Department of Energy & Climate Change

Energy Savings Opportunity Scheme (ESOS)

Guide to ESOS

Version 1.1

September 2014

Amendments to v1.1 – published September 2014.

Version 1.1 of this document was published in September 2014. This addresses minor typographical errors and makes a technical correction in relation to the definition of 'employees' to make clear that these include any employees of a UK company regardless of their geographical location.

Finalised guidance will be published by the Environment Agency later this year. It is anticipated that this will primarily incorporate any clarifications that arise out of feedback from business.

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Executive Summary

What is ESOS?

The Energy Savings Opportunity Scheme (ESOS) is a mandatory energy assessment and energy saving identification scheme for large undertakings (and their corporate groups). The scheme applies throughout the UK.

If you have any questions not addressed by this guidance or wish to provide feedback on this document, you can contact the Environment Agency ESOS Helpdesk on ESOS@environment-agency.gov.uk.

The Environment Agency will be publishing compliance guidance later in 2014. This will supersede this Guide – in the event of any conflict or ambiguity between this Guide and the compliance guidance, please follow the Environment Agency's compliance guidance.

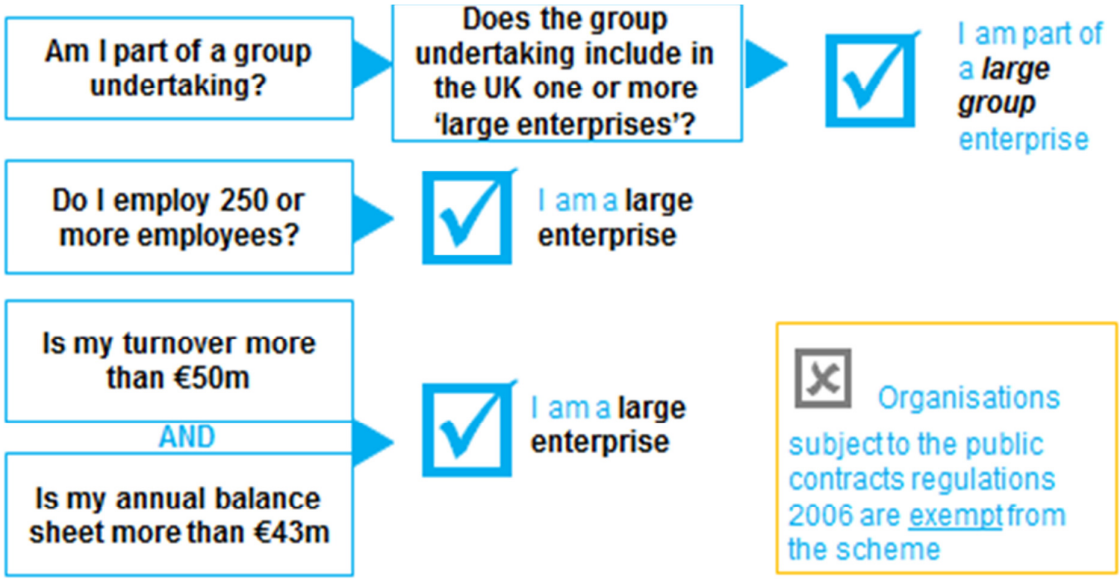
Am I in scope of ESOS?

You are likely to be in scope of ESOS if, on the qualification date (31 December 2014 for the first phase of ESOS), you are:

1. An undertaking which has 250 or more employees[1].
2. An undertaking which has fewer than 250 employees, but has:
   - an annual turnover exceeding €50m **and**
   - a balance sheet exceeding €43m.
3. Part of a corporate group which includes an undertaking which meets criteria (1) or (2) above.

Organisations that are required to comply with the Public Contracts Regulations 2006 or the Public Contracts Regulations (Scotland) 2012 are exempt from the scheme.

Full guidance on whether you are required to participate in ESOS can be found in Section 3.



[1] Here employees include all contracted staff, owner managers and partners employed directly by the undertaking in the UK or abroad. Companies do not have to include employees of subsidiaries or other group undertakings based overseas.

What do I have to do to comply with ESOS?

A full overview of how the scheme operates is provided in Section 2.

In simple terms, an ESOS Assessment requires participants to do three things:

1. Measure your total energy consumption

You must measure your total energy consumption across your buildings, transport and industrial activities.

2. Conduct energy audits to identify cost-effective energy efficiency recommendations.

You must ensure that at least 90% of your total energy consumption is subject to an ESOS compliant energy audit, a Display Energy Certificate, a Green Deal Assessment or a certified ISO 50001 Energy Management System during each phase of the scheme.

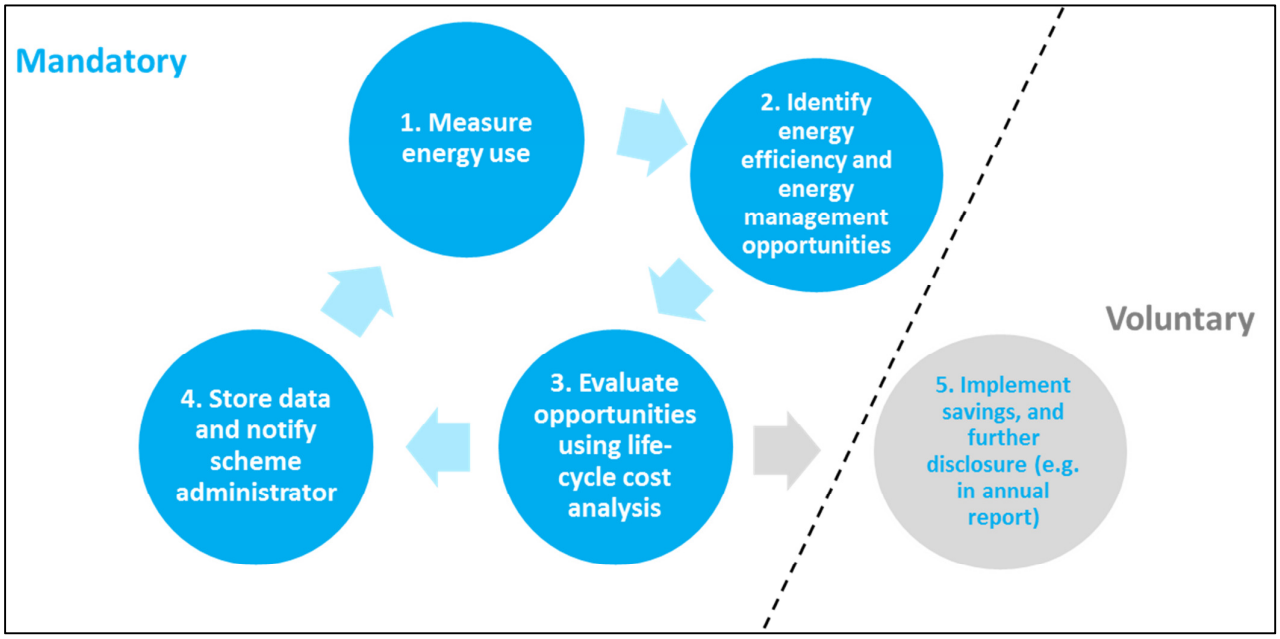
For the first phase of the scheme, you can use any energy auditing activity dating back to December 2011 to support compliance (for example, the Carbon Trust Standard) provided that it meets the minimum standards required of ESOS Energy Audits.

Unless your total energy consumption is covered by a certified ISO 50001 Energy Management System, you must ensure that your ESOS Assessment is conducted or reviewed by a qualified Lead Assessor (the lead assessor may be an in-house expert or external consultant).

3. Report compliance to the Environment Agency (as the scheme administrator)

By 5 December 2015, you must notify the Environment Agency (as the scheme administrator) that you have complied with the scheme.

Prior to notifying the Environment Agency, you must ensure that your ESOS Assessment has been reviewed by a Board-level Director and approved by a Lead Assessor.



Participants are not required to implement energy efficiency recommendations identified by their ESOS Assessments. However, they will only achieve the financial benefits that arise from avoiding energy waste if they do implement cost-effective recommendations identified.

How to use this guidance document

This guidance document is intended for ESOS participants. It provides an overview of how to comply with the scheme and further detail on key aspects of how the scheme operates. It is

intended to provide useful reference material to help you develop your approach to complying with ESOS, but it is not intended to be a technical guide for energy auditors.

Section 2 – provides an **overview of ESOS**, summarising each of the steps to compliance outlined above.

Section 3 – includes detailed guidance on **determining if you are in scope of ESOS**. It is recommended that you read this section, particularly if you are unsure if you are in scope of the scheme or if you are complying as part of a corporate group.

Section 4 – provides guidance on **how to conduct your ESOS Assessment**, including:

- **measuring your total energy consumption;** and,
- **identifying areas of significant energy consumption** that must be subject to audits.

Section 5 – explains the roles and responsibilities of **Lead Assessors** and provides guidance on how to select a suitable Lead Assessor to conduct or oversee your ESOS assessment.

Section 6 – describes the different **ways you can comply with the scheme** including, via ESOS compliant energy audits, including through gaining ISO 50001 certification, Green Deal Assessments and Display Energy Certificates. Section 6 sets out **the minimum requirements of ESOS Energy Audits**.

Section 7 – sets out specific guidance in relation to auditing company **transport** activities, including guidance for companies which own and operate international shipping and aviation fleets, and guidance on auditing grey fleet.

Section 8 – provides guidance on how to comply if you are in scope of the scheme in relation to **assets held in trust**.

Section 9 – provides guidance on the requirements relating to getting Director (or equivalent) and Lead Assessor sign off for your ESOS Assessment, how to **report your compliance** to the Environment Agency.

Section 10 – provides advice on **implementing audit recommendations**

Section 11 – provides information on **penalties, enforcement and appeals** where participants fail to comply with the requirements of ESOS.

Section 12 – provides information on potential **ways to comply with ESOS more easily if you are in scope of other policies** such as the CRC Energy Efficiency Scheme, CCAs, or Mandatory Greenhouse Gas Reporting.

Sections 13 and 14 – provide information on **where to get further advice** and provide **case-studies** on implementing energy efficiency measures.

What if I am an SME or public body?

Although SMEs or public sector bodies are not required to participate in ESOS, they could still benefit from voluntarily meeting the ESOS requirements. ESOS provides a framework you may wish to use to help you identify energy efficiency opportunities, e.g. you may wish to use using a qualified ESOS Lead Assessor to undertake energy audits of your operations.

1 Introduction

The Energy Savings Opportunity Scheme (ESOS) is a mandatory energy assessment and energy saving identification scheme for large undertakings (and their corporate groups). The scheme applies throughout the UK.

If you have any questions not addressed by this guidance or feedback on this document, you can contact the Environment Agency ESOS Helpdesk on ESOS@environment-agency.gov.uk.

The Environment Agency will be publishing compliance guidance later in 2014. This will supersede this Guide – in the event of any conflict or ambiguity between this Guide and the compliance guidance, please follow the Environment Agency's compliance guidance.

1.1 This document

This document provides guidance for participants in ESOS. It outlines the compliance obligations of participants in the scheme and provides advice on good practice for undertaking ESOS Assessments.

It is not intended to be a complete guide to energy auditors on how energy audits should be undertaken. ESOS Energy Audits should however meet the minimum requirements outlined in Section 6.2.1.

1.2 Why ESOS?

ESOS is being established by the Department of Energy and Climate Change (DECC) in response to the requirement for all Member States of the European Union to implement Article 8 of the Energy Efficiency Directive ('the Directive').[2]

In simple terms, an ESOS Assessment requires participants to do three things:

1. Measure your total energy consumption
2. Conduct energy audits to identify cost-effective energy efficiency recommendations
3. Report compliance to the Environment Agency (as the scheme administrator)

The scheme is estimated to lead to £1.6bn net benefits to the UK, with the majority of these being directly felt by businesses as a result of energy savings.[3]

ESOS Energy Audits have the potential to increase your businesses profitability and competitiveness by identifying cost-effective savings which, if implemented, will improve energy efficiency. ESOS Energy Audits must be carried out or reviewed by a suitably qualified assessor; this will help give you assurance that savings identified are real and achievable. If you have already conducted energy audits, for instance as part an existing scheme, you may be able to use them to contribute to your ESOS compliance (see Section 6).

Implementing energy efficiency measures identified through audits can reduce energy costs, but can also have wider benefits – such as reducing other costs (e.g. from waste disposal and maintenance), and increasing employee engagement, comfort and satisfaction in the workplace.

Finally, saving energy is good for the UK as a whole – increasing energy security and helping ensure we all play our part in tackling climate change.

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[2] Directive 2012/27/EU of The European Parliament and of The Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC.

[3] Figure calculated on basis of NPV (2015-2030). Full detailed can be found in the final stage ESOS Impact Assessment, published here: https://www.gov.uk/government/consultations/energy-savings-opportunity-scheme

2 Overview of ESOS

2.1 Scheme operation and timings

ESOS will operate in four-yearly compliance phases. Organisations in the UK must assess whether or not they are required to participate in ESOS on the qualification date of each phase. The qualification date for the first phase is the 31st December 2014.

The last day of each compliance phase ('the compliance date') is the date by which the participant must have undertaken its ESOS Assessment and notified its compliance to the Environment Agency.

For the first phase, this means that activity to support your ESOS Assessment (such as Green Deal assessments or other qualifying energy audits) must have been undertaken between the 6 December 2011 and the 5 December 2015 to be considered compliant. If you remain in scope of the scheme, you must then undertake ESOS Assessments within each subsequent phase. The timing of the phases is shown in Table 1.

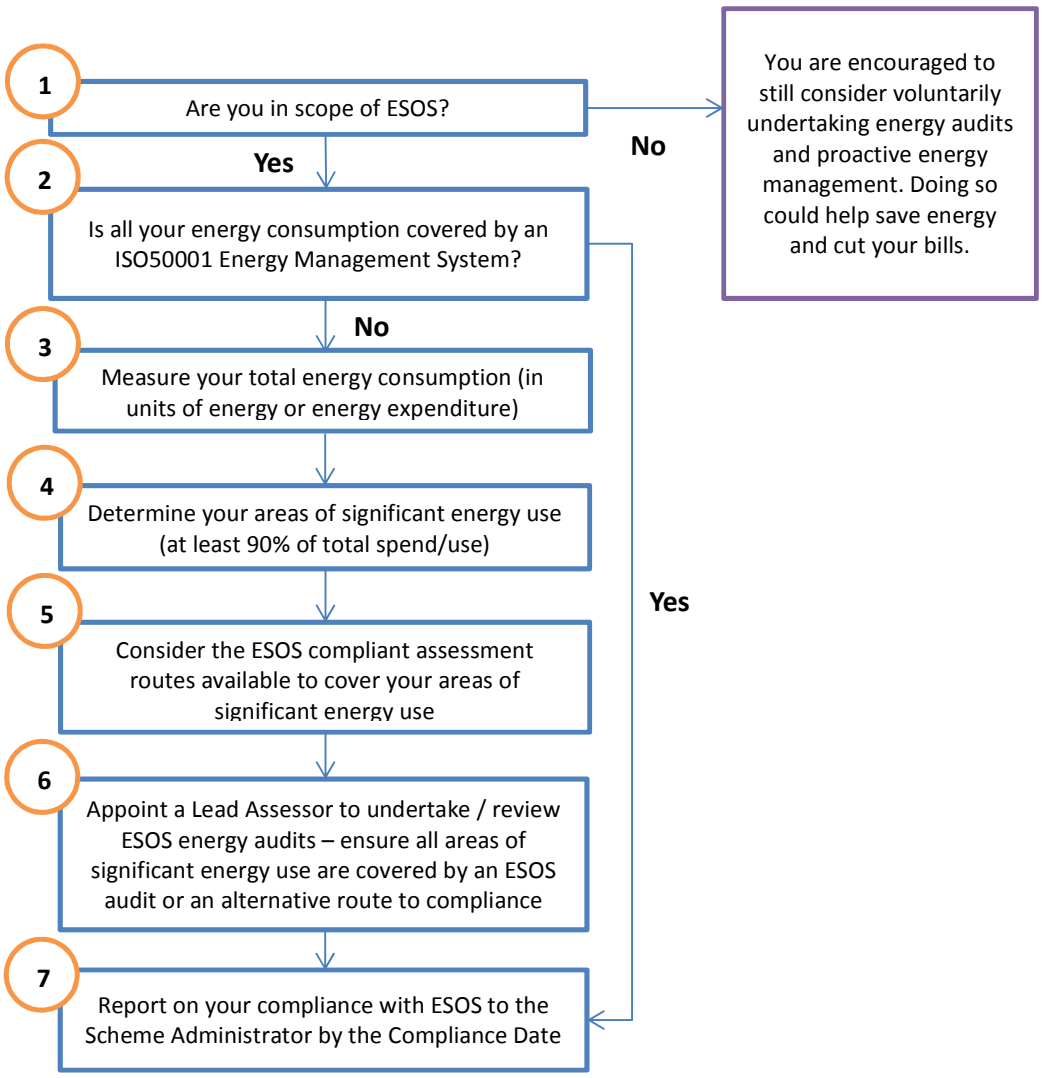
Table 1: ESOS phase timings

Phase	Qualification date:	Four-year compliance phase:	Compliance date:
Phase 1	31st December 2014	6th December 2011 – 5th December 2015	5th December 2015
Phase 2	31st December 2018	6th December 2015 – 5th December 2019	5th December 2019
Phase 3	31st December 2022	6th December 2019 – 5th December 2023	5th December 2023

2.2 Steps to determine qualification and compliance

Figure 1 (overleaf) shows the key steps to determining whether your organisation qualifies for ESOS and what you need to do to comply with the scheme if you do.

Figure 1: Key steps to complying with ESOS



1. Determine if you are in scope of ESOS (See Section 3)

ESOS applies to all undertakings that exceed certain qualification thresholds ('large undertakings'). It also applies to all members of a corporate group which include at least one large undertaking in the UK. Guidance on how to determine if you must participate in ESOS is set out in Section 3.1.

If you qualify as an ESOS participant, you must complete an ESOS Assessment of your organisation (or group of organisations, where you are complying along with other members of your corporate group) by the compliance date. (See Section 3.3 for details of complying as a group).

If you are not in scope of ESOS, you are encouraged to still consider undertaking energy audits voluntarily. Energy audits form part of good energy management practice. Audits can help to identify measures that can save energy and cut costs.

2. Consider if all your energy consumption is covered by an ISO50001 Energy Management System

If you have an ISO50001 Energy Management System (certified by an approved certification body) covering all your energy use this shall be sufficient to constitute an ESOS Assessment. However, you will still need to notify the Environment Agency of your compliance (see Step 7).

To be compliant, the system must have been certified during the compliance period, and the certification must remain valid at the compliance date.

If you do not have an ISO50001 certified Energy Management System covering all your energy use, you should continue with Step 3.

3. Measure your total energy consumption (see Section 4.4)

You are required to measure your total energy consumption across a 12-month period ('the reference period'). The scope of ESOS includes energy consumed in:

- buildings;
- transport; and
- industrial processes.

You can measure your total energy consumption in either energy units (e.g. kWh) or energy expenditure.

To ensure you use up-to-date information reflecting your assets at time of qualification, your reference period for each phase must overlap with the qualification date for the phase (i.e. 31 December 2014, for the first phase of ESOS).

Further details on measuring your total energy consumption are set out in Section 4.4.

4. Determine your areas of significant energy consumption (See Section 4.5)

Once you have measured your total energy consumption you can then identify your 'areas of significant energy consumption'.

Your areas of significant energy consumption must account for at least 90% of your total energy consumption.

Within a phase, all of your areas of significant energy consumption must be covered either by an ESOS Energy Audit or by an alternative route to compliance.

You do not need to audit the remaining 10% of your total energy consumption. This energy use is referred to as *de minimis* energy use.

You may choose not to identify specific areas of significant energy consumption – in which case you must then audit all of your assets (i.e. your total energy consumption).

5. Consider the routes to compliance available to cover your areas of significant energy consumption (See Section 6)

You must conduct compliant energy auditing assessments or energy management activity in relation to all of your areas of significant energy consumption by the compliance date. There are four distinct types of qualifying assessments and management activity available to you:

- ESOS Energy Audits - These may include any energy audit work undertaken during the compliance period under other schemes (such as activity under the Carbon Trust

Standard, Logistics Carbon Reduction Scheme and Green Fleet Reviews), provided your Lead Assessor confirms this work meets the minimum standards required for ESOS Energy Audits);

- An ISO 50001 certified Energy Management System;
- Display Energy Certificates (DECs) and accompanying advisory reports; or
- Green Deal Assessments.

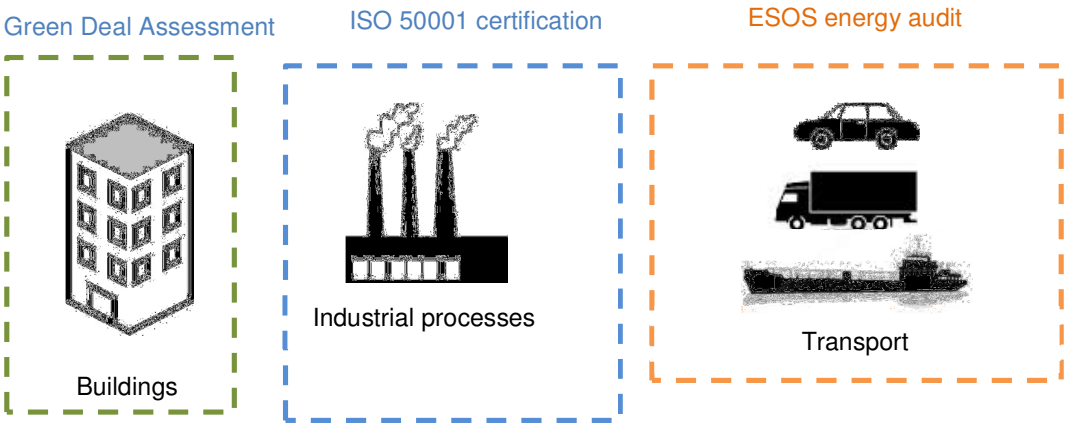
To contribute to your compliance, ESOS Energy Audits, and other compliance activities, can be undertaken at any time within a compliance phase. This means that you can comply by conducting a number of staggered assessment activities at different times.

Importantly, whichever route or combination of routes to compliance you choose, you will need to cover **all** of your areas of significant energy consumption in each phase.

For example, if you had four areas of significant energy use that accounted for 90% of your total energy consumption and an ISO 50001 Energy Management System only covered three of these four areas, you would need to choose another route to address the fourth area of significant energy use.

Once you have considered any compliant activity already undertaken in relation to areas of significant energy consumption, you should consider which compliance activities you want to undertake in relation to the remaining areas of significant energy consumption.

Figure 2: Example – covering all areas of significant energy consumption via a combination of compliance routes



6. Audit areas of significant energy consumption (See Section 6)

ESOS Energy Audits must be carried out by, or overseen/approved by, recognised Lead Assessors (members of professional registers approved by the Environment Agency). These can be either in-house expert(s) or an external individual (see Section 5).

