Department for
Business, Energy
& Industrial Strategy

# ELECTRICITY DEMAND REDUCTION (EDR) PILOT

## Final Evaluation Report

Presented to Parliament pursuant to Section 43(3) of the Energy Act 2013

BEIS Research Paper Number 2019/016

July 2019




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# Contents

# 1 Executive Summary

## 1.1 Context

Clean growth means growing the UK's national income, whilst cutting greenhouse gas emissions and ensuring affordable energy supplies for consumers and businesses[1]. In 2012 the Government introduced the Electricity Market Reform (EMR) in Great Britain (GB), to support investment in low carbon electricity, deliver future security of supply and ensure electricity is affordable for consumers. Introduction of the Capacity Market (CM) formed a substantial part of the reform, in addition to Contract for Difference (CfD) and the Electricity Demand Reduction (EDR) pilot, to test the viability of energy efficiency in the CM.

The EDR pilot was designed to mirror elements of the CM, and aimed to test whether projects delivering lasting electricity savings at peak could, in future, compete for revenue streams in the CM against generation, demand side response (DSR) and storage technologies. The second aim was to provide lessons for Government and wider stakeholders on the delivery of related schemes.

The pilot offered a financial incentive to organisations in GB to deliver lasting significant reductions in peak[2] electricity demand, through the installation of lasting energy efficiency measures such as more efficient lighting systems or more efficient electrical equipment.

EDR funding was awarded through competitive auctions with eligible participants bidding to qualify for a £/kW subsidy. The EDR pilot was delivered across two Phases with several changes made to encourage participation and reduce participant administration burden between Phases I and II. The Phase I auction awarded £1.28m funds for savings to be delivered across the 2015-16 winter peak period, and £4.74m was awarded for Phase II[3]. Across both Phases, the EDR pilot incentivised 22 organisations (comprising 31 projects) across the public and private sectors with the potential to deliver significant peak electricity demand reduction through energy efficiency projects. To ensure value for money and compliance with European State Aid requirements, the EDR pilot did not fund projects if they were already achieving an investment payback of less than two years.

## 1.2 Evaluation

An evaluation was delivered alongside the pilot, designed to address five high level questions (HLQs). HLQ1 through HLQ4 are typical BEIS evaluations questions while HLQ5 is specific to the EDR pilot evaluation and was designed to test the viability of an EDR like scheme in the CM.

- HLQ1: What outcomes can be attributed to the scheme and were they as intended?

[1] Clean Growth Strategy 2017; https://www.gov.uk/government/publications/clean-growth-strategy/clean-growth-strategy-executive-summary
[2] 4-8pm on weekdays, November-February.
[3] Participants did not receive additional funding if they over-delivered against projected savings nor for any savings made outside the winter peak.

- HLQ2: Through what levers and mechanisms has the scheme contributed to these outcomes? For whom and under what circumstances?
- HLQ3: Was the EDR pilot scheme cost-effective?
- HLQ4: Which aspects of the scheme's design and implementation account for the findings of HLQ2 and HLQ3?
- HLQ5: What can we conclude about the viability of EDR in the CM, and what lessons can we draw about any future electricity demand reduction scheme?

The approach to this evaluation employed a range of theory based and analytical techniques to conduct a process, impact and economic evaluation.

The evaluation has drawn upon evidence from a variety of sources, including:

- Telephone interviews with organisations that engaged with the scheme to differing extents, (e.g. organisations aware of the scheme but did not register, to those who delivered an EDR pilot funded project).
- Data provided by organisations through the scheme's online application portal.
- Interviews with members of the BEIS Operations and Policy team that managed the EDR pilot.
- A Wider Population Survey of 750 organisations, comparable in size and energy use to pilot participants.
- 15 interviews with a selection of firms offering aggregator services[4].
- A Cost Benefit Analysis (CBA) to assess if the scheme was cost effective.
- A literature review and interviews with policy makers in other countries to draw comparisons and recommendations from other international energy efficiency and demand reduction schemes.

The interviews and evaluation were delivered concurrently to the pilot and delivery of projects. This report represents the final evaluation findings and updates the interim evaluation report published last year[5]. The interim report covered all project and research activity conducted up to August 2016. The final report covers this and all activity conducted subsequently – including the final round of participant interviews, the Wider Population Survey, CBA and Capacity Market work.

