Department for
Business, Energy
& Industrial Strategy

Evaluation of the Public Sector Energy Efficiency Loan Scheme

Technical Method Annex

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Contents

Introduction

This document sets out the methodology that has been employed to deliver the evaluation of the public sector energy efficiency loan scheme.

This document is structured as follows:

- Evaluation questions – an overview of the high level questions and the scope of the evaluation, including a table of key definitions.

- Overall method and rationale – this sets out the key elements of the approach, the principles used in the evaluation, how the approach answered the evaluation questions, the risks and limitations of the approach and how the approach was reviewed and refined. It includes a table of the high level and sub-evaluation questions addressed in the evaluation with a description on how they were refined and finalised during the scoping phase of the work.

The core of this document will then look at the aims, approach and limitations of the following:

- Phase 1 Qualitative Research
- Phase 2 Qualitative Research
- Quantitative Survey
- Quasi-Experimental Analysis
- Cost-effectiveness Analysis.

Evaluation questions

Prior to the evaluation, BEIS developed five high level evaluation questions (HLQs) which needed to be addressed in order to meet the objectives.

- HLQ1 What have been the outcomes of the scheme before and after the uplift in funding in 2015?
- HLQ2 What is the contribution of the scheme to the observed outcomes?
- HLQ3 What is the cost effectiveness of the scheme?
- HLQ4 How effective and efficient has delivery of the scheme been?
- HLQ5 What is the wider learning from the evaluation for BEIS?

During the scoping phase of the work, the questions were refined and finalised based on insight arising from activities undertaken in the scoping phase and consultation with BEIS.

The table below provides a summary of the high level and detailed evaluation questions. It also points the reader to the relevant section of the synthesis report where each evaluation question is covered.

Table 1 Scope and coverage of evaluation questions within synthesis report

Reference	Question	Scope and coverage within the synthesis report
HLQ1	What have been the outcomes of the scheme before and after the uplift in funding in 2015?	Section 3.1. Quantitative exploration of outcomes pre-uplift through QEA pilot. Qualitative exploration of respondent perceptions of outcomes (not disaggregated between pre and post uplift). Note issues discussed in section 1.4, including key limitations regarding the extent to which outcomes were possible to disaggregate pre-and-post uplift.
1.1	Have recipients of a loan experienced reductions in energy bills, greenhouse gas emissions and energy consumption? [1]	Section 3.1. QEA pilot report outputs. Qualitative exploration of respondent perceptions of outcomes in line with participant expectations.
1.2	Do reductions in energy bills, greenhouse gas emissions and	Section 3. Quantitative exploration of outcomes by participant type and technology where possible (noting limitations discussed in section 1.4). Qualitative exploration

[1] The original wording of this research question was 'Have recipients of a loan experienced reductions in energy bills, greenhouse gas emissions and energy consumption in line with our expectations?' However, as the methodology developed, it became clear that the findings would not be comparable to BEIS energy savings expectations due to limitations in data matching, so this question has been updated.

Reference	Question	Scope and coverage within the synthesis report
	energy consumption differ by different scheme participants and different technologies?	of respondent perceptions of outcomes across participant groups and technologies
1.3	What have been the co-benefits of the scheme?	Section 3.2. Co-benefits and unintended outcomes. Quantitative and qualitative exploration of respondent observation of co-benefits and unintended outcomes.
1.4	Have there been any unintended outcomes?	Section 3.2. Co-benefits and unintended outcomes. Quantitative and qualitative exploration of respondent observation of co-benefits and unintended outcomes.
HLQ2	What is the contribution of the scheme to the observed outcomes?	Sections 3.1.3. Meeting expectations and scheme contribution, 3.1.1 Street lighting and 3.1.2, NHS and Emergency Services. Quantitative exploration of outcomes pre-uplift through QEA, qualitative exploration of contribution of scheme to observed outcomes.
2.1	To what extent are the scheme's observed impacts additional to what would have otherwise happened?	Sections 3.1.3 Meeting expectations and scheme contribution, 3.1.1 Street lighting and 3.1.2, NHS and Emergency Services. Interpretation of QEA outputs, qualitative and quantitative exploration of respondent perceptions of additionality, considering both participant and non-participant activities.
2.2	To what extent does additionality vary across different participants, technologies and funding methods and why?	Sections 3.1.3 Meeting expectations and scheme contribution, 3.1.1 Street lighting and 3.1.2, NHS and Emergency Services. QEA, quantitative and qualitative exploration of variation of additionality across different participant groups.
HLQ3	What is the cost effectiveness of the scheme?	Section 3.3. Cost effectiveness, CBA using outputs from the QEA and activity data.
3.1	For participants, how do the costs of participating in the scheme compare with the overall benefits, and has this changed since the uplift in funding?	Section 3.3. Cost effectiveness, CBA using outputs from the QEA and activity data.

Reference	Question	Scope and coverage within the synthesis report
3.2	For the government, how do the costs of providing a loan compare with the overall benefits?	Section 3.3. Cost effectiveness, CBA using outputs from the QEA and activity data.
3.3	What is the cost-effectiveness of different technologies from the perspective of participants and government?	Section 3.3. Cost effectiveness, CBA using outputs from the QEA and activity data.
HLQ4	How effective and efficient has the delivery of the scheme been?	Section 2. Effectiveness of scheme design and delivery, specifically including sections 2.1 Scheme design and delivery , 2.3 Scheme engagement, 2.4 Reasons for and barriers to participation and 2.6 Scheme experience. Quantitative and qualitative exploration scheme delivery.
4.1	What is the rate of deployment of energy efficiency projects and technologies, what explains this and does this differ for different participants?	Section 2.1. Scheme design and delivery reporting on scheme activity levels over the time period of the evaluation across funds, participant groups and technologies. Section 2.3 Scheme engagement, – quantitative and qualitative exploration of deployment across technologies and participant groups.
4.2	What types of organisations are participating in the scheme, and why? How does this compare to the types of organisations that the scheme is targeted at? What types of organisations are not participating in the scheme, and why?	Sections 2.2. Scheme activity and 2.3 Scheme engagement. Describing who is participating in the scheme and why, based on quantitative data and organisations (participants and non-participants) engaged through qualitative research.
4.3	What strategies have been used to segment, target and reach different participants, and how effective have these been?	Sections 2.3. Scheme engagement and 2.6 Scheme experience, describing (qualitatively and quantitatively) strategies taken by Salix, and that observed through interviews with participants and non-participants. Assessing (qualitatively) which strategies have been effective from the perspective of participants and the perspective of Salix and BEIS.

Reference	Question	Scope and coverage within the synthesis report
4.4	How have risks of insufficient take-up of energy efficiency projects been mitigated?	Section 2.3. Scheme engagement, describing (qualitatively) strategies that Salix have used to make sure all funding agreed with BEIS is distributed each year.
4.5	How are projects prioritised by the delivery body, and has this changed following the uplift in funding?	Section 2.3. Scheme engagement, describing (qualitatively) whether Salix prioritise certain types of energy efficiency projects over others, on what basis and how (i.e. how are these projects treated differently to those that are not prioritised).
4.6	Which elements of the scheme have different stakeholders (including participants) successfully engaged with and how?	Section 2.3. Scheme engagement, describing (qualitatively) which stakeholders are engaging with which activities in the scheme and how this is contributing to participants implementing projects which result in reductions in energy bills, greenhouse gas emissions and energy consumption.
4.7	For participants and non-participants, where are the barriers to take up of the public-sector energy efficiency loan scheme and why do these occur?	Section 2.4. Reasons for and barriers to participation, describing qualitatively and quantitatively who (participants and non-participants) contacts Salix out of interest in using the scheme for an energy efficiency project and who does and does not take the funding forward for this project. Describing reasons why these projects are not taken forward with Salix funding.
4.8	Has offering two different funding mechanisms been effective? If so, who has it benefited, how and why? If not, why was it not effective?	Section 2.7. Funding mechanisms and loan repayment periods, describing qualitatively and quantitatively whether it was beneficial for participants to be able to access either the Recycling Fund or the loan. Who has benefitted from this choice (in terms of their ability to progress energy efficiency projects) and why. Who has not benefitted from this choice (in terms of their ability to progress energy efficiency projects) and why.
4.9	What is the role of match-funding in bringing about energy efficiency projects supported by the scheme?	Section 2.7. Funding mechanisms and loan repayment periods, analysing qualitatively and quantitatively the effect that match-funding has in bringing about energy efficiency projects supported by the scheme

Reference	Question	Scope and coverage within the synthesis report
4.10	What have been the participants' and non-participants perceptions and experiences of the hassle / hidden costs of taking up the loans, and how has this impacted on participation?	Section 2.6. Scheme experience, describing qualitatively and quantitatively perceptions of the hassle / resource costs of participating in the scheme, how these perceptions and experiences impact on scheme take-up.
4.11	Has the offer of different pay-back rates for different types of organisations had an impact on participation?	Section 2.7. Funding mechanisms and loan repayment periods, describing qualitatively and quantitatively views on different pay-back rates and the role that different pay back rates have on take-up of the scheme.
HLQ5	What is the wider learning from the evaluation for BEIS?	Section 4. Wider lessons from the evaluation.
5.1	What other mechanisms are being deployed and utilized to support the uptake of energy efficiency measures in the public sector outside of the scheme?	Sections 2.5. Mechanisms deployed outside of the scheme and 4.4 Design and delivery of energy efficiency policy, describing and summarising the regulations, incentives and advice that scheme participants are using alongside the scheme and how they are being used.
5.2	What changes can be made to the scheme to address the barriers to the installation of energy efficiency measures among public sector organisations?	Sections 4.1. Changes to the existing scheme and 4.2 Design and delivery of a larger scheme, describing and summarising the changes that could be made to how the scheme operates to help both scheme participants and non-participants take more steps to reduce energy bills, greenhouse gas emissions and energy consumption.
5.3	What strategies are most viable / cost-effective for Government to address the	Sections 4.2. Design and delivery of a larger scheme, 4.3 Design and delivery of financial mechanisms to help address outstanding energy efficiency potential and 4.4, Design and delivery of energy efficiency policy. Exploring the changes that could be made to how the scheme operates to help both scheme participants and non-

Reference	Question	Scope and coverage within the synthesis report
	outstanding energy efficiency potential?	participants take more steps to reduce energy bills, greenhouse gas emissions and energy consumption in terms of their ability to deliver reductions cost effectively.
5.4	What role does the provision of zero-cost finance have in tapping into the outstanding energy efficiency potential?	Section 4.3. Design and delivery of financial mechanisms to help address outstanding energy efficiency potential. Analysing the role of zero cost finance alongside the regulations, incentives and advice that scheme participants and non-participants are using to help them take more steps to reduce energy bills, greenhouse gas emissions and energy consumption in terms of their ability to deliver these reductions cost effectively.
5.5	Is there any learning that can be applied to other related policies (e.g. in energy efficiency, loan schemes)?	Section 4.4. Design and delivery of energy efficiency policy. Describing and explaining how insights drawn from this evaluation might be applicable to other existing or future Government administered loan schemes.

Overall method and rationale

Evaluation strategy

The key characteristics of the approach to evaluation of the public sector energy efficiency loan scheme were:

- **Theory based**. The evaluation employed a theory-based approach to better understand the contexts, drivers and barriers and to help distinguish the outcomes from the scheme from other factors. The scheme operates within a complex environment, for example, participants manage energy in very different ways according to their portfolio, organisation structure and needs. Contexts will also differ, for example some organisations own some / all of their buildings, others will not, and the nature of buildings and operations will vary considerably. Furthermore, organisational appetite and approaches to finance will also vary. All of these issues materially influence energy demand, opportunities for efficiency and therefore affect take up of the scheme. Development of a Theory of Change informed refinement of the evaluation questions and underlying research questions which sought to test this theory.

- **Multi-method**. The scheme is an underpinning / facilitatory intervention, which supports the delivery of a complex suite of non-domestic public-sector policies[2], within a multi-faceted suite of wider market drivers and barriers to energy efficiency investment[3]. No single evaluation methodology was able to fully capture all the complexities of how the scheme operates in the real world. A mixed method approach was therefore employed. This included using secondary and primary data to design a quasi-experimental approach to understand impact. Economic and process evaluation approaches were deployed to determine cost effectiveness and learnings.

- **Phased**. The evaluation was split into three phases to support timely delivery of findings and to fit with time lags to required data. Early findings from the evaluation were used to inform potential policy and investment decisions being taken in Spring 2018. However, some scheme data and relevant external datasets that were needed to inform the evaluation were not available in this timescale. The phasing also allowed for the development of methods for subsequent phases. The Theory of Change, final evaluation questions and methodology were informed by the scoping phase. Phase 2 was, to some extent, informed by the findings from Phase 1. The three phases, their timings and purpose are shown in the following table (Table 2).

[2] Talbot, A and Kenington, D (2015) Evaluating DECC's Non-Domestic Energy Efficiency Policy Portfolio. Databuild.
[3] Mallaburn, P. (2016) A new approach to non-domestic energy efficiency policy A report for the Committee on Climate Change. UCL Energy Institute

Table 2 Table of phases of the evaluation

Phase	Dates	Purpose
Scoping Phase	August 2017 – January 2018	Development and finalisation of an evaluation plan including a theory of change. The theory of change was informed by a literature review, consultation with Salix Finance and BEIS, and two workshops. The evaluation plan and theory of change were additionally informed by scoping interviews with a sample of direct and indirect participants in the scheme[4].
Phase 1	December 2017 – December 2018	Development of a quasi-experimental impact evaluation approach and the piloting of this. Qualitative interviews were conducted with both participants and non-participants of the scheme as well as with Salix. Following this an interim report was published.
Phase 2	June 2018 – July 2019	Implementation of the quasi-experimental impact evaluation. Quantitative and qualitative interviews with both participants and non-participants and a cost effectiveness assessment was carried out. Following this a final report was published.

Key elements of approach

In summary, the key elements of the evaluation were:

- Qualitative data collection and analysis, including insight from Salix Finance Ltd
- Quantitative data collection and analysis
- Quasi-experimental analysis (QEA), including an analysis of Salix scheme data
- Cost Benefit Analysis (CBA)

These elements are described in detail in the subsequent chapters of this report.

The following table shows which methodologies were used to address each of the five HLQs and the 29 supporting questions (*Table 3*).

Further detail on the scope of participant organisations, stakeholders and project types to consider follows after the table.

[4] Four indirect participant groups were included (12 interviews), comprising delivery bodies involved directly or indirectly in delivery of the scheme, intermediaries such as Government and third sector, participant group representatives (trade bodies) and private finance providers involved in energy efficiency. Direct participants (18 interviews) comprised organisations who had or were in the process of taking up the scheme split across the main types of organisations targeted by the scheme (Local Authorities, NHS, Universities, Schools).

Table 3 Description of high-level evaluation questions and the methodologies used

Ref	Question	Meaning	Scope	QEA	Ph. 1 qual	Ph. 2 qual	Quant	CBA
HLQ1	**What have been the outcomes of the scheme before and after the uplift in funding in 2015?**							
1.1	Have recipients of a loan experienced reductions in energy bills, greenhouse gas emissions and energy consumption?	Describe (quantitatively) whether recipients of a loan have experienced reductions in energy bills, greenhouse gas emissions and energy consumption in line with BEIS' expectations as set out in their business model.	Analysis should consider recipients of the loan and the Recycling Fund (RF) separately for each financial year 2013-14 through to 2016-17 with a comparison 2013 - 2015 and 2015 - 2017.	✓			✓	
1.2	Do reductions in energy bills, greenhouse gas emissions and energy consumption differ by different scheme participants and different technologies?	Describe (quantitatively) the reductions in energy bills, greenhouse gas emissions and energy consumption experienced by different types of scheme participants and through different types of technologies / different mixes of technology. [5]	Analysis should consider recipients of the loan and the Recycling Fund separately for each financial year 2013-14 through to 2016-17 with a comparison 2013 - 2015 and 2015 - 2017.	✓				
1.3	What have been the co-benefits of the scheme?	Identify and describe (quantitatively and qualitatively) the benefits that scheme participants are aware of and have experienced beyond reductions in energy bills, greenhouse gas emissions and energy consumption. Describe (qualitatively) how important these are to their organisation e.g. relative to financial savings. Analyse (quantitatively and qualitatively) which participants are experiencing which benefits and (qualitatively) whether they have tried to quantify any of the benefits.			✓		✓	
1.4	Have there been any unintended outcomes?	Describe (qualitatively) whether there have been any outcomes of the scheme (either positive or negative) beyond that articulated in the Theory of Change.	To include outcomes for scheme participants and scheme stakeholders e.g. has the scheme had a positive influence on non-participants in encouraging energy efficiency action.		✓		✓	

[5] In the original specification for the work, it was envisaged that how the reductions in energy bills, greenhouse gas emissions and energy consumption differed by different scheme participants and different technologies compared to BEIS' expectations (in the same way as 1.1) would be measured. Following a pilot of the QEA approach, the intention to compare actual reductions to BEIS' expectations was removed for this question when it was agreed that a comparison could not be made on the same basis.

Ref	Question	Meaning	Scope	QEA	Ph. 1 qual	Ph. 2 qual	Quant	CBA
HLQ2	**What is the contribution of the scheme to the observed outcomes?**							
2.1	To what extent are the scheme's observed impacts additional to what would have otherwise happened?	Describe (quantitatively and qualitatively) the extent to which the scheme has led to reductions in energy bills, greenhouse gas emissions and energy consumption that would not have been achieved in the absence of the scheme. Describe (qualitatively and quantitatively) the extent to which projects were fully attributable to the scheme (i.e. the project would not have happened at all without the scheme. Describe (qualitatively and quantitatively) the extent to which projects were accelerated due to the scheme (i.e. the project happened sooner than it would have done without the scheme). Describe (qualitatively and quantitatively) the extent to which the projects were scaled up or somehow made larger due to the scheme. Describe (qualitatively and quantitatively) the extent to which projects were not attributable to the scheme (i.e. the project would have gone forward in the exact same manner, regardless of support from the scheme).	Analysis should involve a comparison 2013 - 2015 and 2015 - 2017, between different funds, between different types of organisations and between different types of projects. Scope to include the acceleration of project implementation for individual scheme participants, the acceleration of projects for different types of participant organisations and the acceleration of projects for the 'public sector' as a whole e.g. the scheme bringing about the installation of certain types of measures in the public sector for the first time.	ü	✓	✓	✓	
2.2	To what extent does additionality vary across different participants, technologies and funding methods and why?	Describe (quantitatively and qualitatively) the extent to which the scheme has led to reductions in energy bills, greenhouse gas emissions and energy consumption that would not have been achieved in the absence of the scheme for different types of participants, different funding methods and different types of projects. Describe (quantitatively and qualitatively) the reasons for any observed differences.	Analysis should consider recipients of the loan and the Recycling Fund separately.	✓	✓		✓	
HLQ3	**What is the cost-effectiveness of the scheme?**							
3.1	For participants, how do the costs of participating in the scheme compare with the overall benefits,	Describe (quantitatively and qualitatively) the extent to which costs are recognised and the extent to which they are quantified. Describe (quantitatively) the cost of participating in the scheme (including hassle costs). Describe (quantitatively) the benefits of	Benefits to be considered include energy bills, greenhouse gas emissions and energy consumption.	[✓][6]			[✓][7]	✓

[6] Contributes evidence
[7] Contributes evidence

Ref	Question	Meaning	Scope	QEA	Ph. 1 qual	Ph. 2 qual	Quant	CBA
	and has this changed since the uplift in funding?	participating in the scheme. Compare the costs and benefits (to produce ratios). Contrast the costs, benefits and cost-benefit ratio before and after the funding uplift.						
3.2	For the government, how do the costs of providing a loan compare with the overall benefits?	Describe (quantitatively) the capital cost of the loan for Government. Describe (quantitatively) the benefits of the scheme for Government. Compare the costs and benefits (to produce ratios).	Benefits to be considered include energy bills, greenhouse gas emissions and energy consumption.					✓
3.3	What is the cost-effectiveness of different technologies from the perspective of participants and government?	Describe (quantitatively) the cost of different technologies for participants (including hassle costs). Describe (quantitatively) the benefits of different technologies for participants. Compare the costs and benefits (to produce ratios) for participants. Describe (quantitatively) the cost of different technologies for Government. Describe (quantitatively) the benefits of different technologies for Government. Compare the costs and benefits (to produce ratios) for Government.	Benefits to be considered include energy bills, greenhouse gas emissions and energy consumption.					✓
HLQ4	**How effective and efficient has the delivery of the scheme been?**							
4.1	What is the rate of deployment of energy efficiency projects and technologies, what explains this and does this differ for different participants?	Describe (qualitatively) how quickly projects are installed by scheme participants, relative to when they are first identified or conceived by the participant organisation. Contrast this for different types of projects and different types of participants.	'Quickly' means the timescales (in weeks, months etc.).		✓	✓		
4.2	What types of organisations are participating in the scheme, and why? How does this compare to the types of organisations that the scheme is targeted at? What types of organisations are not	Describe (quantitatively) who is participating in the scheme. Analyse who is participating in the scheme relative to the population (take-up rate). Describe (qualitatively) why organisations participate in the scheme. Describe (qualitatively) why organisations do not participate in the scheme.	Qualitative description of why organisations do / do not participate in the scheme should identify themes overall and at the level of different types of participant.		✓	✓	✓	

