ZERO WASTE SCOTLAND

Energy Efficiency Business Support

How to carry out a successful lighting replacement project

Advice and support for organisations in Scotland

European Union

gov.scot

EUROPE & SCOTLAND
European Regional Development Fund
Investing in a Smart, Sustainable and Inclusive Future

About this guide

If you are thinking of upgrading or replacing your organisation's lighting as a means of reducing your energy consumption, this guide will help you.

While the guide doesn't provide in-depth technical details about lighting, it will help you successfully carry out a lighting replacement project and avoid the common pitfalls that small and medium-sized enterprises (SMEs) face. It will help you manage your project and achieve the expected savings, while maintaining adequate quality of lighting.

This guide should be used once you have built the business case for your lighting project. If you need help assessing your initial lighting upgrade or replacement opportunities, support is available from our team by calling 0808 808 2268. Alternatively, download the free guide 'How to save money and energy on lighting', for help to understand your opportunities.

Step 1

Factors to consider

1.1 Important parameters of lighting

Before you start looking at obtaining quotes for new lighting, there are important parameters of lighting that you should understand as they are likely be mentioned by suppliers.

Lumen

Lumen (lm) is a measure of the visible light emitted by a source, and thus how bright a particular lamp or light source will appear. In simple terms, one lumen is equivalent to the light produced from a single common candle.

Watt

Watt (W) is a measure of the power the light source will consume to produce the lumens stated. The wattage can give you a direct indication of the expected energy consumption of an electric lamp. Please note that additional energy will be consumed by power conditioning equipment situated between the mains supply and lamps. Typically, this adds up to 10% to the wattage quoted on lamps. Suppliers will often refer to this as 'ballast' or 'induction' power and will refer to 'circuit' or 'system' watts to mean the total power demand of the lighting unit.

Luminous efficacy

Luminous efficacy is a measure of the efficiency of a light source and is expressed in lumens per watt (lm/W). Different types of lighting, such as compact fluorescent and light emitting diodes (LED) have quite different efficacies.

Lux

Lux is a measure of illuminance and is equivalent to lumens per square metre (lm/m^2). It expresses the light falling on a surface and is a common design criterion. The Chartered Institution of Building Services Engineers (CIBSE) produces a Code for Interior Lighting which gives lighting requirements for areas (for example, 100 lux for corridors and 500 lux for a hotel kitchen). Illuminance greatly depends on the type of light fitting and the way it spreads the light on a surface. Watts per m^2 per 100 lux is a good measure to compare different proposals as it takes into consideration all of the factors above.

Colour temperature

The colour of the light emitted by a lamp is either described (usually in terms of being cool or warm) or given with a measure in temperature in kelvin (K) – typically ranging from 1,000K to 6,600K. It should be noted that the higher the temperature the colder the colour. For example, noon sunlight is a cool, blue light with a colour temperature of 5,600K and a traditional tungsten light bulb is a warmer light with a colour temperature of 2,800K.

Colour rendering index

The colour rendering index (CRI) is a measure of how accurately a light source renders all frequencies of light, compared to a perfect white light source. CRI is rated on a range from 1 to 100. CRI is very important for sectors such as printing and textiles where a CRI of 90 or above is recommended.

Human perception of light

Human perception and surrounding decor are important factors. For example, 100 lux in a corridor with white walls and floor will be perceived as better lit than the same corridor with dark colours.

1.2 Other factors

There are factors that could cause delays or higher project costs, and it is important to consider and understand them before proceeding with the purchase of new lighting.

- Disruption – is weekend working likely to be required to avoid disrupting staff? If so, installation costs are going to be higher. Can the project be coordinated to avoid this? Will staff have to be relocated during the works? Are electrical shutdowns going to be required?
- Operational environment – are there any operational areas requiring specialised lighting? For example, in food manufacturing and hospitals, are there areas where sealed lighting is needed to ensure high levels of hygiene? Likewise, are there areas where there are tight temperature controls in place that will influence the choice of lighting technology?
- Health and safety – are there any specific health and safety issues that could affect the project cost or length (for example, ceilings that may contain asbestos or restricted access to certain areas).
- Legislation – will the project be required to meet specific legislation such as the Construction (Design and Management) Regulations 2007 (CDM) and will it need to be covered by a building warrant?

Step 2

Defining your requirements

To carry out your lighting replacement project successfully, you need to define your requirements. Typically, the decision to replace lighting is driven by three main factors – improving energy efficiency, upgrading due to inadequate lighting or a change in the lighting requirements for the tasks carried out in a space.