Other routes to compliance are subject to separate requirements to be considered valid for ESOS purposes – see Section 6 for more details. Lead Assessors can review audits carried out earlier in a compliance phase in order to confirm that these meet the minimum ESOS standards.

You must also ask your Lead Assessor to review your ESOS Assessment as a whole. However, it remains your organisation's legal responsibility to ensure that all of your areas of significant energy consumption are audited.

7. Report your ESOS compliance (see Section 9)

You will need to make a notification to the ESOS Scheme Administrator that you have completed an ESOS compliant assessment for your organisation. The notification must be made to the Scheme Administrator on, or before, the compliance date of each phase. As noted above, the compliance date for the first phase is the 5th December 2015.

2.3 ESOS Scheme Administrator

The Environment Agency will be the ESOS Scheme Administrator for the United Kingdom. As such, the Environment Agency will be responsible for receiving notifications of compliance from ESOS participants, maintaining guidance on compliance and approving registers of Lead Assessors (see Section 5), as well as other duties.

The Environment Agency will also be the compliance body for participants in England. The Scottish Environment Protection Agency (SEPA), Natural Resources Wales (NRW) and the Northern Ireland Environment Agency (NIEA) will be the compliance bodies for participants in Scotland, Wales and Northern Ireland respectively.

The participant's compliance body is determined by the location of its registered office or where there is no registered office its principal place of activity.

The Secretary of State, acting through the Department of Energy and Climate Change's Energy Development Unit, will be the compliance body for participants undertaking activities wholly or mainly offshore.

The compliance bodies will be responsible for monitoring the compliance of those in scope of the scheme and will be able to issue penalties for non-compliance (see Section 11).

3 Qualification for ESOS

3.1 Do I qualify?

3.1.1 Am I an undertaking?

Only undertakings and groups of undertakings can qualify for ESOS.

An undertaking is defined as '*(a) a body corporate or partnership, or (b) an unincorporated association carrying on a trade or business, with or without a view to profit'.* As such, the scheme covers, but is not limited to, the following types of organisations in the UK:

- limited companies;
- public companies;
- trusts;
- partnerships;
- unincorporated associations; and
- not-for-profit bodies (where engaged in a trade or business – see Section 3.4 for details).

Undertakings which meet the qualification criteria set out in Sections 3.1.2 or 3.1.3 will need to comply with ESOS.

3.1.2 Qualification as a large undertaking

Your organisation will be in scope of ESOS if it qualifies as a large undertaking. For the purposes of ESOS, an undertaking is a large undertaking if it meets either of the following criteria:

1. It has 250 or more employees[4].
2. It has fewer than 250 employees, but has:
    - an annual turnover exceeding €50m **and**
    - a balance sheet exceeding €43m.

3.1.3 Qualification via a corporate group

In addition to the qualification route set out above, an undertaking will also qualify for ESOS if it is part of a corporate group containing at least one 'large undertaking' (as determined by the criteria outlined above in Section 3.1.2) within the UK. See Section 3.3 for more details on qualification through and participation as a group.

3.1.4 Determining whether an undertaking meets the thresholds

In determining whether they meet the financial thresholds outlined above in Section 3.1.2, undertakings should use their most recent annual financial statements ending on or before the

[4] Here employees include all contracted staff, owner managers and partners employed directly by the undertaking in the UK or abroad. Companies do not have to include employees of subsidiaries or other group undertakings based overseas.

qualification date. Sterling figures must be converted into Euros using the exchange rate prevailing on the qualification date. You should use the Bank of England Pounds Sterling – Euros spot rate. See http://www.bankofengland.co.uk/boeapps/iadb/Rates.asp?Travel=NIxRSx&into=GBP

However, to fully determine if you meet the qualification criteria you may need to consider older financial statements. See Section 3.2 for more information on how growing organisations that were previously small can qualify as large (and similarly for information on how shrinking organisations may still qualify). Sterling figures in older financial statements must also be considered using the same conversion rate (i.e. that prevailing on the qualification date for the compliance period in question).

Example – Company A

Company A has a financial year running from 1st April to 31st March each year.

Company A only employs 150 people.

At the qualification date for the first phase of ESOS, 31st December 2014, Company A's most recent set of financial statements will be those for the year to 31st March 2014. These accounts show revenue of £42m and balance sheet assets, at the year-end, of £34m.

The exchange rate prevailing on the qualification date is €1.25 per GBP. The revenue and balance sheet assets of Company A should be converted to Euros using this rate, for comparison with the financial thresholds.

For ESOS purposes, Company A's revenue for the year is therefore €52.5m (42 x 1.25 = 52.5) and its balance sheet assets are €42.5m (34 x 1.25 = 42.5).

Company A therefore exceeds the revenue threshold of €50m but does not exceed the balance sheet threshold of €43m. Considering just this financial year, Company A would therefore be considered small. (However, to fully confirm it is in fact small Company A would also need to consider it financial statements for the year 2012/13 – see Section 3.2 for details).

In determining whether they meet the employee threshold, undertakings should add the total number of people they employed (including employees and other persons engaged in the business of the organisation, such as owner-managers and partners) in each of the months of the relevant accounting period (i.e. the period which the financial statements used to consider the financial thresholds relate to) and divide by the number of months in that period.

Example – Company B

Company B has a financial year running from 1st April to 31st March each year.

At the qualification date for the first phase of ESOS, 31st December 2014, Company B's most recent set of financial statements will be those for the year to 31st March 2014. Therefore, it should consider the number of employees during that period.

At 1st April 2013, Company B has 5 Directors and 235 employees. On the 10th July 2013 Company B hires 20 more employees. There are no changes in employee or Director numbers before the end of the year.

For three months in its financial year (April, May and June) Company B has a total of 240 staff (5 Directors plus 235 employees). For nine months of the year (July 2013 to March 2014) the company has a total 260 staff in the month (5 Directors and 255 employees).

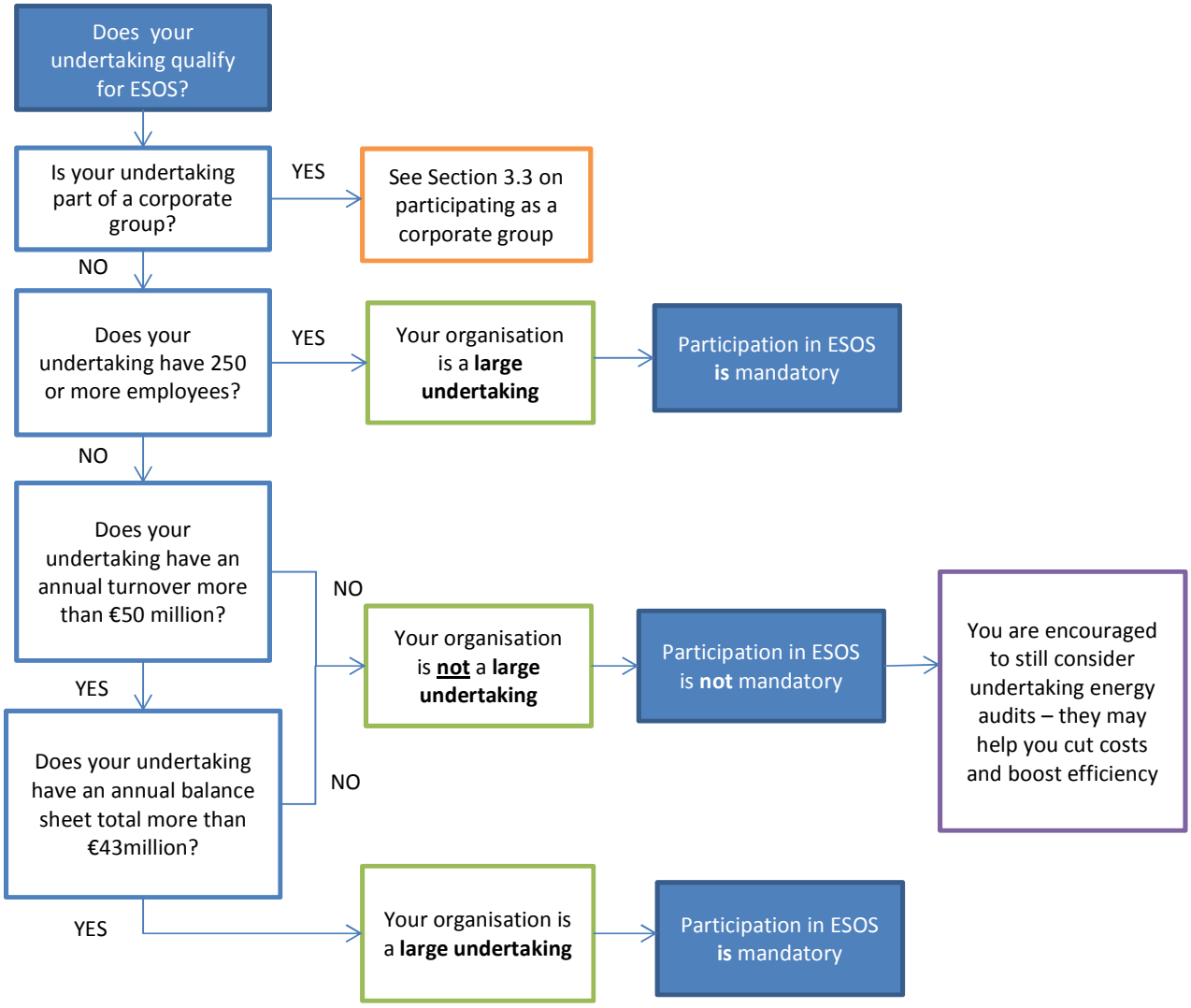
For ESOS purposes, Company B's number of employees for the year is therefore 255, calculated as:((240 x 3) + (260 x 9)) / 12 = 255

The company therefore exceeds the employee threshold at the qualification date.

As described in Section 3.1.3 above, if your organisation does not meet the criteria laid out in Section 3.1.2, you will still qualify for ESOS if you are part of a corporate group that includes one or more undertaking that meets the thresholds – see Section 3.3 for more details on qualification through and participation as a group.

In determining if you are an ESOS participant, you may find the decision tree in Figure 3 useful.

Figure 3: Are you a participant?



3.2 Change of status (two-year rule)

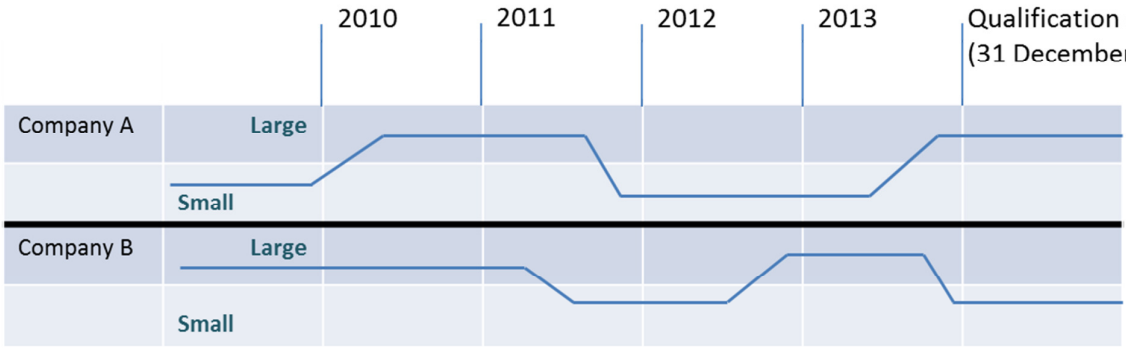
For an organisation to move from not being a large undertaking to being one it must meet either or both of criteria (1) and (2) (outlined in Section 3.1.2) for two successive accounting periods. Similarly, to move from being a large undertaking to not being one, the undertaking must fail to meet both criteria for two successive accounting periods.

So if a change in the status of your organisation or group means that you cross either of the large enterprise qualifying thresholds (1) or (2), then the position must be sustained over two accounting periods to result in a recognised change of status.

For example: If your employee numbers increase from 220 persons in year 1 to 260 persons in year 2 and 270 persons in year 3, then at the end of the year 3 accounting period your organisation is considered to be a large undertaking as it has exceeded the employee number threshold for a large enterprise over two consecutive accounting periods (years 2 and 3).

However, if in year 3 your employee numbers were instead to drop back down to below 250 persons, then your organisation would not be deemed to be a large undertaking at any time over the three years as the threshold had not been exceeded for two successive accounting periods.

The same principles apply to the criteria regarding organisational turnover and balance sheets.



Company A is an SME and is not in scope of ESOS – although it meets the criteria of a large undertaking in the 2011 and 2014 accounting periods, it is not in scope of ESOS because it does not meet the 'large undertaking' criteria for two consecutive accounting periods.

Company B is a large undertaking and is in scope of ESOS – although it falls below the criteria of a large undertaking in 2012 and 2014, it is in scope of ESOS because it does not fall short of the 'large undertaking' criteria for two successive accounting periods.

3.3 Participating as a corporate group

3.3.1 Qualification through a corporate group

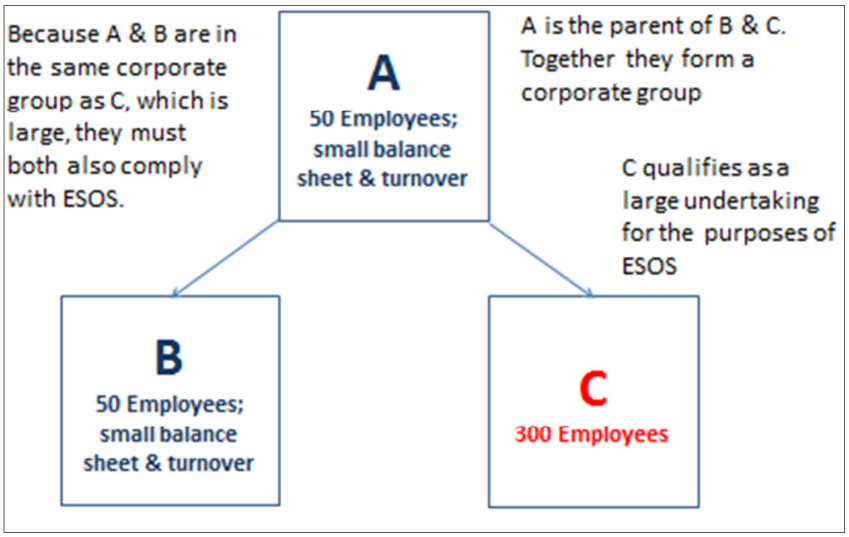
Where a corporate group contains at least one undertaking in the UK which:

1. Has 250 or more employees[5]; or
2. Has fewer than 250 employees, but has:
    - an annual turnover exceeding €50m; **and**
    - a balance sheet exceeding €43m;

The entire UK operations of the corporate group will need to participate in ESOS.

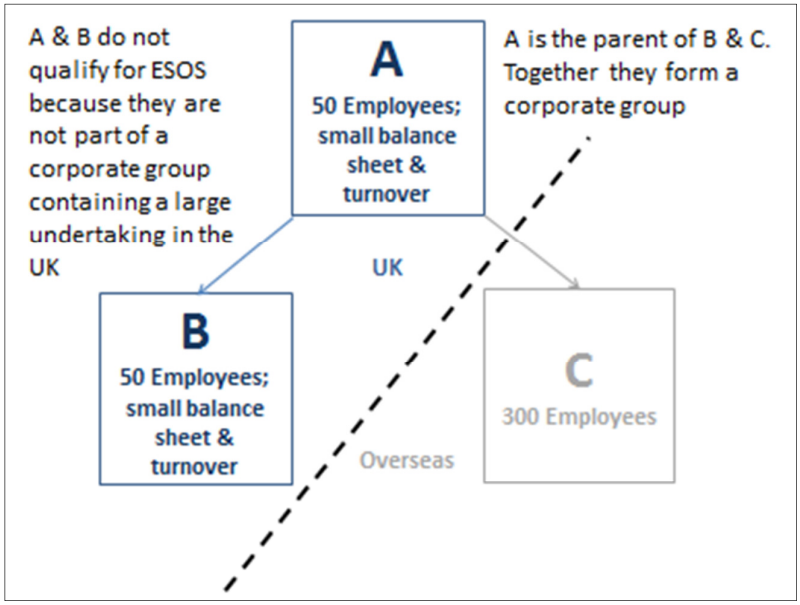
The boxes overleaf provide examples of the application of these rules.

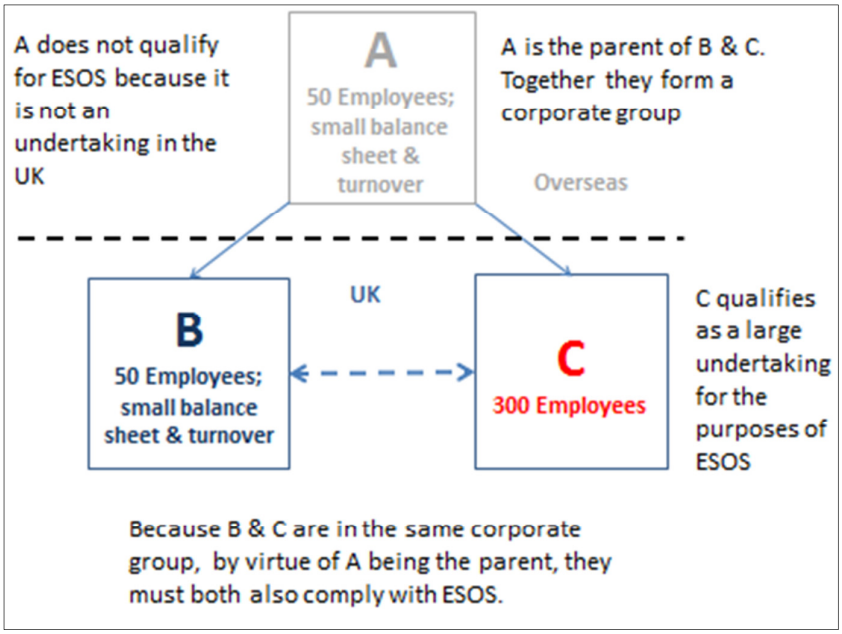
[5] Here employees include all contracted staff, owner managers and partners employed directly by the undertaking in the UK or abroad. Companies do not have to include employees of subsidiaries or other group undertakings based overseas.



Corporate Groups Example 1

Corporate Groups Example 2





Corporate Groups Example 3

3.3.2 Highest parents

The default expectation is that corporate groups will participate in ESOS in their highest parent groups. A highest parent is a member of the group which has no parent, or only has parents which are overseas undertakings. The highest parent group would include this highest parent and any other undertakings in the group which are its subsidiaries.

The default expectation is that the highest parent will take lead responsibility completing the ESOS Assessment and notifying compliance for itself and those other undertakings in the highest parent group. For ESOS purposes the highest parent is therefore termed the 'responsible undertaking'. Another undertaking within the highest parent group may act as the responsible undertaking, providing there is written agreement to this effect between all the undertakings in the highest parent group.

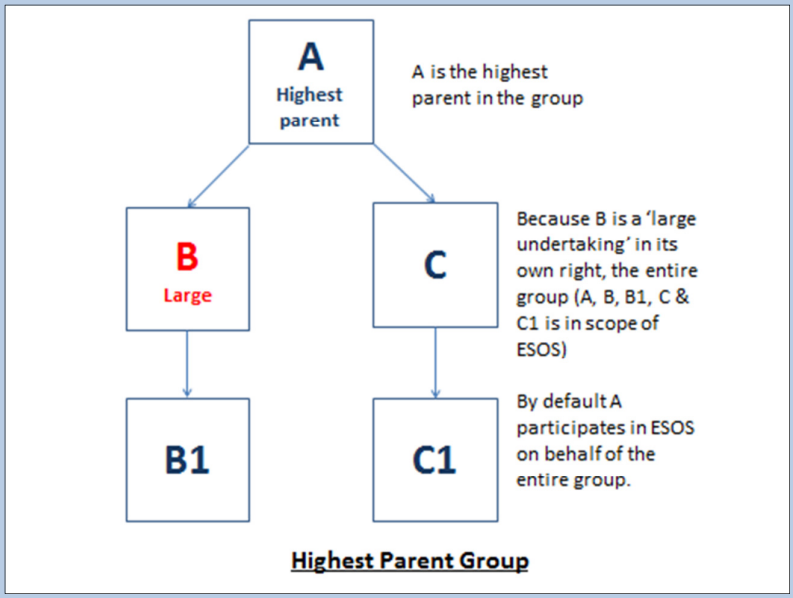
In some cases, the highest parent group will be the same as the corporate group. However, in cases where the corporate group contains overseas undertakings, the corporate group may be comprised of more than one highest parent group.

Undertakings within a highest parent group will have the option (providing they agree in writing with their highest parent) to disaggregate from one another for the purposes of compliance with ESOS, in which case they will notify as two or more separate participants (see Section 3.3.3 below).

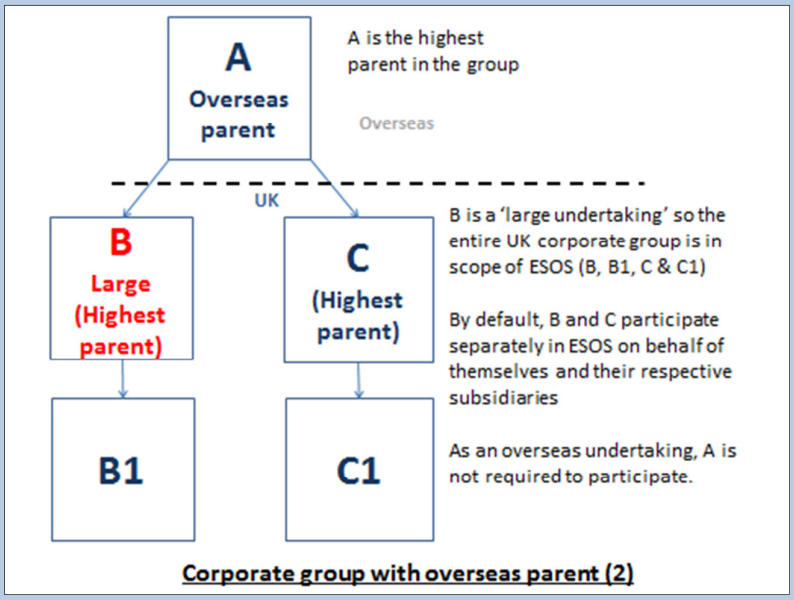
Example

Company A has two subsidiaries: B and C. Company B has one subsidiary, B1, and Company C also has a subsidiary, C1. These companies together make up a corporate group.

All the companies are UK undertakings and B qualifies as a large undertaking, so they must all participate in ESOS. Here, Company A is the highest parent and the companies jointly comprise a highest parent group since they share a common highest parent.



However, if A was an overseas undertaking, both B and C would be highest parents, since neither has a UK based parent. Therefore, there would be two highest parent groups in the overall corporate group: B and B1 would form one highest parent group, while C and C1 would form another.



Corporate group with overseas parent (2)

Note that even if B is the only large undertaking in the group, C and C1 would still need to comply with ESOS, since they are part of the same corporate group as B. The fact they are not in the same highest parent group as B is irrelevant for their qualification for ESOS.

