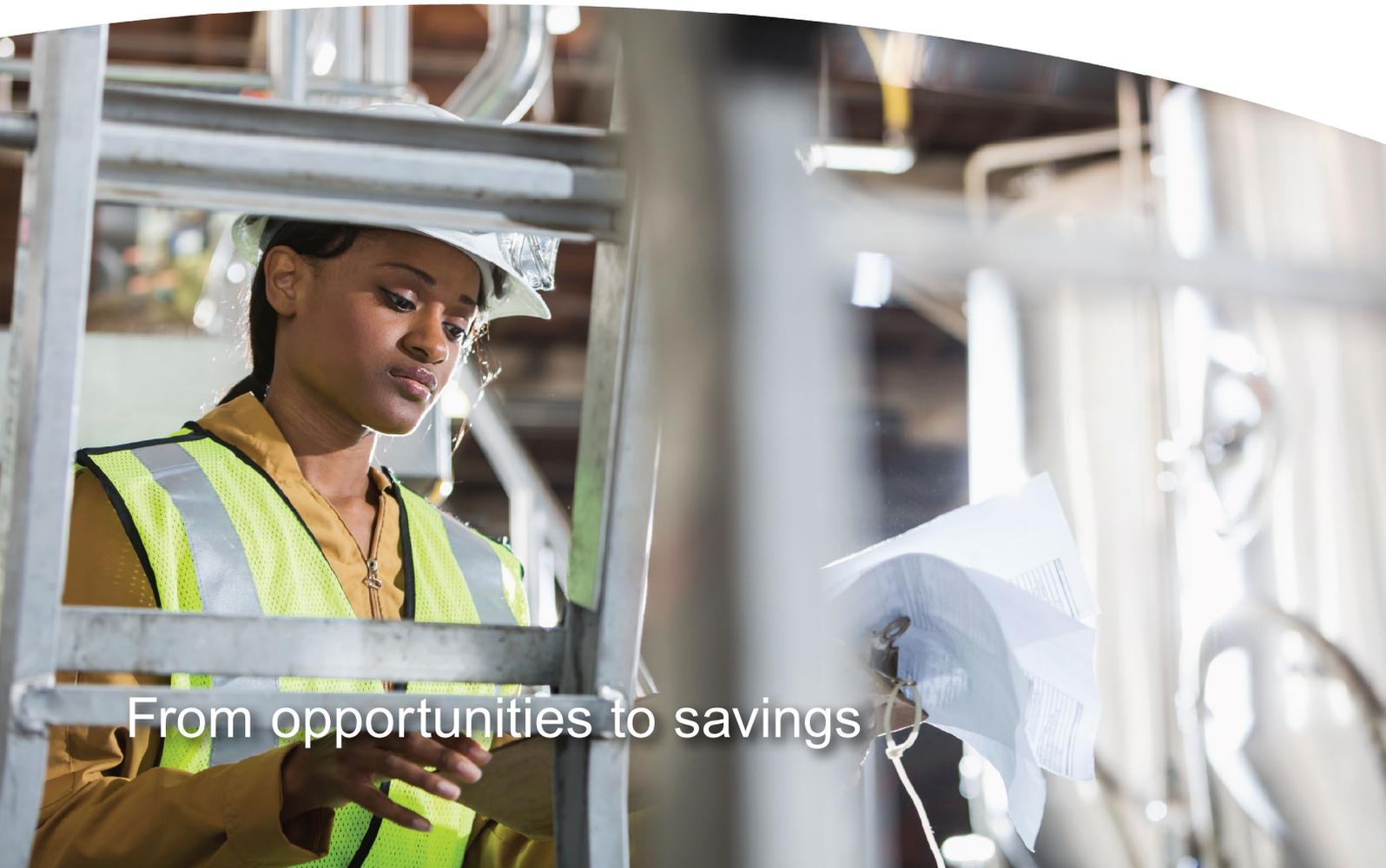




Department
of Energy &
Climate Change

A Guide to Implementing Energy Savings Opportunities



From opportunities to savings

Produced by the Carbon Trust
on behalf of the Department of Energy & Climate Change

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This guide will help you make the most of energy efficiency opportunities identified through the Energy Savings Opportunity Scheme (ESOS) or another energy audit.

Is this guide for me?

MENU

This guide will help you make the most of energy efficiency opportunities identified through the Energy Savings Opportunity Scheme (ESOS) or another energy audit.

This guide has been written for organisations that have completed an ESOS assessment and want to make the most of the identified energy saving opportunities. It will give you an overview of the next steps your business can take to maximise the impact and return on investment of your ESOS assessment.

It is particularly aimed at organisations that have little experience in implementing energy saving projects and may lack a dedicated energy manager. However, much of the information in this guide will be relevant even to more experienced organisations, or those which have identified energy saving opportunities independently of ESOS.

The information in this guide draws upon direct business input gathered through a series of telephone interviews conducted by the Carbon Trust, together with work carried out with hundreds of businesses to implement energy saving opportunities.

Many businesses identify similar challenges in trying to implement energy savings, which this guide aims to help you address:

- ✓ How to quantify the level of savings of individual projects and build confidence in the reliability of the forecast savings
- ✓ How to make the business case attractive to decision makers
- ✓ How to effectively compete against better understood or higher profile alternative initiatives
- ✓ How to align the project with the overall business strategy
- ✓ How to ensure resource is available to make the project happen and see it through to completion

It will also help you to follow best practice and avoid the most common pitfalls around the implementation of energy saving opportunities, helping to build the momentum within your organisation to turn opportunities into real savings.

You will find this guide useful, if:

- You have finalised your ESOS compliance and now have a list of energy efficiency recommendations.
- You have identified energy saving opportunities within your organisation, but have little or no experience in what it will take to implement them.
- You are struggling to convince senior decision makers to dedicate resources and money to energy efficiency projects.
- You have tried to implement energy efficiency opportunities in the past, but projects were not completed or did not deliver the expected benefit.

On average, a business can reduce its annual energy costs by 20% through improving energy efficiency and energy management.

The business opportunity behind energy efficiency

Cutting your energy costs is one of the most straightforward ways for your business to improve its bottom line.

On average, a business can reduce its annual energy costs by 20% through improving energy efficiency and energy management¹. Importantly, becoming more energy efficient does not necessarily mean investing a lot. Many worthwhile energy saving opportunities have low or no costs, such as installing or optimising lighting or heating control systems, changing the way you measure and monitor energy consumption, or engaging your staff to change their behaviour. It is not unusual to save 5%-10% with minimal capital expenditure². Even when more substantial investment is required, energy saving opportunities regularly outperform most other investment opportunities that a business has (see *Figure 1*).

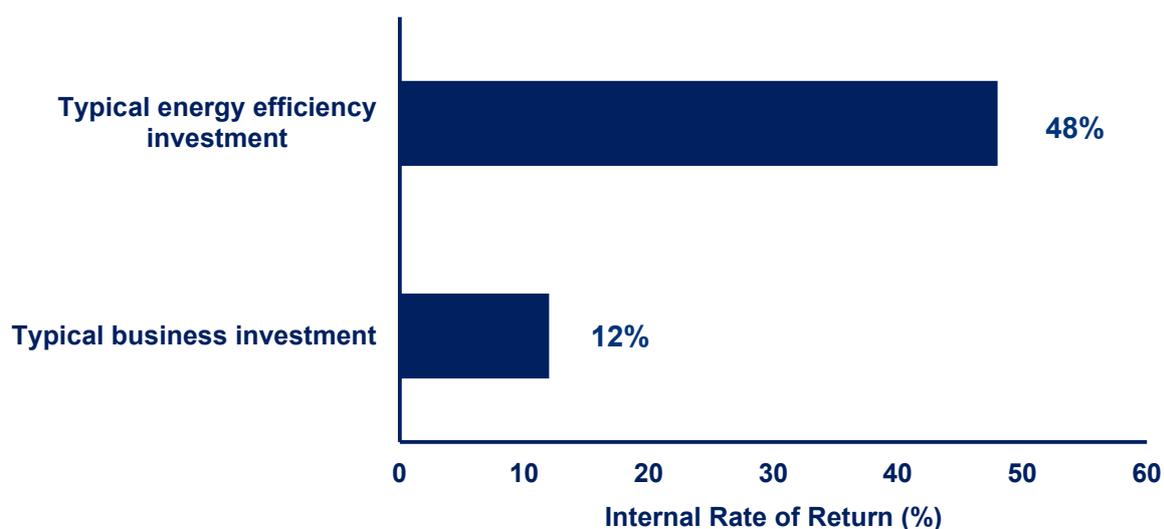
Benefits to your business

Companies which have implemented energy saving opportunities typically realise the following benefits for their business:

- Save money and manage risks by reducing their operating costs and exposure to future energy price increases
- Enhance productivity, competitiveness, and market position
- Exploit new and growing market opportunities

For further reference, the CBI produced a compelling case for the benefits of energy efficiency in its 2013 report, '[Shining a light](#)'.

Figure 1 – Typical returns on energy efficiency investments vs other investments³



¹ Source: Carbon Trust Energy Efficiency Programme

² Source: Carbon Trust 2011 publication 'Energy Management'

³ Source: Carbon Trust, 2010, The Business of Energy Efficiency

Breaking the project down into individual steps will make it easier for you to develop a structured delivery plan, including clear tasks, timelines, project milestones, and a list of colleagues and stakeholders to be involved at each stage.

How to implement energy saving opportunities successfully

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This guide sets out a structured process for implementing energy saving opportunities.

Following the process shown in *Figure 2* and breaking the project down into individual steps will make it easier for you to develop a structured delivery plan, including clear tasks, timelines, project milestones, and a list of colleagues and stakeholders to be involved at each stage. It will also help you identify at the outset how the project impact will be measured, reported and communicated.

The steps are outlined on page 10 and discussed in more detail over the following pages.

Identifying and prioritising opportunities

Your ESOS assessment report will provide you with a comprehensive list of your energy saving opportunities. This should give you the necessary information to prioritise and appraise opportunities in a structured way, and rank these according to criteria that make most sense for your business.

You will want to consider factors such as overall savings and rate of return, cost of implementation, and coherence with other planned organisational changes.

