the energy performance of a building's operation). The production of both types of certificate, and the reports associated with them, highlight opportunities for improving the performance of the building and its operation. In addition to these certificates, the implementation of EPBD introduces new requirements for the inspection of large air-conditioning systems by 2009 and new guidance for the operation of boilers.
- All government departments will participate in the **Carbon Reduction Commitment (CRC)** carbon trading scheme when it begins in January 2010. Participants will be required to purchase allowances corresponding to their emissions from energy use, and then surrender them at the end of the year. Following a three-year introductory period the number of available allowances will be capped, auctioned and steadily reduced over time, with participants trading allowances throughout the year. Bought in renewable energy and

carbon offsetting will not be given credit when working out carbon allowances as the CRC is aimed primarily at driving energy efficiency.

- Remember that, in addition to energy efficiency, there are **other environmental and social issues** that may also be relevant to what contracting authorities buy. Consider these on a case by case basis – what are the biggest issues related to this particular contract? They might be around reducing waste or eliminating discrimination, for example. See the joint OGC and Defra guidance on environmental issues in purchasing and the OGC guidance on social issues in purchasing, for further information.
- Remember contracting authorities must get **value for money** from their spend over the whole life of the contract. In some cases, this will mean spending more upfront in order to obtain a solution with lower running costs, leading to lower whole life costs. In some cases, higher whole life costs can be justified by increased environmental benefits³. Energy efficient equipment will often have lower whole life costs than standard equipment, even if it has a higher purchase price.
- Contracting authorities must also make sure that their procurement exercises are consistent with the **EU Treaty and the EU Public Procurement Directives**, which are implemented into UK law through the Public Contracts Regulations 2006 ('the Regulations'). Treaty principles apply to all procurement activity and procurement exercises above certain financial thresholds must comply with the rules laid out in the Directives and Regulations.

2.4 Energy Services Companies

Energy Services Companies (ESCOs) can be employed to help departments save energy through energy performance contracting. Normally, they will audit energy usage, invest in the necessary infrastructure or equipment to help save energy and then take their payment from the money saved through reduced energy consumption.

Measures implemented by ESCOs can include installing new energy efficient lighting, air conditioning systems, energy management control systems etc. They may also propose repairs to existing systems, such as reinstallation of damaged or missing controls or repairs of leaks in chilled water piping. Generally ESCOs assume responsibility for maintenance and repairs to all new equipment installed. They may also offer to take responsibility for maintenance and even operation of existing equipment, for example by providing remote monitoring and adjustment of temperature set points with a computerised temperature control system.

Using ESCOs can be a good option where organisations do not have enough upfront capital available to invest in energy saving measures, even though they will save money in the long term.

Selection of an ESCO is subject to the same public procurement rules as other commercial activity (i.e. EU Treaty principles, EU procurement Directives and value for money policy, as mentioned above).

³ Please see the section that follows on award criteria for further details.

3.0 Considering Energy Efficiency in Public Procurement

The scope to address energy efficiency varies depending on the stage of the procurement process. The key stages are:

- pre-procurement stage - identifying the need;
- specification stage - when deciding the requirement;
- selection or pre-qualification stage (sometimes known as PQQ stage) - selecting suppliers to invite to tender;
- award stage – evaluating tenders and awarding the contract; and
- performance of the contract – contract conditions and relationship management.

There is often most scope for making the greatest energy efficiency savings through procurement by concentrating on the issue at the early stages of the process.

Identifying the need

This is the stage at which there is most scope for taking energy efficiency (and other environmental) considerations into account. If it is decided at this stage that what is to be bought includes environmental characteristics (such as saving energy), then this must be taken into account throughout the procurement process – in the specification, at the selection and award stages and when defining contract conditions.

There is most scope for addressing energy efficiency through procurement when buying construction works or energy-using products. In some cases (e.g. where the service is carried out on a department's premises, using its energy) it may be relevant to services contracts, but this should be considered on a case by case basis.

At this stage, contracting authorities should consider which environmental aims could potentially be met through the procurement. Where the product uses energy (for example lighting, heating, air conditioning, white goods, ICT hardware) the requirement should be defined in terms of – for example – 'energy efficient washing machines'.

When departments are developing a business case, they should take account of costs and benefits to the whole of society, including social and environmental benefits. All costs and benefits should be considered over the whole life of the contract – at purchase, in use and at disposal. For products, you should also think about impacts during the production stage. More guidance is available on this in the Treasury 'Green Book Appraisal and Evaluation in Central Government' and in 'Managing Public Money'. The most relevant sections of the Green Book for these purposes are chapter 5 and Annex 2 and the supplementary statement on value for money and sustainability.

In particular, departments should consider Defra guidance on the 'shadow price of carbon' at this stage. The guidance is for use in all policy and project appraisals across Government with significant effects on carbon emissions.

ICLEI (Local Governments for Sustainability) has developed a life-cycle costing analysis tool which prompts procurers to consider the costs that should be factored in when deciding what to buy. The tool can be found within the 'DEEP toolkit'.

NHS PASA has developed a tool for calculating the whole life energy costs of medical devices. The tool can also be used to calculate the whole life energy costs of other energy-using equipment.

Even where energy-efficient products cost more on a whole life basis than standard equivalents, contracting authorities may decide that the benefits to the environment justify the extra costs.

Specification

Environmental considerations can be included in the specification where they are relevant to the subject matter of the contract. Where the product being bought uses energy, energy efficiency will always be relevant to the subject matter of the contract. Therefore, in order to fulfil the UK's commitments under the Energy End-Use Efficiency and Energy Services Directive, requirements on energy efficiency should always be included in the specification.

The specification should define the minimum level of energy efficiency required. This should at least meet the standards laid out in the 'Buy Sustainable - Quick Wins' list. In addition, procurers can offer the option to submit 'variant' bids, which (in addition to meeting the basic requirement) can provide even greater environmental benefits, such as greater energy efficiency. More information on using variants can be found within the European Commission publication 'Buying Green!' Contracting authorities should require bidders to provide details of the product's normal power consumption in watts (W) or kilowatts (kW) – both in operation and on standby (if applicable) to allow for comparison.