Ref	Question	Meaning	Scope	QEA	Ph. 1 qual	Ph. 2 qual	Quant	CBA
	participating in the scheme, and why?							
4.3	What strategies have been used to segment, target and reach different participants, and how effective have these been?	Describe (qualitatively) the strategies Salix have taken to segment, target and market to potential participant organisations. Assess (qualitatively) which strategies have been effective from the perspective of participants and the perspective of Salix and BEIS.	Qualitative description of segmentation, targeting and marketing strategy should focus on attracting new participants to the scheme.				✓	
4.4	How have risks of insufficient take-up of energy efficiency projects been mitigated?	Describe (qualitatively) the strategies that Salix have used to make sure all funding agreed with BEIS is distributed each year.	Qualitative description of strategies should focus on identifying energy efficiency projects amongst new participants to the scheme and existing participants to the scheme		✓			
4.5	How are projects prioritised by the delivery body, and has this changed following the uplift in funding?	Describe (qualitatively) whether Salix prioritise certain types of energy efficiency projects over others, on what basis and how (i.e. how are these projects treated differently to those that are not prioritised).	Contrast whether Salix prioritise certain types of energy efficiency projects over others, on what basis and how before and after the uplift in funding.		✓			
4.6	Which elements of the scheme have different stakeholders (including participants) successfully engaged with and how?	Describe (qualitatively) which stakeholders are engaging with which activities in the scheme and how this is contributing to participants implementing projects which result in reductions in energy bills, greenhouse gas emissions and energy consumption.	Elements / activities in the scheme refers to 'inputs' in the Theory of Change.		✓			
4.7	For participants and non-participants, where are the barriers to take up of the public-sector energy efficiency loan scheme and why do these occur?	Describe (qualitatively) who (participants and non-participants) contacts Salix out of interest in using the scheme for an energy efficiency project and who does and does not take the funding forward for this project. Describe (qualitatively) the reasons why these projects are not taken forward with Salix funding.			✓	✓	✓	
4.8	Has offering two different funding mechanisms been effective? If so, who has it benefited, how	Describe (qualitatively) whether it was beneficial for participants to be able to access either the Recycling Fund or the loan. Who has benefitted from this choice (in terms of their ability to progress energy efficiency projects) and why. Who has not benefitted			✓		✓	

Ref	Question	Meaning	Scope	QEA	Ph. 1 qual	Ph. 2 qual	Quant	CBA
	and why? If not, why was it not effective?	from this choice (in terms of their ability to progress energy efficiency projects) and why.						
4.9	What is the role of match-funding in bringing about energy efficiency projects supported by the scheme?	Analyse (qualitatively) the effect that match-funding has in bringing about energy efficiency projects supported by the scheme			✓		[✓][8]	
4.10	What have been the participants' and non-participants perceptions and experiences of the hassle / hidden costs of taking up the loans, and how has this impacted on participation?	Describe (qualitatively) the perceptions of the hassle / resource costs of participating in the scheme. Describe (qualitatively) the experiences of the hassle / resource costs of participating in the scheme. Analyse (qualitatively) how these perceptions and experiences impact on scheme take-up.			✓	✓	[✓][9]	
4.11	Has the offer of different pay-back rates for different types of organisations had an impact on participation?	Describe (qualitatively) views on different pay-back rates and analyse (qualitatively) the role that different pay back rates have on take-up of the scheme.			✓		✓	
HLQ5	**What is the wider learning from the evaluation for BEIS?**							
5.1	What other mechanisms are being deployed and utilized to support the uptake of energy efficiency measures in the public sector outside of the scheme?	Describe and summarise the regulations, incentives and advice that scheme participants are using alongside the scheme and how they are being used.	Scope extends to taxation and fiscal incentives, legislation, regulation, Government supported information and advice, as well as use of private sector and third sector information and advice. Answering this question involves exploring what mechanisms participants of the scheme are using, how the scheme		✓	✓	✓	

[8] Contributes evidence
[9] Contributes evidence to CBA

Ref	Question	Meaning	Scope	QEA	Ph. 1 qual	Ph. 2 qual	Quant	CBA
			interacts with these mechanisms (complements or conflicts), and whether and how these mechanisms affect the outcomes, effectiveness and efficiency of the scheme. It also involves understanding the attractiveness of the scheme relative to these mechanisms, in terms of whether and why organisations choose to use it.					
5.2	What changes can be made to the scheme to address the barriers to the installation of energy efficiency measures among public sector organisations?	Describe and summarise the changes that could be made to how the scheme operates to help both scheme participants and non-participants take more steps to reduce energy bills, greenhouse gas emissions and energy consumption.	Scope extends to potential changes to the scheme operations; the inputs and activities and how these interact.		✓	✓	✓	
5.3	What strategies are most viable / cost-effective for Government to address the outstanding energy efficiency potential?	Analyse (qualitatively) the changes that could be made to how the scheme operates to help both scheme participants and non-participants take more steps to reduce energy bills, greenhouse gas emissions and energy consumption in terms of their ability to deliver these reductions cost effectively. Analyse (qualitatively) the changes that could be made to how the scheme interacts with regulations, incentives and advice to help both scheme participants and non-participants take more steps to reduce energy bills, greenhouse gas emissions and energy consumption in terms of their ability to deliver these reductions cost effectively.	Scope extends to potential changes to the scheme operations, the inputs and activities (and how these interact) as well as the scale of those inputs and activities. Answering this question involves considering the interaction with taxation and fiscal incentives, legislation and regulation and Government supported information and advice, as well as use of private sector and third sector information and advice.		✓			
5.4	What role does the provision of zero-cost finance have in tapping into the outstanding energy efficiency potential?	Analyse (qualitatively) the role of zero cost finance alongside the regulations, incentives and advice that scheme participants and non-participants are using to help them take more steps to reduce energy bills, greenhouse gas emissions and energy consumption in terms of their ability to deliver these reductions cost effectively.	Answering this question involves considering the interaction with taxation and fiscal incentives, legislation and regulation and Government supported information and advice, as well as use of private sector and third sector information and advice.		✓	✓		
5.5	Is there any learning that can be applied to	Describe and explain how any conclusions drawn from this evaluation (i.e. answering the evaluation	Scope extends to policies/schemes that are in existence at the time of			✓		

Ref	Question	Meaning	Scope	QEA	Ph. 1 qual	Ph. 2 qual	Quant	CBA
	other related policies (e.g. in energy efficiency, loan schemes)?	questions) might be applicable to other existing or future Government administered loan schemes.	the evaluation as well as generalisable learnings that could be applied to potential schemes / planning phases of policy. This involves considering loans to organisations in the private sector (SMEs or larger businesses), third sector and public sector organisations.					

Evidence synthesis and analysis

Evidence from each of the workstreams was synthesised at the end of each phase:

- **Scoping phase**. At the close of the scoping phase, the key findings were shared with BEIS both in written form and in a series of workshops – all considering the implications of the findings for the evaluation design.
- **Phase one.** On conclusion of the qualitative research and the initial quasi-experimental impact analysis, key findings were shared with BEIS in workshops. More than one workshop was conducted to discuss the findings from the initial quasi-experimental impact analysis to consider the best approach for assessing the impact of the whole scheme. Findings from phase one were synthesised in an interim report. This was informed by structured discussions with the lead analysts for each workstream (with contributions from other team members as appropriate) to draw out key themes and issues.
- **Phase two**. The findings from the qualitative research, quantitative research, quasi-experimental impact analysis and cost benefit analysis were all presented to BEIS for feedback and discussion. To develop the narrative for the synthesis report, the evaluation team used an analysis framework to collate and co-ordinate the findings from each work element. The analysis framework was based on the Theory of Change (and also considered the assumptions) and the evaluation questions. A systematic review was conducted of all the available evidence against the analysis framework. The process of synthesis further involved a structured workshop between the lead analysts for each workstream to draw out key themes and issues. Follow-up discussions between the consortium were held where there were areas of conflicting evidence and / or to challenge the interpretation of the evidence. A structured workshop was also held with BEIS to test the emerging narrative and the approach for discussing any limitations.

Principles used during the evaluation

The following principles and definitions were applied throughout the evaluation:

- **Participants and non-participants**. Any organisation that has been in receipt of funding through the public sector energy efficiency loan scheme between 2013 and 2017 was referred to as a 'participant'. Organisations who did not received funding through the scheme in this period are referred to as 'non-participants'. The definition of non-participant may include organisations who have received funding through the scheme prior to 2013 (i.e. prior to BEIS taking responsibility for the scheme)[10].
- **Definitions of organisation type**. The following groupings of public sector organisations were used based on the Salix scheme data. However, individual workstreams (quantitative survey and the QEA[11]) grouped organisations differently for methodological reasons.

[10] The scheme was first set up in 2004, with the Recycling Fund running as a pilot until the full programme was launched in 2007 and the SEELs fund launched in 2009. Salix had responsibility for the scheme from 2004 – 2013.

[11] For the former, this was to separate out school projects conducted under LA funding. For the latter, this was to ensure both sufficient levels of homogeneity within groups and numbers of observations used in the QEA. See individual workstream sections below for more detail.

Academy schools
- Emergency services
- Further Education Institutions (FEIs)
- Higher Education Institutions (HEIs)
- Local Authorities (LAs)
- Maintained schools
- NHS.

- **Different project types**. The different types of project considered in the evaluation (in line with the project types identified in the Salix scheme data) included building management systems, compressors, computers and IT, cooling, hand dryers, heating, hot water, industrial heating equipment, insulation (building fabric, draught proofing, pipework, other), lab upgrades, LED lighting, lighting (controls and upgrades), motor controls, motor replacement, street lighting, swimming, time switches, transformers, ventilation and voltage management.

- **Scheme stakeholders**. The key stakeholders for the scheme Salix Finance, BEIS and participant organisations.

- **Co-benefits of scheme participation**. Alongside exploring reduction in energy consumption, energy costs and greenhouse gas emissions, the evaluation sought to explore the organisational benefits of engagement with energy efficiency and the co-benefits of installed technologies as follows:

  Benefits of engagement with energy efficiency

  - Reputational benefit (improved CSR image, brand and / or PR)
  - Improved energy management practice
  - Improved staff engagement in energy efficiency
  - Improved senior management engagement in energy efficiency
  - (Academies / schools / FEIs / HEIs) Improved student engagement in energy efficiency

  Co-benefits of installed technologies

  - Lower maintenance costs
  - Improved indoor air quality
  - Reduction in peak energy demand
  - Better equipment performance
  - Improved visitor / customer / user experience
  - (if implemented a lighting project) Improved lighting quality / visual comfort
  - (if implemented a lighting project) Improvements in safety
  - (if implemented heating or fabric measures) Improved heating performance / thermal comfort.

Risks and limitations

There were a number of risks and limitations relevant to the overall evaluation approach. Further limitations and the approach to minimising risk are discussed below specific to each element of the evaluation.

Comparability with Salix Finance reporting

To inform the methodology, analysis of the administration data provided by Salix Finance was undertaken. In particular, this has included re-categorisation of some projects undertaken in schools whereby if a project indicated in 'organisation type LA' was for a 'school' it has been re-categorised as an 'organisation type maintained school'. The coding of schools on the administration data reflects the variable nature of the model of engagement for schools. For example, maintained schools are sometimes represented by their LA and their LA representative become the intermediary to identify projects and apply to the scheme. However, schools are also able to apply and work directly with Salix.

This re-categorisation was required for the QEA in order to draw out an accurate comparison group. It was also required for the primary research elements in order to ensure that the appropriate organisation was discussed with respondents. However, in re-categorising this data, the evaluation is reporting differently to the reports and online data provided by Salix as Salix report their data according to how it is stored. In any reporting outputs from the evaluation, care has therefore been undertaken to include details of how the data have been categorised and why.

Preventing response fatigue amongst participants

The methodology carried the risk that extensive engagement with participants which could affect 1) their willingness to engage in the evaluation in its entirety and 2) their perception of the scheme. All participants were contacted. Firstly, to collect data on installation addresses to inform the QEA impact evaluation and secondly, as part of the quantitative telephone. Some participants were additionally invited to participate in either phase 1 and / or phase 2 of the qualitative work. Each time an organisation was contacted, the opportunity to decline to participate was made clear. To mitigate the potential burden of repeated contact with participants, the evaluation team ensured that contact with scheme participants was clear about why they were being contacted and that participation was voluntary.

Minimising non-response amongst non-participants

There were a number of considerations in terms of engagement with non-participants:

Identifying the most appropriate contact. In all fieldwork with non-participants, the person responsible for the organisation's energy bills was identified through the gatekeeper.[12] The telephone numbers used for the non-participant sample were, in the main, the main organisation number. Therefore, the gatekeeper was generally someone at a reception desk for the organisation. The role of respondents was confirmed with them, acknowledging that job titles vary. The larger organisations that were sampled (LAs, HEIs and the NHS) often had an energy manager (or equivalent). Within FEIs, schools and academies energy was often

[12] In research the 'gatekeeper' is an intermediary between a researcher and a potential participant.

managed by someone responsible for the operations of the buildings e.g. school manager, facilities manager, governors and administrators.

Despite taking steps to mitigate against this, there is a possibility of self-selection bias in interviewee findings (principally regarding non-participants) affecting both qualitative and quantitative interviews on the basis that those with more interest in energy efficiency could have been more likely to participate.

Review and refinement of the evaluation approach

The following steps were taken to review and refine the evaluation approach:

- Review
    - Reflection and discussion of the key elements of the approach in workshops with the evaluation steering group;
    - In-depth review by BEIS;
    - Peer review of the overall approach and, separately, the approach to the quasi-experimental impact evaluation.
- Refinement
    - Piloting of primary data collection methods before commencing fieldwork in full. The topic guides used in the phase 1 and 2 qualitative interviews were reviewed after the first few interviews. The quantitative survey approach was piloted before final data collection;
    - Piloting the quasi-experimental impact approach in phase 1, prior to a full analysis in phase 2. In addition, some refinements were made to the approach during implementation in response to emerging findings;
    - Design of phase 2 was based on the findings of phase 1.

Theory of Change

This section presents the final Theory of Change (ToC) for the evaluation.

Overview

As cited in the Magenta Book, "Theory-based evaluation approaches provide an overarching framework for understanding, systematically testing and refining the assumed connections (i.e. the theory) between an intervention and the anticipated impacts."[13]

The public sector energy efficiency loan scheme is operating within a complex environment. A theory of change approach can help to get to grips with this complexity, by specifying and testing the contexts, drivers and barriers (referred to as assumptions) that bring about outcomes. Theory-driven methods provide a framework for understanding, systematically testing and refining the assumed connections (i.e. the theory) between an activity (or set of activities) and its anticipated impacts.

The main use of a theory of change is to guide evaluation activity and learning arising from the evaluation to inform strategic development of the programme and wider policy issues.

As part of the scoping phase of the evaluation, a detailed Theory of Change (ToC) ('framework') was drafted, encapsulating understanding of how the scheme is intended to work and the assumptions which lie behind this. The ToC was generated via ToC workshops, a rapid evidence review and stakeholder interviews.

The evaluation questions and supplementary research questions set out by BEIS at the outset of the evaluation were then refined to explore and test this initial ToC.

To support this, a ToC workbook was developed for the evaluation. Its main role was to provide more detail (than can be captured diagrammatically) on key elements of the diagram, in order to help ensure that the evaluation team, and BEIS, share a common understanding of the Theory. In particular, the log captured detail on:

- **Assumptions**. In practice, schemes seldom run exactly as expected or intended. The ToC defines the assumptions on which the successful operation of the scheme is predicated – defining the assumptions is sometimes described as the process of putting the theory into a ToC. Assumptions (as set out in the ToC) are therefore an assertion about the way things work, or the way things are, that underlies the change process set out in the theory. It is not, in itself a performance measure of the policy but what is through to need to be happening for the policy to perform. Testing these assumptions is a key element of this form of ToC led evaluation.

- **External factors**. The social, cultural, economic and political factors, laws, regulations that influence change along the major pathways of the ToC i.e. factors that affect whether one result can lead to the next.

The workbook provided an opportunity to log initial thoughts regarding the implications of the ToC for the research. It also allowed for the inclusion of more general notes and observations.

[13] HM Treasury; The magenta book guidance for evaluation, 2011, Section 6 Theory based evaluation, p57

Through the provision of these functions the workbook acted as a log of the evaluation team's thinking and to help ensure that emergent evidence in relation to the ToC (in particular the assumptions) was recorded, and tracked, over the course of the evaluation.

The ToC evolved over the course of the study, summarising the growing understanding of how the public sector energy efficiency loan scheme is achieving, or failing to achieve, its objectives.

There were formal reviews of the ToC (in light of the emerging evidence) at the conclusion of Phases 1 and 2 of the evaluation. At these points, the ToC was revised in the light of findings.

The final public-sector energy efficiency loan scheme Theory of Change (ToC) is a conceptual model which describes how the scheme is expected to work and the short, medium and longer-term outcomes that it is expected to generate. The ToC is laid out in a hierarchical fashion, but in practice there are multiple feedback loops.

The narrative below describes the ToC and the diagram that follows sets out the final ToC following the review at the conclusion of Phase 2.

On final review of the assumptions, they have been categorised as follows:

- Assumption proven / supported – evidence was found to support the assertion in full
- Assumption partially proven supported (may need amendment) – evidence was found to support the assertion in part e.g. where the assertion refers to 'all' cases, evidence may have been found to support 'some cases'
- Assumption unproven (insufficient evidence to make a judgement) - no evidence was found to support or contradict the assertion
- Assumption unsupported (should be removed or amended) - evidence was found to contradict the assertion.

Table 12 in the Evaluation of the Public Sector Energy Efficiency Loans: Synthesis Report outlines the conclusions of this final review process.

Description of Theory of Change

The public sector energy efficiency loan scheme ("the scheme"; also known as Salix) helps the public sector (including higher / further education organisations) to install energy efficiency measures by providing access to affordable finance. The scheme helps to deliver the following high-level policy goals:

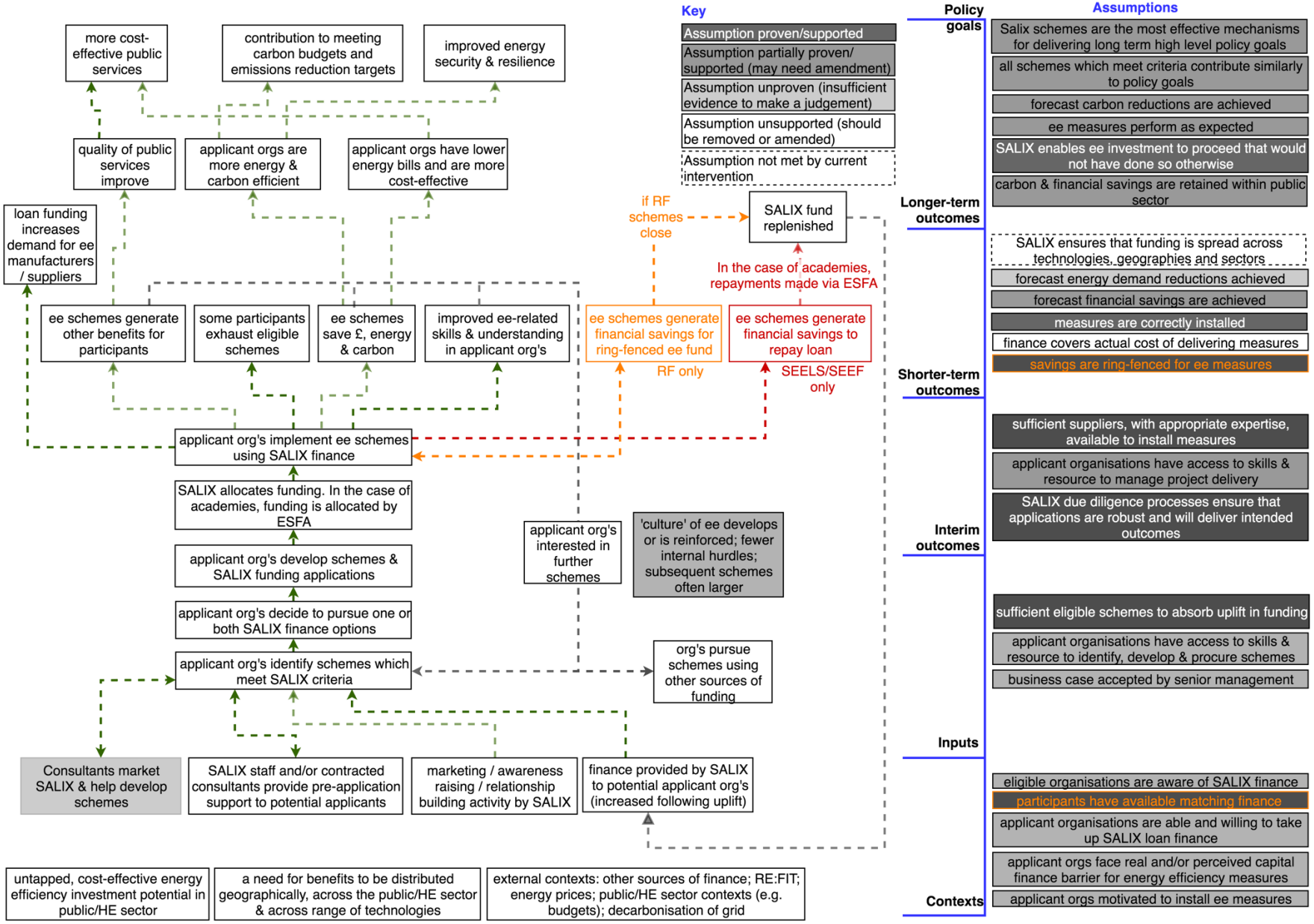
1. A contribution to meeting the UK's carbon budgets and emissions reduction targets
2. More cost effective public services
3. Improved energy security and resilience.