Steps to implementing energy saving opportunities

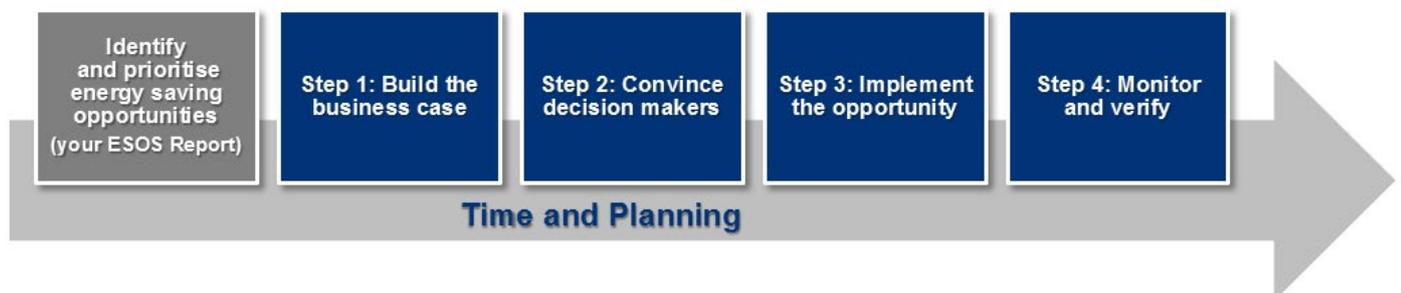


Figure 2 – Steps to implementing energy saving opportunities

This is a suggested process for implementing energy saving opportunities based on best practice examples from a number of different organisations. Your approach may differ slightly depending on your organisation's policies or working practices.

Once you have made a decision on which energy saving opportunities to implement, you should focus on building a compelling business case for each opportunity or group of opportunities.

This includes a robust financial appraisal of the opportunity in a framework which will be readily understood within your business, a view of the project's ease of implementation, an assessment of the project's risks, and an analysis of what

additional benefits the project will deliver.

The level of detail required will depend on the opportunity's complexity and required investment. Making a case for switching off lights after office hours will be very straightforward, whereas a compelling business case for investing in a new boiler should include strong evidence underpinning the assumptions for the business case.

When you have gathered the data to build a compelling business case, it's time to consider how to sell the benefits of your project to senior decision makers within your organisation.

Step 2 gives advice on how to frame your business case to improve your chances of success and on how to present it to decision makers.

After you have secured the go-ahead to proceed with your project, you can start the implementation process. For relatively simple opportunities, like making sure equipment is switched off when it's not required, implementation should be straightforward and will require little planning beyond making the necessary changes to existing procedures.

For more complex opportunities, which may require significant works, you should aim to develop a detailed project implementation plan.

The implementation process of more complex opportunities generally requires you to:

- Identify suppliers and make your selection
- Choose appropriate equipment
- Find an installer (if necessary)
- Secure finance
- Undertake the installation process
- Adapt processes and conduct training for appropriate operation of the equipment

Finally, you should monitor and verify the performance of your project. This will enable you to identify, report and fix any problems early on, track overall performance against objectives, and provide evidence to management to help engage them on future investment opportunities.

Time and Planning

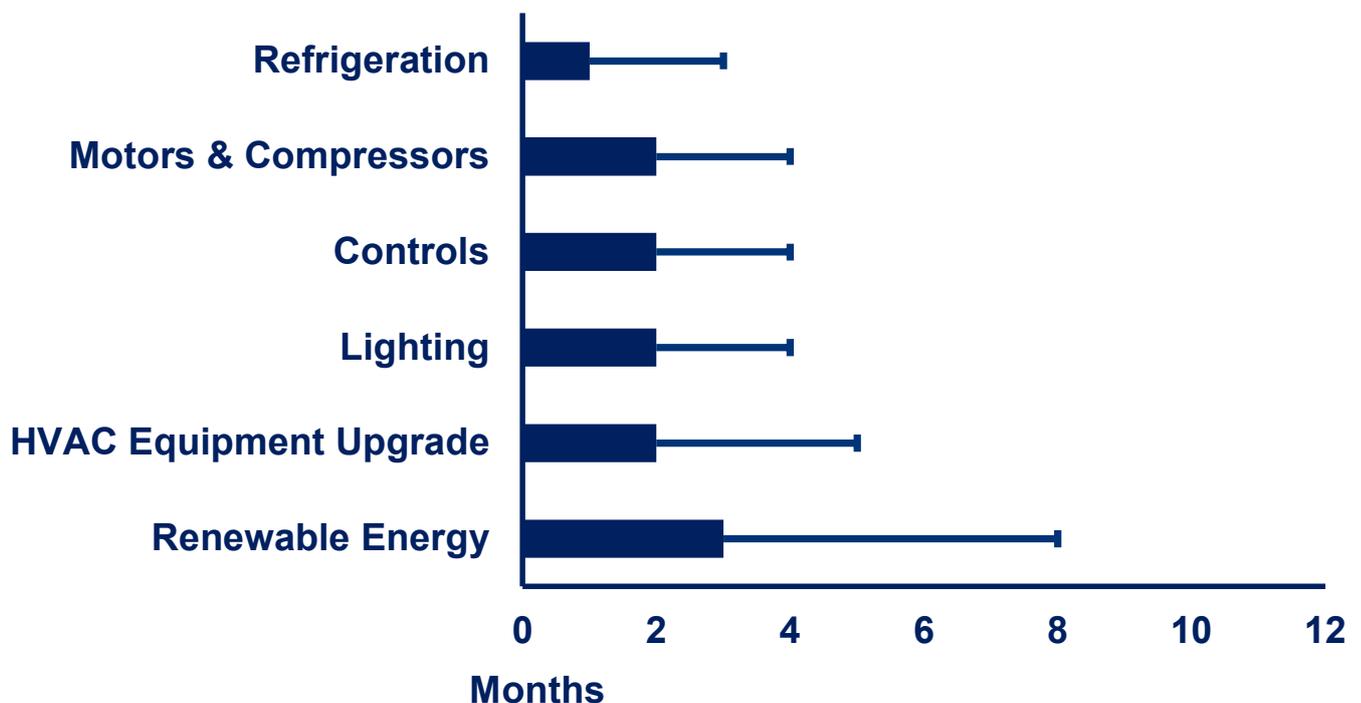
Depending on the specific energy saving opportunity, the time from identifying the opportunity until you start saving energy can range from a few days for simple no-cost measures, to multiple months or even occasionally years for large, capital intensive projects.

It is recommended that you develop a **project plan** at the outset of the project. This should include a contingency period to help avoid unnecessary delays. It will also help you to communicate to project stakeholders when they can expect to start to realise the benefits outlined in the initial business case.

A key consideration to ensure a successful implementation is the **lead time** required for your project. Where possible try and align it with your business cycle, for example by making sure you obtain sign-off from decision makers before budgeting is finalised for the next financial year.

Figure 3 below gives you an indication of the typical range of implementation times for energy saving opportunities that require investments into new equipment for different technologies. The implementation time in *Figure 3* covers the period from having selected a supplier and ordered the equipment to having the equipment operational. No- and low-cost opportunities can take significantly less time.

Figure 3: Typical implementation times for technology investments⁴



⁴ Source: Carbon Trust Analysis of implementation time from ordering equipment to the completion of installation and commissioning of 780 energy efficiency projects supported with loans from 2012-2015

Companies which have been successful at securing funding approval first time round identified allocating the right resource and allowing sufficient time to complete the business case as key success criteria.

Step 1

Build the Business Case

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Focus on building a compelling business case for each opportunity or group of opportunities

This is the most critical stage of the implementation process. When building the business case you should:

- evaluate and present the financial case for the energy saving opportunity
- emphasise the total value of the project to your organisation
- align it with stated business objectives and policies
- identify a comprehensive list of benefits
- consider key risks and have strategies in place to mitigate them

This section covers the content that your business case should address. Equally important is how you frame the business case and proposal that you present to decision makers. This is addressed in **Step 2**, and should be considered when developing the business case.

The financial case

Building the business case for no- and low-cost opportunities

Many energy saving opportunities identified will require no or little investment. These could simply involve changing existing processes and procedures, for example when equipment is switched off, or changing the settings at which equipment operates. Building the business case for these opportunities will often be straightforward. However, you may still have to overcome resistance from internal stakeholders.

Where savings are achieved with no or little investment, the financial case for these opportunities is usually very compelling. The key challenge that remains then is to overcome resistance to change.

Make sure you understand the other implications of the suggested changes. For example switching off lights in staircases could have health and safety implications, or changing temperature settings of the heating and air conditioning system could affect the level of comfort of your colleagues or customers. Your business case should demonstrate that you have taken these consequences into considerations and include suggestions for mitigating them, where possible.

The time required for building a business case, getting sign-off for implementation and then implementing no- or low-cost opportunities is typically much shorter than for capital investments, so implementing these first is often sensible.

Clustering projects

When building the business case for your energy saving opportunities, you should consider which opportunities make the most sense to cluster together.

Reasons for doing this might include implementing them together during the same maintenance cycle, or because their installation will require downtime of the same equipment. This will help you get the most out of your time and budget.

Clustering projects is also a good way to group a number of recommendations with longer and shorter payback periods, as this helps to balance a high investment, e.g. for a boiler upgrade, with savings from say a behaviour change measure, to make the overall financial case for investment attractive for both. This approach can sometimes enable access to external finance for longer-term investments.

Building the business case for opportunities with significant capital investment

When building the business case for energy saving opportunities that require significant investment, it is crucial that the financial case is robust and presented in a way that resonates with your decision makers. Guidance on tailoring your business case to the right audience is given in **Step 2** of this guide.

Depending on the complexity of the project, you may choose to develop the full specification of the equipment, engage suppliers and installers for quotations against these specifications, and investigate potential sources for finance at the business case development stage, to make sure your assumptions are as robust as possible. Detailed guidance on these steps is given under **Step 3** in this document.

For many opportunities, a light-touch approach can be sufficient, building on the cost and saving assumptions in your ESOS assessment report.

How to present the financial case for your project

There are five commonly used techniques to help you evaluate and present the financial case for an energy saving opportunity. These approaches, and the methodologies they apply, are explained in more detail in **Appendix III**. Your organisation will likely have a preference for a particular approach, so do talk to your finance department to understand which one is typically used.

In brief, the common approaches are:

- **Simple Payback Period (SPP)** - A relatively easily derived metric that indicates how quickly the original investment is paid back by cost savings. SPP is a very accessible metric, but says little about the overall value of an investment.
- **Life-cycle cost (LCC)** – A technique that evaluates the cost of equipment over its entire lifetime, including predicted operating and maintenance costs, rather than focusing on the initial investment.
- **Discounted Cash Flow (DCF)** – A technique which, similar to LCC, assesses the costs and savings of an investment over its entire lifetime, but additionally takes into account the decreasing value of money over time.
- **Net Present Value (NPV)** – A financial metric that aggregates the DCF of a project into a single figure, allowing the direct comparison of the value of different investments.
- **Internal Rate of Return (IRR)** – Another financial metric based on an investment's DCF, but focusing on the relative scale of investment's returns compared to the original investment, rather than the overall value.