## 1.3 Contribution

Participating organisations were asked about the extent to which their peak demand reduction projects – and the associated impacts – would have happened without support from the EDR

[4] Aggregator services defined as a third-party organisation that brings energy customers together with the objective of obtaining better prices, service, or other benefits when acquiring energy or energy efficiency related services.

[5] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/589835/EDR_Pilot_-_Interim_Evaluation_Findings_Report_Feb_2017.pdf

pilot. Where the programme had an effect, participants were also asked about the nature of this contribution.

Figure 1 below provides a per-project breakdown of the extent to which projects were deemed to be additional; the extent to which the electricity savings were attributable to the pilot.

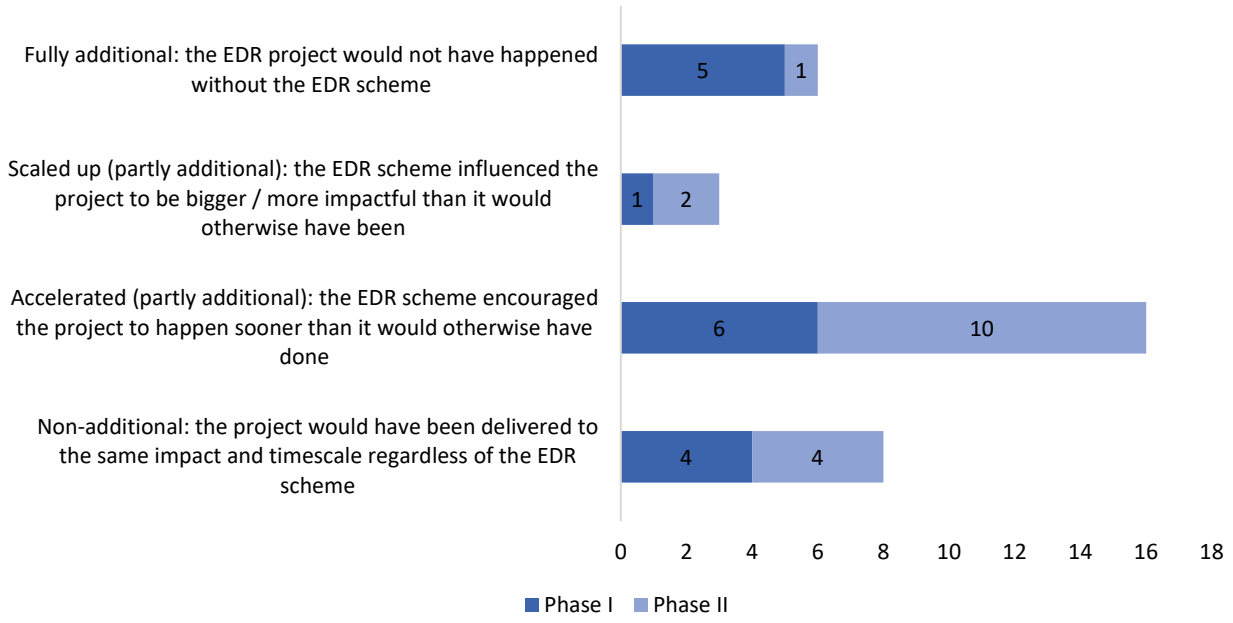


**Figure 1: Scheme contribution, assessing additionality of projects, from fully to non-additional (n=33 projects)**

In line with the published interim evaluation findings, in most cases (25 projects) the pilot had a positive influence in accelerating projects, which was an intended effect of the pilot, leading to the benefits of those projects being realised earlier than they otherwise would. Six projects were deemed to be fully additional (i.e. would not have happened without the EDR scheme), three projects were scaled up (i.e. bigger than they would otherwise have been), sixteen were accelerated (i.e. EDR funding helped the project to happen sooner) and eight would have been implemented anyway (i.e. non additional).

The main driver for all participants to engage with and persist with the pilot was financial although reputational reasons were commonly cited (i.e. emphasising the importance of the project internally or demonstrating organisational commitment to 'energy-saving' goals). The evaluation found that the EDR pilot design, whilst dissuading non-additional projects, may have also made it difficult for organisation to develop new, fully additional projects. Potential participant interviews found that this was due to a number of factors: the limited time for applications to be made (so reducing the likelihood of organisations designing projects from scratch); being a pilot rather than an enduring mechanism that organisations could prepare for; low funding amounts as a percentage of total cost (again meaning participating organisations tended to put low-risk, easily justifiable projects through the scheme); and the challenging process and data requirements for participation in the scheme (meaning most organisations did not think the rewards justified the costs).