The model describes:

1. **Scheme context**: in this instance context describes both the issues which informed the establishment of the scheme (i.e. the reason for the scheme), Scheme requirements (as determined by BEIS) and external contexts (factors likely to impact upon the operation of the scheme in some way).

2. **Scheme inputs**: activities and resources which enable the scheme to operate are described which are concerned with target users of the Scheme becoming aware of, understanding and being receptive to the Scheme – any of which may be supported by Salix staff, contracted consultants and consultants in the wider market.
3. **Interim outcomes**: these outcomes represent the initial engagement of applicants with the Scheme and the early practical steps and decision- making processes. For example, users of the Scheme become applicant organisations, identify projects which meet the criteria for the Scheme, decide to pursue the finance and develop projects and funding applications. For the purposes of the ToC, interim outcomes conclude with the installation of Schemes. Once funding has been allocated by Salix, applicant organisations implement energy efficiency projects using the finance.
4. **Shorter term outcomes**: These include the immediate outcomes that are expected to be generated as a result of energy efficiency measures being installed. These include the generation of financial and carbon savings, but also less easily measurable outcomes including improvements in organisational capability and confidence (in relation to energy efficiency).
5. **Longer term outcomes**: describe the transitioning of applicant organisations to organisations that are more energy and carbon efficient and which ultimately deliver improved public services.
6. **Policy goals**: these describe the ultimate aims of the scheme which, in this case, include more cost effective public services, public sector contributing to carbon reduction targets and improved energy security and resilience.

Figure 1 Final Theory of Change for the public sector energy efficiency loan scheme



Analysis of scheme data

As scheme administrators, Salix Finance provided details of who have been supported through the scheme including the levels of finance provided, and for which projects in a series of Excel files. Descriptive analysis of this data was conducted.

Analysis was conducted:

- By organisation; the number of organisations of each type supported through the scheme (including by fund, geography and value of funding)
- By project; the number of projects supported through the scheme (including by organisation type, fund, technology type and value of funding).

The data were described using means, medians, minimums and maximums.

Scheme uptake

An analysis of the uptake of the scheme within the population for each organisation type was also conducted. Table 4 shows the source of population data for participating organisations for May 2018.

Table 4 Source of population data for organisations participating in the public sector energy efficiency loan scheme

Patient Group	Database name/date	Data Source
Academy Schools	Main tables: SR64/2017 (2017); accessed June 2018	https://www.gov.uk/government/statistics/education-and-training-statistics-for-the-uk-2017
Emergency Services	NHS statistics, facts and figures (2017); accessed June 2018. Police workforce, England and Wales, 31 March 2013 (2013), accessed June 2018. Fire and rescue authorities operational statistics (2017), accessed June 2018.	http://www.nhsconfed.org/resources/key-statistics-on-the-nhs https://www.gov.uk/government/publications/police-workforce-england-and-wales-31-march-2013/police-workforce-england-and-wales-31-march-2013https://www.gov.uk/government/collections/fire-and-rescue-authorities-operational-statistics
FEI	College Key Facts (2018), accessed June 2018	https://www.aoc.co.uk/about-colleges/research-and-stats/key-further-education-statistics

HEI	OfS Register (accessed June 2018)	https://www.officeforstudents.org.uk/advice-and-guidance/the-register/the-ofs-register/
LA	Local Government Facts and Figures (2017), accessed June 2018.	https://www.lgiu.org.uk/local-government-facts-and-figures/#how-many-councils-are-there
Maintained Schools	Main tables: SR64/2017 (2017); accessed June 2018	https://www.gov.uk/government/statistics/education-and-training-statistics-for-the-uk-2017
NHS	NHS statistics, facts and figures (2017); accessed June 2018.	http://www.nhsconfed.org/resources/key-statistics-on-the-nhs

Phase 1 Qualitative Research

Aims of this evaluation strand

Qualitative data collection and analysis.

The qualitative research was designed to enable a detailed understanding of participant experiences of the scheme, focusing on the customer journey and how that journey is influenced by the design of the policy. The evidence collected was used to help answer evaluation questions in their own right (particularly those concerned with informing the process evaluation), to inform the Theory of Change and to inform the other workstreams in the evaluation.

Qualitative research was undertaken in phase 1 and phase 2 of the evaluation. In both phases, interviews were conducted by telephone using topic guides organised around key themes, with specific questions for discussion as well as a series of prompts and probes.

Following the completion of the scoping phase, it was agreed that the phase 1 qualitative interviews would look to capture the full range of views and experiences of both the SEELs and RF schemes to provide some insight on as many of the evaluation questions as feasible for the interim report. It was agreed that the qualitative interviews in phase 2 would provide an opportunity to focus on particular types of organisations and / or particular evaluation questions.

More specifically the scoping research suggested that the qualitative research in phase 1 should include consideration of the:

- Views of non-participants – to establish the extent of latent market for the scheme amongst non-participant groups;
- Importance of co-benefits – through the scoping phase it became clear that, for the target audience for the scheme, energy efficiency is associated with a diverse range of co-benefits and these are often highly valued. In response, the research was designed to identify and assess the measured / perceived value of co-benefits as part of the evaluation;
- Extent to which schemes can be considered to be used strategically. The scoping phase revealed that plan led (ideally audit led) schemes may be more effective than 'ad-hoc' schemes. As a result, the qualitative research sought to understand how far the scheme is used as part of an overall plan for reducing energy efficiency.

The phase 1 qualitative research involved interviews with participants in the SEELS and the RF. Interviewees were operational managers (individuals with some level of direct responsibility for on-site energy management) in the following organisation types: schools (academy and maintained), FEIs, HEIs, Las and the NHS. Non-participant interviews were conducted with operational managers from all of the aforementioned groups except for higher education; this being a lower priority group (owing to high levels of scheme participation) for BEIS.

Given that the phase 1 qualitative research was looking to capture the full range of views and experiences of both the SEELs and RF schemes as well as feed into the phase 2 qualitative work, insight against all five of the HLQs was sought.

Methodology

Sampling

The key principles underlying the proposed sampling plan for the qualitative interviews in phase 1 were:

- That sample selection would be purposive, with the aim of eliciting a variety of organisational views and experiences within each type of participant;
- To ensure – as far as possible – that the sample was representative of the sample populations; and
- To conduct a minimum of five interviews within each research participant sub-group to be confident that the sample numbers would provide some coverage of the diversity of experiences for each group.

With this in mind, sample selection was informed by:

- The distribution of projects 2013 – 17 as provided by BEIS in supplementary information at the tender stage of the project (this was used as a proxy for the distribution of participants prior to this information being provided by Salix);
- Project information as provided by Salix for projects funded 2014 - 15 and 2016 – 17;
- Information on the population of each type of organisation sourced during the scoping phase of the work; and
- Findings from the scoping phase of the evaluation.

In total, phase 1 included 80 interviews with a purposive sample of 55 scheme participants (drawn from all projects awarded funding between 2013 and 2017) and 25 non-participants, representing the range of organisation types targeted by the scheme (see Table 5 for full details of the sampling frame used).

Table 5 Breakdown of phase 1 qualitative research participants

Sector	SEELS	Recycling Fund (RF)	Total Participants	Non-participants
Academy	5	0	5	5
Further Education	5	0	5	5
Higher Education	5	6	11	0
Local Authority	10	5	15	5
Maintained schools	10 (5 self-applied / 5 LA applied on their behalf)	0	10	5

NHS	5	4	9	5
Totals	**30**	**15**	**55**	**25**

Recruitment

Potential interviewees were initially contacted by email and where necessary, follow up contact was made via the phone.

Approach to interviews

The interviews were conducted by telephone. Interviews were semi-structured and guided by pre-designed topic guides; one for participants and one for non-participants.

Before conducting interviews, researchers were required to participate in a three-part briefing session. This introduced the SEELS and RF schemes, the evaluation aims and objectives and the topic guides.

Topic guide for participants

The topic guide for participants was designed around a 50-minute interview and included questions relating to the following thematic issues:

- Experience and understanding of energy efficiency (including drivers);
- How the organisation became aware of SEELS/RF and how and why it was decided to apply;
- Other sources of finance used to fund low carbon initiatives;
- Experience of using SEELS/RF (what went well / not so well, the 'hassle' factor);
- The role of SEELS/RF in delivering energy efficiency within the organisation (extent to which funding is used strategically, use of match funding);
- Whether participation in the scheme delivered against expectations;
- The benefits (including co-benefits) associated with participation in SEELS /RF;
- The additionality of the scheme;
- Scope for improving the scheme; and
- Views on the role of Salix and how the existing Salix loan schemes might be improved or evolved.

Topic guide for non-participants

The topic guide for non-participants was designed to allow for a 35-minute interview. It explored:

- The importance of energy as a strategic issue within the interviewee organisation;
- Current and historic activity on energy efficiency;
- Drivers of energy efficiency activity;

- How the organisation identifies and finances energy efficiency;
- Barriers which prevent or constrain activity on energy efficiency; and
- Awareness of Salix and reasons (amongst those aware of the scheme) for non-participation.

Both topic guides are included in Appendix 1.

Insight from Salix Finance

As scheme administrators, Salix Finance were able to provide essential data and insight to inform both the process and economic evaluation. Salix Finance were able to provide information about. In particular, Salix Finance are familiar with how the scheme is marketed – to whom and how could describe how the scheme has developed and how the scheme currently works. Insight was captured both in response to written questions and through qualitative interviews with Salix Finance as part of phase 1.

Analysis

A thematic analysis of interview transcripts was undertaken by a team of those who had conducted interviews. A coding 'template' was developed before the analysis began. The research team tested the coding frame on a small number of initial interviews after which it was adjusted before being finalised. This ensured a consistent approach to the coding and interpretation of findings.

Phase 2 Qualitative Research

Aims of this evaluation strand

The qualitative interviews in this phase concentrated on LA, FEI and NHS finance and operational managers and trade associations to better understand the themes which had emerged from the phase 1 qualitative research and to look in depth at some of the key findings from the quantitative survey.

As has already been described, the phase 1 qualitative research involved interviews with participants and non-participants in both the SEELS and the RF. Phase 2 qualitative research was confined to consideration of the SEELS (new participation in the RF having been ceased) and was restricted to interviews with individuals within those organisation types that were felt to hold the most significant opportunities for expanding the take-up of SEELS in the future; namely, the NHS, LA and FEI sectors.

In addition to operational managers, phase 2 included interviews with finance managers. This group were identified, in the phase 1 research, as being pivotal in the decision-making process but are relatively unknown in research terms. In order to investigate potential differences, the phase 2 research with finance managers included both SEELS participants and non-participant organisations.

The Phase 2 qualitative research was limited to consideration of HLQ's 4 and 5.

Methodology

Sampling

The intended sample for phase 2 was:

- 24 finance managers (8 NHS / 8 LA / 8 FEI split equally between participants and non-participants)
- 21 operational manager participants (7 NHS / 7 LA / 7 FEI)

In practice it proved impossible to secure the desired mix of interviewees during the fieldwork period. The achieved sample is shown below.

Table 7 Breakdown of phase 2 qualitative research participants

	LA		NHS		FEI	
Interviewee type	**Participants**	**Non-participants**	**Participants**	**Non-participants**	**Participants**	**Non-participants**
Operational managers	13	N/A	3	N/A	7	N/A

Finance managers	4	4	2	4	5	2
Totals	**17**	**4**	**5**	**4**	**12**	**2**

In addition, three interviews were conducted with individuals involved in sector trade associations to offer a sector view of public sector energy efficiency.

Selection and recruitment

Operational managers were selected at random from a list of organisations who had participated in the quantitative survey and who had consented to participate in a more in-depth interview. Finance managers, from both participant and non-participant organisations, were selected from a list of individuals identified by operational managers and trade associations. In both cases, sampling was purposive and designed to ensure that the sample was representative of the diversity of the sample population. Potential interviewees were initially contacted by email and, where necessary, follow up contact was made via the telephone

As noted above, securing interviews for some groups proved highly challenging and considerably more demanding of resource than anticipated. Reasons for this included:

- Organisations who did not receive funding through the scheme were often reluctant to engage with the research as there seemed to be less of a general interest in energy efficiency;
- Finance managers cited time pressure as being something which precluded their involvement in the research – some indicated that energy was a low priority on their list of things that needed finance and this also mitigated against their involvement;
- There was less familiarity with the scheme amongst people who had not received the funding and consequently less interest in the research amongst this group;
- Timing – in general the people we were speaking to had senior roles (directors/managers) and therefore had busy schedules and insufficient time for their day to day job (let alone to participate in research). This was the case for both participant and non-participant organisations;
- Some NHS finance departments proved to be centralised and so the overall population size was smaller than had been anticipated.

Approach to interviews

The interviews were conducted by telephone. Interviews were semi-structured and guided by pre-designed topic guides. Before conducting interviews researchers were required to participate in a three part briefing session.

Three topic guides were designed– one for operational managers, one for finance managers and one for trade associations. The guides were informed by, and designed to build on, phase 1 findings.

Topic guide for finance managers (participants and non-participants).

The topic guide, for recipients of Salix loans, was designed around a 40-50-minute interview and included questions relating to the following thematic issues:

- Experience and understanding of the scheme;
- General financial decision making;
- Current level of interest/activity in relation to low carbon initiatives, areas of interest, key drivers and views on potential future activity;
- Other sources of finance used to fund low carbon initiatives (including EPCs), interactions between different funding types / sources and their relative strengths and weakness;
- Issues affecting their use of low carbon finance (barriers, internal competition for scarce funding, institutional perspectives on the use of loan finance);
- Views on the role of Salix and how the existing scheme might be improved or evolved; and
- Co-benefits - recognition of, extent to which they inform decision-making, etc.

The non-participant topic guide covered a similar range of topics to those listed above, but the focus was adjusted to enable an exploration of issues such as their awareness (of the scheme) and reasons for non-participation:

- Awareness and understanding of the scheme;
- Current level of interest/activity in relation to low carbon initiatives, areas of interest, key drivers and views on potential future activity;
- Other sources of finance used to fund low carbon initiatives (including EPCs), interactions between different funding types / sources and their relative strengths and weakness (in comparison to Salix loan schemes);
- Issues affecting their use of low carbon finance (barriers, internal competition for scarce funding, institutional perspectives on the use of loan finance); and
- Views on the role of Salix and how the existing scheme might be improved or evolved to better meet their needs.

Topic guide for operational managers

The topic guide for operational managers was designed to allow for a 25-30-minute interview. The relatively short nature of these interviews accounted for the fact that most interviewees had already participated in the telephone survey and was intended to address the risk of interview fatigue.

The questions included in this topic guide were directly informed by the findings of the quantitative telephone survey and were based around questions relating to the following thematic issues:

- Factors which dictate the nature and scale of energy manager ambitions (including an exploration of key budget holders and their role in relation to organisations energy ambitions);

- Factors which influence the type of technologies and initiative that operational staff become involved in; and
- What other forms of support (from Salix) would be of value to those with responsibility for energy management.

The final topic guides are included in Appendix 1.

Analysis

A thematic analysis of interview transcripts was undertaken by a core team involved in conducting interviews. A coding 'template' was developed before the analysis began. The research team tested the coding frame on a small number of initial interviews after which it was adjusted before being finalised. This ensured a consistent approach to the coding and interpretation of findings.

Challenges and limitations

Restrictions on the breadth of insight

The most significant challenge associated with the phase 2 qualitative research was securing interviews with NHS and, to a lesser extent, FEI staff. As previously noted, finance managers within the NHS sector proved to be particularly challenging to engage. This may have restricted the ability of the report to reflect the range of views extant in the wider population, particularly within the NHS operational manager segment. That said, this group were well represented in the phase 1 research and in the quantitative survey and this may go some way towards mitigating the impacts of their relative absence in this element of the research.

Self-selection bias amongst interviewees

Some potential finance managers in non-participant organisations chose not to engage with the research. Their reluctance to do so, in some cases, was reportedly owing to a low level of interest or priority associated with energy in their organisation. This seems likely to be a source of bias in the non-participants findings. Issues where such bias may exist are identified in any reporting of these findings.

Quantitative Survey

Aims of this evaluation strand

In phase 2 of the evaluation, a quantitative telephone survey was conducted to collect data to feed into the other elements of the evaluation, namely:

- The impact evaluation – through collecting data on perceptions of energy consumption and energy bills over the past few years and, for participants, data to inform an assessment of attribution including exploring the extent to which the scheme brought forward energy efficiency projects;
- The process evaluation – through exploring experiences of participating with the scheme or reasons why they haven't participated and details of organisational contexts;
- The economic evaluation – through collecting data from participants on the different costs associated with participation.

Interviews were conducted with both participants and non-participants of the scheme. The survey employed a stratified random sampling approach on the basis of scheme participation (whether or not an organisation has participated in the scheme) and type of organisation. In total 482 interviews were conducted; 249 with scheme participants (covering 925 projects), 233 with non- participants.
All participant organisation types were sampled; academy schools and maintained schools (whether they applied directly or through their LA), FEIs and HEIs, LAs, emergency services and the NHS.

Scheme participants were selected at random from the administrative data provided by Salix (which also provided contact details). Non-participants were primarily drawn from the control group formed for the quasi-experimental impact evaluation. This was to ensure the non-participant organisations were as closely matched as possible to participants. Contact details for these organisations were identified manually through internet searches.

The vast majority of interviews were conducted via telephone using Computer Assisted Telephone Interviewing (CATI) software. However, to accurately capture the detail and complexity for those organisations with a very large number of projects, four participants were interviewed face-to-face.

Given that there were multiple requirements from the quantitative research insight against all five of the HLQs was sought.

Approach to this evaluation strand

Sample design considerations

The key principles of the sampling plan for participants were to ensure the sample was representative of all organisation types participating in the scheme, to conduct at least 30 interviews per strata, and to target 50% of the population per strata.

Further considerations for the participant sample were:

- To minimise respondent fatigue, those who participated in the phase 1 qualitative survey were removed from the sample.
- Due to small populations for some subgroups, target response rates of 100% were set and all organisations approached. This applied to:
    - Six LAs that only participated in the scheme on behalf of schools
    - Emergency services
    - NHS participants.
- Maintained schools were undersampled due to the large number in the participant population.
- To avoid small sample sizes the number of projects was not used as a stratification variable.

For non-participants, the aim was to match the sample size for participants. However, the sample was adjusted for some non-participant subgroups to oversample those organisations with previously limited involvement with the scheme (e.g. FEIs) or those with the greatest untapped energy efficiency potential (e.g. NHS). The HEI group was excluded from the survey non-participant sample because of high representation amongst participants. Therefore, HEI non-participants were reserved for the qualitative research in phase 2 of the evaluation.

Multiple projects

The survey was designed to collect data for all projects an organisation had implemented, if they had implemented four projects or fewer. For organisations who had implemented more than four projects, projects were grouped based upon technology type implemented, and (if known) building where the project was implemented, using the description of the project in the administrative data.

Where more than four individual projects or groups of projects remained for an organisation, priority was given to groups of projects. For example:

- If an organisation had a group of projects and five individual projects, questions were asked about the group, and three of the individual projects were chosen at random to ask about.
- If an organisation had four groups of projects and several individual projects, only the groups of projects were asked about.
- If an organisation had more than four groups of projects, four of the groups were selected at random to be asked about. Remaining groups and individual projects were not asked about.
- If grouping resulted in an organisation having fewer than four projects/groups of projects/combination, these were not un-grouped.

As this was the only opportunity to evaluate the impact of street lighting projects, any organisation which had implemented a street lighting project was asked about their street lighting project(s) first and as a priority over any other type of project they had implemented.

Sample plans

Using the agreed sampling principles, the survey employed a stratified sampling approach on the basis of scheme participation (whether or not an organisation has participated in the scheme), and organisation type.

The table below shows the sampling plan for participants.

Table 8 Sampling plan for participants

Organisation type	Total number of scheme participants	Sample Population	Target respondents - number	Target respondents - percentage
Academy Schools	70	61	35	57.4
Emergency Services	4	4	4	100
Further Education Institutions	57	55	37	67.3
Higher Education Institutions	79	68	50	73.5
Local Authorities	94	67	47	70.1
Local Authorities (schools)	39	6	6	100
Maintained Schools	226	219	60	27.4
NHS	29	18	18	100
Total	**598**	**492**	**257**	**52.2**

In the LA (Schools) category, 33 out of 39 LAs had undertaken at least one other project within their LA as well as a project in a school, and therefore they are counted twice. Hence the total number of organisations is greater than 565. The number of entries in the 'Sample Population' column is lower than the number of scheme participant organisations. This is primarily due to the removal of participants who had responded to other areas of the evaluation (phase 1 qualitative interviews for example).

The table below shows the sampling plan for non-participants.

