Department for
Business, Energy
& Industrial Strategy

RESEARCH ON ENERGY AUDITS AND REPORTING, INCLUDING ESOS

Phase 1 Report

February 2020

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Contents

Executive summary

Key findings from Phase 1

This report has found that:

- Energy audits are generally not widely used by organisations, unless mandated by policy, although some energy intensive firms and others have used such tools voluntarily.
- Similarly, energy and emissions reporting is not widely used by organisations unless mandated by government, exceptions being some use of voluntary external reporting through private carbon reduction schemes as part of wider corporate social responsibility (mainly large organisations) and local government commitments to reporting against voluntary targets (public sector).
- By mandating energy audits among large organisations, ESOS has led to many undertaking such audits and including transport energy for the first time.
- ESOS did not mandate the implementation of recommendations from audits and without this obligation most organisations did not do so. For those who did, implementation was more likely when one or more of the following applied:
    - the recommendations had a payback period of up to three years;
    - if implemented, the recommendations would cause minimal disruption to the business;
    - the audit was 'investment-grade'; and
    - there was senior management buy-in.
- The implementation of Article 8 (4-6) of the Energy Efficiency Directive (EED) in the UK was broadly similar in other EU member states, particularly in terms of eligibility and the lack of mandated implementation of recommendations from audits. However some differences were identified such as templates for audit recommendations and mandating energy efficiency action plans.
- The main barriers to energy efficiency action are when organisations lack:
    - awareness of, and commitment to the energy efficiency opportunity;
    - technical solutions and expertise for understanding and implementing energy efficiency; or
    - financial resources to invest in energy efficiency projects.

  Policies need to target barriers of all three types to achieve energy efficiency improvements.

Background, objectives and methodology

Background

BEIS commissioned this research to inform how to best support greater energy efficiency in buildings and industry, and so support the objective to minimise business energy costs by converting cost-effective energy efficiency potential.[1]

The research focuses on two tools that can encourage improved energy efficiency in organisations:

- **energy audits** whereby the various activities and processes that make up an organisation's energy consumption are audited by a trained assessor, who then makes tailored energy savings recommendations based on the audit; and
- **energy reporting,** which takes two forms: internal reporting of energy use from one part of an organisation to another (for example, different sites or subsidiaries reporting to a head office); and public external reporting in annual reports and/ or directly to government.

In response to Article 8 (4-6) of the EU Energy Efficiency Directive[2] (EED), energy audits are already mandatory for large undertakings[3] in the UK due to the Energy Savings Opportunity Scheme (ESOS), as they are across other Member States through equivalent schemes[4]. This research builds further on an interim process and early impact evaluation of ESOS carried out from 2015 – 2017 by Ipsos MORI and University College London (UCL)[5]. This study will feed into the Post-Implementation Review (PIR) of ESOS.

Objectives

This research seeks to answer four key research questions about energy audits and reporting, and ESOS in particular.

RQ1: Energy audits and reporting: *To what extent, (in which ways and in which contexts) are energy audits and reporting effective in identifying and delivering energy efficiency savings across organisations?*

RQ2: ESOS influence and impact: *To what extent, (in which ways and in which contexts) has ESOS influenced organisational energy efficiency policy and practice? What impact has ESOS had on energy efficiency in organisations?*

RQ3: ESOS lessons for future policy: *What are the lessons learned from implementing ESOS that could feed into future policies?*

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[1] This will be supported by BEIS recent call for evidence on the role of government in overcoming barriers to energy efficiency action

[2] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX%3A32012L0027

[3] Large undertakings refer to those with at least 250 employees, or both a turnover in excess of €50m and a balance sheet total greater than €43m, i.e. non-SMEs according to the EC definition. Many SMEs are also involved in ESOS where they are part of a group with a non-SME.

[4] The Directive requires all qualifying undertakings to carry out an audit of their energy consumption and identify energy saving opportunities by December 2015, and every four years thereafter.

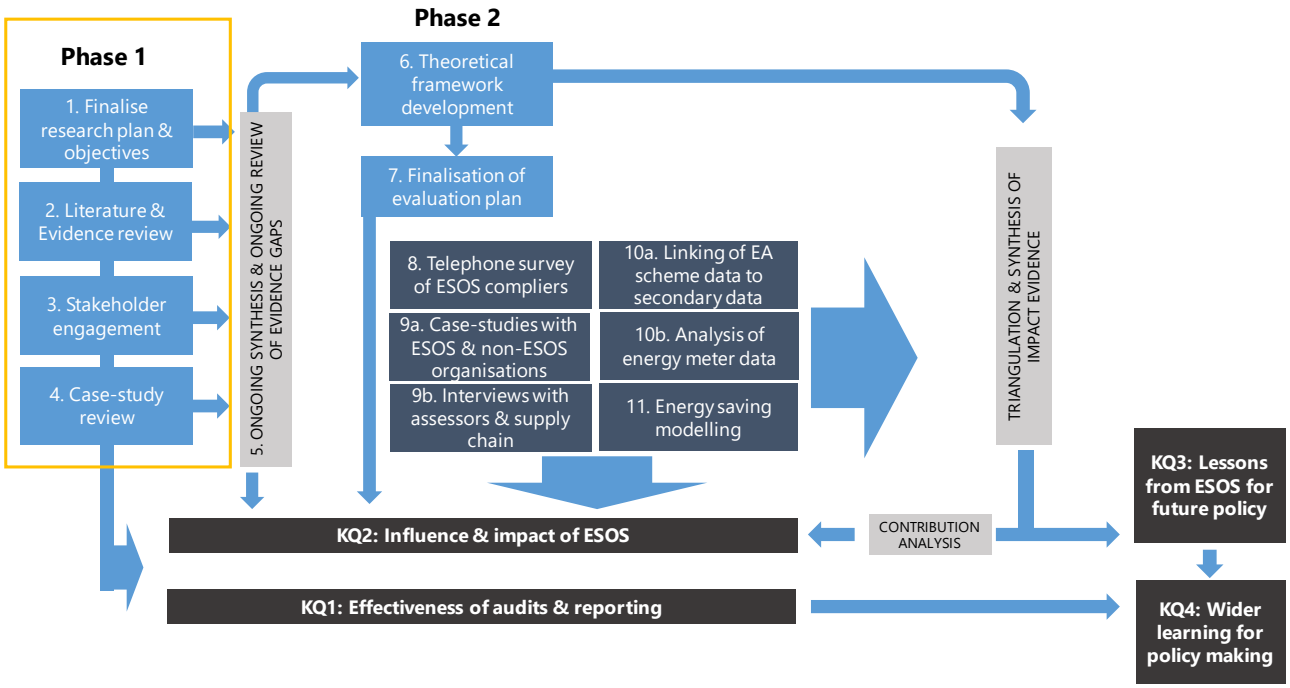
[5] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/650722/Evaluation_of_ESOS_Interim_process_and_early_impact_evaluation_report_FINAL.pdf

RQ4: Wider learning: *What is the wider learning from this research for BEIS policy making?*

Methodology

This study is divided into various workstrands being delivered across two phases, as shown in the diagram below. This report presents the findings from Phase 1. Further detail on the study method, and approach to analysing and synthesising the evidence across workstrands is provided in the Introduction chapter and the annexes to this report.

Figure 1: Phase 1 and Phase 2 evaluation workstrands



Use of audits and reporting in the non-domestic sector

Phase 1 of this research has found that in general, audits and reporting were not widely used by organisations before ESOS, unless there was a legal requirement to do so, such as in complying with the CRC[6] or Mandatory Greenhouse Gas Reporting (MCHG)[7] (this is true internationally, as well as in the UK). This has remained the case since ESOS was introduced.

Energy audits are most likely to be carried out voluntarily:

- if the organisation is highly energy intensive, meaning there is a strong financial driver to be energy efficient. Such organisations tend to have a dedicated energy manager to commission such work, or carry it out themselves.

[6] CRC Energy Efficiency Scheme (formerly the Carbon Reduction Commitment)
[7] For the financial years starting from 1 April 2019, Streamlined Energy and Carbon Reporting (SECR) has replaced MGHG, extending reporting requirements for quoted companies and introducing new ones for large unquoted companies

- for less energy intensive organisations, if the business owner or others within senior leadership positions are 'energy champions'.

Some organisations consulted during Phase 1 reported having investigated energy efficiency internally ahead of carrying out an audit. For the most part, in these organisations, audits were therefore described as having validated existing information or planned projects. Energy audits were found to be much more likely to identify new opportunities in organisations starting from a baseline of very low awareness and understanding of energy efficiency, or when auditing previously unmonitored areas, such as transport.

Audits are more likely to lead to implementation of recommendations the more of the following conditions hold:

- the recommendations have a payback period of up to three years;
- if implemented, the recommendations would cause minimal disruption to the business;
- the audit is 'investment-grade'[8]; and/or,
- there is senior management buy-in to energy efficiency.

The research also suggested recommendations may be more likely to be implemented where there are non-energy related co-benefits such as improving product quality or workplace conditions; however, evidence for this is limited and requires further exploration.

Reporting is also used voluntarily by:

- Large private organisations – where some use of voluntary external reporting (beyond ESOS) takes place through private carbon reduction schemes or as part of charitable commitments.
- Public sector organisations – some reported against voluntary targets e.g. for Mayor of London. Public sector participants also believed that reporting against benchmarks was effective in raising awareness and importance of energy management within an organisation's agenda.
- SMEs did not have mandatory external reporting obligations, although some were part of associations that had some level of voluntary reporting on sustainability, and others reported to their customers in the supply chain.

[8] An investment-grade audit provides detailed information of the potential energy savings and payback periods from recommended measures such that an accurate estimate of return on investment can be made. As such, an investment-grade audit will include operating hours analysis, an inventory of all energy consuming equipment, energy rates and cost figures for all utilities, analysis of at least one year of historical utility billing data, energy balance analysis and identification of the major energy-consuming equipment and processes in the building.

A review of ESOS implementation and lessons learned for delivering successful audits

ESOS has been the key policy mechanism driving uptake of audits in the UK by mandating this activity among non-SMEs. While, overall, organisational feedback (as well as spot-checks by the scheme administrator) was positive about the quality of audits conducted under ESOS, Phase 1 of this research has uncovered examples of lower quality audits being reported. These have been associated with less helpful recommendations and a lower likelihood of energy efficiency measures being implemented. A spike in demand for audits close to the compliance deadline in December 2015 was commonly raised by stakeholders as a factor that has led to issues with both the supply and demand for audits, with some organisations seeking low-cost assessor services at this time to quickly reach compliance, and some less-experienced assessors being attracted into the market at this point. This experience was not unique to the UK, with similar challenges faced in other EU Member States (MS).

Where examples of higher quality audits were given, this tended to be when the following success factors were met:

- assessors had strong sector-specific knowledge (and there was some feedback that ESOS Lead Assessor training could have been more tailored to sector-specific issues, for example in conducting transport audits);
- a scoping phase was conducted to understand business possibilities and needs;
- there was on-site engagement of employees; and
- actionable business-grade recommendations were provided.

Assessors' opportunity to influence the awareness and engagement of organisations in energy efficiency measures depended on the motivations of organisations themselves. **Key success factors from the assessor point of view were**: the level of audit preparation to provide good quality energy use data, and the level of access to those making investment decisions.

Assessors reported trying a variety of approaches to increase the likelihood of their audit recommendations, providing a real opportunity for encouraging organisational behaviour change. **Examples of effective approaches included**: making reports digestible with the use of dashboards, and making energy efficiency salient (for example, by linking energy savings to equivalent increases in turnover).

ESOS was found to have provided an *opportunity* to many organisations to benefit from the audit through the provision of energy efficiency recommendations. For organisations with no or a very limited understanding of energy efficiency, ESOS provided critical baseline information – on the scale of their energy use, their highest energy-related expenditures and potential actions. For more engaged organisations, ESOS mostly helped to increase visibility of energy efficiency to senior management, and in some cases had helped dedicated energy managers to make the case for investment. In some cases, ESOS also helped to provide new information on energy and fuel use (particularly related to transport) and/ or identified new energy saving opportunities.

Overall, however (and in keeping with feedback on the uptake and impact of audits more generally), the evidence suggests that ESOS has predominantly helped keep or push energy efficiency agendas amongst engaged organisations.

Obligated organisations reported that they have faced **several barriers in their capability to respond to recommendations** provided in their ESOS audit. The most prevalent of these was the availability of upfront capital, or where this exists, the challenge of making energy efficiency projects an investment priority. However, there were other important barriers identified, such as:

- tenure – tenants have not always had the capability to make recommended changes, or sometimes reported that they were unlikely to be in the premises long enough to benefit from the payback, or that the benefit of energy savings would accrue to the landlord;
- lack of technical understanding of energy efficiency, and challenges understanding what would be required to progress a recommended project; and
- corporate group structures – sometimes limiting the involvement of, and dissemination to, subsidiaries and so inhibiting the capability of undertakings below the parent level to pursue recommended actions.

In keeping with feedback on audits more generally, ESOS-led recommendations were generally only implemented if conditions around payback periods and minimal business disruption were met. Lighting recommendations were most likely to meet these criteria, and were the most commonly implemented, although those with longer payback periods such as boiler replacements were also implemented in certain cases.

Implementation of energy audit requirements for large undertakings (Article 8 (4-6) of the EED) across the EU

Phase 1 of this study also reviewed the approach taken by other MS to transpose the audit obligation requirements of Article 8[9] (4-6) of the EED, and found that implementation was broadly similar across MS: **most MS adhered to the EU definition of non-SME to act as the eligibility criterion** for the audit obligation, although the inclusion or not of SME subsidiaries varied. In addition, **MS did not generally mandate the implementation of audit recommendations,** although many incentivised follow-up actions, for example with grants or concessional loans.

Other differences in emphasis in the approach taken by MS included:

- including a **minimum energy consumption threshold** in eligibility criteria;
- mandating **energy efficiency action plans** for the most energy intensive organisations with a requirement to implement measures deemed cost-effective;

[9] The 2012 Energy Efficiency Directive (EED) established a set of binding measures to help the EU reach its 20% energy efficiency target by 2020. Article 8 set out the role of Energy Audits and Energy Management systems in achieving this goal. Article 8 (4-6) describes the obligation for member states to ensure that non-SMEs carry out an energy audit by 5 December 2015 and every four years thereafter.

- requiring organisations to **report on the total identified and planned energy savings** and costs to improve the government's understanding of potential savings;
- **provision of more focused sectoral guidelines**, including detailed sectorial FAQs;
- **providing long timeframes for implementing alternatives to audits** (for example, energy management systems);
- **providing clear guidance on responsibility for building audits** (addressing landlord/tenant divide);
- **penalising employees** of non-compliant companies, or auditors;
- **systematic collection of audit results** for benchmarking purposes; and
- **follow-up implementation and knowledge sharing support**, for example via published databases or the creation of networks of businesses.

A lack of published data on the impact of these national schemes has restricted the ability of this study to identify the most effective elements of other policy approaches. This will be a key focus for Phase 2 (the Phase 2 report has been published alongside this one[10]).

Lessons learned for effectively driving beneficial changes in organisational energy management approaches

The report identifies **three main categories of barriers to energy efficiency**:

- lack of awareness of, and commitment to, the energy efficiency opportunity;
- lack of technical solutions and expertise for understanding and implementing energy efficiency; and
- lack of financial resources to invest in energy efficiency projects.

Policies need to target barriers of all three types to achieve energy efficiency improvements.

Beyond specific policy measures, the evidence gathered and analysed during Phase 1 points to the following wider learning for non-domestic energy policy:

- the importance of having a **coherent policy framework** that is easy for organisations to engage with;
- a complex set of overlapping barriers exists, and the policy framework needs to provide **support that addresses the key barriers** in a coherent and systematic way (for example, in the case of encouraging audit activity, there is a need to provide support that not only gives organisations access to high quality information,

[10] https://www.gov.uk/government/publications/energy-audits-and-reporting-research-including-the-energy-savings-opportunity-scheme

but also provides technical assistance to enable recipients of the information to engage with it and act on it); and

- delivering interventions to organisations is complex, given they are made up of multiple actors, with differing priorities and incentives to act. Policy interventions need to reflect this through **providing tools and incentives to engage and act at different levels**, encouraging engagement at differing stages in decision-making processes – for instance, targeting right 'entry' into organisation and providing information/tools that can take it to next stage.

Summary of evidence gaps for further exploration during Phase 2 (to March 2019)

The following evidence gaps will be explored in Phase 2 of this evaluation:

- the uptake of energy efficiency measures two and a half years post-compliance deadline with ESOS to quantify the impact of the policy;
- the decision-making processes and mechanisms within organisations (including non-ESOS) around energy efficiency.; and
- the mix of policies that will most effectively deliver energy efficiency savings in organisations.

1 Introduction

This research assesses the effectiveness of energy audits and reporting in driving energy efficiency savings in organisations. It also further develops an understanding of the impact of the Energy Savings Opportunity Scheme (ESOS), following on from the previous interim process and impact evaluation (2015-2017)[11]. In particular, this research will seek to understand in which ways, and in which contexts, energy audits and reporting as provided by ESOS specifically have been effective, so that lessons can be learned for wider policy development.

1.1 Background to this research

1.1.1 Policy context

This research seeks to inform how to best support greater energy efficiency in buildings and industry and so support the objectives to minimise business energy costs, improve productivity and reduce carbon emissions by converting cost-effective unrealised energy efficiency potential. This will be supported by the recent BEIS call for evidence on building a market for energy efficiency which outlines current barriers to energy efficiency action, invites views about the role of government in overcoming these, and considers a range of potential solutions.[12]

This research focuses on two tools that can encourage improved energy efficiency in organisations - **energy audits** and **energy reporting**.

- **Energy audits**: an internal or external assessor audits an organisation's energy consumption, broken down by different activities and processes. Based on this, the assessor identifies specific and tailored energy saving opportunities. The best audits provide detailed costs and potential energy savings for each recommendation to help organisations make energy efficiency investment decisions appropriate to their business. Audits may be voluntary or mandatory, as with ESOS.

- **Energy reporting** has two forms. **Internal reporting** is the reporting of energy use from one part of an organisation to another; for example, different sites or subsidiaries may be required to report to a head office or parent. This may be accompanied with 'league tables' and/ or targets for energy use reductions. **External reporting** is the public reporting of energy use and activities, which can be published directly by an organisation in its annual report and/ or to government. This usually takes place when mandated by policy, such as under the CRC, mandatory greenhouse gas reporting, EU Emissions Trading System or Climate Change Agreements. For both types, the intention of reporting is that it encourages organisations or other entities to reduce their energy use between reporting periods and/ or compete on energy efficiency with other entities.

[11] https://www.gov.uk/government/publications/energy-savings-opportunity-scheme-esos-evaluation-of-the-scheme
[12] https://www.gov.uk/government/consultations/building-a-market-for-energy-efficiency-call-for-evidence

This research aims to help BEIS to understand the effectiveness of energy audits and reporting and what alternatives and complementary policies could be developed to promote further energy savings, as well as supporting the PIR of ESOS. It will also provide evidence to support the Government's commitment to decarbonising the British economy: realising significant improvements in energy efficiency in business and industry is imperative to achieving the UK target of reducing emissions to net zero by 2050. It is recognised in the Clean Growth Strategy[13] that non-domestic organisations must make a large contribution to this necessary improvement.

However, energy efficiency is often a low investment priority, particularly for businesses/industries where energy bills constitute only a small fraction (less than 5%) of their total expenditure. Consequently, legislation has to play a vital role in encouraging take-up. The key first step for implementing energy efficiency measures is to understand the overall use of energy and where the savings can be realised. This is particularly important given that most businesses are not well versed in energy use and management. Audits and reporting therefore are key targets for policymakers wanting to spur action in the commercial sector.

1.1.2 ESOS Policy context

ESOS is an energy audit scheme that is mandatory for all large undertakings[14], (hereafter 'qualifying organisations'). The ESOS Regulations (SI 2014/1643) came into force in July 2014 to implement Article 8 (4-6) of the Energy Efficiency Directive (2012/27/EU).

ESOS required qualifying organisations to measure their total energy consumption and carry out audits (or measures designated as alternative routes to compliance, such as the ISO50001 energy management system) of the energy used by their buildings, industrial processes and transport to, among other things, recommend reasonably practicable and cost-effective energy saving opportunities by 5th December 2015. ESOS requires that qualifying organisations will also need to do this at least every four years thereafter. The implementation of any identified measures is voluntary. While BEIS is responsible for ESOS policy/Regulations, the overall scheme administrator for ESOS in the UK is the Environment Agency. The Environment Agency, along with the other UK compliance bodies[15], are empowered to monitor and enforce compliance with ESOS.

The objectives of ESOS are to:

- Provide large undertakings with enterprise-specific information about how they can make energy savings;
- Stimulate the take-up of cost-effective energy efficiency measures;
- Minimise the cost to businesses of complying with the regulations; and
- Maximise the synergies with existing policies.

[13] https://www.gov.uk/government/publications/clean-growth-strategy
[14] Including small or medium undertakings which are group undertakings with respect of a large undertaking, with specified exceptions.
[15] SEPA (Scottish Environment Protection Agency), NRW (Natural Resources Wales) and NIEA (Northern Ireland Environment Agency)

Ipsos MORI and UCL carried out an interim process and early impact evaluation of ESOS between 2015 – 2017[16]. This report makes reference to findings from this previous evaluation, particularly drawing on quantitative data from a representative survey which formed part of it.

1.2 Aims and objectives of this research

The main aim of this study is to provide evidence on the effectiveness of energy audits and reporting in driving energy efficiency savings across organisations and how these mechanisms can be used to develop future policy. Given ESOS is the current key policy which involves energy audits, it also aims to build on the findings of the interim process evaluation and assess: ESOS impacts and benefits, the operation of the scheme, and the extent to which its policy objectives have been achieved. ESOS will also be a key source of information to support disclosures under SECR, which since April 2019 has required all UK large businesses and limited liability partnerships, and all quoted UK companies, to report specified energy and carbon information in annual reports, including energy efficiency action in the reporting year.

1.2.1 Research questions

Four high level research questions have been set by BEIS for this research. A full list of the sub-level research questions is provided in Annex 1.

RQ1: Energy audits and reporting

To what extent, (in which ways and in which contexts) are energy audits and reporting effective in identifying and delivering energy efficiency savings across organisations?

RQ2: ESOS influence and impact

To what extent, (in which ways and in which contexts) has ESOS influenced organisational energy efficiency policy and practice?

What impact has ESOS had on energy efficiency in organisations?

RQ3: ESOS lessons for future policy

What are the lessons learned from implementing ESOS that could feed into future policies?

RQ4: Wider learning

What is the wider learning from this research for BEIS policy making?