## 1.4 Scheme participation and bidding

Overall, 22 participants (not to be confused with projects) to date have progressed through the scheme (19% of those submitting applications).

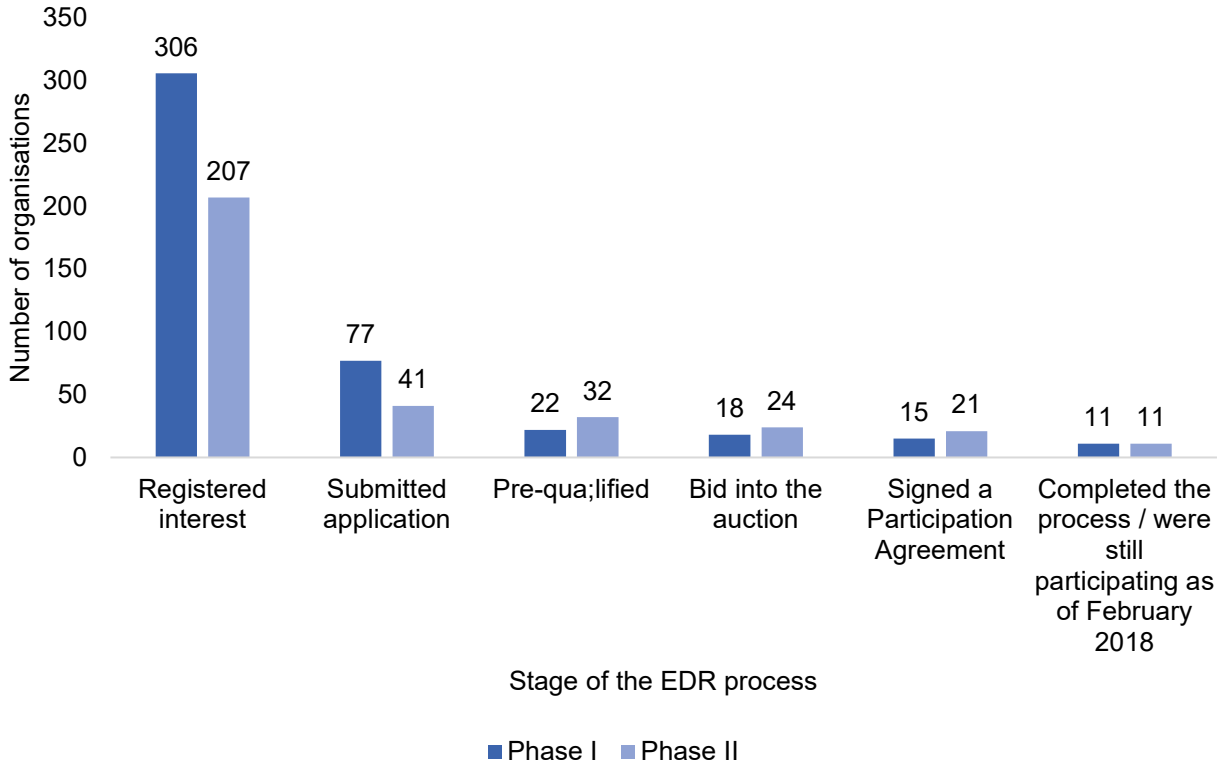


**Figure 2: Numbers of participants at key stages of the EDR scheme process**

In response to early evaluation findings a number of changes were made between Phases I and II in order to encourage participation and broaden the range of projects, including reducing the minimum size project to 50kW rather than 100kW, giving greater support to organisations to help them through the process, increasing flexibility on amending projects post-application, and reducing the administrative burden of scheme participation.

The changes were welcomed by Phase II applicants, especially those that had first-hand experience of Phase I[6]. In addition, Phase II saw reduced withdrawals and greater conversion from registering interest to full participation (11 from 207) than Phase I (11 from 306).