Other factors influencing the financial case

In addition to investment costs and cost savings, two other factors could particularly influence the financial case for an energy efficiency investment: **Taxation** and **Energy Cost Projections**.

It is worth considering these and including them in your business case.

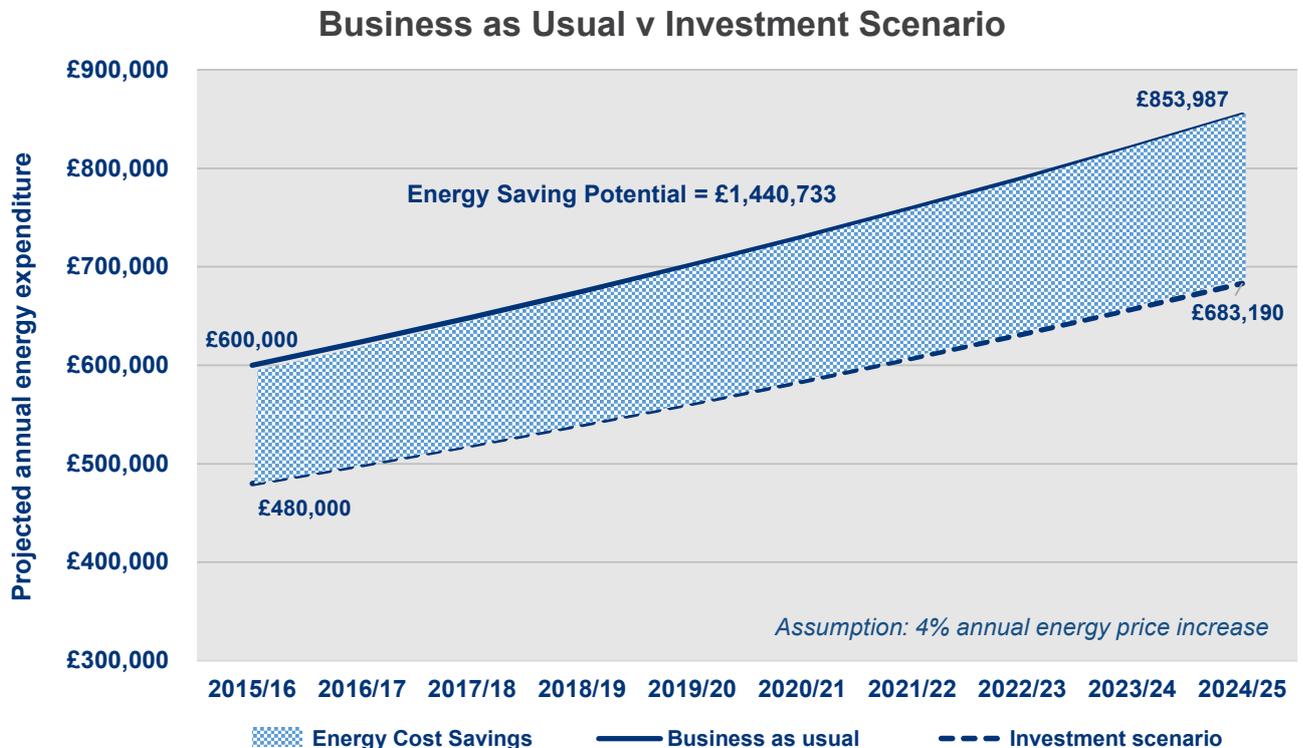
The total value of the project

The cost of inaction

When presenting the potential financial savings of an energy saving opportunity, you can also present them as the ‘cost of inaction’, i.e. avoidable losses generated by delaying/avoiding implementation of the energy efficiency opportunities. It has been demonstrated that people respond more strongly to the notion of avoiding losses than that of acquiring gains. In other words, decision makers are more likely to sign-off on a project that avoids losses than on a project that makes money.⁵ Your story can become even more powerful if you break down the costs further, creating urgency: “Every day we delay implementing this project costs us £500.”

An example of ‘the cost of inaction’ is illustrated in *Figure 4*. In this example, investing in an energy saving opportunity would reduce the annual energy bill of a business by 20% from £600k to £480k. Assuming an annual energy price increase of 4%, the business-as-usual energy bill after 10 years would be over £850k, which the investment could reduce to a little over £680k. The energy saving potential over this 10 year period is £1.4m. In this example then, the ‘cost of inaction’ for not making the investment is more than £1.4m pounds over 10 years, or in excess of £2,700 per week.

Figure 4: Graph showing the potential “Cost of Inaction” – energy saving potential of investment⁶



⁵ Source: Kahneman & Tversky, 1979, Prospect Theory: An Analysis of Decision under Risk https://www.princeton.edu/~kahneman/docs/Publications/prospect_theory.pdf

⁶ Source: Carbon Trust analysis

Business objectives

Your business case should be aligned with stated business objectives and policies.

Give consideration to the broader organisational context and how your project aligns with the overall organisational objectives, structure, and policy framework. Relating your business case to strategic considerations will help define the business need and underline the value of the investment to your organisation. Beyond the overall business objectives, you should also be aware of the needs of key stakeholders within your business who may be affected by the proposed project.

For instance, if one of your corporate objectives is to maximise efficiency or to minimise your environmental impact, then making the link is relatively straightforward.

But you can also link energy efficiency to more tangential objectives, e.g. by stressing competitive advantage that being more efficient can bring, the fact that it can help you deliver cheaper products to customers by minimising costs, demonstrate innovation or make a positive social contribution.

It might even be possible to link energy efficiency directly to business objectives. For instance,

for a healthcare company you might emphasise health benefits or reducing emissions; or for a communications company you might link investing in energy efficiency to promoting the company as being at the cutting edge of technology.

Further guidance on how to frame your business case is given in **Step 2** in this document.

Additional benefits

You may also be able to enhance your proposal's attractiveness by citing additional benefits such as:

- Reduced maintenance costs
- Increased availability and reliability of key equipment
- Avoidance of capital expenditure on power supply reinforcement
- Reduced emissions
- Reduced noise nuisance and improved thermal comfort
- Enhanced reputation and public relations advantage
- Future proofing from energy price inflation

Several of these benefits are further explored in reports by CBI, CIBSE and Carbon Trust, which you can find in the **Further Guidance** section.

Case studies and testimonials

Another element that can lend your proposal credibility are case studies for the types of opportunities that you are proposing to implement where savings have been achieved, especially if you can demonstrate that peers or competitors have implemented similar opportunities.

Useful sources to consult might be:

- Annual corporate and social responsibility reports
- Supplier case studies
- Advisory bodies
- The Trade association representing your sector
- Technology associations for the technology you are considering implementing

You can find [links to some key organisations](#) at the end of the guide.

Mitigating risks

Finally, your business case should demonstrate that you have considered the key risks to its success and have strategies in place to mitigate them. Common risks and mitigation strategies are listed in the table below:

Common risk	Suggested mitigation
Project over-spend	<ul style="list-style-type: none"> • Develop a robust project plan and specification document. • Include a realistic contingency in project costs. • Track spend and implement regular project review meetings.
Savings lower than projected	<ul style="list-style-type: none"> • Review assumptions made by suppliers and or check they are appropriate. Consider specialist advice. • Train all relevant staff to operate new equipment and update operating procedures. • Monitor and verify energy consumption of project to identify drivers for reduced savings.
Late delivery or non-completion	<ul style="list-style-type: none"> • Develop a robust project implementation plan which takes into account drivers for delays of project stages. • Obtain clear statements from suppliers on delivery and installation timelines.
Quality of performance of new plant (especially quality in a process)	<ul style="list-style-type: none"> • Check performance claims by following up customer references provided by suppliers. • Train all relevant staff to operate new equipment and update operating procedures. • Monitor and verify performance project to identify drivers for reduced savings.
Scheme compromised in the long term by a short term outlook on project payback	<ul style="list-style-type: none"> • Develop business case based on Life-Cycle Costing.
Poor commissioning	<ul style="list-style-type: none"> • Factor in time in your implementation plan for commissioning to take place. • Ensure effective commissioning is included in the price quoted. • Train all relevant staff to operate new equipment and update operating procedures • Secure after-sales support.

Mitigate these risks by ensuring the appropriate due diligence is carried out during the scoping, project planning and procurement stages.

Advice on developing robust specifications, implementation and post-implementation plans is provided under **Step 3**.

How to structure your proposal

In order to help structure your business case proposal or presentation, consult the checklist in [Appendix I](#).

Structure your written proposal appropriately, with all technical detail in appendices and a succinct high-level summary at the front. Make sure that it contains one clear recommendation or request (the most compelling one), rather than confusing the audience with several options.

You can find a suggested structure for the business case proposal report in [Appendix II](#). More advice on how to structure your proposal is given in the next section of this guide.

Relating your business case to strategic considerations will help define the business need and underline the value of the investment to your organisation.

Step 2

Convince decision makers

How to frame your business case to improve your chances of success and how to present it to decision makers.

Having a business case that stacks up financially is not always enough in itself to convince decision makers to invest time or money in energy efficiency. Energy saving opportunities have often found it hard to compete for funding because historically these investments were in a 'discretionary' category. They have often not been seen as essential for sustaining or growing the business (unlike production machinery, for example), or for regulatory compliance (unlike health and safety equipment).

Energy saving opportunities also tend to be smaller

scale than other projects being dealt with by your board of directors or other senior decision makers, diminishing their perceived importance. This is why it is important to consider how to sell the benefits of your project to key decision makers.

Although implementation of energy saving opportunities identified from ESOS audits is not mandatory from a legal or regulatory perspective, Director-level sign-off of the ESOS compliance report provides energy saving opportunities with a visibility among senior decision makers that they might not otherwise receive.

Common pitfalls to avoid if you want to secure buy-in from decision makers

- Not addressing typical implementation issues when challenged
- Using unexplained jargon or ambiguous terms
- Not addressing key issues of relevance to the board
- Not demonstrating alternative solutions or options were considered
- Not identifying risk factors and mitigation strategies
- Not using the appropriate financial appraisal method preferred by your business
- Giving a rambling or unfocused presentation
- Not making a clear recommendation

In order to make the most of this opportunity, it is important to consider the backgrounds and interests of the decision makers and the likely challenges that may be raised in relation to your project.