When buying a service, it is unlikely that energy efficiency will be directly related to the subject matter of the contract, in which case it cannot be included in the specification. (However, departments should consider inserting a clause covering energy efficiency in the contract conditions, but only where it is relevant to the *performance* of the contract.) There will be exceptions to the general rule that energy is not linked to the subject matter of service contracts - for example, if the service is being carried out on the department's premises it will affect its energy consumption (e.g. a catering service or a facilities management service). In these circumstances energy efficiency is linked to the subject matter of the contract and should be built into the specification.

When the procurement is for construction or refurbishment, it is important to consider how the works can be specified in such a way as to maximise the energy efficiency of the buildings and enable the department to meet SOGE targets.

Where departments are not sure how to best meet their environmental needs, suppliers may be able to offer innovative solutions. See the OGC and DIUS publication 'Finding and Procuring Innovative Solutions' for more information.

Selection

This is the point at which suppliers are selected to participate in the next stage of the procurement process. This is sometimes referred to the 'PQQ' or 'pre-qualification' stage, because only those that qualify will be eligible to bid for the contract and be sent an 'ITT' (Invitation to Tender).

The selection stage should be used to make sure that those selected to tender have the necessary technical and professional ability to carry out the contract (based on the requirements laid out in the specification.) As part of this, procurers should ask for relevant evidence of technical capability to deliver the environmental elements of the contract. The public procurement Regulations contain an exhaustive list of references or evidence that potential suppliers can be required to provide to prove their technical or professional ability.⁴ For example, if a contract requires energy saving solutions, a supplier can be asked at selection stage to demonstrate their track record of providing energy efficient solutions.

⁴ Regulation 25 of the Public Contracts Regulations 2006.

Where it is relevant to the performance of the contract the provider can also be asked to provide evidence of the environmental management measures it is able to apply when performing the contract⁵.

The evidence requested must only relate to the specific contract itself – not to the operation of the supplier's whole business.

Where a candidate fails to meet the minimum standard of technical or professional ability required for a particular contract, they can be excluded from the remainder of the procurement process. Candidates may also be excluded from competition at selection stage if they have been convicted of a criminal offence relating to the conduct of their business or profession, or if they have committed an act of grave professional misconduct in the course of their business or profession.⁶ Therefore, a provider may be excluded from further competition for a breach of environmental law, provided such a course of action is proportionate.

Award

Under EU procurement rules, contracts must be awarded on the basis of either lowest price or the Most Economically Advantageous Tender ("MEAT"). In the UK, a policy decision has been taken that all contracts should be awarded on the basis of MEAT and value for money. Value for money has been defined as 'the best mix of quality and effectiveness for the least outlay'⁷ on a whole life basis.

Award criteria, including any sub-criteria and weightings, must be specified in either the OJEU Contract Notice or the ITT documents. Award criteria must be linked to the subject matter of the contract and should be designed to determine which tender offers best value for money. Therefore, if a contracting authority is procuring a product, which is required in the specification to be energy efficient, energy efficiency or whole life cycle costs will probably be headline award criteria. The Regulations expressly state that "environmental characteristics can be included in the award criteria, provided they are linked to the subject matter of the contract"⁸. Any such criteria must also be specific and objectively quantifiable and comply with the fundamental principles of Community law - particularly the principle of non-discrimination.

In particular, if the product uses energy during its lifetime it is important to include the costs of this energy when calculating whole life costs to the contracting authority at award stage. Various guidance documents and tools are available to help procurers make these calculations when buying different things. For example:

- the DEEP toolkit produced by ICLEI (the 'Local Governments for Sustainability' organisation);
- the NHS PASA tool for calculating the energy use of medical devices;
- the OGC 'Life Cycle Costing' and 'AE7: Whole Life Costing' guidance;
- the Building Research Establishment guidance on whole life costing and life cycle assessment for sustainable building design.

Contract conditions

Contract conditions should be drafted to ensure that the contract is carried out in line with the contracting authority's needs. Environmental requirements, such as energy efficiency, can be included in contract conditions where they are relevant to the performance of the contract. The conditions should be linked to contract management mechanisms to ensure that the contractor is motivated to carry out all requirements, including the environmental ones, and

⁵ Regulation 25 (2)(h) and 25 (4) of the Public Contract Regulations 2006.

⁶ Regulation 23 (4)(d) and (e) of the Public Contract Regulations 2006

⁷ Chapter 4.2.3 – Managing Public Money – HM Treasury

⁸ Regulation 30(2) of the Public Contract Regulations 2006

managers are enabled to address any failures by suppliers to meet them. In many cases, it will be important to include requirements around monitoring and reporting on the energy savings achieved.

Contracting authorities should also ensure that the conditions are:

- not disguised technical specifications, selection or award criteria (that is, they can be complied with by whoever wins the contract);
- advertised in advance to candidates in the contract notice or tender documentation;
- compatible with EU Treaty principles – and in particular do not discriminate against tenderers from other countries.

Where appropriate and relevant to the performance of the contract, contract conditions can be used to require the winning bidder to set up an accredited Environmental Management System (EMS) to cover the performance of the contract, **where the contract is for works or services**. Further guidance on this is available in the EU Commission publication 'Buying Green!'

Relationship management with suppliers

Departments can achieve a lot by working with their existing suppliers outside the formal procurement process. Once a supplier has been awarded a contract, there are often opportunities to work co-operatively with them and their supply chain to raise awareness and promote environmental objectives.

In particular, facilities management contractors should be encouraged to assign staff to check that equipment is switched off outside working hours, that power-saving equipment such as movement-sensitive lighting controls is installed (and correctly set), that buildings are not excessively heated in winter or cooled in summer and to regularly check and analyse energy consumption and follow up as required.

Service providers can be encouraged to undertake energy efficiency audits of their own and to - for example - choose more environmentally friendly travel options and/or put mechanisms in place to reduce waste (e.g. setting up printers to print double sided).