However, Phase II also saw a reduced number of registrations and applications (41 applications in Phase II versus 77 in Phase I), and did not provide much innovation with the vast majority[7] continuing to be LED lighting projects. Some organisations had already been 'put off' by their previous experience with Phase I (in terms of resource vs reward) and did not explore Phase II at all. For others, the changes were felt to be in the right direction although for most organisations or projects the changes did not go far enough in the risk vs reward calculation. The process was still perceived to be too onerous and the eligibility requirements were still considered to be too large for some. In addition, the application process still required a detailed formulation of the project a few months after expression of interest to replicate the

[6] Around one third of organisations expressing interest in Phase II also expressed interest in Phase I and four organisations had projects delivered in both phases.
[7] All successful projects were lighting, apart from part of a completed project, which included motors.

level of detail that might be expected for a CM project. Overall, while the changes did lead to significantly increased capacity being successful at auction and more aggregation, they do not appear to have had the desired effect of encouraging more – or at least a greater technological diversity – of applications.

## 1.5 Factors driving participation

No one factor was 'sufficient' for participation. Instead, analysis of organisations delivering projects across both phases (compared to those who chose not to apply or dropped out) highlighted a combination of often **interdependent** factors, all of which seemed to be 'necessary', though not sufficient, for full participation. These were:

- Having a project at some stage of development when first hearing about the scheme.
- Being able to fit the project within the EDR pilot's timescales.
- Being able to secure – or already having – a dedicated resource for the project.
- The organisation having a stated strategic commitment to energy efficiency.
- The organisation possessing a team or individual with the willingness to spend the required time and resource on the scheme[8].

Commensurately, non-participants pointed to one or more of the following barriers:

- A limited time to formulate a project for application (versus say a longer or rolling window).
- Too much complexity in the application process (which meant either a lack of understanding or the organisation feeling it wasn't worth the effort in trying to understand the process given the reward). The implication from respondents was that although the auction was never the key reason for withdrawal, it did add to a perception of the process as complex and risky.

There were a number of organisations that possess some of the same attributes listed above but did not fully participate or even apply. The key differences between non-participating organisations and full participants was that the latter had the full combination of factors listed above.

Aggregators are brokers who would act on behalf of a group of customers to help offer economies of scale to potential participants as they could draw together individual projects that, on their own, would not be eligible. Aggregators can reduce administrative burden for both participants and scheme administrators. Five aggregators participated – one in Phase I and four in Phase II.

Some aggregators saw the scheme as a potential business opportunity in further incentivising project ideas for clients, while many struggled to see a clear business case for the time required compared to the rewards. Additionally, certain scheme rules – challenging timetables and requirement for a degree of certainty on savings – were not viewed as conducive to client

[8] This factor was more difficult to detect as it came from fully participating respondents speculating as to how they or their organisation differed from those who did not fully participate. It was not – and would be difficult to – corroborate from the views of those who did not fully participate.

recruitment (especially in Phase I). Phase II reduced hurdles on project size and certainty, giving aggregators more time to plan a project and gather clients for Phase II. While Phase I saw similar aggregator interest to Phase II, more aggregators progressed to participation in Phase II and with much larger projects.

## 1.6 Impact of the EDR pilot

The total additional winter peak kW reduction delivered through projects supported by the EDR pilot was 2,162 kW in Phase I and 1,845 kW at time of writing in Winter 16-17 of Phase II[9] (within the context of a GB-wide winter peak demand of approximately 53GW). This only includes savings that were directly attributable to the EDR pilot and is based on the projects that were delivered on time. For Phase I, this is 48% of the 4,518 kW initially contracted in the auction. For Phase II's winter 16-17 projects, this is 17% of the contracted 10,559 kW; Phase II's winter 17-18 projects were still delivering at the time of writing. The difference is due to projects being cancelled, delivered differently than originally planned or projects not being attributable to the EDR pilot (and so would have happened even without the incentive from the EDR pilot).

For both participants and society at large, the EDR pilot was cost effective with a positive net present value (NPV).

## 1.7 Key lessons learned

### 1.7.1 Evaluation Findings

Findings from the evaluation have provided a number of lessons learnt in relation to the design of the EDR pilot.

**Calculations of cost versus reward.** Those that either did not participate or dropped out after expressing interest usually stated that the perceived level of effort of participation outweighed the limited reward. Whilst complexity was somewhat reduced for Phase II, participants continued to comment that the scheme had required a substantial time investment.