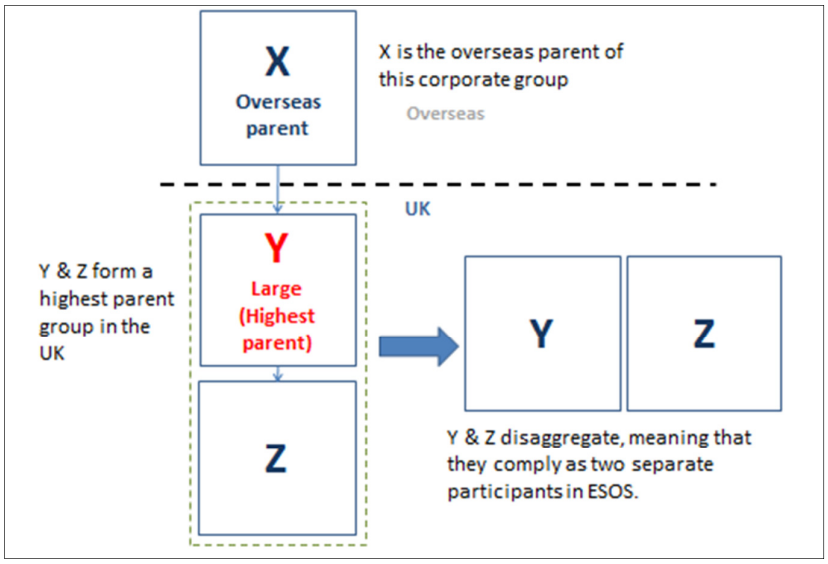
3.3.3 Disaggregation of highest parent groups

Highest parent groups are able to disaggregate relevant undertakings within the groups. These undertakings will be able to participate in ESOS as smaller groupings or individually. To disaggregate from the highest parent group, an undertaking must agree in writing with the highest parent.

Disaggregation may be attractive to you if it helps you manage ESOS participation more effectively. For example, if parts of your group operate separate energy management processes or company finances.

Disaggregation does not exempt subsidiaries from participating in ESOS. Participants must notify the Environment Agency of any disaggregation when they notify of compliance with the scheme.

Where highest parent groups choose to disaggregate, individual undertakings participating on their own will act as their own responsible undertaking, and undertakings participating as smaller groups must agree which will act as the responsible undertaking.

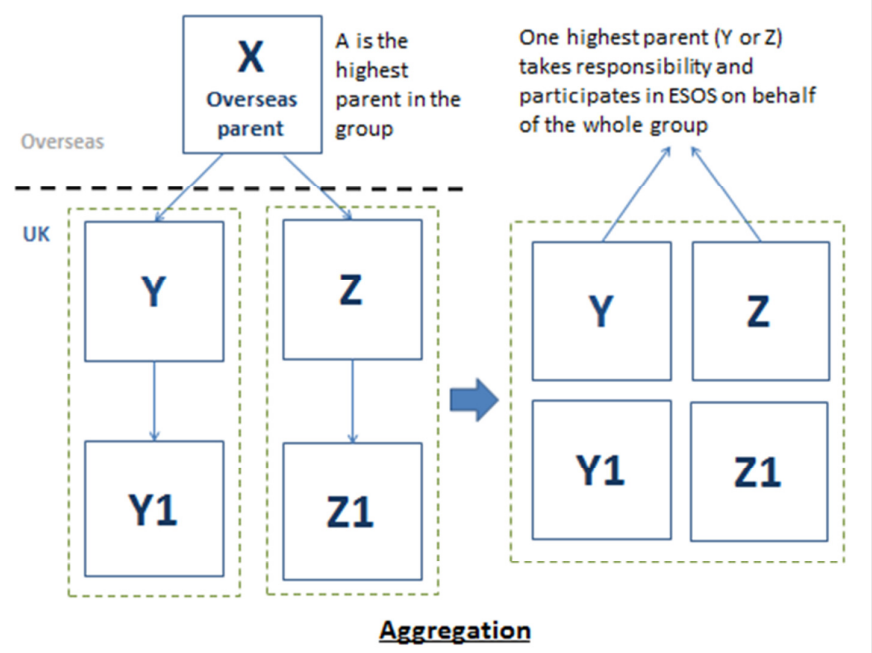


Disaggregation

3.3.4 Aggregation of highest parent groups

Where there is more than one highest parent in a corporate group, the highest parent groups will be able to aggregate, if they so wish, so as to comply as one participant. Aggregation between highest parents (and their undertakings) will require the mutual consent of the highest parents.

The aggregation of two or more highest parent groups does not prevent parts of any of those groups from disaggregating from the larger whole for the purposes of compliance, provided that all the UK organisations in the overall corporate group comply.



3.3.5 Changes to group undertakings

If an undertaking, or a number of undertakings, leave a corporate group between the qualification date (31st December 2014 for the first ESOS phase) and the compliance date (5th December 2015 for the first ESOS phase) they will, as a default, comply with ESOS separately from their former group. However, they may, by mutual consent with their former highest parent, choose to aggregate with their former group for the purposes of compliance.

They may also choose to aggregate with their new group, for the purpose of compliance, again providing there is mutual consent.

3.4 Not-for-profit bodies

The definition of an undertaking, using the definition within the Companies Act 2006, includes not-for-profit bodies which are engaged in a trade or business activity. Therefore, the activities of some charities will fall within the scope of ESOS subject to the body meeting the definition of a large undertaking, as outlined in Section 3.1.2. Charities' and other not-for-profits' finance professionals should be able to advise whether activities they carry out should be considered 'trade or business activities' as this will have implications for other parts of their operations.

3.4.1.1 Public bodies

Public bodies are not included within the scope of ESOS. Public bodies are defined under ESOS as those bodies which must adhere to the UK public contract regulations – these are the Public Contracts Regulations 2006 in England, Wales and Northern Ireland and The Public Contracts (Scotland) Regulations 2012 in Scotland.

3.4.1.2 Universities

Some universities will be included within the scope of ESOS. Whether or not an individual university is included will depend on how it is funded.

Any university that is not subject to the Public Contracting Regulations 2006 in England, Wales and Northern Ireland and The Public Contracts (Scotland) Regulations 2012 in Scotland is within scope of ESOS. Where a university derives more than half of its income from private sources, such as fee-paying students, it may not need to comply with public contract regulations. In this case, it would not be deemed a public body for ESOS purposes, and would therefore need to participate in ESOS, if it is a large undertaking. Universities will need to individually determine whether they need to comply with public contracting regulations.

Where university colleges are separate legal entities from the university as a whole (and, therefore, constitute separate undertakings), they shall not be required to group together with the university for the purposes of:

- assessing qualification for the scheme; or
- participating in the scheme, should both the college(s) and university qualify.

3.5 Franchises

The franchisor of a franchise business is **not** required to aggregate its franchisees for participation in ESOS.

However, franchisees will be able to aggregate with the franchisor and/or other franchisees for the purposes of compliance with ESOS, providing there is mutual agreement between the aggregating parties.

In such instances, the franchisor or a nominated lead franchisee will take on the responsibility for compliance of all parties and for notifying the Environment Agency of that compliance.

4 Steps to complete an ESOS Assessment

4.1 Conducting an ESOS Assessment – planning stages

To determine what energy audit activity you may need to undertake to comply with ESOS, you first need to:

- Consider any Energy Management System you have in place
- Consider how to involve an ESOS Lead Assessor
- Measure your total energy consumption; and
- Identify your areas of significant energy consumption.

The sections below give more guidance on both of these processes.

4.2 Considering your Energy Management System

If you have in place an Energy Management System that is certified to ISO50001 this will be considered sufficient to comply with ESOS, providing all of the following conditions are met:

- The Energy Management System has been certified to ISO50001 during the compliance period;
- The certification remains valid at the compliance date; and
- The Energy Management System covers all of the assets held and activities carried on by your organisation as at the qualification date.

If these conditions are met, you can move to reporting your compliance with the scheme to the Environment Agency (see Section 9).

If you do not have an Energy Management System, or it does not meet all three of the above criteria you will need to undertake further activity to complete your ESOS Assessment. The rest of Section 4 to Section 6 outlines the required activities.

4.3 Consider how to involve an ESOS Lead Assessor

Most participants will not have in place an Energy Management System meeting all the requirements outlined in Section 4.2. If your organisation is one of these, you'll need to measure your total energy consumption (Section 4.4), identify your areas of significant energy consumption (Section 4.5) and ensure these are covered by one of the routes to compliance (see Section 6).

You'll need to have an ESOS Lead Assessor to undertake at least some parts of this process. For example, a Lead Assessor will have to sign-off your overall ESOS Assessment once complete (see Section 5.3 for more information on roles and responsibilities in ESOS) and you will need to submit the details of this Lead Assessor to the Environment Agency when reporting your compliance (see Section 9).

You may wish to have your Lead Assessor help oversee other parts of the ESOS Assessment process, such as overseeing the measurement of your total energy consumption and the identification of areas of significant energy consumption. They will need to at least review these calculations in order to verify that your ESOS Assessment overall meets all the requirements.

Whether you ask your Lead Assessor to lead the calculation of total energy consumption and the identification of areas of significant energy consumption or just review how you have done this, will be a matter for agreement between you and your Lead Assessor. Section 5 provides more detail on who can act as a Lead Assessor, and their role in the ESOS assessment.

4.4 Measuring your total energy consumption

Participants must measure their total energy consumption as part of their ESOS Assessment. This can be measured either in energy units (such as kWh) or in expenditure terms (£).[6] You may choose to use either metric for the determination of your total energy consumption; however, the metric you choose must be applied consistently to all energy uses.

In measuring your total energy consumption, you should include all energy used in buildings, industrial processes and transportation.

In determining your total energy consumption you should take into account:

- The definition of energy consumption in the scheme;
- The supply rules, including the rules on unconsumed supply; and
- The exclusion of energy use outside the UK (with the exception of international travel, where special rules apply).

4.4.1 Definition of energy consumption

Under ESOS, energy consumption includes the consumption of all forms of energy products, combustible fuels, heat (excluding the participant's own waste heat), renewable energy, electricity, or any other form of energy.

Some participants will already be gathering relevant data under existing policies, such as the CRC Energy Efficiency Scheme and Climate Change Agreements. Further information on how to take account of this activity, to avoid duplicating effort, is included in Section 12.

4.4.2 Determining your energy consumption

For most participants, determining what energy is in scope of ESOS will be simple. It will usually be the same as the energy that they pay for. However, there are some situations in which the energy that participants pay for is not the same as the energy that is in scope of ESOS.

Below are a set of rules that set out what energy participants must consider as part of their energy consumption. In general terms, energy that is supplied to and consumed by a participant is in scope of ESOS.

4.4.2.1 Energy supplied

Energy supplied to a participant means energy that is provided to a participant further to an agreement with a supplier. An example of an agreement could be a contract to provide energy from an energy supplier.

Energy supplied to a participant will, for ESOS purposes, also include energy that is generated by the participant. This includes all forms of energy generation, except where this is in the form of capturing and consuming surplus heat.

[6] N.B. With the exception of calculations around grey-fleet mileage, individual audits of areas of significant energy consumption cannot use energy cost data in place of consumption data based on energy units. Energy costs may only be used in the assessment of your total energy consumption (i.e. for the purpose of identifying areas of significant energy consumption);

Surplus heat is heat generated as a by-product of an industrial process carried out by the participant. Surplus heat energy does not need to be included within scope of an ESOS Assessment – although the industrial process itself is likely to be in scope of the assessment.

4.4.2.2 Energy consumed

Energy consumed by a participant means:

- Energy that is consumed by the participant's assets (e.g. the fuel consumption of a participant's fleet)
- Energy that is consumed as part of the activities of the participant, where activities means any work that the participant is engaged in.

See Section 7 for specific guidance on the supply and consumption of energy for transport.

4.4.2.3 Unconsumed supply

The intention of the supply rules are that they cover energy that participants are supplied with for consumption. As such, unconsumed supplies of energy may be excluded from your measurement of total energy consumption and subsequent auditing activities.

Unconsumed supplies include any supplies of energy that you do not consume but instead provide to a third party. You can deduct these unconsumed supplies, provided:

- the supply is measured (e.g. with metering), or
- can be calculated based on verifiable data, or
- can be reasonably estimated.

If you supply energy to a third party that consumes the energy, but you do not measure this supply and cannot calculate or reasonably estimate it, then you cannot deduct the supply to the third party as unconsumed supply and you will need to include it within your total energy consumption.

As an example, where energy is supplied from a landlord to a tenant and the amount of that energy is measured, and known by the tenant, the landlord does not have to include that energy as part of their ESOS Assessment.

Where energy is provided from a landlord to a tenant and the amount of that energy is not measured and known to the tenant, the landlord must include that energy as part of their ESOS Assessment.

4.4.2.4 Shared parts

A landlord who provides energy to the shared part**s** of a tenanted building is required to include that energy in scope. This is because the provision of energy to the shared parts of the building is part of the activity of the landlord. As such it must be included as part of an ESOS Assessment.

4.4.2.5 Energy consumption outside the UK

Energy consumption that takes place outside the UK (with the exception of international travel, where special rules apply) is not within the scope of ESOS.

Please note: If you have energy consumption outside of the UK but within the geographical extent of the European Union, you should check the relevant Member State's transposition of Article 8 of the Energy Efficiency Directive on energy audits into national law, to ensure you comply with that Member State's law.

4.4.3 Types of energy use

ESOS does not prescribe a list of specific energy sources/fuels considered within the scope of an ESOS Assessment. The calculation of your total energy consumption should include all qualifying supplies of energy to your organisation, determined in line with the ESOS supply rules and definition of energy.

Therefore, your total energy consumption may include energy associated with the use of electricity and the combustion of gaseous, liquid and solid fuels and/or the use of other direct supplies of energy, such as heat (where it is supplied to you - e.g. through a district heating scheme).

If you are measuring your total energy consumption in energy units these should be converted into a common unit for all the forms of energy you are supplied with, so you can calculate a total. You should consider the amount of energy supplied to and consumed by you and, for the purpose of ESOS, disregard energy use further up the supply chain. For example, if you are supplied with 100 kWh of gas and 100 kWh of electricity your total energy supply is 200 kWh, for the purposes of calculating your total energy consumption.

Information on how to convert your various forms of energy consumption into common units is provided below.

Determining your total energy consumption

In determining your total energy consumption and areas of significant energy consumption you should consider if you have the necessary processes, resources and contacts in place to facilitate the:

- collection of and access to energy consumption data (particularly if you are a group organisation);
- aggregation of data – across different areas of energy consumption/different group companies; and
- conversion of energy consumption into standard units and your chosen metric (energy units or expenditure).

The fuels listed in the *UK Government conversion factors for Company Reporting* cover the most common sources of energy and should be referred to as part of an energy use mapping exercise for your organisation.[7]

In measuring your total energy consumption, you will need to convert all your energy consumption data into common units (either energy units (e.g. kWh) or expenditure (£)).The following information on conversion factors may be helpful in this regard.

[7] UK Government conversion factors for company reporting (http://www.ukconversionfactorscarbonsmart.co.uk/)

Table 2: Energy conversion factors

		GJ	kWh	therm	toe	kcal
Energy	Gigajoule, GJ		277.78	9.47817	0.02388	238,903
	Kilowatt-hour, kWh	0.0036		0.03412	0.00009	860.05
	Therm	0.10551	29.307		0.00252	25,206
	Tonne oil equivalent, toe	41.868	11,630	396.83		10,002,389
	Kilocalorie, kcal	0.000004186	0.0011627	0.000039674	0.000000100	

A list of fuels and their properties from the 2013 *UK Government conversion factors for Company Reporting* is provided in Annex I. You may find this useful in converting your different energy uses into a standard unit as part of calculating your total energy consumption.

This is the current version at the time of publication; however, as it is updated in future you should refer to the most up-to-date version.

If you use a fuel or waste stream not listed in the *UK Government conversion factors for Company Reporting* then you should approach your fuel provider regarding its properties.

Source: Government conversion factors for company reporting

www.ukconversionfactorscarbonsmart.co.uk/

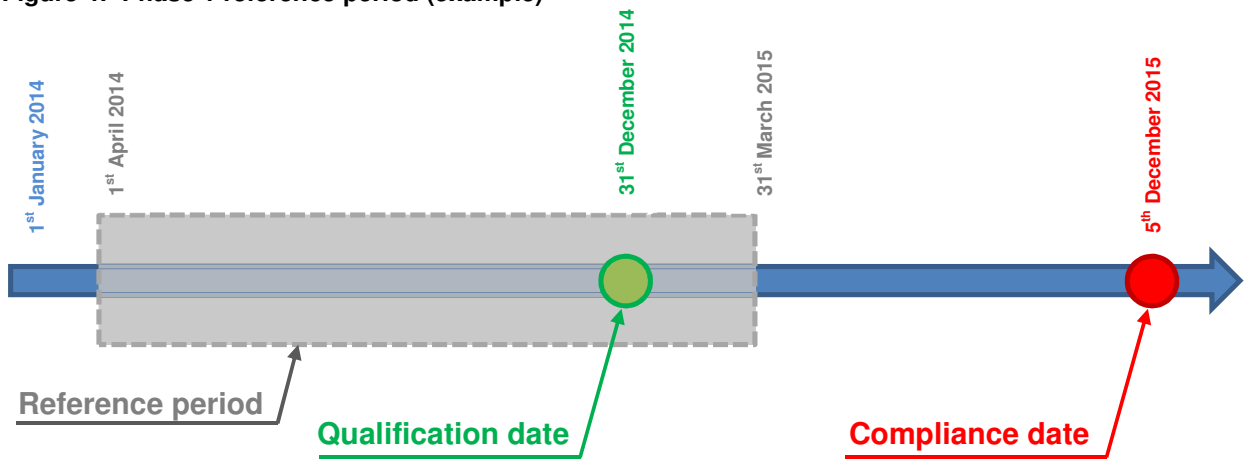
4.4.4 Reference period

You must determine your total energy consumption over a consecutive 12-month period known as the reference period. The reference period **must overlap with the qualification date.** The end date of the reference period must also occur prior to the compliance date. This is to ensure that your calculation of total energy consumption is based on your energy consuming assets and activities at the qualification date. You are free to choose any reference period you wish for your organisation, provided it meets these requirements.

For example, in the first phase of ESOS, the reference period must cover a consecutive 12-month period starting no earlier than the 1st January 2014 and ending before the 5th December 2015.

An example of a suitable reference period in the first Phase of ESOS is shown in Figure 4 (overleaf).

Figure 4: Phase 1 reference period (example)



Other examples of acceptable reference periods would be 1st March 2014 to 28th February 2015, or 1st December 2014 to 30th November 2015. Reference periods are not required to start or end on the first and last day of a month (though it is anticipated most organisations will choose such an approach).

If you are unable to use data for a consecutive 12-month period, for example due to the unavailability of records, then you are required to use data for as close to twelve months as practically possible. You must then record the reason for using a shorter period within your ESOS Evidence Pack (see Section 6.6.1).

If you do not have data for part of your reference period, you can use estimates to fill in any gaps. See Section 4.4.6 for further information on the requirements when using estimated data.

4.4.5 Organisational changes and determining your total energy consumption

Where a participant disposes of an asset or undertaking, or ceases an energy-consuming activity, prior to the compliance date, the energy use from these may be excluded from the determination of total energy consumption. Assets or undertakings acquired, and activities commenced, after the qualification date should be excluded from your total energy consumption, even if they are acquired before the compliance date.

You will need to retain records that demonstrate that you have undertaken an assessment of your total energy consumption, including the identification of areas of significant energy consumption, within your ESOS Evidence Pack (see Section 6.6.1).

4.4.5.1 Organisational Changes before the qualification date

You should not include energy use in your organisations calculation of total energy consumption for assets, activities or undertakings that you do not own on the qualification date.

4.4.5.2 Organisational Changes after the qualification date

Any organisation that qualifies for ESOS on the qualification date will need to comply with ESOS, including organisations that qualify via their group on the qualification date, but leave this group prior to the compliance date. Such an undertaking (or group thereof) can do this by either:

- Agreeing in writing with its previous highest parent that it will participate in ESOS along with this previous group.
- Agreeing in writing with its new highest parent that it will participate in ESOS as part of its new group.
- Participating separately from either its previous or new group and notifying the Environment Agency of its compliance independently.

Assets/activities that are sold/discontinued after the qualification date but before the compliance date do not need to be audited. The energy use of such assets/activities in the reference period does not need to be included in the participant's total energy consumption.

Assets/activities purchased/commenced after the qualification date but before the compliance date do not need to be audited. The energy use of such assets/activities in the reference period does not need to be included in the participant's total energy consumption.

4.4.6 Verifiable data

When calculating your total energy consumption, you will be required to use 'verifiable data' (for energy use or energy spend) for the purposes of identifying areas of significant energy consumption.

Verifiable data means data that can be evidenced or otherwise proven and, in the case of summary data, can be traced back to the primary data source.[8]

Actual records of energy use/spend should be used where practicable. For example, electricity invoices are considered a source of verifiable data. Other examples of verifiable energy use data include:

Table 3: Examples of verifiable data sources

Verifiable data source:	Energy use (examples only):
Meter reading records/schedules	Electricity**,** natural gas
Delivery notes	Stored gaseous (including gas canisters), liquid and solid fuels, and wastes
Stock records/readings	Stored liquid and solid fuels, and wastes
Automatic meter reading (AMR)/smart and half hourly (HH) meter data outputs	Electricity**,** natural gas

4.4.6.1 What if I don't have verifiable data?

ESOS adopts a 'comply or explain' approach regarding the requirement to use verifiable data. It may be impracticable or disproportionately burdensome to obtain verifiable data – such as where no invoices have been received for a connected electricity or natural gas supply, or for a negligible number of gas canisters used.

[8] Summary data means data taken from a primary data source and handled/manipulated in the production of a more useable summary for a given user.

If you cannot obtain verifiable data of energy use/spend you should:

- use a reasonable estimate derived through calculation (where possible based on other verifiable data);
- retain records as part in your ESOS Evidence Pack (see Section 6.6.1):
  - outlining the methodology used to determine your estimates; and
  - explaining why it has not been possible or practicable to obtain verifiable data.

Illustrative methods for estimating energy consumption

Where practicable, energy supply estimates should be based on verifiable data. There are a number of estimation techniques that you can use to fill in gaps in data:

- **Direct comparison** – This technique uses a different and comparable time period (i.e. the same day/week/month in another year) and uses the consumption in that period to fill the gap. This technique is useful in taking into account seasonal variations in energy consumption.
  - *E.g. Using energy data from April 2014 to fill a data gap for April 2015*

- **Pro-rata** – This technique uses a period of known data to derive an average consumption over a defined, shorter period of time (e.g. using a known monthly total to derive a daily average consumption). This average is then used to estimate the data for the unknown period by extrapolating
  - *E.g. Using the average day rate of energy use for the 1st March to 25th March 2015 to estimate the energy use between the 26th March and 30th March*

- **Benchmarking** – This is where the energy consumption of a comparable asset or activity (e.g. a building of a similar size, age or construction) is used as a proxy for the consumption of an asset/activity where the consumption is not known. This technique is particularly useful if you have a number of assets of similar size and design (e.g. retail outlets)
  - *E.g. Using the annual energy use of one retail outlet as an estimate of the annual energy use of a comparable retail outlet that has no available data.*

4.4.6.2 Data used in other schemes

ESOS participants may also fall in scope of other energy management/reporting schemes, such as the EU Emissions Trading System (EU ETS), the Climate Change Agreement (CCA) programme, the CRC Energy Efficiency Scheme or mandatory greenhouse gas reporting for quoted UK companies.