However, it is important to note that measures that do not relate to the subject matter or performance of the contract must be voluntary on the part of the service provider and must not have any bearing on the award of future contracts.

4.0 Some Examples of Good Practice

DWP used its PFI estate contract to secure investment for 41,000 'spend-to-save' measures and is installing automatic meter reading (AMR) in its largest 700 buildings to improve reporting and energy management. These measures, together with an intensive energy efficiency and communications campaign, resulted in carbon emission reductions of 10.8% in 2007/08. Their ongoing implementation, together with improved governance and a review of site plant and equipment, mean that DWP predicts a further reduction of 15% by 2011, meeting the SOGE target.

DCSF seized a regular replacement requirement to upgrade lighting and fan coil units in their Sanctuary Buildings head quarters to more energy efficient models. This has resulted in energy savings of 64,865 KWh and prevented over 27 tonnes of carbon dioxide being produced. DCSF has also implemented a power management solution to ensure that IT equipment is properly shut down at night and over weekends, saving energy, generating estimated saving of over 500,000 kg of carbon between November 2006 and October 2007. The Cabinet Office has launched a similar solution, with proposed savings of 500 tonnes of carbon dioxide and £88,000 a year.

The Cabinet Office has installed Passive Infra Red (PIR) lighting controls in a number of Cabinet Office buildings and will shortly roll these out to other parts of the estate. The PIRs detect movement and switch the lights on only if the area is occupied. It is estimated that once this programme is complete it will save approximately 90 tonnes of carbon dioxide and £17,000 a year.

Defra is currently installing Advanced Metering at approximately one hundred of its sites. The meters will capture over 90% of Defra's utility use from electricity, gas, oil and water. Advanced Meter Reading (AMR) provides regular and accurate meter readings, using Smart Meters, which collect data at half hourly intervals. Key buildings on the Defra Estate will be able to display real time utilities usage. Carbon Trust sources indicate that savings of up to 10-15% can be achieved through the implementation of initiatives realised through the analysis of AMR data, through reducing the base load, optimising the use of equipment and reducing peak usage.

Companies House has a multi-storey car park located at its Cardiff Office. During 2007 the Building Services department reassessed the lighting in the car park to identify potential carbon savings. As a result of this assessment, the following measures were implemented:

- A 40% reduction in lighting units used (250 units in total)
- All remaining fittings were switched from using T8 fluorescent tubes to 45% more energy efficient T5 tubes.
- Movement sensors were fitted in all of the lift lobbies. (The lights will automatically switch off when not in use)
- All perimeter lighting was connected to a photocell. (The lights will automatically switch off depending on the natural daylight levels.)
- As a result of implementing the above measures Companies House have made an annual saving of £6,000 through reduced energy costs, repaying the investment required within one year, and prevented over 10 tonnes of Carbon being released into the atmosphere on an annual basis.

5.0 Annex – List of Actions to Increase Energy-Efficiency

5.1 Introduction

The following summary report provides overview checklists which set out realistic cost-effective actions on energy efficiency. These checklists should allow departments to cross-check current building operation against best practice measures, identify opportunities, and progress through to implementation projects that cost-effectively reduce the consumption of energy, thereby allowing them to develop a simple business case for investment.

Further information has also been provided on no-cost and low-cost actions which are readily achievable, albeit requiring support from all staff levels.

5.2 Energy action lists

The potential for energy savings will vary from one building to the next and a “one size fits all” solution is rarely possible. The checklists have been designed to permit both technical and non-technical personnel to begin the process of evaluating opportunities to reduce energy consumption whilst maintaining the core function of providing a comfortable working environment. It is recommended that non-technical staff engage some form of expertise, either internally from maintenance staff or externally from professional energy consultants, manufacturers etc, prior to expenditure.

The following column headings have been included under each table. A description of each has been provided below.

Action	Brief description of measure
Relevance to building type	Prerequisites, building types, modes of operation, environmental system design, etc.
Typical energy and carbon savings	Percentage saving expected from implementation of measure. The savings have been expressed in percentage terms to enable ready application, but should be considered to be indicative. The actual savings that could be achieved will depend on many factors. In addition, the quoted savings assume full application of the measure e.g. from having no pipe work insulation to having a well-insulated system. Expectations should be reduced for partial application of recommendation.
Typical costs (£)	Summation of indicative capital and installation costs. These costs are provided to enable review and prioritisation and should not replace the need for a full building/site specific cost review as part of the development of the business case (some measures could be carried out in-house depending upon the knowledge level and qualifications of staff).
Typical payback period (yrs)	Utility costs, occupation patterns, etc. all impact on the payback period length. Figures quoted are realistic expectations, however, these will clearly depend on site/building specific issues
Procurement routes	Suggestions on how best to progress opportunities.
Considerations, issues and constraints	Important items to evaluate prior to progressing recommendations.

The following table provides a further breakdown of the terms used within the “procurement route” column to assist in identifying the recommended way forward.

Procurement Route	Brief description
Manufacturer	Refers to a manufacturer or authorised installer of specialist equipment, e.g. Variable Speed Drives, where a number of potentially complex technical factors will require to be evaluated to determine if

	the proposed project is practical and cost-effective.
Specialist Advice	Requires specialist energy and/or technical advice to determine the detailed specification, e.g. installation of sub-metering with associated communication strategies and equipment specifications.
Self Generated	Can be carried out in-house through allocation of existing staff resources and equipment, e.g. training, Monitoring and Targeting using standard software spreadsheet packages.
Government Framework Agreement	A route to purchasing goods and services for which standards of service, prices and deliverables have been pre-assessed and can be sourced directly from approved providers without following normal tendering procedures.
Term Maintenance Contractor	Also potentially referred to as the FM provider, Heating Maintenance Provider, Building Maintenance Company. Confirmation of individual arrangements can be obtained from Estates/Building management. These organisations often have a detailed knowledge of a buildings' environmental systems and can provide good advice for any proposed project. (Limited provision of above services can also be provided by a janitor for small buildings)

Utilities prices vary considerably. Contract structures, contract lengths, energy consumption patterns, etc. all impacting on the price paid for each unit of energy. Figures quoted within this report have been based on consumption unit costs only (see below) and do not include Maximum Demand, Available Capacity or Fixed Charges. There is therefore potential for additional indirect savings to be achieved, however, without information on each contract structure they will be impossible to quantify.