You should also consider engaging a wider set of stakeholders. For example you may need 'buy-in' from colleagues. If your idea implies any change for them, they may well resist or even disrupt implementation in subtle ways. Be prepared to make the case to them as well and consider how best to influence and persuade them to support the change.

What are decision makers looking for?

The decision makers whom you are trying to convince will probably be interested in cost reduction, improved environmental performance or enhanced corporate reputation. Your project must therefore offer a compelling financial return and, if possible, worthwhile additional benefits. The decision makers will also have their own personal agendas and objectives. Energy managers experienced in securing business case approvals highlight that they have achieved success by aligning the business case they submit with their company values and goals, as mentioned in [Step 1](#).

Focusing on the project benefits is the most likely way to get decision makers on side

Businesses which have successfully implemented energy saving opportunities often found that demonstrating results through a pilot, evaluating the findings and then rolling out the approach more widely can have a major impact in addressing perceived business risks.

Alternatively, for larger projects, investing in a detailed feasibility study to get a greater level of assurance from independent experts, suppliers and installers that the expected cost and energy savings are achievable in their case is also an approach worth considering.

Implementing a pilot approach reduces risk and helps to collect primary evidence of actual performance, while providing the option to address any issues before the decision to roll the project out across a wider estate.

Identify a senior project sponsor

It can make a big difference if you can enlist the support of someone at an appropriate level who can act as a supporter of your proposal. In a small organisation this might be the owner or board member whom you know to be interested. In a large company it might be a department head or senior management representative.

This person will normally fulfil a number of valuable functions. They will help you to understand the perspective of the decision makers you are trying to influence. They will also have a wider appreciation of related business issues that need to be taken into account.

Most importantly, they can act as an advocate for your recommendations not only on the day the decision is taken, but in the crucial phase beforehand when senior decision makers need to be sounded out, consulted and reassured.

Build a reputation for success

Reputation is a key factor. Putting forward a case for investment or change is always much easier if you can demonstrate that previous projects have been successful. When implementing energy saving opportunities it may be helpful to draw on examples of energy savings your business has previously delivered to help reassure decision makers that energy efficiency projects are worthwhile investing in.

How to write your proposal

Providing a well thought through executive summary will help engage key decision makers from the outset. The body of the proposal must be written in a clear and logical style. If, as is likely, the project is technical in nature it will be very helpful to include a lay person's explanation of the technology in question before going on to say how you propose to apply it.

Ideally, you should give just **one clear recommendation** that the senior decision makers can endorse. There may be alternatives - in which case it is a good idea to show that you have considered them.

When drafting the proposal:

- Be concise
- Have a clear proposal culminating in a single recommendation or request
- Present a summary of the case you want to make
- Have the appropriate analysis of the costs, benefits, risks and implementation timetable to hand should there be questions or further detail required
- Avoid jargon and explain any abbreviations
- Use images and charts to help communicate where possible

It may be worthwhile asking your senior sponsor for examples of past proposals that they would regard as exemplary.

Implementing no-cost and low-cost opportunities is typically the first priority for companies and can help to achieve “quick wins” that return immediate savings and stimulate interest for further energy savings.

Step 3

Implement the project

The advice and ideas in this guide will help any business become more energy efficient, but it will be especially helpful if:

Implementation approach

Implementing no- and low-cost recommendations

Implementing no-cost and low-cost opportunities is typically the first priority for companies and can help to achieve “quick wins” that return immediate savings and stimulate interest for further energy savings. It is important to remember that whilst the capital outlay for these projects is low they still require a structured implementation approach to ensure the required aims are successfully achieved.

For example while energy saving opportunities based on implementing more sophisticated control systems may require relatively low investment, implementing them can often be technically challenging and should include a detailed implementation plan as described on the next pages. Other quick wins can be implemented swiftly and don't require much planning, for example optimising the settings of equipment, including shut-down procedures into business as usual, or realising identified opportunities for “good housekeeping”.

“Good housekeeping” approaches encompass straightforward tasks that can help make a big difference quickly. For example ensuring windows are clean and unobstructed will help ensure that your company is making the most of natural daylight.

Behaviour change

Another popular type of no-cost and low-cost recommendation are behaviour change measures, which have long been recognised as ways of reducing an organisation's energy costs. People's behaviour is complex and so is changing it. When it comes to behaviour change, awareness and training programmes, what works well in one organisation may not work at all in another. Fortunately, there are some tried and tested principles that underpin all successful behaviour change programmes. The key principles are listed in **Appendix V** and there is some good guidance on a step-by-step approach to achieving behaviour change in your business available **online**.

Implementing more complex energy saving opportunities

Implementing energy saving opportunities that include installing new or upgraded equipment will require several steps:

- **Develop a detailed project implementation plan**
- **Choose appropriate equipment and suppliers**
- **Find an installer (if necessary)**
- **Secure finance**
- **Undertake the installation works (covered in the Project Implementation Plan section)**

You may have already covered some of these when building the business case. They are discussed in more detail on the following pages.

Develop a detailed project implementation plan

Once you have achieved sign off for your business case, the next step is to create a detailed plan for implementation. The implementation plan can take many forms and vary in its detail depending on the scale and complexity of the project.

The steps your project plan should normally cover are detailed below.

Implementation schedule

- Identify and set milestones for your project to give you an overview of the key tasks to be completed. Depending on the nature and complexity of the project, these would typically include:
 - Specification of equipment and installation works
 - Evaluation of bids/offers from suppliers
 - Delivery of equipment and implementation of works
 - Completion of installation and beginning of operation/monitoring
- Implementing the project successfully will depend on buy-in from a range of stakeholders across the business. Develop an overview of who you need to work with for each milestone and engage them early to:
 - Understand their availability and concerns
 - Understand potential sources for slippage of project timelines and discuss how these could be addressed.
- Develop an implementation schedule that has clearly defined timelines for the individual milestones and steps, and assigns tasks and responsibilities to delivery team members.
- Make sure you achieve alignment across the business by circulating the schedule and responsibilities to key stakeholders.

Key stakeholders in your business may include:

- Property/facilities/office management
- Procurement department
- Finance department
- Equipment operators
- Stakeholders responsible for operations, e.g. store managers in retail, factory managers in manufacturing, etc.

Plan specification, installation and operation

- Work with your facilities/office management team to develop a Health and Safety (H&S) plan for the project, including the main H&S risks and strategies to mitigate them
- When planning the exact specifications of the equipment and works, engage stakeholders such as facilities management, equipment operators and production managers to:
 - Capture their experience of existing systems
 - Get their feedback to ensure all deficiencies and opportunities for improvement have been identified
 - Understand whether installation can be completed in-house or external support is required
 - Identify temporary disruptions to operations communicate these to relevant stakeholders
 - Verify specifications, including performance, service level, and compatibility requirements with engineering team/equipment users/IT department
 - If it's a scalable opportunity, such as a rollout of LED lighting, investigate possibility of trial implementation on smaller scale to prove the business case and verify the possible savings
 - Understand and plan required staff training for operation and maintenance of equipment to ensure equipment is used as intended

Agree procurement approach

The appropriate procurement approach will be determined by the complexity and scale of the project, as well as your business's established procurement processes. See more details on **procurement** below. Decide on an appropriate procurement approach as well as the criteria that you want to apply when choosing your supplier. Make sure you verify this approach with your business's procurement department.

Plan monitoring and verification

At this stage you should also plan on how to monitor and verify predicted savings once implementation of the project is completed. For example you should:

- Specify what performance and energy consumption data you want to collect to understand and evaluate the performance of the project. Make sure the required metering systems and internal processes are set up and running
- Identify any new or updated maintenance requirements the project has created and establish a maintenance schedule reflecting this

A checklist to help you ensure your project implementation plan addresses all important aspects is in **Appendix IV**.

Choosing appropriate equipment, suppliers and installers

Procurement

The nature and scale of the project will determine the most appropriate procurement approach.

Smaller, simpler projects may require you to tender to up to three suppliers to ensure you are getting the most suitable and best value solution from the market.

For **larger, more complex projects** it is recommended that you invest the time to develop a detailed specification or tender document, in line with your organisation's procurement procedures. This specification should then be sent to a selection of, typically, three to five possible providers.

Think through how you plan to assess the tender responses, for example using a standard matrix to compare them. Ask suppliers to provide evidence of how their solution performs against a common set of metrics to make your comparisons more straightforward.

If you do not know exactly what specification you need, you may choose a supplier based on their ability to meet an outline scope, and then agree a full, detailed final specification before signing the contract.

Depending on the scale of your project, you might be able to negotiate a better price with the equipment supplier by aggregating projects across a number of sites and buying equipment in bulk.

Specification document guidance

Below is a suggested list of questions to address in your specification document, to which you may want to add.

Item the specification document should include	Suggested questions to address
A description of the project and its objectives	<ul style="list-style-type: none"> • What does the project change, how does it achieve this change? • What other objectives does the project address beyond energy savings?
A description of the technology and/or service that makes up the solution and description of any works required	<ul style="list-style-type: none"> • What technology is required to deliver this project? (be as specific as possible, and list all pieces of equipment required) • What are the works required for the installation and operation of the equipment?
Required performance characteristics	<ul style="list-style-type: none"> • What level and quality of output do you require? (e.g. lighting levels and colour for lighting solutions)
Any trial requirements	<ul style="list-style-type: none"> • Can equipment be tested on a small scale first to prove performance?
Request for compatibility guarantees – some products might not always work when combined with other equipment (e.g. lighting and controls)	<ul style="list-style-type: none"> • What other equipment do you have in operation that will interact with the new equipment? • Can the supplier guarantee that the new equipment is compatible with these pieces of technology?
Request for case studies, customer references, and testimonials	<ul style="list-style-type: none"> • Does the supplier have experience with similar projects? • Can the supplier provide contact information of clients where they have delivered similar projects?
Service level requirements	<ul style="list-style-type: none"> • How essential to your operations is this piece of equipment? • How quick a response time do you require?
Operating and/or capital costs guidelines	<ul style="list-style-type: none"> • What is the level of cost you expect for equipment?
Timing for delivery, installation and commissioning	<ul style="list-style-type: none"> • What is your planned timeline for implementing the project?
Operational constraints that may need to be considered during installation and commissioning	<ul style="list-style-type: none"> • Access to building; out of hours; do people need to be removed? Do you have to interrupt any parts of your operation, e.g. manufacturing processes?
Any staff training requirements to ensure that once implemented the predicted benefits can be achieved	<ul style="list-style-type: none"> • What level of staff training and support can the supplier provide to ensure the successful implementation of the project?