1.2.2 Purpose of this report and ongoing analysis and evidence collection

This report represents an interim study output at the end of Phase 1 of the study. It builds further on the presentation of evidence given to BEIS in April 2018. While this first stage of the study has aimed to gather some evidence against all the research questions set out

[16] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/650722/Evaluation_of_ESOS_Interim_process_and_early_impact_evaluation_report_FINAL.pdf

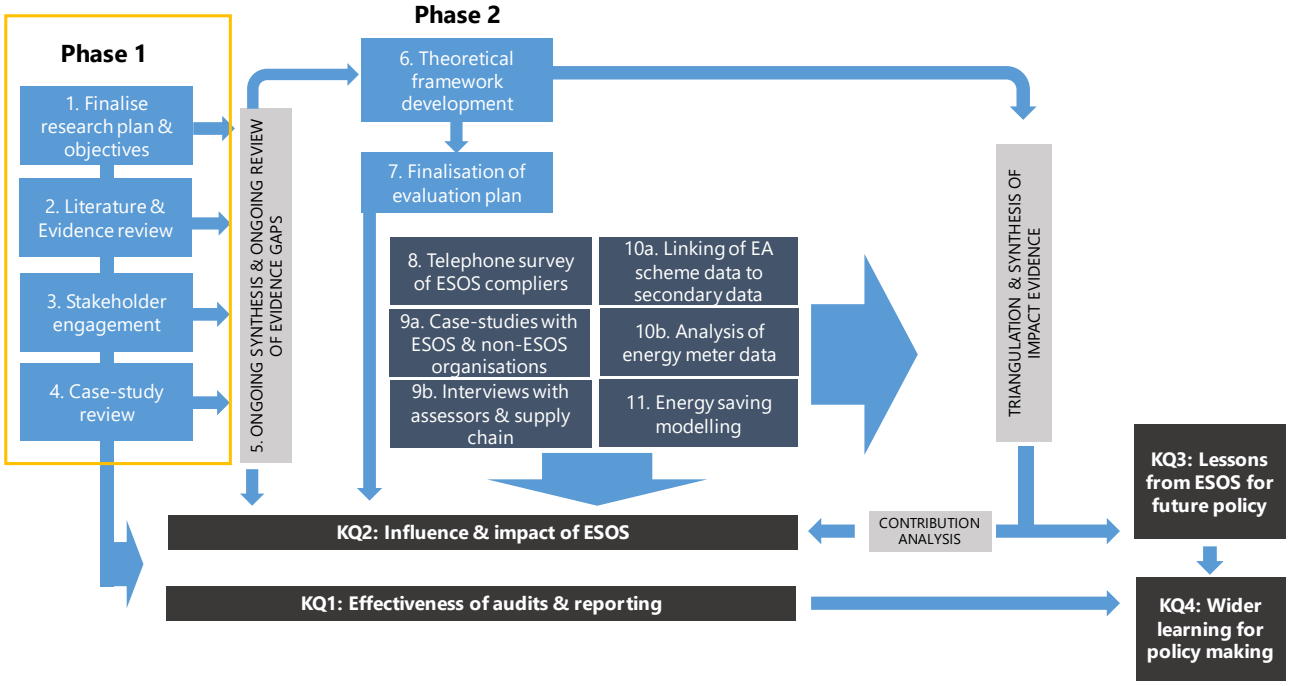
above, this evidence base, and the level of detail provided against each research question, will be further enhanced as the study progresses.

An Evidence Gaps report has also been provided – this reviews the evidence gathered and synthesised at this point against the detailed research questions provided in Annex 1. This will be used to further inform and refine the research activity delivered during Phase 2 of the study.

1.3 Research Methodology

This study comprises two main phases of research activity, as shown below. Phase 1 comprises a review of existing evidence and qualitative research to gather further evidence on the influence and impact of ESOS and the effectiveness of audits and reporting more generally. Phase 2 will explore energy audits and reporting in greater depth, focussing in particular on the longer-term impact of ESOS on complier organisations, building on the earlier process and impact evaluation through a mixed methods approach. This report presents findings from Phase 1 only.

Figure 1: Phase 1 and Phase 2 evaluation workstrands



1.3.1 Literature review

The literature review on existing audit and reporting practices aimed to review the existing initiatives and extract learnings about different approaches and, where possible, the factors driving their success or lack of it. Sources were targeted and the subsequent analysis broken down into three geographic categories:

- European Union (EU) Member States (MS);
- Non-EU States; and
- UK.

The review drew evidence wherever possible from official reports and evaluations directly published by the relevant government departments responsible for overseeing the energy efficiency programmes. These sources were complemented with academic research from relevant journals (e.g. Energy Policy) and reports from third party organisations (such as think tanks) where necessary to add further to the available information. These sources were selected via a rapid review based on the evaluation team's knowledge of the sector.

The primary literary sources for the analysis of MS EED Article 8 (4-6) implementation were the progress reports published by the European Commission and the National Energy Efficiency Action Plan submitted by each MS. The selection of countries reviewed was agreed based on feedback from BEIS officials on which countries were deemed of greatest interest and relevance for the project.

A full list of sources reviewed to date is provided in Annex 2.

1.3.2 Stakeholder interviews and workshops

Phase 1 involved 25 interviews and six workshops across the following stakeholder groups:

Table 1: stakeholder interviews and workshops

Category	**No. of interviews**
ESOS obligated organisations	8
ESOS organisations also participating in Climate Change Agreements	4
SMEs	5
ESOS assessors	5
Trade bodies	3
Total	**25**

A more detailed breakdown of the characteristics covered by these stakeholder interviews is provided in Annex 3. Interviews were conducted over the phone by Carbon Trust experts using a structured discussion guide, with answers being recorded by key question in an excel spreadsheet for ease of reference. Interviews were also recorded for sample audit quality checks by Ipsos MORI personnel.

Of the six workshops, three covered ESOS obligated organisations and ESOS Lead Assessors, of which one had a specific focus on organisations which also had a CCA in place. Two covered SMEs and one covered the public sector. All workshops were facilitated by Carbon Trust and Ipsos MORI employees, and all were attended by officials from BEIS.

The full discussion guides for each type of organisation interviewed, and the workshop agendas and questions are provided in Annex 4.

1.3.3 Case studies

The case study strand is being designed to fill evidence gaps from the interim process and early impact evaluation of ESOS. This strand aims to engage with multiple actors within an organisation (such as energy managers, facilities managers, finance directors, and board members) to gather a rounded picture on the approach of the organisation to energy management.

The case studies conducted in Phase 1 focussed on three sub-strands:

Implementation of the EED Article 8 (4-6) in Sweden and Germany

To complement the extensive literature review of the implementation of the EED Article 8 (4-6) across the EU, the case studies have focussed on two states, Sweden and Germany, to gain a deeper understanding. These states were chosen because of the range of business energy efficiency policies they employed. Interviews were carried out with a national policymaker from each country, as well as an assessor with experience of undertaking audits in Sweden, and a member of a regional energy agency in Germany. Furthermore, an interview was carried out with an environmental lawyer who operates around the EU including in both Sweden and Germany.

Response to ESOS of non-notifying organisations

The interim evaluation of ESOS included 50 interviews with organisations that had not submitted a compliance notification according to Environment Agency records. A subset of these organisations were followed up at Phase 1 of this study to understand the reasons for non/ delayed compliance, and their appetite for energy audits more broadly. Four interviews were conducted – two organisations believed they did not qualify for ESOS, one said they had complied on time, and the fourth had complied late, in November 2017.

Response to ESOS across corporate groups

The interim evaluation used the compliance database as a sampling frame and focussed on organisations that were the highest UK parent. However, many compliance notifications were submitted on behalf of subsidiary undertakings, as well as the parent. This sub-strand therefore sought to understand how the compliance process was managed across the group; for example, the level of involvement of subsidiaries in audits, and approach to dissemination of the audit report and implementation if relevant. One full case study with various undertakings of the same group took place. This was supplemented with two scoping calls with other corporate groups to ascertain their relevance, however these were not suitable to be carried forward into full case studies as the subsidiary level undertakings did not take an active role in the ESOS process, and had no recollection of seeing the audit report. These subsidiaries also did not take an active role in energy management more broadly, which was managed by the parent.

Summary

The total number of interviews and case studies is summarised in the table below:

Table 2: stakeholder case studies

Sub-strand	Summary
Implementation of EED Article 8 (4-6) in Sweden and Germany	2 national policymaker interviews (1 from Sweden; 1 from Germany) 1 assessor interview (Sweden) 1 regional policymaker interview (Germany) 1 interview with environmental lawyer (with experience in both countries)
ESOS non-notifiers	4 interviews – 2 did not qualify, 1 compliant, 1 complied late 2017 (based on self-reporting)
Corporate groups	2 scoping calls + 1 full case study

1.3.4 Approach to analysis and synthesis

The analysis of all strands of the research draws on behavioural frameworks to help understand the contexts and mechanisms by which audits and reporting lead to the desired behaviours (i.e. changes to energy efficiency). In particular, the COM-B framework was used, which helps to systematically understand whether the auditor, and then the organisation itself, has the right type of Capability, Opportunity and Motivation to lead to an effective audit intervention (i.e. one that encourages engagement in, and uptake of, the recommendations, the desired Behaviour). A collaborative analysis session was held between Ipsos MORI and Carbon Trust to triangulate evidence, with BEIS in attendance.

1.4 Notes on interpreting findings

The primary data collection for this project has all been qualitative to date. This can shed light on why people hold particular views, rather than how many people hold those views. The results are thus intended to be illustrative rather than statistically reliable and, as such, do not permit statements to be made about the extent to which something is happening. The samples for the qualitative research were drawn to reflect a breadth of different audiences but are not representative. For example, the SME population at large is not heavily engaged with energy efficiency; therefore, those that attended workshops are likely to be much more engaged than SMEs on average. However, their attendance provided useful insight into the particular contexts and priorities SMEs face.

The interim process and early impact evaluation of ESOS[17] did include a representative survey of complier organisations. This report sometimes draws on this evidence, particularly to add robust quantitative support to the insights drawn in this research.

[17] https://www.gov.uk/government/publications/energy-savings-opportunity-scheme-esos-evaluation-of-the-scheme

1.5 Structure of the report

This presentation of evidence from Phase 1 is structured through the following chapters:

Chapter 2: Review of existing practice – drawing on evidence from the literature review exploring the approach to audit and reporting across other EU Member States and through energy efficiency programmes in other parts of the world (RQ1)

Chapter 3: Review of ESOS implementation – drawing on primary evidence gathered from organisations and assessors to consider the extent to which these key stakeholder groups have the capability, opportunity and motivation to maximise the potential of audit and reporting (RQ2)

Chapter 4: Lessons learned for effectively driving beneficial changes in organisational energy management approaches (RQ3 and RQ4)

Chapter 5: Summary of Evidence against Key Evaluation Questions

2 Review of international approaches to audits and reporting

This chapter reviews the ways in which audits and reporting are currently implemented in European Union (EU) Member States (MS) and also through energy efficiency programmes in other parts of the world. It seeks to identify examples of best practice so as to understand the types of policy measure that can effectively drive organisational energy efficiency savings. Evidence in this chapter comes from an evidence and literature review and discussions with international policy-makers and assessors in EU MS. It is important to note that this chapter draws on evidence of practice outside the UK; however, there is a lack of evaluation evidence from these countries. The findings are therefore limited in the extent to which they can assess the success of different approaches.

This chapter contributes evidence to one of the key research questions set for this study:

RQ1: To what extent, (in which ways and in which contexts) are energy audits and reporting effective in identifying and delivering energy efficiency savings across organisations?

This study aims to review the existing initiatives and extract significant learnings about different approaches and, where possible, their success or lack of it. In addition, it focuses on interesting case studies that provide specific lessons for effective reporting and auditing initiatives.

The following analysis is subdivided by geography:

- EU MS;
- non-EU States; and
- UK [presented in Chapter 3]

2.1 EU Member States

For the EU, the Energy Efficiency Directive (EED) of 2012 is the central piece of legislation that EU MS have built their own national policy around. The review provided in this report focused primarily on Article 8 of the Directive[18], in particular Article 8 (4-6), as this is the

[18] Article 8 mandates that all Member States shall:
§1: Promote the availability to all final customers of cost-effective, independent and supervised high quality energy audits.
§2: Develop programmes to encourage SMEs to undergo energy audits and the subsequent implementation of the recommendations from these audits.
§3: Develop programmes to raise awareness among households about the benefits of such audits through appropriate advice services.
§4-7: Ensure that non-SMEs are subject to an energy audit (first audit until 5 December 2015, thereafter every four years) based on minimum criteria (Annex VI) or they may implement an energy or environmental management system (which includes an audit).

instrument which gave rise to the ESOS scheme in the UK, and which mandates the implementation of an energy audit by non-SMEs in all MS.

However, some countries had already implemented energy audit and reporting schemes before this Directive, such as Sweden as described below.

For this study, the implementation of Article 8 (4-6) of the EED provides a useful centre point to compare and analyse the different approaches to energy auditing and reporting taken by the EU MS. The majority of the information below is taken from the MS' respective National Energy Efficiency Action Plans, and the 2016 report by the European Commission, *A Study on Energy Efficiency in Enterprises: Energy Audits and Energy Management Systems*[19].

This section illustrates what requirements MS set for qualification under the provisions of Article 8, how they approached non-compliance, whether they provided any kind of support or mandatory requirements for implementing the energy efficiency opportunities identified by the mandatory audits, and whether they provided any support for companies to share the knowledge gained from the audit process amongst each other.

The following analysis draws out some of the key findings in greater depth across the sample of MS. Examples are highlighted where implementation differed substantially from the UK, or where interesting mechanisms were deployed which went beyond the requirements of the directive.

2.1.1 Implementation of EED Article 8 (4-6) in EU MS

The implementation of mandatory energy audits by large undertakings falls under Article 8 of the EED. Overall, the message is that methods of implementation vary across the different Member States, but not by a significant margin. There are various differences across the eligibility of companies, requirements for follow-on action and assistance on offer.

Eligibility: most MS adhere to EU definitions of what constitutes an SME, and hence have similar definitions for what size of companies are mandated to audit and report on their energy use. A few have added a minimum energy consumption threshold, leading to exemptions for large companies that have low energy consumption - such as Brussels region of Belgium, which goes by minimum energy use per square meter of floor space.[20] It has also been reported to the study team that Sweden used a different definition of SME whereby only organisations that met both the headcount and financial thresholds of a large business had to comply, meaning that many organisations who were eligible in other MS (such as financial institutions with low headcounts) were not eligible in Sweden.

Most MS have limited the mandatory audits to parts of companies that are within the national territory; however, approaches to whether multinational companies are included or excluded, depending on what share of their energy consumption is outside of the country, have varied. The approach to mandating compliance across corporate groups is also believed to have varied across MS. It has been reported to the study team that in some

[1919] A Study on Energy Efficiency in Enterprises: Energy Audits and Energy Management Systems, European Commission, April 2016
[20] Ibid

markets, a subsidiary would not always need to be audited if it was a SME, whereas in the UK they would have to be unless excluded under the de minimis rule.

Other exemptions of interest include the exclusion of public bodies in Germany and the UK.

In addition, Portugal goes further by only mandating the implementation of energy audits if they are deemed financially viable.

There has been quite a lot of variation in terms of the amount of guidance provided by MS for companies to identify themselves. Some MS (Austria, Hungary and Germany) had reportedly easy to use classification tables. Other states provided European information sources for cross-comparison purposes.

In some MS fuel-use by a transport fleet can be excluded if it is covered by a fleet management system as part of a broader energy management system exclusion.

Requirements for action: there is little in the way of mechanisms that force companies to implement the measures identified by audits. The Netherlands perhaps goes furthest with the demands of its Long-Term Agreement 3 (LTA3) and Long-Term Agreement for the Energy Efficiency of ETS Enterprises (MEE). These agreements are voluntary but companies are incentivised to participate through exemptions from mandatory policies such as energy taxes. The c. 1,100 companies that participate under these agreements, accounting for 80% of industrial and 25% of total energy use in the Netherlands,[21] must construct energy efficiency plans every four years, and implement those measures deemed cost-effective,[22] reporting annually on their progress.[23] These audits are reviewed by the Netherlands Enterprise Agency. All c. 1,100 companies drew up the latest plans in 2016 to cover actions from 2017 to 2020.

In Sweden, obligated organisations were required to provide more detail in their compliance notifications than in other MS. Organisations had to report on their annual energy use, the aggregated energy savings and financial costs of all audit recommendations, and to highlight which of these they planned to implement (which could be zero as implementation of recommendations was not mandatory). While this mechanism did not necessarily lead to greater action, it gave the scheme management a more accurate picture of the potential and planned energy savings from audit obligation than in MS without such detailed reporting requirements.

Whilst obligatory implementation is therefore rare, many Member States provide support and **incentives for encouraging the uptake of both audits and follow-on actions**. For instance, grants, concessional loans and subsidies are all common instruments used to help companies implement audits and energy efficiency measures.

An interesting example of helping encourage greater implementation of energy efficiency audits and measures is the multi-pronged approach taken by the Republic of Ireland (ROI). Further detail is provided in the case-study box below.

[21] Fourth National Energy Efficiency Action Plan for the Netherlands, Ministry of Economic Affairs, April 2017
[22] From the literature, it is not known what defines a ‘cost-effective’ investment in this case.
[23] A Study on Energy Efficiency in Enterprises: Energy Audits and Energy Management Systems, European Commission, April 2016

Case study: Republic of Ireland

The Republic of Ireland has introduced numerous policies and initiatives which can be seen to intertwine to provide an extensive support network for the commercial sector. These are outlined below:

1. **Energy Audit Scheme** sets out the rules for compliance with Article 8. This includes mandatory audits as well as guidance on audit standards and criteria for the training and qualification of energy auditors.

2. **Energy Audit Handbook** is a 'comprehensive best practice manual' for auditors and recipient organisations.

3. **Interactive SME guide** is a toolkit that assists smaller organisations, less familiar with energy management, to kick-start their understanding of energy efficiency opportunities.

4. **Free training for SMEs** on energy management and best practice for 3 days over a 3-month period if their annual energy bill is greater than €100,000 or 1.5 days over the same period if it is less.

5. **Voluntary Large Industry Energy Network (LIEN)**, facilitated by the Government, helps encourage knowledge sharing and best practice across 192 of Ireland's largest energy users.

6. Within the LIEN, the **Energy Agreements Programme** is devoted to helping 80 companies implement ISO 50001, through which they receive government support via an Agreements Support Manager who can provide technical assistance.

7. **National Energy Services Framework** establishes a standardised and structured approach for implementing energy efficiency measure. In particular, it outlines how energy performance contracting can be integrated in to projects through guidance, templates, model contracts and monitoring and verification requirements.

8. **Project Assistance Grant** supports the preparation of business cases that centre on energy performance contracting or energy performance related payment structures. This to help companies who spend over €250,000 per annum on energy offset the additional transaction costs associated with these types of projects.

9. **Accelerated Capital Allowance** enables businesses to deduct the entire cost of energy efficient equipment from their taxable profits in the year of purchase. There are 52 technologies and over 17,400 products that are eligible on the Triple E (Energy Efficient Equipment) Register.

10. **Energy Efficient Public Procurement Regulations** oblige public bodies procure products from the Triple E Register.

Effective dissemination of key information and skills has been found to be important for unlocking large-scale uptake of energy efficiency.[24] Certain MS have mechanisms to help companies share best practices, monitor energy performance and set goals.

Monitoring energy performance can be a challenge for organisations with less experience of these processes. Therefore, the Netherlands has developed a template for audits, which aims to improve ease of use and consistency of application. Moreover, Hungary allows organisations to undertake a preliminary self-assessment to make it easy to begin the journey and incentivise further action by demonstrating what can be achieved.

Encouraging more ambition from the private sector is imperative to achieving energy efficiency goals. Under its National Action Plan Energy Efficiency (NAPE), Germany has a scheme specifically set up to find innovative methods to save energy and to establish business models for products and services that can reduce energy. This includes a target of establishing 500 cross-industry networks to share best practice by 2020.[25] It also provides implementation support to SMEs in the form of technical assistance supporting the adoption of better energy management practices with guidelines, tools and training by dedicated consultants. In addition to these knowledge exchange channels, Germany has fiscal measures that encourage greater ambition in the private sector to systematise better energy management. This is achieved through tax discounts and other incentives (available for companies of all sizes) to implement ISO 50001 or similar certification for energy management. As a result, Germany has the highest number of ISO 50001 certifications in Europe.

Finally, some MS (such as Austria) have established databases which collect all information from the audits including the characteristics of companies, the identified measures, and potential savings resulting from the energy audits and alternative systems.

Establishment of programmes that support SMEs with energy audits and energy efficiency are also recommended by Article 8 (2). To date, measures implemented by MS fall under four broad categories:

- regulatory instruments such as extending mandatory audits to energy intensive SMEs;
- financial instruments such as low cost loans or grants for audits;
- information instruments such as databases and benchmarking; and
- voluntary agreements such as Climate Change Agreements in the UK.

A large majority of MS have implemented financial instruments specifically for SMEs, in addition to other instruments or agreements. The UK, Netherlands and Finland only have voluntary agreements in place for SMEs, with no regulatory, financial or information instruments in place specifically for these organisations. However, the UK does have measures in place for all businesses, including SMEs, such as enhanced capital allowances that can help support implementation of more efficient products and the Energy Technology List which provides information on energy efficient products. In March

[24] Available, Attractive, Too Slow?, Carbon Trust, March 2017
[25] A Study on Energy Efficiency in Enterprises: Energy Audits and Energy Management System, European Commission, April 2016

2019, the UK government also launched a consultation to seeks views on various proposals for a new Business Energy Efficiency Scheme focused on SMEs[26].

In terms of financial support, the Swedish Energy Audit Programme described below is one of the main examples. Others include the German SME Energy Consulting Programme, which provides up to 80% (or €8,000, whichever is higher) for SMEs to cover costs of audit and implementation (with a 43% implementation rate reported for energy savings). Luxembourg provides up to 40% (with a limit of €30,000), Poland 70% and Portugal 50% (but maximum €750).

Case study: Swedish Energy Audit Programme

While Article 8 (4-6) of the EED was the trigger for many EU Member States to look into energy efficiency in the commercial sector, Sweden has a legacy of successful interventions. As a result, in contrast to many Member States, there are data that can be analysed around auditing and implementation.

The Swedish Energy Audit Program (SEAP) is a flagship initiative that has run since 2010. It targets the typically challenging SME sector by addressing informational and financial barriers.

The European Regional Development Fund and the Swedish Government fund the SEAP. Between them, they can provide up to €5,000 (€2,500 each) for SMEs undertaking an energy audit, with the companies required to provide at least an equivalent contribution to the grant they receive.

The average payment to participating firms was €2,700 in 2012.[27] Accounting for the extra administrative state expenses – such as internal and outreach costs – this amounted to €4,360 per audit. Including the in-kind contribution made by the participating SMEs, the total for an audit arrives at €9,160.[28]

[26] https://www.gov.uk/government/consultations/energy-efficiency-scheme-for-small-and-medium-sized-businesses-call-for-evidence
[27] Sandra Backlund and Patrik Thollander, Impact after three years of the Swedish energy audit program, 2015, Energy, (82), 54-60.
[28] Ibid.

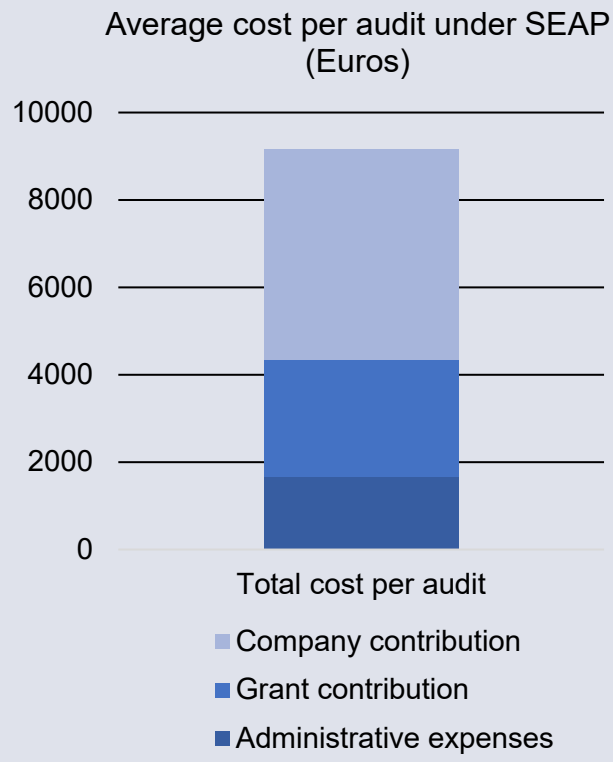


Figure 2: average cost per audit under SEAP

Whilst SMEs can undertake the audit themselves, it is recommended that they seek external help. In fact, since 2016 the grant financing could be used by municipalities to employ an 'energy coach' to boost implementation in the target sector.