Table 9: Sampling plan for non-participants

Organisation type	Participants targeted	Non- participants total population (see table below)	Number of non-participant target responses
Academy Schools	35	6,399	40
Emergency Services	4	98	10
Further Education Institutions	37	275	50
Higher Education Institutions	50	104	NA
Local Authorities	47	353	80
Local Authorities (schools)	6	NA	NA

Maintained Schools	60	14,121	50
NHS	18	448	60
Total	**257**		**290**

Table 10: Population of non-participants

The population of non-participants was defined as follows.

Group	Source of population data
NHS	NHS (NHS_Trusts_and_CCG_organisations_in_England_by_name_code_and_type_July_2016)
Further Education Institutes	The HEFCE (Higher Education Funding Council for England) Register – (http://www.hefce.ac.uk/reg/register)
Maintain schools - primary	Department for Education (https://www.gov.uk/government/publications/schools-in-england)
Maintain schools - secondary	Department for Education (https://www.gov.uk/government/publications/schools-in-england)
Local Authorities	UK Government (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/491463/List_of_councils_in_England.pdf)

The sample frame for fieldwork was manually constructed from a random sample of each of these groups.

Final sample profile

The table below shows a breakdown of the number of interviews targeted and the number achieved by participant / non-participants and by organisation type (i.e. in the sampling plan, 35 interviews with academy schools interviews were sought, 32 were achieved, equating to 91% of the target).

Table 11 Breakdown of number and percentage of interviews achieved compared to target

Organisation type	Participants (number achieved / number targeted)	Non- participants (number achieved/ number targeted)
Academy	32/35 (91%)	43/40 (108%)
Emergency Services	3/4 (75%)	11/10 (110%)
FEI	34/37 (92%)	52/50 (104%)
HEI	40/50 (80%)	NA
Local Authority	54/47 (115%)	39/80 (49%)

Local authority - schools only	7/6 (117%)	NA
Maintained School	61/60 (102%)	57/50 (114%)
NHS	18/18 (100%)	31/60 (52%)
Total	**249/257 (97%)**	**233/290 (80%)**

Recruitment approach

There was a distinct recruitment approach for participants and non-participants.

For participants, the contact details in the administration data provided by Salix were used. However, the scheme administration data was up to five years-old and some individuals had moved on from their position. If an individual was temporarily unavailable during the period of data collection (e.g. through leave) or if the original contact had moved on an interview was sought with the person with responsibility for energy, sustainability, facilities or maintenance. When surveying LAs, if they implemented a large number of street lighting projects, the individual responsible for street lighting was asked for, in place of or as well as a lead contact.

For non-participants the recruitment approach was adapted following piloting. During piloting, a commercial database organisation provided contact details for a random sample of non-participants in the organisation types of interest. The database provided often did not identify the best person to discuss energy efficiency. Therefore, in the main fieldwork, the datasets identified for the population were sampled directly. Contact details for a random sample of non-participant organisations were identified through manual searching on internet search engines. The approach was to identify contact details for five times the number of organisations in each stratum, and then commence fieldwork. When the dataset became exhausted, further contact details were identified.

When the researchers used internet search engines to identify persons and contact details, the approach was to seek the individual responsible for energy, sustainability, facilities or maintenance, or otherwise, with the expected persons shown below for each organisation type:

- Headteachers for academy schools and maintained schools
- Facilities / Maintenance manager for emergency services organisations, FEIs and NHS (larger organisations may have an energy / sustainability manager in place)
- Energy / Sustainability manager for HEIs and LAs (smaller institutions / authorities may not have an energy / sustainability manager in place).

Approach to fieldwork

The main fieldwork was carried out during September and October 2018, with a pilot taking place in July and August 2018.

The survey used was routed to allow for a core set of questions and then some tailoring for participants and non-participants, different organisation types and to allow specific questions for those undertaking street lighting projects. Telephone interviews varied in length from 10-40 minutes dependent upon an organisation’s experience of the scheme. Factors affecting interview length were:

- For participants – the number of years their organisation had been using the scheme, whether they had accessed SEELS and / or the RF, and the number of projects that had been financed through the scheme
- For non-participants – whether they had experience of the scheme prior to 2013.

The following key topics were explored in the questionnaire:

- Organisational context - size and type of organisation, approach to energy efficiency, maintenance and energy efficiency policies and approach to funding these;
- Outcomes of the scheme - projects implemented using the funding, changes in energy consumption, other factors that may have contributed to changes in energy consumption;
- Attribution - the extent to which the projects implemented relied on funding and what would have happened in the absence of funding;
- Costs of participation - additional time and cost (hassle costs) associated with participation as well as additional maintenance costs associated with project implementation;
- Implementation of other energy efficiency projects - how are these identified, who by, typical timescales for project delivery;
- Barriers to participation and changes that could be made to overcome these; and
- Engagement with Salix including communications and keeping up to date.

The additional section for street lighting projects covered; number and types of lamps affected, what had been implemented including manufacturers information on energy consumption, quantification of reduction in energy consumption and other factors that may have affected this.

Approach to data weighting

The survey data from scheme participants was weighted prior to analysis. The following principles were followed to weight the data:

- Separate weights were calculated and applied to questions which were asked on an organisation-by-organisation basis. To calculate the weight for questions asked on an organisation-by-organisation basis, the total population of scheme participants in the administrative data was used, by organisation type
- Separate weights were calculated and applied to questions which were asked on a project-by-project basis. To calculate the weight for questions asked on a project-by-project basis, the total population of projects in the administrative data was used, by organisation type and by fund type (reflecting the fact that the distribution of projects varied by organisation type across the two funds);

The resulting weights are shown in the table below.

Table 12: Resulting weights for both organisation by organisation questions and project by project questions

Organisation type	Organisation by organisation	Project by project for SEELS projects	Project by project for RF projects
Academy	2.19	2.66	n/a
Emergency Services	1.33	1	3.25
FEI	1.68	1.58	n/a
HEI	1.98	3.52	4.21
LA	1.74	3.00	4.29
LA - schools only	5.57	7.50	n/a
Maintained School	3.70	4.09	n/a
NHS	1.61	1.75	13.67

Because of the differing approaches to weighting by participation in the scheme, where applicable in the report, data are provided as either weighted or unweighted proportions for scheme participants.

A few of the resulting survey weights are notable because of their size; for LAs who have implemented projects in schools only, and for NHS RF projects survey weights are large due to the small number of surveys conducted with these groups relative the population of each group. Although they are notable, the populations are comparatively small, and therefore the effect of the large weights in aggregate figures is minimised.

The data for scheme non-participants are not weighted. The size of academy and maintained school populations would have led to very large weighting factors (given the large numbers of each in the population relative to how many participated) and there were no alternative datasets that could be easily used for weighting purposes.

As survey data for non-participants are not weighted, any comparisons to participants are made to unweighted data.

Missing data

Data was missing from the final dataset for a number of reasons:

- The final dataset included data collected in the pilot. A small number of new questions were added to the final questionnaire which were not included at the pilot stage, and so for these questions for respondents who participated in the pilot, the data points were treated as missing;
- Not all respondents answered all questions;
- Data were cleaned prior to analysis, and in cases where the answer provided by the respondent does not meet the question, these responses were removed, and treated as missing.

Analysis approach

Analysis of quantitative data involved:

- Describing the data – e.g. frequency distributions, central tendency, dispersion;
- Exploring data to determine whether sub-groups can be identified and characterised;
- Assessing whether differences between types of respondents were statistically significant.

Analysis of data captured through open-ended questions in the telephone survey involved:

- Assessment of themes and issues;
- (on the basis of these) developing code frames for the data;
- Coding the data;
- Reporting values for each code.

The analysis of the scheme administration data was used to support any analysis and findings from the survey data.

Approach to statistical significance testing

Differences between the following groups were compared for statistical significance:

- Participants and non-participants;
- Organisation type;
- Fund type used.

Wald tests were conducted to test whether the difference between two proportions was significant. The 95% confidence interval was used, which means that if the likelihood of the difference being zero was less than 5%, the difference was statistically significant.

Where comparisons were found to be statistically significant this is described in the text of the report.

Limitations of this evaluation strand

Sample size

The small number of interviews in some strata, for both participants and non-participants. For example, the Emergency services had a population of 3 in the participant strata and 11 in the non-participant strata. This makes finding significant relationships from the data more challenging.

Stratification

Due to stratification, cases have been selected in each stratum with unequal probability. Weighting allows for adjustments to produce the proper representation. For participants,

weighting has been applied in different ways for different questions (see ‘Approach to data weighting’ section above). Weighting has not been applied to data from non-participants. This limits the ability to make statistically robust comparisons between groups.

Grouping projects

Some participants were asked about individual projects. For organisations who had implemented more than four projects, projects were grouped based on technology type implemented, and (if known) building where the project was implemented, using the description of the project in the administrative data. This assumed that all the projects in each group have sufficiently similar characteristics, rationale and impact for respondents to answer questions about them as a group. This may not always be the case.

Bias in reporting retrospective perceptions

The results of the survey are self-reported managers’ retrospective perceptions. Self-reported data can contain sources of bias including poor recall of events, poor recall of the timing of events, inaccuracies in assessment of both positive and negative effects and exaggerated reporting. There is therefore greater value in giving a general indication and in comparing across groups, than in the absolute numbers themselves.

Quasi-Experimental Analysis

Aims of this evaluation strand

The aim of the Quasi-Experimental Analysis (QEA) was to empirically assess the additional impact on organisations implementing projects funded by the scheme. The QEA was carried out on the metered energy (natural gas and electricity) consumption of those implementing projects funded by the scheme between 2013 and 2016. After estimating the additional impact on the consumption of these two fuels, savings in terms of energy bills and CO_2 emitted were computed based on the market price of these fuels and the CO_2 conversion factors of natural gas and electricity.

The QEA sought to address the following evaluation questions – part of HLQ1 and HLQ2:

- Have recipients of a loan experienced reductions in energy consumption, energy bills and greenhouse gas emissions?
- Do reductions in energy bills, greenhouse gas emissions, and energy consumption differ by scheme participants and different technologies?
- To what extent does additionality vary across different participants, technologies and funding methods and why?
- To what extent are the scheme's observed impacts additional to what would have otherwise happened?

An approach to the QEA was developed in the Scoping Phase of the project, this was piloted in phase 1 on a sample of participant organisations. At the end of phase 1, recommendations were made for how to conduct a QEA across all participant organisations, which was then conducted in phase 2. The development of this analysis method is discussed first, before details of how the data matching process was piloted and implemented.

Overview of analysis methods used

QEA is an empirical study that aims to test causal hypotheses with regards to the impact of a programme or policy on a defined target group (also referred to as "treated units"). In the QEA literature, the programme or policy under consideration is referred to as an 'intervention' in which a treatment is administered to treated units. In the case of the public sector energy efficiency loan scheme, funding is the 'treatment' and this is provided to public sector organisations (the 'treated units').

A crucial part of QEA is to identify a comparison group (comprising non-treated units) that is as similar as possible to the treated group in terms of baseline (pre-treatment) characteristics. The comparison group captures what would have been the outcomes in the treated group if the programme/policy had not been implemented, i.e. the counterfactual, which is otherwise unobservable.

Within a QEA, if certain conditions of the analysis approach are fulfilled, the programme/policy can be said to have caused any difference in outcomes between the treated and comparison groups observed after the introduction of the programme/policy. There are different techniques

for creating a valid comparison group and reducing risks related to the possibility that those who are eligible or choose to participate in the intervention (treated group) are 'systematically different' from those who cannot or do not participate (included in the control group).

For the QEA the unit of analysis ('treated unit') was a building or a small collection of buildings affected by the project or projects funded by the scheme. This was chosen as it correlates with the meter consumption dataset owned by BEIS that was used for the analysis. Although in several cases the same building was affected by multiple projects, meter consumption data are only available at building / small collection of building level.

Prior to full implementation of the approach, the QEA was piloted to test the chosen analytical method. Control groups were built based on the characteristics of the participant groups as recorded in the Display Energy Certificate (DEC) database and the databases held by organisations such as NHS, Higher Education Council Funding for England (Hefce), and the Local Government Association (LGA).

The Synthetic Control Method (SCM) was selected as the preferred method at the outset of the work. The SCM enabled quasi-experimental analysis of each single project, through construction of a comparable non-participant organisation, i.e. a synthetic control unit, replicating the pre-intervention energy use of the unit where a project is implemented.

However, the pilot showed Difference-in-Difference with Propensity Score Matching (DiD PSM) to be more appropriate to use as the main QEA approach as the DiD PSM model worked better than the SCM for scheme participants with multiple buildings and / or implementing multiple projects (the majority of participants available for analysis).

As a result of the pilot, DiD PSM was the main approach used when the QEA was implemented in full, with the SCM only implemented for projects affecting electricity consumption in primary schools. As the DiD PSM is a very common approach for QEA, only a very brief description is presented below. As the SCM is a relatively innovative approach, this annex presents a longer discussion of this methodology.

How the QEA method was developed

Challenges to estimating impact

The challenges in implementing quasi-experimental analysis of the scheme included:

- The diversity of projects funded by the scheme and the diversity in the participants of the scheme;
- The overall small size of the population affected by the scheme;
- The absence of an obvious control group which can provide counterfactual levels of energy consumption for the organisations implementing projects funded by the scheme.

The scheme activity data provided by Salix Finance identified different types of organisations implementing a diverse set of projects and technologies. As different types of organisations, say a school and an LA, have different patterns of energy consumption, there was a rationale for implementing separate quasi-experimental analysis for different types of organisations. In addition, it was anticipated that two different projects implemented in two organisations belonging to the same organisation type might generate different impact. Ideally, QEA would

be applied on groups including a specific type of organisation implementing a specific technology or set of technologies. At this level of granularity, however, sample size quickly becomes an issue[14].

Another challenge in the implementation of QEA of the scheme is the absence of an obvious control group which can be used to obtain counterfactual levels of energy consumption for the organisations implementing projects funded through the scheme. Options pursued in other evaluations, such as drawing the counterfactual from those enquiring about the scheme but not applying or, those applying but not implementing any measures, are not feasible due to the way in the scheme operates and how engagement is recorded by Salix Finance.

The SCM synthetically creates a control group by building the weighted average of non-treated units that best reproduce characteristics of the treated unit before treatment started (i.e. before they were supported by the scheme). This can be implemented for as few as one treated unit.

In the application of the SCM, inference (to test for robustness of the results) is implemented through placebo studies, as described below, rather than the traditional frequentist approach, with the implication that achieving the customary levels of statistical significance can be challenging. When it was decided to pilot the SCM, Difference-in-Difference with Propensity Score Matching (DiD PSM) was identified as an alternative methodology if, on piloting the approach, the SCM was not found to work.

Piloting the approach

In the first instance, it was suggested that the challenges that related to the heterogeneity in implemented projects and affected organisations, the relatively small sample size and the lack of an obvious control group could be addressed through the adoption of the Synthetic Control Method (SCM).

The pilot phase of the evaluation tested the application of the SCM in primary schools implementing projects funded by the scheme. The choice of Primary Schools was motivated by the fact that it was the largest group among participants of the scheme therefore allowing a thorough analysis of the SCM methodology.

In the pilot phase, the SCM was implemented for lighting projects affecting electricity, insulation projects affecting gas and all other projects affecting gas consumption. The SCM delivered insights on the additionality of savings related to lighting projects implemented in financial year 2013/14. This finding provided sufficient confidence to conclude that SCM could be used in the QEA for projects implemented by other types of organisations.

However, the application of the SCM on projects affecting natural gas in primary schools did not deliver significant results. This identified risks related to the implementation of the SCM and the potential advantages of DiD PSM, which could more easily deliver statistically significant results (as inference is based on a frequentist approach).

[14] An additional consideration in determining the final sample size for analyses is that some observations are lost during the dataset matching process.

Finalising the approach

Based on some early success in application of the SCM, the approach was further tested including with a sample of participants that had multiple buildings and had implemented more than one project through the scheme. DiD PSM was also piloted on the same sample.

The first part of further testing involved exploring the statistical significance of the estimates of the savings delivered by projects targeting natural gas in primary schools. This involved geo-referencing schools, so that a time series was built to control for the impact of average temperature on the consumption of natural gas. Although it was hoped that by more closely controlling for temperature variations, more statistically significant results would be delivered, this approach did not deliver marked improvements and for this reason, it was decided not to use this methodology.

Implementation of the SCM delivered limited advantages in terms of taking into account technological diversity (one of the reasons for preferring the method), as it was possible to split the projects into four technology types, two for each fuel.

The pilot also showed that in order to deliver robust results for participants with multiple buildings, it was important that the control units closely replicate the energy consumption patterns experienced by the participant organisation prior to the project being implemented. This means that the units selected to generate the control when evaluating projects implemented in applicants with multiple buildings, needed to reflect the characteristics of the building where a project has been implemented.

In contrast, implementation of the DiD PSM model for scheme participants with multiple buildings and / or implementing multiple projects delivered significant results. It was therefore decided to use PSM DiD as the primary approach in this evaluation, with the SCM implemented only in those cases when assumptions required by the DiD PSM were not met.

How the approach to data matching approach developed

Matching across a number of datasets was required by the QEA in order to put together the dataset used in the estimation. The pilot phase of the evaluation tested automated data matching. However, the data matching procedure was only tested to a limited extent as primary school buildings are relatively simple, compared to the complexity of, for example, university campuses. In addition, primary school participants tended to implement single projects (whereas most HEIs implementing projects funded through the scheme implemented more than one project). This suggested further testing of the approach would be required.

During development of the matching procedure, it became apparent that matching of scheme data to other datasets, through the address of the building where a project was implemented, was too complex for an automated matching procedure. As the number of participant organisations was felt to be manageable, it was determined that manual matching of the scheme data to other datasets was feasible. Initially, manual matching was confined to the first step of the procedure, the matching from scheme data into UPRNs. However, when matching UPRNs into meter consumption dataset owned by BEIS, it became apparent that the second step of data matching was affected by the complexity of the organisations implementing projects funded by the scheme. For this reason, a fully manual matching process was agreed as the final approach and ultimately implemented.

Final approach adopted for this evaluation strand

Sources of data used in the analysis

Four sources of data were used to obtain information to estimate the impact of the scheme and select potential members of the control groups.

- BEIS Meter dataset. This dataset contains a time series of consumption for each electric and gas meter in the UK, measured in kWh, and observed at annual frequency. In some cases, a building may have more than one meter while in other cases a single meter can serve a number of buildings. The meter consumption dataset was used to provide data on the outcome assessed in the QEA, i.e. metered electricity and gas consumption by those applying for funding under the scheme.

- The OSAB database was used to obtain Unique Property Reference Numbers (UPRNs) for the buildings where projects were implemented. The UPRNs were then used to match scheme data into the meter consumption dataset.

- Display Energy Certificate (DEC) dataset. This source contains information about energy use in public buildings. The public version of the DEC database includes information on Energy Performance Operational Rating, CO2 emissions, annual energy use, main heating fuel and total floor area. It was used to characterise the buildings where the projects funded by the scheme have been implemented e.g. by type of building. For schools, a further dataset provided a description of the organisation implementing the projects, e.g. the size of the school or the phase of education.

- Schools dataset. Information on each school and academy in the UK can be found in a dataset published by the Department for Education[15]. The dataset includes information on the type of establishment, open date, phase of education, school capacity, outcome of last Ofsted inspection, and whether the establishment is part of a trust or a federation.

Final approach to data matching

The starting point for data matching was the information provided in the scheme data, in particular the address of the building or buildings affected by the projects funded by the scheme.

In the case of schools, a preliminary step was implemented to obtain information on school capacity, phase of education and urban or rural location of the school. Matching applicant details to the schools database resulted in a near 100% success rate, obtained through a mixture of automated and manual matching process.

During piloting, the next step taken was an address matching process to link scheme data from an applicant to Unique Property Reference Numbers (UPRNs) based on automated matching routines. In the case of maintained schools used in the pilot of the QEA, these routines worked well so minimal intervention when the code failed was required to ensure a success rate of 100%. Next, during piloting, UPRNs were matched to meter data held by BEIS. In the case of schools used in the pilot of the QEA, the matching rate was about 66%. Matching to DEC was also high, with a matching rate of about 90%.

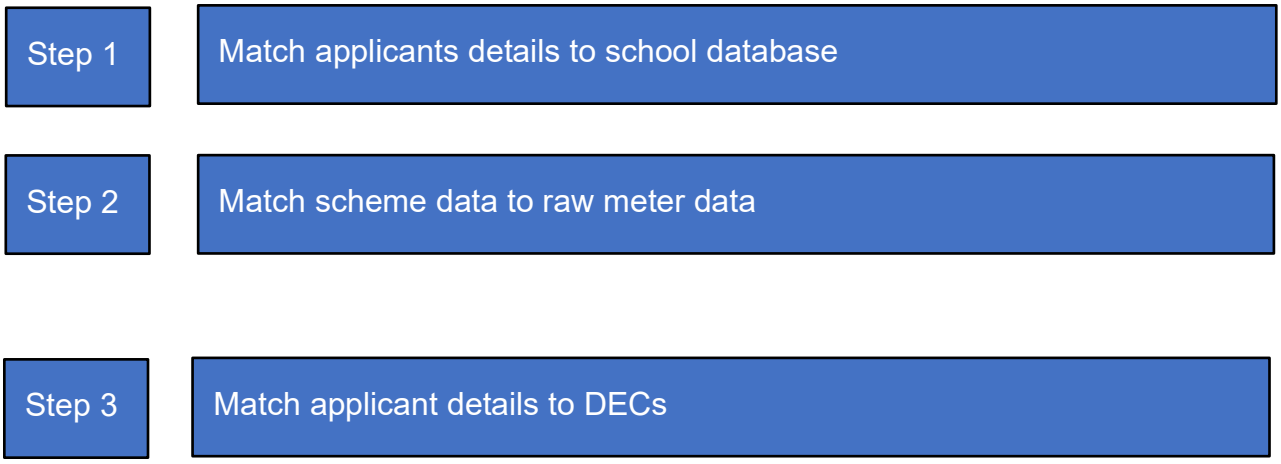
[15] https://epc.opendatacommunities.org

However, during the process of finalising the QEA approach following the pilot, it became evident that automated matching of scheme data into UPRN and the raw meter data did not provide satisfactory matching rates. For this reason, it was decided to merge the two steps described in the above paragraph and implement a single step matching process from the scheme data into the meter dataset. This was implemented manually by the project team.