Ask for relevant additional information from all those invited to bid, to help you make your final choice a fully informed one.

The **Price** for equipment and installation will stand out the most, but there are different aspects of the bid that will affect the **Life-Cycle Cost** and performance of the project to be considered:

- **Energy Performance** – How much energy does it consume? Does it have different operating levels and is it the most efficient at the performance level you require?
- **Warranties** – What level of warranty does the supplier offer and for how long? Is only equipment failure covered or also the performance and efficiency level of the equipment?
- **Presence/Location** – Is the supplier a local business and therefore accessible or does the supplier offer UK coverage through a network of locations?
- **Maintenance requirements** – How often does the equipment have to be maintained? Does it require maintenance by external experts or can it be maintained in-house? How easily are spare parts available?
- **After-sales support** – Is there a helpline or technical advisors who will be on hand to answer any post installation queries or questions?
- **Reputation/Brand** – Does the brand of technology provided have a good reputation? Does a quick internet search of the brand and equipment return any feedback on the equipment, are there any reviews?
- **Operational performance** – Does it provide the output you require? Is it sized appropriately or can the performance be adjusted?
- **Lead time** – When would the supplier be able to deliver and/or install the equipment? Does that fit with your project plan and operational requirements?

Validating suppliers and installers

To ensure that you select credible technology and equipment suppliers look for evidence of quality memberships, standards and awards, for example:

- **Memberships**
Memberships in professional bodies and industry associations typically include requirements for relevant qualifications and quality assurance processes respectively. This makes them a good first indicator for the quality of the supplier/installer. Relevant institutions for different technologies are listed in the **Further Support and Guidance** section.
- **Standards and Schemes**
Certification against a quality management standard, most prominently the ISO 9001 standard, is a good sign of the supplier's reliability. Furthermore, inclusion of the supplier, or the equipment they provide, into schemes such as the **Energy Technology List**, or the **Green Business Directory**, demonstrate they have already undergone a robust level of verification.

Most suppliers will also be able to deliver the necessary installation work for the energy saving technologies they provide, or at least recommend a suitable installer.

Some useful sources of quality suppliers are listed below.

Supplier Accreditation Schemes

Such schemes can offer independent validation of a supplier's skills and services, a quality standard to differentiate between suppliers in a crowded and growing market place.

Technology Trade Associations

If you don't already know of a reputable contractor, contacting a recognised trade association for technology advice can be very helpful.

Sector Trade Associations

The trade association representing your sector should have a good practical knowledge of what works in your type of organisation.

The Energy Technology List

A number of the technologies recommended as part of the ESOS report are supported by the Government's Enhanced Capital Allowance Scheme. You can find a list of all the technologies and products supported on the Energy Technology List online.

When looking for testimonials by organisations that have implemented similar projects to yours, these two platforms are good places to consult:

Online forums

There are a range of online forums that you can use to get advice from peers and experts on suppliers and implementation. For instance **2degrees** is a collaboration and marketplace platform where members can raise questions and receive answers from experts and peers.

The Crowd is another collaboration platform which enables organisations to share cost and energy saving details of their energy project and rate supplier companies they have worked with.

Securing finance

Some energy saving recommendations will focus on simple, low- and no-cost actions available to help you reduce your energy spend and consumption, whilst others might require more substantial financial investment. Investing in energy efficient equipment usually makes sound business and environmental sense, but organisations often need assistance to fund the changes.

The stage of the implementation process at which you secure funding will partly depend on where your funding will come from. If the project is financed in-house, you will likely already have funding in place when the business case has been signed off for implementation. For other sources of funding, securing the funds may be part of developing the implementation plan.

Furthermore, the type of funding you source will depend on whether you need access to upfront capital or longer term payments.

Client testimonials

An important step in validating your supplier is to seek testimonials or references from your supplier's customers. Look for a project or equipment similar to that which you are hoping to implement.

Financial considerations will vary between technologies, companies and individual projects, but finance should not be seen as a barrier to implementation – there are many options available for funding:

Government Grants and Support

The first place to start is by identifying whether your project and business qualifies for any government grants, loans or incentives.

Grants can be available for certain industry sectors, job creation, or business activity. One of the main benefits is that most don't have to be repaid and don't show up on your balance sheet. On the downside, the application process can be time-consuming, competition for funds is usually high, you will often need to 'match funds' (i.e. the grant will only part fund the project), and you may subsequently have to show evidence of progress on your project.

Government funded loan schemes are another good source of funding and provide a business with the upfront capital to invest in upgrading their energy inefficient equipment. Whilst the loans do need to be repaid, this is over a period of time, and usually in line with expected savings on your monthly energy bill.

The Government also provide long term incentives to encourage the uptake of renewable technologies. The **Renewable Heat Incentive (RHI)** is aimed at renewable heating solutions, such as biomass, whereas the **Feed-in Tariff (FiTs)** scheme supports investments into renewable energy technologies such as solar PV and wind energy.

For the latest information on available grant schemes, contact the following helplines

If in England or Wales	Energy Saving Advice Service	0300 123 1234
	Resource Efficient Wales	0300 123 2020
	Business Wales	03000 6 03000
If in Scotland	Resource Efficient Scotland Advice & Support Service	0808 808 2268
	If in Northern Ireland	Bryson Energy

If you are looking for longer term payments, consider:

Enhanced Capital Allowances (ECAs)

To help businesses identify and purchase energy efficient products, DECC provides the **Energy Technology List (ETL)** which works in tandem with the Enhanced Capital Allowance Scheme for Energy Saving technologies (ECA).

The ETL database lists over 16,000 energy efficient products from nearly 60 technologies including boilers, electric motors, lighting, refrigeration systems, air conditioning systems, and automatic monitoring and targeting equipment.

ETL qualifying criteria can be used as procurement specifications by businesses to better define product performance characteristics prior to and

during discussions with suppliers. ECAs provide businesses with enhanced tax relief for investments in equipment that meet published energy saving criteria. They provide a first year 100% accelerated capital allowance, which enables businesses to set aside the total cost of the asset against taxable profits (or losses) in the year of purchase.

Green Investment Bank

The **Green Investment Bank (GIB)** is an institution investing public money into energy efficiency and renewable energy projects and may be suitable for larger investment projects.

Typically the projects the GIB invests in are:

- Building retrofits (e.g. lighting, insulation, glazing)
- Onsite generation (e.g. CHP, renewable heat, heat pumps)

- Industrial process (e.g. motors, pumps, kilns)
- Infrastructure (e.g. street lighting, heat networks, transport, smart meters)

The bank often partners with established finance institutions to provide energy efficiency loans, e.g. Société Générale (see below).

Talk to your Supplier

Suppliers or installers quoting for the work may be able to signpost to you available funding sources for the project, or could even operate their own finance schemes, which should be considered alongside other available commercial finance schemes.

Commercial Finance Schemes

A wide range of commercial financing schemes are available to businesses where the lender will balance risk with reward (i.e. the higher the level of risk the higher the interest rate). Such schemes can often pay for themselves, as new, more efficient equipment should lower energy bills and the savings made should enable regular finance repayments to be met (and often exceeded).

The benefits of finance schemes typically include: convenience, speed to implement, affordability, flexibility, and structured payment plans to facilitate budgeting and cash flow.

High Street Banks

Dedicated loans for energy efficiency can cover the upfront costs of installation, and savings can often exceed repayments, creating a positive cash flow. Investigate with your banking partner whether they have any options available. Examples include:

Société Générale

Société Générale Equipment Finance (SGEF) has partnered with the Green Investment Bank to provide £50m of finance for energy efficiency projects.

RBS

The Royal Bank of Scotland offers renewable energy and energy efficiency advice and tailored loans to its business customers.

Siemens Energy Efficiency Finance

Funding is available for UK businesses to invest in cost effective energy efficiency equipment and other low carbon technologies, such as new efficient lighting and biomass heating. Finance is available from £1,000 with no upper limit, and is available to all kinds of businesses and organisations operating in the UK, including sole traders, partnerships and charities. This scheme is operated in partnership with the Carbon Trust.

Buying Groups

Explore if any informal or formal buying groups have been set up locally, or if you can join a sector or supply chain initiative. A good place to start finding a local buying group will be your Local Authority and sector associations relevant to your business. The collaboration platform **2degrees** has also worked with larger corporates to support the smaller companies among their suppliers to come together and buy equipment at a preferential rate, as well as to share experience and approaches in order to reduce risk.

ESCOs & Energy Performance Contracts

Energy Service Companies (ESCOs) offer companies an integrated energy management and implementation service where the fee for the service is structured to be less than the energy savings achieved reducing risk. This is still an emerging area in UK. There are several industry initiatives that are aimed facilitating investments into energy efficiency projects, for example the **Investor Confidence Project**.

Monitor the performance of implemented opportunities to identify, report and fix any problems, and track overall performance against objectives.

Step 4

Monitor and verify

Monitoring the performance of the implemented opportunity will allow you to identify, report and fix any problems early, and track overall performance against objectives. Verifying savings will also help you overcome any scepticism from senior decision makers, concerning the ability of your project to deliver the promised savings.

Benefits of metering, monitoring & targeting

As part of the ESOS or energy audit process, you might have found it hard to compile the relevant energy data, or you may have received recommendations to improved metering and data collection. The practice of collecting and analysing data can help you identify areas of high or unusual consumption, and allows you to measure and monitor the results of implementation and communicate achievements to all involved.

Metering, monitoring and targeting allows you to:

- **Detect avoidable energy use** that might otherwise remain hidden. This use could be a result of poor control, unexpected equipment faults or human error, and which can usually be put right quickly and cheaply (or, indeed, at no cost). Intercepting and rectifying such problems should more than cover the cost of conducting monitoring.
- **Quantify the savings achieved** through new equipment. This is essential to ascertain whether or not the technology is delivering the expected savings and performing correctly. Any problems can be detected, reported and fixed early, and this can also help highlight any examples of inefficient behaviour and operation. Many users cite this as the most valuable result of monitoring procedures.
- **Identify lines of investigation** for energy surveys, such as those necessary for future rounds of ESOS compliance. Rather than starting a survey with no clear agenda, you can go prepared with specific questions to ask, prompted by observed erratic or unexpected patterns of consumption.
- **Provide feedback** for staff awareness, improve **budget setting** and undertake benchmarking.