In the latest evaluation, based on interim reports submitted by the organisations to the Swedish Government, the implementation rate of measures following an audit was reported to be 53%.[29] This is broken down by technology as per Figure 2.

Between 2010 and 2014, the programme reduced energy consumption by 5,374GWh/yr, working with 800 SMEs in total. This is equivalent to 1.5% of 2013 Swedish final energy consumption[30].

[29] Sandra Backlund and Patrik Thollander, Impact after three years of the Swedish energy audit program, 2015, Energy, (82), 54-60. – implementation figure based on 241 interim self-reports provided to the Swedish Government by participants in the SEAP. It is unknown how this question was phrased and what verification, if any, was undertaken

[30] New Energy Audit Program in Sweden, Swedish Energy Agency, 2016; Energy in Sweden 2015, Swedish Energy Agency, 2016

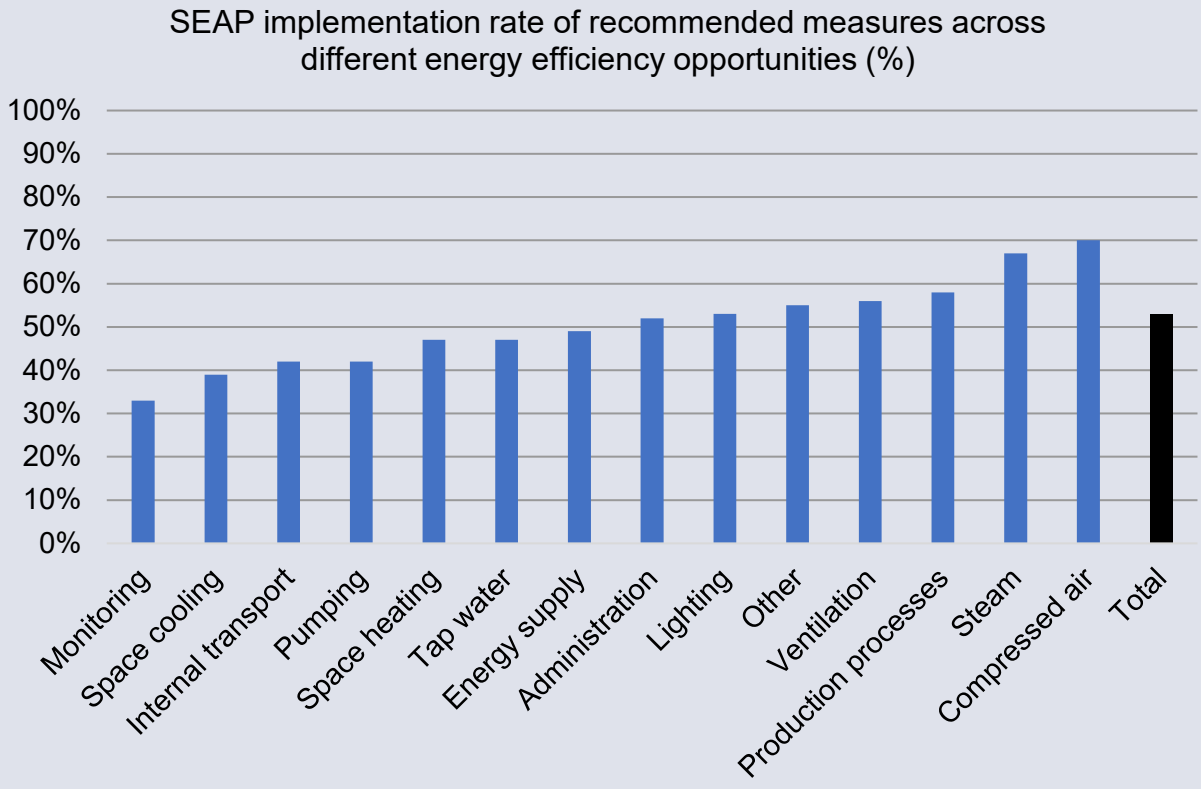


Figure 3: SEAP implementation rate

Non-compliance with Article 8 (4-6) of the EED, and related legislation, is treated consistently across all EU MS: fines can be issued to companies that do not adhere to the auditing and reporting requirements, although this is generally preceded by enforcement notices. These penalties can range from €10,000 to €200,000 depending on company size. A few countries have decided to penalise company directors as well for up to €10,000. Finally, Hungary also issues a penalty directly to auditors of €320.

Lessons from EU MS for maximising effectiveness of Article 8 (4-6) implementation

Given that most MS have not yet carried out a full evaluation of the impact of the EED Article 8 and its various provisions, it is hard to establish which mechanisms have been most successful in ensuring that audits and reporting lead to implemented energy savings.

A review of the EED across MS presented at a workshop in 2017[31] found that the effectiveness of Article 8 (4-6) could be maximised if MS prioritised the following aspects in their implementation:

- **Cost effectiveness of the audits**

[31] Article 8 of the Energy Efficiency Directive on Energy Audits, presentation by Claudia Canevari (Deputy Head of Unit European Commission DG Energy), Vienna, 23 November 2017

- Ensuring that audit's value is maximised - return on investment of audit is a function of subsequent implementation, which needs to be supported
- Balance requirements on audit quality: investment-grade audit preferred to maximise chance of implementation, but at the same time this increases cost

- **Proportionality**
  - Balancing the administrative effort with likely benefits (avoiding focus on small sites with low energy consumption)
  - Providing focus and prioritisation for an audit plan that covers the main sources of energy use and identifies the most cost-effective opportunities across most technology areas
- **Representativeness**
  - Addressing all energy uses equitably
- **Compliance**
  - Achieving the above while ensuring compliance with Article 8 (4-6)
  - Providing clarity to regulated enterprises

The extent to which the ESOS policy embodies these elements of best practice, and what else might be learned from looking across the approaches and experiences of other MS, is discussed in Chapter 4.

Whether these penalties increase the rate of compliance is difficult to tell. Further study would be required to unpick the rate of compliance in each MS, in addition to interviews with local companies to reveal whether the threat of penalties was a factor in their action or inaction.

In-depth look at Article 8 transposition, in Sweden

Sweden was selected as a 'deep dive' case study, with implementation explored in greater depth to understand learnings for the UK. This comprised of interviews with a national policy-maker, an assessor and an environmental lawyer.

The key differences in the Swedish approach to transposing the regulations include:

Eligibility, compliance routes and enforcement

Sweden used a different definition of non-SME to the EU legislation – undertakings had to meet the headcount criterion **and** either the balance sheet **or** turnover criteria, rather than **either** the headcount criterion **or both** the balance sheet **and** turnover criteria. This meant that organisations such as financial institutions that met both the financial criteria but had fewer than 250 employees did not have to comply in Sweden, but did elsewhere. However, such organisations also fell outside of Sweden's SME policies due to their financial size.

The policy-maker in Sweden was positive towards Energy Management Systems, and preferred for organisations to comply via the ISO 50001. However, there were no specific incentives for this (as in Germany for example), and this was not a common route to compliance, although it was deemed more prevalent than in the UK by assessors.

An assessor with experience in both Sweden and the UK reported that enforcement action, including 'naming and shaming' of non-compliant organisations, took place much more quickly in Sweden. This was felt to be a good approach as it demonstrated enforcement actions were a credible threat.

Compliance notifications

A key distinguishing feature of the Swedish scheme was the detail required in the compliance notification. Organisations reported:

- their total annual energy consumption;
- the aggregate energy savings of all recommendations in the audit report;
- the aggregate cost of all recommendations in the audit report; and
- the energy savings and costs of recommendations they planned to implement.

This helped the government to understand the potential and planned energy savings across the non-SME sector as a whole. Furthermore, an assessor reported that organisations were required to separate the consumption and savings for buildings, processes and transport in the report, in addition to the aggregates.

In Sweden, unlike in the UK, board members of obligated organisations did not have to sign off the audit report itself; rather, they just had to verify that it was the named company submitting the notification.

Challenges

Swedish policy makers experienced some similar challenges to the UK in implementation, for example organisations took time to respond to the policy, and financial barriers were believed to have driven limited uptake of measures (though it was noted that high energy costs could reduce the payback periods compared with the same measure in the UK, making implementation relatively more attractive). In addition, the infrastructure for energy distribution and networks in Sweden posed some additional challenges. One assessor reported that many organisations use district heating, which is paid per unit of floor area; such measures aimed at reducing energy consumption for heating may not manifest in financial savings, unless organisations can negotiate with their landlord.

In-depth look at Article 8 transposition, in Germany

Germany was also selected as a 'deep dive' case study, with implementation explored in greater depth to understand learnings for the UK. This comprised interviews with both a national and a regional policy-maker, as well as an environmental lawyer.

The learning from Germany finds a very similar approach to the **design** of their audit obligation scheme: Germany used the same turnover and headcount thresholds in the UK, and also excluded public institutions, and allowed compliance without audits for organisations with ISO 50001 certification. Those complying via audits could similarly procure externally (from a publicly available list of approved auditors) or internally and had to name the senior person signing-off the audit. As in the UK, there was no template for the report, nor a requirement to report on the outcomes of the audit or any action plans to reduce the burden on businesses. Nevertheless, compliance checks were carried out on a sample of audits. Penalties up to EUR 50,000 were possible, but in reality lower value penalties have been issued.

There were also many similarities in the **challenges** experienced. It was challenging to identify the exact obligated population due to lack of complete database, and challenges tracking through complex organisational structures. Germany, similarly to the UK, also experienced an intense period of high demand for audit services just before the compliance deadline. This resulted in both very high, and very low, price audits being available and an increase in new entrants to the assessor market, with some evidence of low-quality and fast-turnaround audits being conducted.

While many MS have adopted a similar design to the UK, of particular interest is that the **response to the scheme in Germany** was also very similar:

- Some organisations (particularly obligated public companies) felt the scheme has placed a burden on them and that an energy threshold would have been fairer approach to eligibility. However, there were high levels of satisfaction with audits among organisations participating in independent evaluation.

- Energy intensive organisations reported higher levels of implementation, most commonly lighting measures, followed by heating and cooling, with fuel saving

measures less common. However, energy efficiency is often low on the agenda given relatively affordable energy prices, long payback periods and lack of appetite to commit upfront capital.

- One key point of difference was the high proportion of compliance (approx. 50%) achieved via ISO 50001 as noted above.

Impacts of scheme in Germany within wider policy context and landscape:

Overall, the scheme has not generated the anticipated level of CO2 savings. However, it has proved challenging to disentangle its effects from other mechanisms e.g. that many obligated organisations already had energy management systems in place.

Considerations for future approach to regulations:

Germany are considering revisions to their regulation for the 2019 compliance cycle, including: whether or not to incorporate a reporting element; what steps could be taken to minimise unsustainable peaks in demand for audits close to deadlines; and training auditors in how to effectively communicate to organisations the results of audits and the potential for energy efficiency gains, to help encourage implementation.

2.2 Non-EU States

Beyond the EU, there are a number of initiatives that have leveraged energy audits to increase energy efficiency in the non-domestic sector. This study looks at five initiatives which were selected as BEIS officials indicated the approaches as being of particular interest:

- Energy Efficiency Opportunities (EEO) in Australia;
- ecoENERGY in Canada;
- Top 10,000 in China;
- Free Energy Audit for SMEs in Japan; and
- Industrial Assessment Centres (IACs) in the United States of America (USA).

The analysis below outlines how each initiative functions, the results it has realised and the key lessons to take away based on a review of evaluations for each case study. Please note that the reporting on the outcomes of each initiative is taken at face value from the source material and has not been independently verified as part of this research.

2.2.1 Energy Efficiency Opportunities in Australia

The EEO Program ran from 2005 until 2014, and was designed to address market failures relating to the availability and use of energy efficiency information. It required corporations that use more than 0.5PJ of energy to host site visits by external auditors to identify and assess energy efficiency opportunities, and required an assessment of 80% of their total

energy use.[32] The companies subsequently reported outcomes of the energy assessments both publicly and to the Australian Government.

The EEO achieved a 98% compliance rate and has been credited with c. 40% of energy efficiency improvements in Australian industrial sector (against a business-as-usual scenario). Active energy management in participating organisations increased from 54% to 97%.

The initiative identified savings opportunities of 164.2 PJ or 2.7% of 2011 Australian energy consumption, 54% of which were implemented achieving financial savings of AU$808m and 8.2Mt$CO_2$e (1.5% of Australia's emissions in 2011).

In an evaluation of the initiative, the success of the EEO was attributed to its specific targeting of barriers relating to information, skills and organisational practices – all of which were reported to be significantly reduced. However, in contrast, there was little impact reported on the capital and non-capital barriers to implementing energy efficiency measures. Indeed, in some cases they were perceived to have increased.

Specifically, the evaluation highlighted the following key factors of success for an energy efficiency reporting scheme:

- **Leadership** – requires senior and operational managers to provide direction for energy assessments through setting and communicating energy use and assessment objectives, as well as allocating sufficient people, time and money;
- **People** – corporations need to utilise skilled individuals (both internal and external) to undertake quality energy assessments. Clarity regarding both the roles, and responsibilities, of these individuals, as well as process for responding as a business, must be set out;
- **Information, data and analysis** – necessitates the implementation of data measurement systems and analytical techniques so businesses can understand in depth how and where energy is used, lost and can be saved;
- **Opportunity identification and evaluation** – to develop effective processes to identify and evaluate the whole-of-business costs, and the benefits of energy savings opportunities, to help make convincing business cases to management;
- **Decision making** – the outcomes of energy assessments need to be seriously considered by decision makers within organisations, and practical steps taken on the timing and implementation of energy saving opportunities; and
- **Communicating outcomes** – the results of assessments and subsequent business decisions need to be communicated to the corporation's board, internal employees and the public to build awareness and commitment to energy efficiency.

The weight of evidence suggests that the EEO Program delivered a substantial additional benefit. It had a strong compliance rate that translated into significant energy savings which is likely to have been supported through effective mitigation of non-financial barriers. Despite these positive results, the government decided to close the programme in 2014 as part of its business deregulation agenda.

[32] ACIL Tasman, Energy Efficiency Opportunities Program Review, April 2013. All data in this assessment derived from this evaluation.

2.2.2 ecoENERGY in Canada

Regional provinces in Canada have a commitment to meet 20% improvement in energy efficiency by 2020 for industrial enterprises; the ecoENERGY initiative provided assistance to organisations wishing to meet these commitments. From 2007 to 2011 the financial contribution totalled C$17.8m.[33] The initiative aimed to make it straightforward for organisations to comply with energy efficiency-related regulations and invest in opportunities.

This voluntary scheme supported organisations through benchmarking, data tracking, training, awareness-raising and networking[34] In addition, it provided cost-sharing support up to C$25,000 for ISO 50001 pilots,[35] as well as $17.8 million of financial assistance for retrofits in SMEs.

The results of these incentives are mixed. The evaluation estimated that 74% of investments by SMEs would have been undertaken without support; therefore, ecoENERGY was only responsible for 26% of all projects. Yet, all but one of the SMEs interviewed in the evaluation agreed that "funding enabled them to implement those retrofits sooner, more quickly, or more extensively than would have been possible without the funding."

The overall scheme was reported to have achieved 66% of its target for number of projects in industrial SMEs and 61% in commercial SMEs by 2009. A primary reason given for the slow uptake was the "burdensome application process" for these smaller organisations. Another factor cited was the insufficient promotion of the scheme.

Financial incentives were deemed less effective for larger companies in the industrial sector given that firms may have taken on retrofits regardless. However, capacity building activities under the ecoENERGY initiative were identified as encouraging improved uptake in energy management and investments in energy efficiency projects. In particular, 347 large firms were recruited as leaders in energy efficiency and over 2,000 individuals were trained from 2007 to 2009 alone – amounting to 231% and 88% of the respective targets for each instrument.

Overall the ecoENERGY initiative was judged to be a moderate success but with some key areas for improvement that included:

- looking closer at the additional value of financial incentives and whether they just encourage 'free-ridership';
- considering offering incentives for high-risk components such as audits (instead of, or in addition to, retrofits);
- basing incentives on verified energy savings and/or demonstrations of effective practices; and
- providing more concrete and detailed information related to cost-savings and payback via training programs.

[33] Evaluation Report: Evaluation of the Office of Energy Efficiency, Natural Resources Canada, 2015
[34] Evaluation of Energy Efficiency for Industry, Housing and Buildings, Natural Resources Canada, 2010. All subsequent information is drawn from this report unless otherwise noted.
[35] CA-3:ISO 50001 implementation Support, Industrial Efficiency Policy Database (accessed 27/03/2018)

2.2.3 Top 10,000 in China

The energy efficiency opportunity in China is vast due to the combination of a highly industrialised economy and the prevalent use of outdated equipment. This initiative was a direct follow-on from the Top 1,000 programme (2006-2010).

The Top 10,000 programme expanded the multiple services of its forbearer to more than 15,000 industrial organisations that each consume >293 TJ/year from 2011 to 2015. This amounts to c. 2/3 of China's energy consumption.

Local governments were given targets that ranged from 0.03mtce (Tibet) to 25.30mtce (Shandong); with funding provided by the national government ranging from RMB 6.5 million (Fujian) to RMB 166.42 million (Sichuan), with funding related both to the extent of industry in the province and its wealth.[36] The local governments had freedom to act on how to best achieve these goals within their constituencies through a combination of incentives and penalties. Key features included:

- establishing energy efficiency working groups within companies;
- utilisation of energy efficiency benchmarking and targeted accounting and reporting for energy use;
- expansion of training pilots for energy managers;
- set up of energy management systems;
- mandatory audits that comply with the Chinese standard GB/T 17166;
- mandatory phase-out of inefficient technologies for those that fail to pass a government review;[37] and
- provision of dedicated funds – including an incentive of c. €30 for every GJ saved due to implementation of energy efficiency measures - and cooperation with ESCOs to accelerate retrofits.

The Top 10,000 initiative was reported as a success and exceeded its original target by 23% – realising 309Mtce in energy saving versus its original 250Mtce target. This is equivalent to over 1/3 of China's national energy efficiency target of a 16% reduction in energy intensity by 2015 from 2010 levels.

It is the view of this evaluation team, that the use of incentives and penalties, working in tandem, was likely to be important in driving this success. Provincial governments were liable for penalties if they failed to achieve their targets agreed by the central government. This translated into strong political commitment to drive change by mandating that companies submit audits for review. Thereafter, energy efficiency measures were implemented due to either enforcement or financial incentives and technical support.

2.2.4 Free Energy Audit for SMEs in Japan

To unlock energy efficiency potential in the SME market, the Japanese Government provided free-of-charge energy audits to SMEs conducted by the governmental organisations ECCJ and NEDO (Energy Conservation Centre Japan and New Energy and Industrial Technology Development Organisation). SMEs were defined as having less than 300 employees or less than ¥300m in revenue.

[36] The Specialized Funding for Environmental Protection and Energy Conservation, details of which can be found through these links (please note, no English translation available):
[37] About 10% of companies failed to reach their targets in 2012 (Industrial Efficiency Policy Database. CNx3a: Top-1000 Energy-Consuming Enterprises Program. Accessed: 02.09.2015.)

ECCJ audited between 300 and 1000 organisations annually since 1980, with cumulative energy savings amounting to 2.38 TWh.[38] NEDO audited 40 to 100 premises per annum between 1999 to 2007, realising 6.95 TWh in energy savings.[39] The overall cost of the initiative per ton of CO_2e emissions abated is estimated at €10 to €20/tCO_2e.[40]

Free audits were attributed with successfully raising awareness of energy consumption among SMEs, and in some cases, driving the realisation of energy savings. However non-informational barriers persisted, particularly the lack of finance and low priority of energy efficiency investments[41].

Successive evaluations of Japanese energy efficiency policy for SMEs recommended that audits be complemented by[42]:

- financial support mechanisms;
- environmental taxes raising energy prices; and/or
- making implementation of energy efficiency measures mandatory.

2.2.5 Industrial Energy Audit programme in USA

The US has implemented a number of energy efficiency initiatives targeting the industrial sector which use audits as one of the main mechanisms of support. During the design phase of its programmes the US Government Department of Energy (DOE) reviewed 22 audit programmes in 15 countries, plus the EU. It drew a number of conclusions about the key structures and mechanisms that result in successful implementation of energy savings:

- **Organisation and coordination** – push from central government for energy audits coupled with a national-level entity to lead the effort in organising and coordinating audit activities
- **Establishing program goals, scope, size** – focus on assessing cost-effective saving opportunities rather than on energy accounting audit; tailor to sector, company size, energy intensity
- **Types of audits offered** – tailored to sectorial needs, for example offering technology-specific audits for quick savings (steam, process heating, compressed air, pumping or fan systems)
- **Supporting measures** – subsidies for assessments, investment incentives, technical assistance (software tools, templates and standards, training schemes), publicity

For large-energy intensive plants (500bnBTU/yr), the DOE developed a 3-day system assessment, with site visit, to be delivered by qualified energy experts trained by DOE. Experts are available for specific areas of energy consumption, and a full list is available on the DOE's website with a searchable database. Support provided includes software tools, technical assistance, and hands-on training for plant personnel. Financial support is

[38] Patrik Thollander, Osamu Kimura, Masayo Wakabayashi and Patrik Rohdin, A review of industrial energy and climate policies in Japan and Sweden with emphasis towards SMEs, 2015, Renewable & sustainable energy reviews, (50), 504-512.
[39] Ibid.
[40] Ibid.
[41] Fact-finding study on Japan's Energy Management Policies (2011), Ministry of Economy, Trade and Industry
[42] Ibid.

offered to companies that join the LEADER programme, a voluntary commitment to reduce energy consumption similar to the CCA in the UK, albeit without fiscal incentives[43].

For SMEs, the DOE created the Industrial Assessment Centres (IACs). The IAC initiative leverages engineering students to deliver free energy audits to SMEs.

The audits and their results are collected in a publicly available IAC database that classifies the information according to the type of facility assessed (size, industry, energy usage, products, location) and the resulting recommendations (description, energy savings, implementation costs, and payback).[44] Going back to 1981, the database provides a valuable resource for assessing the applications and paybacks of different technologies.

It is a low cost scheme that has proven to be effective in achieving its goals. Students at 24 participating universities provided c. 16,000 audits as of 2016.[45] The average energy savings identified amounts to $130,000 following the first year of the audit.[46] The implementation rate per year fluctuates between 35% and 45%[47].

Key findings from non-EU states

The most successful auditing and reporting measures appear to be those that have **clear mandates coupled with incentives and/or penalties**. The Top 10,000 initiative in China represents this most clearly. Local governments were set targets, and penalised if they failed to achieve them. To assist them, they could utilise a range of technical and financial assistance to incentivise implementation, as well as obligatory technology replacement where necessary.

Other key success factors include **straightforward and easy-to-understand procedures**. This was a limiting factor for take-up in the Canadian ecoENERGY initiative. Furthermore, the review of ecoENERGY suggested more detailed and clearer explanations of energy efficiency projects in audits would lead to improved understanding and greater chance of action as a result.

Technical assistance, particularly when concessional, was key for reaching sectors that are less experienced with energy efficiency. An increase in awareness of the opportunity for and, hence, ability to take advantage of, potential efficiency gains was attributed to the provision of technical assistance. Both the Japanese and American examples demonstrate this; trusted sources of advice were provided free of charge, helping to mitigate both technical and financial barriers for SMEs.

2.3 Conclusion of the review of international approaches to audits and reporting

Overall, the review found that implementation of Article 8 (4-6) was broadly similar across MS: **most MS adhered to the EU definition of non-SME to act as the eligibility**

[43] Industrial Energy Efficiency Assessments, Lawrence Berkeley National Laboratory, May 5-6, Berkeley, California
[44] Ibid
[45] Ibid
[46] Ibid
[47] Ibid

criterion for the audit obligation, although the inclusion or not of SME subsidiaries varied. In addition, **MS did not generally mandate the implementation of audit recommendations** although many incentivised follow-up actions, for example with grants or concessional loans.