The following unit costs have been assumed in the evaluation of savings:

Electricity	10 p/kWh
Gas	3 p/kWh
Water (including wastewater)	£2/m ³

Quoted savings have been based upon information available from the Carbon Trust and other best practice publications, and reflect a realistic expectation of the potential savings available from each measure. Each measure has been reviewed by experienced energy consultants for accuracy and applicability with respect to the central government estate. Capital costs have been based upon experience of similar projects and where required manufacturers and equipment suppliers have been contacted to provide up to date costs. Energy savings figures and costs have been based upon a normal office environment, operating a typical working week, unless otherwise stated. Proportional adjustments based on an area for a similar office type can be made, however, as with all quoted figures it is recommended that expert advice is sought to determine building specific costs and benefits.

5.3 Carbon conversion factors

In line with Defra's guidance on best practice for carbon reporting, energy use can be converted into kg of CO₂ equivalents by applying appropriate conversion factors.

For electricity the 5-year rolling average grid electricity conversion factor was 0.53702 kg CO₂/kWh in 2008 but will likely to change year-on-year due to variations in the generation mix.

For natural gas the conversion factor was 0.185 kg CO₂/kWh in 2008

Up-to-date conversion factors can be obtained from the Defra Guidelines to Greenhouse Gas Conversion Factors for Company Reporting, published on the following web site:

<http://www.defra.gov.uk/environment/business/reporting/pdf/ghg-cf-guidelines2008.pdf>

5.4.1 Energy Management

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
1. Install a Building Energy Management System (BEMS).	Buildings above 2,000 m ²	10% -30% of energy consumption	£50,000	3-6 yrs	Specialist manufacturer advice required	BEMS, if correctly utilised can reduce energy costs by 10% or more. However, the system needs to be operated by trained personnel who can identify anomalies, adjust set points and control curves along with ensuring adequate system maintenance is carried out. It can provide benefits in reduced maintenance, cost allocation and improved energy information.
2. Implement a monitoring and target setting (M&T) system.	All buildings	15-25% of energy consumption	£1,000 - 10,000	1-2 yrs	Self generated or purchase of bespoke software package. Government framework agreement.	You can't manage what you can't measure! In order to control energy costs managers and staff need information on, and be made accountable for, energy use that is accurate, timely and appropriate. The principles of monitoring and target setting are a key element of good energy management. Purchase and installation cost of M&T software packages can be reduced by using an in-house spreadsheet based system. A pan government AMR framework to include automatic Monitoring & Targeting software will be available through Buying Solutions from September 2009.
3. Install sub-metering of substantial energy uses.	All buildings above 3,000 m ²	5-25% of energy consumption	£200-500/m	<1.5 yrs	Specialist advice/ Manufacturer. Government framework agreement.	Metering does not in itself save energy, however, it assists in identifying specific excessive consumptions, allows for checking of use against invoiced amounts from suppliers, and raises awareness of energy consumption for specific equipment items. Addressing instances of identified inefficiencies can save up to 20% of applicable energy consumption. A pan government AMR framework to include sub-metering and other utility meters will be available through Buying Solutions from September 2009
4. Install Advance/Smart Metering to electricity and gas main meters	All buildings with an annual energy spend above £20,000	5-25% of energy consumption	£300-600/m	<1.5 yrs	Specialist advice/ Manufacturer. Government framework agreement.	See above comment. This requires interaction with utility suppliers in order that quality systems are met. Communication options should be Investigated thoroughly. A pan government AMR framework to include gas and electricity meters will be available through Buying Solutions

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
						from September 2009.
5. Apply Voltage Reduction Technology	All buildings with inductive electrical plant, e.g. motors, fluorescent lighting etc	10-20% of electrical energy consumption	£3,000 - 50,000 depending on size	2-4 yrs	Requires specialist advice from manufacturer. Government framework agreement.	This offers potential additional benefits with improved harmonics, power factor etc. A pan government Voltage Reduction framework to include equipment and installation will be available through Defra from October 2009.
6. Initiate an energy awareness campaign. A campaign is an excellent way to realise quick wins with respect to energy management and it helps to achieve the buy-in required by staff to achieve sustainable savings. A campaign can be made up of many different activities, as detailed below	All buildings	10% of all energy consumption	£2,500-15,000	<1 yr	Combination of internal and external provision.	An essential element of any campaign is visible committed support from senior management. A campaign should also have a defined life of approximately 6 months, too long and it may have a negative impact. Costs refer to design and production of publicity material, external design and combined external/internal delivery of training. A short life working group is an excellent way to engage with different departments across a large organisation.
a. Promote good housekeeping through use of posters and stickers.	See above	See above	See above	See above	See above	Signs placed near light switches to instruct or remind personnel to switch off lights when they are no longer needed can be very effective. Remember to refresh, replace or remove signs after a maximum period of 6 months
b. Publicise energy performance. This provides staff with evidence of senior management interest and also demonstrates achievements realised from energy related initiatives that have been undertaken.	See above	See above	See above	See above	See above	Publicising performance increases accountability. Even if there are not direct financial benefit for individual teams or areas there can be visibility of relative performance.
c. Raise awareness of energy efficiency to encourage	See above	See above	See above	See above	See above	Training can be successful but should be used as part of a wider campaign. Initially, staff should be targeted who have a

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
employees to adopt simple energy efficiency actions in the workplace. Conduct formal energy education and awareness training for staff as an on-going part of the induction process.						higher impact on energy consumption, e.g. maintenance staff, supervisors and energy champions. This requires engagement with HR and scheduling into existing training programmes.
d. Raise awareness amongst all personnel including cleaners, security guards and other contractors of the expected operation of lighting systems.	See above	See above	See above	See above	See above	Account should be made of health & safety requirements.
e.g. "Recruit" energy wardens/ champions and establish an informal network of interested staff who can provide assistance with posters and staff engagement.	See above	See above	See above	See above	See above	Engagement with staff and visual demonstration of the organisation's commitment will sustain and promote good house-keeping achievements. On-going support to this group is important.