You may want to prepare a request for quotation (RFQ) document for issue. The document doesn't have to be lengthy or complicated, but is a good way of ensuring that potential suppliers meet your requirements. For example, if you have decided that you only want to consider LED type fittings or have preference for a particular manufacturer or supplier, state this in the RFQ.

Example sections in an RFQ may include:

- site address and contact names;
- project start and completion date;
- any site-specific issues, such as restrictions on working at height, highlighting asbestos risks or areas where automatic control of lighting is prohibited;
- any client or project-specific requirements, such as preferred suppliers;
- any breakdown required in the quotes for different areas of your facility – this will make it easier for you to prioritise if the quotes are higher than your available budget;
- any restrictions on when the works can be undertaken, such as only at weekends and nights;
- assumptions the supplier should use when calculating potential energy savings, such as expected run hours and the unit cost of electricity;
- instructions on the disposal of old lamps and fittings; and
- minimum registrations, accreditations and requirements that the provider must meet, such as holding current and adequate insurances; quality, health and safety, and environmental registrations; and membership of a trade association.

You may also want to detail some of the questions outlined in step 5 at this time.

To enable you to make an informed decision, we recommend you request that the projected costs and savings are separated out as follows:

- costs of installing new fittings and the expected cost savings;
- the additional costs and savings from installing intelligent controls, such as motion and daylight sensors;
- maintenance costs, such as costs for replacing lamps; and
- annual cost savings.

If you have very specific requirements or preferences, or the cost of the project is expected to be high, you should consider employing a professional consultant to prepare a detailed lighting design and technical specification to accompany the RFQ. If this is required, the four main professional organisations for lighting professionals (the Chartered Institution of Building Services Engineers, the Energy Institute, the Institution of Engineering and Technology and the Institution of Lighting Professionals) have websites that allow you to search for professionals in your area.

Step 3

Finding potential suppliers and contractors

Now that you have a full set of requirements/RFQ document, you are ready to obtain quotes from potential suppliers. We recommend getting at least three quotes.

Whether you need to find a supplier, contractor or both will depend on the project you are undertaking. You may only need to identity suppliers if you are simply looking to replace lamps in existing fittings. However, if you are rewiring or replacing whole fittings, you may need an electrical contractor. For large projects, you may want to select a preferred supplier of the lamps and fittings, and tender the installation to a number of contractors.

3.1 Referral and word of mouth

If you know someone who has recently undertaken a lighting project, ask if they would recommend the supplier or contractor they used.

Alternatively, the Green Network for Businesses website has information on a range of organisations that have already carried out projects to reduce their energy, water, waste and raw material costs. Through the website, you can learn about these projects and arrange to visit an organisation near to you so you can see and discuss what they did first hand.

3.2 Technology suppliers

The Lighting Industry Association is Europe's largest lighting trade association for retailers and manufacturers of lighting. All members have to sign up to a code of conduct.