Finally, participants that were successfully matched to electric or gas meters were matched, to the Display Energy Certificates (DECs) database to recover information on the buildings where projects funded by the scheme were implemented. This dataset contained information such as size (in square meters), fuel used for heating, electricity and heating rating, etc. In the case of schools matched during the pilot, this step resulted in a matching rate of about 90%.

As such, the final approach to data matching took the three-step process shown in Figure 2. Matching rates differed considerably across applicant types, with low rates for applicants with a complex building structure, such as university campuses and hospitals.

Figure 2: Graphical representations of the steps implemented in the data matching. (Note that Step 1 was for schools only.)



Approach to quality assurance of data used

Annual meter reading data were assessed to ensure they related to the fuel type affected by the project, (i.e. if a school implemented a lighting project, data were required for the school's electricity meter) and that the quality of the data was sufficient for use in the QEA. Checks were made by visualising data in order to identify (a) step change patterns, (b) V-spike patterns, (c) inverted V-spike patterns, or (d) a combination of V-spike and inverted V-spike patterns occurring before the project was implemented. Step-change patterns were deemed plausible if they occurred once, on the basis that this may indicate a change in the characteristics of the building, i.e. adding floor area. Organisations having more than one step change in the data, however, were discarded as frequent step-changes may indicate issues with the data, rather than changes in the organisation. V-spike patterns were deemed implausible if one-year decreases in consumption were higher than 33% of the consumption in the previous year. Equally, an inverted V-spike was deemed implausible if one-year increases in consumption were higher than 33% of the consumption in the previous year. In both cases, data were interpolated for the year in which consumption dropped or increased significantly. Some data showed an inverted V-spike occurring after a V-spike, likely indicating estimated and corrected readings. As this required correcting data for two consecutive years, these

cases were removed rather than interpolated, as it was not always clear which amount of consumption had been wrongly assigned to which specific year.

Groupings used in the analysis and reasons for grouping

The scheme data includes grouping of applicants, as detailed in the left column of Table 14, while the groupings used in the QEA are presented in the right column. The regrouping of the applicant types contained in the scheme database was motivated by two contradicting objectives. On one hand, QEA would benefit from being implemented at a disaggregated level so that the groups contain relatively homogenous applicants. On the other hand, grouping different applicant types had the obvious advantages of increasing the number of observations used in the QEA.

Comparison of the two columns in the table shows that FEIs and HEIs participating in the scheme were grouped in order to increase the number of observations used in the QEA. In the case of academies, maintained schools, LA applicant for school projects and schools there was no indication of the differences between these being a factor impacting energy consumption and potential energy savings. Therefore, the four categories were merged together. The merged category was, however, divided into primary and secondary schools to reflect the diversity, in terms of scale and consumption pattern, between the establishments belonging to one category rather than the other. Three applicant types in the scheme database were dropped from the analysis due to very small number of observations in the matched database. These are ‘Emergency Services’, ‘National Health Services’ and a generic category named ‘Other’ in the scheme database.

Table 13: Original and proposed taxonomy for client types contained in the Loan Fund Dataset

Original Taxonomy	Implemented Taxonomy
Academies	Schools (divided into Primary and Secondary)
LA Applicant for School Projects	
Maintained schools	
Schools	
Emergency Services	NA
FEIs	Further and Higher Education Institutes
HEIs	
Las	Local Authority
National Health Services	NA
Other	NA

Econometric models used in the analysis

The Difference-in-Difference (DiD) implies assuming the following data generation process

$$y_{it} = \delta T_{it} + x_{it}^{'}\beta + \xi_t + \alpha_i + \varepsilon_{it} \quad (1)$$

where y_{it} is an outcome variable, electricity and gas consumption in the case of this evaluation, T_{it} is a dummy indicating whether the unit has been treated or not, $\mathbf{x}_{it}$ is a vector of strictly exogenous control variables, including for notional convenience a constant, ξ_t and α_i are unobserved time and unit effects and ε_{it} a disturbance term. Based on a number of assumptions, one can take the first difference of (1), so that α_i which might be correlated with the disturbance, drop off and estimate it by ordinary least squares [OLS][16]. DiD assumes that heterogeneity in the treated and control group is limited in a way which can be easily differenced out.[17] The extent to which the assumption on the limited difference between the control and the treatment group can be verified through analysis of the trends in the dependent variable in the control and treated group through ordinary t-tests. This is important because DiD does not deliver an unbiased Average Treatment effect on the Treated (ATT) (i.e. in our case the average effect of the scheme on those organisations implementing projects funded by the scheme) when the control group does not satisfy the 'Parallel trend' assumption, or more generally when the difference between control and treatment groups is more complicated than what is allowed in the model. The propensity score matching adds an additional observable component to the DiD design, so that only control units similar to the treated units are used in the estimation.

The SCM is a relatively innovative quasi-experimental approach for building a counterfactual for policy evaluation. The SCM is a methodology originally introduced for policies evaluated at the 'macro' level, i.e. using aggregated data normally grouped based on the political unit affected by the policy (e.g. a geographical region). More recently, the SCM method has also been adopted in micro-studies.

The SCM does not assume that a control group (with limited difference from the treated group) exists or can be identified by analysts. Implementation of the SCM uses the assumption that a suitable control group can be created (or synthesised). This is done by building a weighted average of potential control units, using data from organisations not engaging in the scheme. This control best reproduces the characteristics of the treated units (i.e. scheme participants) during the period before the treatment. After estimating the effect of the projects on electricity and gas consumption, placebo experiments are run to assess the statistical significance of the estimates.

The specific steps involved in the implementation of the SCM included:

1. Identifying the donor pool. The donor pool contained units which could be used to synthesise the control unit using 'characteristics' observed in the treated and potential control units (e.g. whether the building was located in an urban or rural area).
2. Identifying variables to select which members in the donor pool should be used to synthesise the control unit. Variables affecting energy consumption (e.g. total floor area) were selected.

16 Ordinary least squares estimates the parameters in a regression model by minimising the sum of the squared residuals. The method draws a line through the data points that minimizes the sum of the squared differences between the observed values and the corresponding fitted values.

17 The DiD model allows for time-invariant heterogeneity as it is differenced out by taking first differences of the data. Similarly, the impact of homogenous time-varying impacts is differenced out by assessing the difference between the treated and the control units. However, the impact of unobserved time-varying factors would not be differenced out if their influence is heterogeneous across units included in the analysis.

3. Synthesising control units by replicating (as close as possible) the pre-treatment values of the variable of interest in the treated units. The variables used in the process of synthesising the control unit were selected on the basis of the Root Mean Square Prediction Error (RMSPE)[18].
4. Implementing placebo tests to assess confidence in the results. Each member of the donor pool was taken in turn as a 'pretend' treated unit. The difference between the value of the outcome in the treated unit and its synthetic control, and between each placebo unit and its synthetic control was used to assess confidence in the analysis through the creation of pseudo p-values. These were generated by comparing the estimated savings in the treated unit to the distribution of savings obtained when pretending that each member of the pool was being treated.
5. Forming a judgement on the confidence of the additionality of the estimates delivered by the SCM through the placebo analysis. A large pseudo p-value suggested that the estimated impact could be due to chance. Measures which might have been funded regardless of the scheme could have produced relatively high pseudo p-values. On the other hand, additional measures funded by the scheme were expected to display relatively low pseudo p-values.

This section describes the way in which the SCM works in a technical way. Given the outcome of interest for unit i at time t in presence of an intervention, $Y_{i,t}^{I}$ (which can be observed for treated units), and the outcome of interest for unit i at time t in absence of the intervention $Y_{i,t}^{N}$, implementation of the SCM consists in constructing the unobserved counterfactual $Y_{i,t}^{N}$ for the treated units. In the case of one treated unit, given J + 1 units observed over t = 1, 2, …, T periods one can assume, for ease of exposition, that only the first unit is treated while the other {2, 3, … , J+1} units are not affected by the intervention occurring at period T_0 < T. The set of the {2, 3, … , J+1} units is normally called 'donor pool' in the SCM literature. The ATT, i.e. in our case the average effect of the public sector energy efficiency loan scheme on those organisations implementing projects funded by the scheme, can be recovered by comparing the observed outcome in the treated unit $Y_{i,t}^{I}$, with the outcome in the synthetic control, obtained through the selection of a vector of weights W = (w_2, w_3, …, w_{J+1}), with each weight applied to one of the {2, 3, … , J+1} units normally taking value bigger or equal to zero[19]. An approximately unbiased estimator of the impact of the policy on the first unit, $\hat{\alpha}_{1,t}$, can be obtained as

$$\hat{\alpha}_{1,t} = Y_{1,t}^{I} - Y_{1,t}^{N} = Y_{1,t}^{I} - \sum_{j=2}^{J+1} w_j^{*} Y_{j,t}^{N} = Y_{1,t}^{I} - Y_{W^{*},t}$$

i.e. the difference between the observed outcome and the synthetic control, under the assumption that we have a sufficiently large pre-treatment window to get an unbiased estimate of $Y_{1,t}^{N}$, or less demandingly that the synthetic control group is a good replication of the observed pattern in the treated unit. The value of the weights in W are selected to maximise the similarity between the treated unit and those of the synthetic control based on a number of characteristics observed in the pre-treatment period.

The implementation of the SCM implies having to forego traditional tests on statistical significance of the treatment effect. In the SCM literature, the validity of the estimated impact is

[18] Generally speaking, the root mean square error reflects the difference between two data points; it is used in regression analysis to measure the distance between the fitted line and the data points. In the SCM, the synthetic control unit is composed using weights attributed to control units, such that to minimise the difference in the predictors during the pre-treatment period between the treated and a weighted average control unit. These weights minimize this distance, targeting the lowest root mean square prediction error. In this way, the synthetic control unit matches as close as possible the pattern of the treated unit in the pre-treatment period.

19 This requirement has been lifted in the methodology presented in Doudchenko and Imbens (2016). Doudchenko, N. and G. W. Imbens (2016) Balancing, Regression, Difference-In-Differences and Synthetic Control Methods: A Synthesis, NBER Working Paper No. 22791

evaluated on the basis of placebo tests which consist in assessing whether a spurious impact can be estimated when randomly allocating the treatment across units which have not been treated – hence the placebo terminology. Comparison of the difference between the value of the outcome in the treated unit and its synthetic control, on one side, and between each placebo and its synthetic control on the other is used to assess confidence on the estimated impact, $\hat{\alpha}_{1,t}$, being attributable to the policy. One can be confident on results from SCM studies if the difference between the outcome in the treated unit and its synthetic control, $Y_{1,t} - Y_{W^*,t}$, is generally smaller than the difference between each placebo and each synthetic control, say $Y_{P,t} - Y_{W_P{}^*,t}$, before the treatment, i.e. t < T_0, but becomes bigger in the period after the treatment, i.e. t > T_0. A large placebo estimate undermines confidence in the results, as it points out that the estimated impact of the policy, $\hat{\alpha}_{1,t}$, can be simply due to lack of predictive power, imprecise estimates or chance.

Testing for confidence in the results

Confidence in the results has been explored in two ways. First of all, when sufficient units were available, the DiD PSM has been run for all the projects implemented in financial years 2013-14, 2014-15 and 2015-16, has been conducted separately on projects implemented in 2013-14, and on those implemented in 2014-15 and 2015-16.

This exercise has enabled an assessment of the sensitivity of the estimates to the projects comprised in the treated group, bearing in mind that in most cases a decrease in the statistical significance of the estimate was to be expected due to the reduced of the sample used in the analysis. In addition, in those cases where the 'parallel trend' assumption does not hold, confidence in the results is explored by implementing the SCM.

Scaling approach

To calculate the total annual energy savings, the average annual electricity and gas consumption savings estimated from the sample of 294 projects was scaled up by the number of projects funded between 2013/14 and 2016/17.

The approach takes into account the fact that the unit of analysis is not project, but the building affected by one or more projects. As an example, if two different projects affect the same building, one would be able to identify only the combined impact of the two projects, not the impact of each single project on that building. On the other hand, if a project affects two different buildings, each associated to its own energy meter, the impact of the project will be assessed on the two building separately.

An alternative approach of scaling based on project cost was considered, and did result in broadly similar results. However, the scaling by number of projects approach was deemed more representative as the project cost approach was subject to over influence from large scale projects, particularly in the case of HEI/FIE.

Limitations of this evaluation strand

A number of challenges should be borne in mind when considering the data and implications of the QEA. Although mitigating steps have been taken where feasible, a number of limitations with the analysis remain.

Small sample size available for analysis.

Some aspects of the scheme were excluded from the QEA. The low population numbers (which prevented meaningful analysis) has meant that the four Emergency Services organisations and 29 NHS organisations receiving funding in the period covered by the evaluation were excluded from the QEA. Street lighting projects were also excluded from the QEA because the BEIS energy consumption dataset does not include street lighting meters which are calculated as an average rate. Issues with data matching further reduced the sample size available for analysis; these issues were principally influenced by challenges in address matching to meter data. Salix administration data contains details of the applicant head-quarters, which is usually different to the buildings where the projects were implemented. This made it difficult to match the projects to the meter data required to measure impact. Although steps were taken to address this by collecting additional address data from participants, this was not achieved for all participants. As a result, the analysis focused on a sample of 294 projects for which QEA was possible, (out of the total of 3,470 projects).

Primarily due to NHS, emergency services and streetlighting projects not being included in the QEA, the estimated annual energy savings attributed to the projects delivered by funding in 2013-17 that were included in the QEA were not deemed to be representative of the total population, and thus not comparable to the approximate total expected savings discussed with BEIS at the beginning of the research.

Ability to isolate the effect of the scheme

In some cases, especially with institutions implementing projects affecting complex buildings, the meters matched to the address where the project was implemented included electricity or gas consumption related to a number of other buildings which were not affected by projects funded by the scheme. As a consequence, the energy reduction identified by the QEA as delivered by the scheme could be diluted by electricity and gas consumption in other buildings, not affected by the scheme. In some instances, this undermines the value of the estimated reductions and, in particular, their statistical significance. This limitation and the previous limitation were prevented by collecting the identifier (MPANs and MPRNs) of the electricity and gas meters affected by projects funded by the scheme at the time of application, or at least, the address of the buildings where projects were implemented.

Within schools, it is acknowledged that the Condition Improvement Fund could also lead to energy efficiency activity. However, as schools could apply for this as well as the Public Sector Energy Efficiency Loan Scheme treated units could be equally as affected by the scheme i.e. treated and control units are assumed to be equally affected.

Inability to disaggregate impact by technology and fund

As a result of the relatively small sample used in the QEA and the fact that the unit of analysis is a building (in which more than one project may have been implemented), detailed analysis of the scheme, for example based on the technology implemented or the fund used (RF or SEELS) has not been

feasible[20]. To provide some insight into the impact of technology, analysis has been conducted by meter types (e.g. electricity, gas) and lighting vs. non-lighting projects. Furthermore, outside of the QEA, street lighting was analysed using applicant estimated energy savings.

Inability to evaluate the impact of the scheme pre-and post-uplift

Scheme data available for the evaluation was limited to financial years 2013/14 to 2016/17. In addition, the data available for the QEA included a significant lag in meter data availability. As a result, the influence of the £255.3 million uplift (introduced in 2016/17) on energy consumption could not be investigated.

[20] Although an assessment of the distribution of electricity and gas projects by fund for each organisation types suggests which funds are driving the savings for each type of organisation

Cost Effectiveness Analysis

Aims of this evaluation strand

The cost benefit analysis (CBA) helps to answer the following higher-level questions of the project:

- For participants, how do the costs of participating in the scheme compare with the overall benefits, and has this changed since the uplift in funding?
- For society, how do the costs of providing a loan compare with the overall benefits?
- What is the cost-effectiveness of different technologies from the perspective of participants and society?

The cost effectiveness assessment covered:

- Cost effectiveness across the three-key scheme aims: lower energy bills for the public sector; reduced greenhouse gas emissions; and reduced consumption and demand for energy
- Cost effectiveness for scheme participants and Government
- Insight into the comparative cost effectiveness of different technologies deployed, both for beneficiaries and for Government.

This work element drew on primary data collection from other strands of this evaluation as well as secondary sources to inform cost effectiveness calculations.

Approach to this evaluation strand

The CBA report is structured on the basis of these questions with separate chapters on costs and benefits for society and participants. The costs and benefits of different technologies are considered in each of these respective chapters.

The cost benefit analysis draws on information from project monitoring data and from other streams of the evaluation work, including participant interviews in the quantitative survey workstream, the qualitative workstream and the QEA workstream.

Energy savings data from the QEA is a crucial input into the cost-benefit analysis. Due to data limitations, the QEA has only been able to produce energy savings data at scheme and organisational level; it has not been possible to produce breakdowns by technology types, fund type or pre- and post- uplift periods. Therefore, the main benefit cost ratios (BCRs) in this analysis are also only shown for the overall scheme and at organisational level. In addition, the core analysis has excluded projects delivering electricity savings from HEIs/FEIs, due to data gathered from the QEA for these projects being non-significant (only available at 85% confidence level). This is explained further below.

The modelling of cost effectiveness for both participants and for society, draws together information on several different types of cost and benefit. These are summarised in the table, along with relevant data sources, and explained further below.

Table 14 Summary of costs and benefits

Costs/Benefits	Relevant to participant analysis	Relevant to Societal analysis	Data source
Costs			
Value of Salix Loan for Capital Investment	✓	✓	Salix data
Value of Other Capital Investment	✓	✓	Salix data
Hassle Costs	✓	✓	Participant survey
Policy Delivery Costs		✓	Salix data
Benefits			
Energy Bill Savings	✓	(1)	QEA / Salix data
Maintenance Cost Savings	✓	(1)	Participant survey
Greenhouse Gas Emissions Reduction		✓	QEA and HMT Green book assumptions
Savings from Change in Energy Use		✓	
Air Quality Savings		✓	
Security of Energy Supply (qualitative)		✓	HMT Green book assumptions
Increased engagement with energy efficiency (qualitative)	✓	✓	Participant survey
Enhanced productivity (qualitative)	✓	✓	Participant survey
Enhanced health and wellbeing (qualitative)	✓	✓	Participant survey

(1) For societal analysis these savings are captured in the wider 'Savings from Change in Energy Use' Category

Summary of costs and benefit types

Costs for society

Costs for society considers:

- **Value of capital invested.** This includes net capital investment by Government (the cost of loans paid, netting off the loan repayments) and the capital investment by participants (including value of Salix loan for capital investment and value of other capital investment). No defaults are expected on loan repayments; however, the interest free nature of loans means that the value of capital repaid to Government will be lower than the original sum invested using a constant cost base (due to inflation effects).

- **Other investment in delivery of the policy**. This includes running costs of Salix Finance Ltd. For the purposes of the evaluation there is no assumed cost of the policy delivery within BEIS in this analysis.

- **Hassle costs for beneficiaries**. This is a wider societal cost and so is incorporated in the assessment of total costs to society. This can include: research time, time and materials for decorating post-installation and disruption time costs[21].

Benefits for society

As above, this focuses on all societal benefits. This considers:

- **Greenhouse gas emissions reduction**. This is based on an assessment of the net additional reduction in energy consumption as a result of public sector energy efficiency loan fund investments. It is translated into greenhouse gas emissions savings and valued using Green Book guidance on valuing carbon savings[22]. It is assumed that these benefits will last the length of the technology life or site life, whichever is shorter, with these assumptions provided through Salix monitoring data.

- **Changes in energy use**. This benefit is based on savings in the use of resources for production, transportation and final supply and use of energy. This is valued using data on net change in fuel use and the long run variable cost of energy supply, drawing on Green Book guidance[22]. It is similarly assumed that these benefits will last the length of the technology life or site life, whichever is shorter.

- **Air quality impacts**. This is based on an assessment of the reduced damage costs arising from greenhouse gas emissions, as a result of Salix fund investments, and utilising Green Book guidance on valuing damage costs. It is assumed that these benefits will last the length of the technology life or site life, whichever is shorter.

- **Security of supply**. The new energy efficiency measures should lead to a reduction in energy consumption, supporting increased national security of supply. There is no standardised approach to quantifying these impacts through Green Book guidance. This benefit is therefore assessed qualitatively.

The analysis of societal benefits also captures the rebound and co-benefit effects for participants set out under participant benefits below and captured qualitatively. Participant benefits relating to energy bill savings and maintenance cost savings are not incorporated in the societal benefit analysis as these would already be captured in the broader 'Changes in Energy Use' valuation.