A lack of published data on the impact of these national schemes has restricted the ability of this study to identify the most effective elements of other policy approaches and therefore to recommend how learnings from other policies could be applied to the UK. This will be interesting to explore if/when this evidence becomes available as some elements of the most successful auditing and reporting measures identified in non-EU states can be seen in the approaches of some EU states, suggesting potential for effective outcomes. Examples include:

- **providing clear guidance – straightforward explanations of responsibility, sectoral guidance to help make it easy to understand in different contexts**;
- **penalising employees** of non-compliant companies or auditors;
- **systematic collection of audit results** for benchmarking purposes; and
- **follow-up implementation and knowledge sharing support**, for example via published databases or the creation of networks of businesses.

Beyond specific policy measures, the evidence gathered and analysed across different geographies, points to the importance of the following wider learning for non-domestic energy policy:

- having a **coherent policy framework** that is easy for organisations to engage with;
- recognising that a complex set of overlapping barriers exists and the policy framework needs to provide **support that addresses the key barriers** in a coherent and systematic way (for example, in the case of encouraging audit activity, there is a need to provide support that not only gives organisations access to high quality information, but also provides technical assistance to enable recipients of the information to engage with it and act on it); and
- recognising the complexity of delivering interventions to organisations given they are made up of multiple actors, with differing priorities and incentives to act. Policy interventions need to reflect this by **providing tools and incentives to engage and act at different levels**, encouraging engagement at differing stages in decision-making processes. One example of this is targeting the right ‘entry’ into an organisation and providing information/tools that can take it to next stage.

3 Use of audits and reporting in the UK, including ESOS

This chapter reviews the contexts in which audits and reporting have been implemented by non-domestic organisations in the UK. Given that ESOS is currently the main policy requiring energy audit activity in the UK, this chapter goes on to consider in more detail the implementation of ESOS audits specifically. It considers the motivations, opportunities and capabilities of key stakeholders involved in the administration and implementation of energy efficiency audits and the reporting and uptake of energy efficiency opportunities.

It contributes evidence to two of the key evaluation questions set for this study:

RQ1: To what extent, (in which ways and in which contexts) are energy audits and reporting effective in identifying and delivering energy efficiency savings across organisations?

RQ2: To what extent, (in which ways and in which contexts) has ESOS influenced organisational energy efficiency policy and practice?

3.1 Use of voluntary audits in the UK, before and after ESOS implementation

Phase 1 of this research has found that, in general, audits are not widely used by organisations, unless there is a legal requirement to do so, such as under ESOS.

This section considers the appetite for and use of voluntary audits among large organisations (making up the ESOS obligated population), as well as SMEs and public sector organisations who are not mandated to undertake audits.

Pre-existing use of voluntary audits among large organisations (the ESOS-obligated population)

While, as discussed further later in this section, ESOS has often been the policy that has encouraged large organisations in the UK to undertake audits for the first time, this has not always been the case and there are examples of ESOS-obligated organisations which had pre-existing audit regimes prior to the implementation of the scheme. Phase 1 of this study also uncovered examples of organisations undertaking audits voluntarily, in addition to their requirements under ESOS.

ESOS-compliant organisation [Property company] “We had a pre-existing plan to audit our five biggest users every year as long as it wasn't included the previous year - so in theory over 2 years we should have covered top 10 sites. This process had already been established and ESOS just sits alongside it. Some of the audits we carried out on our own can be used for Phase 2 [ESOS compliance].”

Organisations, trade association representatives and assessors consulted during Phase 1 reported that energy audits were more likely to have been carried out voluntarily by large and more energy intensive organisations (such as those in the industrial sector, and also those with Climate Change Agreements). In these cases, organisations had been motivated to conduct audits by what they considered to be a strong financial driver to be energy efficient, and such organisations tended to have a dedicated energy manager. Organisations carrying out voluntary audits were more likely to have conducted these audits internally, rather than commissioning an external auditor.

Large private sector organisations which had carried out voluntary internal audits had typically done so with a view to making specific energy efficiency changes. For example, one organisation had carried out audits on its larger sites as part of a feasibility study for introducing combined heat and power (CHP). Another had conducted audits to investigate potential changes to their lighting and heating systems, while another had done so to look at particular machinery on its construction sites.

These highly targeted internal audits contrast with ESOS audits which aim to identify energy savings opportunities across the range of energy uses within an organisation, which as discussed further below can include areas of energy use not previously considered.

Phase 1 found that, for less energy intensive organisations, voluntary audits were only likely to take place if the business owner or others within senior leadership positions acted as 'energy champions'.

Use of voluntary audits among SMEs and the Public Sector

This section considers the extent to which audits have been taken up in the UK in other organisational contexts among SMEs and public sector organisations, who were not obligated under the ESOS policy.

SMEs

Previous surveys of SMEs have shown the very limited use of audits amongst these organisations[48]. Stakeholder discussions conducted during Phase 1 of this research found that SMEs are very unlikely to have conducted energy audits, unless these have been provided free of charge, for example via the Carbon Trust Green Business Fund.

Among the few representatives of SMEs engaged directly through Phase 1, the highest levels of motivation to undertake audits came from cash rich companies whose **owners had a commitment to the environment**, or where employees took on the role of '**energy champions'** and pushed for behavioural change from within. (It should be noted that such energy champions were often also the SME representative choosing to attend the workshops).

[48] Research includes 'Business awareness and uptake of energy audits: Main report' (BEIS, 2017), which showed that only 9% of SMEs reported ever having undertaken an energy audit in surveys between 2014 and 2015. This survey showed the proportion having undertaken audits increasing with the number of employees from 7% of sole traders to 42% of medium-sized businesses. Similarly, findings from questions asked in the 2016 Longitudinal Small Business Survey (BEIS, 2017) showed that only 10% of GB SMEs with separate premises had undertaken an audit in previous 12 months. Results for question E6, combined from data tables for businesses with/ with no employees.

An example of the potential for an internal 'energy champion' to promote energy efficiency action, including the use of audits, is provided through the organisational case-study below. This also highlights some of the typical challenges faced by employees in such roles within SME's:

Case study: SME with internal 'energy champion' seeking to change practices

Organisational background

- Long-established family-run business
- Food & Drink sector; two food manufacturing sites; over 20 stores; 300 wholesale customers
- Transport fleet: over 20 vehicles, including freezer vans, split temperature vans, company cars

Respondent background:

- Operations Manager across all sites, working between Board of Directors & Heads of Department.
- Previously Operations Manager for a restaurant group – involved in (free) energy audit across chain, setting energy reduction targets for 5-year plan.

Challenges faced securing engagement in energy efficiency investments:

- ***Relatively low energy spend***: main use is refrigeration, manufacturing equipment and lighting (~2.5% of outgoings)
- ***Capex focus***: investment decisions usually based on Capex, with little consideration of Opex
- ***Board sign-off on any expenditure*** – no budget held by Operations/Facilities Manager
- ***No client-base pressure*** – established brand in area with older client base
- ***Lack of policies on energy use***
- ***Lack of organisational culture around collaborative projects***
- ***Lack of appetite to use external consultants***

Ways in which increased attention on energy efficiency issues is being encouraged –

Operations Manager appears to be a potential 'change agent' within the business:

- Operations Manager **presented to Board on Opex** involved in open fridges – decision was taken not to purchase new fridges but instead to review other point of sale approaches
- Operations Manager **encouraged trackers to be installed on fleet** to increase visibility of routes

- **Presenting reputational value** of sustainability-related projects (which led to recent involvement in a circular economy project)

- Operations Manager has found **promoting site-to-site competitiveness** worked at a previous organisation, and showing what success looked like. He has done this through providing stock control comparisons and showing the cash benefit generated by more efficient stock control – at a previous company, he worked up from there to talk to people about leagues based on carbon benchmarks

- He is thinking about how to **encourage engagement through translating figures** into a language employees can understand – e.g. instead of 'saved £20,000 kwh', 'this is equivalent to the sale of x-number of baked goods'.

The role of **visual information** was highlighted as important in raising awareness and achieving engagement with SMEs on energy issues and in the potential value of audit activity. One contractor who participated in a workshop described how they supported the sales of efficient lighting by bringing audit equipment – such as thermal cameras – on site to SMEs to show them the heat loss from their current lighting. This was deemed a success factor across many cases, highlighting the role that audits could play in encouraging SMEs to reduce energy use.

SME [on lighting improvements carried out as a result of energy audit]: "The energy audit was purely aimed at achieving energy and cost saving benefits, but it didn't talk about the other, additional benefits it brought: better working conditions, happier staff, better retention and a better customer-facing image…"

Several workshop attendees also mentioned the role of **contractors** who are not directly responsible for energy but nonetheless could help an SME reduce its consumption – for example architects, builders and engineers who supervise a refurbishment process. Contractors with whom SMEs have long established relationships remained very important and were seen as the most trusted in terms of procuring the best kind of products which would deliver against expectations in terms of energy use, maintenance requirements, and cost.

SME representatives engaged through the workshops confirmed that they faced similar overarching challenges in relation to their capability to follow energy saving opportunities. They reported that a **lack of financial and human resources** deprioritises their investment in energy audits, and also in energy efficiency investments. For SMEs with **limited balance sheets**, even concessional loans are often not attractive enough to incentivise investment, as they reported that they can often only deploy their limited debt capacity for areas relating to their core business.

In terms of skills, none of the SME participants had dedicated energy managers, and in at least one instance the person responsible for energy in the organisation highlighted that they had no technical background at all. SMEs consulted were therefore reliant on contractors for energy management.

To overcome this issue, Phase 1 evidence suggests audits that can come as part of a **wider support package** would help more SMEs realise more energy savings. For example, combining audits with a pre-made investment decision as an 'add on' and/or with technical assistance support guiding implementation.

These findings were reinforced by discussions with a trade association consulted in Phase 1. They reported feedback from some of their members (mostly small energy-intensive businesses) that government assistance (such as financial support to carry out audits and knowledge sharing mechanisms) and tax incentives would drive increased investment in energy efficiency by their company.

Public sector

Representatives from public sector organisations consulted during Phase 1 perceived audits to be useful and most stated they would commission an audit before investing in energy efficiency. However, despite this level of interest most of them highlighted financial and technical constraints which were likely to reduce the chances of audits being prioritised.

Moreover, these organisational respondents felt an audit would rarely be the direct cause of investment in energy efficiency projects; rather, from their experience of the public sector, they expected that an organisation with a pre-existing notion of wanting to save energy may use an audit to understand where to focus its efforts. At the same time, it was recognised that a good audit might help increase the ambition and scale of the savings realised.

A key discussion point at the public sector workshop which differed from engagement with private sector attendees, was the importance of **high-level organisational priorities and direction**. For instance, a constabulary reported that a new police commissioner with a commitment to the environment will trigger cascading interest in energy efficiency all the way through the bodies that respond to them. Representatives of local government saw parallels to this mechanism through the role of mayors or other political figures.

In contrast, several attendees reported cuts to their capital budgets, making it impossible to pursue energy efficiency projects.

Public sector organisations faced fewer challenges than SMEs in terms of staff capabilities. Some of the larger ones did have dedicated energy managers, while others were providing some training to staff members to acquire some of the required technical skills.

3.2 Background to ESOS and wider UK policy landscape

As most large organisations had not undertaken audits voluntarily, Phase 1 found that the legal requirements of ESOS led to many carrying out audits for the first time.

ESOS was developed by the Department of Energy & Climate Change (DECC)[49] to meet the requirements of Article 8 (4-6) of the EU Energy Efficiency Directive[50] with a key aim of providing flexible and cost-effective routes to compliance[51] but with quality assured through an accredited assessor market. Organisations notified compliance with the scheme administrator (the Environment Agency[52]), with implementation of the energy saving measures identified left as voluntary.

The following sections consider how the ESOS policy, and its position within this wider policy landscape, is perceived by key groups of stakeholders, namely: those organisations obligated under ESOS; and the assessor market, which has responded to provide services that underpin the delivery of the policy.

The findings presented reflect the feedback gathered from these stakeholder groups during Phase 1 of this study (27 interviews and 6 workshops have been carried out – further information is provided in the Introduction). In places, reference is also made to evidence on the implementation and effectiveness of the ESOS policy taken from the Interim Process and Early Impact Evaluation of ESOS[53].The gathering of further new primary evidence on the response to the ESOS policy (particularly on aspects such as the types of recommendation received through the process and the extent to which they are being implemented, as well as how the ESOS policy and its outputs have been communicated across corporate groups) will continue at a larger scale, and across a more representative sample of stakeholders, in the next phase of this study.

Given the key aim of ESOS is to drive organisational behavioural change, the response of stakeholders to the policy is presented in this chapter within the framework provided by the COM-B approach to understanding behaviour change[54]. This supposes that behaviour change is influenced by a set of factors related to Capability, Opportunity and Motivation (please see Annex 5 for further detailing of these sets of factors). The COM-B framework is used here to provide a way of thinking about whether the auditor, and then the organisation itself, has the right type of Capability, Opportunity and Motivation to lead to an effective audit intervention (that is, one that encourages engagement in, and uptake of, the recommendations).

3.3 Response of assessor market to ESOS

Certified Lead Assessors are qualified energy experts who could undergo specific training under one of the ESOS Accrediting Institutions to become Lead Assessor accredited,

[49] Moved to the new Department for Business, Energy and Industrial Strategy (BEIS) as of July 2016
[50] Article 8 (4-6) of the EU Energy Efficiency Directive (2012/27/EU) requires all large non-SME enterprises (or smaller organisations that are part of a large group) to undertake audits or a specified equivalent (such as ISO 50001) of the energy used by their buildings,
[51] ESOS compliance can be reached through ISO 50001 certification, a Display Energy Certificate, Green Deal Assessment or ESOS compliant energy audit.
[52] The Environment Agency is the scheme administrator for the whole of the UK. Responsibility for compliance and enforcement rests with the Environment Agency in England and the equivalent devolved agencies i.e. Scottish Environment Protection Agency, Northern Ireland Environment Agency, Natural Resources Wales; and the Secretary of State for Business Energy and Industrial Strategy for organisations with wholly or mainly offshore activities).
[53] https://www.gov.uk/government/publications/energy-savings-opportunity-scheme-esos-evaluation-of-the-scheme
[54] https://implementationscience.biomedcentral.com/articles/10.1186/1748-5908-7-37

which enables them to sign off[55] ESOS-compliant audits. During the first phase of the scheme, over 900 ESOS Lead Assessors were accredited to 14 approved ESOS assessor registers, hosted by a mix of industry bodies and training and certification providers.

An assessment of the role played by ESOS in driving energy efficiency savings requires consideration of whether these accredited assessors have the right:

- **motivation** to deliver high quality audits, exploring, for example, whether they seek to be in the market long-term, and how their business model plans to respond to ongoing cycles of ESOS requirements;
- **capability** to deliver high quality audits, including whether they have the right skills, and access to the necessary training and guidance, to identify energy saving opportunities for organisations; and
- **opportunity** to influence the awareness and engagement of organisations in, and ultimately their uptake of, energy saving recommendations.

Motivations

ESOS was considered a good business opportunity by auditors engaged in this study. They viewed the scheme as providing a 'hook' to offer further services to their existing client base as well as to target new clients. Most of these assessors (as was also found in the interim evaluation) had a background in energy auditing, and were linked to an energy accreditation register through existing affiliations to a relevant professional body which hosted a register – they reported that this provided them with a straightforward route to accreditation, and was another factor motivating them to become involved in the scheme.

In theory, there is a clear motivation for auditors to deliver high quality audits, as their business case depends on a pipeline of clients seeking to understand their energy use and identifying opportunities for reducing it.

Indeed, evidence to date suggests that overall audit reports provided to organisations through the ESOS process were of good quality[56].However, some auditors who attended the Phase 1 workshops explained that they had turned down work near the compliance deadline where they felt the timeframe was too tight to deliver to the quality standard they held themselves to. Some assessors and organisations held a view that the high demand for audits created by the policy, and in particular close to the compliance deadline, drew some less experienced auditors who were mainly motivated by a short term monetary opportunity. In addition, examples were given of prices being marketed to organisations which were considered unrealistically low and a potential indicator of low quality services.

The Environment Agency carries out audits of the ESOS evidence packs to check they meet the required standard, and found that some fell short. However, in general, where there were lapses in the quality of auditing services and audit reports provided, this may

[55] Only accredited lead assessors could sign off an ESOS audit. However, other consultants could be involved in the audit process; for example, some lead assessors would add the recommendations and sign off the report, but junior colleagues would carry out the actual on-site audit.
[56] A review of a random selection of 50 ESOS audit reports conducted by the Environment Agency in 2016 found most to be of the required quality (none failed this check although 69% received a pass with some remedial actions). The interim evaluation of ESOS also identified relatively high levels of satisfaction among complier organisations with the audit reports received.

relate to issues around skills or training (capability) rather than mis-aligned motivations, as explored further below.

Capabilities

Stakeholders engaged during Phase 1 held a view that the quality of audits conducted through ESOS varied. This largely appears to be an issue of capability which tended to be due to the overall skills of the auditor, their experience with sector-specific nuances and/or their available time and resources.

Where there were instances of dissatisfaction with their ESOS audit report, organisations sometimes reported this to be when the auditor was felt to have offered limited additional value in the recommendations provided, above and beyond what they felt they were already aware of. For example, some organisations felt that low quality auditors provided recommendations with a generic payback period for that measure, without taking into account the specifics of the site and its energy usage. However, it should be noted that some assessors complained about receiving poorly scoped briefs for their services, which could explain why organisational expectations were not met.

Assessors consulted during Phase 1 generally considered the training available for ESOS Lead Assessors to be appropriate given their experience in energy auditing. However, a few believed the training could have offered more specific advice on the application of ESOS guidelines in particular circumstances, such as for organisations in the transport or aviation sector, or for organisations with large fleets or where complex site sampling may be required.

Energy auditors consulted in Phase 1 primarily had expertise in building energy audits; some found it challenging to carry out the fleet audits that were often required for ESOS compliance. This was in part due to difficulties gathering the necessary vehicle usage data, and – as evidenced in the interim evaluation – where vehicle energy use primarily comes from ‘grey’ fleets this data proved particularly challenging to collate with high accuracy.

Some organisations suggested that more detailed ‘signposting’ of auditor specialisms (such as transport) on the websites of registers would help to ensure the relevant expertise was procured.

The availability of reliable utility data was also raised as a barrier to providing accurate payback times for energy saving opportunities. Some auditors said that, due to a lack of sub-metering equipment, they had to provide wide bands for estimates of the payback periods for energy saving opportunities, resulting in lower opportunity implementation rates as organisations had less certainty about the benefits.

Opportunities

In a business-as-usual scenario, if they are not energy intensive, the evidence reviewed during Phase 1 suggests that many companies are unlikely to seek audits. ESOS therefore acts as an important catalyst for opportunities for auditors.

Assessors reported that the extent to which ESOS had provided them with an opportunity to influence the awareness and engagement of organisations in, and ultimately their uptake of, energy saving recommendations, was largely dependent on the attitude of the organisation to the policy; namely whether they approached it as a pure compliance

exercise or whether they had an appreciation of the ways in which their organisation might benefit from the audit process and engaging with the audit output. The response of obligated organisations to the policy is covered in the next section, but two key ways in which this interacted with the opportunity afforded to assessors were highlighted as:

- The **level of audit preparation** completed by the organisation: in some cases, the opportunity for assessors to make effective energy efficiency recommendations was limited by the quality of organisational energy-use data, or the information on prior energy efficiency action, available to them. In some cases, a factor interacting with this was the lack sub-metering data available. Although auditors were sometimes asked to gather this data on behalf of the organisations, in some cases organisations were not willing to pay higher audit fees for this to be done.
- The **level of access** to senior decision-makers given by the organisation: assessors often reported it to have been challenging, particularly in large corporate organisations, to access and communicate their findings to the senior individuals in a company, who ultimately made the investment decisions, which may have contributed to low levels of follow-up reported.

Some auditors reported steps they had taken to maximise the chances of their ESOS audits driving energy efficiency action. These particularly focused on their approaches to reporting audit feedback. For example, a few had used the term “energy productivity” rather than “energy efficiency” which was felt to be more engaging for some organisations. Others had: presented the equivalent increase in sales turnover represented by a certain reduction in energy use; linked energy efficiency opportunities to new product lines, new building outfitting, job creation or the purchase of new equipment; or insisted on a presentation to the Board as part of their contract. The use of dashboards, graphical representations and other rapidly digestible ways of presenting the information were also highlighted as beneficial.

3.4 Response of obligated organisations to ESOS

Compliance with ESOS has been reported at over 99% by the overall scheme administrator, the Environment Agency. The interim evaluation, conducted in the year after the compliance deadline, found most compliant organisations commissioned external energy auditing services (83%) to determine the majority of their energy consumption, with much lower proportions using ISO 50001 (c. 5.7%) or Display Energy Certificates (c. 3.5%) or Green Deal Assessments (0.1%)[57].

This level of compliance is consistent with other mandatory reporting measures seen elsewhere in the world, such as EEO in Australia and the Top 10,000 scheme in China. However, for real impact, compliance needs to translate into action. This section therefore considers the extent to which obligated organisations have the:

- **Motivation** to gain a benefit from ESOS beyond complying with it as a regulation;
- **Capability** to respond to their audit – including whether they have the right internal culture and set-up, and access to the right skills and finances, to pursue recommended energy saving opportunities; and

[57] In addition, approximately 8% of notifications were from organisations that used multiple compliance routes across their total energy consumption or had energy consumption that was not audited under de minimus rules (≤10%).

- **Opportunity** to benefit from ESOS through the receipt of a high-quality audit providing them with actionable and viable energy saving opportunities.

ESOS-mandated organisation: "We implemented ISO 50001 because of ESOS, and my current role as energy manager definitely wouldn't have been created without it…next month I hope to travel to Sweden to share the benefits of our company's energy management system with our sister companies…"

Motivations

A majority of stakeholders engaged in Phase 1 (both assessors and organisational representatives) reported that ESOS has been predominately seen as a compliance exercise. As a result, stakeholders felt it was not featuring in the core thinking or operation of a significant number of businesses and that further action beyond that which is obliged was rarely seen as a high priority. This in turn accentuated the demand for low-cost audits, driving down overall audit quality and reducing the overall effectiveness of the auditing process. Evidence also suggests that organisations which hold energy efficiency as a high priority had often already identified a number of potential energy savings. Indeed, these organisations similarly perceived the scheme as a compliance exercise, rather than a new opportunity.

Feedback from interviews at Phase 1 (which, although small in number, do tally with the findings of the interim evaluation among a larger, and representative sample of ESOS notifiers), was that the ISO 50001 route was favoured by those companies who are energy intensive or for whom energy represents a large fixed cost. This reflects that ISO 50001 requires an energy management system to be implemented with associated staffing requirement. However, the interim evaluation also found that some organisations did not pursue the ISO 50001 route due to lack of time – they did not think it was possible to be certified by December 2015, and the extension to June 2016 came too late. Thus the evidence suggested a later compliance deadline from the outset via ISO 50001 may have mitigated the increased time and staff cost of this compliance route.

The motivations of organisations for energy efficiency were observed (during both Phase 1 and the interim evaluation) to be closely tied to the characteristics of a company – particularly, whether companies were the direct owners of their assets or tenants. If the former, they were more likely to consider investments with longer payback periods, while among the latter, there was far less motivation to do so. However, the interim ESOS evaluation suggested that while there were some differences by tenure, the critical factor for energy efficiency investment decisions was lack of funding, both among those who leased (39%), or owned (46%) their premises. Of those who leased their premises, just 8% said the landlord would not allow upgrades, and 10% mentioned limitations of the premises.