The energy data already collated as part of your compliance with these schemes can be used, at least in part, for the purposes of determining your total energy consumption as part of an ESOS Assessment.

Please note: The scope of energy required to be included in the assessment of your total energy consumption under ESOS is broader than the mandatory and voluntary schemes listed above. Therefore, you may not be able to rely solely on the data reported under these schemes in determining your total energy consumption.

Table 4: Data used in other schemes and mapping to ESOS scope requirements

Scheme	Applicable to:	Energy/emissions coverage:	Additional ESOS coverage:	Additional ESOS energy uses:
EU ETS	Sites ('installations')	• All 'direct' energy use • **Not** electricity	Sites not included in EU ETS	• Electricity use • Imported heat • Transportation
CCA	Sites ('facilities')	• Site specific (generally electricity, natural gas and other significant fuel use)	Sites not included in the CCA(s)	• Fuel use not covered by CCA • Imported heat • Transportation
CRC	Qualifying organisations and groups	• Electricity • Natural gas	Organisations/groups not in CRC but meeting the definition of a large undertaking	• Fuel use not covered by CRC • Imported heat • Transportation
GHG reporting	Qualifying organisations and groups	• Scope 1 and 2 emissions	Organisations/groups not mandated to undertake GHG reporting but meeting the definition of a large undertaking	• Imported heat

4.5 Identifying areas of significant energy consumption

Once you have determined your total energy consumption, you are required to audit assets and activities that amount to 90% of this (your 'areas of significant energy consumption').

This is intended ensure that energy audits are proportionate, cost-effective and identify the most significant and cost-effective energy saving opportunities.

You can exclude up to 10% of your total energy consumption, as measured in the reference period, from the requirement to undertake an energy audit, by allocating it to the *de minimis*. This is to reduce the overall administrative cost of auditing areas with little energy consumption.

Under ESOS, there are no additional constraints on which energy using activities may be allocated to the *de minimis*. As such you may apply the *de minimis* at:

1. A **group level** – to exclude the energy consumption of a group undertaking or number of undertakings.
2. An **organisational level** – to exclude the energy consumption of an asset and/or activity, or a defined list of assets and/or activities of the organisation.
3. A **fuel level** – to exclude the energy consumption associated with the use of a particular fuel or fuels.
4. A **supply point level** – to exclude the energy consumption associated with a supply point or a defined list of supply points.

The *de minimis* rule provides you with the flexibility to exclude some energy and to focus your ESOS audit(s) on your areas of significant energy consumption.

For example, you could choose to exclude all energy consumption by a small group undertaking, accounting for 6% of your total energy consumption (organisational level), and exclude the energy consumption associated with gas oil usage across all other UK operations, accounting for 3% (fuel level).

You will need to retain records within your ESOS Evidence Pack (see Section 6.6.1) that describe which assets and activities have been identified as areas of significant energy consumption and describe the audits or alternative routes to compliance that have been undertaken in respect of each of these.

Example of determining total energy consumption, areas of significant energy consumption and de minimis energy use

Group A Ltd – transport group

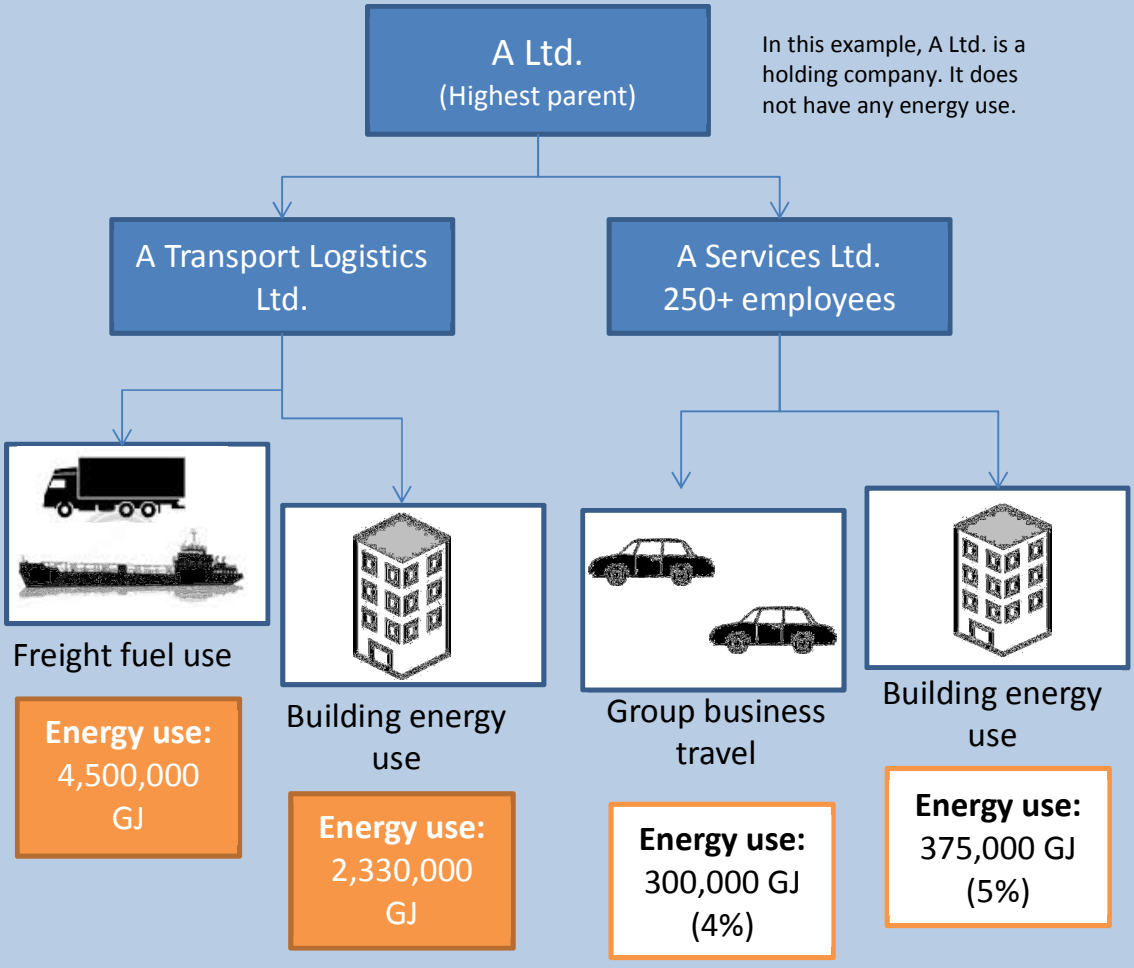
Group A is a UK-based corporate group in the transport industry. The group consists of A Ltd, the holding company, and its two subsidiaries: A Transport Logistics Ltd and A Services Ltd.

A Services Ltd has more than 250 employees and as such meets the definition of a large undertaking. As a result, the other member of the group, both A Ltd and A Transport Logistics Ltd, also qualify for ESOS through the group (see Section 3.1.3 for details).

The default is that all three members of the group will participate as one participant (see Section 3.3.2 for details of group participation and disaggregation/aggregation). To do so, the group must first select a reference period (see section 4.4.4) and determine its total energy consumption (in either energy units or energy expenditure) in this period.

Group A has mapped its organisational structure and the energy consuming activities of each group company, as presented in Figure 5 and Table 5.

Figure 5: Group A's energy use map



The principal business activity of Group A is the shipping and transportation of goods by road and sea. Group A knows (prior to calculation), that the energy associated with fuel consumption in its freight operations will be the largest single item of significant energy consumption. As such, Group A decides to convert all energy use into Gigajoules (GJ) as a standard unit of energy use of all its activities.

Table 5: Group A's summary of energy using activities

Activity	Fuel used	Fuel use	Density (litres/ tonne)	Energy conversion	Energy conversion source	Energy (GJ)	Percentage of total energy consumption
Freight	Diesel	125,244,755 litres	1,194	42.90 GJ/Tonne	UK Government conversion factors for company reporting	4,500,000	60%
Buildings	Electricity & Gas	647,222 MWh	N/A	3.6 GJ/MWh		2,330,000	31%
Buildings	Electricity & Gas	104,166 MWh	N/A	3.6 GJ/MWh		375,000	5%
Company vehicle travel	Diesel	8,349,650 litres	1,194	42.90 GJ/Tonne		300,000	4%

Having conducted its assessment of its total energy consumption, Group A has determined that energy used in its freight operations and in the buildings of A Transport Logistics Ltd represents its areas of significant energy consumption. Given the usages, Group A can exclude the energy associated with group business travel and in the buildings of A Services Ltd as de minimis. As such, these energy usages of A Services Ltd do not need to be covered by an energy audit under one of the accepted ESOS routes to compliance.

5 Lead Assessors

5.1 Purpose of Lead Assessors

Participants in ESOS must have a Lead Assessor to undertake various roles in relation to their ESOS Assessment. The exception to this is where a participant has an ISO50001 certified Energy Management System meeting the criteria outlined in Section 4.2.

There are some activities your Lead Assessor will have to undertake. For example, your Lead Assessor will have to undertake, oversee or review your ESOS Energy Audits (see Section 6.2) and/or any other auditing activities, such as Display Energy Certificate assessments or Green Deal Assessments (see Section 6.4). Your Lead Assessor will also have to sign-off your overall ESOS Assessment once complete, to confirm it meets the requirements of ESOS overall.

Section 5.3 provides more information on roles and responsibilities in ESOS) and you will need to submit the details of this Lead Assessor to the Environment Agency when reporting your compliance (see Section 9).

However, you may wish to have an ESOS Assessor to help oversee other parts of the ESOS Assessment process, such as overseeing the measurement of your total energy consumption, identifying areas of significant energy consumption and conducting ESOS Energy Audits.

Lead Assessors must belong to a register of energy professionals approved by the Environment Agency.

Selecting an appropriate Lead Assessor:

In selecting an appropriate Lead Assessor from an approved register, you should consider what other qualifications and/or experience that individual holds and how these might best benefit you in getting the best results from your audit(s). You may wish to consider your prospective auditor's:

- sector-specific experience;
- familiarity with industry specific technologies and processes; and
- accreditation/certification to audit against prescribed standards (ISO standards) or other UK schemes (DEC assessor or Green Deal Advisor).

5.2 Finding a Lead Assessor

Energy management and energy auditing professionals will be able to demonstrate their competence as a Lead Assessor through registering with a professional body whose professional register has been approved by the Environment Agency. Details of approved registers will be published on the Environment Agency's website (in its capacity as the scheme administrator). See: https://www.gov.uk/energy-savings-opportunity-scheme-esos

A professional body must apply to the Environment Agency, as scheme administrator, to have its register of energy professionals approved as one whose members meet the standards set by the British Standards Institution (BSI) Publicly Available Specification (PAS) 51215, '*Energy efficiency assessment – Competency of a lead energy assessor'*.[9] The Environment Agency will commence the approval of professional registers in July 2014.

Professional bodies must have their registers re-approved by the scheme administrator each phase. We intend that the Environment Agency's re-approval process for the first ESOS professional registers will take place in 2018.

[9] The PAS was finalised in June 2014 and is available through BSI's website at http://shop.bsigroup.com

Registers approved by the scheme administrator are known as 'approved registers' and individuals who are members of an 'approved register' are considered 'Lead Assessors'.

Please note: individuals wishing to become ESOS Lead Assessors should not apply directly to the scheme administrator.

5.3 Roles and responsibilities

5.3.1 Participants and Lead Assessors

The table below sets out the roles of both the participant and Lead Assessors in completing ESOS Assessments. However, it is important to note that overall legal responsibility for compliance remains with the participant. The table is only a guide as to what actions you should expect your Lead Assessor to complete.

The table is based on the assumption that the Lead Assessor conducts the audits. However, the allocation of roles would differ for a participant that uses a Lead Assessor to review energy audits that had been conducted by individuals other than approved Lead Assessors. For example, in the case that an external Lead Assessor was contracted to review in-house work by people who are not Lead Assessors, it would be up to the participant to identify energy saving opportunities.

Table 6: Role of ESOS participants and Lead Assessors

	Work to be undertaken by	
Requirement/action:	**ESOS participant**	**Lead Assessor**
Overall responsibility for compliance with ESOS	✓	
Appoint Lead Assessor	✓	
Highlight any audit work already undertaken	✓	
Agree audit methodology for new audits	✓	✓
Define scope of audits	✓	
Agree audit timetable	✓	✓
Agree sampling approach	✓	✓
Agree no. of site visits required	✓	✓
Make available data for audit	✓	
Identify energy saving opportunities		✓
Calculate energy/cost savings of measures identified (LCCA or another method, e.g. SPP)		✓
Determine energy use profiles		✓
Present audit(s) recommendations		✓
Review overall ESOS Assessment		✓
Obtain director(s)/senior managers sign off of audit(s) findings and recommendations	✓	
Notify the Scheme Administrator of compliance by the compliance date	✓	
Maintain an ESOS Evidence Pack to substantiate the audit(s) and its findings and recommendations	✓	✓

5.3.2 Participating as a group undertaking

For each highest parent group (see Section 3.3.2), the responsibility for complying with the requirements of ESOS lies, as a default, with the highest parent. The highest parent may agree that another undertaking within the highest parent group takes on this responsibility for ensuring compliance with ESOS, as the nominated 'responsible undertaking'.

Where disaggregation occurs (see Section 3.3.3), the highest parent or nominated responsible undertaking will be responsible for the compliance of only some of the undertakings within the highest parent group. Those undertakings that have disaggregated will be responsible for their own compliance.

Where aggregation occurs (see Section 3.3.4), the highest parents must come to mutual agreement on which of them, or which nominated responsible undertaking from among the aggregating parties, will take lead responsibility for ensuring compliance.

6 ESOS routes to compliance

6.1 Overview

ESOS provides participants with a number of possible routes to demonstrate that a compliant assessment of their organisation or group has been undertaken.

Therefore, you can choose to comply using:

- ESOS Energy Audits;
- ISO 50001 certification;
- Display Energy Certificates (DECs); and
- Green Deal Assessments.

Your Lead Assessor will also be able to consider audit work undertaken as part of other energy audit schemes (such as activity under the Carbon Trust Standard, Logistics Carbon Reduction Scheme and Green Fleet Reviews), if conducted within the compliance period, and take this into account for the purposes of ESOS compliance where it meets the minimum requirements of an ESOS Energy Audit.

Each compliance route will bring with it some advantages and disadvantages for your organisation or group, examples of which are shown below.

Table 7: Example advantages and disadvantages of ESOS routes to compliance

Route to compliance	Advantage	Disadvantage
ESOS Energy Audits	Covers all energy uses – buildings, industrial processes and transport. Can draw on data from existing energy efficiency compliance activities, such as CRC and CCAs to the extent that these support compliance. Organisations can use existing energy auditing/measurement activity to support compliance (e.g. Carbon Trust Standard or CEMARS) provided that these are carried out in a way which meets the minimum requirements for ESOS audits.	
ISO 50001	Part of an overall energy management system for effective management of energy consumption. ISO 50001 could be employed by a multi-national company across its operations. This would likely mean that for any operations qualifying for audits under other European mandatory auditing schemes, the requirements would be met through the energy management system.	Additional effort, above minimum ESOS requirements, may be required to maintain a certified ISO 50001 energy management system.

Display Energy Certificates	Low cost assessment	Restricted to building energy use including regulated energy (such as heating and building fabric) but also lifts, and small power (e.g. IT) use. Certificate needed for each individual building, so less suitable for large portfolios
Green Deal Assessments (domestic)	Domestic GDAs are bespoke assessments that take account of the occupant's specific energy use behaviours. Domestic GDAs build on the established EPC assessment process. Market is free to market assessments however they see fit – meaning some offer free or low cost assessments.	A good quality assessment is reliant on good quality rdSAP assessment.
Green Deal Assessments (non-domestic)	Non-domestic GDAs are bespoke assessments that take account of the occupant's specific energy use behaviours. EPC and DEC data can be imported to inform these. Green Deal Assessments builds on the established EPC assessment process.	Non-domestic GDAs are restricted to building energy use (e.g. heating, cooling, ventilation, lighting hot water, refrigeration, and building fabric) and do not cover energy used in industrial processes (however, waste heat produced by industrial process, office equipment etc. is taken account of). One assessment is needed for each individual building, so the approach is less suitable for large portfolios. Due to the range of assessment tools on the market, it is difficult to transfer Green Deal Assessment Reports from one assessor to another. There is currently a shortage of available qualified assessors.

You can choose to adopt a single compliance route to demonstrate compliance under ESOS, or a number of routes. However, you must ensure that the selected route(s) covers all your areas of significant energy consumption.

If you choose to comply with ESOS through an existing certification or assessment, you will need to check that the certification/assessment will still be valid at the compliance date and was issued in the current compliance phase. For the first phase of ESOS, a relevant certification and/or assessment must be valid on the 5th December 2015 and have been issued on or after 6thDecember 2011. Each ESOS route to compliance is explained in further detail in the sections below.

Unless you are able to demonstrate compliance with ESOS via a certified ISO 50001 energy management system that covers your whole organisation, or the group of organisations with whom you are participating, you will also need a Lead Assessor to review your compliance with ESOS. N.B. this does not mean that the Lead Assessor is auditing the elements within ISO 50001 – that is the job of a qualified energy management system auditor.

6.2 ESOS Energy Audits

Energy audits are a valuable tool in understanding and improving the energy performance of your organisation. Undertaking energy audits allows you to:

- Measure and understand the energy consumption of your assets and activities.
- Build an energy consumption profile showing where and how your organisation consumes energy. This data can also be used to identify any variations in your energy use, both between areas and over time.
- Identify patterns, build explanations for these and identify any opportunities to reduce your overall energy use through increased levels of efficiency.

Implementing such opportunities may provide long-term savings and reduce the impact of future energy price increases for your organisation. Improved efficiency can also boost productivity and growth.

Participants can either undertake energy audits with the specific aim of complying with ESOS, or use previous energy audits to contribute to ESOS compliance provided that these meet the minimum requirements for ESOS Energy Audits. (See Section 6.2.1).

6.2.1 Audit requirements

ESOS sets minimum requirements for compliant ESOS Energy Audits. ESOS Energy Audits must:

- Use 12 months of energy consumption data, from within a specific period (see Section 6.2.1.1).
- Use data not used to support ESOS compliance in a previous compliance period (See Section 6.2.1.2).
- Produce cost-effective recommendations for the area being audited (see Section 6.2.5), or confirm that there is no scope for cost-effective energy efficiency improvement
- Be overseen, conducted or reviewed by an ESOS Lead Assessor (see Section 6.2.1.3 and Section 5).

6.2.1.1 Use 12 months of energy consumption data from within a specific period

In summary, the data used for ESOS Energy Audits must:

(1) Comprise of a period of 12 consecutive months data on energy use.
(2) Begin no earlier than 12 months before the commencement of the compliance period (i.e. data must begin no earlier than 6 December 2010 for the first ESOS phase).
(3) Begin no earlier than 24 months before the commencement of the first ESOS Energy Audit that the participant undertakes in the compliance period (e.g. for an ESOS Energy Audit undertaken on say 1 April 2015, data must begin no earlier than 1 April 2013).
(4) Not extend beyond the compliance date (i.e. not extend beyond 5 December 2015 for the first ESOS phase).

ESOS Energy Audits should, wherever practicable, be based on 12-months' worth of energy consumption data. For the purposes of ESOS Energy Audits, energy consumption should be measured in energy units (e.g. kWh). You are free to use whichever units of energy are most suitable for the area of energy use being assessed.

Energy cost data is not sufficient to inform ESOS Energy Audits – the use of units of cost in measuring energy consumption is only appropriate for the initial measurement of total energy consumption and identification of areas of significant energy use.

If 12 consecutive months of data is not available you should use as much as reasonably practicable. You should record your reasons for not using a full 12 months of data in your ESOS Evidence Pack (see Section 6.6.1).

Your ESOS Energy Audit should be based on recent energy consumption data. As such, the data should begin within 24 months of the ESOS Energy Audit in which it is used.

The data used for ESOS Energy Audits must also begin no earlier than 12 months before the compliance period begins and it must not extend past the compliance date. The first of these provisions is to allow participants, if they so wish, to undertake ESOS Energy Audits in the first year of a new phase, using data from the last year of the preceding phase – providing there is no overlap in the data used for audits in successive phases (see Section 6.2.1.2).

6.2.1.2 New data for each compliance period

Energy consumption data used for the purposes of an audit conducted in one compliance period may not be used to support an audit undertaken in the subsequent compliance period.

As detailed in Section 6.2.7, you can undertake your energy audit(s) at any point in time within a compliance period.

Good practice guidance for measuring energy consumption

To facilitate you in carrying out your audits, it is helpful to have systems in place to collect, collate and analyse your energy data as frequently as possible. In addition, it's a good idea to make sure that you can 'drill down' into your data, to identify trends and informs detailed analysis.

You will need to have verifiable data for your areas of significant energy consumption. Even though *de minimis* energy is not subject to audit under the ESOS regulations, endeavouring to obtain better quality data in relation to relatively small areas of energy use, identifying trends and implementing energy saving measures can lead to substantial savings when implemented across, for example, a large number of assets or sites.

Listed below are some generic methods that your organisation can implement to assist with data measurement:

- Collecting and collating as much data as possible, such as: meter readings, energy bills, fuel or waste delivery notes, transport receipts, vehicle/shipping/aviation routes and average fuel consumption rates, mileage claims (i.e. expense claims) and heat imports will help to determine patterns that can be analysed to find sources of savings.
- If your organisation's accounting system already includes the necessary data, define a report that incorporates all energy use and costs information so that it can be easily and readily retrieved on a frequent basis. If it's not included in your accounting system, then nominating a person to note, collect and collate energy use and costs incurred in a spread sheet tool will assist with energy analysis.
- Validate/cross-check the data. This can be done via a number of possible checks:
  - independent check – a high level check against another independent source (e.g. invoice totals against meter reads);
  - previous period check – a check against a previous, similar period of time;
  - sample check – a check of a data point against another independent source; and

  - sense check – a check of a data point or range of data points against reasonable expectations based on an understanding of historical energy use.
- Identify data gaps and look to determine the data for the gap using an alternative data source or the use of an estimation.
- Attempt to make readings as accurate as possible – regular meter reads, install Automatic Meter Reading (AMR), data loggers.
- If you generate energy onsite, ensure this is metered.
- Install a reliable data storage system, allowing annual data storage

Further data gap methodologies are provided in:
- Defra's Environmental Reporting Guidelines;
- CRC Energy Efficiency Scheme (CRC) guidance;
- Climate Change Agreement (CCA) guidance;
- EU Emission Trading System (ETS) guidance; and
- Carbon Trust 'Energy Management' guidance.

6.2.1.3 Role of Lead Assessor in ESOS Energy Audit

ESOS Energy Audits must be undertaken or approved by a Lead Assessor, who may be an internal expert or an external individual. See Section 5 for more information on Lead Assessors in ESOS generally.