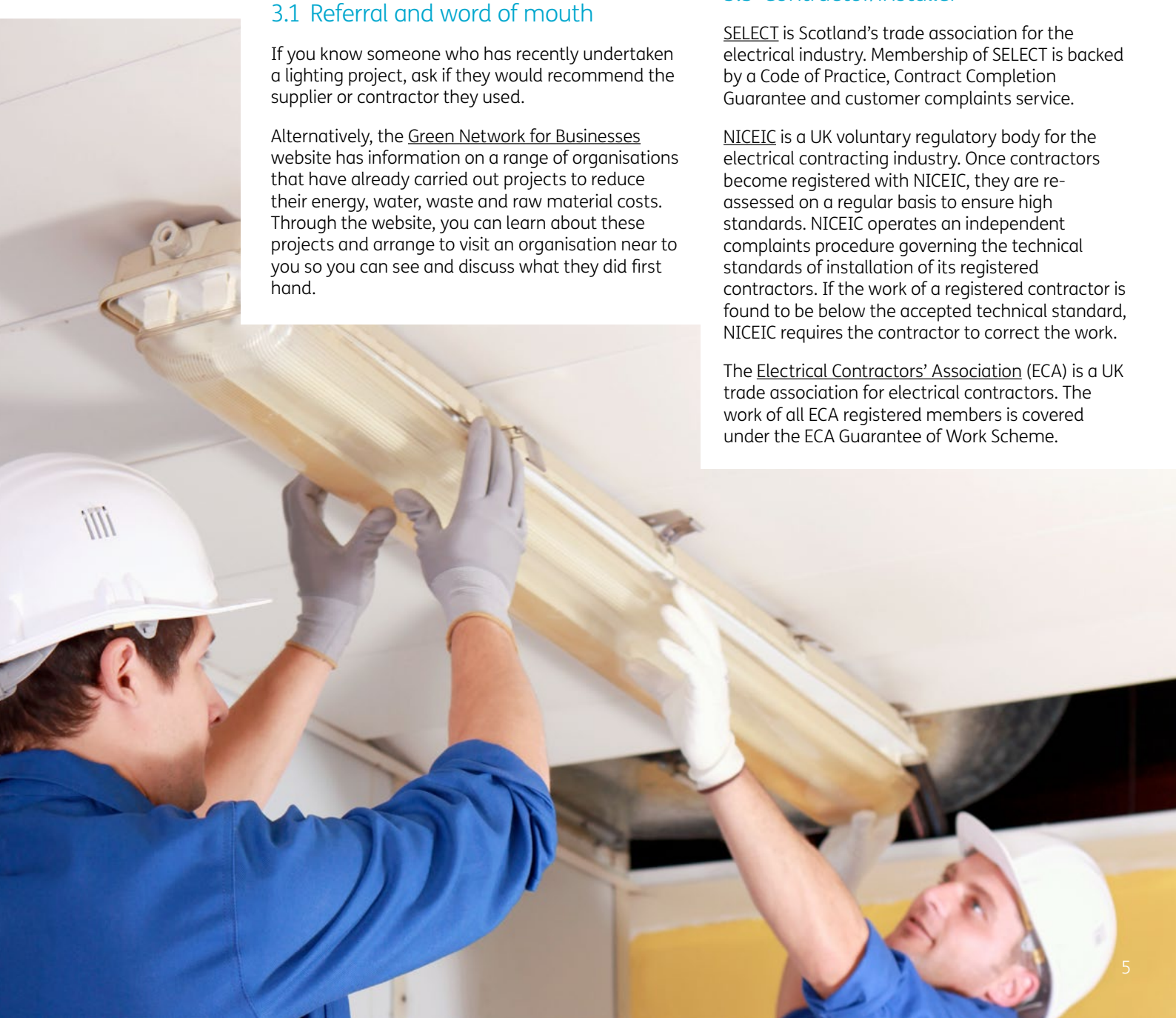
The UK Government's Enhanced Capital Allowance (ECA) Scheme is a key part of the Government's programme to manage climate change. It provides businesses with enhanced tax relief for investments in energy efficient equipment. Any item on the Scheme's Energy Technology List has to meet minimum energy performance criteria.

3.3 Contractor/installer

SELECT is Scotland's trade association for the electrical industry. Membership of SELECT is backed by a Code of Practice, Contract Completion Guarantee and customer complaints service.

NICEIC is a UK voluntary regulatory body for the electrical contracting industry. Once contractors become registered with NICEIC, they are re-assessed on a regular basis to ensure high standards. NICEIC operates an independent complaints procedure governing the technical standards of installation of its registered contractors. If the work of a registered contractor is found to be below the accepted technical standard, NICEIC requires the contractor to correct the work.

The Electrical Contractors' Association (ECA) is a UK trade association for electrical contractors. The work of all ECA registered members is covered under the ECA Guarantee of Work Scheme.



Step 4

Working with suppliers during the bid process

Whether you plan to prepare an RFQ or not, insist that lighting providers visit your premises and allow them access to the required areas. The information they should leave with includes:

- areas to be covered;
- tasks carried out in each area;
- occupied hours and occupancy profile;
- position of existing fixtures;
- types of existing fixtures and lamps;
- existing lighting controls;
- window positions;
- required lux levels; and
- the price you pay for electricity (£/kWh).