Costs for participants

Costs for participants considers:

- **Value of Salix loan for capital investment**. This relates to the costs repaid on the public sector energy efficiency loan for the measures installed.

- **Value of other capital investment**. This relates to the up-front capital funding invested by the participant alongside the Salix loan investment.

[21] Ecofys, 2009, The hidden costs and benefits of domestic energy efficiency and carbon saving measure.
[22] BEIS (2018), Valuation of Energy Use and Greenhouse Gas: Supplementary Guidance to the HM Treasury Green Book on Appraisal and Evaluation in Central Government.

- **Hassle costs**. While the Salix loan covers participant project management costs for delivery of investments, any other administrative or hassle costs to the participant would be classified as “hassle costs”.

Benefits for participants

Benefits for participants considers:

- **Energy bill savings**. This is based on an assessment of the gross savings on energy bills as a result of public sector energy efficiency loan scheme fund investments. It is assumed that these benefits will last the length of the technology life, or site life, whichever is shorter.
- **Net maintenance cost savings**. The installation of new energy efficiency measures could ease the strain on energy generation equipment, leading to reduced maintenance costs. Note: in some circumstances it is possible that the new measures installed could lead to increased maintenance costs – this measure therefore captures the net effect of changes in maintenance costs, which could be positive or negative, but in most cases are anticipated to provide cost savings. It is assumed that these benefits will last the length of the technology life, or site life, whichever is shorter.
- **Rebound effects (relating to quality of building environment)**. Rebound effects relate to cases where bill savings from energy efficiency measures lead to changed behaviours in energy use (e.g. heating buildings more as it is cheaper to do so). This effect may also lead to a better building environment, improving the environment for users. The rebound effects have been captured as part of the net energy savings through the QEA, but cannot be isolated in this analysis. As such we are unable to quantify the value of this effect as part of the participant cost-benefit analysis. Through the participant survey however we have gathered information to allow us to provide an overview of the extent to which there has been any rebound effect.
- **Co-benefits from engagement with energy efficiency.** Participating in the public sector energy efficiency loan scheme investment may have raised interest and awareness in energy efficiency and raised organisations’ appetites for further investment. While it has not been possible to collect full information on the costs and benefits of potential subsequent investments that have arisen from any enhanced interest in energy efficiency in order to include these in the benefit cost analysis, this has been assessed more widely as a co-benefit.
- **Co-benefits from enhanced productivity**. The enhanced working environment as a result of loan scheme investments can lead to productivity benefits. Again, we have not sought to value these wider benefits to feed into the benefit cost analysis, but rather assess these more widely as co-benefits.
- **Co-benefits from enhanced health and wellbeing.** This relates to any wider benefits of investments on factors that could affect health and wellbeing. There is potential for overlap with the rebound effects outlined above, which relate to enhanced environment as a result of additional energy use (e.g. more heating of buildings). This factor therefore covers other potential benefits, such as enhanced air quality in buildings, as a result of reduced energy generation. The extent of these impacts were tested with participants in the quantitative survey, but as any additional impacts are difficult to robustly value for benefit cost analysis these have instead been assessed more widely as co-benefits.

Assumptions used in the analysis

Scaling approach

For scaling up variables in the CBA to population level, the same approach was taken as for the QEA: namely, scaling up figures averaged from a sample of 418 projects funded in financial years 2013/14, 2014/15 and 2015/16, by the number of projects funded between 2013/14 and 2016/17.

Scaling was applied to costs and benefits at the sub-sector level so that the subsector share of the overall BCR figures reflects the population-level distribution of projects.

Cost and benefit timescales

Costs and benefits data have been collected where possible for the suite of investments made between April 2013- March 2017 (based on financial commitment date).

For the main benefit cost analysis, the analysis has been limited to the sample of projects analysed for the QEA analysis (covering 418 projects). As the net energy savings analysis has been conducted at this level, and we have been able to match project level costs data to this sample, this allows for a robust level of analysis.

For other analysis on costs only, and the additional analysis using Salix-estimated energy savings data, the full sample of projects over this period has been used, for which full data is available (covering 3,397 projects).

The Salix management costs cannot easily be isolated to those associated just with the investments made in these years (as loans from before 2013-17 will still be under management during these years, and new loans will be made from 2018 onwards, when these loans will still be being repaid). To assess this we have therefore taken the total value of management costs for 2013-17 (as a proxy for the lifetime management costs of four years' worth of investment) and split these equally over a ten year period (2013-22), as the majority of these loans will be repaid by that stage. This approach assumes the size of the loan book has not substantially changed over this period, but does introduce a small potential margin of error.

Discount rate and cost base

In line with Green Book guidance we have assessed future costs and benefits at a social discount rate of 3.5% per year, dropping to 3.0% beyond 30 years. The discount base year used for this analysis was 2013.

The core findings are presented on a non-discounted, as well as a discounted basis, for completeness.
Findings are presented using a 2019 cost base.

Optimism and pessimism bias

Optimism bias adjustments are made in order to redress the demonstrated, systematic, tendency for project appraisers to be overly optimistic in estimates of a project's costs, benefits, and duration.

In the case of this assessment, most of the costs and benefits to be analysed will be based on objective data, and so not affected by optimism (or pessimism) bias. Those factors which could be affected include:

- Participant costs - hassle costs.
- Participant benefits – maintenance cost savings.

As these factors could be affected by both optimism and pessimism bias, no direct adjustments have been made to these figures. Instead, where relevant, these factors have been tested through sensitivity analysis.

Sensitivity testing

Sensitivity analysis has been applied on the following factors:

- **Energy Savings** – this would affect the value of participant bill savings and also societal benefits relating to carbon savings, air quality and changes in energy use. High and low scenarios draw on the upper and lower confidence intervals from the QEA workstream analysis.
- **Energy Retail Prices** – this would affect the value of participant bill savings. High and low scenarios draw on the scenarios set out by BEIS in the latest Energy and Emissions Projections Dataset (2017, Annex M, https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2017)
- **Long Run Variable Cost of Energy Supply** – this would affect the value of societal benefits. High and low scenarios draw on the scenarios set out by HM Treasury in the latest Green Book Supplementary Guidance on Valuing Energy Use and Greenhouse Gas Emissions supporting datasets (March 2019)
- **Carbon Prices** – this would affect the value of societal benefits. High and low scenarios draw on the scenarios set out by HM Treasury in the latest Green Book Supplementary Guidance on Valuing Energy Use and Greenhouse Gas Emissions supporting datasets (March 2019)
- **Lifetime of Installed Measures** – this would affect the value of participant and societal benefits. Through agreement with BEIS, the sensitivity testing is applied by scaling these values up and down by 10%.
- **Hassle Costs** – this would affect the overall participant and societal costs. Given that there is limited data available through the survey, and so potential for substantial variance, high and low scenarios are based on hassle costs being 50% higher and 50% lower than average derived from the survey.
- **Deadweight Assumption** – this would affect the calculation of gross energy savings for assessing value to participants. Given relatively limited data available through the survey, and so potential for substantial variance, high and low scenarios are based on deadweight being 50% higher and 50% lower than average derived from the survey.

- **Including Higher and Further Education Electricity Measures** – the QEA analysis of electricity savings relating to higher and further education institutions was only found to be significant at 85%, while all of the other QEA analysis was significant at 90% or higher. As such, these findings have been removed from the core analysis. This sensitivity test includes the higher and further education electricity measures into the analysis to set out the higher scenario impact if the costs and benefits associated with these measures were included.

Limitations of this evaluation strand

This section sets out a number of more detailed aspects of the methodology and some of the key limitations faced in delivering this methodology.

The QEA workstream is the primary data source for analysis of scheme benefits derived from energy savings and therefore limitations from the QEA were inherited in the analysis.

Limitations of meter reading data

- In the original methodology design for the CBA analysis, we intended to match meter reading data to project data to provide evidence on gross change in energy use for supported organisations as part of the cost benefit analysis for participants. Our analysis would have then been able to compare total costs for participants against the energy bill savings (using the gross energy change in meter readings and prevailing energy retail prices).
- In practice, the specific meters and meter reading data were matched to funded projects as part of the QEA as intended, but matching was only achieved for a small proportion of the total population of projects (418 projects out of 3,397 projects covered in our analysis period). Further detail on the challenges in this matching is provided as part of the QEA workstream outputs. Furthermore, once the relevant meter reading data were matched, we identified a high degree of 'noise' in the data ie other factors having a substantial impact on the figures. As such, in many cases energy use increased despite the implementation of energy efficiency measures.
- As a result of this, it was identified that the gross meter reading data would be unsuitable to support the CBA analysis, and therefore the only way to capture gross energy savings was through the QEA approach which, by design, removed the wider 'noise' effects, and isolated the change in energy use solely relating to the energy efficiency measures.
- One challenge with this was that the QEA approach also removed the deadweight effect from the energy savings figures (i.e. a proportion of energy savings which would have gone ahead anyway, without funding through the scheme). In order to address this, we used a deadweight calculation derived from the participant responses in the quantitative survey to inflate the net energy savings figures (after deadweight) back up to estimated gross energy savings figures. This is described further under 'attribution of benefits' below.
- A second challenge was that the QEA energy savings data was only available at organisational and energy type (electricity or gas) level, but not broken down by technology type, fund (SEELS or Recycling Fund)[23] or timescale (pre or post uplift), limiting the analysis that could be achieved (explained further under 'limitations of QEA analysis', below).

Coverage of QEA and limitations

[23] Although, an assessment of the distribution of electricity and gas projects by fund for each organisation type suggests which funds are driving the savings for each type of organisation; this is not a direct analysis of savings for each fund that can be used in the CBA.

The QEA workstream is the primary data source for analysis of scheme benefits derived from energy savings. Due to limitations in available data and matching, there are a number of limitations in the coverage of this data:

- Although supported by the scheme, NHS and Emergency Services led projects are not included in this analysis, as the number of relevant projects supported was too low to enable robust analysis for these organisation types
- Further and higher education organisations have been combined as an organisation type, as separately the number of projects was too low for robust analysis, however the organisation types were deemed to be sufficiently similar for this data to be combined.
- Street lighting schemes were not included in this analysis, as metering data is not applicable to this intervention type. Analysis of street lighting schemes has been undertaken separately, however. This is described below in the section on disaggregating costs and benefits by technology.
- Due to methodological challenges in the QEA work relating to issues in data matching and aggregation processes, it has not been possible to break down net energy savings findings by technology type, fund (SEELS or Recycling Fund) or timescale (pre or post uplift). For further details on these methodological challenges, please refer to the output from the QEA workstream.
- Despite demonstrating credibility in other ways, the analysis of electricity savings for higher and further education institutions was not significant (c. 85% confidence), whereas all other findings from the QEA were significant (90% confidence or higher). In order to address this, we have excluded these non-significant findings in the core analysis, however, we have tested the impact on the BCR if these figures are included in the analysis as part of our sensitivity testing.

Attribution of benefits

The societal cost benefit analysis only captures the net effect of the intervention after accounting for what would have happened anyway (the deadweight effect). This means netting off the costs and benefits associated with the counterfactual case (without Salix investments).

For societal benefits deriving from energy savings, the QEA workstream already accounts for this counterfactual case. It provides robust evidence on the extent to which energy use by loan scheme participants has reduced, compared to a control group of non-participants. This analysis removes the effect of confounding factors in order to isolate the effects of the energy efficiency measures installed. It also removes the deadweight scenario effect i.e. the effects related to any energy efficiency measures which would have been installed regardless of the investment from the scheme, and accounts for any rebound effects (whereby bill savings from energy efficiency measures enable changed behaviours in energy use, such as heating buildings more as it is cheaper to do so).

To ensure societal costs and benefits can be compared in an even way, the costs associated with the scheme need to be considered on an equivalent basis to the benefits. As outlined above, these costs include total capital costs for the interventions, hassle costs for participants, and costs to Government of delivering the scheme.

As it is not possible to identify from the QEA work which projects, or parts of projects represent the deadweight effect, the only way to achieve this is to proportion down the total scheme costs using an estimate of the scale of the deadweight effect. This has been estimated through a specific question on the counterfactual case with the participant sample in the quantitative survey work.

This data from this question were used to scale down the total capital costs and hassle costs for undertaking the interventions to remove the deadweight scenario effect i.e. the effects related to any energy efficiency measures which would have been installed regardless of the investment from the scheme, and accounts for any rebound effects (whereby bill savings from energy efficiency measures enable changed behaviours in energy use, such as heating buildings more as it is cheaper to do so).

With regard to policy delivery costs, evidence from the participant survey suggests that those who would have gone ahead with the intervention in the counterfactual scenario would have done so through organisation own funds. As such it is assumed these costs would not have been incurred in the counterfactual scenario, and so the deadweight calculation has not been applied to these costs.

Disaggregating costs and benefits by technology

As outlined above, the challenges faced in using metering data to gather gross energy savings, and the inability to breakdown net energy savings to a technology level through the QEA workstream have impacted on the ability of the CBA analysis to disaggregate costs and benefits by technology type.
Recognising that BEIS were particularly keen to gather intelligence on costs and benefits at a technology level, a number of additional pieces of analysis have been undertaken, with an aim to provide as much information at this level, as possible with the evidence available.

- **Analysis of costs data at a technology level**. Full information on the costs of projects by technology type is available and has been set out in detail for each main technology category, helping to better understand the composition of costs for each technology type.
- **Comparing costs and benefits relating to energy type.** Using the QEA analysis, we have produced BCRs for projects only generating electricity savings and those only generating gas savings. By drawing out the most common energy efficiency measures supporting electricity and gas savings respectively we have been able to compare high level findings on the relative costs and benefits of different types of measures installed (i.e. those targeted towards gas savings and those targeted towards electricity savings).
- **Analysing street lighting energy savings.** Street lighting energy savings estimates have been used to estimate the cost effectiveness of street lighting as meter data is not applicable to this technology type. These estimations are based on the same energy usage calculations used for billing energy use, so these can be seen as fully robust figures.
- **Analysing expected energy savings**. A final piece of analysis has been undertaken comparing cost data at technology level against expected energy savings from projects (drawing on applicant energy savings estimates data provided by Salix) in order to provide an assessment of the expected variation in BCR across different technology types. This draws on information across all projects funded in 2013-17, and will provide

an indication of likely differences in BCRs for different technology types – albeit with the analysis only based on estimates, not actual energy savings data. While significantly limited in its robustness, BEIS have indicated this analysis has not been undertaken before and will provide additional useful insight.

With respect to this final piece of work, though expected energy savings are based on estimates, they are scrutinised at different levels to ensure they are realistic, in particular:

- For large projects (those costing over £100k), which account for around 81% of all project spend for the period we are analysing, the energy savings estimates (and wider business cases) are assessed by external engineering consultants who ask applicants for detailed assessments of factors such as utilisations factors and part load efficiencies, as well as full details of building use and plant performance, all of which will help ensure a realistic estimate of energy savings were made.
- For mid-sized projects (typically those costing between around £1,000 and £100,000), Salix required more basic details of how the energy savings figures have been estimated, but still allowing for a degree of sense checking.
- For small projects (costing below c£1,000), a lighter-touch assessment was accepted as an estimate of energy savings.
- It is also worth noting that for schools funding programmes, a lot more due diligence was done by the Salix team across all project size levels, recognising the weaker expertise within these organisation types, compared to larger organisations which may have estates departments or energy managers.

Overall, this approach ensures sufficiently robust estimates of savings to allow a useful piece of analysis that will help to draw insights on the potential difference in BCRs for different technology types.

It should also be noted that there are a substantial number of multi-technology projects – whereby single projects incorporate several technologies, therefore not allowing a breakdown of specific costs and benefits. These projects account for around 11% of the total capital costs of projects analysed in this study. In the tables showing breakdown by technology type, these projects are incorporated into the ‘other’ category.

Appendix 1: Research instruments

Phase 1 Qualitative Research Topic Guides

Participant Topic Guide

Interviewer Guidance
Before the interview please check scheme(s) details. These should have been provided during the interview booking process.

Introduction
Aim: To introduce the research, ensure the interviewee is aware of, and set the context for, the proceeding discussion

Overview:

- Introduce yourself and CAG Consultants/Databuild [very brief]
- State that the evaluation has been commissioned by BEIS
- Thank interviewee for making time to speak today

Introduce the study:

- Overall objective of the study is to research the impacts of the public sector energy efficiency loan scheme on energy efficiency activity within public sector organisations and the university sector
- Main purpose of the interview is to understand their experience of dealing with energy efficiency and to explore their experience of the loan scheme
- The findings will inform future government policy on energy efficiency

Talk through key points about the interview:

- Length of interview - up to 50 minutes
- Any data used from the interview will be anonymised (neither the interviewee nor the organisation will be identifiable to BEIS) in our reporting of the findings
- Interview data will be stored securely in accordance with the Data Protection Act
- Note that we would like to record the interview and explain that the recording, transcription and notes will not be shared outside of the research consortium. BEIS will not have access to them
- Check that they consent to you recording the interview [if they don't, still go ahead with interview, just take notes]

Ask if interviewee has any questions before you start

Organisational Contexts

Aim: The aim of these opening questions is to establish key organisational contexts for this organisation.

- Please confirm the name of your organisation
- If not obvious from the name, check the type of organisation (local authority, university, school etc)
- What is your role in the organisation and to what extent do you become involved in energy matters? Probe to determine:
    - Their experience and expertise in relation to energy
    - The level and scope of their responsibility for energy matters e.g. number of sites / buildings they deal with / types of activity they are responsible for
    - Whether they deal with energy directly or via others (consultants / junior staff / external support)?
- What experience does your organisation have of undertaking work on energy efficiency? [Probe to determine how long they have been active and to get examples of the types of schemes they have experience of working on]
- What are your organisation's main reasons for undertaking energy efficiency projects? [If necessary, probe for:]
    - Financial savings
    - Carbon savings
    - Reputational benefits
    - Other non-financial benefits, e.g. improved lighting quality / improved thermal comfort etc.

Probe to establish if different types of decision maker / influencer have different objectives or priorities.

- (IF organisation has prior experience of energy efficiency) How do you usually finance your work on energy efficiency? [Probe for use of:]
    - Internal funding
    - External funding
    - Salix (loan or recycling fund)
    - Other loan funds
    - Other sources of funding / finance

Probe also to establish the factors that inform their choice of funding

Decision Making

Aim: to understand what the drivers for the organisations participation in the scheme were and what informed their decision making

Introduction: Only ask if this information has not been supplied through the recruitment process.

Otherwise use as a confirmatory question. I.e. check the accuracy of the information you have been provided with.

- Confirm that they have received scheme funding and the type of funding, i.e. loan or recycling fund scheme.
    - Establish when the loan / recycling fund was secured. NB the respondent may have secured multiple loans.
- We would like to understand the extent to which you drawn on Salix funding schemes and the types of activity you have used funding for. Can you briefly indicate:
    - The number of successful loan applications you have made;
    - The value of applications;
    - The number of projects you have used funding for; and
    - The types of project you have undertaken.

IF this question is asked the interviewer should avoid getting involved in too much detail, particularly in relation to projects where it is suggested you just seek some headline information (top 5) rather than an exhaustive list.

- How did you become aware of Salix Finance and the loan / recycling scheme?
    - Probe to see if became aware of the scheme via a single route or multiple.
- What factors informed your choice of scheme?
    - We wish to understand why they opted for one type of scheme (i.e. the loan scheme as opposed to the recycling fund scheme) as opposed to the other.
- Who made the final decision regarding your application to Salix?
    - We wish to understand where authority for making such decisions lies in the applicants organisation.
- Who else (if anyone) was involved in the decision making process?
- Why did you chose to apply for funding from Salix?
    - It is likely that respondents will suggest that the low cost of Salix Finance is what made it attractive to them, but we would like to understand if there were other factors that made them prefer to use Salix rather than alternatives. For example:
        - Relative complexity in comparison to alternative options
        - Ease of access
        - Preference to use public sector over private sector finance.
        - Support provided by Salix
- Did you consider other, non scheme, forms of funding or financing mechanism to fund your energy efficiency activity?

  - Probe to establish awareness / experience, of alternative sources of finance (private and public) and of mechanisms such as Energy Performance Contracting.

- Do you think you would you still have looked to undertake work on energy efficiency if you had not been able to access the scheme?

  - If YES probe as to how and what type of funding they would have used and what, if any, impact this might have had. E.g. whether work might have proceeded at a different scale or pace.

(IF using the recycling fund)

- Where did the match funding come from?
- How simple was it to set up a recycling fund?
- Have you experienced any challenges in running the fund?

  - Probe for views on match funding. E.g.

    - How easy or otherwise it was to secure
    - How easy it was to maintain the fund
    - Any issues from the perspective of the finance department
    - Suggestions for improvement (could include changes to Salix requirements)

What types of activity has funding been used for?

- How did you identify your projects?

  - We are particularly interested in understanding whether projects form part of a strategic plan (energy / carbon reduction plan, or other) or are 'stand alone' projects. Probe for:

    - Use of energy audits
    - Existence of a pipeline of projects
    - Projects identified via refurbishment programmes
    - Assisted by external organisations
    - Choice being determined by personal preference or received wisdom.

IF opportunities identified by external actors (e.g. consultants, NGOs etc) please identify and seek an explanation of how they became involved and what their role was.

- What were your expectations of the projects that you have undertaken, in terms of expected energy / financial benefits, and how successful were you in delivering them?