A Lead Assessor would be responsible for one or more of the following:

- directly conducting compliant ESOS Energy Audits; or
- overseeing and/or approving the conduct and quality of ESOS Energy Audits conducted by others.

In relation to the latter point, energy audits can be undertaken by an energy auditor other than a Lead Assessor (an 'auditor'), provided the audit is overseen or approved by a qualified Lead Assessor prior to the organisation notifying the Environment Agency that it has complied.

6.2.2 Planning for an ESOS Energy Audit

An ESOS Energy Audit, or a number of audits, must cover all your areas of significant energy consumption.

In planning how you will undertake your ESOS Energy Audits and compliance via other routes, you and/or your Lead Assessor should consider and make provisions for:

- identifying any work already undertaken in the compliance phase that may contribute towards compliance;
- agreeing on the audit methodology to be used, for example ISO 50002 or BS EN 16247.
- defining the scope of the audits to be undertaken (e.g. an audit of a defined organisation/group member or a defined number of buildings, sites or transport assets);
- ensuring relevant staff are available to inform an audit and work with the Lead Assessor;
- agreeing an audit timetable, ensuring all audits will be completed suitably in advance of the compliance date; and

- agreeing a sampling approach – regarding the possible grouping of similar assets (e.g. similar retail units) for auditing and/or site visits:

Examples of possible approaches to selecting an audit methodology:

ISO 50002 and BS EN 16247 Energy Audits set out a good practice method for identifying energy savings opportunities. It is for in-house managers or external consultants carrying out an energy audit, or as a guideline for organisations who want to understand what a good energy audit looks like.

The *EN16247* series of standards also includes more detailed standards setting out possible auditing approaches to buildings, transport and industrial processes.

There are also more technical standards, such as *ISO 14414: pump system energy assessment* (see below). These may be suitable to deploy for particular aspects of a participant's energy audits.

Individual auditors or energy auditing companies may also have their own in-house methodologies designed to meet the requirements of ESOS.

Other potentially relevant standards:

ISO 15099:2003 Thermal performance of windows, doors and shading devices -- Detailed calculations. This standard specifies detailed calculation procedures for determining the thermal and optical transmission properties (e.g., thermal transmittance, total solar energy transmittance) of window and door systems. This standard may be applicable as an auditing methodology when seeking to determine the energy saving potential associated with an organisation upgrading the windows (inc. glazing) and/or doors in its buildings.

ISO 16346:2013 Energy performance of buildings -- Assessment of overall energy performance. This standard defines the general procedures to assess the energy performance of buildings, including technical building systems. This standard may be an applicable auditing methodology for the assessment of energy saving potential from buildings.

ISO 15686-3:2002 Buildings and constructed assets, Service life planning, Part 3: Performance audits and reviews. The standard outlines the approach and procedures to be applied to planning, briefing, design, construction and, where required, the life care management and disposal of buildings and constructed assets. This standard may be applicable as an auditing methodology when seeking to determine the whole-life energy saving potential related to the replacement or retrofitting of a building and its likely performance over time.

ISO 11011:2013 Compressed air -- Energy efficiency – Assessment. This standard sets out requirements for conducting and reporting the results of a compressed air system assessment from the energy input through the work performed by the compressed air system. This standard may be applicable as an auditing methodology when seeking to determine the energy saving potential associated with an upgrade/change to a compressed air system as part of an industrial process.

ISO/DIS 14414 - Pump system energy assessment. This Standard sets the requirements for conducting and reporting the results of a pumping system assessment. This standard may be applicable as an auditing methodology when seeking to determine the energy saving potential associated with an upgrade/change to a pump system as part of an industrial process.

6.2.3 Audit scope

Your ESOS Energy Audits and activities to comply via other routes (e.g. Green Deal Assessments) will need to address all your areas of significant energy consumption.

If you have already undertaken audits which you wish to be used for the purpose of ESOS compliance then please note that if an asset, activity or legal undertaking was not part of your organisation or group when an audit of such areas of significant energy consumption was last undertaken, but was acquired subsequently, then that item cannot be considered to have been covered by the previous energy audit.

For example, if you acquired a new building on 1st April 2014 - after an ESOS Energy Audit of your organisation's buildings conducted in December 2013 – the new building cannot be considered to have been covered by the December 2013 audit. In these circumstances, you will need to consider whether you need to conduct an audit of that area in order to ensure that you audit at least 90% of your total energy consumption.

6.2.4 Audit methodology

You should agree the audit methodology to be followed with your Lead Assessor, as well as any other auditors, before the audit(s) starts as part of maximising the effectiveness of, and standardising, the audit work being undertaken.

You will need to record the methodology used within your ESOS Evidence Pack. This will allow you to evidence that your energy audits meet the requirements of ESOS.

6.2.5 Identifying energy saving opportunities

ESOS Energy Audits are required to include recommendations for cost-effective energy efficiency improvements, where opportunities for such improvement exist. Recommendations should directly save energy or lead to an indirect energy saving through improved energy management (e.g. improved metering). Any recommendations must be for cost-effective measures, where these exist.

ESOS Energy Audits may identify a number of types of cost-effective energy efficiency improvements. These might include:

- installing smart meters and improved energy monitoring tools;[10]
- improvements to service and maintenance strategy to ensure vehicles or machinery are operating efficiently;
- replacing enterprise travel with videoconferencing where cost-effective;
- capital investment projects; and
- behaviour change projects.

An ESOS Energy Audit should:

- identify practicable energy saving opportunities for your organisation to implement;
- assess and report on the cost-effectiveness of each energy saving opportunity identified; and

[10] Defra's Smart Meter (non-domestic) leaflet

- use appropriate calculations to determine potential savings in terms of potential energy and monetary value.

Where practicable, an ESOS Energy Audit should:

- use life-cycle cost analysis (LCCA) instead of simple payback periods (SPP) for cost/benefit analyses (see Section 6.2.5.2 for more details); and
- be informed by a minimum of 12 months of energy use data.

Energy saving opportunities and measures identified as part of an ESOS Energy Audit will need to be reported to the participant. These opportunities/measures will then need to be presented to a board-level director (or, in organisations without directors, a senior manager of equivalent seniority) for sign-off (see Section 9.1). Directors will need to review a summary of all ESOS recommendations and audits; they will also need to satisfy themselves that, to the best of their knowledge, their organisation (and any organisations they are reporting on behalf of) have complied with the scheme.

Good practice in identifying and analysing energy saving opportunities

Examine

Examining your energy patterns to identify minimum usage levels (base load), maximum usage levels (peak load) and fluctuations in energy use (e.g. per unit output) will assist in identifying any priority areas for energy efficiency action. This examination should also seek to identify potential areas of waste, such as unnecessary base-load energy use, in your organisation.

Engage

You may find that energy use is affected by behaviour or processes in your organisation. In identifying energy saving measures, you first need to understand the drivers of energy consumption. Therefore, you should engage with energy consumers (stakeholders) across your organisation to understand where they think savings could be made.

You should consider whether this is best undertaken before or after any analysis of energy data or physical auditing work is undertaken.

You might consider engaging with stakeholders by implementing a system of more structured energy governance (e.g. by setting up an energy management committee to oversee energy measurement and performance reporting).

The results of any subsequent energy analysis or physical auditing work then need to be fed back to the stakeholders. This is to obtain their views on the practicality of any energy saving measures identified and the magnitude of estimated energy/cost savings highlighted. Taking into account feedback on the practicality of energy saving measures and addressing stakeholder concerns as part of this process will help to facilitate buy-in to the implementation of the measure across the organisation and therefore to maximise benefits.

6.2.5.1 Common energy saving opportunities

Your Lead Assessor, as part of undertaking or reviewing and approving your energy audit(s), may present you with organisation, sector, site and activity specific recommendations on the most cost-effective and applicable energy saving opportunities.

Some common examples of energy savings found when undertaking energy audits of buildings, industrial processes and transport are given below.

Table 9: Common energy saving opportunities

Buildings
Heating – turn heating down, replace inefficient boilers, install de-stratification fans (fans used in commercial/industrial buildings with high ceilings), shorten hours of operation
Ventilation - specify higher efficiency motors, consider variable speed fans, review time settings and turn off when not in use`
Air-conditioning – review temperature controls, consider variable speed drives, free cooling coils (using external air as a source of cooling)
Lighting – install occupancy sensors, install daylight sensors, review and improve the maintenance plan (more regular maintenance), replace inefficient incandescent bulbs with high efficiency LED lighting or energy saving fluorescent lighting (e.g. T5 lighting).
Building fabric – install cavity wall and roof insulation, install high efficiency windows and glazing, draught proofing.
Building control – install a computer-based building management system, ensure control systems are set correctly for different weather conditions and occupancy levels, install variable-speed drives
Industrial processes
Refrigeration – reduce the heat loads on systems through reduced air infiltration, free cooling, raise process temperatures, improve control of auxiliary equipment (pumps/fans), install better temperature control, keep doors closed, don't overfill units, ensure lights are off inside units when not in use, regular cleaning of the condenser
Motors and drives – install high efficiency motors, install variable speed drives, implement automatic switch off controls/procedures, install time switches, interlocks or sensors, monitor motor output to identify energy wastage
Transport
Fuel consumption – Monitor fuel consumption, monitor driver fuel performance, undertaking fuel efficiency driver training, invest in telematics systems that can identify areas for improvement. **Driver fuel performance** – can be enhanced by: switching off the engine when safe to do so, minimising idling, shifting to higher gears earlier, accelerating and braking gently and smoothly**, avoiding excessive speeds, use of cruise controls and, closing windows at higher speeds. This could be supported by linking to driver incentives.**
Routing and scheduling – Review logistics routes, reduce empty running, maximise loads
Maintenance and vehicle improvements – Tyre management, implement fleet renewal programme, aerodynamic improvements, improved maintenance schedules
Employees
Awareness campaigns – employee engagement, communications on energy efficiency, targeted incentives

Further information and guidance on energy efficiency saving opportunities in buildings, industrial processes and transport, and through employee engagement is available from a range of sources. For instance:

- The Carbon Trust website: http://www.carbontrust.com/resources/guides
- The Freight Transport Association's website page relating to their Logistics Carbon Reduction Scheme (LCRS): www.fta.co.uk/lcrs

6.2.5.2 Life-Cycle Cost Analyses (LCCAs) and Simple Payback Periods (SPPs)

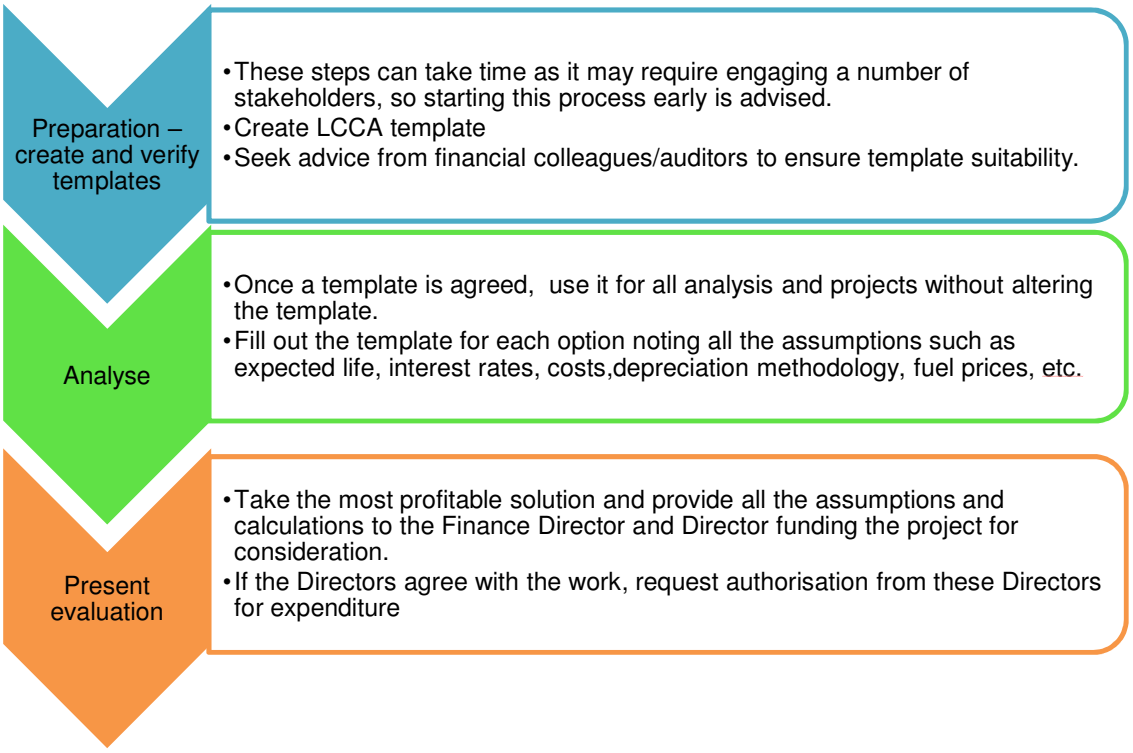
For ESOS purposes, the cost savings of energy saving measures under an energy audit should be based on a life-cycle cost analysis (LCCA) where practicable, rather than alternatives such as a simple payback period (SPP) assessment.

However, it may not always be practicable to undertake a LCCA for an identified energy saving measure in every case and other approaches, such as simple payback calculations, can then be used instead.

These types of cost analyses are common accounting methodologies for many types of financial investments.

An LCCA is a way to demonstrate an investment will be economical over its entire life by accounting for all the costs that could reasonably be incurred during a given period of time.

Figure 6: LCCA framework



LCCAs are particularly useful when the implementation of an identified energy saving measure involves a significant capital investment.

Your Lead Assessor or accountants may know this methodology well. The ultimate aim is to calculate the net present value (NPV). An acceptable NPV will be specific to your organisation. Figure 6 describes a potential process framework to complete this calculation.

The framework in Figure 6 is intended to provide consistency and efficiency when evaluating recommendations. The preparation stage can be completed at any time as it forms the basis of all potential works. An example LCCA template is provided in Annex II.

For relatively inexpensive, simpler measures, calculating the SPP can be enough to make a sound decision on investment. SPP is a method for determining how long it will take for the cumulative energy savings and other benefits to equal, or payback, your initial investment.

Table 10: Advantages and disadvantages of Simple Payback Periods

Advantages of SPPs	Disadvantages of SPPs
A simple way to screen relatively low-cost measures based on payback	Can't compare complex measures where costs and savings vary in magnitude and timing
	Does not account for benefits and costs after the equipment has paid for itself, so can disadvantage projects with long useful lives
Easier to communicate to a non-technical audience	It does not account for (1) maintenance costs, interest on any loans and disposal costs; (2) volatility of utility costs
	It can make economically sound improvements to efficiency look economically unviable

It may be more appropriate to apply a SPP where the energy saving measure identified has, for example:

- low asset life; and
- no, or low, associated capital and maintenance costs.

For more costly measures and measures that might be more complicated to implement, doing a Life-Cycle Cost Analysis (LCCA) may be necessary to make a sound decision. As the term implies, LCCA is a financial decision making method that considers all costs and benefits over the lifetime of the project.

Table 11: Advantages and disadvantages of Life-Cycle Cost Analyses

Advantages of LCCAs	Disadvantages of LCCAs
Helps you compare measures like-for-like, financially - even if they have different timings and magnitudes of costs and savings	Is a more complex and time-consuming methodology to apply
Provides you with a more complete financial picture by considering all costs and benefits over the lifetime of the measure	
Enables you to compare different combinations of measures and choose the one that will maximise your savings and financial return	Getting accurate input data (costs, timeframes) can be more challenging
Allows you to present the financial benefits of your proposal in terms used by your directors/Chief Financial Officer - for example, net present value (NPV), internal rate of return (IRR), and cash flows	
Reduces your investment risk by projecting a more complete picture of the future	

It may be more appropriate to apply a LCCA where the energy saving measure identified has, for example:

- a long asset life;
- a high upfront capital cost;
- an initial downtime period (i.e. a process has to be shutdown to implement the measure);
- Additional quantifiable benefits other than reduced energy consumption
- associated maintenance costs; or
- where the energy saving measure is applied to a process or piece of equipment where the usage profile of that process/equipment is likely to change (e.g. ramped up usage of a new production line).

An example of a fully costed LCCA for a boiler replacement measure is provided in Annex II.

6.2.5.3 Energy consumption profiles

ESOS requires an ESOS Energy Audit to include the development of 'energy consumption profiles'. These provide the breakdown of how energy is used within a particular asset or activity and how that energy use varies.

For example, in an office building, the energy consumption profile may include energy used for heating, ventilation and air conditioning (HVAC), lighting, appliances and plant.

An ESOS Energy Audit should, where practicable and useful, review the energy consumption profile of buildings or groups of buildings, industrial processes and transportation.

ESOS provides flexibility in the use of energy consumption profiles for items of significant energy consumption, as it may not always be possible or proportionate to develop energy consumption profiles.

Energy consumption profiles are valuable and applicable in a number of situations:

- **Static profiles**: these are useful in situations where there are many different energy uses within an asset or activity (i.e. at a manufacturing site) at any given time and the profile of energy use is poorly understood.
- **Time profiles**: these are useful in situations where there is a cyclical or identifiable pattern of energy use over time within an asset or activity and you want to (further) understand what is driving that pattern – e.g. seasonal demand, weather, or human behaviour (e.g. shift patterns)
- **Time interval profiles**: this is where two or more time profiles are undertaken at intervals to identify any changes in energy use highlighted by the changing profiles (e.g. conducting short time profiles before and after the implementation of an energy saving measure).

If your auditor does not consider an energy consumption profile for an area of significant energy consumption, you should retain a justification to support this decision within your ESOS Evidence Pack.

6.2.5.4 Recommendations

An ESOS Energy Audit should include recommendations that you, as the recipient of the energy audit, can act upon. Thus, the audit recommendations should be focussed on your areas of significant energy consumption and limited to measures that are within your operational control.

ESOS requires recommendations for cost-effective energy saving measures. Therefore any recommendations should make reference to the life-cycle cost analysis (LCCA) or simple payback period analysis that has been undertaken (see Section 6.2.5.2).

Areas of operational control - examples

If you are a tenant occupying a leased office within a multi-occupancy office building, your ESOS Energy Audit may highlight the opportunity to save energy by installing double glazed windows in your office.

However, as a tenant you may be unable to modify the windows. As such, this measure could be considered outside your operational control.

In such a case, the recommendation to install double glazed windows for the office would not be a valid recommendation for you as the tenant as part of your ESOS Energy Audit.

If a landlord undertakes an ESOS Energy Audit and it has the authority and access to make upgrades to the areas of the office building occupied by its tenants then the installation of double glazing would be a valid recommendation for its ESOS Energy Audit.

If the landlord of the office building does not, under the terms of the lease, have access to or control over the use of the tenanted areas of the building, then they should not receive recommendations relating to the tenanted areas as part of their ESOS Energy Audit. However, the Energy Audit should include recommendations regarding energy consumption in common areas and measures over which it has control, such as the boiler, exterior wall insulation, etc.

6.2.6 Undertaking site visits as part of an ESOS Energy Audit

It is important that site visits are conducted by your appointed auditor(s) as part of an ESOS Energy Audit. This is so that the audit findings and recommendations are practical, cost-effective and applicable to your organisation – and not simply theoretical.

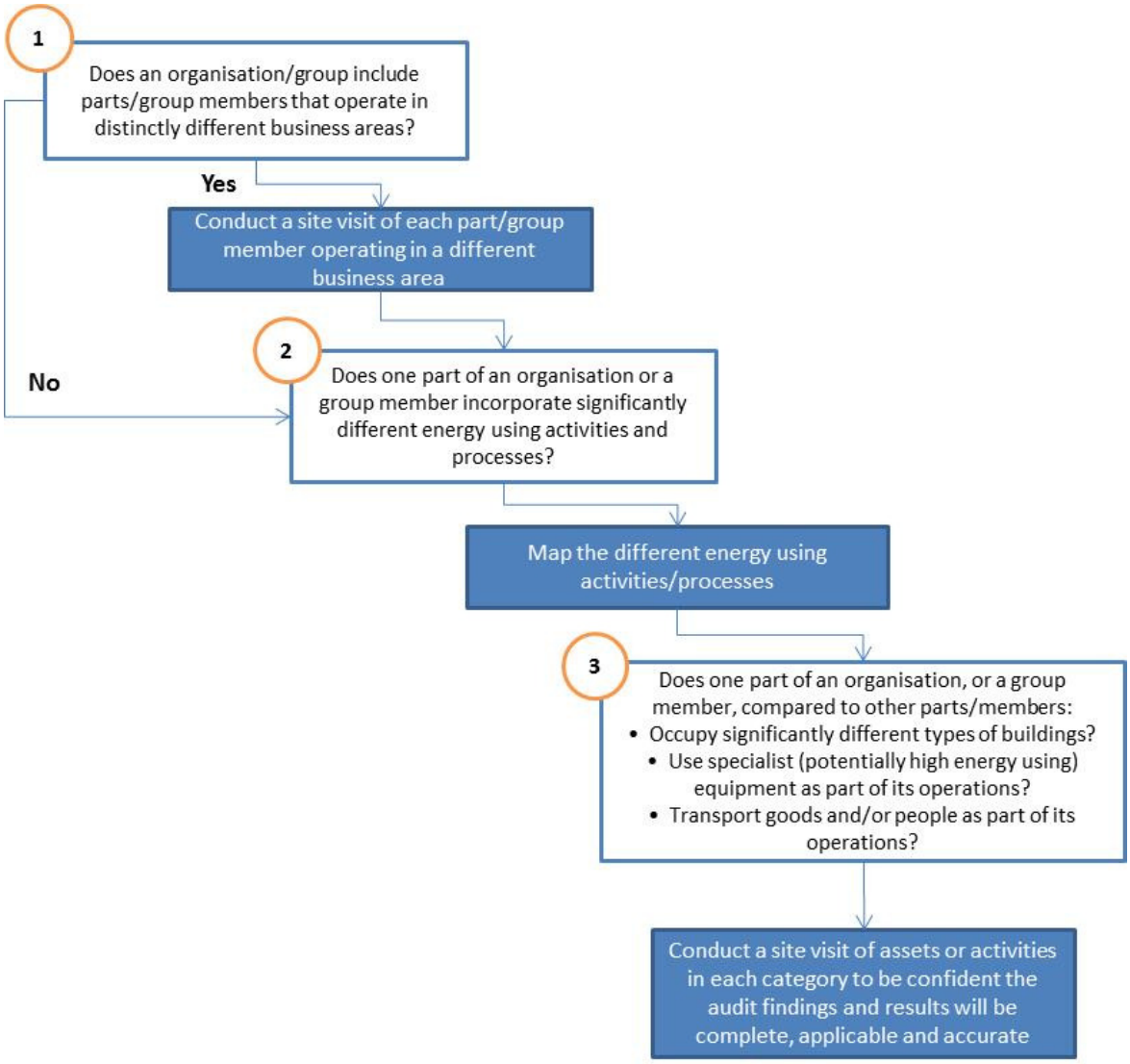
The site visits conducted should be sufficient to give the Lead Assessor a confidence that the audit findings and recommendations for the participant will be complete, applicable and accurate.