Step 5

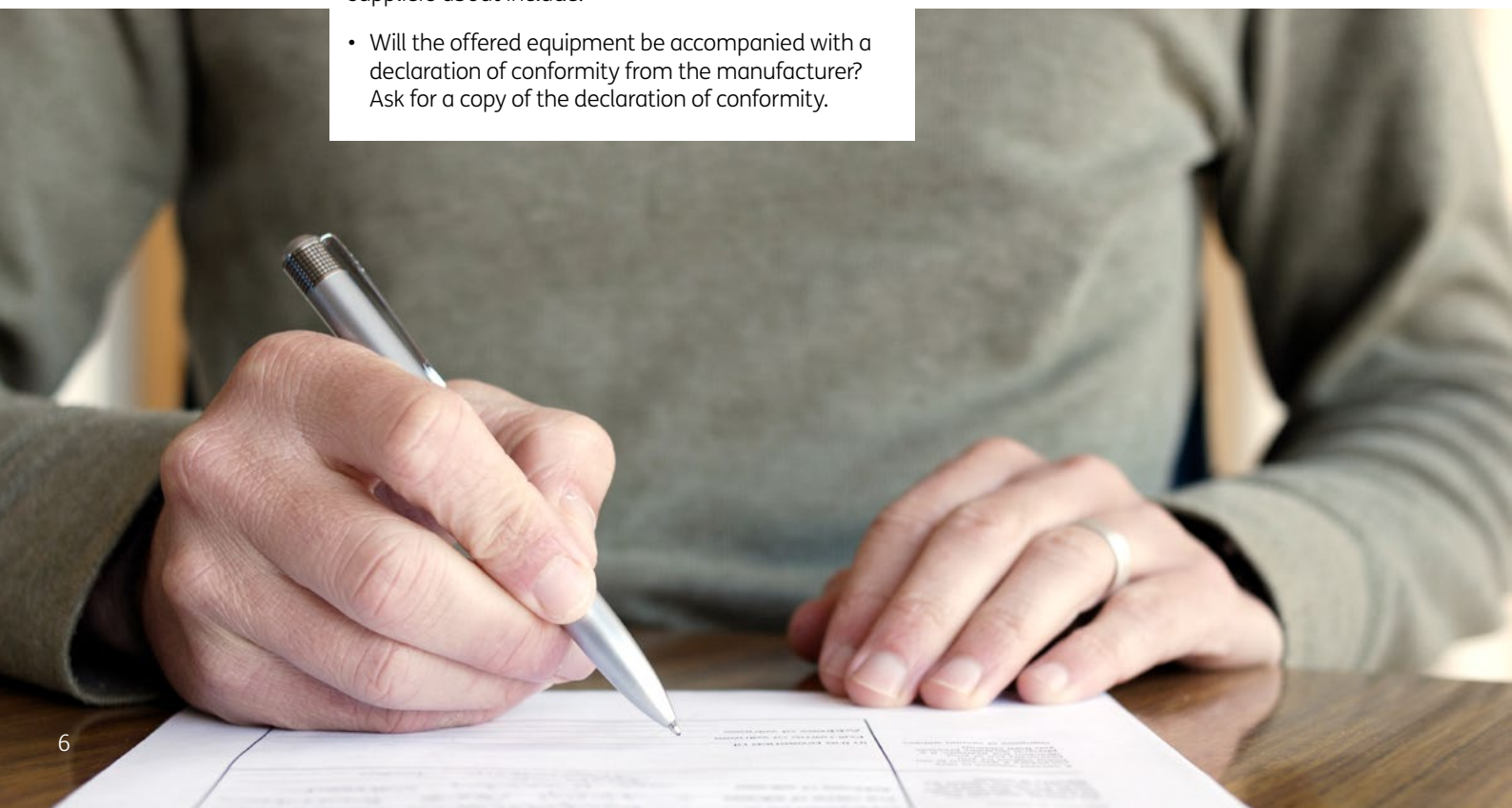
Quotation review checklist

Once you receive your quotations, you should first compare them against the requirements you have set, as discussed in Step 2.

Then, in addition, you may find it useful to ask the lighting providers some of the questions on the next page.

There are specific technical standards that any lighting installation should meet. However, most of these will be met if you have considered the questions on the next page. Although not exhaustive, other requirements for lighting installations that may be worth questioning the suppliers about include:

- Will the offered equipment be accompanied with a declaration of conformity from the manufacturer? Ask for a copy of the declaration of conformity.
- Are the luminaires manufactured in accordance with BS EN 60598-1:2008 Luminaires - General requirements and tests?
- Are they manufactured in accordance with the electromagnetic compatibility standards?
- Are they manufactured in accordance with the Low Voltage Directive?
- Are they compliant with the Restriction on the Use of Certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment (EEE) Directive (where applicable)?