  - Probe to establish if scheme achieved estimated benefits (in terms of energy reduction / cost saving.) IF scheme did not deliver expected benefits probe regarding extent of shortfall and reasons why.

- Did your scheme deliver any other types of benefit to your organisation?

- Probe for benefits other than financial / energy savings / carbon. For example: improved customer experience; improved working environment; health / well being impacts; improved learning environment; improved public / customer experience or perception. IF other benefits identified look to establish:
    - What such benefits are
    - Who experiences them
    - Who values them
    - Whether any attempt has been made to quantify benefits
    - NB organisations might also generate co-benefits as a result of scheme funding being used to pay for enabling work. I.e. activity undertaken to allow for the installation of an energy efficiency measure.

Experience of the scheme

- What has gone well (or less well) during your project? We are interested both in your experience of the application process and project implementation.
    - Probe for different stages in the funding process:
        - Application process (applications over 100k value will have had to complete a business case template in addition to other administrative requirements)
        - Project administration
        - Engagement with Salix Finance
        - Procurement
        - Installation
        - Post installation (reliability / maintenance issues etc)
        - Overall timeliness of the project (did it run to schedule)
    - Probe for views on payback times and whether they had problems finding projects that met the payback criteria (5 years except for schools where it is 8).
    - Probe to see if any proposed types of technology were rejected. If YES ask what they were and why they were rejected.
- Did Salix provide you with any support in the development of your project? If YES please expand on what was supplied and how useful or otherwise this was.
    - We are mainly interested in understanding whether or not Salix provided any practical technical support to assist them with identifying projects, quantification of benefits etc. I.e. not just support with queries regarding scheme administration.
- Other than staff time did you incur any other costs as a result of participating in the scheme?

    - Probe for 'hassle' factor as well as costs such as need for consultancy etc. IF hassle factors identified probe to establish extent to which they were a problem and whether they had been anticipated.

- How might the scheme be improved to reduce the cost (or other forms of burden) of participation for your organisation?
- Has participation in the scheme enhanced you and / or your organisations skills, expertise and confidence in dealing with energy efficiency.
    - Allow interviewee to respond then (if it has not already come up) probe to see whether they participate in Salix meetings, webinars and workshops and or other forms of Salix run activity and if so whether, and if so how, this has been of value to them.

Interview close and thank you

- Ask if interviewee would like to say anything else about energy efficiency, the scheme or Salix?
- Check permission to recontact them if needed.
- Thank the participant for their time. Reiterate that their anonymity will protected in our reporting. Tell them they are welcome to contact members of the study team to ask questions at a later date if they wish

END INTERVIEW

Non-Participant Topic Guide

Guidance
Aim: To introduce the research, ensure the interviewee is aware of and set the context for the proceeding discussion

Overview:

- Introduce yourself and CAG Consultants/Databuild [very brief]
- State that the evaluation has been commissioned by BEIS
- Thank interviewee for making time to speak today

Introduce the study:

- Overall objective of the study is to research the impact of the energy efficiency loan scheme on energy efficiency activity within public sector organisations
- Main purpose of the interview is to understand their experience with energy efficiency and explore why they have NOT used scheme funding since 2013
- Findings will inform future government policy on energy efficiency

Talk through key points about the interview:

- Length of interview [30- 35 minutes]

- Any data used from the interview will be anonymised (neither the interviewee nor the organisation will be identifiable to BEIS) in our reporting of the findings
- Interview data will be stored securely in accordance with the Data Protection Act
- Note that we would like to record the interview and explain that the recording, transcription and notes will not be shared outside of the research consortium (BEIS will not have access to them
- Check that they consent to you recording the interview [if they don't, still go ahead with interview, just take notes]

Ask if interviewee has any questions before you start.

Organisational Contexts

- Confirm the nature of the organisation (e.g. secondary school)
    - Probe for details on how many sites organisation has and how many staff
- Establish the interviewee's role in the organisation
    - Probe to determine:
    - Their experience and expertise in relation to energy efficiency.
    - Whether they deal with energy directly or via others
    - What experience does your organisation have of undertaking work on energy efficiency?

Energy efficiency context

- How important is energy as a strategic issue for your organisation?
    - Probe: The reasons behind the strategic importance attached to energy use (e.g. cost, reputation, regulatory compliance, other (including co-benefits such as improved working conditions etc) - over short, medium and long-term).
- Could you briefly summarise any progress that your organisation has undertaken on energy efficiency?
    - Probe for what they have and have not done on energy efficiency. For example, have they:
        - Appointed someone to lead on energy management (a dedicated role?)
        - Developed an energy efficiency or carbon reduction plan?
        - Set targets for carbon reduction?
        - Done any behavioural change work with staff?
        - Installed energy efficient lighting?
        - Invested in other energy efficient measures (e.g. insulation, HVAC, Building management systems, boilers)?
- How do you generally identify energy efficiency projects?

  - Probe for:
    - Use of energy audits
    - Inclusion in general refurbishment programmes (i.e. equipment is replaced as part of general refurbishment programmes)

- How do you generally finance any energy efficiency investments?
  - Probe for:
    - Internal funding
    - External funding
    - Other loan funds
    - Other sources of funding
    - Other types of EE finance scheme, e.g. EPC
- What payback do you generally seek on energy efficiency investments?
- What are your organisation's main reasons for undertaking energy efficiency projects (if any)?
  - Probe for relative importance of:
    - Bill savings
    - Reputational benefits
    - Co-benefits (e.g. improved quality of lighting; reduced maintenance costs)
    - Energy efficiency being a side benefit from wider renovation projects
    - Other benefits
- What are the barriers, if any, that make it difficult to progress energy efficiency projects within your organisation?
  - Probe for:
    - Lack of strategic priority
    - Access to capital
    - Easy wins already completed
    - Competing priorities
    - Lack of staff time to progress
    - Lack of staff knowledge
    - Budget cuts
    - Operational constraints on implementing projects
    - Other

- Probe for any recent changes to these barriers.

Knowledge and Awareness of Salix Finance
Aim: to understand how far they are aware of Salix and why they did not apply/progress Salix applications

- Are you aware of the public sector energy efficiency loan [and revolving loan scheme]?
  - Probe awareness and understanding of both types of scheme.
- How did you become aware of Salix Finance and the loan / recycling scheme?
  - Probe to see if heard of Salix via an event, including industry events.
- Have you or your organisation considered making a bid to Salix Finance?
  - Probe to understand what sort of project was considered.
- If you or your colleagues got some way towards applying for Salix funding, why did you not progress this?
  - Probe for:
    - Internal barriers (lack of capacity / expertise/ lack of internal buy in)
    - Barriers associated with the scheme itself
    - Ability to proceed without Salix (e.g. via other forms of funding)
- Did you or your colleagues progress the identified energy efficiency projects by other means?
  - Probe for how funded / managed
- What would need to change in order for your organisation to make an application to Salix?
- Are there any other policy changes that could be made to address the barriers to installation of energy efficiency measures within organisations like yours?

Interview close and thank you

- Ask if interviewee would like to say anything else about energy efficiency or Salix?
- Check permission to recontact them if needed.
- Thank the participant for their time. Reiterate that their anonymity will protected in our reporting. Tell them they are welcome to contact members of the study team to ask questions at a later date if they wish.

END INTERVIEW

Phase 2 Qualitative Research Topic Guides

Finance Managers – Participants

Introduction
Aim: To introduce the research, ensure the interviewee is aware of and set the context for the proceeding discussion
Overview:

- Introduce yourself and CAG Consultants [very brief]
- State that the evaluation has been commissioned by BEIS
- Thank interviewee for making time to speak today

Introduce the study:

- Main purpose of the interview is to understand their views and experience of financing low carbon projects and to explore their experience of the Salix loan schemes in particular
- State that the evaluation has been commissioned by BEIS the findings will inform future government policy on energy efficiency

Talk through key points about the interview:

- Length of interview 35-45 minutes
- Any data used from the interview will be anonymised (neither the interviewee nor the organisation will be identifiable to BEIS) in our reporting of the findings
- Interview data will be stored securely in accordance with the GDPR
- Check they received information regarding the privacy notice
- Note that we would like to record the interview and explain that the recording, transcription and notes will not be shared outside of the research consortium. BEIS will not have access to them
- Check that they consent to you recording the interview [if they don't, still go ahead with interview, just take notes]

Ask if interviewee has any questions before you start

Warm-up and context
The aim of these opening questions is to warm up the interviewee and to provide context for the rest of the interview.

- Please confirm the name of your organisation
    - If not obvious from the name, check the type of organisation (local authority, university, school etc)
- What is your role in the organisation? (Double-check that they are a finance manager if not clear)
    - Probe to determine:

- Role in the organisation (where they sit in the hierarchy)
- How long they have been in this role

Experience and interest in energy and low carbon projects
The aim of these questions are to understand the organisation's current level of interest/activity in relation to low carbon initiatives, areas of interest, key drivers and views on potential future activity.

- What experience does your organisation have of financing energy related projects (on their own estate). Activity might include energy efficiency / installation of renewables / heat network development / other?
  - Probe to determine:
    - what types of projects they are/have been involved with (e.g. energy efficiency projects, renewable energy generation, other)
    - Scale (value) of projects.
    - how long their organisation has been involved in funding energy projects
    - how frequently they get involved in financing these types of project

- What is your understanding of the reasons why your organisation is undertaking these projects?
  - Probe to establish:
    - Why organisation is undertaking such projects (NB these may not be related to environmental objectives, e.g. could be seen as being about cost reduction / income generation [in the case of renewables and heat networks])
- Is the organisations interest in energy projects growing / declining or stable (at current level) Query response to establish 'why' and what factors are influencing the direction of travel.

Financial decision-making for energy and low carbon projects
The aim of these questions are to understand (a) the processes involved in deciding on the financing of energy/low carbon projects and (b) the factors that determine whether or not a project proceeds

- Could you please briefly describe the processes that are involved in deciding whether to finance energy and low carbon projects?
  - Probe to determine:
    - How are projects identified to the finance team (e.g. do the finance team identify projects or are they brought to them?)
    - Is there a formal appraisal process? If so what does it look like and does it vary depending upon the scale of investment (would expect to see different approaches for different types of investment)?

        - Are the decision-making processes for energy projects the same as for other types of projects?

- What are the main factors that influence decisions about whether to go ahead with energy and low carbon projects?

    - Probe to determine:

        - Are there particular financial criteria they use or look for e.g. return on investment (hurdle rates), payback periods, etc.

        - What other financial considerations determine their decision. E.g. assessments of risk / availability of finance (including energy specific finance such as Salix)

        - What, if any, non-financial considerations affect their decisions (e.g. level of familiarity with activity being financed, co-benefits, political interest etc)?

        - To what extent are energy projects in competition with other types of project and what factors determine which projects receive preference?

        - Ultimately what are the main (2-3) factors determine whether or not you proceed with an investment in energy infrastructure?

Sources of finance for energy and low carbon projects

Other sources of finance used to fund low carbon initiatives (including EPCs), interactions between different funding types / sources and their relative strengths and weakness

- What types of finance have you used to fund energy and low carbon projects?

    - Probe to determine:

        - the types of finance sources used (including Salix)

        - whether the type of finance used differs according to project type

        - Does the organisation blend different types of funding?

- What factors informed your choice of funding source?

    - Probe to determine:

        - Why were these sources preferred to other alternatives?

- Are you aware of other funding options and if so what are they and have been considered for financing energy and low carbon projects?

    - Probe to determine:

        - Awareness of other funding sources / options including Energy performance Contracting [EPC])

        - If aware of other options have these been considered and if so why have they not been used?

- Other than those you may have already identified, are there any particular issues or barriers that affect your choice of finance for energy and low carbon projects?

- Probe to explore:
    - Both actual and perceived barriers to using different types of low carbon finance

Perceptions and experience of Salix
To understand participant views on the role of Salix and how the existing Salix loan schemes might be improved or evolved

- Confirm with the applicant the value of funding and types of projects they have funded through Salix [presumed that this will be provided by Winning Moves ahead of interview]
- What was your experience of using Salix finance to fund projects?
    - Probe to determine:
        - Why their experiences were positive or negative
- Other than what you have already told me, can you explain what you think the relative strengths and weaknesses of using Salix finance are, compared to other potential sources of finance for low carbon projects?
    - Probe to determine:
        - Are there particular aspects of the loan that are particularly attractive, or work particularly well? (e.g. how important is the zero interest part of the loan, how attractive or not is the payback period)
        - Are there particular barriers or issues to make using Salix challenging from their perspective?
- How important was Salix in enabling you to finance these projects? Why?
    - Probe to explore:
        - What would they have done in the absence of Salix? Would the projects still have been financed? Why?
- How could the existing Salix loan schemes be improved or evolved in order to enable you to finance more low carbon projects in the future?

Interview close and thank you

- Ask if interviewee would like to say anything else about Salix or financing low carbon projects
- Check permission to recontact them if needed.
- Thank the participant for their time. Reiterate that their anonymity will protected in our reporting. Tell them they are welcome to contact members of the study team to ask questions at a later date if they wish

END INTERVIEW

Finance Managers– Non-Participants

Introduction

Aim: To introduce the research, ensure the interviewee is aware of and set the context for the proceeding discussion

Overview:

- Introduce yourself and CAG Consultants [very brief]
- State that the evaluation has been commissioned by BEIS
- Thank interviewee for making time to speak today

Introduce the study:

- Overall objective of the study is to research the impacts of Salix loan schemes on energy efficiency activity within public sector organisations and the university sector
- Main purpose of the interview is to understand their views and experience of financing low carbon projects and to explore their awareness, understanding and views on different options for financing, including the Salix loan scheme
- The findings will inform future government policy on energy efficiency

Talk through key points about the interview:

- Length of interview up to 50 minutes
- Any data used from the interview will be anonymised (neither the interviewee nor the organisation will be identifiable to BEIS) in our reporting of the findings
- Interview data will be stored securely in accordance with the GDPR
- Check they received information regarding the privacy notice
- Note that we would like to record the interview and explain that the recording, transcription and notes will not be shared outside of the research consortium. BEIS will not have access to them
- Check that they consent to you recording the interview [if they don't, still go ahead with interview, just take notes]

Ask if interviewee has any questions before you start

Warm-up and context

The aim of these opening questions is to warm up the interviewee and to provide context for the rest of the interview.

- Please confirm the name of your organisation
    - If not obvious from the name, check the type of organisation (local authority, university, school etc)
- What is your role in the organisation? (Double-check that they are a finance manager if not clear)
    - Probe to determine:
        - Role in the organisation (where they sit in the hierarchy)
        - How long they have been in this role

Experience and interest in energy and low carbon projects
The aim of these questions are to understand the organisation's current level of interest/activity in relation to low carbon initiatives, areas of interest, key drivers and views on potential future activity.

- What experience does your organisation have of financing energy related projects (on their own estate). Activity might include energy efficiency / installation of renewables / heat network development / other?
    - Probe to determine:
        - what types of projects they are/have been involved with (e.g. energy efficiency projects, renewable energy generation, other)
        - Scale (value) of projects.
        - how long their organisation has been involved in funding energy projects
        - how frequently they get involved in financing these types of project
        - Check if aware of Salix, they may know it as the public sector energy efficiency loan scheme, but don't explore at this point.
- What is your understanding of the reasons why your organisation is undertaking these projects?
    - Probe to establish:
        - Why organisation is undertaking such projects (NB these may not be related to environmental objectives, e.g. could be seen as being about cost reduction / income generation [in the case of renewables and heat networks])
- Is the organisations interest in energy projects growing / declining or stable (at current level) Query response to establish 'why' and what factors are influencing the direction of travel.

Financial decision-making for energy and low carbon projects
The aim of these questions are to understand (a) the processes involved in deciding on the financing of energy/low carbon projects and (b) the factors that determine whether or not a project proceeds

- Could you please briefly describe the processes that are involved in deciding whether to finance energy and low carbon projects?
    - Probe to determine:
        - How are projects identified to the finance team (e.g. do the finance team identify projects or are they brought to them?)
        - Is there a formal appraisal process? If so what does it look like and does it vary depending upon the scale of investment (would expect to see different approaches for different types of investment)?
        - Are the decision-making processes for energy projects the same as for other types of projects?

- What are the main factors that influence decisions about whether to go ahead with energy and low carbon projects?
    - Probe to determine:
    - Are there particular financial criteria they use or look for e.g. return on investment (hurdle rates), payback periods, etc.
    - What other financial considerations determine their decision. E.g. assessments of risk / availability of finance (including energy specific finance such as Salix)
    - What, if any, non-financial considerations affect their decisions (e.g. level of familiarity with activity being financed, co-benefits, political interest etc)?
    - To what extent are energy projects in competition with other types of project and what factors determine which projects receive preference?
    - Ultimately what are the main (2-3) factors determine whether or not you proceed with an investment in energy infrastructure?

Sources of finance for energy and low carbon projects
Other sources of finance used to fund low carbon initiatives (including EPCs), interactions between different funding types / sources and their relative strengths and weakness

- What types of finance have you used to fund energy and low carbon projects?
    - Probe to determine:
        - the types of finance sources used (including Salix)
        - Does the organisation blend different types of funding?
- What factors informed your choice of funding source?
    - Probe to determine:
        - Why were these sources preferred to other alternatives?
- Are you aware of other funding options and if so what are they and have been considered for financing energy and low carbon projects?
    - Probe to determine:
        - Awareness of other funding sources / options including Energy performance Contracting [EPC])
        - If aware of other options have these been considered and if so why have they not been used?
- Other than those you may have already identified, are there any particular issues or barriers that affect your choice of finance for energy and low carbon projects?
    - Probe to explore:
        - Both actual and perceived barriers to using different types of low carbon finance

Perceptions and experience of Salix

To understand participant views on the role of Salix and how the existing Salix loan schemes might be improved or evolved

- What is your awareness and understanding of the Salix loan schemes, if any?
- [If not already covered above] IF aware of Salix. Have you considered using Salix loans to finance low carbon projects and if so did you undertake any formal assessment of the scheme? NB some may have had historic experience of Salix. If so it would be useful to understand why they are not now calling on the scheme.
- IF aware of Salix Why did you choose not to apply for a loan through Salix?
    - Probe to determine:
        - Why they chose not to apply for a loan.
        - For actual / perceptual barriers?
        - Other reasons for choosing other sources of finance over Salix.
- IF aware of Salix. Do you have any suggestions about how the existing Salix loan schemes could be improved to better enable you to take advantage of the scheme?

Interview close and thank you

- Ask if interviewee would like to say anything else about Salix or financing low carbon projects
- Check permission to recontact them if needed.
- Thank the participant for their time. Reiterate that their anonymity will protected in our reporting. Tell them they are welcome to contact members of the study team to ask questions at a later date if they wish

END INTERVIEW

Operational Managers Topic Guide

Introduction
Aim: To introduce the research, ensure the interviewee is aware of and set the context for the proceeding discussion

Overview:

- Introduce yourself and CAG Consultants [very brief]
- State that the evaluation has been commissioned by BEIS
- Thank interviewee for making time to speak today

Introduce the study:

- Main purpose of the interview is to understand to understand their views and experience of delivering energy efficiency and renewable energy projects, the factors that influence the nature and scale of the projects they undertake and what support would help them to achieve more
- State that the evaluation has been commissioned by BEIS the findings will inform future government policy on energy efficiency and in particular the energy efficiency loan schemes currently run by Salix Finance.

Talk through key points about the interview:

- Length of interview 25-30 minutes
- Any data used from the interview will be anonymised (neither the interviewee nor the organisation will be identifiable to BEIS) in our reporting of the findings
- Interview data will be stored securely in accordance with the GDPR
- Check they received information regarding the privacy notice
- Note that we would like to record the interview and explain that the recording, transcription and notes will not be shared outside of the research consortium. BEIS will not have access to them
- Check that they consent to you recording the interview [if they don't, still go ahead with interview, just take notes]

Ask if interviewee has any questions before you start

Warm-up and context
The aim of these opening questions is to warm up the interviewee and to provide context for the rest of the interview.

- Please confirm the name of your organisation
    - If not obvious from the name, check the type of organisation (local authority, university, school etc)
- What is your role in the organisation?
    - Probe to determine:

        - Role in the organisation (where they sit in the hierarchy)
        - How long they have been in this role
        - How much/what aspects of their role are focused on energy management

- Are you responsible for energy related activity across the organisations or do you share responsibility with others?
    - We are interested in whether energy management responsibilities are centralised or whether they are split across different budget holders within the organisation. If the latter probe to establish who else is involved.
- Can you briefly summarise the types of project that you have been involved in?
    - If necessary, probe for:
        - Technology types (e.g. lighting, energy generation, insulation, etc)
        - Scale and number of projects recently delivered (e.g. last 2-3 years) and currently delivering
- Could you tell us how you financed these projects?
    - Probe for use of:
        - Capital Budget
        - Salix (recycling and or SEELS)
        - PWLB
        - EPC
        - Other sources of funding / finance
- Which projects have you used SEELS to support?
    - If necessary, probe for:
        - Whether Salix used for all forms of energy related activity, or channelled for specific purposes, e.g. technology types.
        - What factors determine what SEELS funding is used for?
        - Whether Salix funding seen as limited in terms of the types of technology it can be used for?