5.4.2. Boiler plant

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
1. Re-affirm recommended heating system control set points (e.g. optimisers, compensators, zone controls) through recommissioning of system. Set heating controls to the correct levels and check them regularly.	All buildings with a combined boiler plant heat output rated at greater than 100 kW	5-25% of heating related energy consumption	£500 – 1,500	1-5 yrs	Term Maintenance Contractor	<p>Controllers regulate the amount of fuel fed into a boiler to suit the load. They can significantly improve the efficiency of a boiler. In addition, labour savings may be realised by reducing the requirement for the boiler to be attended.</p> <p>In addition to seasonal adjustments for heating and cooling plant, calibration of sensors and controls may have drifted over time, resulting in increased energy consumption and associated costs. It is commonplace for users to make short-term adjustments and forget to reset controls to the original level. Specific control settings, together with a description of</p>

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
						their intended operation should be recorded and kept in an appropriate and accessible location for user reference. Use of a building log book is recommended.
2. Apply sequence control where multiple boilers are installed, so that only the number of boilers that are actually required to meet the demand are operating. This provides for a more efficient operation of those boilers.	All buildings with 2 or more boilers serving a common heating system	15-20% of heating related energy consumption	£750-2,000	1-3 yrs	Term maintenance contractor for heating	Savings are possible by using the most efficient boiler(s) earlier in the sequence and allowing the less efficient (e.g. the oldest) boilers to fire only when absolutely necessary (e.g. during periods of peak demand). Economisers transfer heat to the incoming feed water, and air pre-heaters transfer the heat to the incoming combustion air. Both technologies reduce the energy required to heat the boiler feed-water. Every 5°C increase in the feed-water temperature will save approximately 1% of the fuel used to raise hot water.
3. Install condensing boilers as standard where boiler plant is due for replacement.	Most buildings with Low Temperature Hot Water (LTHW) and under-floor systems.	15-20% of heating related energy consumption	£1,100 per boiler extra over capital cost for condensing version	2-4 yrs	Term maintenance contractor with specialist advice	Payback will be dependent on the length of time that the boiler is in condensing mode. It is best to employ condensing boilers in systems with low return temperatures (<57°C) such as under floor heating systems or weather compensated systems. Consider direct weather compensation of the boiler flow temperature or taking low temperature weather compensated circuit returns directly to the condensing boiler. Use of condensing boilers in conventional constant temperature (82/71°C Flow/Return) systems or in systems with higher temperature constant temperature primary shunt circuits will lead to non-condensing operation and loss of available operational efficiency. Careful consideration should be given to flue design.
4. Install weather compensation plus optimised start/stop controls on a space heating system where there are no existing similar controls.	All buildings with a combined boiler plant heat output rated at greater than 50 kW	10-40% of heating related energy consumption	£2,500-5,000	1-3 yrs	Term maintenance contractor for heating	Costs for this modification include installation of the control system, external sensor and internal space sensor. It is suitable for both wet zones and Air Handling Units (AHU's). It is used to set back flow temperature for variable temperature systems or to improve time scheduling controls on constant temperature circuits.

5.4.3 Space heating & domestic hot water (DHW)

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
1. Install thermostatic radiator valves (TRVs) on central heating radiators where there are no existing similar controls	All buildings with LTHW radiator based heating systems.	5-10% of heating related energy consumption	£50 per unit	1-2 yrs	Term maintenance contractor	Energy savings may range from very small up to 15%, depending on utilisation.
2. Install pin restrictions on TRVs and limit radiator settings in corridors to setting 3.	Applicable to transitional areas only	2-5% of heating related energy consumption	0 - very low	<1 yr	Term maintenance contractor	On a standard TRV a "3", or midpoint, setting is equivalent to 20°C. Only applicable if TRV has "pin" facility. If not refer to Action No 1, but with a reduced savings estimation.
3. Install zone control valves on a central heating system, where there are no existing similar controls.	Best applied to buildings with varying occupation pattern within defined areas.	5-10% of heating related energy consumption	Variable depending on building	>2 yrs	Term maintenance contractor Plumbing contractor	Zone sensors should be installed in open or representative areas. Up to 3 temperature sensors in each zone should be used to obtain an "average" temperature. Typical energy savings of 5% to 25%, depending on hours of operation, zone occupancy and existing control exercised. As an example a 24-hr call centre on the 1st floor should be on a dedicated zone, permitting remainder of building to be isolated overnight.
4. Implement 'interlocking' of services with factors that significantly impact upon energy consumption. Applicable to heating, lighting and ventilation.	Dependant upon individual site conditions and operations	Where applicable	£1,500, but potentially free depending upon capabilities of existing system	1-2 yrs	Term maintenance contractor Plumbing contractor	For example, the installation of simple and inexpensive controls to interlink delivery doors and heating systems stops the heating system from operating when the delivery doors are opened. Interaction and engagement with affected staff is required.
5. Install destratification fans in areas where there are no existing similar devices.	HQ offices, distribution centres and warehouses	Variable	£500-700 per fan	1-3 yrs	Manufacturer	Requires high ceilings for effective operation.
6. Upgrade insulation on hot water system distribution pipe work,	All buildings with central	5-10% of DHW related	£15 - £60/m	<18 months	Term maintenance contractor	Payback dependent upon pipe work diameter, hot water temperature, thickness of insulation, and cladding.

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
valves and flanges where existing insulation is inadequate.	generation and distribution of Heating and DHW	energy consumption (*)				* Dependant upon existing provision
7. Install Point of Use or limited direct fired water heating with time control to isolate the DHW out side occupied hours.	All buildings with central generation of DHW.	Variable	Variable	Variable	Manufacturer, Plumbing contractor	Particularly applicable to buildings with long DHW pipe runs, where large central boilers are operate during the summer just for DHW and where DHW loads are sporadic and intermittent.
8. Install 7-day time controls on domestic hot water (DHW) boilers, where there are no existing similar controls.	All buildings with DHW	5-10% of DHW related energy consumption	£250-500 per unit	<1 year	Term maintenance contractor Plumbing contractor	Ensure that any primary and secondary pumps are also controlled by time switch.