Evidence from both Phase 1 of this study and the interim evaluation suggested that ESOS may have helped keep or push energy efficiency agendas primarily among organisations already interested in energy efficiency – this includes those reporting high levels of priority being placed on energy efficiency prior to ESOS (which tended to be larger, multi-site organisations), as well as those achieving compliance through ISO 50001 or via an internal assessor. Office-based organisations, and particularly those close to the employee threshold for the scheme (or below where they had triggered eligibility due to high turnover) were among those least likely to be demonstrating any early impact from ESOS.

Exploring reasons for ESOS non-notification

Follow-up in-depth interviews were carried out in Phase 1 with organisations that had not yet submitted a compliance notification at the time of the baseline survey. One of these organisations was aware of their eligibility but had made a conscious decision to delay compliance. They were prompted to do this by advice from their energy consultants who, based on their experience of other schemes such as the Green Deal, doubted that penalties would be enforced. This organisation did eventually comply in late 2017 after enforcement action from the Environment Agency.

Other organisations interviewed felt that, although they had been identified by the Environment Agency as part of the obligated population, they did not in fact qualify for ESOS – for example, as their employee size figures were skewed by seasonal workers, or because they were publicly funded. Such organisations had not been threatened with enforcement penalties by the Environment Agency. This reflects evidence from the interim evaluation that it was challenging for the Environment Agency to assess eligibility (a challenge shared by other MS, such as Germany).

ESOS-compliant organisation [Large drinks manufacturer]: "Auditor did identify areas of opportunity – but we needed more expertise on how these could be rectified…unlocking the capital isn't the particularly difficult part of the process, getting people together to agree things is…"

Capabilities

The majority of organisations have chosen to comply with ESOS through the commissioning of externally-led audits.

With regards to organisational capability to follow-up on audit recommendations, the following key barriers were identified by stakeholders engaged in this study:

- **Financial limitations** were regularly mentioned as a fundamental barrier to implementation. The UK does not provide financial assistance in the same fashion that other countries do – see examples of Ireland, Sweden and China above.
- A **lack of technical understanding** was a barrier for some in being able to breakdown the recommendations into actionable steps – for example, what type of contractor, and terms of reference, might be required to implement the recommendation.
- **Corporate group structures** also frequently led organisations to be limited in their ability to enact energy efficiency savings. The interim evaluation of ESOS found that the vast majority of notifications were submitted by parent companies. From the small number of interviews conducted during Phase 1 with organisations within larger corporate groups, it appears that where compliance was led by the parent company the involvement of subsidiaries in the process was minimal, and reports were not widely disseminated. As noted above, even parent organisations faced

major challenges in implementation: for subsidiary organisations, these were exacerbated by lack of awareness of what might be implemented.

Opportunities

The ESOS policy was considered, among assessors and organisations interviewed in Phase 1, to have offered an opportunity to businesses to improve their understanding of the potential for energy efficiency improvements in the following ways:

- **Providing a baseline** for companies that had limited, or no, understanding of energy efficiency opportunities.
- **Providing increased visibility** of energy use and related savings opportunities to senior management: while in many cases facilitates or energy managers at organisations reported that their ESOS-identified recommendations were already known to them, the ESOS audit process provided external verification. This, in some cases, had helped them to make business cases to their Board, expediting the implementation process.
- **Providing new information**, in some cases, on the energy use, and energy efficiency opportunities, at certain sites or related to certain processes. Through requiring reporting on 90% or more of energy use, ESOS required some organisations to collate and report on energy use information for sites that had not been assessed before, providing visibility on their energy use for the first time. Energy managers at ESOS-compliant organisations also had little prior understanding of the importance of vehicle fuel consumption to their organisation's overall energy consumption. The inclusion of this data was therefore considered, by some, to be a significant "value-add" of ESOS Phase 1.

Evidence collected during Phase 1, supporting the interim evaluation, found that, the energy saving recommendations identified by assessors fell into the following broad categories:

- **improved monitoring or information quality** to better understand levels of usage and identify energy expensive or faulty machines or processes;
- **zero or low-cost measures** with quick payback (<6 months) (for example, control-optimisation to reduce out-of-hours usage, installing timers or occupancy sensors, repositioning thermostats, or fixing compressed air leaks and other wastage);
- **behavioural changes** (for example, more efficient IT equipment use or training on appropriate use of heating controls);
- **larger investments**, up to 4-year payback (for example, LED lighting, heat recovery, switching power generation for specific processes from a diesel generator to direct grid power);
- **Heating, Ventilation and Air Conditioning (HVAC)** (recommended interventions included boiler replacement, better insulation, better piping, new control systems, thermos-regulators, and fuel switching); and
- **transport measures**, for example, 'good driving practice' policies, rewards for staff using public transport/cycling, and improved focus on vehicle maintenance (these

were particularly likely to be new information for organisations, as most had not collated data on fuel to measure consumption previously).

Most organisations will only be able to implement recommendations, however, based on high quality audits including accurate information on the expected investment cost and projected savings of measures. Despite broadly high levels of satisfaction with ESOS audit reports received, a few participants made references to recommendations with unrealistic pricings or uncertain rates of return, which, in some cases, had undermined the confidence of senior management in the proposed projects. This was particularly the case in highly specialised manufacturing sectors where assessors required particularly high levels of understanding of specific sites and processes in order to deliver implementable investment-grade audits.

Companies who already participated in other policies, such as Climate Change Agreements, were less likely to find the ESOS audits provided them with new information. Organisations, trade association representatives and assessors interviewed during Phase 1 reported that for those organisations with Climate Change Agreements (CCAs), the ability of ESOS to provide new information was often more limited. Some trade associations, representing more energy intensive sectors and organisations, reported that their members with CCAs had often already conducted audits prior to this activity being mandated through ESOS. Often the recommended energy savings opportunities obtained through the ESOS process were therefore reported to already be in the planning stages and ESOS confirmed the decision as opposed to providing new insights.

However, some of these organisations themselves indicated that ESOS had helped them to identify new energy saving opportunities in areas of the business not covered by CCA – for example, one organisation met their CCA targets through renewable energy at one site rather than through energy efficiency measures. ESOS had therefore identified new opportunities at that site, as well as at others that they had not needed to consider for CCA. There was limited evidence, however, of ESOS providing additional visibility to organisational Board members of energy savings opportunities for organisations with CCA commitments. Some trade associations also reported a view that CCAs could be more effective at motivating companies to implement energy efficiency measures than ESOS audits, given CCAs provide an incentive structure to encourage implementation of energy saving opportunities.

In addition, the reporting requirement on recent energy use within the ESOS Evidence Pack was found to overlap with other policies such as the GHG Mandatory Reporting by quoted companies. The lesser opportunity represented by ESOS to these CCA and GHG Mandatory Reporting-undertaking organisations is in line with expectations in the initial Impact Assessment[58].

Initial feedback suggests company structure and type could have played a role in determining the scale of opportunity for energy savings identified by ESOS. Some sectors with similar underlying assets (such as retail) were able to replicate energy saving investments identified by audits across multiple sites. This was considered more difficult for sectors with greater variation in business operations across sites. Some sectors also had an advantage in that implementing energy saving opportunities could also result in

[58] Impact Assessment: Energy Savings Opportunity Scheme, Department for Energy and Climate Change and Department for Transport, 2014.f

secondary benefits, such as lighting measures directly benefitting the customer experience.

A shared view across stakeholders engaged in this study was that the 4-year cycle of ESOS compliance was not promoting better ongoing approaches to energy management. It was considered to be too infrequent for energy efficiency to maintain visibility amongst the decision makers in an organisation. A concern expressed by assessors was that ESOS Phase 2 may struggle to offer clients additional opportunities if they have not acted on recommendations from Phase 1.

Outcomes

To judge impact, reporting and auditing policies are only as effective as the measures that they encourage to be implemented. The extent to which participatory organisations took on the recommended measures after auditing is vital for scaling energy efficiency in the UK.

Extent of implementation

Phase 1 suggested that a majority of energy savings recommendations had not yet been implemented. Evidence from both organisations and assessors suggested that although organisations invariably received at least one energy saving recommendation in their audit report, these were only taken forward in a small proportion of cases. This was supported by the 2016 survey of compliers carried out as part of the interim evaluation of ESOS. The survey found that although four out of five (79%) complier organisations had implemented one or more energy efficiency measures between early 2015 and autumn 2016, only one in four (26%) attributed the installation of at least one of these measures in full or in part to ESOS.

Contexts in which measures are/ are not implemented

Feedback from Phase 1 workshop attendees who had complied with ESOS suggested that recommendations were generally only implemented if two key conditions were met:

- **payback below an absolute maximum of three years**, with two being a more realistic limit for smaller companies or the public sector; and
- **minimal disruption to the business** – including avoiding closing down offices/factories, and the taking up of staff time to oversee the implementation of the savings.

Lighting was commonly highlighted by Phase 1 organisations and assessors as the archetypal measure that meets the above criteria. Evidence from the interim evaluation supported this; organisations had most commonly installed lighting measures (59% of organisations), which were also most commonly directly (9% of installed measures) or at least partly (28%) attributed to ESOS. Even though many organisations reported being aware of potential lighting improvements, ESOS could still lead to implementation as per the example below.

ESOS providing evidence to take forward already known improvements

A voluntary organisation had undertaken an energy audit around seven years before their ESOS audit in order to reduce their carbon footprint, therefore they felt they were aware of most of the recommendations in the ESOS report. Nevertheless, the

report is leading to impact – one of the recommendations was to upgrade the fluorescent lighting to LED. The facilities team believed the clearly depicted benefits and 18 month payback period gave them 'clout' with the board to move forward with the upgrade, which is being finalised in discussion with the finance director.

Further detail on the uptake of measures in other categories based on the interim evaluation data is provided in the annex and in the Phase 2 report published alongside this report.

However, Phase 1 also highlighted that measures with longer payback periods were implemented in some circumstances. For example, where boiler replacements had been implemented, this had sometimes been approved by senior management after being communicated to them in terms of required refurbishments (for example, the boiler being 30 years old).

Implementation of measures with longer payback periods

An ESOS lead assessor gave an example of recommending boiler replacement in the report, with a very long payback, but this was implemented as they also found a small leak which meant that the boiler would need to be replaced as part of scheduled maintenance in any case

In addition, Phase 1 suggested that in a small number of cases, organisations implement measures with longer payback periods due to non-financial or indirect benefits. For example, a factory owner installed lighting with a long payback believing it would improve the wellbeing and productivity of staff.

During the Phase 1 discussions, tenure proved to be another significant barrier to the implementation of energy saving opportunities. In many cases, tenants were not incentivised to implement energy saving opportunities because they were not responsible for the energy bills that would be reduced by energy saving opportunities. Similarly, short-term tenancy agreements often dampened appetite to implement energy saving opportunities, particularly those with long payback. Furthermore, some recommendations were not practicable for tenants to install under the terms of their lease.

Implementation of fuel efficiency measures

Organisations and assessors engaged in Phase 1 of this study reported that where transport recommendations were not implemented this tended to be due to perceptions of excessive disruption to the business or to employees' livelihoods (for example, where company cars are part of the salary package). An exception to this was a major car company which decided to switch to electric vehicles following the ESOS audit. The 2016 survey found that while four in five (82%) of complier organisations with a vehicle fleet had implemented fuel efficiency measures between early 2015 and mid-2016, only one in five (22%) attributed the implementation of at least one such measure at least partly to ESOS, supporting evidence from Phase 1 that ESOS was not a major driver of implementation of fuel efficiency measures.

However, some assessors expressed that they hoped that the time-consuming process of collating vehicle fleet usage for ESOS Phase 1 will have encouraged some companies to implement more streamlined, online databases and processes for monitoring vehicle fuel

consumption – this would represent an important step towards being able to better manage fuel efficiency and provide an easier starting point for this element of future phases of ESOS-compliance. This hypothesis has also been tested during the Phase 2 survey of complier organisations published alongside this report.

3.5 Reporting

This section considers the extent to which organisations in the UK conduct internal or external reporting on energy efficiency or energy efficiency audits and the perceived impact and value of reporting on driving action.[59]

As with audits, Phase 1 has found that reporting on energy efficiency tends to take place only when mandatory. Several large organisations consulted in Phase 1 were subject to multiple mandatory external reporting obligations (e.g. CRC, EU ETS) in addition to ESOS compliance. However, in some cases these organisations also had voluntary external reporting obligations (associated with private carbon reduction schemes they were members of, or as part of charitable commitments).

Some organisations consulted during Phase 1 were concerned that mandatory external reporting requirements such as CRC and GHG reporting can conflict with ESOS and with each other. For example, some organisations had found that different schemes necessitated reporting the same metric over different time periods, or having to adjust what assets were included in the process depending on scheme rules. Trade body representatives interviewed reported that this had led to some of their members viewing mandatory external reporting as a hassle and not something that was driving additional action to improve energy management and energy efficiency.

Phase 1 found reporting was more common among public sector organisations. For example, some representatives from public sector organisations noted that reporting against voluntary targets set by the Mayor of London was compulsory. They believed this had greatly helped public sector energy managers in London to build traction and get senior management support within their organisations to focus on energy management and audits.

Public sector participants also believed that reporting against benchmarks was effective, particularly if it was in line with national or international norms, and that reporting progress against carbon management plans was effective in raising awareness and importance of energy management within an organisation's agenda. This awareness was seen as critical to energy being perceived as more than just a fixed cost, particularly in public sector organisations where it was reported to usually only make up a small percentage of overall costs.

SMEs engaged in Phase 1 noted that they did not have mandatory external reporting obligations, although some were part of associations that had some level of voluntary reporting on sustainability. Similarly, none of the SMEs were conducting internal reporting

[59] It should be noted that the evidence presented here is based on small-scale qualitative research with eight SMEs, six public sector organisations, five trade body representatives and twelve ESOS obligated organisations. This does not, therefore, represent a comprehensive, or representative, review of reporting experiences to date among these sectors.

of energy efficiency and therefore could not comment on the impact or value of reporting in driving action.

4 Lessons learned for effectively driving beneficial changes in organisational energy management approaches

This chapter compares the design, implementation and experience of ESOS (Chapter 3) against what has been learned about effective audit and reporting practice elsewhere (Chapter 2). It provides an assessment of the extent to which ESOS is designed in a way that helps to encourage intended behaviour change around energy management and uptake of energy efficiency opportunities. It also considers what alternative or complementary policies might be needed to further promote energy savings.

It contributes evidence under two of the key evaluation questions set for this study:

RQ3: What are the lessons learned from implementing ESOS that could feed into future policies?

RQ4: What is the wider learning from this research for BEIS policy making?

4.1 Review of ESOS implementation against audit and feedback success factors

The use of audit and feedback to encourage organisational behaviour change is a well-recognised intervention in the field of implementation science, in the energy sector[60] and also in other organisational contexts, with a particular prevalence in the healthcare sector. Phase 1 included a review of a paper setting out best practices in the design of audit and feedback from the health sector. This has shown that there is potential for much of this learning to be translated from other sectors to the energy sector; learning from the healthcare sector can help to provide a framework for the key ingredients that an audit and reporting process might include to be effective.

In this section, the ESOS policy design is reviewed against the key components of audit and feedback that have been identified in this research from the healthcare sector. This helps to identify which elements of best practice are already part of the ESOS approach, and also areas of the policy design that could benefit from changes, or complementary policies, to encourage the desired behaviour change among obligated businesses.

[60] Staddon, Sam C. et al. "Intervening to change behaviour and save energy in the workplace: A systematic review of available evidence." (2016)

Key success factors for effective audit and feedback *(identified in research with the health sector[61, 62])*		**Summary of ESOS policy design and performance to date against these success factors**
Audit components	**Data are valid** (note that in context of ESOS policy, validity of data may relate to both energy consumption data and data presented to back-up recommendations e.g. around likely costs of implementation, predicted energy savings and payback periods)	While some issues with ***energy consumption data*** included in audit reports has been reported in interviews with obligated organisations and assessors, this has not tended to point to limitations in the ESOS policy design, but rather to challenges around the quality and availability of non-domestic energy data. Assessors highlighted, for example, the lack of sub-metering on many non-domestic sites making it difficult to identify usage data for particular machinery or processes. In addition, assessors highlighted poor existing processes within organisations to collate and store energy use data, and in particular fuel use data (something that the ESOS policy has helped to accelerate and improve in some organisations). That said, in general it is believed that valid data was mostly used during ESOS audits. This was supported by the Environment Agency's pilot review of 50 randomly selected ESOS audit reports – all passed the spot-check, although there were some that required the energy consumption data to be checked and/ or re-calculated, or required further evidence on conversion factors used. **Feedback on recommendations-related data:** During the interim ESOS evaluation, a majority of ESOS compliers reported being confident with the data included in their audit report. However, a few organisations engaged in that evaluation, and also in this more recent study, highlighted their uncertainty over the validity of recommendations-related data included in their ESOS report, for example the estimated savings presented or the costs of implementation. In the few instances where this was the case, organisations reported this affected their likelihood of pursuing the recommendations. Remedial actions related to this element of the audit report were only picked up in a minority of cases by the Environment Agency's small scale quality-assurance check on 50 ESOS audits – in a few cases amendments to cost benefit analysis were requested, or best practice approaches were recommended such as including life cycle costing methods for energy saving opportunities. ESOS performance rating against success factor: **GREEN**

[61] Ivers, Noah M et al. "No more 'business as usual' with audit and feedback interventions: towards an agenda for a reinvigorated intervention." Implementation science : IS (2014).1186/1748-5908-9-14.

[62] These success factors were identified by a group of international experts at a two-day meeting, building on a Cochrane review of 140 randomised audit and feedback trials conducted in a variety of countries and clinical settings.

	Data is based on recent performance	The ESOS policy design helps to ensure this; the reference period for data was mandated to include the qualification date in December 2014 and December 2018), and evidence from qualitative research suggested this was adhered to. In addition, given the majority of obligated organisations complied through audit activity, in most cases it is likely that the data included was based on much more recent energy use and performance. ESOS performance rating against success factor: **GREEN**
	Data are about the individual/team's own behaviour	The ESOS policy design helps to ensure this: audits are required to cover at least 90% of total energy use with site visits based on a suitable sample of the company's own sites. The de-minimis element – allowing up to 10% of an organisation's energy use to be excluded – has, however, resulted in some areas of energy use being missed (transport commonly listed as de-minimis). ESOS performance rating against success factor: **GREEN**
	Audit cycles are repeated, with new data presented over time	The ESOS policy design helps to ensure this as compliance is required every 4 years. Feedback from organisations and assessors engaged in this study, and in the earlier process evaluation of ESOS, suggests however, that this (in combination with no annual reporting requirement) may be too infrequent to encourage sustained attitudinal and behaviour change in relation to energy management, and may instead encourage short periods of concentrated activity around the compliance deadlines. ESOS performance rating against success factor: **ORANGE** Experiences to learn from: *requirements for annual reporting (see later section on Targets, Action Plans, Goals)*
Feedback components	**Presentation is multi-modal including either text and talking or text and graphical materials**	The quality of feedback presentation in ESOS audit reports has varied. The ESOS policy did not mandate any specific template for the audit report. These outputs have therefore varied depending on the approach taken by the assessor, but also the price paid for audit (often itself an indicator on an organisation's level of motivation to receiving implementable recommendations). The evidence suggests that the format of outputs tended to be led by the assessors rather than organisations; as most viewed ESOS as a compliance exercise, they did not see a need to take ownership of report design. Feedback gathered through this study has found that some auditors did include easy to understand dashboards, for example, prioritised recommendation lists, and a presentation of findings to senior personnel. These types of approach were reported to have helped drive engagement with recommendations. ESOS performance rating against success factor: **ORANGE**

		Experiences to learn from: *The Netherlands has a recommendations template which has supported consistent quality returns from auditors, and helped organisations understand what to expect from their audit process.*
	Delivery comes from a trusted source	This success factor has been broadly met by ESOS, but it still poses a challenge for the SME population. The design of ESOS ensures suitable processes are in place to ensure only accredited Lead Assessors from approved registers sign off audits. These assessors in general had sufficient qualifications and experience to be a trusted source for delivery of feedback. However, there were some organisations that were dissatisfied with the level of sector-specific knowledge of their ESOS assessor (for example, in relation to transportation). Some representatives from the assessor market highlighted concerns about quality, particularly as the compliance deadline approached and there was insufficient supply of assessors to meet demand - it was possible that some lower quality assessors were contracted to meet the shortfall by organisations struggling to comply via audits by the deadline. ESOS performance rating against success factor: **ORANGE** Experiences to learn from: *learning lessons from the first phase of ESOS about the importance of encouraging compliance activity to start early (perhaps through further information on the typical length of time needed to complete compliance activity and/or greater threat of penalty for late compliance)*.
	Feedback includes comparison data with relevant others	There is limited evidence to suggest that ESOS audits included benchmarking. Some organisations (particularly those that had multiple sites, or were part of corporate groups) did report that site-to-site comparisons or company-to-company comparisons could motivate engagement among senior managers, through creating 'competition' on the metrics. It should be noted that willingness to be involved in company-to-company comparisons varied significantly by sector. Those where organisations may have proprietary manufacturing processes were particularly averse to benchmarking on the grounds of commercial sensitivity. ESOS performance rating against success factor: **RED** Experiences to learn from: *Carbon Trust low carbon programmes have used optimal benchmarks, or a "pool of standards" to help encourage companies to feel they could always do more.*
Nature of the behaviour change required	**Targeted behaviour is likely to be amenable to feedback**	Evidence suggests that for many organisations, particularly those that are not energy intensive, this was not the case with ESOS. Many organisations were contracting the audit (and feedback) as a means of complying with the obligation at lowest cost, and therefore would not be amenable to changes in the target behaviour (i.e. improving energy efficiency), particularly where recommendations were associated with capital investment costs. Nevertheless, there was

		evidence that some organisations were yet to capture low hanging fruit with respect to energy efficiency and as such would be amenable to feedback on the targeted behaviour. ESOS performance rating against success factor: **ORANGE** Experiences to learn from: *Swiss/German energy networks scheme encourages sharing of recommendations across businesses about how to achieve change, creating a community of individuals motivated to push their companies to continue engaging with energy efficiency*.
	Recipients are capable and responsible for improvement	Evidence from the first phase of this study, as well as the early process evaluation of ESOS, suggested this varied hugely depending on organisational contexts, but in many cases was a major barrier to change, in particular when: 1) The organisation rents or leases premises meaning (depending on the terms of their lease) that at best they are limited to implementing measures with a payback period shorter than the term of the lease. In some cases, they could not make changes to the building and/ or bills were included in the terms of the rent/ lease, meaning the capability and/or motivation to change behaviour was highly limited. 2) The organisation lacks dedicated energy management expertise. In some organisations compliance with ESOS was led by persons for whom energy management was a small part of their role, meaning they lacked understanding of the detail of audit reports. 3) There was lack of senior management buy-in. Even where 1 and 2 did not apply (i.e. compliance was led by someone capable of improving energy efficiency in suitable premises), a lack of senior management buy-in often precluded any energy efficiency investment. In some cases, energy managers were able to surmount this by making a good business case to the board. However, a board with a pre-existing interest in energy efficiency was much more likely to approve investment. ESOS performance rating against success factor: **ORANGE** Experiences to learn from: *Swedish SEAP providing training to energy managers. Readily available guidelines, tools and/or expert advice might help to prepare companies for audits, and could provide additional sources of knowledge when it came to implementing recommendations.*
Targets, goals, and action plan	**The target performance is provided**	There is limited evidence to suggest that ESOS audits included target setting. In addition to this being recommended in the healthcare sector, the setting of targets is also recommended in many carbon management programmes (for example, those run by the Carbon Trust and it is also a key element of Climate Change Agreements). This has the potential to be most effective where it is linked to public reporting against this target as otherwise it risks being viewed as a ‘tick box’ exercise. ESOS performance rating against success factor: **RED**

		Experiences to learn from: *Carbon Trust private and public carbon management programmes. China's Top 10,000 program also set targets by province, which may have been passed down through company level targets.*
	Goals set for the target behaviour are aligned with personal and organisational priorities	As above, many organisations did not put a priority on energy efficiency therefore goals often did not align with organisational priorities. Personal priorities were particularly important when energy management was a small part of individuals' roles (i.e. it would be expected that an energy manager would be seeking to improve energy efficiency, and as such goals for the target behaviour would be aligned with their personal priorities, but a facilities manager with a personal interest in energy efficiency could act as an agent of change). ESOS performance rating against success factor: **ORANGE** Experiences to learn from: *While there are Member States with personnel-level fines for non-compliance (Croatia and Hungary), it is hard to say whether these penalties have resulted in a more direct alignment of directors' and auditors' goals with the purpose of the audit process. In general, behavioural change remains one of the hardest areas to address through policy and there appears to be a lack of strong success factors from other MS the UK could draw from.*
	Goals for target behaviour are specific, measurable, achievable, relevant, time-bound **A clear action plan is provided when discrepancies are evident**	Only the recommendation of measures was mandatory, not implementation. Therefore, while recommendations were for the most part specific, achievable and relevant, without any requirement or commitment to implement, there was no goal for the target behaviour in place. Energy Management Systems (ISO50001) compliance includes explicit target setting and continuous improvements in energy management, ensuring that awareness and engagement with energy becomes embedded in a company and thus aligning business goals with energy efficiency goals in a SMART way. However, just 5.7% of complier organisations complied via ISO 50001. ESOS performance rating against success factor: **RED** Experiences to learn from: *Some European countries have complemented their EED Article 8 (4-6) implementation with incentives for the roll-out of ISO50001. Germany is the leading example in Europe, with an order of magnitude more ISO certifications than any other country. Key success factors are: step-wise implementation support, via platforms that provide a number of tools and guide leading companies step by step through the process; advice and first certification support, with financial support and advice for the first time a company seeks certification, including funding for IT systems; and sector-specific guidance which goes beyond the general guidance provided by ISO.*

Table 3: review of ESOS implementation against audit and feedback success factors

Looking back now to evidence from the energy sector specifically, a review of the implementation of the EU Energy Efficiency Directive across Member States[63] found that the effectiveness of Article 8 provisions could be maximised if Member States took on board three main lessons. These areas can be generalised to policies mandating energy audits more broadly, and as such provide useful lessons beyond ESOS. Furthermore, they are strongly aligned with the feedback from the stakeholder consultation (set out in Chapter 3).