The decision on how many site visits to undertake as part of an audit should be agreed between the Lead Assessor and the participant. It is expected that an auditor will carry out **at least one** site visit as part of an audit. In determining if more than one site visit is required as part of an audit, you and your auditor may wish to consider the process outlined in Figure 7.

Other information may also highlight buildings, divisions or teams that could then be subject to a site visit. For example, the DEC methodology/software could be used in a desk-based assessment of a portfolio of buildings[11] to identify those that are poorer performing. These could then be the focus of site visits, because there could be greater high payback savings at these buildings.

[11] N.B. This would not constitute a full DEC assessment that could be used separately for ESOS compliance for these buildings

Figure 7: Considerations regarding the number of site visits to undertake as part of an ESOS Energy Audit



6.2.7 Staggering ESOS Energy Audits

Audit work undertaken at any point within a four year compliance phase can be used to support compliance provided it is completed by the compliance date.

For instance, you might choose to look at:

- All buildings in one year, all industrial processes in the next, and transport in the third; or
- Undertake a rolling assessment of different buildings/assets over the course of the compliance period.

The compliance date for the first phase of ESOS is the 5th December 2015. As such, audit work undertaken in the 4 years preceding the 5th December 2015 (that is, since 6th December 2011) may be counted towards compliance in the first phase, provided it meets the minimum requirements of an ESOS Energy Audits, outlined above (see Section 6.2.1).

The flexibility of undertaking a staged audit may be particularly useful if you have a large number of assets and activities in the UK and auditing all the assets/activities at once would

either put a significant strain on internal resources or simply not be feasible due to the number of assets and activities comprising your significant energy consumption.

6.2.7.1 Audit timetable

How you develop your energy auditing timetable in each compliance phase is at your discretion and you are not required to implement the same timetable for each compliance phase you participate in.

It may be timely to conduct audits before and/or after:

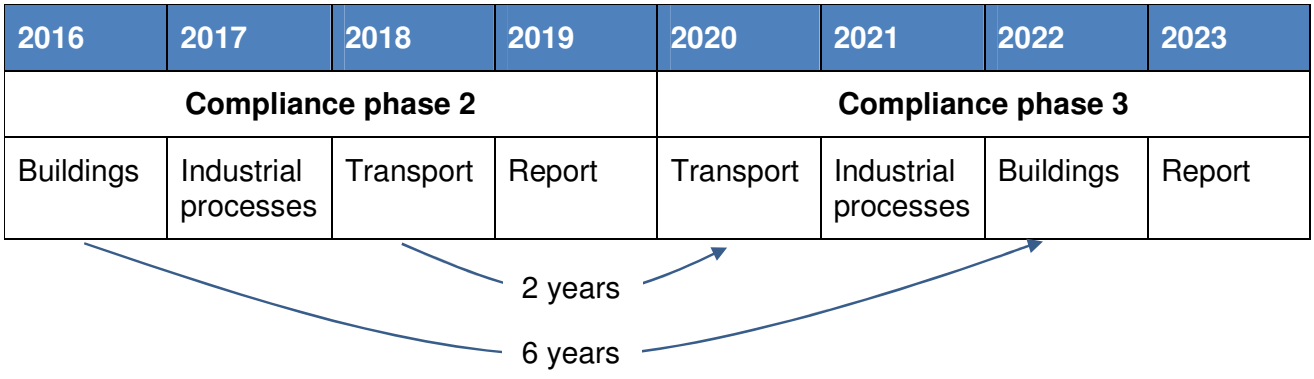
- significant group acquisitions or disposals
- significant alterations to your building(s)' layout and internal/external appearance;
- upgrading a building's heating, ventilation, air conditioning (HVAC) or lighting;
- upgrading your IT equipment;
- a major replacement of process machinery or purchase of additional process equipment;
- replacing a fleet of owned or leased company vehicles; and
- implementing a new working procedure for staff.

Conducting audits before such changes may inform such investment/operational decisions. Undertaking audits following these changes may help to identify how effective they have been from an energy efficiency perspective, and if further changes are necessary.

Alternatively, conducting audits before and after a 'pilot' measure has been implemented (within a defined area of your organisation or group) will help to inform your procurement processes regarding the cost savings and benefits the measure has realised for your organisation.

ESOS will require organisations as a whole to be audited once every four years. Some areas of significant energy consumption could be audited more frequently or less frequently depending on how an organisation manages its audit of different assets. However, on average, it is expected that each area will be audited once in each compliance period.

Figure 8: Example of a participant's audit timetable



Ideas for developing an audit timetable:

Figure 8 outlines a possible audit timetable, with the audits of transport energy being conducted 2 years apart and the audits of buildings energy being conducted 6 years apart. However, the organisation as a whole is audited once every four years (with reports for the second and third compliance phases in 2019 and 2023 respectively).

You may choose to plan an audit timeline like this to stage audits to occur before and after the implementation of an energy saving measure, to best capture the effect the measure has had compared to the anticipated impacts.

So, as shown in the example in Figure 8, planning an audit of transport energy in 2018, before implementing a new transport policy in 2019, and subsequently auditing transport energy again in 2020 will best capture the impact of the new policy and allow you to make amendments as part of continual improvement, as well as meet your ESOS requirements.

6.3 ISO 50001 certification

Certification under international standard ISO 50001:2011(energy management system, EnMS) is permitted as a compliance route under ESOS as an alternative to undertaking ESOS Audits.

ISO 50001:2011 provides a framework of requirements[12] for organisations to:

- develop a policy for more efficient use of energy;
- fix targets and objectives to meet the policy;
- use data to better understand and make decisions about energy use;
- measure the results;
- review how well the policy works; and
- continually improve energy management.

A certified ISO 50001 energy management system can be applied across all of the assets and activities of an organisation/group or applied to a specific asset/activity (e.g. utilised to manage a high energy using asset/activity).

To be valid as a route to compliance under ESOS, your ISO 50001:2011 energy management system **must** be certified by a United Kingdom Accreditation Service (UKAS) accredited certification body, by a body accredited by another EU member states' national accreditation body, or by a body which is a member of the International Accreditation Forum.

If you maintain a compliant but not certified system, you may wish consider seeking certification to permit the use of your energy management system as a route to compliance under ESOS.

Where an ISO 50001 certified system covers all of your organisation or group, at the time the certification was undertaken, this shall constitute compliance with ESOS provided the certification is still valid at the compliance date (5th December 2015 for the first ESOS phase). In this circumstance, there is no requirement for an organisation or group holding such a certification to have its ESOS compliance verified by a Lead Assessor.

[12] Source: ISO (International Organization for Standardization) http://www.iso.org/iso/home/standards/management-standards/iso50001.htm Accessed February 2014.

ISO50001 Guidance

If you are considering an ISO 50001 certified energy management system, guidance is available online. See the links below:

1) Getting Started - ISO 50001 Energy Management – Part 1
   http://youtu.be/MCPL3qk2qKI

2) Important Terms - ISO 50001 Energy Management – Part 2
   http://youtu.be/g_kQve_-D3g

3) Measuring Performance - ISO 50001 Energy Management – Part 3
   http://youtu.be/OPgyrYit3qM

4) Top 10 Tips - ISO 50001 Energy Management – Part 4
   http://youtu.be/PDlp9AFvXyY

Case studies are available from major certification bodies, for example:

http://shop.bsigroup.com/Browse-By-Subject/Energy-Management/BS-ISO-50001-case-studies/

6.3.1 Acquisitions and ISO 50001

If you acquire new undertakings, assets or activities in the compliance period and your ISO certification covers your entire organisation or group then the acquisition will not prompt a requirement for recertification for continuing compliance with ESOS, provided the newly acquired undertaking/asset/activity is within the scope of the certification.

Example: If parent company 'C' purchases a new subsidiary company 'D' and company C's ISO 50001 certification is compliant with the requirements of ESOS (i.e. includes an energy audit) and the certification specifies that it applies to, for example, 'company C and its subsidiaries', then it is considered that the certification will include company D – as company D will be incorporated as part of company C's energy management system.

6.3.2 Partial coverage

Where an ISO 50001 certified system covers only part of your energy consumption, there will remain a requirement to measure your total energy consumption and for a Lead Assessor to oversee or approve that the system addresses all the areas of significant energy consumption identified in the reference period (i.e. at least 90% of your total energy consumption).

If your certification doesn't cover all the identified areas of significant energy consumption, additional assessment work – via another route to compliance – will be required for any areas of significant energy consumption not addressed by the certified management system.

If you are complying with the requirements of ESOS through more than one compliance route, you should keep a documented record of your areas of significant energy consumption and their coverage by one of the recognised compliance routes as part of your ESOS Evidence Pack (see Section 6.6.1).

6.4 Display Energy Certificates (DECs) and Green Deal assessments

An assessment of a building's energy performance as part of the Display Energy Certificates or Green Deal schemes is considered compliant with the requirements of ESOS. Note that DECs are not available for buildings in Scotland[13].

Display Energy Certificates (DECs)[14] are required for non-domestic buildings that have a floor area of more than 500m^2 and are either occupied by a public body or an organisation providing a public service and visited by the public. DECs are also voluntarily available for other buildings.

A DEC shall constitute an ESOS compliant energy assessment for the aspects of energy consumption within a building which it covers, provided:

- it is still valid on the compliance date of a compliance period; and
- the assessment has been undertaken and the certificate issued (and accompanying recommendation report provided) within the compliance period.

Green Deal assessments are provided under the Government's Green Deal scheme for domestic and non-domestic buildings. Where these assessments are qualifying assessments[15], they shall constitute a compliant energy assessment for the aspects of energy use within a building which they cover, provided they are conducted within the compliance period and are still valid at the compliance date.

Where DECs or Green Deal assessments are used to contribute to compliance with ESOS, there remains a requirement for your organisation or group to consider whether they constitute an assessment of all areas of significant energy consumption. Where this is not the case, further assessment work will be required for the undertaking to be in compliance.

6.5 Other sources of activity which may be used to support ESOS compliance

6.5.1 ISO 14001

The ISO 14001:2004 (Environmental management systems, EMS) certification does not expressly require energy audits that would meet the minimum requirements of the Directive. As such, ISO 14001 in itself does not demonstrate compliance with ESOS.

However, ISO 14001 certified organisations may wish to use their ISO 14001 management system to support ESOS compliance.

One of the requirements of ISO 14001 is that organisations establish, implement and maintain procedures to ensure that legal requirements are taken into account in establishing, implementing and maintaining its environmental management system. Therefore, organisations which operate a certified ISO 14001 environmental management system should either

1) already be managing and auditing their energy and fuel use to some extent, as part of their existing environmental management system; or

2) will be driven by legal compliance requirements of ISO 14001 to engage in a process to integrate the requirements of ESOS into their EMS.

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[13] Energy Performance Certificates, in Scotland or in the rest of the UK, do not provide an alternative route to compliance.

[14] As defined by the Energy Performance of Buildings Regulations 2008 and 2013 (separate regulation exist in England and Wales, and Northern Ireland)

[15] As defined by regulation 7 of The Green Deal Framework (Disclosure, Acknowledgement, Redress etc.) Regulations 2012

Integrating ESOS and an ISO 14001 certified Environmental Management System

Participants may be able to integrate ESOS compliance with their ISO 14001 environmental management system through some of the following steps:

- Establish energy efficiency targets or energy auditing programmes as part of complying with the requirement of ISO 14001 to establish objectives & targets and implement programmes to achieve these.
- Consider the qualification of in-house energy managers under the ISO 14001 provisions relating to resources & roles, and competence, training and awareness.
- Using EMS documentation to support ESOS data collection and maintain ESOS Evidence Pack in line with EMS documentation procedures.
- Using a suitable qualified ESOS Lead Assessor to conduct ISO14001 internal audits as well as considering an organisation's ESOS compliance.
- Incorporating sharing audit findings with top management through the management review processes established under the EMS.

ESOS participants may also wish to extend their existing ISO 14001 EMS in order to gain ISO 50001 certification.

6.5.2 Other energy auditing activity

There are a range of energy management schemes and programmes already run by private enterprises and other bodies in the UK. Some examples of these include the Carbon Trust Standard, Logistics Carbon Reduction Scheme, and Green Fleet Reviews.

ESOS is designed to allow companies to include activities under these schemes, or other business as usual reviews of energy efficiency opportunities, to contribute to compliance.

Where an organisation wishes to use such activities to support ESOS compliance, they will need to ensure that these meet the minimum requirements of ESOS. This includes ensuring that a Lead Assessor reviews records of this activity to confirm that they have been conducted to a satisfactory standard, in line with the requirements of ESOS.

Some examples of existing schemes are outlined below. These may contribute to ESOS compliance provided that they are conducted in a way which meets the minimum requirements for ESOS Energy Audits.

Energy Saving Trust – Transport Energy Audit Services

The Energy Saving Trust (EST) is a not for profit social enterprise that exists to help businesses, the public sector and consumers reduce their energy use and fuel costs whilst acting to combat the emissions of harmful greenhouse gases. Part of the EST remit is to provide on behalf of the Department for Transport a range of services for fleet operators to understand their carbon footprint and develop strategies for reducing this by using less fuel.

The Energy Saving Trust provides three distinct products that are free to use across the UK, with some small variances across devolved administrations. The three products are aimed at car and van fleets up 3.5t. They are:

- Green Fleet Review
- Fleet Carbon Audit
- Online Fleet Health Check

All products are provided free of charge to the end user and provide a range of support from initial reporting to tailored recommendations.

http://www.energysavingtrust.org.uk

Freight Transport Association (FTA) - Logistics Carbon Reduction Scheme

Many leading transport companies (e.g. third party logistics) and retailers are members of the FTA.

The Logistics Carbon Reduction Scheme is a voluntary industry-led approach to reducing carbon emissions from road freight by recording and reporting reductions in CO_2 emissions. The scheme is free to join and open to all commercial vehicle operators.

The scheme works by measuring fuel usage in businesses signed up to the LCRS. Participants are asked to provide readily available information on fleet numbers, fuel usage and business activity data. The fuel usage data is converted into carbon dioxide emissions using Government-approved conversion factors.

The scheme has established five Logistics Efficiency Indicators (LEIs) to help members identify key decarbonisation measures. The LEIs highlight the wide range of technologies and techniques vehicle operators are deploying to reduce energy/carbon emissions and could assist operators in reviewing recommendations for reducing energy usage.

Further information is available at www.fta.co.uk/lcrs

Carbon Trust Standard

The Carbon Trust Standard was included as an early action metric under the CRC Energy Efficiency Scheme. Over a 1000 certificates have been awarded to successful Standard Bearers.

Attaining the Standard involves measuring and analysing energy consumption and demonstrating reductions in carbon footprint or equivalent improvements in energy efficiency.

http://www.carbontrust.com/

6.6 Additional compliance activities

6.6.1 ESOS Evidence Pack

Each participant in ESOS is required to maintain an ESOS Evidence Pack detailing certain aspects of their compliance with ESOS.

Ultimately, the responsibility for maintaining the Evidence Pack lies with the participant.

Your ESOS Evidence Pack should include:

- Details of the undertakings making up your participant and identification of the responsible undertaking (see Section 3.3).
- Details of the responsible board-level Director(s) or equivalents that have taken the lead on signing-off your compliance with ESOS.
- Details of your Lead Assessor (see Section 5).
- The calculation of your total energy consumption.
- A list of your identified areas of significant energy consumption.
- Details of the routes to compliance used to cover each area of significant energy consumption.

- Your reasons, where applicable, for using less than 12 months of data for the measurement of total energy consumption (see Section 4.4.4).
- Your reasons, where applicable, for using less than 12 months of data to support an ESOS Energy Audit (see Section 6.2.1.1).
- Details of the audit methodology used in your ESOS Energy Audits (see Section 6.2.4).
- Your reasons, where applicable, for being unable to use verifiable data on energy use or energy expenditure to support your calculation of total energy use and the methodology of any estimation made.
- Justification, where applicable, where your auditor does not consider an energy consumption profile in their audit of an area of significant energy use (see Section 6.2.5.3).

6.6.2 Making available previous audit results

From the second compliance period onwards, you will need to provide your Lead Assessor with the ESOS Evidence Pack, including audit results, for the ESOS Assessment undertaken as part of the first compliance phase and from the third phase onwards you will need to provide the results and records of the previous two compliance phases.

This requirement does not apply to the first compliance phase or to new entrants undertaking their first ESOS Assessments.

Considering previous results

You may find that continuing to monitor the energy performance of certain aspects of your business, after taking energy efficiency measures, can inform your decision to roll-out the measures elsewhere in the organisation to achieve similar savings. This process of comparing sites or activities across time, or to other comparable sites/activities is referred to as benchmarking.

Benchmarking is crucial for assessing your organisation's energy performance. Benchmarks allow comparisons to be drawn over a period of time, between sites or facilities, or between your teams. The key is that they provide your organisation with the starting point for setting goals and evaluating future efforts and overall performance.

There are numerous methods for benchmarking as outlined in guidance provided under the Climate Change Agreement scheme.[16] Determining which method is best for you will depend on which metric is most applicable to your core activity. Examples include:

- industrial processes – typically expressed as specific energy ratios (SER), kWh per unit of output;
- buildings – typically expressed by the normalised performance indicator (NPI), the weather-adjusted kWh per square metre of floor area;
- transport – route optimisation (using a routing efficiency ratio), average distance travelled per journey per employee; and
- energy use per employee.

[16] E.g. benchmarks described in CCA guidance [accessed August 2013], KPI described in Defra Environmental Reporting Guidelines [accessed August 2013]

7 Transport specific considerations

Energy consumption from transport is included within the scope of ESOS.

You are only required to include transport where your organisation is supplied with the fuel, not where you procure a transportation service that includes an indirect payment for the fuel consumption (e.g. train or flight ticket includes an indirect payment for the fuel consumed).

7.1 Who accounts for the fuel?

Under ESOS, it is the party that is supplied with the energy for use in its business (i.e. within a car, train, aircraft or ship) that must account for the consumption in its ESOS Assessment.

ESOS does not require participants to measure and audit fuel which they are not supplied with and do not use in their business. Therefore, if your organisation uses contractors to carry out transport activities on its behalf, these operations would be exempt from your ESOS Assessment, but may be part of the contractor's ESOS Assessment, if they qualify.

7.2 Freight transport

For participants operating commercial vehicle fleets (e.g. Heavy Goods Vehicles and vans), fuel data should be captured and collated to establish the amount of energy consumed in transport.

In line with the section above, the ESOS Energy Audit should only cover energy usage relating to fuel which is supplied to the participant for use in its business. Note, a supply to an employee of the participant counts as a supply to the participant, provided the fuel is used in the business of the participant. So, if an employee pays for vehicle fuel for use in the company vehicle, and then reclaims this cost, this is within the scope of ESOS for the participant.

An approach to measuring fuel consumption in the freight transport sector:

As a freight transportation organisation you may operate a fleet of vehicles and trailers ranging in size and consuming different input fuels. As the energy use profiles of these vehicles will vary significantly, it is valuable to have detailed information to allow you to categorise your fleet, including the vehicle numbers in each category.

It may also be useful to monitor number of trailers in use and to categorise these as applicable. For example, the categories could be:

- single-decked trailers up to 4.3m;
- single-decked trailers over 4.3m; and
- multi-decked trailers (all heights).

You may also wish to consider monitoring your fleet's fuel usage by using telematics systems. Fleet telematics systems use global positioning system (GPS) transmitters in each vehicle to collate information about a vehicle's position at any given time. The collated information is often then presented to the user using software program installed onto a computer (e.g. within the head office). Telematics systems can provide real-time data on the fuel consumption and routing/scheduling of your fleet, helping to identify fuel saving opportunities linked to better routing / scheduling and/or improved driver fuel efficiency performance. Real-time, actual data may be more useful in identifying fuel saving opportunities.

Other potential considerations for determining freight transport data for an ESOS Assessment and ESOS Energy Audit

Vehicle operations and maintenance:

- the structure of your distribution network;
- routing and scheduling planning;
- vehicle records and maintenance schedules; and
- the criteria for fleet renewal.

Data collation, flow and checking:

- what system is in place for recording total fuel quantity purchased for the fleet?
- how do you ensure that data from each depot is collected?
- what checks are in place to ensure the accuracy of the data?

7.2.1 Participation in existing freight transport energy management schemes

Businesses which have undertaken Green Fleet review, or which are part of another transport focussed energy management scheme, such as the Freight Transport Association's Logistics Carbon Reduction Scheme (LCRS) will be able to use those activities to support ESOS compliance, where they are undertaken in a way which meets the minimum requirements of an ESOS Energy Audit.

7.3 International shipping and aviation

If your organisation is supplied with any fuel for international aviation/international shipping, you are required to include energy use for all journeys that start and/or end in the UK in your assessment of your total energy consumption (i.e. covering all flights / shipping movements to/from the UK, irrespective of whether the fuel has been supplied to you in the UK or overseas).

You can choose to include energy consumption associated with journeys that do not start/end in the UK. However, this is at your discretion and goes above the minimum requirements of ESOS. The Government has permitted flexibility in this area as it recognises that it may be administratively simpler for some participants to include all journeys rather than having to include only those that start and/or end in the UK.

If you choose to include in ESOS the energy use of additional journeys you must use this total energy consumption to determine your areas of significant energy consumption (at least 90% of the total) and areas of energy use that can be allocated to the *de minimis* (no more than 10% of the total).

7.4 International road and rail

If your organisation is supplied with any fuel for international road and rail transportation, you are required to include energy use for that proportion of any journey taking place within the UK in your assessment of your total energy consumption (irrespective of whether the fuel has been supplied to you in the UK or overseas).

You can choose to include energy consumption associated with the proportion of international journeys taking place outside the UK and journeys that take place wholly outside the UK. However, this is at your discretion and goes above the minimum requirements of ESOS.

If you choose to include in ESOS the energy use of additional journeys you must use this total energy consumption to determine your areas of significant energy consumption (at least 90% of the total) and areas of energy use that can be allocated to the *de minimis* (no more than 10% of the total).

7.5 Company cars

The energy (fuel/electricity) consumption of vehicles owned or leased by the participant will be within the scope of ESOS. Specifically, it is the fuel/electricity usage which is paid for by the company and consumed in undertaking company business that is in scope.

Fuel/electricity consumption associated with the personal use of company-owned cars is not considered within scope of ESOS, as the fuel is not being used for company business.

7.6 Grey fleet

The term '*grey fleet*' refers to vehicles not owned by the company, but instead owned by its employees, owners, directors or other persons related to the company; and used in undertaking company business.

The fuel consumption within a participant's grey fleet will be considered within scope of ESOS where the participant makes payment to the vehicle owner in relation to the use of the vehicle on business (e.g. on a pence per mile basis).

This is because this fuel is being used in journeys undertaken on the business of the participant and the participant has an influence over whether and how such journeys are undertaken – e.g. the participant may require that customer visits are done in person rather than via telephone.

If the participant does not make such a payment in relation to the use of the vehicle, then it is considered outside the scope of ESOS. So, for example, the fuel consumption associated with employees commuting to work is not considered within scope of ESOS.