Creating an in-house case study of a successfully implemented energy saving opportunity should greatly facilitate the take up of further opportunities.

Metering, monitoring & targeting within an energy management strategy

Companies with a mature approach to energy management have invested time and effort into implementing good energy management processes which includes appropriate metering, data collection and reporting processes.

When considering your metering, monitoring and targeting strategy it is worthwhile thinking through your longer term energy management goals as this will help you to decide your approach. In its simplest form it is important to capture spend and consumption data for all energy supplies that your business uses on a monthly basis. You should capture this information in an electronic format so that it can be analysed and store this information centrally so that it can be accessed by those who need it.

For medium sized companies developing a metering plan may be more appropriate and for large companies' installation of sub-metering may be required to provide a detailed view of energy use.

For those companies with large volumes of data, consider whether it is appropriate to use an energy bureau service or a software platform to store your data. These options provide an easy way to track and report on usage, understand consumption patterns and spot emerging trends.

It is essential to ensure that variations in input data are not caused by faulty measuring equipment or sensors. Meters and sensors should be regularly maintained and calibrated.

Using metering, monitoring and targeting to verify your project

The most suitable approach to metering and monitoring for your project will depend on its scale, the required effort and level of investment. The most basic form of monitoring is comparing your overall energy consumption from a 'baseline' period previous to the implementation of the project. Ideally this baseline period will cover twelve consecutive months of consumption to account for any variation in consumption over the course of a year.

Understanding and verifying the performance of your equipment will require some level of sub-metering. There are different ways to sub-meter different sources of energy consumption (these are also discussed in more detail in the [Metering Technology](#) guide referenced below).

Direct metering is the most accurate option. However it is also relatively costly and it may not be cost-effective or practical to directly meter the performance of your project. You should weigh the cost of the meter and the required resource to run and monitor it against the impact the equipment has on energy use. An affordable option for direct sub-metering that also allows for the reuse of the metering equipment are temporary and portable metering solutions which are available in the form of clip-on meters and other non-invasive options.

For equipment that operates at a constant known load, e.g. a motor or a fan, **'hours-run' metering** can be used. This type of meter records the time that the equipment operates which can then be multiplied by the known load (in kW) and the load factor to estimate the actual consumption (in kWh).

Where sub-metering with equipment is not a cost-effective option, it may be possible to use **estimates of energy consumption** by assessing the average load of the equipment by its operating hours. You can find an explanation of common estimation techniques in the Environment Agency's **guidance for participants in the CRC Energy Efficiency Scheme**. However the value of estimates for verification is much lower as they are likely to use the same information that you have used to estimate your savings in the first place.

When monitoring your energy consumption you should be aware of factors other than the impact of the project which can affect the consumption. Common factors that influence the duration or intensity of equipment use and thus energy consumption in buildings and processes are:

- Outside temperature and/or humidity
- Hours of darkness
- Operating hours of site
- Production quantity

Where you suspect that these factors may have had a significant impact on the monitored consumption, you should conduct an analysis to correct for them. Guidance on how to conduct this analysis is provided in the guide referenced below.

Externally verifying performance

Verifying project performance is usually an internal matter, but for some larger projects where it is important to be able to substantiate saving figures and claims, it may be worth considering external verification. This is where an independent third party will review the project and confirm that the expected savings have been achieved. This verification will be provided in the form of a letter which can be used to substantiate claims if required, which may typically be made in case study videos and other promotional materials.

Further support and guidance:

Background

The Confederation of British Industry's recent guide to energy efficiency for businesses is a comprehensive introductory read on the value of energy efficiency for businesses and approaches to implement them.

Confederation of British Industry (CBI) - 'Shining a light - Uncovering the business energy efficiency opportunity' <http://news.cbi.org.uk/business-issues/energy-and-climate-change/publications/shining-a-light/>

The CIBSE Guide F: Energy Efficiency in Buildings provides comprehensive guidance on energy efficiency in buildings. <http://www.cibse.org/knowledge/cibse-guide/cibse-guide-f-energy-efficiency-in-buildings>

The Carbon Trust's energy management guide is a useful introductory read into the concepts and benefits of energy management.

Energy Management – <http://www.carbontrust.com/resources/guides/energy-efficiency/energy-management>

Background reading on the ESOS scheme and its requirements can be found at: <https://www.gov.uk/guidance/energy-savings-opportunity-scheme-esos>

Standards

The ISO 50001 standard is the most recognised standard for organisational energy management systems around the world. An accreditation can help you verify that your energy management is best practice as well as help you towards future ESOS compliance.

<http://www.iso.org/iso/home/standards/management-standards/iso50001.htm>

CIBSE has a wealth of publications and benchmarking tools accessed from its knowledge site. A useful source for benchmarking of energy consumption against industry standards is the TM 46 Energy Benchmarks guide. <http://www.cibse.org/knowledge/cibse-tm/tm46-energy-benchmarks>

A further useful source for building benchmarks is Carbon Buzz, which provides 'real-world' building energy performance data. <http://www.carbonbuzz.org/>

There are a number of technology specific standards against which the specific equipment you procure should be assessed:

Lighting – **BS EN 13032-1:2004**

Air Conditioning, Chillers & Heat Pumps – **BS EN 14825:2013** & **BS EN 14511:2013** & **BS EN 1397:2015**

Heating Boilers, including Biomass Boilers – **BS EN 303-5:2012**

Room heaters – **BS EN 13240:2001**

Compressed Air Equipment – **BS ISO 7183:2007**

Motors – **BS EN 60034-1:2004**

More detailed guidance on performance criteria standards for different technologies can be found in the Energy Technology Criteria List.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/450932/ENERGY_TECHNOLOGY_CRITERIA_LIST_July_2015_-_signed.pdf

Building the business case & convincing decision makers to act

The Carbon Trust's 'Making the business case...' guide is a step by step guide on building compelling business cases for carbon reduction and energy efficiency saving projects and elaborates on several of the themes touched upon in this guidance document.

Carbon Trust: Making the business case for a carbon reduction project – <http://www.carbontrust.com/resources/guides/carbon-footprinting-and-reporting/making-the-business-case-for-a-carbon-reduction-project-download/>

The Department of Energy & Climate Change publishes annual projections for future energy prices which will be useful when calculating the expected future savings of an energy saving opportunity.

DECC Projections for Future Energy Prices – https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/399175/Annex_M__corrected_23-Dec-2014_.xls

Implementing energy saving opportunities

A great way of learning more about how to implement energy saving is taking lessons from people that have experience in overcoming the most common challenges.

2degrees provides an online collaboration platform and community where best practice and lessons from implementing sustainability and energy efficiency projects are shared.

2degrees – <https://www.2degreesnetwork.com/>

Global Action Plan is an independent charity specialising in environmental behaviour change.

Global Action Plan – <http://www.globalactionplan.org.uk/page/categorytabs/sectors#business>

The National Energy Foundation has a great collection of information around different energy saving technologies.

National Energy Foundation – <http://www.nef.org.uk/knowledge-hub-landing#climate-change-energy>

The Crowd is a platform for the knowledge exchange on sustainability issues by the business community.

The Crowd – <http://www.thecrowd.me/>

Implementing no- and low-cost opportunities

The Carbon Trust's 'Creating an awareness campaign' is a step-by-step guide for the implementation of behaviour change programmes in your organisation.

Carbon Trust: Creating an awareness campaign – <http://www.carbontrust.com/resources/guides/energy-efficiency/creating-an-awareness-campaign-download/>

Selecting equipment suppliers and installers

The links to professional/industry associations and wider accreditation schemes below are a good first step towards identifying reliable suppliers and installers for specific technologies. Most suppliers will also be able to install the technology they sell, or at the least recommend an installer. Even if you approach suppliers through the schemes and associations listed below, make sure you go through the due diligence processes described in **Step 3**.

Lighting

Lighting Industry Association – <http://www.thelia.org.uk/>

Heating, Ventilation & Air Conditioning (HVAC)

HEVAC – <http://www.feta.co.uk/associations/hevac>

Industrial and Commercial Energy Association (ICOM) – <http://icom.org.uk/>

Controls and Variable Speed Drives (VSDs)

GAMBICA – Trade Association for Instrumentation, Control, Automation and Laboratory Technology - <http://www.gambica.org.uk/>

The Buildings Controls Industry Association (BCIA) – <http://www.feta.co.uk/associations/bcia>

Compressed Air

British Compressed Air Society (BCAS) – <http://www.bcas.org.uk/>

Pumps

British Pump Manufacturers Association – <http://www.bpma.org.uk>

Refrigeration & Heat Pumps

British Refrigeration Association (BRA) – <http://www.feta.co.uk/associations/bra>

Heat Pump Association (HPA) – <http://www.heatpumps.org.uk/>

Institute of Refrigeration (IOR) – <http://www.ior.org.uk/>

Motors

BEAMA – <http://www.beama.org.uk/>

Insulation

National Insulation Association (NIA) – <http://www.nia-uk.org/consumer/>

Thermal Insulation Manufacturers and Suppliers Association (TIMSA) – <http://www.timsa.org.uk/>

Solar Energy

Renewable Energy Association – <http://www.r-e-a.net/>

Solar Trade Association – <http://www.solar-trade.org.uk/>

Decentralised Energy

Association for Decentralised Energy – <http://www.theade.co.uk>

Wind Energy

RenewableUK – <http://www.renewableuk.com/>

Biomass Energy

Renewable Energy Association – <http://www.r-e-a.net/>

Wood Heat Association – <http://www.woodheatassociation.org.uk/>

Industrial and Commercial Energy Association (ICOM) – <http://icom.org.uk/>

Energy Management Services

Building & Engineering Services Association – <http://www.b-es.org/>

Energy Services & Technology Association – <http://www.esta.org.uk/>

Wider Accreditation Scheme

Green Business Directory – <http://www.carbontrust.com/resources/green-business-directory/>

Energy Saving Trust – <http://www.energysavingtrust.org.uk/businesses/product-performance>

For smaller installation jobs, these schemes also provide a list of qualified installers:

Check a trade – <http://www.checktrade.com/>

Electrical contractors association – <http://www.eca.co.uk/>

Gas safe register – <http://www.gassaferegister.co.uk/>

Green deal installer – <http://gdorb.decc.gov.uk/find-a-green-deal-supplier/advanced>

HETAS – <http://www.hetas.co.uk/find-installer/>

Microgeneration certification scheme – http://www.microgenerationcertification.org/index.php?option=com_content&view=article&id=44&Itemid=154

Finance solutions

There is a range of different finance solutions available, many specifically tailored for energy efficiency projects.