Lessons Learned from EED Article 8 (4-6) review	**Review of ESOS policy**
Clustering: Grouping energy use into clusters to reduce the need to audit all activities. This could be by site, by type, or by energy use.	This approach has not been followed by ESOS, preferring a lighter touch approach to avoid the challenge of excessive complexity of guidance. That said, evidence gathered through this study and the interim evaluation of ESOS has not flagged that this is likely to be needed to make a significant improvement to the policy. The cost of compliance analysis conducted by Ipsos MORI for BEIS in 2017 suggested the ESOS scheme is being delivered at the costs and level of burden anticipated by the Impact Assessment. ESOS performance rating against success factor: **ORANGE**
De-minimis: Aim to identify a proportion of energy consumption which can be reasonably excluded. This could be as a share of total consumption or by focusing on thresholds for individual energy consumption areas (buildings, transport, etc.)	ESOS has adopted this design from the outset – it focuses on at least 90% of energy consumption being audited. ESOS performance rating against success factor: **GREEN**
Sampling: Only require audits on a sample basis, targeting the most significant sources of energy consumption and then using more light touch tools to estimate consumption across similar sites.	ESOS allows for this approach; there is no requirement to audit all sites if there is evidence that sampling is representative. ESOS performance rating against success factor: **GREEN**

Table 4: review of ESOS performance against lessons learned from EED Article 8 review

[63] Canevari, C: Article 8 of the Energy Efficiency Directive on Energy Audits (2017)

In addition to the above, the review of EED Article 8 implementation across Members States conducted for this study (presented in Chapter 2), has identified a number of points of difference to the approach taken in the UK. Where possible the Member State which has implemented this approach in those areas is referenced in brackets.

For large companies:

- extensive provision of guidelines, including detailed sectorial FAQs (Austria, Germany, Hungary, Italy);
- providing sufficiently long timeframes for implementing alternatives to audits such as energy management systems (Sweden);
- providing clear guidance on responsibility for audits (particularly addressing landlord/tenant divide);
- providing clear guidance on how to account for cross-border transportation activities which are harmonized with those of other MS to avoid double counting;
- systematic collection of audit results for benchmarking purposes (Italy, Austria);
- follow-up implementation support, for example through knowledge sharing tools such as databases (Italy); and
- mandatory implementation reporting on a frequent basis (Netherlands).

For SMEs:

- including energy intensive SMEs under the mandatory audit provisions (Romania, Bulgaria);
- implementation support through technical assistance (Germany);
- low interest loans for implementation (Croatia, Germany); and
- creating public easily accessible platforms providing advice and collating reporting (Italy, Austria).

There is unfortunately a lack of published evaluative evidence on the impact of these policy design features and so firm conclusions on the extent to which they could enhance the outcomes of ESOS cannot be made. However, a judgement on the likely efficacy of these features can be made where they can be seen to be well suited and adept at mitigating the critical barriers to energy efficiency implementation. This is discussed in the section below.

4.2 Review of alternative or complementary policy approaches

In reality, the barriers to energy efficiency are multiple, interlinked and, often, specific to different organisations. However, they can be aggregated into three major categories:[64]

- lack of awareness of, and commitment to the energy efficiency opportunity (A&C);
- lack of technical solutions and expertise for understanding and implementing energy efficiency (TS & E); and
- lack of financial resources to invest in energy efficiency projects (FR).

[64] Available, Attractive, Too Slow?, Carbon Trust, March 2017

To encourage desired behavioural outcomes, effective policies or policy frameworks therefore need to include measures which address this full range of barriers. In Table 1 below, examples of measures included in energy efficiency policies identified in the literature review are matched against the barriers they are most likely to address. It is important to note that, due to the interlinking nature of many barriers, the policy measures often address multiple barriers at once. However, this may not always be to the same level of success. Therefore, Table 1 uses evidence from the literature review to categorise the policy measures by whether they are deemed likely to have a high, medium or low impact on each of the barrier categories, if they were to be implemented in the UK.

Table 1 also provides more detailed conclusions from the study team (drawing on evidence from the literature review as well as direct stakeholder engagement via interviews and workshops) on the likely impact of these measures on energy efficiency action and decision making in UK organisations, taking the UK policy context into consideration. In some cases, challenges and barriers to implementing these are also highlighted. A recommendation is provided against each measure, categorising it as either: a measure that the study team recommends remains under consideration, and is the subject of further research over the remaining phases of this study; or as a measure which is deemed lower priority for further investigation as the challenges or barriers to implementing it, or the lack of evidence for its effectiveness, mean it is unlikely to be taken forward.

Table 51: Predicted level of impact of policy measures in overcoming energy efficiency barriers in the UK, including potential implementation challenges and recommendations

Key:

A&C = lack of awareness and commitment; TS & E = lack of technical solutions and expertise; FR = lack of financial resources

■ = high impact; ▒ = medium impact; □ = low or no impact

Type of measure	Specific policy measures	Predicted level of impact on barrier categories			Potential for impact of this measure in the UK and any challenges or barriers
		A & C	TS & E	FR	
Obligation	Agreed energy efficiency targets	■			Regular reporting against energy efficiency targets, or against an action plan, may encourage action, particularly if reports are in the public domain and if an organisation comes under pressure from its wider corporate group or shareholders to complete this reporting and document progress/positive results. Evidence suggests however, that mandatory reporting on its own does not drive action on energy efficiency. It needs to be linked to more significant measures, such as league tables or 'name and shame' publications to prevent being viewed as a 'tick box' exercise. A few organisations engaged in this study mentioned that the CRC league table had been effective in driving some senior management attention to carbon; Any policy requirement for reporting, such as the Streamlined Energy and Carbon Reporting (SECR)[65], would also have to be weighed up against the burden placed on obligated organisations. Some would also expect financial support to comply with mandatory requirements. Recommendation: **Measures to keep under review**
Obligation	Mandatory public reporting of audit outcomes				
Obligation	Mandatory implementation of energy efficiency opportunities				
Obligation	Penalties e.g. for not achieving EE targets or non-compliance, including at employee level				Non-compliance with the EED Article 8 (4-6), and related legislation, is treated consistently across all EU Member States: enforcement notices and fines (between €10,000 and €200,000 depending on company size) are issued to companies that do not adhere to the auditing and reporting requirements. A few countries have decided to penalise company directors as well for up to €10,000, while Hungary also issues a penalty directly to auditors of €320. The impact of these penalties on compliance rates

[65] https://www.gov.uk/government/consultations/streamlined-energy-and-carbon-reporting

					is not currently known. Organisations engaged in this study remarked that penalties tend only to be effective if 1) they are greater than the cost of compliance and 2) they affect key decision makers. High levels of compliance with ESOS suggest stricter penalties may not be needed, although some organisations and assessors in the UK shared a view that a stronger threat of penalty around ESOS may have prevented the delayed start to compliance-related activity among a significant proportion of obligated organisations. One organisation interviewed during Phase 1 specifically said they had delayed compliance until they received an enforcement notice as they had been advised by energy consultants to hold off until forced to comply, assuming that enforcement was unlikely. Recommendation: **Measures unlikely to need to be taken forward**
Obligation	Maximum payback period for recommendations to increase rates of implementation				Organisations engaged in this study were found to commonly focus on <3 year payback measures, indicating that an intervention such as this could be favourably received. Recommendation: **Measures to keep under review**
Obligation	Mandatory phase-out of inefficient technologies				Properly implemented, such a measure could help make fairly significant improvements in energy efficiency. Lessons should be learned, however, from experiences of other phase-out schemes, such as the problems faced by a Canadian fridge scrappage scheme, as raised by an assessor at one of the Phase 1 workshops. Positive examples, such as the mandatory phasing out of incandescent lightbulbs in some MS, were also mentioned and could be learned from. Recommendation: **Measures to keep under review**
Skills and information	Training for energy managers				Organisations engaged in this study responded positively to the concept of policy measures such as these. They were expected to be helpful for bridging gaps in technical understanding and capabilities (particularly for SMEs). Better benchmarking
Skills and information	Mechanisms to share best practice (public				

	databases, benchmarking, networks)				databases and tools were of particular interest and perceived as lacking at the moment, particularly by SMEs and the public sector.
Skills and information	Templates to ensure consistency of audit recommendations				The sharing of recommended templates for audit reports (as is done in the Netherlands), or publishing anonymised examples of best practice audit reports was also welcomed. This could encourage higher quality, and more consistent, presentation of data to businesses (with guidance on most engaging language to use, how to prioritise recommendations lists, and what types of financial metric to include to facilitate business case development).
Skills and information	Benchmarking				
Skills and information	Reporting system for energy utilisation				The extent to which organisations would be willing to be active contributors to these types of support mechanism (which would rely on the sharing of data, potentially in combination with mandatory reporting requirements) would have to be investigated however. Willingness to pay for energy manager training, and what types of business would take this up, also needs further exploration. Recommendation: **Measures to keep under review**

5. Summary of evidence against RQs

The key findings from the first phase of this study are organised and presented here against the key research questions (RQs) for the full study. This summary is based on synthesis of evidence from across a literature review (of energy efficiency schemes in other European Union (EU) MS (Member States), as well as wider international examples), and primary evidence gathering among a range of organisation types (including large ESOS obligated organisations, SMEs, public sector organisations and policy makers in selected EU MS).

The synthesis against the RQs will be further updated at subsequent reporting milestones during Phase 2, and so only represents the evidence base at the current point in time.

RQ1. To what extent, (in which ways and in which contexts) are energy audits and reporting effective in identifying and delivering energy efficiency savings across organisations?

Evidence reviewed over the course of this study so far highlights that **audit and reporting tends to be most effective at delivering energy efficiency savings where it involves**:

- a high quality audit, including **valid, time and organisational-relevant data**;
- a **skilled auditor with relevant expertise** (in the right sector, organisation type); and
- strong **senior management engagement** with the auditing process (an essential precursor in many instances, although something that can be encouraged by the first two conditions – quality of audit and auditor).

Lower quality audits (which the evidence suggests are less likely to drive the uptake of beneficial energy efficiency improvements), are characterised by the limited scope of information they contain, a lack of technical depth and/or understanding, or insufficient cost/benefit analysis. Whilst organisations who had received audits under ESOS were generally positive about the quality of their audits, some organisations were less satisfied due to their experience of receiving audit reports with these limitations. In some cases, organisations attributed their low quality audit to auditors because they lacked sufficient sector-specific expertise. However, there were also examples of organisations opting for the lowest cost audit available on the market, which in some cases were delivered by less experienced assessors or involved rushed processes.

Although the most effective audits may provide entirely new information to a business (revealing previously unknown energy efficiency opportunities) and be investment-grade (translating into clear business cases), feedback from recipients of audits (including ESOS audits) has shown they can also be effective if they address informational barriers in other ways. For example, some ESOS compliers benefited from their **audits driving them to gather data for the first time** (such as from specific sites) **or acting to improve the**

underlying understanding and management of energy use (this appears to have been the case for transport fleet data in particular).

Several large and energy-intensive organisations (including those already conducting energy management, or audit activity) were able to benefit from audits where this was the case because the third-party expertise was useful in validating pre-existing energy management decisions. For the most part, however, large organisations obligated under ESOS had used audits to achieve compliance, rather than viewing this as an opportunity to identify, or validate, energy saving opportunities.

In non-energy intensive sectors, evidence suggests that auditing was not common practice in large organisations before ESOS and there was little evidence of other energy-use related quality systems in place. Professional audits are often deemed too expensive relative to energy spend for smaller organisations, who are not obligated to conduct them under ESOS, although there was interest in free or low-cost energy checks. Where audits can be provided free, or at subsidised rates, there is interest in audit reports which can more easily (relative to large organisations) reach decision-makers (although dependent on levels of control based on building tenure).

Engagement with organisations during this study (which was particularly apparent for, but not limited to, SMEs) has found that **decisions to act on energy efficiency can also come from non-energy related concerns**, such as improving conditions for the workforce or customer base or improving product quality. One hypothesis developed in this study (and tested further during the Phase 2 evaluation published alongside this report), has been that where these co-benefits can be illustrated this may encourage greater uptake of recommendations, as while financial barriers are often cited as a barrier to action, loan schemes have limited effectiveness if the company is reluctant to take on extra debt (this is often the case in areas outside the core business).

It appears likely from the evidence reviewed to date (and this was also explicitly mentioned by some organisations and assessors themselves), that for many organisations, **high quality audit information needs to be complemented by technical assistance** that supports recipients of the audit to engage with, and act on, the information provided. This is particularly the case for SMEs, which rarely have dedicated energy managers with experience in this field, and who may lack confidence in the savings (or technology) proposed to them.

Evidence gathered and reviewed by this study suggests **similar drivers and barriers to audit and reporting exist internationally as in the UK**. Organisations tend to carry out audits or report on consumption or action only if mandated to do so by law. Internal energy reporting practices are sometimes in place for intensive energy consumers, but energy management is not a high priority in other sectors.

RQ2. To what extent, (in which ways and in which contexts) has ESOS influenced organisational energy efficiency policy and practice?

Evidence gathered to date through this new study furthers the assessment made in the interim process and early impact evaluation of ESOS, that the scheme has **helped keep or push energy efficiency agendas primarily among organisations already interested in energy efficiency** – this includes those reporting high levels of priority being placed on energy efficiency prior to ESOS (which tended to be larger, multi-site organisations) as well as those achieving compliance through ISO 50001 or via an internal assessor. Office-based organisations, and particularly those close to the employee threshold for the scheme (or below where they had triggered eligibility due to high turnover) were among those least likely to be demonstrating any early impact from ESOS.

Companies who already complied with other energy policies, such as CRC, or who hold Climate Change Agreements (CCAs), have also been less likely to find the ESOS audits provided them with new information. Often the recommended energy savings opportunities were already in the planning and ESOS confirmed the decision as opposed to providing new insights. Nevertheless, in some cases ESOS did identify new opportunities, particularly in transport – an area organisations were less likely to have looked at for efficiency savings previously. In addition, the energy data collation requirement (to feed into the audit report and Evidence Pack) was found to overlap with other policies such as the GHG Mandatory Reporting. The lesser opportunity represented by ESOS to these organisations is in line with expectations in the initial Impact Assessment[66].

A **broad variety of energy efficiency recommendations were made by Lead Assessors** in their ESOS audit reports. These included improvements to energy use monitoring; reducing out of hours usage; behaviour changes, such as regarding staff IT use; quick payback capital measures such as timers, thermostats or fixing wastage; longer payback capital measures such as improvements to lighting, heat recovery, HVAC or power generation; and transport measures, such as fitting trackers and changes to driving practice.

Phase 1 suggested that most energy savings recommendations recommended through ESOS audits were not yet implemented, however. Evidence from both organisations themselves and assessors suggested that although organisations invariably received at least one energy saving recommendation in their audit report, these were only taken forward in a small proportion of cases. This was supported by the 2016 survey of compliers carried out as part of the interim evaluation of ESOS. The survey found that although four out of five (79%) complier organisations had implemented one or more energy efficiency measures between early 2015 and autumn 2016, only one in four (26%) attributed the installation of at least one of these measures in full or in part to ESOS. Feedback from Phase 1 workshop attendees who had complied with ESOS suggested that recommendations were generally only implemented if two key conditions were met:

[66] Impact Assessment: Energy Savings Opportunity Schemev, Department for Energy and Climate Change and Department for Transport, 2014

1) **Payback below an absolute maximum of three years**, with two being a more realistic limit for smaller companies or the public sector.
2) **Minimal disruption to the business** – including avoiding closing down offices/factories, and the taking up of staff time to oversee the implementation of the savings.

Lighting was commonly highlighted by Phase 1 organisations and assessors as the archetypal measure that meets the above criteria.

A shared view across stakeholders engaged to date in this study was that the 4-year cycle of ESOS compliance (for those that did not comply via ISO 50001) was not promoting better ongoing approaches to energy management. It is considered to be too infrequent for energy efficiency to maintain visibility amongst the decision makers in an organisation. A concern expressed by assessors was that ESOS Phase 2 may struggle to offer clients additional opportunities if they have not acted on recommendations from Phase 1.

RQ3. What are the lessons learned from implementing ESOS that could feed into future policies?

The following policy design features were found to be important for encouraging effective engagement in energy efficiency policies, and the realisation of intended outcomes and benefits for those participating or obligated. They have been identified through research and evaluation of the ESOS policy in the UK, and through a review of the approach to implementing the EU Energy Directive in other Members States. This section draws directly from Chapter 4 of this report, as well as developing the findings from other chapters into additional “lessons learned”.

- **Early and clear engagement** with the obligated population on policy aims, and most importantly on scheme guidance, including the nature of the requirements, the timelines for action and the eligibility criteria.
- **Targeting obligations at those with greatest potential to realise benefits**. Although the EED Article 8 (4-6) threshold is clear that all large undertakings are in scope of the audit obligation, stakeholder feedback and the approach taken by some other schemes, has suggested that taking into account energy use/intensity and sector can improve the reception to audit requirements (rather than basing eligibility only on company size and revenue).
- **Standardisation and accreditation of key scheme actors**. In the case of ESOS this was the Lead Assessor population and this element of the scheme was essential to ensure obligated organisations were provided with access to high quality information and advice, which was consistent across the scheme. Scheme actors, such as assessors, are a vital component in the intended behaviour change journey as they are a key mechanism through which intended outcomes can be encouraged (or deterred in the case of quality being sub-optimal).
- **Encouraging a commitment to action**. Even if specific action is not mandated, the requirement to report back (ideally publicly) on a self-imposed target or action plan can help reduce a ‘tick-box’ response to policy. This has not been common in the approach taken by other Member States to the EU Energy Efficiency Directive, although it has been adopted by some, including the Netherlands. The requirement

for a continuous development plan, and reporting against it, which forms part of the ISO 50001 certification, is another mechanism which can encourage a commitment to action.

- **Providing technical assistance and sharing examples of best practice**. High levels of compliance suggest the status of the policy as regulation often provides the motivation; however, without a wider package of policy support this does not address other key types of barriers that prevent those responding to the regulation from engaging with, and acting on, the information provided through it (i.e. barriers related to opportunity and capability). Some other countries have examples of schemes that offer training to energy managers (such as SEAP in Sweden) or sharing of experiences in improving energy efficiency (e.g. the Swiss/German EEN policy[67], or the US Department of Energy's IAC database which provides a resource for assessing the applications and paybacks of different technologies).
- **Taking advantage of the data created by the policy** – Some EU MS have taken advantage of the wealth of data created by the mandatory audits implemented under Article 8 to create publicly accessible databases gathering recommendations, payback periods, estimated savings, and other useful benchmarking tools.
- **Avoiding as far as possible policy overlaps and duplication, or providing exemptions** – Organisations desire a more coherent policy landscape, combining CCA, CRC, ETS and mandatory reporting into a single logical framework. At present, organisations perceived there to be too much confusion and conflict around these measures that they felt made energy efficiency more complicated, and hence less attractive for businesses to talk about and act on. Particular effort should be expended so that companies are not subject to regulations that duplicate the requirements of each other, or where this is unavoidable, that exemptions or simplified compliance processes are made available.

RQ4. What is the wider learning from this research for BEIS policy making?

The evidence gathered and analysed to date during the first phase of this study, points to the importance of the following wider learning for non-domestic energy policy:

- Having a **coherent policy framework** that is easy for organisations to engage with.
- Recognising that a complex set of overlapping barriers exist and the policy framework needs to provide **support that addresses the key barriers** in a coherent and systematic way. For example, in the case of encouraging audit activity, there is a need to provide support that not only gives organisations access to high quality information, but also provides technical assistance to enable recipients of the information to engage with it and act on it.
- Recognising the complexity of delivering interventions to organisations given they are made up of multiple actors, with differing priorities and incentives to act. Policy interventions need to reflect this through **providing tools and incentives to engage and act at different levels**, encouraging engagement at differing stages in

[67] http://www.odyssee-mure.eu/publications/policy-brief/networks-energy-efficiency.pdf

decision-making processes. For instance, targeting right ‘entry’ into organisation and providing information/tools that can take it to next stage.

For energy efficiency specifically, policy needs to tackle three main groups of barriers: lack of **awareness** and **commitment**, lack of **technical expertise** and **skills**, and lack of **financial resources**. These can be targeted by a mix of **obligations**, **information tools**, **capacity building**, and **financial support**.

As such**, complementary policies** to encourage better uptake of opportunities could include:

- external reporting and knowledge sharing of best practice;
- direct incentives or penalties for implementation of energy savings;
- subsidised or mandatory roll-out of enabling technologies such as sub-metering and energy management systems; and
- financial support for implementation – such as concessional loans.

These measures clearly go beyond the *identification* of opportunities under ESOS, and target the *implementation* of energy efficiency.

Annexes

Annex 1: Detailed research questions

1. **To what extent, (in which ways and in which contexts) are energy audits and reporting effective in identifying and delivering energy efficiency savings across organisations?**
   - 1.1. How are audits and reporting used within organisations, if at all?
   - 1.2. What are the outcomes from conducting audits or equivalent processes?
   - 1.3. What are the key mechanisms within energy audits and reporting that deliver energy efficiency savings?
   - 1.4. What are the types of organisations who do not use audits and reporting or have not realised benefits?
   - 1.5. What are the barriers (if any) which prevent energy audits and reporting from delivering energy efficiency measures? What would be required to overcome any identified barriers?
   - 1.6. To what extent are organisations voluntarily undertaking energy audits or equivalent processes? What are their motivations for doing so?
   - 1.7. What are the perceived and / or actual benefits or dis-benefits for organisations undertaking energy audits or equivalent processes?
   - 1.8. To what extent and in which contexts are audits (or equivalent processes) cost effective for organisations? And how can cost-effectiveness be maintained?
   - 1.9. What approaches to audits and reporting have other countries adopted and to what extent have these been effective?