Factors which dictate the nature and scale of activity
The aim of these questions are to understand the factors which dictate the nature and scale of energy related activity

- How do you identify potential projects?
    - Probe to establish if:
        - Have an existing pipeline of projects
        - Whether the organisation has an EE strategy

        - To what extent is the organisation led by strategy as opposed to opportunism, e.g. do they have fixed annual energy / carbon reduction targets and a planned schedule of works, or do they have short / medium terms targets that they meet by whatever means presents itself? Or do they have no targets / fixed programmes and simply focus on maintenance and take advantage of whatever other opportunities might present themselves (priority for BEIS so ensure explore in detail).
        - The extent to which other actors are involved in identifying projects and setting priorities

- What factors influence the type of technology that feature in your projects?
    - Probe issues such as:
        - do they go with what they know (or are asked to do) or are they actively seeking new ideas
        - role of external organisations in promoting new technologies to them, making them aware of new products etc
        - role of internal actors in promoting / identifying opportunities
        - approach to EE, i.e. business as usual (keeping the lights on) as opposed to more progressive drivers - efficiency/ service improvements etc (may have been covered in earlier questioning)
- What factors determine the scale at which you operate?
    - Probe issues such as:
        - Individual capacity: time, skills, expertise, resources, authority. (Priority matter for BEIS so ensure is explored)
        - Other organisational factors (corporate ambition, level of senior buy-in / support)
        - Technical constraints
        - Resources
        - Other factors
- Is there scope for you and your organisation to do more on energy?

  if YES what would need to change to make this possible? If NO check why not.
    - Probe issues such as:
        - internal attitudes (are these a factor? If so who are the key decision makers etc who need to be influenced and in what ways?
        - if capacity is identified as an issue explore what they mean by this
        - if capability is identified as an issue explore what skills / expertise they think they need

- IF the respondent has identified constraints ask if they can identify ways by which Salix might support them to do more.
    - Probe issues such as:
        - IF they use other funding sources how well, or otherwise, does Salix complement these?
        - how might Salix encourage / enable the organisation to uptake a broader suite of technology options?
        - should Salix be more active in targeting internal stakeholders (if YES then who, in what ways, what messages)
        - Other ways in which Salix might help to address constraints.

Interview close and thank you

- Ask if interviewee would like to say anything else about Salix or financing low carbon projects
- Check permission to recontact them if needed.
- Thank the participant for their time. Reiterate that their anonymity will protected in our reporting. Tell them they are welcome to contact members of the study team to ask questions at a later date if they wish

END INTERVIEW

Trade Associations Topic Guide

Introduction to discussion
We are interested in exploring how public sector organisations make decisions about whether or not to use external finance (primarily loans) to fund capital investments; in particular we are interested in how public sector organisations make use of external sources of finance when investing in energy related activity, for example energy efficiency in building, renewables, street lighting and heat networks.

Topics

- What, if any, experience or understanding do you have of low carbon finance schemes, including the public sector energy efficiency loan scheme (Salix)?
- Does your organisation have a position, or view, on how best organisations in your sector might access external finance for energy / low carbon investments?
    - If YES probe to establish what this is, whether there is a position paper and whether there is a special interest group within their organisation
    - If NO probe to establish whether the organisation is neutral on such investments, i.e. does it see them as simply business as usual.
- What is the current level of interest/activity in relation to low carbon initiatives amongst finance managers in the sector? Is this changing?
    - If YES probe how and in what ways
    - If NO probe for views on what, if anything, could/should be done to encourage/ enable finance managers to be more active in this area.
- When accessing loan finance what the key consideration for finance managers?
    - Probe: cost of finance / familiarity / trust – in source of finance / views on risk / regulations or other sectoral restrictions
- What are the general sources of finance that finance managers in the sector use most frequently / are most comfortable with?
- What are the main obstacles / barriers that finance managers face when considering the use of less familiar forms of finance?
- Would you like to offer any final thoughts on the issue of low carbon finance in your sector?
- Lastly, we are interested in exploring issues regarding energy related investments within finance departments with a sample of finance managers within the sector. Do you have any recommendations of people we could speak to or any suggestions for sources we could use to identify finance managers we could approach?

Quantitative Survey Questionnaire

Introductions

KEY: P = Participant NP= Non-participant OE = Open ended question		
1	Gatekeeper	Good morning / afternoon, this is [name] calling from Winning Moves on behalf of the Department for Business, Energy and Industrial Strategy. We are currently doing some work for BEIS to help understand the impact of the public-sector energy efficiency loans scheme administered by Salix Finance Ltd.
2	Gatekeeper	P: Could I speak to <X> about this? NP: Could I speak with the person responsible for energy efficiency at your organisation?
3	Respondent	Good morning / afternoon, this is [name] calling from Winning Moves on behalf of the Department for Business, Energy and Industrial Strategy. We are currently doing some work for BEIS to help understand the impact of the public-sector energy efficiency loans scheme administered by Salix Finance Ltd.
4	Respondent	P: Can you talk about this now? [If the respondent cannot participate in the survey straight away, an appointment will be made to call them back.] NP: Could I speak with the person responsible for energy efficiency at your organisation?

A Background (question codes profilea1-5)

	Questionnaire Topic Area		Element	Question text	Response options	Audience P= Participant NP= Non-Participant
1	Individual profile	N/A	N/A	Can I check your name is <recall from database>	Correct Incorrect, but okay to talk about Salix Incorrect, not okay to talk about Salix	
2				What is your job title, please?	Capture open end	P
3				Can you confirm you are able to talk about energy efficiency projects using Salix funding at your organisation?	Yes No	P
4				Have you heard of Salix before?	Yes No	N
5				How long have you had responsibility for energy efficiency projects for your organisation?	Capture open end – number of years	P/NP

B Impact (question codes contextb1-11)

	Organisational context	N/A	N/A	I'd like to start by asking some questions about your organisation's approach to energy efficiency		

1				Do you have annual funds in place for implementing energy efficiency measures?	Yes No Don't know	
2				How many staff (FTE equivalent) with direct responsibility for energy are employed by the organisation?	Capture no. of FTE equivalent None Don't know	
				Does your organisation have:		
3				Energy policy / Energy efficiency policy	Yes No Don't know	
4				Sustainability / environmental policy covering energy	Yes No Don't know	
5				Maintenance / refurbishment policy covering energy	Yes No Don't know	
6				a senior level commitment to energy / energy efficiency	Yes No Don't know	P/NP
7				We appreciate that the frequency of your energy bills will be related to the supplier, fuel and/or building, but on the whole, how often do you check your energy bills (prompted list)	Monthly Quarterly Bi-annually Annually Don't know	
8				How does your organisation check and verify energy bills to ensure they are correct? [we are interested in any form of monitoring and verification, how they use it, how frequently]	Verbatim Don't know	
9				Does your organisation have Automated Meter Reading (AMR) equipment?	Yes No Don't know	
10				What do you use AMR equipment for?	Verbatim Don't know	
11				Has your organisation ever undertaken an energy audit? This is an assessment by an energy expert of the amount of energy you use, and ways in which energy consumption can be reduced.	Yes No Don't know	

C Street lighting – repeated for every street lighting project the organisation has implemented (question codes streetc1-10)

1	What have been the outcomes of the scheme before and after	1.1	Impact	We would now like to ask some questions specifically about street lighting projects. Have you implemented any street lighting projects using Salix funds in the last five years? (question will be altered for non-participants removing reference to Salix funds and included reference to 'in the last five years')	Yes	

	the uplift in funding in 2015?					
					No	
					Don't know	
2				How much was the total cost of the project?	Verbatim OE	
3				What did the project involve? What did you change?	Verbatim OE (numerical answer only)	
4				(Make sure they cover) Number of lamps affected	Yes	
5				(Make sure they cover) Wattage of lamps replaced	Verbatim OE (numerical answer only)	
6				(Make sure they cover) Wattage of new lamps	Verbatim OE (numerical answer only)	
7				Have you been able to measure the impact from the project in terms of energy costs, energy consumption or greenhouse gas emissions? [note: we just need a yes / no / don't know here. Following questions asks for details if they say yes]	Yes	
					No	
					Don't know	
8				What is the impact? (capture in terms of kWh, ££, tonnes CO2) <prompt using Salix database if required. Make a note if prompt required>	Verbatim OE	
9				What are the hours of operation for the street lights affected by the project?	Verbatim OE (Expect daily or annualised figures)	
10				Did the hours of operation change as a result of the project?	Verbatim OE	

D Project – repeated for each project implemented, up to four projects, for all organisations unless otherwise stated (question codes projectd1-17)

1	What have been the outcomes of the scheme before and after the uplift in funding in 2015?	1.1	Impact	We would like to check some details about the projects you have implemented using funding from Salix. <project details from administrative data> We can see from our data that you implemented <technology> in <year>, can I ask you a few questions about this project?	Yes	P
					No	
2				Can I confirm that this project was funded using the <Recycling/Loans> fund?	Yes	
					No (capture verbatim)	
3				Has the project delivered cost reductions in line with your organisation's expectations?	Yes	
					No	
					Don't know	
4				(if 'yes') Would you say your expectations have been exceeded in any way?	Verbatim	
5				(if 'no') Why not?	Verbatim	
6				(if 'no') Are you making the necessary savings in order to repay the costs of the funding?	Verbatim	
7				Have you been able to detect a change in energy consumption in the buildings where Salix funded projects have been implemented? [note:	Yes	
					No	

				we just need a yes / no / don't know here. Following questions ask for details if they say yes]	Don't know	
8-10				How have you noticed this change - is it in the		
8				meter data	Yes	
					No	
8b				Can you quantify this change? <prompt using Salix database if required. Make a note if prompt required>	Verbatim OE	
9				energy bills	Yes	
					No	
9b				Can you quantify this change? <prompt using Salix database if required. Make a note if prompt required>	Verbatim OE	
10				display energy certificate?	Yes	
					No	
10b				Can you quantify this change? <prompt using Salix database if required. Make a note if prompt required>	Verbatim OE	
11				Has this project led to an increase in use of the technology or an increase in use of other technologies (for example, a new boiler might mean that you use it more frequently as it is more efficient or if you are saving money on heating in the winter you may decide to use air conditioning in the summer)	Verbatim OE	
				Questions D12, D13, D14, D15, D16 and D17 only to be asked once per organisation		
12				Aside from energy efficiency works funded through Salix, are there any other factors that have affected energy consumption in the building where the projects we have been discussing were undertaken (such as change of use, change of equipment, other energy efficiency works not funded through Salix)	Yes	
					No	
13				Which project does this affect?	Verbatim	
14		1.4		Has your organisation experienced any other benefits outside of energy consumption, energy costs, and/or greenhouse gas emissions as a result of the project, such as: (prompted list; choose as many as are applicable)(Only ask once per organisation)	Reputational benefit (improved CSR image, brand and / or PR)	
					Improved energy management practice	
					Improved staff engagement in energy efficiency	
					Improved senior management engagement in energy efficiency	
					Academies / schools / FEI / HEI) Improved student engagement in energy efficiency	
					Lower maintenance costs	
					Improved indoor air quality	
					Reduction in peak energy demand	
					Better equipment performance	
					Improved visitor / customer / user experience	

					(if implemented a lighting project) improved lighting quality / visual comfort	
					(if implemented a lighting project) Improvements in safety	
					(if implemented heating or fabric measures) improved heating performance / thermal comfort	
					Other, please specify	
					None of the above	
					Don't know	
15				Were these benefits known before the implementation, or realised since? (Only ask once per organisation)	Known beforehand	
					Not known beforehand	
					Don't know	
16				(if known beforehand) Were these benefits used by internal stakeholders to justify applying for funding and implementing the project? (Only ask once per organisation)	Yes	
					No	
					Don't know	
17				Which project does this affect?	Verbatim OE	

E Additionality – ask for each project (question codes additione1-8)

1		2.2	Impact	We would now like to ask some questions about the importance of Salix funding in helping you to deliver energy efficiency projects. To what extent was the project reliant on funding from Salix? Please choose one from the following four options (prompted list, choose one)	Project wouldn't have happened without Salix funding (Fully attributable)	P
					Project happened sooner because of Salix funding (Accelerated)	
					Project was scaled up or made bigger because of Salix funding (Scaled)	
					Project would have happened at the same time to the same scale without Salix funding (Not attributable)	
2				(if 'Not attributable') where would you have found the funding to implement/scale up/accelerate this project?	Internal funds	
					Other external funds	
					Both	
3				(if 'Fully attributable') what would you have done?	Nothing	
					Found another way to reduce energy costs/consumption/greenhouse gas emissions without funding	
					Delivered a scaled down version of the project	
					Delayed the project	
					Don't know	

				Can you tell me some more about these funds…(this routes from 'not attributable' so funds are specifically non-Salix funds)		
4				Do you need to apply to receive this funding?	Yes	
					No	
4b				What does the application process involve?	Verbatim OE	
5				Are there criteria relating to payback periods to receive funding?	Yes	
					No	
5b				What criteria relating to payback periods is required to receive funding?	Verbatim OE	
6				Do you consider that this funding is easier or harder to achieve than funding from Salix?	Easier	
					Harder	
					Same	
					Don't know	
7				Why do you say this?	Verbatim OE	
				Question E8 only to be asked once per organisation		
8				Would you say that implementing this project has led to further work in this area? So would you say.....	We've identified other energy efficiency projects but have yet to implement them	
					We've identified and implemented other energy efficiency projects	
					This project has not led us to identify or implement other energy efficiency projects	
					This project has put us off other energy efficiency projects	
					Other, please specify	

F CBA – ask for each project (question codes costbenefitf1-7)

1	For participants, how do the costs of participating in the scheme compare with the overall benefits, and has this changed since the uplift in funding?	3.1	Economic Evaluation	We would like to understand the associated costs of implementing energy efficiency projects. When you implemented the project, were there hassle costs which were not covered by Salix? By hassle costs we mean the additional time and associated financial cost of the design and delivery of the Salix funded energy efficiency improvements, in addition to the main capital costs for equipment and installation.	Yes	P
					No	
					Don't know	
2				How much was the total hassle cost?	Verbatim OE	
3				As a result of the project, have there been any changes to your annual maintenance costs relating to the new investments supported by Salix? By maintenance costs we mean costs associated with enabling the technology implemented to be useable (for example: annual service, safety checks).	They have increased because of the project	
					They have decreased because of the project	
					No change in maintenance costs	
					Don't know	

4				How much is the increased maintenance cost, on an annual basis?	Verbatim OE	
5				What is the anticipated life expectancy of the building in which the measure was installed?	Up to 5 years	
					6-10 years	
					11-25 years	
					More than 25 years	
				Question F6 and F7 only to be asked once per organisation		
6				Would the hassle costs we have discussed prevent your organisation applying for Salix funding in the future?	Verbatim OE	
7				Would the maintenance costs we have discussed prevent your organisation applying for Salix funding in the future?	Verbatim OE	

G Overall (question codes processg1-34)

	What is the rate of deployment of energy efficiency projects and technologies, what explains this and does this differ for different participants?	4.1	Process Evaluation	I'd like to ask some questions about energy efficiency projects at your organisation, regardless of how they are funded (not specifically Salix funded projects)		P/NP
1				Since 2013, have you implemented any energy efficiency projects that were not funded by Salix?	Yes - capture number of projects per year	
					No	
					Don't know	
2				What prompted the implementation of these energy efficiency projects?	Verbatim OE	
3				How were these energy efficiency projects identified?	Verbatim OE	
4				Who identified these energy efficiency projects?	Employee with direct day-to-day responsibility for energy efficiency	
					Employee with responsibility for energy efficiency, but not main part of their job	
					External professional (such as energy consultant)	
					Don't know	
5				How were these energy efficiency projects funded?	Verbatim OE	
6				Which of the following types of technologies were installed? <multiple choice>	Streetlighting	
					LED lighting measures (non-street lighting)	
					Heating services (boilers, pumps, valves, controls)	
					Building fabric (improvements to insulation, windows, draught proofing)	
					Building Management System (BMS)	
7				Does your organisation have a pipeline of projects waiting to be implemented?	Yes	
					No	

					Don't know	
7b				[if yes] What are the anticipated payback timescales for these projects?	less than 12 months	
					1 to 5 years	
					6 to 8 years	
					9 to 12 years	
					more than 12 years	
					Don't know	
8				How long does it take between identifying an energy efficiency project and beginning installation?	Less than 3 months	
					3-6 months	
					7-12 months	
					More than 12 months	
9				What led your organisation to take out its first Salix loan	Verbatim OE	P
10	What types of organisations are participating in the scheme, and why? How does this compare to the types of organisations that the scheme is targeted at? What types of organisations are not participating in the scheme, and why?	4.2	Process Evaluation	Do you think your organisation will identify energy efficiency projects in the future, specifically using funding from Salix?	Yes - why do you say this?	
					No - why do you say this?	
					Don't know	
11				What are the benefits of the scheme, when compared to other methods of funding energy efficiency projects?	Verbatim OE	
12				What are the disbenefits of the scheme, when compared to other methods of funding energy efficiency projects?	Verbatim OE	
13	For participants and non-participants, where are the barriers to take up of the public-sector energy efficiency loan scheme and why do these occur?	4.7	Process Evaluation	What prevents / might prevent your organisation from participating in the scheme?	Internal policy / rules / regulations regarding finance	P/NP
					Internal motivation for energy efficiency projects	
					Inability to identify qualifying projects	
					Additional costs associated with projects	
					Employee time available to oversee projects	
					Salix rules regarding payback timescales	
					Other, please specify	
					Nothing	
14	What changes can be made to the scheme to address the barriers to the	5.2	Process Evaluation	What would need to be changed about the scheme for your organisation to participate in the future?	Salix rules regarding payback timescales - how many years would this criteria need to be extended to?	
					The amount of funding available	
					The list of approved technologies	

	installation of energy efficiency measures among public sector organisations?				Other, please specify 999 - Don't know	
	What have been the participants' and non-participants perceptions and experiences of the hassle / hidden costs of taking up the loans, and how has this impacted on participation?	4.10	Process Evaluation	Please indicate to what extent you agree or disagree with these statements in relation to the scheme, on a scale of 1 to 5 where 5 is strongly agree, 1 is strongly disagree, centred on neither agree/nor disagree	5 - Strongly Agree	P/NP
15				Applying for funding from Salix is a hassle	4 - Agree	
16				The associated costs of applying for Salix funding are manageable for my organisation	3 - Neither agree, nor disagree	
17				The costs associated with implementing projects has an impact on the delivery of the project	2 - Disagree	
18				The application process should be made simpler	1 - Strongly Disagree	
19				The interest free nature of the finance from Salix influenced my organisation to take out a loan		
20				Would the introduction of a low-interest rate affect your organisation's decision to apply for Salix funding in the future?	Yes - we wouldn't apply for Salix funds again Yes - we'd look elsewhere for funds, but may still use Salix No - we'd still use Salix funds Don't know	
21				[For users of the recycling fund] Salix has recently enabled participant matched funding to be paid back over longer periods than scheme funding. How has this change affected your organisation's ability to engage with the scheme?	We've applied for funding for projects which previously didn't qualify We are in the process of identifying projects that meet the new criteria We have plenty of projects to implement that meet the previous criteria which we'll complete first The payback timescales haven't been relaxed sufficiently for us to apply We still won't apply, regardless of payback timescales Not aware of change Other, please specify	
22	What is the rate of deployment of energy efficiency projects and technologies, what explains this and does this			Is your organisation currently involved in, or have you considered being involved in, an Energy Performance Contract (EPC)?	No Yes - we considered an EPC but decided against it Yes - we are currently considering an EPC	

	differ for different participants?					
					Yes - we are currently in an EPC	
23	What strategies have been used to segment, target and reach different participants, and how effective have these been?	4.3	Process Evaluation	Are you accessing Salix funds in order to implement energy efficiency projects as part of an Energy Performance Contract?	Verbatim OE	
24				Do you receive regular updates from Salix, such as marketing communications or news items?	Yes	
					No	
					Don't know	
25				If yes, how do you receive these? What do you receive?	Verbatim OE	
26				If no, would you like to receive updates?	Verbatim OE	
27				Do you find these updates useful or not useful for keeping up to date with Salix?	Useful	
					Not useful	
					Don't know	
28				Why do you say that? Is there anything else you'd like to receive?	Verbatim	
29	What other mechanisms are being deployed and utilized to support the uptake of energy efficiency measures in the public sector outside of the scheme?	5.1	Process Evaluation	Are there any regulations, policies or incentives which are resulting in energy efficiency measures being installed by your organisation?	Yes	P/NP
					No	
					Don't know	
30				(if 'yes') What are they?	Verbatim OE	
31				(if 'yes') How have they affected your take-up of energy efficiency measures?	Verbatim OE	
32				Are there any regulations which are preventing your organisation implementing energy efficiency measures? (such as listed buildings)	Yes	
					No	
					Don't know	
33				(if 'yes') What are they?	Verbatim OE	
34				(if 'yes') How have they prevented your take-up of energy efficiency measures?	Verbatim OE	

Closing remarks

1	Closing Remarks	N/A	N/A	That covers all the questions I have today; many thanks for your time and help. Summary results will be published. If, having reviewed your responses, there is anything I need to clarify, would it be okay to re-contact you?	Yes	P/NP
					No	
2				Are you willing to participate in other aspects of this research project?	Yes	
					No	
3				Would you like to take our number or the Market Research Society Free-phone number in order to confirm who we are?	MRS: 0500 39 69 99	
					Winning Moves: 0121 285 3800	
4				Finally, would you like a copy of the privacy notice for this research?	If yes, ask for email address	

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