The Energy Technology List gives you an overview of all the technologies that are eligible for the Enhanced Capital Allowance scheme. Suppliers of these technologies will be able to advise you on the required steps to take advantage of the scheme.

Enhanced Capital Allowance/Energy Technology List – <https://www.gov.uk/guidance/energy-technology-list>

The Feed-in Tariff (FiT) and Renewable Heat Incentive (RHI) schemes are government subsidy schemes for solar, wind and biomass projects. In addition to the links below, suppliers of these technologies will be able to provide you additional information on how to make the most of these funds.

Feed-in Tariff – <https://www.gov.uk/feed-in-tariffs/overview>

Renewable Heat Incentive – <https://www.gov.uk/domestic-renewable-heat-incentive>

Green Investment Bank – <http://www.greeninvestmentbank.com/>

The Royal Bank of Scotland provides loan funding for energy efficiency measures.

RBS Energy Efficiency Support – <https://www.mygov.scot/rbs-energy-efficiency-support/>

The Siemens Energy Efficiency Finance scheme offers financing for energy efficiency projects in the forms of leases, loans and hire purchase, designed to be offset by energy cost savings.

Siemens Energy Efficiency Finance – http://finance.siemens.com/financialservices/uk/products_solutions/equipment-finance-leasing/energy-efficiency-financing/pages/index.aspx

Monitoring & Metering

The Carbon Trust's Monitoring & Targeting Guide is an introduction to the technologies, analysis methods and tools that can be used to meter, monitor & target a business energy consumption.

Carbon Trust Monitoring & Targeting Guide – <http://www.carbontrust.com/resources/guides/energy-efficiency/monitoring-and-targeting/>

CIBSE's TM39 Building Energy Metering guide provides best practice in the design of energy metering and submetering in non-domestic buildings.

<http://www.cibse.org/knowledge/cibse-tm/tm39-building-energy-metering>

The Carbon Trust's Metering Technology Overview provides a deeper explanation of different metering technologies and techniques.

Carbon Trust Metering Technology Overview – http://www.carbontrust.com/media/31679/ctv027_metering_technology_overview.pdf

OFGEM, the UK's electricity market regulator, provides accessible guidance on the basics of metering on their website.

OFGEM – <https://www.ofgem.gov.uk/gas/retail-market/metering>

Verification

The Energy Efficiency Verification Service (EVS) is a centre of expertise in Measurement & Verification (M&V) which evaluates energy efficiency retrofit projects, providing certainty in outcomes and improving investor confidence.

Energy Efficiency Verification Service – <http://www.eevs.co.uk/>

Training

The bodies and professional associations listed below all offer training for energy efficiency professionals.

BRE – <https://www.bre.co.uk/academy/e-learning>

City & Guilds – <http://www.cityandguilds.com/qualifications-and-apprenticeships/built-environment-services#fil=uk>

Institute of Environmental Management & Assessment – <http://www.iemasts.com/training-courses/certified-courses.html>

The Energy Institute – <https://www.energyinst.org/training/energy-management-courses>

Chartered Institution of Building Services Engineers (CIBSE) – <http://www.cibse.org/>

The Energy Managers Association – <http://www.theema.org.uk/>

Lead Assessor Registers – <https://www.gov.uk/guidance/energy-savings-opportunity-scheme-esos#approved-registers-of-lead-assessors>

BSRIA runs a technical advice line for building energy efficiency and provides energy efficiency training courses.

BSRIA Advice Line – <https://www.bsria.co.uk/information-membership/information-centre/ask-an-expert/>

BSRIA Training Courses – <https://www.bsria.co.uk/information-membership/events/>

Glossary of terms

Benchmarking – measure and evaluate something by comparison with a standard.

Capital – This is distinct from ‘revenue’ expenditure representing wages, fuel, materials, maintenance and other ongoing annual costs. In some organisations, it may be institutionally difficult to recognise and account for revenue savings arising from capital expenditure.

Commissioning – Process by which equipment, a facility, or plant (which is installed, or is complete or near completion) is tested to verify if it functions according to its design objectives or specifications.

Discounted Cash Flow (DCF) – The **discounted cash flow (DCF)** is an assessment of an investment’s balance of financial gains and losses, i.e. how much money it makes minus how much money it costs, that takes into account how much stronger you value money in the near future over money in the farther future. How strongly future gains and losses are discounted compared to today’s gains and losses is determined by the discount factor, i.e. the rate by which value is decreased every year. Many organisations will probably have a policy about what discount rate to use in assessments, often related to the interest they pay on loans.

Enhanced Capital Allowance (ECA) – The ECA Scheme for energy saving technologies allows businesses to benefit from tax breaks when investing in eligible energy-saving equipment.

Energy Cost Projections – There is a strong argument for including the increasing price of energy into your financial business case. This will effectively increase savings over the lifetime of the project. You should also include energy price projections to demonstrate the increasing ‘cost of inaction’ over time. Projections for energy prices can be found on the DECC website.

Energy Technology List (ETL) – The ETL is a government-managed list of energy-efficient plant and machinery. It is part of the Enhanced Capital Allowance (ECA) tax scheme for businesses.

Feed-in Tariffs – The Feed-in Tariffs (FITs) scheme encourages the deployment of small-scale (less than 5MW) low carbon electricity generation. Those with a qualifying technology receive a guaranteed payment for the electricity they generate and use, as well as a guaranteed payment for unused surplus electricity they export back to the grid.

Internal Rate of Return (IRR) – The **Internal Rate of Return (IRR)** is a financial appraisal metric that is derived from a Discounted Cash Flow of a project. It is closely related to the net present value (NPV) in that it presents the discount rate at which a project just fails to give a positive return (i.e. yielding an NPV of zero). The IRR indicates how well a project pays back an initial investment, taking into account the value of money over time.

Life-cycle cost (LCC) – **Life-cycle costing (LCC)** is an approach to evaluate investments that takes into account costs incurred over their entire life. Take the costs of a car: while the initial price to buy a car will be an important part of its lifetime costs, understanding the full picture means also taking into account how much you will have to pay for fuel, maintenance, and insurance every year until the end of its lifetime. Adding all these costs up gives you the life-cycle costs of the car.



MM&T: Metering, Monitoring and Targeting – the process by which energy data is collected, analysed and used to inform a consumption management strategy.

Net Present Value (NPV) – The **net present value (NPV)** is an approach to assess an investment's value over its lifetime, while taking into account the value of money over time. Calculating the NPV is closely linked to the concept of discounted cash flow (see above) In order to calculate the NPV, you add up the discounted cash flow over an investment's lifetime. The NPV will depend on: a) the initial cost of investment, b) the annual returns of the investment, i.e. how much money it makes minus how much money it costs, the c) the lifetime over which it brings you these returns, and d) the discount rate, i.e. how strongly you value money in the near future over money in the far future.

Renewable Heat Incentive (RHI) – The Renewable Heat Incentive (RHI) is the world's first long-term financial support programme for renewable heat. The RHI scheme provides payment to those who generate and use renewable energy to heat their buildings, such as heat from biomass boilers, heat pumps and solar thermal panels.

Simple Payback Period (SPP) – The 'simple payback period' (SPP) of a project helps you understand over what time a project pays back the initial investment. You calculate it by dividing the project's cost by the annual return, e.g. energy cost savings.

Taxation – Writing down the investment into a project can help the business case. As with many tax issues, this can get quite complex quite quickly, so you should request guidance from your finance department if you wish to include this into your assessment.

TWh – Terawatt-hour - a measure of electrical energy, 10^{12} watt-hours.

Appendix I

Business case checklist

MENU

Background preparations	✓
Senior management 'mentor' identified and engaged in the process	
Energy price forecast in place	
Potential further projects identified in outline	
Project evaluation	
Project costs evaluated; supporting documentation available	
Requirements for other project resources evaluated (e.g. staff time)	
Cost, energy and carbon savings calculated	
Project life estimated	
Sources of funding identified	
Project timetable worked out (with due regard to funding cycles)	
Internal rate of return and net present value calculated	
Risk analyses carried out	
Other interested parties (e.g. workforce) consulted	
Precedents, case histories and references for the technology available	
Residual value of replaced equipment	
Additional non-financial benefits identified	
Linked benefits of project to the strategic objectives of your business	
Preparation for drafting and presentation	
Confirmed which set of decision makers will hear the proposal	
Examples of previous successful business case proposals seen	
Confirmed who will present the proposal	
Confirmed time available for presenting proposal	
Photographs and other visual aids assembled	

Appendix II

Business case proposal structure

Executive summary

- Statement of opportunity or problem
- Proposed action (with clear recommendation)
- How proposal fits with corporate objectives
- Internal rate of return
- Non-financial advantages/disadvantages
- Risks and mitigation strategies

This should be as brief as possible. Detail can be provided in the main body and appendices.

Background

- Links to organisation's energy or environmental policy
- Annual energy spend and carbon emissions
- Proposer's credentials
- Summary of relevant previous successful projects

Provides business context for the proposal, so would be similar regardless of specific project being proposed.

Introduction to proposed project

- Problem or opportunity that has been identified
- If needed, a layman's introduction to the technology
- Outline description of the proposed solution, including where it is to be implemented

The narrative now becomes project-specific.

Options considered

- Solutions considered but rejected, with explanations
- Recommended option, with reasons for giving it preference

Detailed arguments and calculations are best put in appendices.

Appendix III

Financial appraisal methodologies

MENU

Simple payback

Project X	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Cost of project	-£10,000						-£10,000
Savings		£5,000	£5,000	£5,000			£15,000
Cash flow	-£10,000	£5,000	£5,000	£5,000	£0	£0	£5,000
Project Y	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Cost of project	-£10,000						-£10,000
Savings		£4,500	£4,500	£4,500	£4,500	£4,500	£22,500
Cash flow	-£10,000	£4,500	£4,500	£4,500	£4,500	£4,500	£12,500

Table II- Worked Example for SPP

The method of evaluating and expressing the cost effectiveness of projects most familiar to most businesses is the 'simple payback period' (SPP). Dividing the project's cost by the annual savings tells us how long it will take until the project has paid back the initial investment. Table II provides two scenarios to help us understand the subtle difficulties of choosing between projects. Project X will save £5,000 a year for three years, while Project Y saves only £4,500 but will last five years. Both projects cost £10,000 to implement. We can see here, that Project X has an SPP of $10,000/5,000 = 2.0$ years, while Project Y achieves an SPP of $10,000/4,500 = 2.2$ years.