7.7 Commuting

The fuel/energy consumption associated with employees commuting to work is outside the scope of ESOS. This is because the fuel is not being used directly in the business of the organisation.

7.8 Measuring fuel consumption in transportation

When calculating total energy consumption from transport activities, you may make reasonable estimations of the energy consumption based on verifiable data (e.g. expenditure) in cases where you do not have actual usage data (e.g. litres).

For instance, you could use the number of expensed miles multiplied by an average fuel consumption factor to estimate the usage.

Worked example of converting an expensed mileage figure into energy

Expensed mileage can be converted into energy use by applying standard conversion factors, such as those included in the *UK Government conversion factors for Company Reporting*[17].

Below is an example of calculating energy use in kilowatt hours (kWh) from an expensed mileage figure, using some reasonable and permissible assumptions:

Company X needs to determine the energy use associated with employee transport in company cars. Company X is determining its total energy consumption on a net calorific value (net CV) basis i.e. in order to measure it's total energy consumption, Company X is converting all its energy use into net calorific value. N.B. The company could have chosen to measure total energy consumption using a different unit, including gross calorific value, if it so wished.

Available data: The only data that company X has is a total mileage figure of 4,500,000 miles. Company 'X' also knows that all company cars are diesel fuelled.

Step 1: Company X refers to a reputable source of conversion factors, such as the latest *UK Government conversion factors for Company Reporting* and reviews what conversion factors are available for the fuel it is using.

Company X finds the following for diesel:

Emission conversion factors for different types of cars, on the 'Passenger vehicles' sheet:

Assumption: Company X does not keep centralised records of the size or engine capacity of its company cars so it assumes an 'average car' to obtain an emission conversion factor.

The conversion factor is **0.294864008** kg CO_2e per mile for an average car.

Emission conversion factors for diesel, on the 'Fuels' sheet in the *UK Government conversion factors for Company Reporting* is **0.26112** kg CO_2e per kWh, on a net CV basis

Energy conversion factor between kWh and GJ, on the 'Conversions' sheet is **277.78** kWh per GJ

Step 2: Company X undertakes the following calculations:

Company X converts the mileage into an emissions figure using an activity-based (mileage) emission conversion factor:

4,500,000 miles x **0.294864008** kg CO_2e per mile = 1,326,888 kg CO_2e;

Company X converts the emissions into energy (in kWh) using a fuel-property emission conversion factor:

1,326,888 kg CO_2e/**0.26112** kg CO_2e per kWh = 5,081,525 kWh; and

Company X has now converted its expensed miles into an energy use figure, using a suitable assumption where information was not available.

NB. If Company X had central records of its fuel consumption in its company cars, and could find an appropriate conversion factor, it could have used this factor to convert fuel use to kWh directly.

As per this worked example, you may wish to refer to the *UK Government conversion factors for Company Reporting* to obtain conversion factors for common fuels used in transport.

[17] UK Government conversion factors for Company Reporting, available to download from http://www.ukconversionfactorscarbonsmart.co.uk/

Where an estimate is not based on verifiable data (e.g. where there is a lack of data for a given transport activity and a benchmark is used), your audit will need to outline a reason for not using verifiable data, and outline the methodology and calculations used for the estimation. These details should be retained within your ESOS Evidence Pack (see Section 6.6.1).

Advice and guidance on transport auditing and energy saving opportunities:

Good practice guidance for freight transport is provided to members of the Freight Transport Association's Logistics Carbon Reduction Scheme (LCRS).

The Energy Saving Trust also provides advice, training and independent reviews of on transport good practice on fuel efficiency.

8 Trust specific considerations

8.1 Qualification of assets held in trust

Assets held in trust will be included in ESOS if the organisation that is party to the agreement for the supply of energy to the assets qualifies for ESOS. The qualification of these parties will be determined in the normal way (see Section 3).

8.2 Who is responsible?

In most cases, it shall be the undertaking that is party to the agreement to supply energy to the asset which shall be responsible for ensuring the compliance of these assets with ESOS.

However, where this organisation is a trustee of the relevant trust, the responsibility to comply with ESOS will fall first to any alternative investment fund manager (AIFM) or operator in relation to the relevant trust, provided they are an undertaking which qualifies for ESOS.

If there is no AIFM or operator in relation to the relevant trust, or the AIFM or operator would not qualify for ESOS, the responsibility shall remain with the trustee.

8.3 Transferring responsibility

Where, under the rules outlined above, responsibility for undertaking the ESOS Assessment lies with either the dominant beneficiary or a trustee of the relevant trust they may agree (in writing) with a third party that this third party will act as the responsible undertaking, and take the lead on the ESOS Assessment of the relevant assets.

The audit recommendations made in such ESOS Assessments should be based on the operational control of the dominant beneficiary or trustee which entered the agreement, rather than the control of the third party over the assets in question (which would be minimal).

8.4 Separate participation

Trustees, operators / AIFMs and third party undertakings (under the rules outlined in Section 8.3) which have a responsibility to undertake an ESOS Assessment in relation to assets held in trust shall participate separately in relation to the trust, themselves and any other trust for which they have ESOS responsibilities.

9 Reporting ESOS Assessments

As an ESOS participant you will need to provide a notification to the Environment Agency, that you have complied with the requirements of ESOS on or before the compliance date of each phase.

9.1 Signing off your Assessments

Before you can submit your notification to the Environment Agency, you will need to have your ESOS Assessment signed off by a director (see definition in the box below) or, if your organisation does not have a director, an equivalent senior manager.

A **director** is any person occupying the position of the director as per Section 250 of the Companies Act. If the participant does not have any directors, then a senior manager may provide this sign-off. A **senior manager** is a person exercising management control in an undertaking.

The requirement for sign-off and notification applies irrespective of the compliance route, or routes, you've chosen in complying with ESOS – i.e. ESOS Energy Audits, Display Energy Certificate (DEC) reports, Green Deal assessments or an ISO50001 certified Energy Management System.

Making a senior representative take responsibility for reviewing whether an organisation has complied with ESOS will help to ensure that senior figures within your organisation or group are fully aware of the compliance requirements as well as highlighting the opportunities for improved energy efficiency to them.

If you are using an in-house Lead Assessor to conduct, oversee, or verify assessments, two directors (or senior managers) are required to sign off that they have seen and considered the ESOS Assessment. This is to provide an additional safeguard as to the independence and quality of the report, given that it is being conducted in-house.

Additional guidance on obtaining sign off for your ESOS Assessment:

The requirement for a board-level director (or, where there is no board-level director, an equivalent senior manager) to sign off the results of your ESOS Assessment(s) provides an opportunity to present the cost-effective and practicable energy saving measures to individuals at board level within your organisation or group.

If you opt to comply with the requirements of ESOS through multiple compliance routes or a number of ESOS Energy Audits, you may wish to consider summarising the key findings into a single board friendly report. An example form is provided in Annex III.

Within such a report you may wish to highlight:

- a summary of the assessment(s) undertaken and their coverage;
- a prioritised list of energy saving measures identified across all assessments;
- estimated total identified energy savings (kWh);
- estimated total identified cost savings (£); and
- other recommendations and considerations.

9.2 Confirming compliance with the Environment Agency

As an ESOS participant you will need to submit a formal notification to the Environment Agency on or before the compliance date stating that you have met the requirements of ESOS in that compliance period.

You will be required to submit this notification to the Environment Agency through an online notification system. This system will become operational in 2015, and details will be published on the ESOS website: https://www.gov.uk/energy-savings-opportunity-scheme-esosWhen you submit your notification of compliance to the Environment Agency, you will need to include some basic details about your compliance. These details are required to allow the Environment Agency to follow up with participants and to allow the Scheme Regulators to check compliance and, if necessary, undertake enforcement activities.

9.2.1 Notification details

As part of your notification you will need to include the following basic details:

1. Information on the participant
2. Information on any aggregation or disaggregation that has taken place.
3. Information on the lead auditor
4. Information on the ESOS Assessment

Information on the participant

As part of your notification you will need to include the following details:

- Organisation name/name of highest parent (for groups) (and trading name if different);
- The company registration number of the highest parent (if applicable);
- The registered office address (or place of principal activity if no registered office exists);
- The name and contact details of at least two persons, one of which should be the responsible officer.
- Where the participant is a group of undertakings, the number of undertakings making up the participant
- Details of the director(s) who has reviewed the recommendations of the ESOS Assessment on behalf of the participant, including:
    - name of Director(s)/senior manager(s);
    - full title(s);
    - contact details (telephone and email address); and
    - the date the directors(s)/senior manager(s) signed off the ESOS Assessment.

Information on any aggregation/disaggregation

Where highest parent groups have aggregated or subsidiaries of a highest parent have disaggregated for the purposes of compliance, you will also need to provide the names of the organisations that have been disaggregated, and/or details of the other highest parent groups with which you have aggregated.

Information on the Lead Assessor

You will need to provide details on the Lead Assessor used to conduct, oversee, or approve the ESOS Assessment. This is to assist the scheme compliance bodies in ensuring that the participant has used a qualified Lead Assessor to conduct their ESOS Assessment.

You will need to provide the following information:

- the name of the Lead Assessor; and
- the approved professional body with which the Lead Assessor is registered.

Information on the ESOS Assessment

You will also need to provide simple details on the ESOS Assessment undertaken in the compliance period and its results.

The participant will be required to notify the scheme administrator of:

- The route(s) taken to comply with ESOS (i.e. any use of ISO 50001, Green Deal Assessments and Display Energy Certificates alongside standard ESOS audits);
- Confirmation that these routes collectively cover all areas of significant energy consumption
- Any instances where you were not able to use 12-months verifiable data for the purpose of measuring total energy consumption or to inform the ESOS Energy Audit.
- Any case where an energy audit does not include analysis based on energy consumption profiles.

9.2.2 Other mandatory communications with the compliance bodies

As an ESOS participant you are required to notify the relevant scheme compliance body of a breach in compliance as soon as you become aware of it.

9.3 Voluntary reporting

ESOS will only mandate the notification of basic information, as outlined in Section 9.2, which will support the compliance bodies in ensuring compliance.

However, the Environment Agency as Scheme Administrator will ask ESOS participants to disclose additional information voluntarily.

The voluntary questions are outlined below:

1. (a) Does your organisation have a quantitative energy efficiency target and/or benchmarks?

   (b) If your organisation does have a quantitative target and/or benchmarks, can you disclose a key target / benchmark?

   (c) If your organisation does not have a quantitative target and/or benchmarks, will you adopt any such measures in light of your ESOS audit?

2. (a) Has the Board of Directors of your organisation discussed the results of your ESOS Assessment?

   (b) Has senior management of your organisation discussed the results of your ESOS Assessment?

3. (a) Have you published any information relating to your ESOS audit report? (e.g. key findings, or key actions taken in light of the ESOS Assessment)

   (b) If you have published any information on-line, please provide a link to the web page where this information is available

The Environment Agency will publish a list of participants, together with any of the voluntary information provided. This is intended to increase the profile of action taken by scheme participants on energy efficiency and to publicise the leadership exhibited by those participants that choose to disclose voluntarily.

Why provide additional voluntary information when reporting?

The Government is aware that many organisations already voluntarily publish a greater level of detail regarding their targets, actions and performance on energy efficiency. As such, for organisations already or wishing to undertake a greater level of public disclosure, the results of an ESOS Assessment may help to supplement and improve the quality of the information given to interested stakeholders and may identify new energy saving opportunities for the organisation.

Such organisations may wish to consider voluntary disclosure of:

- a summary report of the ESOS Assessment findings and recommendations;
- a plan of actions you will take in response to the ESOS Assessment findings/recommendations; and
- selected ESOS Assessment information within their annual report(s).

10 Implementing audit recommendations

ESOS is intended to provide high quality and targeted advice to large enterprises on cost-effective energy efficiency opportunities, which will ultimately lead to financial savings.

Participants who invest more time and effort in their ESOS audits are more likely to identify further financial savings as a result of reduced energy consumption.

Optimising energy use leads to improved profitability and increased competitiveness. It also constitutes an integral part of the UK's climate change mitigation effort, as demonstrated by the CCA scheme, the CRC Energy Efficiency scheme and the EU ETS. There is significant potential to decrease energy consumption across all sectors, and yet opportunities to improve energy efficiency are often under-exploited.[18]

DECC estimates that ESOS could realise £1.6bn net present value of benefits to the UK, with the vast majority of these being directly felt by businesses in the form of reduced energy bills.[19] This benefit would be realised if participants in ESOS reduced their energy consumption by an average of 0.7%.

This would also lead to energy savings of around 3TWh per year – that's enough energy to power nearly 160,000 households for a year.[20]

We expect the average cost/benefit per ESOS participant to vary significantly, given the different sizes of organisations and different levels of maturity of their approaches to energy management. That said, the average cost per participant is estimated at around £6,600 (this is the cost of an audit required in each 4-year cycle). The average bill saving per enterprise – which is subject to the same caveats as above – is estimated at around £35,400 from the initial audit.

However, businesses and the UK as a whole will only realise this benefit (which more than offsets the cost of complying with ESOS) if they implement the cost-effective recommendations identified in ESOS audits and engage with their auditor to ensure that they have access to the information and staff they need to develop meaningful recommendations.

10.1 Moving from recommendations to implementation

10.1.1 Board level engagement

Large investment projects may require authorisation from your board of directors. In addition, your ESOS Assessment will need to be signed off by a Director. Therefore, engaging with them at the most appropriate time and presenting the correct data are important to ensuring projects are authorised. To enable this, it is important that your cost-appraisal methodology can stand up to financial scrutiny, is consistent and not biased.

ESOS audits will identify cost-effective recommendations, including the pay-back period for proposed measures. Your board-level director, or equivalent senior manager, will be responsible for reviewing these findings as part of the ESOS compliance process.

For organisations which do not already do so as a matter of routine, this provides a key opportunity to engage with board-level managers on energy expenditure and potential savings.

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[18] Energy Management Programmes for Industry

[19] Central estimate from final policy Impact Assessment calculated as Net Present Value (2015-2030).

[20] Based on average household energy consumption of 19,140 KWh in 2012.

Senior management buy-in is key to establishing a successful energy use reduction programme.

You may wish to propose that your board discuss the findings of the audit to ensure that the whole board is aware of energy expenditure and the potential savings that could be made.

10.1.2 Effectively presenting findings and recommendations

ESOS Assessments will have a greater impact if the findings are presented in an accessible manner for directors (and, potentially, your board) to consider.

To build board engagement when presenting recommendations it will be important to make clear the financial cost of energy and the financial benefits and pay-back periods from investing in energy efficiency recommendations. A potential template for presenting findings is included at Annex III to this guidance.

10.1.3 Overcoming potential barriers to implementation

In addition to securing financing for investment in energy efficiency opportunities, a range of potential barriers to implementation of recommendations can exist within organisations:

- **Split financial incentives** – in larger organisations, the team which is responsible for paying utilities bills may not be responsible for selecting and replacing plant or other equipment. It is valuable to ensure that investment decisions and equipment replacement/maintenance decisions consider the full cost to the organisation. One option that a number of organisations are increasingly adopting is ensuring that energy budgets are appropriately delegated.

- **Undervaluing energy efficiency opportunities** – it may be helpful to present financial savings that can arise from energy efficiency in terms familiar to the board – such as equivalents in increases in turnover. Your energy audits should also ensure that all potential costs and benefits of recommendations are captured (e.g. reduced tax liabilities reduced waste, and greater energy security and reduced exposure to future price shifts).

- **Lack of access to trusted information** –ESOS is intended to overcome this barrier by ensuring that audits are undertaken or approved by a suitably qualified Lead Assessor. To get the best for your organisation, you will need to ensure that the Lead Assessor has the right technical skills for your sector too. (See Section 5.1).

10.2 Government support for implementing energy saving opportunities

The implementation of energy saving measures will be case and organisation specific. However, there are many sources of information and financial support available to organisations looking to implement energy saving measures.

Sources of financial support for implementing audit recommendations

The following list outlines some sources of Government financial support to help cover the cost of implementing audit recommendations.

Enhanced Capital Allowances (ECAs)

ECAs provide businesses with enhanced tax relief for investments in equipment that meets published energy-saving criteria.

ECA information: www.gov.uk/government/policies/reducing-demand-for-energy-from-industry-businesses-and-the-public-sector--2/supporting-pages/enhanced-capital-allowances-ecas

Energy Technology List under the ECA scheme: https://etl.decc.gov.uk/etl/site.html

Quality Assurance for Combined Heat and Power (CHPQA)

CHPQA certification allows CHP operators to claim Climate Change Levy (CCL) exemption on fuel inputs to and power outputs from its CHP Scheme(s).

http://chpqa.decc.gov.uk/

Office for Low Emission Vehicles, Plug-in Car/Van Grant

You can get a grant towards the cost of each new electric (plug-in) car or van you buy, if it meets certain conditions.

Website: https://www.gov.uk/plug-in-car-van-grants/overview

Green Fleet Reviews

Energy Saving Trust provide free transport audits, supported by the Department for Transport for certain company vehicle fleets.

http://www.energysavingtrust.org.uk/Organisations/Transport/Products-and-services/Fleet-advice/Green-Fleet-Consultancy

Electricity Demand Reduction pilot

The Government is currently piloting an Electricity Demand Reduction scheme to provide financial incentives to encourage businesses to make electricity energy efficiencies.

https://www.gov.uk/government/policies/reducing-demand-for-energy-from-industry-businesses-and-the-public-sector--2/supporting-pages/electricity-demand-reduction-project

Renewable Heat Incentive

A Government scheme, delivered by Ofgem, to provide financial support for the installation and use of renewable heating systems in business and homes.

https://www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies/supporting-pages/renewable-heat-incentive-rhi

10.2.1 Energy Performance Contracting

Energy Performance Contracting is a way for organisations to reduce the cost of investing in energy efficiency measures and mitigate the risk that can arise from uncertainty about benefits that will be realised. Energy Performance Contracts are typically delivered by Energy Service Companies (ESCOs)

An ESCO typically conducts an energy audit for a client and then identifies and implements energy efficiency opportunities and guarantees that these will be self-funding through energy savings generated. In the event that the savings are not realised, the ESCO will generally make up the difference. The ESCO will realise any energy savings for the duration of the contract, with the client receiving any benefits once the contract ends.

To build business confidence in the ESCO model for energy performance contracting, Government are currently developing a model Energy Performance Contract, guidance for using this contract, and guidance on energy performance contracting, which will be published in summer 2014.

11 Penalties, enforcement, appeals

11.1 Enforcement and penalties

The scheme compliance bodies will have the authority to apply civil penalties against an organisation/group found to be required to participate in ESOS and found to be non-compliant with its requirements.

- **For all non-compliances**, the compliance bodies will have the power to publish information on non-compliance on their website such that this information is available to the public. This will include:
  - the name of the ESOS participant;
  - details of the failure in respect of which a civil penalty has been imposed; and
  - the penalty amount.
- For **failure to notify the Scheme Administrator** of compliance by the required date and/or failure to provide basic details as part of notification, there will be a fixed penalty and an additional penalty for each day of non-compliance. This is in order to encourage compliance as soon as possible. For failure to do so, the compliance bodies may impose some or all of the penalties outlined below:
  - a fixed penalty of up to £5,000; and/or
  - an additional £500 for each day starting on the day after the date of compliance until the notification is completed, subject to a maximum of 80 days; and/or
  - publication of details of non-compliance by the compliance bodies.
- For **failure to maintain adequate records to demonstrate compliance** with ESOS the penalty which can be applied is:
  - a fixed penalty of up to £5,000; and/or
  - the cost to the compliance body for undertaking sufficient auditing activity to confirm that an organisation has complied with ESOS; and/or
  - publication of details of non-compliance.
- For **failure to undertake an ESOS Assessment** there will be a discretionary penalty allowing the compliance body to require the participant to take a number of steps toward compliance and a fixed monetary penalty. Failure to comply with any aspect of an ESOS Assessment (not using sufficient data, not using a Lead Assessor etc.) would be considered failure to comply. Where non-compliance is explained under 'comply or explain' provisions then the compliance body will consider whether the justification given is reasonable before determining whether to impose a penalty. The penalty is:
  - a requirement to conduct an ESOS Assessment by a date specified by the compliance body; and/or
  - a penalty of up to £50,000; and/or
  - an additional £500 per day penalty for each day starting on the day after the compliance date that the organisation remains non-compliant, subject to a maximum of 80 days; and/or
  - publication of details of non-compliance.

- **Failure to comply with an enforcement, compliance or penalty notice** will incur a fixed penalty and an additional penalty for each day of non-compliance. This in order to encourage compliance as soon as possible. The penalties are:
  - a fixed penalty of up to £5,000; and/or
  - an additional £500 for each day starting on the day after the date of compliance until the notification is completed, subject to a maximum of 80 days; and/or
  - publication of details of non-compliance.
- For **making a statement which is false and misleading** there will be a monetary penalty that is flexible enough to take account of the nature of the misdemeanour and large enough that it can act as a deterrent to this offence. The penalty is:
  - a monetary penalty of up to £50,000; and
  - publication of details of non-compliance.

The compliance bodies will be able to pursue corrective action and will also have the power to reduce and waive penalties after issuing them to participants.

11.2 Appeals

Participants will be able to appeal enforcement actions undertaken by the compliance bodies. Participants have the right to appeal any determination, enforcement notice or penalty notice that is based on an error of fact; wrong in law; or unreasonable.

For enforcement activity conducted on participants registered in England and Wales, participants can appeal to the First-tier Tribunal. Participants registered in Scotland can appeal to the Scottish Ministers, and participants in Northern Ireland can appeal to the Planning Appeals Commission.

To find out more information on appeals, you can contact your relevant compliance body.

12 ESOS and other climate change policies

Your organisation or group might be part of other energy efficiency schemes, such as the CRC Energy Efficiency Scheme (CRC), which may mean that you can save time and effort by using some of the information gathered under these schemes for an ESOS Assessment.

Other UK climate change policies also require organisations to measure and manage energy consumption accurately. These include the CRC Energy Efficiency Scheme (CRC), Climate Change Agreements (CCA), EU Emissions Trading System (EU ETS) and mandatory company reporting. However, the eligibility requirements and scope of energy and emission reporting varies across these mechanisms. ESOS is different in placing a greater emphasis on the identification of energy saving opportunities.

The requirements of ESOS have been designed to align, as far as is possible, with those of other schemes. For example, if you are a participant in other schemes, then you will already be gathering energy data and you are encouraged to draw on this to comply with ESOS. This will avoid the duplication of compliance efforts and reduce your administrative costs.

To assist with this, ESOS allows participants flexibility in when they set their reference period, the window in which they measure their energy use.

The following sections describe how you can use data reporting under existing systems to support your ESOS compliance.

CRC Energy Efficiency Scheme

The CRC seeks to improve energy efficiency in large non-energy intensive public and private sector bodies. The focus for CRC, like ESOS, is on the whole enterprise or group.

CRC requirements include the annual reporting (for the period 1st April to 31st March) of electricity and gas consumption across the entire participant organisation. ESOS participants will be allowed to align data collection to the CRC timetable. So, if you are in the CRC, this means that you can use electricity and natural gas data collected to comply with the CRC scheme to support your ESOS Assessments (e.g. you could align your chosen reference period under ESOS with the CRC reporting year of April to March).