5.4.4. Heating, ventilation & air conditioning (HVAC)

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
1. Install insulation on refrigerant pipe work (particular external insulation) and replace any that is wet or damaged.	Buildings with central generation of Air Conditioning	5-20% of Air Conditioning related energy consumption	£5-25/m	1-3 yrs	Term maintenance contractor	Wet or damaged insulation will result in increased energy consumption.
2. Install inverter driven condensing equipment for AC systems, e.g. Inverter driven condensing unit compressors and fans in lieu of on/off capacity control for AC units	Buildings with central generation of Air Conditioning	Variable	Variable	Variable	Specialist advice required, Manufacturer	Savings dependent on size, type and usage of plant. Specialist technical expertise required

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
3. Install plate heat exchanger heat recovery into air handling supply and extract plant	Buildings with centralised conditioned air provision, normally large HQ buildings	8-15% of heating related energy consumption	£2,000 extra cost over a standard unit.	>4 yrs	Specialist advice required, Manufacturer	Payback based upon the additional cost of incorporating heat recovery in the form of a plate heat exchanger to a fresh air supply and extract air handling plant of approximately 0.6 cubic metres/second volume serving an office with occupancy 5days/week, 10hours/day.
4. Install speed controllers to point of use extract fans	Most buildings	Application specific	£50-75	>4 yrs	Term maintenance contractor, Electrical contractor	Payback based on a typical 200mm diameter in line fan (with a 200 watt motor) running for 2000 hour/annum, for which the speed may be reduced from full speed to half speed for 50% of its running hours is considered.
5. Maintain appropriate room temperatures by ensuring that cooling is only used for higher than usual temperatures.	All buildings with separate heating and cooling systems	5-20 % (*)	N/A if applied by internal maintenance dept	Immediate	Term maintenance contractor	<p>The maximum temperature recommended for heating is 19°C. The temperature in an area can be comfortably above 19°C but a system should not be providing heat at this time. Similarly most air-conditioned areas need not be cooler than 24°C (unless they need to be for a specific process). Set controls to give a wide gap between the temperatures at which they cut in. Set a gap between 19 to 24°C to create a comfortable 'dead band' where no heating or cooling is operating. This will help to keep occupants happy and increase cost savings. Unless this is implemented, both systems may operate simultaneously and waste energy and money.</p> <p>* Variable but where applicable an expected 5-20 % saving would be achievable on heating and cooling related energy consumption</p>

5.4.5. Lighting & controls

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
1. Install time switches in areas that are used for fixed duration activities.	All buildings	10% of lighting related energy consumption	£20-100 per unit	1-4 yrs	Term maintenance contractor	These include e.g. push buttons, fixed period operation switches or time delay switches. Can be undertaken internally or externally.
2. Install light sensors or 'photocells' near windows or in external areas that receive high levels of natural light. Also applicable to external lighting	All buildings	10-20% of external lighting energy related consumption	£100-200 per unit installed	2.5-4 yrs	Term maintenance contractor	Sensors provide closer control than manual or time controls. If lights are not required to be on all the time it is dark consider also controlling with time switch
3. Install the following types of occupancy sensors in the following areas: <ul style="list-style-type: none"> PIR sensors — used for small areas that are occupied infrequently such as storerooms and bathrooms; they are also useful for security purposes. Ultrasonic sensors — useful for office areas. Microwave sensors — used for external or large internal areas that are occupied infrequently such as conference rooms, meeting rooms, and tearooms. 	All buildings	10-30% of lighting related energy consumption	£100-250 per unit installed	3-5 yrs	Term maintenance contractor	Modern microprocessor controls are more accurate and allow greater flexibility, close control, lower running costs and better comfort conditions. Always consult a qualified equipment installer or adviser. PIR sensors can detect movement over a range of 12 metres in direct line of sight. Assessment of H&S considerations should be undertaken.

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
<ul style="list-style-type: none"> Occupancy sensors are especially useful in: store rooms; toilets; staff rooms and areas where lighting is 'zoned' with occasional late activities. 						
4. Make the most of natural light by creating lighting zones parallel to the windows.	All buildings	5-15% of lighting in applicable area.	See comment	Immediate	Term maintenance contractor, Electrical contractor	Normally only cost-effective to undertake as part of a general refurbishment or re-wiring programme. Saving potential dependant upon orientation

5.4.6. Building fabric

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
1. Install 250mm or more of mineral wool roof void insulation where there is no existing insulation.	All buildings with accessible attic spaces	15-20% of heating related energy consumption	£10/m ²	<3.5 yrs	Term maintenance contractor	Upgrading of insulation thicknesses less than 100 mm is also considered cost effective. When applying insulation, ensure that there is sufficient ventilation at the eaves. Minimise gaps in the insulation through cross laying of insulation layers. Do not cover electrical cables with insulation, it reduces the electrical capacity rating. Remember to insulate any water tanks and pipes in the loft space to reduce the risk of freezing.
2. Install automatic door closers on doors leading outside, to ventilated areas (such as bathrooms and stair wells) or between heated and unheated zones to minimise air infiltration into the building.	All buildings	Variable	£100 per unit	3-5 yrs	Term maintenance contractor	These are available for swing and sliding doors. For doors that are used very frequently, such as main entrance doors, consider installing automatic doors.