**Limited time for applying.** One of the key factors in organisations choosing not to participate was the limited window available to express interest and apply for the EDR pilot as well as that there were only two such windows. The scheme set out some rigidity for rules and deadlines which discouraged some potential applicants and proved to be difficult to administer in practice. This suggests that the scheme would still need to fit in with decision making cycles in terms of timing of application. Giving a longer lead time – and guaranteeing year-on-year funding – could give organisations the space (and certainty) to develop projects, and potentially more ambitious projects, involving technologies other than lighting.

**Financial mechanisms to encourage action.** Financial mechanisms (such as the auction format or payment timelines) were rarely an organisation's main basis for non-participation. While an incentive such as grant funding or loans (instead of an auction format) may still require a competitive process against specific eligibility criteria, this approach was generally viewed by potential participants as much more straightforward.

[9] With GB-wide winter peak demand of approximately 53GW.

**Aggregators may be key to unlocking energy efficiency potential at scale.** Aggregators could reduce the administrative burden, build portfolios with smaller energy saving projects and lower the risks of more innovative projects by packaging them with less risky projects.

### 1.7.2 Viability in the Capacity Market

As currently designed, it is unlikely EDR would be viable in the GB CM. The pilot had low participation; introducing EDR into the CM would likely exacerbate many of the issues participants and potential participants had with the EDR pilot.

- The CM, including DSR transitional arrangements, had significantly lower clearing prices and a lower maximum bid than the EDR pilot auctions (although the differences in eligibility criteria between the two mean that the numbers are not directly comparable). While the EDR pilot's maximum bid of £300/kW was designed to replicate the maximum CM bid (£75/kW) over four years (as energy efficiency would operate multiple years in a row and therefore could, in theory, have competed for multiple years of CM funding), bidding closer to the maximum was much more likely to be successful in the EDR pilot than in the CM. The 2014 T-4 CM auction had a clearing price of £19.40 kW/year and the 2016 T-4 auction cleared at £22.50 kW/year. More recently, the 2018 T-4 CM auction cleared at a record low price of £8.40/kW. Both EDR pilot auctions in 2015 and 2016 (which were "pay as bid" rather than "pay as clear") had weighted average prices in excess of £200/kW, although in the second auction there was a bid that received £48/kW. Even with four years of eligibility, bids seen in the EDR auctions would not have been competitive in the CM. Furthermore, many EDR pilot participants commented that the scheme covered a very small amount of their project costs and they would not have participated at lower £/kW levels.

- There are international markets where permanent energy efficiency competes in capacity markets (mainly PJM[10] and ISO New England[11] transmission networks in the U.S.). In these regions, subsidy from capacity markets is not the main funding source, but rather a supplementary revenue stream for their schemes. In addition, both ISO-NE and PJM have legal obligations that require energy suppliers to invest in energy efficiency (as does the UK through schemes such as the Energy Company Obligation (ECO)). It is possible EDR participation could be higher (or required £/kW levels lower) if participants were able to access multiple sources of revenue. But participation of EDR in the GB CM would also need to consider the State Aid regime. Under the State Aid regime, support to EDR projects would be capped at a set level to avoid over-cumulation of aid (the CM counts as aid).

- It is clear that there are examples of where energy efficiency represents a resource to help ensure secure energy supplies and can be delivered through competitive markets. However, significant changes to the current EDR pilot design or the CM would be needed before lasting energy efficiency (EDR) could viably compete in the GB CM. Given the low likelihood of EDR winning agreements in the CM at the prices observed in the pilot, it therefore appears that it would not be the right time for EDR to enter the main CM.

- Given the results of our evaluation and research into international schemes, EDR would be more likely to come forward if energy efficiency projects can leverage multiple sources of funding to enable energy efficiency to compete with generation, DSR and

[10] https://www.pjm.com/
[11] https://www.iso-ne.com/

storage to reduce future capacity requirements. In doing so, it could reduce transaction costs through economies of scale and implement more cost-effective measurement and verification systems. In that context, BEIS launched in March 2019 a competition that makes available £6M of funding for innovative solutions that reduce transaction costs and encourage the take up of energy efficiency by SMEs.

- There was also low participation in the EDR pilot due to several reasons. The risk of facing penalties, the complexity of the auction processes and difficulties with metering were cited as reasons for non-participation; all of which would need to be considered if bidding into the CM.