You need to ensure that you have in place processes to collect the additional data that you may need for ESOS Assessments that isn't included in CRC – including but not limited to:

- combustion of other gaseous, liquid and solid fuels and wastes;
- fuel usage in transport; and
- imported heat.

CCA

CCAs are voluntary agreements that provide discounts on the Climate Change Levy (CCL) to a number of sectors. The scheme is primarily aimed at energy-intensive sectors, requiring participants to meet energy reduction targets and report their energy consumption against targets set for a reporting period.

If you have a CCA then you can use the CCA milestone data as a part of the ESOS Assessment. Furthermore, to meet your targets, you may have undertaken energy audits as part of your participation in the CCA scheme. The results and recommendations of such an audit(s) could feed into ESOS. It may also count as an ESOS compliant energy audit, provided it was conducted, verified or reviewed by a qualified Lead Assessor and meets the minimum standards set by ESOS.

The CCA scheme requires reporting on the combustion of any fuel and consumption of electricity within an eligible industrial process at a facility.

The CCA scheme operates on a facility basis. So, in complying with the requirements of ESOS, you will need to extend your data management processes to cover any additional on-site energy use and sites that are not part of the CCA target unit.[21]

EU ETS

The EU ETS requires the measurement and reporting of direct emissions from eligible installations on an annual basis with a calendar year monitoring, reporting and verification cycle. ESOS will allow participants to align their data measurement period with that of the EU ETS; therefore, data reported under EU ETS could be used. For ESOS Assessments you would need to consider data collection processes for other sites and activities not included in EU ETS and also for the inclusion of electricity.

Environmental reporting

The geographical scope of environmental reporting, including mandatory greenhouse gas (GHG) emission reporting, is much wider than ESOS and it requires energy to be accounted for internationally. However, mandatory GHG reporting is likely to include a lot of the energy data required for an ESOS Assessment, including energy usage in buildings, industrial processes and transport.

Industrial Emissions Directive /Environmental Permitting Regulations

The Industrial Emissions Directive (IED) requires all prescribed installations to apply best available techniques for energy efficiency and to be operated in an energy efficient manner. Permits issued under the Environmental Permitting Regulations (EPR) deliver these IED requirements and also include a requirement to provide information on energy consumed or generated by the activities falling within the permit.

Information collated as part of compliance with an EPR permit may, in part, be useful in the development of energy data for an ESOS reference period. Horizontal and sector-specific EPR guidance from UK regulators outlines how to comply with the energy efficiency requirements in the environmental permits. This guidance outlines the specific sources of energy consumption and generation required to be covered in the permit.

Voluntary schemes

A number of ESOS participants will already participate in voluntary mechanisms such as the Carbon Trust Standard and the Carbon Disclosure Project. As such, they are likely to already have gathered a lot of the energy data required, and often have the advantage of data having already been audited.

[21] A CCA 'target unit' is a facility, or group of facilities, subject to a CCA scheme energy reduction target

13 Further information and support sources

Further details about ESOS can be found at https://www.gov.uk/energy-savings-opportunity-scheme-esosA helpdesk to support companies to comply with ESOS is available by emailing esos@environment-agency.gov.uk.

Scheme administrator and compliance bodies

UK and England: Environment Agency

See pages: https://www.gov.uk/government/organisations/environment-agency

Wales: Natural Resources Wales

www.naturalresourceswales.gov.uk

Scotland: Scottish Environment Protection Agency

www.sepa.org.uk

Northern Ireland: Northern Ireland Environment Agency

www.doeni.gov.uk

Offshore: Department of Energy and Climate Change

https://www.gov.uk/oil-and-gas-uk-oil-portal

Other source of information

Although by no means an exhaustive list, you may also find useful information from the following sources:

British Standards Institute (BSI)

Website: www.bsigroup.co.uk

ISO 50001 case studies: http://shop.bsigroup.com/Browse-By-Subject/Energy-Management/BS-ISO-50001-case-studies

Carbon Trust

Low carbon guides and carbon reduction advice http://www.carbontrust.com/resources/guides

Climate Change Agreement guidance on benchmarking:

https://www.gov.uk/government/publications/climate-change-agreements-draft-target-setting-for-new-entrants

Department for Transport

'Guidance on measuring and reporting Greenhouse Gas (GHG) emissions from freight transport operations' Available here:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/218574/ghg-freight-guide.pdf

Energy Saving Trust

Website: www.energysavingtrust.org.uk

Transport specific guidance and advice:
http://www.energysavingtrust.org.uk/Organisations/Transport/Products-and-services

Freight Transport Association (FTA)

Logistics Carbon Reduction Scheme (LCRS):
http://www.fta.co.uk/policy_and_compliance/environment/logistics_carbon_reduction_scheme/index.html

Resource Efficient Scotland (for participants in Scotland)

Website: http://www.resourceefficientscotland.com/

14 Case studies

14.1 Camfil – ISO 50001 Energy Management System implementation

Camfil develop air filters and clean air solutions, and operate globally. Already certified to the ISO 14001 environmental management standard, EN 16001 and the BSI Kitemark in Energy Reduction Verification, in 2011 Camfil decided to certify to ISO 50001.

Camfil has put energy management at the heart of its business model. It has initiated an energy reduction programme, the Camfil Energy Awareness Saves Environment (CEASE), and its key objective is to educate property and building managers about the financial and energy saving opportunities that can be made by replacing existing air filters with low energy air filters.

The introduction of ISO 50001, alongside its existing energy management processes, led to Camfil looking at its energy use in more detail and a focus on continual improvement of energy performance. This meant that previously unmonitored areas of energy use were identified and energy savings achieved that would otherwise have been overlooked.

Results:

As a result of the energy management steps that Camfil has taken, significant reductions in energy usage and improvements in energy efficiency have been achieved. These improvements resulted in Camfil saving over £200,000 on energy bills through minimal cost, self-funding opportunities.

14.2 npower

Energy company npower has put in place a number of measures in order to maximise energy efficiency across many of its own sites, from offices to depots. At the end of last year the company was successful in reducing their carbon intensity by 41.6%, compared to 2008 levels. They have also achieved significant cost savings for the business, reducing costs by £740,000 in a year.

npower has used a measure, monitor, minimise (m^3) strategy to embark on an energy-saving programme.

By installing smart meters across both electricity and gas the company measured where and when energy was being used at its premises every half hour, identified opportunities to lower energy use and created individual site-specific plans. npower has also invested in renewable energy, installing wind turbines and solar panels at a number of its offices and sites. npower has maximised the sustainability of its office refurbishments by adopting the Royal Institute of Chartered Surveyors' SKA rating of environmental assessment.

This has already resulted in some impressive savings for npower. At one office in the West Midlands, the company saw electricity consumption fall by 40% using solar panels, energy efficient lighting and new cooling and heating systems.

As a result of their focus on energy efficiency last year npower received ISO 50001 accreditation for their energy management across their offices and continues to hold the Carbon Trust Standard.

Jonathan Hulbert, Energy Manager at npower said:

"We remain focused on delivering further measurable improvements in energy efficiency. To ensure continual improvement and to keep our savings on track we plan to further embed the systematic approach we adopted for ISO 50001. This will not only reinforce good practice and maintain motivation but also ensure that we continue to lead the way on energy management excellence."

14.3 Bibby Distribution Ltd

'***Bibby Distribution is a family-owned logistics company providing supply chain, warehousing, transport/international freight services and cost effective IT solutions from many sites throughout the UK*'.**

The Utility Forum (www.theutilityforum.co.uk)) have managed the purchase and use of energy at all of Bibby's premises for many years. It was noted that at the company's site in Stoke Meir the electricity load factor was very high in relation to the activities taking place on site. A heat map showed very high 24/7 use.

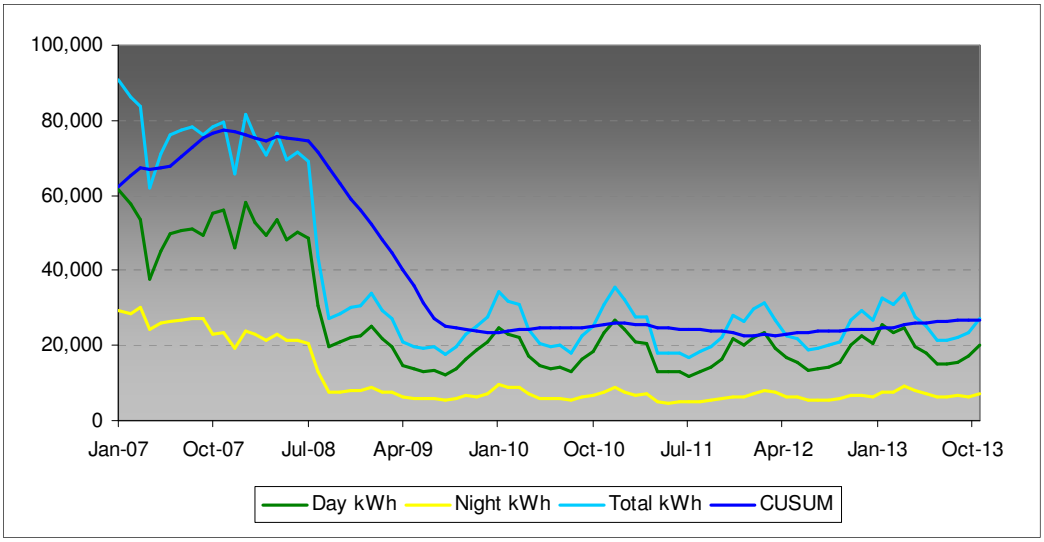
A physical audit of the site identified warehouse lighting to be the major use of electricity. There was little control of use at night when activity was low and no possibility of having automatic sensing in the aisles because the existing 400 watt SON lights took too long to re-strike, which would have caused Health and Safety issues. A business case was put to the Board of Directors' to replace the existing lighting with PL fittings (4 x 2ft T5 lamps) with built in presence sensing.

This reduced the capacity per lamp from 470watts to 220watts and enabled the lighting to be automatically controlled for non-occupancy at night and in empty aisles throughout the day. Because the lux per watt was to be increased, it was also possible to reduce the total number of fittings at the site.

Bibby's £70,000 investment was recovered in a little over twelve months.

The project implementation caused little disruption to the site and the resulting improved lighting levels increased staff morale.

The graph below shows electricity consumption for the site pre and post project.



15 Glossary

Aggregation – Where organisations choose to group together for the purposes of compliance.

Areas of significant energy consumption – Energy consuming activities/assets that consume at least 90% of the participant's total energy consumption in the **reference period**.

Approval body - An organisation which manages one or more **approved registers**

Approved register - A register of individuals which has been approved by the Scheme Administrator as demonstrating that registered individuals are competent to act as **Lead Assessors.**

CCA – Climate Change Agreements

Company cars - Road vehicles that are owned or leased/rented by the **undertaking** for the use of staff in the business of the undertaking but are also available for personal use.

Company fleet - Road vehicles that are owned or leased/rented by the **undertaking** for the use of staff in the business of the undertaking.

Compliance date - The deadline by which participants must notify the Scheme Administrator that they have complied with ESOS. This is: 5th December 2015 (phase 1), 5th December 2019 (phase 2), 5th December 2023 (phase 3), and every 4 years thereafter.

Compliance period - The period in which participants may conduct an ESOS Assessment. This is 6th December 2011 to 5th December 2015 (phase 1), 6th December 2015 to 5th December 2019 (phase 2), etc.

CRC – the CRC Energy Efficiency Scheme

DECs – Display Energy Certificates

De minimis – The proportion of an organisation's total energy consumption (measured as energy units used or energy expenditure) for which audits are not required. This is to allow participants to focus on areas of significant energy use.

The Directive – The EU Energy Efficiency Directive 2012/27/EU.[22] Article 8 of this Directive relates to energy audits, while Article 8(4) is the major basis for the ESOS policy.

Disaggregation – Where organisations (a highest parent and its subsidiary organisations) choose to separate for the purposes of compliance.

ESOS – The Energy Savings Opportunity Scheme.

ESOS Assessment – Includes all activities required to ensure compliance including the measurement of total energy use; the calculation of the *de minimis* and identification of areas of significant energy consumption; the ESOS Audits undertaken; and any use of alternative routes to compliance.

ESOS Audit – An energy efficiency audit meeting the minimum requirements of the ESOS scheme.

Evidence Pack – An organisation's record of their ESOS Assessment, including justifications for any deviations from scheme requirements.

Financial year – The 12 month period for which an organisation prepares its financial statements and annual report.

Fixed monetary penalty - A fixed sum of money due by a specific date

[22] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:315:0001:0056:EN:PDF

Franchisee – An organisation which has purchased the right to use another company's trademarked name in order to do business.

Franchisor – A company which owns its trademarks and overall rights and from whom other organisations purchase the right to use these trademarks and rights.

Grey fleet - Road vehicles that are owned or leased/rented by the staff of the undertaking but are used in the business of the undertaking.

Highest parent – An organisation that does not have a parent organisation that is captured by the scheme.

Individual accounts – As defined by paragraph 396 of the Companies Act 2006. As per paragraph 396(1):

Companies Act individual accounts must comprise—
(a) a balance sheet as at the last day of the financial year, and
(b) a profit and loss account.

Large undertaking - An undertaking which:

- Has 250 or more employees; or
- Has fewer than 250 employees, but has an annual turnover exceeding 50 million euros **and** a balance sheet exceeding 43 million euros.

Lead Assessor – A person included on an approved register held by a professional body.

Life cycle cost analysis – A way to demonstrate an investment will be economical over its entire life by accounting for all the costs that could reasonably be incurred over the period, including in manufacture/installation and disposal. For instance, this would include maintenance and depreciation costs.

Public body – Any organisation that is required to comply with public contracting regulations in force in the UK, as either a contracting authority or as an organisation which receives a majority of its funding from public sources.

Qualification date – The date on which organisations must determine whether they qualify for the scheme in that phase. The qualification date shall be 31st December 2014 and every four years thereafter.

Reference period - The period of time for which undertakings must measure their total energy consumption in order to identify their 'areas of significant energy consumption' that they are required to assess.

The reference period must:

a. Comprise of a period of 12 consecutive months;
b. Begin less than 12 months before the qualification date (in the first compliance period, this means the reference period can begin no earlier than 1st January 2014 and every 4 years thereafter; and
c. End by the compliance date

Simple Payback Period assessment - The period of time required for the financial savings from reduced energy usage to equal the amount of the investment in an energy saving measure.

SME undertaking – An small to medium undertaking which:

- Has fewer than 250 employees; **and**
- Has an annual turnover below 50 million euro or a balance sheet below 43 million euro (or both).

- Note that an SME undertaking may be required to participate in ESOS if it is part of a corporate group which has at least one UK large undertaking.

Staff – This shall include the employees, owner-managers and partners of an organisation. This includes all contracted staff, owner managers and partners employed directly by the undertaking in the UK or abroad. Companies do not have to include employees of subsidiaries or other group undertakings based overseas.

Total assets – The value included in the top half of an organisation's balance sheet, or equivalent.

Turnover – Money generated by an organisation's business activities.

Undertaking – As defined by paragraph 1161 of the Companies Act 2006:

In the Companies Acts "undertaking" means— (a) a body corporate or partnership, or (b) an unincorporated association carrying on a trade or business, with or without a view to profit.

UK organisation – An undertaking which exists in the UK and which may qualify for ESOS, if it meets the qualification requirements.

Verifiable data - Data that can be proven and traced to a particular and objective source – e.g. a meter reading.

Annex I

Fuel property figures for commonly used fuels, as taken from the 2013 UK Government conversion factors for Company Reporting.

Note: These figures are provided for information purposes only. Please use the most recent version of these factors available at http://www.ukconversionfactorscarbonsmart.co.uk

		Net CV	Gross CV	Density	Density	Net CV	Gross CV
		GJ/tonne	GJ/tonne	kg/m^3	litres/tonne	kWh/kg	kWh/kg
Commonly Used Fossil Fuels	Aviation Spirit	45.10	47.40	708.72	1,411.00	12.53	13.17
	Aviation Turbine Fuel	43.90	46.20	798.72	1,252.00	12.19	12.83
	Burning Oil	44.10	46.40	801.92	1,247.00	12.25	12.89
	Coal (domestic)	28.70	30.20	850.00	1,176.47	7.97	8.39
	Coal (electricity generation)	24.00	25.20			6.67	7.00
	Coal (industrial)	25.60	26.90			7.11	7.47
	Coking Coal	30.40	32.00			8.44	8.89
	Diesel	42.90	45.70	837.52	1,194.00	11.92	12.69
	Fuel Oil	40.70	43.30	985.22	1,015.00	11.31	12.03
	Gas Oil	42.70	45.40	856.16	1,168.00	11.86	12.61
	LPG	46.00	49.30	508.18	1,967.80	12.78	13.69
	Naphtha	45.30	47.70	683.06	1,464.00	12.58	13.25
	Natural Gas	47.73	52.96	0.75	1,340,650.98	13.26	14.71
	Petrol	44.70	47.10	734.21	1,362.00	12.42	13.08

		Net CV	Gross CV	Density	Density	Net CV	Gross CV
		GJ/tonne	GJ/tonne	kg/m^3	litres/tonne	kWh/kg	kWh/kg
Other fuels	Biodiesel (ME)	37.20	41.04	890.00	1,124.00	10.33	11.40
	Biodiesel (BtL or HVO)	44.00	46.32	780.00	1,282.00	12.22	12.87
	Bioethanol	26.80	29.25	794.00	1,259.00	7.44	8.13
	BioETBE	36.30	39.62	750.00	1,333.00	10.08	11.01
	Biogas	30.00	33.30	0.96	1,038,840.29	8.33	9.25
	Biomethane	49.00	54.39	0.73	1,376,907.15	13.61	15.11
	CNG	47.73	52.96	175.00	5,714.29	13.26	14.71
	Grasses/Straw	14.50	15.26	160.00	6,250.00	4.03	4.24
	LNG	47.73	52.96	452.49	2,210.00	13.26	14.71
	Wood Chips	14.00	14.74	250.00	4,000.00	3.89	4.09
	Wood Logs	14.70	15.48	425.00	2,352.94	4.08	4.30
	Wood Pellets	17.00	17.90	650.00	1,538.46	4.72	4.97

Annex II

Illustrative Example of Life-Cycle Cost Analysis (LCCA) for a programme of boiler replacements over a 10-year expected lifetime.

LCCA Example 1

During an ESOS audit a measure to improve boiler efficiency is identified as a potentially economical energy efficiency measure. To decide if the measure is economical, an LCCA should be completed. The calculation below shows that when you cost various components over a 10-year period the present value of these costs is equivalent to just under £17,500. By comparison, the present value of the savings is just over £21,000 over the same period. The calculation shows that this could be a good investment as the present value of the savings is greater than the costs, i.e. the measure has a positive net present value (NPV).

Example: Boiler replacement	Years										
	0	1	2	3	4	5	6	7	8	9	10
Capital cost											
Boiler	6,000										
Ancillary parts	7,000	700		1,750	700		1,750	700		1,750	700
installation	1,300	130		325	130		325	130		325	130
Total Capital Cost	**14,300**	**830**	**-**	**2,075**	**830**	**-**	**2,075**	**830**	**-**	**2,075**	**830**
Utilisation cost											
Fuel cost	29,531	29,531	29,531	29,531	29,531	29,531	29,531	29,531	29,531	29,531	29,531
Tax/Levy	15,947	15,947	15,947	15,947	15,947	15,947	15,947	15,947	15,947	15,947	15,947
Total Utilisation Cost	**45,478**	**45,478**	**45,478**	**45,478**	**45,478**	**45,478**	**45,478**	**45,478**	**45,478**	**45,478**	**45,478**
Maintenance/Other Running costs											

Maintenance	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Loan	1,516	1,614	1,614	1,928	2,074	2,074	2,624	2,918	2,918	5,117	5,997
Depreciation	1,300	1,533	1,533	2,117	2,117	2,117	2,117	2,117	2,117	2,117	2,117
Total Maintenance/other running costs	**5,816**	**6,147**	**6,147**	**7,044**	**7,191**	**7,191**	**7,741**	**8,034**	**8,034**	**10,234**	**11,114**
Counter factual costs											
Fuel cost	33,696	33,696	33,696	33,696	33,696	33,696	33,696	33,696	33,696	33,696	33,696
Tax	18,196	18,196	18,196	18,196	18,196	18,196	18,196	18,196	18,196	18,196	18,196
Maintenance	3,000	3,098	3,098	3,412	3,559	3,559	4,108	4,402	4,402	6,601	7,481
Total Counter factual costs	**54,892**	**54,990**	**54,990**	**55,304**	**55,451**	**55,451**	**56,001**	**56,294**	**56,294**	**58,493**	**59,373**
Net Cash Flow	-	1	2	3	4	5	6	7	8	9	10
Net benefit	- 10,702	2,534	3,364	706	1,951	2,781	706	1,951	2,781	706	1,951
Cash flow	- 10,702	- 8,168	- 4,803	- 4,097	- 2,146	635	1,341	3,293	6,074	6,780	8,731

Net present value	
Discount rate	2.2%
NPV	£6,581
Break even	5 years

Assumptions and figures used in the above LCCA example:

Boiler replacement	Notes
Boiler	200kW @ £30/kW
Ancillary parts	200kW @ £35/kW and then replacement of 10% and 25% value
installation	10% capital cost
Energy Cost	89% boiler efficiency, annual energy use 525MWh charged @ 5p/kWh
Tax/Levy	2.7p/kWh
Maintenance	£15/kW boiler
Loan	All capital paid back in 10-year term @ 6% interest
Depreciation	Initial capital expenditure depreciated linearly over 10 years other ancillary capital expenditure on 3-year cycle
Fuel cost	78% boiler efficiency, annual energy use 525MWh charged @ 5p/kWh
Tax	2.7p/kWh
Maintained	As above except no depreciation and no loan for major capital expenditure
Discount rate	2.2%

Annex III

Example of a reporting form for the presentation of ESOS Assessment findings for director/senior manager sign-off:

ESOS energy assessment report

For (organisation):	*ABC Solutions*
ESOS compliance deadline:	*5th December 2015*
Total organisational energy consumption:	
Total energy consumption assessed (i.e. minimum 90%):	
Total cost-effective energy saving potential identified (in energy):	
Total cost-effective financial saving identified:	

Assessment findings

	Detail of measure identified:	Assessed via:	Applicability:	Identified energy savings:	LCCA or SPP?	Identified cost savings:
Measure 1	*LED lighting*	*ESOS Energy Audit*	*Building 1*	*8,000kWh/yr*	*SPP*	*£1,040*
Measure 2	*Boiler replacement*	*ESOS Energy Audit*	*Manufacturing site 3*	*20,000kWh/yr*	*LCCA*	*£30,000*
Measure 3						

Sign-off

Director/senior manager (1):	
Director/senior manager (2):	

Lead Assessor (Name), for each assessment (as applicable):	*Mr Joe Bloggs*
Lead Assessor (Organisation), for each assessment (as applicable):	*ABC Solutions*

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Department of Energy & Climate Change
3 Whitehall Place
London SW1A 2AW
www.gov.uk/decc
URN 14D/178