✗/✓	Question	Comment
	Are there any assumptions or exclusions in your quote?	If there are, the final cost could be higher than that quoted.
	Will the new lighting scheme achieve the luminance levels required in CIBSE Guide F?	Lighting may not be sufficient if it is not.
	Is all equipment (lamps, luminaires if required, ballasts or drives) to be fitted with the CE mark?	If not, the lighting may not be legally compliant.
	For any rewiring or luminaire replacement, will the new installation be in accordance with the IET 17th Edition Wiring Regulations?	If not, the lighting may not be legally compliant.
	Has the supplier given you details of the disposal method for any old lamps or light fittings that will be removed?	Lighting equipment must generally be disposed of in accordance with the Waste Electrical and Electronic Equipment (WEEE) Regulations. However, sometimes, materials can be re-used or recycled.
	Do the lamps offered have an Energy Label rating of Class A or B?	Class C or below would not generally be considered energy efficient.
	Has the supplier provided references for previous projects?	Follow up on supplier references.
	Is the new lighting scheme going to change the direction of light spread?	Will this produce dark patches in task areas?
	Will the new lighting scheme achieve at least 45 lumens per circuit watt?	This is the minimum standard for energy efficiency.
	Have the watts per m^2 per 100 lux values for each area been stated?	A benchmark for energy efficiency is less than 2.0W/m^2/100 lux.
	Has the supplier provided a calculation of the energy savings and payback time?	Check if the calculation is based on your site and electricity tariff and not on general assumptions.
	Has the supplier provided you with figures on the estimated life of the lamps?	Without this, it will be difficult to predict maintenance costs.
	Are the proposal and products backed by any warranty or guarantee?	Ensure the products are covered by a UK-based warranty.
	Is the new scheme compatible with the controls (if any) you are currently using at your premises?	If not, request an explanation and clarification.
	Has a breakdown been provided of the extra costs and savings associated with controls upgrades?	It may not be cost-effective to replace lights and install intelligent controls.
	Does the proposed installation meet the ECA Scheme's requirements?	The ECA Scheme provides businesses with enhanced tax relief for investments in equipment that meets published energy-saving criteria.
	Does the new scheme include flexibility for areas with natural light?	A separate switch for the row of lights nearest to windows or auto-dimming fittings in those locations may be appropriate.
	Will the light controls be easily accessed and understood by users?	Good labelling and layout of switching which matches your activity patterns can reduce energy use substantially.
	Where automatic controls are provided, do users have the option to manually override?	A good option for energy reduction is 'manual on, manual or auto off' (that is, either the user or the automatic control can switch the light off).

Step 6 Funding options and further support

If you are unable to cover the investment in a lighting project from your own funds, then contact us for details of the main sources of finance available for such purposes.

We can also provide free technical expertise and support to help you implement your improvement projects.

Further reading

- Energy Efficiency Business Support Service 'How to save money and energy on lighting'
- Lighting Industry Association, the trade association for lighting equipment manufacturers and suppliers in the UK (www.thelia.org.uk)
- The Energy Technology List (https://etl.decc.gov.uk)
- The Society of Light and Lighting 'The SLL Lighting Handbook'
- The Society of Light and Lighting 'The SLL Code for Lighting'
- The Society of Light and Lighting 'Lighting Guide 7: Office Lighting'
- CIBSE 'Guide F: Energy Efficiency in Buildings'
- BS EN 12464-1:2011 'Light and lighting. Lighting of work places. Indoor work places'
- BS EN – 8206-2:2008 'Lighting for buildings. Code of Practice for daylighting'
- BS EN – 13032-1:2004+A1:2012 'Light and lighting. Measurement and presentation of photometric data of lamps and luminaires. Measurement and file format'
- Health and Safety Executive 'Lighting at Work (HSG38)' (www.hse.gov.uk/pubns/books/hsg38.htm)
- Health and Safety Executive 'Memorandum of guidance on the Electricity at Work Regulations, 1989. Guidance on Regulations' (www.hse.gov.uk/pubns/books/hsr25.htm)
- CIBSE 'SLL Code for Lighting (2012)'

Additional advice and support

Zero Waste Scotland's Energy Efficiency Business Support Service helps Scottish businesses to cut their energy costs by an average of 24%. Each year over 34,000 individuals from a range of organisations get in touch with us for impartial advice and free, specialist consultancy support.

Supporting Scottish organisations to be more energy efficient and reduce their carbon footprint will make a significant contribution to addressing the climate emergency and helping achieve the Scottish Government's strategic economic objectives as well as climate change and energy efficiency targets.

Funded by the Scottish Government and the European Regional Development Fund, the service offers free advice and technical support as well as sharing best practices and new technologies.

We're here to help.
Call us on 0808 808 2268
Email: EnergyEfficiency@zerowastescotland.org.uk
Visit: www.energy.zerowastescotland.org.uk

ZERO WASTE SCOTLAND

Energy Efficiency
Business Support

European Union

gov.scot

EUROPE & SCOTLAND
European Regional Development Fund
Investing in a Smart, Sustainable and Inclusive Future