On those grounds, Project X seems preferable. Yet the net return from Project Y is £12,500 over its lifetime compared with only £5,000 for Project X, making Project Y preferable. Clearly we need to dig deeper than simple payback to understand what the best investment is.

While SPP provides us with a quick and easy way for evaluating investments, it faces two major drawbacks. For one, it does not adequately take into account the lifetime of a project, i.e. two projects that have the same investment costs and annual returns will look equally attractive based on their SPP, although one may give you returns for three years and the other for ten years. Another of the drawbacks of simple payback is that it tells us nothing about the absolute value of the proposal: replacing a filament lamp with a compact fluorescent would give a stunningly short SPP, but will only have a negligible impact on your organisation's energy bill.

Life-Cycle Costing

Life-Cycle Costing is a method that will help you to fully understand how much equipment will cost, over its whole life. The energy cost of running most equipment is many times higher than the original purchase price. This can justify a higher purchase cost for more efficient equipment. Some other examples can be even more important, the capital cost of an electric motor may be as little as 1% of its lifetime cost. Another everyday example where life-cycle costing is increasingly applied is the procurement of cars. Depending on the lifetime and fuel efficiency of a vehicle, fuel costs typically account for 20% of a car's life-cycle costs.

To calculate a life-cycle cost for power using equipment, determine the following:

- The total power demand of the equipment (in kilowatts). The supplier should be able to provide this information.
- The number of hours the equipment will operate each year.
- The unit price of energy (£ per kilowatt-hour). Check energy prices and the current tariff, usually on the energy bill. Consider if future price changes are likely.
- The annual maintenance cost of the equipment (£).
- The number of years for which the equipment will be used.
- The equipment capital cost (£).

The annual cost of operating the equipment is then calculated by multiplying A, B, and C, and adding D, or $(A \times B \times C) + D$. Multiply this figure by the number of years the equipment will be used (E) to provide the total lifetime operating cost. The sum of the total lifetime operating cost and the capital cost (F) is the total life-cycle cost of the equipment.

The life-cycle costs of different options can be compared to determine the most attractive solution – see the worked example in Table I below.

Lighting Solution A	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Cost of project	-£15,000						-£15,000
Energy Costs		-£9,600	-£9,600	-£9,600	-£9,600	-£9,600	-£48,000
Maintenance Costs		-£500	-£500	-£500	-£500	-£500	-£2,500
Total Cost	-£15,000	-£10,100	-£10,100	-£10,100	-£10,100	-£10,100	-£65,500
Lighting Solution B	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Cost of project	-£12,000						-£12,000
Energy Costs		-£12,000	-£12,000	-£12,000	-£12,000	-£12,000	-£60,000
Maintenance Costs		-£500	-£500	-£500	-£500	-£500	-£2,500
Total Cost	-£12,000	-£12,500	-£12,500	-£12,500	-£12,500	-£12,500	-£74,500

Table I – Life-cycle cost worked example

Lighting Solution A has an initial investment cost of £15,000, which is £3,000 more than the investment required for Lighting Solution B at £12,000. Lighting Solution A consumes 400kWh per day, whereas Lighting Solution B consumes 500kWh. During its 5-year life, Lighting Solution has energy costs over £12,000 in excess of those for Lighting Solution A.

The lifetime energy savings achieved by choosing the more efficient option will repay the premium in purchase cost for Lighting Solution A four times over.

The example has clearly demonstrated the benefits of using life-cycle costing over a singular focus on the initial investment.

Discounted Cash Flow analysis

The most widely applied methodology to capture the value of continued savings in the future, and to show how the proposed project compares with other possible investments, are assessments based on discounted cash flow (DCF). DCF calculations sum up all of a project's current and future costs and savings to a single lifetime figure, but take into account the fact that cash flows in the far future have less weight than those in the near future.

Weighing up relative values of cash by when we receive them may seem counterintuitive, but there is good reason to do so, particularly in a business context. Consider the following example:

You can earn an interest of 4% on money you have in the bank. Now suppose that you have the option of being paid one of three cash gifts, paid at separate points in time. Importantly, irrespective of when you receive them, you cannot spend either of them until five years from now. The three options are

- £822 today; or
- £889 in a year's time; or
- £1,000 in five years' time.

Intuitively, you would probably chose the highest number, £1,000. However, the truth is that give or take a few pence, they all give you the same value. Whether you invest £822 for five years or £889 for four years, both yield £1,000 at 4% compound interest, meaning that the payment of £1,000 in five years' time is equivalent to £822 received today. Accountants call the £822 the present value of the £1,000 in question, and the 4% the discount rate. The higher the discount rate, the lower the present value.

Let's look at how we can apply the concept of DCF to comparing projects.

Net present value

Project X	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Cost of project	-£10,000						-£10,000
Savings		£5,000	£5,000	£5,000			£15,000
Simple cash flow	-£10,000	£5,000	£5,000	£5,000	£0	£0	£5,000
Discount factor	1.000	0.909	0.826	0.751	0.683	0.621	
Discounted cash flow	-£10,000	£4,545	£4,132	£3,757	£0	£0	£2,434
Project Y	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Cost of project	-£10,000						-£10,000
Savings		£4,500	£4,500	£4,500	£4,500	£4,500	£22,500
Simple cash flow	-£10,000	£4,500	£4,500	£4,500	£4,500	£4,500	£12,500
Discount factor	1.000	0.909	0.826	0.751	0.683	0.621	
Discounted cash flow	-£10,000	£4,091	£3,719	£3,381	£3,074	£2,794	£7,059

Table III – Discounted cash flow analysis of two projects

An example of using discounted cash flow to evaluate the projects from Table II is illustrated in Table III. Again, Project X will save £5,000 a year for three years, while Project Y saves only £4,500 but will last five years. Again both projects cost £10,000 to implement. Table 2 sets out the costs and savings for each project in each year. The undiscounted cash flow is now referred to as 'simple cash flow' in the table.

We will use a discount rate of 10% in this example. A straightforward way of applying the discount rate to the cash flow is calculating the discount factor for each year and applying it to that year's simple cash flow. Calculating the discount factor requires some basic algebra: the discount factor P for a discount rate r for a year t is calculated with the formula: $P(t) = 1/(1 + r)^t$. There are also convenient tools available online to make your life easier, an example of a discount factor calculator can be found at <http://www.miniwebtool.com/discount-factor-calculator>

The annual discount factors for a discount rate of 10% are set out in Table III. Multiplying the simple cash flow in each year with the discount factor for that year gives us the discounted cash flow in that year. As you can see from the example, the value of the discounted cash flow becomes smaller with every year, although the savings are nominally the same.

Looking at the right-hand columns in Table III you will notice that Project X, which yielded a net return of £5,000 in terms of simple cash flow, yields a net return of £2,434 in terms of discounted cash flow. This is called its net present value (NPV) because it is the sum of all the expenditure and income, discounted to present values. Project Y, meanwhile, has an NPV of £7,059.

This gives us a clear picture of which project to choose. Doing project Y is the equivalent of a cash gift of £7,059, while Project X is only worth £2,434. As both projects have positive NPVs, both would be worth pursuing.

Note that this assessment is highly dependent on the discount rate applied. Your organisation will probably have a policy about what discount rate to use in assessments. High rates make it harder to pass the test, and are sometimes used as insurance against risk.

There are many tools available online to help you calculate the NPV, e.g. at <http://www.calculatorsoup.com/calculators/financial/net-present-value-calculator.php>

Internal rate of return

Project X was viable at a 10% discount rate but if we increase the discount rate, the present value of future savings will decrease faster. The discount rate at which it just fails (yielding an NPV of zero) works out at 23.4%.

This is called its internal rate of return (IRR). There is no analytical method of calculating IRR; traditionally it was done by trial and error or by using graphs. However, spreadsheet programs provide an IRR function which makes life easy. The IRR for Project Y, incidentally, is 34.9%.

The example of Project Y is telling. It has a simple payback period of 2.2 years, and for many organisations it would fail the typical hurdle of one or two-year payback applied to energy projects. But when one realises that it gives a 34.9% internal rate of return, it sounds – and is – much more compelling. What other investment would give a better return?

Appendix IV

Project implementation plan checklist

MENU

Develop Implementation Schedule	✓
Identified key milestones	
Required contributions from stakeholders for each milestone identified	
Potential risks for project slippage identified and addressed where possible	
Delivery team decided and tasks assigned	
Schedule and contributions agreed with key stakeholders	
Plan Specification, Installation and Operation	
Health and Safety plan for project in place	
Consulted stakeholders to capture their experience of existing systems	
Identified all deficiencies and opportunities for improvements	
Established whether installation can be completed in-house or external	
Temporary disruptions to operations identified, cleared and communicated	
Verified specifications, including performance, service level, and compatibility requirements with engineering team/equipment users	
Investigated possibility of trial implementation on smaller scale	
Required staff training planned	
Set Procurement Framework	
Weighed complexity and scale of project to decide procurement approach	
Defined decision criteria for purchasing decision and supplier verification	
Verified approach with business' procurement rules	
Plan Monitoring and Verification	
Data collection scope and approach specified	
Internal process for data collection established	
Maintenance schedule established	
Regular review and reporting of monitoring data put in place	

Appendix V

Principles for successful behaviour change

- **Understand the opportunities, and how they fit with your company and its culture**

Take time to think about how best to approach behaviour change within your organisation and again consider how best to align your approach with your company culture and its people. Identifying and implementing an energy champion structure is often a good way to build buy-in to the need to change agreed behaviours, provides a two way communication channel for the flow of guidance and ideas and helps to establish “bottom up” accountability.
- **Get senior support**

Whether it is an individual or a decision-making group, it is important that you identify the appropriate level of senior endorsement which is going to help support and embed your behaviour change campaign.
- **Set realistic goals**

Ideally, objectives should be stretching enough to be meaningful, but also achievable and well-defined enough to achieve wholehearted buy-in from all parties. Many behaviour change projects have fallen down on the basis of failing to set appropriate goals.
- **Deploy marketing and psychology techniques as appropriate**

The big challenge with behaviour change and training programmes is ensuring lasting change. Social marketing combines psychology, sociology, anthropology and commercial marketing techniques to develop actions which deliver consistent results.
- **Use a values-driven approach**

Our values impact everything we do and programmes should be structured to address participants’ values. Forcing someone to do something outside of their value system will not deliver long term benefits. Work with people’s existing values and build an effective campaign around them.

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