# 2 Context and background

## 2.1 Context

Clean growth means growing the UK's national income, whilst cutting greenhouse gas emissions and ensuring affordable energy supplies for consumers and businesses[12]. In 2012 the Government introduced the Electricity Market Reform (EMR) in Great Britain, to support investment in low carbon electricity, deliver future security of supply and ensure electricity is affordable for consumers. The EMR included the introduction of the following mechanisms to the GB electricity markets:

- A **Capacity Market**[13] (CM) ensures security of supply by providing revenue certainty for generation and demand reduction at the least cost to consumers using an auction format.
- The **Contracts for Difference**[14] scheme provides investment certainty for low carbon energy sources.
- The **Electricity Demand Reduction** (EDR) pilot to provide funding for energy efficiency projects that would reduce peak demand.

## 2.2 Pilot design

The EDR pilot was set up to test two objectives:

1. To determine the viability of EDR in the CM, and whether it could compete effectively and,
2. To generate wider lessons for related policies.

It was not known if energy efficiency could compete in the CM and so EDR was procured separately as a pilot programme. The pilot was designed to mirror some aspects of the CM, such as procuring lasting demand reduction through a competitive auction. Organisations bid their projects into the scheme to qualify for a £/kW subsidy, and committed to delivering electricity demand reduction during the winter peak, to contribute to security of supply.

### 2.2.1 EDR pilot and the Capacity Market

One of the aims of the evaluation was to draw conclusions on the viability of lasting energy efficiency projects in the CM and if they could compete with generation, demand side response and storage. While energy efficiency participates in capacity markets elsewhere in the world (such as the PJM15 and ISO New England16 CMs in the USA); there was uncertainty as to how energy efficiency might fit into GB's technology-neutral, competitively allocated CM. The

[12] Clean Growth Strategy 2017; https://www.gov.uk/government/publications/clean-growth-strategy/clean-growth-strategy-executive-summary
[13] https://www.gov.uk/government/collections/electricity-market-reform-capacity-market
[14] https://www.gov.uk/government/publications/contracts-for-difference/contract-for-difference
[15] More information available at: http://www.pjm.com/markets-and-operations/rpm.aspx
[16] More information available at: https://www.iso-ne.com/markets-operations/markets/forward-capacity-market/

EDR pilot was therefore established as a separate pilot programme to test aspects of the CM including the following:

- **Competitive auction**. Participating organisations bid for a £/kW saving through a competitive auction process. The CM has a price cap of £75/kW[17], however, as energy efficiency projects provide lasting savings and the EDR Budget needed to be spent within a relatively short window, the EDR pilot had a maximum of £300/kW[18] (assuming technologies deliver savings for at least four years).
- **Peak savings**. Savings bid for at auction had to be achieved during peak times (Monday-Friday, 4-8pm, November to February, excluding Bank Holidays), to contribute to security of supply.
- **Aggregators**. As in the CM, aggregator organisations were permitted to compete in the auction.

However, there were also a number of differences to bear in mind:

- **Yearly vs. one time payments**. The EDR pilot provided a one-time incentive payment, while CM assets can bid multiple years in a row (though no guarantee of success with clearing price fluctuation), or indeed for new and refurbishing generation capacity, there is the option to bid to secure longer term payments.
- **Technology**. The CM is technology neutral while the EDR pilot was for electricity efficiency measures that would deliver a lasting electricity reduction (it did not allow generation or demand side response (as well as access to the main CM auction, DSR was also targeted directly with support through two transitional arrangement CM auctions) to participate).
- **Metering vs deemed savings**. The CM mandates that all participating units are metered using devices with appropriate accuracy; the EDR pilot required metering for some measures but also provided deemed calculations for more common equipment (partly to test whether such an approach would be suitable in any enduring regime).
- **Additionality**. The pilot aimed to stimulate electricity savings that otherwise would not have occurred, to this end all EDR projects had to have a payback longer than two years.
- **Clearing prices**. Successful EDR bidders received the price they bid, while in the CM the auction clearing price was the same for all successful bidders. The maximum bid allowed in the EDR pilot was £300/kW, the maximum CM bid was £75/kW/year.

The evaluation was designed to provide evidence of the impact of each of these policy levers on the take up of funding offered to promote improvement in electricity efficiency.

### 2.2.2 Pilot process

Figure 3 provides an overview of the pilot scheme process:

[17]For clearing prices, see: https://www.ofgem.gov.uk/system/files/docs/2018/08/20180802_annual_report_on_the_operation_of_cm_2017-18_final.pdf

[18] The maximum auction price was calculated based on the assumption that energy efficiency projects would generate at least four years' worth of savings (£75/kW x 4).