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
3. Install blinds or curtains on all windows to help prevent draughts, as well as heat loss in winter and heat gain in summer. If already installed ensure timely use to minimise energy consumption	All buildings	up to 5% of related energy consumption	N/A	N/A	N/A	This will assist the ventilation system to cool the building and reduce the need for air-conditioning. Note that outside shading is more efficient than internal shading to reduce heat gains. Consider the use of reversed horizontal blinds that reflect daylight upward onto internal ceilings. Pelmetts can be installed above curtains to further prevent draughts and heat loss.
4. Install cavity wall insulation where there is no existing insulation.	Buildings with cavity wall construction	10-15% of heating related energy consumption	£15-30/m ²	<5 yrs	Specialist contractor	An inspection by qualified personnel should be undertaken to assess the building for damp or potential damp problems. Extra care should be applied if SW facing wall is routinely subject to extreme weather conditions. Cavity walls only became widespread after 1930 and after the mid 1980s walls were insulated during construction.
5. Install draught-proofing on windows, doors and other access points.	All buildings	10%	low cost	< 2 yrs	Term maintenance contractor, Manufacturer	Draught strips for windows and doors include adhesive foam, flexible plastic or polypropylene pile strips. When adhesive strips are used, good surface preparation is essential. Attach draught excluders firmly with screws at the door base to ventilated areas such as toilets, bathrooms and laundries, and attach draught strips between the door and its frame. Unless air is meant to be able to enter through the door in order to enable ventilation. In this case a ventilation system with closable openings should be considered. A door with a 3mm gap around it will let in as much cold air as a hole in the wall the size of a brick.

5.4.7. Water

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
1. Install water saving features such as AAA rated showerheads, aerators on taps, in-tap volume restrictors or flow regulators, or mechanisms to allow users to adjust flow to need, to minimise the use of water and energy.	All buildings with office based staff	40-80% (spray taps) of related water consumption	Variable	1.5-3 yrs	Term maintenance contractor	May increase Legionella risk, for poorly maintained systems.
2. Install urinal controls and toilet controls, such as siphoned flush and dual flush with low flush volume, to achieve water savings by reducing the number of flushes annually.	All buildings with office based staff	30-80% of related water consumption	£200 per unit	0.2-1 yrs	Term maintenance contractor	To maintain cleanliness, ensure controls flush at least twice per 24-hrs
3. Replace 'ordinary' taps with percussion taps.	All buildings	5-15% of related water consumption	£35-55 per pair	3-5 yrs	Term maintenance contractor	Cost have been based on fitting of new pair of taps at each basin. Savings have been based on cost of energy to heat hot water and purchase/disposal cost of water.

5.4.8. Maintenance

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
1. Raise awareness of energy efficiency and encourage maintenance employees to adopt and apply simple energy efficiency	All buildings	10-20% of energy consumption	N/A	N/A	Internally provided	Define limits of involvement so that more complex issues are dealt with by qualified personnel/ contractors

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
actions in the workplace						
2. Implement a metering, monitoring and targeting system. – referred to in Section 2.1	All buildings	10-25% of energy consumption	£500-5,000	0.5-2 yrs	Term maintenance contractor, Specialist Advice Government framework agreement.	You can't manage what you can't measure. Measures range from self generated spreadsheets to full invoice processing software packages A pan government Automatic Meter Reading (AMR) framework to include utility billing meters, sub-metering, other utility meters, and the provision of associated services, including data collection and collation; customer data and reporting and the provision of Automatic Monitoring Targeting (AMT) software will be available through Buying Solutions from September 2009
3. Implement good control of building services (heating, ventilation, cooling and lighting).	All buildings	N/A	N/A	N/A	Term maintenance contractor	This not only saves energy and money, but also produces a comfortable environment for staff and customers.
4. Implement a lighting maintenance programme.	All buildings	N/A	N/A	N/A	Term maintenance contractor	Lights, light fittings and lighting design features should be maintained on a regular basis so that light output is maximised. Light switches and various lighting control systems should be maintained regularly by a suitably qualified person to maximise their working efficiency.
5. Arrange for a regular heater service and combustion check. Heaters and burners should be properly cleaned and serviced at least once a year by a qualified contractor.	All buildings with centralised heating generation	Variable depending on existing condition	Variable	Variable	Term maintenance contractor	Servicing should include a regular combustion efficiency check, with results provided to end user.
6. Implement a motor maintenance programme.	N/A	N/A	N/A	N/A	Term maintenance contractor, Motor maintenance contractor	Small electric motors lose about 15% efficiency on rewinding.
7. Maintain water system.	All buildings	N/A	N/A	N/A	Term maintenance contractor	A dripping tap can waste £7 of water per year. A dribbling tap can waste £50 of water per year.

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
8. Reduce the heating temperature by 1°C.	All heated buildings	8%	N/A	N/A	Term maintenance contractor	This 1°C reduction in space temperature would save an estimated 8% in space heating energy use. A similar reduction is estimated in raising the temperature for cooling.

5.4.9. Office equipment

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
1. Use a time switch to reduce out of hours electricity use.		Based on purchase and application of 7-day plug in timer on a vending machine - 30%	£5	2 weeks	Self purchased	Office equipment is the fastest growing user of energy in the business world, representing around 25% of total electrical energy use in commercial offices. A cheap and easy way to achieve instant savings is to use a 7-day plug-in time switch to automatically switch off printers, photocopiers, vending machines and water coolers. A plug-in time switch is an inexpensive piece of equipment. For example, an annual saving of around 70% can be achieved if a vending machine is switched off at night and weekends. Moreover, this will result in less heat being generated in the office which will reduce the air conditioning cooling load by up to 75% over the course of the year. Computers and monitors should be switched off manually by the user prior to leaving the building.
2. Turn equipment off at the machine (and power point if possible) when it is not needed, such as by means of plug-in timers on power outlets.	N/A	N/A	N/A	N/A	N/A	Office equipment consumes energy if not turned off at the wall. Therefore, it should be turned off at the wall at the end of each day where possible. This includes hot water urns or water boilers in the kitchen.
3. Implement and utilise energy saving features such as 'standby' or 'sleep' modes.	N/A	N/A	N/A	N/A	N/A	Newer office equipment has energy saving features. These may be in the form of an automatic shutdown, standby or sleep mode, which can be activated when not in use, through software or a push-button. Make sure the