ESOS influence and impact

2. **To what extent, (in which ways and in which contexts) has ESOS influenced organisational energy efficiency policy and practice?**
   - 2.1. What impact has ESOS had on energy efficiency in organisations?
   - 2.2. What are the types of energy efficiency recommendations made as a result of ESOS assessments?
   - 2.3. Which energy savings recommendations have been /will be undertaken by organisations and why? Over which timescale/ payback period? To what extent are transport savings included within these recommendations?
   - 2.4. Which energy savings recommendations were not undertaken by organisations and why? What would be required in order for action to have been taken?
   - 2.5. What are the energy savings (estimated or actual), that can be attributed to ESOS?
   - 2.6. What is the context of any actions taken e.g. work brought forward or foregone, other investments or drivers?
   - 2.7. Under which circumstances are organisations more likely to take action or benefit from ESOS?

ESOS lessons for future policy

3. **What are the lessons learned from implementing ESOS that could feed into future policies?**
   - 3.1. To what extent has the operation and implementation of the policy been effective?
   - 3.2. To what extent has the enforcement process been effective?
   - 3.3. To what extent have the objectives of ESOS been met?
   - 3.4. Using existing literature and Commission reports, what are the main lessons to be learned from how the requirements of article 8 (4-6) have been implemented in other member states? How does this compare to the implementation in the UK?

Wider learning

4. **What is the wider learning from this research for BEIS policy making?**
   4.1. What other policy tools (such as regulation and incentives) can work alongside energy audits, reporting or ESOS?
   4.2. What other approaches adopted by organisations can work alongside energy audits, reporting or ESOS to support the promotion of energy efficiency?
   4.3. Is there any additional learning from this research on stakeholders' perception of the operation and effectiveness of other energy efficiency policies e.g. Climate Change Agreements (CCAs)?

Annex 2: List of literature sources reviewed in Phase 1

The literature review drew evidence wherever possible from official reports and evaluations directly published by the relevant government departments responsible for overseeing the energy efficiency programmes. These sources were complemented with academic research from relevant journals (e.g. Energy Policy) and reports from third party organisations (such as think tanks) where necessary to add further to the available information. These sources were selected via a rapid review based on the evaluation team's knowledge of the sector.

The primary literary sources for the analysis of MS EED Article 8 (4-6) implementation were the progress reports published by the European Commission and the National Energy Efficiency Action Plan submitted by each MS.

While the accuracy of the findings presented across this literature cannot be guaranteed, this selective approach to the inclusion of sources sought to ensure quality in the review. Sources are carefully referenced throughout and where felt necessary by the authors of this report, caveats are included to flag uncertainties about the evidence base (for example, in the definition of an outcome or claim).

1. *A Study on Energy Efficiency in Enterprises: Energy Audits and Energy Management System,* European Commission, April 2016
2. ACIL Tasman, Energy Efficiency Opportunities Program Review, April 2013.
3. *Article 8 of the Energy Efficiency Directive on Energy Audits*, presentation by Claudia Canevari (Deputy Head of Unit European Commission DG Energy), Vienna, 23 November 2017
4. *Available, Attractive, Too Slow?,* Carbon Trust, March 2017
5. *CA-3:ISO 50001 implementation Support*, Industrial Efficiency Policy Database, available at: http://iepd.iipnetwork.org/policy/iso-50001-implementation-support (accessed 27/03/2018)
6. Energy audit practices in China: National and local experiences and issues (2012), Energy Policy
7. Energy Efficiency Opportunities Program – The First Five Years: 2006–11 – Overview (2013), Australian Department of Industry
8. Energy Policies of IEA Countries – Japan 2016 Review, (2016), IEA
9. *Environment Agency launches penalty proceedings against firms flouting Esos energy audits,* The Energyst, June 20 2017. Available at: https://theenergyst.com/environment-agency-launches-penalty-proceedings-against-firms-flouting-esos-energy-audits/
10. *Evaluation of Energy Efficiency for Industry, Housing and Buildings*, Natural Resources Canada, 2010. All subsequent information is drawn from this report unless otherwise noted.
11. Evaluation of the Energy Savings Opportunity Scheme (2017), IPSOS MORI / BEIS
12. Evaluation of the Energy Savings Opportunity Scheme: Impact evaluation scoping report (2017), BEIS
13. *Evaluation Report: Evaluation of the Office of Energy Efficiency,* Natural Resources Canada, 2015
14. Fact-finding study on Japan's Energy Management Policies (2011), Ministry of Economy, Trade and Industry

15. *Fourth National Energy Efficiency Action Plan for the Netherlands*, Ministry of Economic Affairs, April 2017
16. Industrial Efficiency Policy Database. CN-3a:Top-1000 Energy-Consuming Enterprises Program. Online: http://iepd.iipnetwork.org/policy/top-1000-energy-consuming-enterprises-program. Accessed: 02.09.2015.)
17. Japan's Policy on Energy Conservation (2013), Japan Agency for Natural Resources and Energy
18. Patrik Thollander, Osamu Kimura, Masayo Wakabayashi and Patrik Rohdin, A review of industrial energy and climate policies in Japan and Sweden with emphasis towards SMEs, 2015, Renewable & sustainable energy reviews, (50), 504-512. http://dx.doi.org/10.1016/j.rser.2015.04.102
19. Promoting energy efficiency in industrial/commercial sector: Japanese Experience (2006), Central Research Institute of Electric Power Industry, Tokyo, Japan
20. Sandra Backlund and Patrik Thollander, Impact after three years of the Swedish energy audit program, 2015, Energy, (82), 54-60.
21. The Specialized Funding for Environmental Protection and Energy Conservation, details of which can be found through these links (please note, no English translation available): http://www.mof.gov.cn/zhengwuxinxi/caizhengwengao/wg2015/wg201507/201512/t20151221_1623606.html; http://www.audit.gov.cn/n5/n25/c97055/content.html; and http://jjs.mof.gov.cn/zxzyzf/jnjpbzzj/201607/t20160719_2364294.html.
22. Upgrading Power: Delivering a Flexible Electricity System (2016), EEF

Annex 3: Detailed breakdown of organisations engaged in Phase 1

		ESOS	SME
Total		**13**	**5**
CCA	Yes	3	0
	No	10	5
Energy intensity	<1%	3	1
	1-1.99%	2	2
	2-4.99%	3	0
	5-9.99%	0	0
	>10%	3	0
	N/A	2	2
Number of sites	1	0	2
	2-5	1	1
	6-10	2	0
	11-50	3	0
	51-100	2	0
	>100	3	0
	N/A	2	2
Turnover	<£10m	0	4
	£10-£99m	2	1
	£100-£499m	4	0
	£500m-£999m	3	0
	>£1bn	4	0

Annex 4: Discussion guides and workshop agendas from Phase 1

INTERVIEW GUIDE

Introduction (all)

- Introduce self, Carbon Trust and rest of consortium, and thank interviewee for their time.
- Explain that this research aims to carry out an evidence review and research on the effectiveness of energy audits and reporting in driving energy efficiency savings in organisations to support the wider understanding of the effectiveness of energy audits and reporting. In addition, this work will also include a further evaluation to develop the understanding of the impact of the Energy Savings Opportunity Scheme (ESOS), following on from the previous process evaluation (2015-2017).
- The study is being conducted on behalf of the Department for Business, Energy and Industrial Strategy.
- Confidentiality: reassure participants that they are not being judged and confirm that participants comments will be treated as confidential and will be aggregated with feedback from other participants and will form part of a research report, but comments and any quotations used in this report will not be attributed personally to them or their organisation and will be kept anonymous.
- Recording: Ask if respondents are happy to be recorded on the confidentiality basis set out above.

Non-ESOS organisations

Overarching question:

To what extent, (in which ways and in which contexts) are energy audits and reporting effective in identifying and delivering energy efficiency savings across organisations?

Define what is meant by energy auditing and reporting:

*An **energy audit** is a systematic review of how energy is used within a building or industrial site. It includes a physical inspection of buildings and equipment, which can range from a simple visual inspection to a fully instrumented study.*

***Reporting** includes external reporting of energy use (e.g. to the Environment Agency) for compliance with government policies, and internal reporting (for example from energy managers or internal auditors to chief executives or board of directors).*

- On what basis did your organisation not qualify for ESOS?
- Who in your organization is responsible for energy management? How long has your organisation considered energy management to be part of somebody's job

role? If recent – what prompted your organisation to create this role/responsibility? Why do you think that energy management sits in this particular part of the business as opposed to in any other team?

- What processes do you have in place to manage energy? How long have these processes been in place? What was the motivation behind establishing these processes? [***Interviewer****: Listen out for whether interviewee mentions the impact of any audits they have conducted as leading to processes being put in place*]
- What is your turnover? Approximately how much does your business spend annually on energy?
- What are the main types of energy used across your main sites? How many sites do you have and how many employees do you have across the organisation?
- Are you part of a corporate group? If so does this shape your own processes and energy policy?
- Do you always competitively procure your energy supplies when contracts expire?
- Have you ever been asked by a client or stakeholder if you have any energy management systems or processes in place or if you have undertaken an energy audit?
- Does your company have any investment criteria that must be met for energy saving capital investments? e.g. have a simple payback period of less than 5-years
- Do you have ring-fenced budgets for energy saving investments or does the finance have to come from a shared pot?
- Who is involved in the decision-making process around energy saving capital investments? What is the sign-off process that has to be followed?
- Has your organization ever carried out any energy audits?
- If yes:
- What was the motivation for the audit (your most recent)?
- When (which year) was the most recent audit carried out? Was the audit commissioned externally or carried out internally? What factors were considered when deciding whether to commission an external auditor or whether to conduct this internally? Was a cost-benefit assessment conducted?
- If internally, was the time and cost of training internal auditors significant?
- If externally, was the audit paid for? What was the approximate cost? How did you select the auditor? Were there any particular qualifications, accreditations or specialisms that influenced your choice of auditor?
- Was the audit carried out remotely or did it include site visits? If the latter, how did you decide on the number and nature of the site visits? Were many of your sites visited and do you feel the audit was comprehensive? [For site visit audits: Did the auditor use any survey instrumentation as part of the audit? E.g. electricity data logger; thermal camera; ultra-sonic leak detector (for compressed air)].

- Who commissioned the audit and how was the audit scope specified?
- Who read the subsequent audit report? Did the auditor provide a de-brief on the audit findings – in person or via telephone? [If both a report and a debrief were received – which of these did you find most helpful for understanding the results of the audit and why?]
- Were the report findings discussed by the company's Board/Senior Management Team? Have the questions been shared widely across the organisation e.g. with the Facilities team, Transport team, Finance team, main staff body?
- To what extent did you find that the report confirmed ideas you already had for energy saving improvements versus giving you new ideas for things you had not thought about before? To what extent was that in line with what you expected the value of the report to be for you?
- What was the most beneficial outcome from the audit? Have you been incentivised to conduct any additional audits?
- Did you feel that the audit recommendations comprehensively reflected the improvement opportunities at the site? How would you rate the quality of the audit report on a scale of 1-10 (1=no value to the business, 10=could identify material energy/cost savings/insights)? What are you thinking about when you give this score? What could have been done differently to improve your score?
- Against the total energy saving potential identified by the audit, what percentage of these savings would you estimate you have achieved through implementation of the audit recommendations? What percentage was achieved within 12-months of receiving the audit report? Is further implementation of the recommendations planned? What factors would make those plans more or less likely to be fulfilled e.g. is budget already assigned, are subcontractors in place to do the works etc.?
- Which specific recommendations have been implemented and which haven't? What were your main motivations for implementing the recommendations?
- What were the barriers to implementation e.g. lack of internal skills needed, challenges subcontracting/finding right skills, change in budget priorities, if rented property – challenge getting permission/convincing landlord etc.? Were there any recommendations you wanted to implement but couldn't for some reason?
- How cost-effective would you rate the audit process [on a scale of 1-10]? Were there any additional costs imposed on the business beyond the fees of the auditors (e.g. staff time)? Any equipment you had to purchase?
- Based on your audit experience, would you consider/have you undertaken further energy audits at your site(s)? What was the main reason for [not] undertaking further energy audits? Would you encourage other organisations to carry out energy audits at their premises?

If no:

- Have you ever invested in energy efficiency interventions? If not, why? If yes, was it as part of a broader investment or targeted at energy specifically? Who initiated the project (e.g. in-house staff; equipment supplier; energy supplier)?

- On a scale of 1-10 (1=no value to the business, 10=could identify material energy/cost savings/insights) what is your perception of energy audits? What do you think has informed this perception? What do you think might be their potential benefits and barriers to implementation (e.g. costs, organisational barriers, concerns over business disruption?)
- Do you expect to carry out an energy audit in the near future? Why? What would you be looking for the audit to provide? What would it be most important for the audit to provide?
- Where would you go to look for an auditor? Why there? What would you be looking for in the auditor? How confident, or not, are you that you could find an auditor meeting these requirements? What makes you say this?
- How much would you be prepared to spend on an energy audit?
- Are you subject to any energy efficiency related government policies (e.g. CCA, CRC, EU ETS)? Have any of these policies influenced your approach to energy efficiency?

If yes to any policies:

- To what extent, if any, have these policies influenced changes in action on energy efficiency in your organisation? To what extent have they lead to the use of energy audits or reporting within your organisation? [*Explore this in depth – BEIS has indicated interest in this area]*

ESOS organisations

Overarching question:

To what extent, (in which ways and in which contexts) has ESOS influenced organisational energy efficiency policy and practice? What impact has ESOS had on energy efficiency in organisations?

Please specify whether your organisation is a subsidiary of a larger organisation or an independent company, and for which level of the organisational hierarchy you will be answering these questions.

What is your turnover? Approximately how much does your business spend annually on energy?

Do you have any sites in the Devolved Administrations? [Wales, Scotland, Northern Ireland]

What are the main types of energy used across your main sites? How many sites do you have and how many employees do you have across the organisation?

Who in your organization is responsible for energy management? What processes do you have in place to manage energy? How long have these processes been in place? What was the motivation behind establishing these processes?

What route did you take to comply with ESOS (e.g. audits, or ISO, use of DEC?) Why did you choose this route?

Was the audit commissioned externally or carried out internally? What factors were considered when deciding whether to commission an external auditor or whether to use an in-house Lead Assessor? Was a cost-benefit assessment conducted?

If internally, was the time and cost of using an in-house Lead Assessor to verify your ESOS compliance significant?

If externally, how did you select your Lead Assessor? How did you select the Assessor? Were there any particular qualifications, accreditations or specialisms that influenced your choice of auditor?

What was the cost of the compliance service, including any necessary energy audits?

How was the scope of the audit specified? Was the audit carried out remotely or did it include site visits? If the latter, how many of your sites were visited; how many sites do you operate? [For site visit audits: Did the auditor use any survey instrumentation as part of the audit? E.g. electricity data logger; thermal camera; ultra-sonic leak detector (for compressed air)].

How was the report delivered and did the auditing process include a debrief? Who read the audit report e.g. company's Board/Senior Management team, Facilities team, Transport team, Finance team, and how were findings communicated to other teams, sites, offices and the main staff body?

How long was the ESOS audit report and what was its level of detail e.g. did it include detailed costs expressed as payback periods, was estimated time required to implement the changes/level of disruption to the business etc. provided? What were the main areas of energy use affected? If you did not implement all of the recommendations, which ones did you not implement and why?

When establishing your total energy consumption (TEC) profile, were you required to report the energy consumed by a vehicle fleet? If so, what percentage of your overall energy profile was attributed to vehicle fuel consumption? If your vehicle fleet consumption was deemed significant enough (over 10% of TEC) to warrant auditing, was this fleet audit conducted by the ESOS building energy assessor, by an independent vehicle fleet specialist, or by internal staff? Were the audit, and subsequent recommendations, for the vehicle fleet of a better or worse standard than the audit you received for your buildings? Have you, or are you likely to implement any of the recommendations provided in your vehicle fleet audit?

What was the most interesting/surprising audit finding? What was the most beneficial outcome from the audit?

Did you feel that the audit recommendations comprehensively reflected the improvement opportunities at the site? How would you rate the quality of the audit report on a scale of 1-10 (1=no value to the business, 10=could identify material energy/cost savings/insights)?

Against the total energy saving potential identified by the audit, what percentage of these savings would you estimate you have achieved through implementation of the audit recommendations? What percentage was achieved within 12-months of receiving the

audit report? Did you make these improvements solely because of ESOS, or did ESOS simply affirm the value of an improvement you already had planned?

What were the main motivations and barriers to implementing specific recommendations?

How cost-effective would you rate the audit process [on a scale of 1-10]? Were there any additional costs imposed on the business beyond the fees of the auditors (e.g. staff time)?

Based on your audit experience, would you consider/have you undertaken further energy audits at your site(s)? What was the main reason for [not] undertaking further energy audits? Would you encourage other organisations to carry out energy audits at their premises?

Are you subject to any other energy efficiency related policies (e.g. CCA, CRC, EU ETS)? How would you describe their interaction with ESOS (synergistic, overlapping, conflicting)?

If yes to CCA participation:

How much of your energy use is covered by CCA?

[If CCA does not cover all energy use] –To what extent has ESOS helped you identify measures relating to activities not covered by a CCA?

To what extent has ESOS helped you to identify measures to help you meet your CCA targets cost effectively?

To what extent has ESOS provided additional visibility to board members of the opportunities for energy efficiency within the company?

If no to CCA participation:

What additional benefits (if any) has compliance with ESOS provided for your organisation? Would you say the ESOS policy is a net positive, negative or neutral for your organisation?

For future phases of ESOS, do you intend to comply in the same way as for phase 1, or do you intend to take an alternative route to compliance, such as implementing an ISO 50,001 energy management system? What, if anything, have you already started/put in place for the next round of ESOS compliance?

Trade bodies

Overarching question:

To what extent, (in which ways and in which contexts) are energy audits and reporting effective in identifying and delivering energy efficiency savings across organisations?

Define what is meant by auditing and reporting:

*An **energy audit** is a systematic review of how energy is used within a building or industrial site. It includes a physical inspection of buildings and equipment, which can range from a simple visual inspection to a fully instrumented study.*

***Reporting** includes external reporting of energy use (e.g. to the Environment Agency) for compliance with government policies, and internal reporting (for example from energy managers or internal auditors to chief executives or board of directors).*

- How frequently do you communicate with your members on energy related issues (e.g. new regulations, policy changes, promotion of energy saving initiatives)
- Has your organisation ever surveyed its members regarding their attitude to energy related matters? [if so, when was the last occasion and can you please share a summary/report of the findings]
- Has your organisation ever published or promoted energy best practice guidance or case studies to encourage your members to implement energy saving measures? [If so, please cite the topic of the most recent and publication date]
- Does your organisation offer a confidential energy benchmarking service for its members e.g. to report their energy intensity against the sector average/range?
- What would you say is the attitude of your members towards energy audits and reporting (positive, negative, neutral)?
- What would you say drives those attitudes? Are there strong perceptions of benefits or costs associated with energy audits? What are those?
- If your members are subject to ESOS, what is their view of its effectiveness as a policy? What is their perception of it (positive, negative, neutral)?
- What are the most common questions your members have asked you around the ESOS policy?

ESOS assessors

Overarching question

What are the lessons learned from implementing ESOS that could feed into future policies?

- Through which body/organisation are you accredited as a Lead Assessor? Did you specifically join this register in order to provide ESOS Lead Assessor services?
- What prior qualifications did you have before applying to become an ESOS Lead Assessor? What further training was required in order for you to receive your Lead Assessor accreditation?
- Had you conducted audits prior to ESOS and have you delivered non-ESOS related audits alongside? If so, what do you think are the main benefits of auditing and reporting for organisations?
- In your experience, what percentage of ESOS clients seeking your services did so with a disposition of: (1) Just wanting to comply with legislation at minimal cost/effort that feeling ESOS will deliver little or no additional benefits over & above existing efforts [Negative]; (2) Being open-minded regarding the ESOS process

[Neutral]; (3) Viewing ESOS as an opportunity to obtain value-add insights into how their business manages energy and can make savings [Positive] Do you find ESOS clients' perceptions of ESOS compliance are linked to an organisation's type or sector?

- Approximately how many clients have you provided ESOS Lead Assessor services for? What percentage of these did you provide both energy auditing and Lead Assessor services for? For what percentage did you need to engage the services of additional auditors?
- How many ESOS clients have re-engaged you to deliver follow-on or additional services post-ESOS compliance? How many of your ESOS clients were 'new' to you i.e. you hadn't worked for them previously? Do you feel any particular sectors or sizes of organisations have tended to commission more or less activity than others?
- How would you describe clients' 'state of readiness' for ESOS compliance?
- What are the key sections that you tend to include in your audit reports?
- Which bits of the reports would you say get read most by the clients – what's the detail they are most interested in?
- What did they find least beneficial / most challenging about the process?
- Did you undertake any audits of vehicle fleet consumption while supporting any organisations with ESOS compliance? If so, have you conducted audits of vehicle fleets before, or had you received any specialist training in vehicle fleet assessment? Did you engage any vehicle fleet specialists to support the audit of vehicle fleets? Are there any improvements or changes that could be made to vehicle fleet assessments in future ESOS rounds? Do you feel that a typical ESOS assessor has the required skill set to be able to perform a vehicle fleet audit to the same standard as a building audit?
- What percentage of client Board Directors who were signing-off compliance, did you personally brief on the key outcomes of the ESOS process e.g. audit recommendations?
- Have you received updates/feedback from your clients regarding specific actions they have taken as a direct result of the ESOS compliance process? If "YES": What are the characteristics of these actions (e.g. improved data management; development of policy/strategy; appointment of energy manager; commitment to implement 50001; implement of CAPEX projects with payback periods <x-years etc)?
- To what extent has the operation and implementation of the ESOS policy been effective in your opinion? What changes would you make to make it more effective?
- Have you needed to contact the Environment Agency's ESOS helpdesk support to seek clarification/guidance regarding the regulations? If "YES", how would you rate their overall response, taking timeliness and qualify of reply into account: [1=very poor; 10=excellent]

- On a scale of 1-10 [1=very poor; 10=excellent] how would you rate the standard of guidance and update communications to Lead Assessors from the Environment Agency? Are there any changes you would make to help improve the guidance documentation? Were any of your ESOS compliance packs audited by Environment Agency assessors?
- If so, were there any findings or recommendations from the audit that could be addressed through clearer or additional information in guidance documentation? What are your reflections on the nature, quality, depth of the compliance audit process? Did you need to undertake any remedial work to confirm compliance? If "YES", please summarise what was needed:
- What is your opinion on the Environment Agency's approach to enforcement?
- What are the top three aspects of the current ESOS process you would change to make it more effective in catalysing businesses to take action to reduce their energy consumption? (1) / (2) / (3)
- Are there any other policy or regulatory instruments which you would recommend in addition to or to replace ESOS?

Conclusions (all)

- Thank you very much for your contributions. Are there any additional comments or issues you would like to raise?
- If you have any further questions or clarifications, please do not hesitate to get in touch with us via email.

BEIS ESOS Workshop I January 2018

Agenda

1. *Welcome remarks and introduction to the project – background, aims and methodology (10:00-10:15)*

The project team welcome the attendees and begin the workshop with a summary of the rationale behind the project, what we hope to achieve and how we will undertake it. This will include context on energy efficiency in the UK commercial sector, the role of energy audits, reporting and ESOS and why BEIS wants to test and improve its approach.

BEIS officials will be given the opportunity to provide a brief introduction to the wider study and how it is going to be used by the government.