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
						equipment supplier or maintenance staff has enabled the use of these features.
4. Set printers to print double-sided, where possible.	N/A	N/A	N/A	N/A	N/A	Inkjet printers are generally cheaper to run than laser printers. Ask yourself: "do I need to print this document?" Display this question by shared printers as a reminder to staff.
5. Switch off computer monitors if the computer is not going to be used even for short time periods.	N/A	N/A	N/A	N/A	N/A	Monitors other than flat-screen monitors consume a significant portion of the energy used by the computer. They can easily be turned on and off and a switched off monitor uses no energy! This should occur if the user is likely to be away from their desk for more than ten minutes.
6. Shut down computers if inactive for longer than thirty minutes.	N/A	N/A	N/A	N/A	N/A	This may seem inconvenient, yet it usually takes only a few minutes to restart if the computer system is working efficiently. For some computers, restart can be programmed to automatically occur when moving the mouse or hitting a key. Most computers will have power settings adjustable for energy efficiency. Some server computers and other office equipment cannot or should not be shut down. Consult the operating manual or relevant personnel prior to shutting down any equipment you are unsure about.
7. Install Automatic IT Power management software	All buildings with networked PCs	250 – 450 kWh per PC	£6-10 per PC	3-9 months	A pan government framework for IT Power Management is available now through DCMS. For further information go to www.1e.com/publicsectorportal	This type of software allows the automatic shut down of PC's during non-working hours and can include a safe document recovery system and, if combined with power-up software, permits automated IT upgrades. Additional features are product specific such as reporting of actual savings achieved are available.
8. Make personnel aware of energy saving features on office equipment, and remind and encourage them to use these features as well as to switch	N/A	N/A	N/A	N/A	N/A	

Action	Relevance to building type	Typical energy savings (kWh)	Typical costs (£)	Typical payback period (yrs)	Procurement routes	Considerations, issues and constraints
equipment off when it is not needed.						
9. Establish a purchasing policy ensuring you only buy equipment which at least meets 'Buy Sustainable – 'Quick Wins' standards.	N/A	N/A	N/A	N/A	N/A	Some brands of office equipment use less energy than others. Consider the running and standby energy costs of all alternatives. Energy efficient appliances may cost more to buy but will cost less over the lifetime of the equipment. It is mandatory for central government departments and agencies to buy equipment meeting 'Buy Sustainable – 'Quick Wins' standards. These standards include energy efficiency criteria.

6.0 Further Reading

- **Achieving Excellence in Construction**
http://www.ogc.gov.uk/ppm_documents_construction.asp
- **Automatic Metering**
http://www.ogc.gov.uk/documents/automatic_meteringAR.pdf
- **BREEAM**
<http://www.breeam.org/>
- **Building Research Establishment guidance on whole life costing and life-cycle assessment for sustainable building design**
<http://www.brebookshop.com/details.jsp?id=93588>
- **Buy Sustainable – Quick Wins**
<http://www.defra.gov.uk/sustainable/government/what/priority/consumption-production/quickWins/index.htm>
- **Buying Green!**
http://ec.europa.eu/environment/gpp/pdf/buying_green_handbook_en.pdf
- **Carbon Trust**
<http://www.carbontrust.co.uk/>
- **Common Minimum Standards for the Built Environment -**
http://www.ogc.gov.uk/construction_procurement_common_minimum_standards_for_the_built_environment.asp
- **Contract Management**
http://www.ogc.gov.uk/policy_and_standards_framework_contract_management.asp
- **DEEP toolkit**
<http://www.procuraplus.org/index.php?id=4614>
- **Energy End-Use Efficiency and Energy Services Directive**
<http://www.defra.gov.uk/environment/climatechange/uk/energy/energyservices/>
- **Energy Performance of Buildings Directive**
<http://www.communities.gov.uk/planningandbuilding/theenvironment/energyperformance/>
- **Environmental Issues in Purchasing**
http://www.ogc.gov.uk/documents/environmental_issues-defra.pdf
- **Finding and Procuring Innovative Solutions**
[http://www.ogc.gov.uk/documents/Finding_and_Procuring_Innovative_Solutions_\(3\).pdf](http://www.ogc.gov.uk/documents/Finding_and_Procuring_Innovative_Solutions_(3).pdf)

- **Funding Opportunities for Public Sector Energy Efficiency Projects**
http://www.ogc.gov.uk/documents/funding_opportunities.pdf
- **Green Book, Appraisal and Evaluation in Central Government**
<http://greenbook.treasury.gov.uk/>
- **Green Book supplementary guidance on vfm and sustainability**
http://www.hm-treasury.gov.uk/guide_money_and_sustainability.htm
- **Green Public Private Partnerships**
http://www.ogc.gov.uk/documents/Green_Public_Private_Partnerships.pdf
- **Introduction to the EU procurement rules**
http://www.ogc.gov.uk/documents/Intro_to_EU.pdf
- **Life Cycle Costing**
http://www.ogc.gov.uk/implementing_plans_introduction_life_cycle_costing_.asp
- **Managing Public Money**
<http://www.hm-treasury.gov.uk/6441.htm>
- **NHS PASA Whole Life Costing Tool**
<http://www.pasa.nhs.uk/PASAWeb/NHSprocurement/CEP/CEPproducts/CEP+catalogue.htm#Other%20CEP%20reports>
- **Pan Government Energy Project**
http://www.ogc.gov.uk/commodities_procurement_energy.asp
- **Power Factor Correction and Capacity Matching**
http://www.ogc.gov.uk/documents/power_factor_correctionAR.pdf
- **SASETO (Self-Assessment Energy Audit Tool)**
<http://www.procuraplus.org/index.php?id=4614>
- **Shadow price of carbon**
<http://www.defra.gov.uk/environment/climatechange/research/carboncost/index.htm>
- **Social issues in Purchasing**
http://www.ogc.gov.uk/documents/Social_Issues_in_Purchasing.pdf
- **Value for Money**
[http://www.ogc.gov.uk/documents/VFM\(1\).pdf](http://www.ogc.gov.uk/documents/VFM(1).pdf)

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