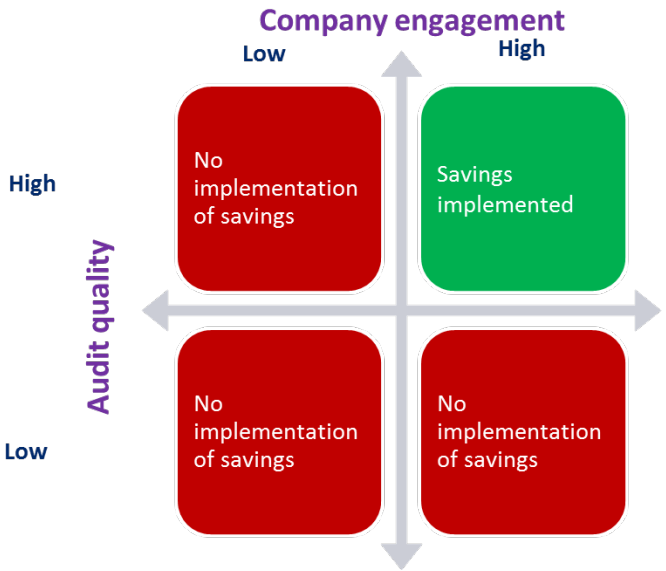
2. *Roundtable introductions (10:15 – 10:30)*

Each attendee will have the opportunity to introduce themselves and their company at the workshop.

3. *Session 1: effectiveness of ESOS and energy audits (10:30-11:15)*

*An **energy audit** is a systematic review of how energy is used within a building or industrial site. It includes a physical inspection of buildings and equipment, which can range from a simple visual inspection to a fully instrumented study.*

This workshop session will seek to test an assumption regarding the effectiveness of ESOS which has emerged from the literature review and interviews, name that there are two fundamental dimensions predicating the success of ESOS audits (and audits more broadly): the quality of the audit, and the engagement of the company.



After a short summary, the project team will frame three key questions for discussion, within which there are sub-questions and prompts to aid the discussion. We will split the room in three groups of 7-8 people each. Each group will address two key questions and report to the room at the end of the session before the break.

Key questions:

How do companies perceive ESOS-mandated audits or other compliancy routes?

An important determinant of ESOS effectiveness is whether the company commissioning it considers the audit just a compliancy exercise, or as a chance to improve their understanding of energy use.

Sub-questions:

- What are the reasons for complying with ESOS via the audit route versus ISO or DEC compliance?
- What was the perception of the audit process and its results within the company?
- How can we overcome barriers such as hassle, cost and a lack of information?

When is an audit well, or poorly, implemented?

A key feature of out interviews to date is the significant number of participants who are unimpressed with the quality of energy audits. Without producing audits that are helpful and actionable, the necessary scaling-up of energy efficiency measures will not take place. Uncovering the indispensable information and the typical failings of audits will provide important guidance for future best practice, whilst identifying what tends to pre-empt good performance will help provide a marker for quality auditors.

Sub-questions:

- What are the key bits of information you look for in an energy audit?
- If an energy audit fails to live up to expectations, what are the main reasons for this?
- In your experience, what is the best indicator that an auditor is up-to-the-job, such as qualifications or recommendations?

What can encourage the execution of audit recommendations?

From our initial research, it is an unfortunate finding that many of the recommendations from energy audits go without implementation. An energy audit is only as useful as the savings it helps realise. If no measures are executed, there is a lack of utility in the audit. Therefore it is crucial to understand how the wider barriers to energy efficiency deployment interact with audits, and whether there are solutions to these problems.

Sub-questions:

- Looking beyond audits, what are the most significant barriers to implementing energy efficiency measures?
- Are there approaches that could mitigate these, such as follow-up appointments?

- How can long-term awareness of, and engagement with, energy efficiency be maintained in your organisation?

4. *Break (11:15-11:30)*

Coffee and snacks to be provided by the Carbon Trust.

5. *Session 2: role of policy and mandatory reporting (11:30-12:15)*

After discussing what makes an effective energy audit, the workshop will investigate how policy can make these happen and how ESOS could be improved. The sessions will look at policy through the lens of reporting as well as exploring potentially complementary measures.

Session 2 will follow a similar format to the previous.

Key questions:

Do reporting requirements spur action?

Reporting *includes external reporting of energy use (e.g. to the Environment Agency) for compliance with government policies, and internal reporting (for example from energy managers or internal auditors to chief executives or board of directors).*

Sub-questions

- Under what circumstances and conditions are reporting requirements likely to improve energy efficiency uptake?
- What approaches can be combined with reporting to encourage implementation?
- What is the perception of ESOS reporting requirements vis a vis other policies such as GHG mandatory reporting?

How effective has the implementation of ESOS in the UK been?

Various element of the implementation process have been discussed during interviews, including the guidance and documentation provided, the enforcement approach taken by the Environment Agency, and the differential implementation of the policy in other European countries.

- Is the guidance provided by the government fit for purpose?
- Has the Environment Agency approach to compliance been effective at driving uptake of ESOS?
- Have other European countries implemented ESOS in a different way and if so could anything be learned from them?

What is the role of policy in supporting action on energy efficiency, looking beyond ESOS?

Policy can be an effective instrument to foster the implementation of energy efficiency savings, either via incentives and subsidies or through taxes and mandatory mechanisms.

This session will explore various policy instruments, which could complement or replace ESOS.

- Are other UK policies such as the CCL/CCA synergistic, overlapping or conflicting with ESOS? If a CCA participant, to what extent has ESOS helped you to identify measures to help you meet your CCA targets cost effectively?
- What policy mechanisms could complement or replace ESOS?
- Are there any other policies or mechanisms from countries around the world that the UK could learn from?

6. Conclusion (12:15-12:30)

The conclusion will involve a short summation of the key ideas to emerge from the workshop and provide an insight into the next steps of the project.

BEIS ESOS Workshop II January 2018

Agenda

1. *Welcome remarks and introduction to the project – background, aims and methodology (10:00-10:15)*

The project team welcome the attendees and begin the workshop with a summary of the rationale behind the project, what we hope to achieve and how we will undertake it. This will include context on energy efficiency in the UK commercial sector, the role of energy audits, reporting and ESOS and why BEIS wants to test and improve its approach.

BEIS officials will be given the opportunity to provide a brief introduction to the wider study and how it is going to be used by the government.

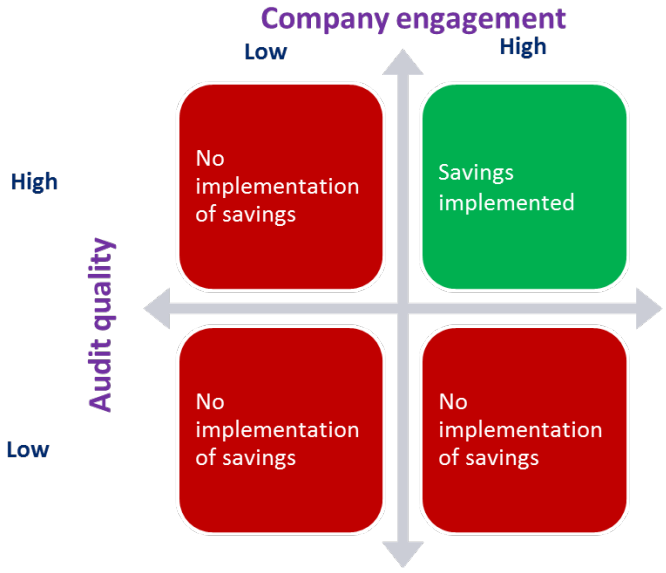
2. *Roundtable introductions (10:15 – 10:30)*

Each attendee will have the opportunity to introduce themselves and their company at the workshop.

3. *Session 1: effectiveness of ESOS and energy audits (10:30-11:15)*

*An **energy audit** is a systematic review of how energy is used within a building or industrial site. It includes a physical inspection of buildings and equipment, which can range from a simple visual inspection to a fully instrumented study.*

This workshop session will seek to test an assumption regarding the effectiveness of ESOS which has emerged from the literature review and interviews, name that there are two fundamental dimensions predicating the success of ESOS audits (and audits more broadly): the quality of the audit, and the engagement of the company.



After a short summary, the project team will frame three key questions for discussion, within which there are sub-questions and prompts to aid the discussion. We will split the room in

three groups of 7-8 people each. Each group will address two key questions and report to the room at the end of the session before the break.

Key questions:

How do companies perceive ESOS-mandated audits or other compliancy routes?

An important determinant of ESOS effectiveness is whether the company commissioning it considers the audit just a compliancy exercise, or as a chance to improve their understanding of energy use.

Sub-questions:

- What are the reasons for complying with ESOS via the audit route versus ISO or DEC compliance?
- What was the perception of the audit process and its results within the company?
- How can we overcome barriers such as hassle, cost and a lack of information?

When is an audit well, or poorly, implemented?

A key feature of out interviews to date is the significant number of participants who are unimpressed with the quality of energy audits. Without producing audits that are helpful and actionable, the necessary scaling-up of energy efficiency measures will not take place. Uncovering the indispensable information and the typical failings of audits will provide important guidance for future best practice, whilst identifying what tends to pre-empt good performance will help provide a marker for quality auditors.

Sub-questions:

- What are the key bits of information you look for in an energy audit?
- If an energy audit fails to live up to expectations, what are the main reasons for this?
- In your experience, what is the best indicator that an auditor is up-to-the-job, such as qualifications or recommendations?

What can encourage the execution of audit recommendations?

From our initial research, it is an unfortunate finding that many of the recommendations from energy audits go without implementation. An energy audit is only as useful as the savings it helps realise. If no measures are executed, there is a lack of utility in the audit. Therefore it is crucial to understand how the wider barriers to energy efficiency deployment interact with audits, and whether there are solutions to these problems.

Sub-questions:

- Looking beyond audits, what are the most significant barriers to implementing energy efficiency measures?
- Are there approaches that could mitigate these, such as follow-up appointments?

- How can long-term awareness of, and engagement with, energy efficiency be maintained in your organisation?

4. *Break (11:15-11:30)*

Coffee and snacks to be provided by the Carbon Trust.

5. *Session 2: role of policy and mandatory reporting (11:30-12:15)*

After discussing what makes an effective energy audit, the workshop will investigate how policy can make these happen and how ESOS could be improved. The sessions will look at policy through the lens of reporting as well as exploring potentially complementary measures.

Session 2 will follow a similar format to the previous.

Key questions:

Do reporting requirements spur action?

Reporting *includes external reporting of energy use (e.g. to the Environment Agency) for compliance with government policies, and internal reporting (for example from energy managers or internal auditors to chief executives or board of directors).*

Sub-questions:

- Under what circumstances and conditions are reporting requirements likely to improve energy efficiency uptake?
- What approaches can be combined with reporting to encourage implementation?
- What is the perception of ESOS reporting requirements vis a vis other policies such as GHG mandatory reporting?

How effective has the implementation of ESOS in the UK been?

Various element of the implementation process have been discussed during interviews, including the guidance and documentation provided, the enforcement approach taken by the Environment Agency, and the differential implementation of the policy in other European countries.

- Is the guidance provided by the government fit for purpose?
- Has the Environment Agency approach to compliance been effective at driving uptake of ESOS?
- Have other European countries implemented ESOS in a different way and if so could anything be learned from them?

What is the role of policy in supporting action on energy efficiency, looking beyond ESOS?

Policy can be an effective instrument to foster the implementation of energy efficiency savings, either via incentives and subsidies or through taxes and mandatory mechanisms. This session will explore various policy instruments, which could complement or replace ESOS.

- Are other UK policies such as the CCL/CCA synergistic, overlapping or conflicting with ESOS? If a CCA participant, to what extent has ESOS helped you to identify measures to help you meet your CCA targets cost effectively?
- What policy mechanisms could complement or replace ESOS?
- Are there any other policies or mechanisms from countries around the world that the UK could learn from?

6. *Conclusion (12:15-12:30)*

The conclusion will involve a short summation of the key ideas to emerge from the workshop and provide an insight into the next steps of the project.

BEIS SME Workshop January 2018

Agenda

1. *Welcome remarks and introduction to the project – background, aims and methodology (09:30-09:45)*

2. *Roundtable introductions (09:45 – 10:00)*

3. *Session 1: energy management and energy audits (10:00-10:45)*
   - **What is your company's approach to energy management and energy efficiency?**
     - How is energy managed within SMEs? Are there dedicated energy managers? Is energy an important cost?
     - How can we overcome barriers such as hassle, cost and a lack of information?
     - To what extent have you used energy audits in your organisations? What are the reasons for investing (or not) in an energy audit? Do you think there are any alternatives to energy audit for understanding energy consumption?
     - Do you know of any schemes or policies, which are useful in incentivising the uptake of energy audits?
     - What is your company's approach to energy management and energy efficiency?
   - **When is an audit well, or poorly, implemented?**
     - What are the key bits of information you look for in an energy audit?
     - If an energy audit fails to live up to expectations, what are the main reasons for this?
     - In your experience, what is the best indicator that an auditor is up-to-the-job, such as qualifications or recommendations?

4. *Break (10:45-11:00)*

5. *Session 2: implementation of energy efficiency measures and role of policy including reporting (11:00-11:45)*
   - **What can encourage the implementation of energy efficiency actions or measures?**

- Looking beyond audits, what are the most significant barriers to implementing energy efficiency measures? What are the enablers for action?
- Are there approaches that could mitigate these?
- How do you finance energy efficiency investment?
- How can long-term awareness of, and engagement with, energy efficiency be maintained in your organisation?
- What are the links to wider energy management e.g ISO50001?
- What else would trigger further action?

- **What role could reporting playing in further incentivising action on energy efficiency?**
  - Do you currently carry out any kind of internal or external reporting of audits? Is it connected to any policy requirements?
  - Do reporting requirements spur action? If not, why not?
  - Under what circumstances and conditions are reporting requirements likely to improve energy efficiency uptake?
  - What approaches and policies can be combined with reporting to encourage implementation?

6. *Conclusion (11:45-12:00)*

BEIS ESOS Public Sector Workshop January 2018

Agenda

1. *Welcome remarks and introduction to the project – background, aims and methodology (09:30-09:45)*

The project team welcome the attendees and begin the workshop with a summary of the rationale behind the project, what we hope to achieve and how we will undertake it. This will include context on energy efficiency in the UK commercial sector, the role of energy audits, reporting and ESOS and why BEIS wants to test and improve its approach.

BEIS officials will be given the opportunity to provide a brief introduction to the wider study and how it is going to be used by the government.

2. *Roundtable introductions (09:45-10:00)*

Each attendee will have the opportunity to introduce themselves and their company at the workshop.

3. *Session 1: energy management and energy audits (10:00-10:45)*

Key definitions:

*An **energy audit** is a systematic review of how energy is used within a building, industrial site or transport fleet. It includes a physical inspection of buildings and equipment, which can range from a simple visual inspection to a fully instrumented study.*

***Reporting** includes external reporting of energy use (e.g. to the Environment Agency) for compliance with government policies, and internal reporting (for example from energy managers or internal auditors to chief executives or board of directors).*

Energy management approaches in the public sector is usually driven by two competing factors: a relative lack of resources and expertise to implement efficient practices, and a desire to reduce energy consumption both to save resources and to be seen as green leaders.

This session will seek to understand what are the main drivers and barriers for public sector entities in regards to their approach to energy management and energy efficiency, with a particular focus on energy audits and reporting as tools to understand and reduce energy consumption.

Opening comments from the project team will be based on early findings from the literature review and interviews. After a short summary, the project team will frame two key questions for discussion, within which there are sub-questions and prompts to aid the discussion. These can be discussed either as a whole group, or by splitting the room into

breakout groups before reporting to the group for wider discussion. The approach will be confirmed based on final attendance numbers.

Key questions:

What is your institution's approach to energy management and energy efficiency?

Public sector bodies are often resource constraint and have to set their priorities carefully. Energy is not necessarily one of their primary cost drivers, which means it can be deprioritised. However in the case of hospitals, schools and other similar institutions energy management is an important factor in determining the comfort of the members of the public who use the services provided.

Understanding what motivates, or turns off, public sector bodies when it comes to investing the extra time, energy and money into an energy management interventions, including audits, will provide insights into how future policy can target incentives for increasing their uptake.

Sub-questions:

- How is energy managed within the public sector? Does this change between different types of bodies?
- Are there dedicated energy managers? Is energy an important cost?
- To what extent have you used energy audits in your institutions? What are the reasons for investing (or not) in an energy audit? Do you think there are any alternatives to energy audit for understanding energy consumption?
- Do you currently carry out any kind of internal or external reporting of audits? Is it connected to any policy requirements?
- If instead of audits you rely on advice from trusted suppliers, what have you received by way of advice from them and what has been the outcome/barriers to progressing actions?
- Do you know of any schemes or policies, which are useful in incentivising the uptake of energy audits?

4. *Break (10:45-11:00)*

Coffee and snacks to be provided by the Carbon Trust.

5. *Session 2: implementation of energy efficiency measures and role of policy including reporting (11:00-11:45)*

After discussing energy management approaches and energy audits and reporting specifically, the workshop will investigate what leads public sector bodies to implementing energy efficiency savings and what role policy can play in incentivising further action and complement auditing.

Session 2 will follow a similar format to the previous.

Key questions:

What can encourage the implementation of energy efficiency actions or measures?

From our initial research, it is an unfortunate finding that many of the recommendations from energy audits go without implementation. An energy audit is only as useful as the savings it helps realise. If no measures are executed, there is a lack of utility in the audit. Therefore it is crucial to understand how the wider barriers to energy efficiency deployment interact with audits, and whether there are solutions to these problems.

- In your experience, what distinguishes success stories of energy efficiency (which lead to implemented savings, whether identified by audits or not) from negative experiences?
- What are the key enablers to action on energy efficiency?
- How do you finance energy efficiency investment?
- Do reporting requirements spur action? If not, why not? Under what circumstances and conditions are reporting requirements likely to improve energy efficiency uptake?
- How can long-term awareness of, and engagement with, energy efficiency be maintained in your organisation?
- What are the links to wider energy management e.g ISO50001?
- What else would trigger further action?

6. *Conclusion (11:45-12:00)*

The conclusion will involve a short summation of the key ideas to emerge from the workshop and provide an insight into the next steps of the project.

BEIS ESOS Workshop III March 2018

Agenda

1. *Welcome remarks and introduction to the project – background, aims and methodology (09:30-09:45)*

2. *Roundtable introductions (09:45-10:00)*

3. *Session 1: energy management and energy audits (10:00-10:45)*
   - **What is your company's approach to energy management and energy efficiency?**
     - How is energy managed within SMEs? Are there dedicated energy managers? Is energy an important cost?
     - To what extent have you used energy audits in your organisations? What are the reasons for investing (or not) in an energy audit? Do you think there are any alternatives to energy audit for understanding energy consumption?
     - Do you currently carry out any kind of internal or external reporting of audits? Is it connected to any policy requirements?
     - If instead of audits you rely on advice from trusted suppliers, what have you received by way of advice from them and what has been the outcome/barriers to progressing actions?
     - Do you know of any schemes or policies, which are useful in incentivising the uptake of energy audits?

4. *Break (10:45-11:00)*

5. *Session 2: implementation of energy efficiency measures and role of policy including reporting (11:00-11:45)*
   - **What can encourage the implementation of energy efficiency actions or measures?**
     - In your experience, what distinguishes success stories of energy efficiency (which lead to implemented savings, whether identified by audits or not) from negative experiences?
     - What are the key enablers to action on energy efficiency?
     - How do you finance energy efficiency investment?

- Do reporting requirements spur action? If not, why not? Under what circumstances and conditions are reporting requirements likely to improve energy efficiency uptake?
- How can long-term awareness of, and engagement with, energy efficiency be maintained in your organisation?
- What are the links to wider energy management e.g ISO50001?
- What else would trigger further action?

6. *Conclusion (11:45-12:00)*

7. *Energy Efficiency Training (12:00 – 12:45)*

BEIS ESOS CCA Workshop March 2018

Agenda

1. *Welcome remarks and introduction to the project – background, aims and methodology (09:30-09:45)*

2. *Roundtable introductions (09:45-10:00)*

3. *Session 1: effectiveness of ESOS and energy audits (10:00-10:45)*
   - **How has ESOS been implemented by companies?**
     - What are the reasons for complying with ESOS via the audit route versus ISO or DEC compliance?
     - Did you already have energy management processes in place before ESOS? Did ESOS expand your knowledge of your energy consumption?
     - Was the ESOS process useful overall in influencing your decision to invest in energy efficiency?
   - **What makes for a good energy audit?**
     - Please briefly list the recommendations you received or made under the ESOS process. We have set out a number of categories in the print outs but feel free to add your own.
     - What are the key bits of information you look for in an energy audit?
     - If an energy audit fails to live up to expectations, what are the main reasons for this?
     - In your experience, what is the best indicator that an auditor is up-to-the-job, such as qualifications or recommendations?
   - **What can encourage the execution of audit recommendations?**
     - Which of the above categories of recommendations have seen the most implementations?
     - Looking beyond audits, what are the most significant barriers to implementing energy efficiency measures? What are the enablers for action?
     - Are there approaches that could mitigate these, such as follow-up appointments with auditors to check implementation status and provide further advice?
     - How can long-term awareness of, and engagement with, energy efficiency be maintained in your organisation?

4. *Break (10:45-11:00)*

5. *Session 2: role of policy and mandatory reporting (11:00 -11:45)*

   - **Do reporting requirements spur action?**
     - Under what circumstances and conditions are reporting requirements likely to improve energy efficiency uptake?
     - What approaches can be combined with reporting to encourage implementation?
     - What is the perception of ESOS reporting requirements vis a vis other policies such as GHG mandatory reporting?
   - **How effective has the implementation of ESOS in the UK been?**
     - Is the guidance provided by the government fit for purpose?
     - Has the Environment Agency approach to compliance been effective at driving uptake of ESOS?
     - Have other European countries implemented ESOS in a different way and if so could anything be learned from them?
   - **What is the role of policy in supporting action on energy efficiency, looking beyond ESOS?**
     - Are other UK policies such as the CCL/CCA synergistic, overlapping or conflicting with ESOS? If a CCA participant, to what extent has ESOS helped you to identify measures to help you meet your CCA targets cost effectively?
     - What policy mechanisms could complement or replace ESOS?
     - Are there any other policies or mechanisms from countries around the world that the UK could learn from?

6. *Conclusion (11:45:12:00)*

Table of recommendations

Please fill in the table below with the recommendations you received as part of the ESOS Process. Then list which one where implemented within 12 months of receiving the audit. Please provide as much detail about the recommendations as you can.

Area	Sub-area	Recommended	Implemented
Buildings	**Lighting**		
	Heating		
	Cooling		
	Water heating		
	Ventilation		
	Office equipment		
	Other		
Industry	**Material processing**		
	HVAC		
	Process heat		
	Compressed air		
	Process fans		
	Process refrigeration		
	Other		
Transport	**Vehicle upgrades**		
	Fuel switching		
	Modal switching (e.g. to teleconferences)		
	Other		
Other	**[specify]**		
	LPG consumption		

Annex 5: COM-B Framework

Further detail on COM-B framework for considering behaviour change. This study has drawn on the following mapping of the Behaviour Change Wheel's COM-B system to the domains included in the Theoretical Domains Framework.

Source: https://implementationscience.biomedcentral.com/articles/10.1186/1748-5908-7-37

COM-B component		TDF Domain
Capability	Psychological	Knowledge
		Skills
		Memory, Attention and Decision Processes
		Behavioural Regulation
	Physical	Skills
Opportunity	Social	Social Influences
	Physical	Environmental Context and Resources
Motivation	Reflective	Social/Professional Role & Identity
		Beliefs about Capabilities
		Optimism
		Beliefs about Consequences
		Intentions
		Goals
	Automatic	Social/Professional Role & Identity
		Optimism
		Reinforcement
		Emotion

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