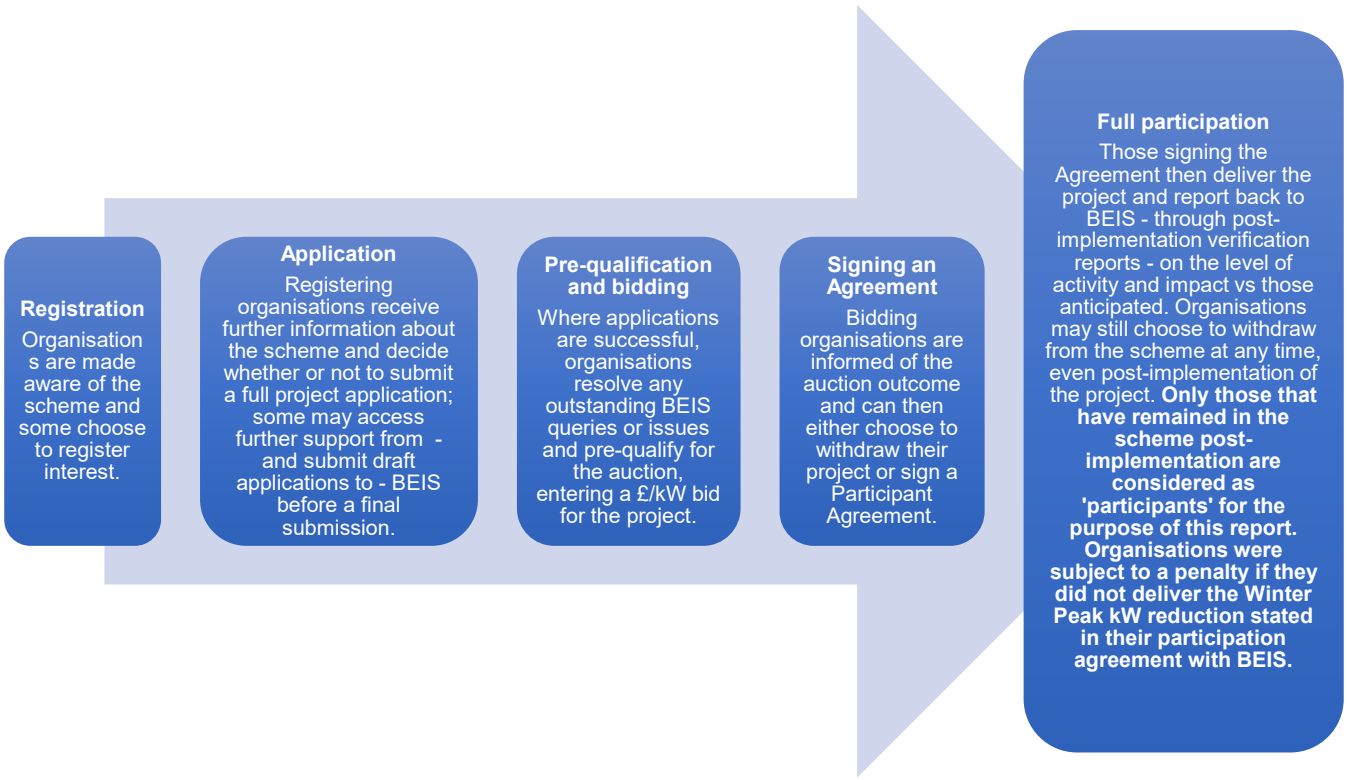


**Figure 3: Pilot scheme process**

As part of the pilot process, participants were required to submit the following main reports:

- Measurement and Verification (M&V) Plan. This included details on the proposed and existing equipment and calculated expected peak savings. Estimated peak savings were calculated using deemed savings calculations[19] or through electricity meters to directly measure consumption[20].
- Operational verification. This provided evidence that equipment had been installed and was operational.
- Winter Capacity Savings Report (WCSR). This reports the savings from the equipment after it was actually installed.
- Final report. This is a wrap-up document that reports on non-energy benefits and the scheme's time requirements.

The pilot was delivered across two Phases. The Phase I auction was run in January 2015 awarding funds for projects installed before, and delivering savings across the 2015-16 winter peak period. The Phase II auction was run in January 2016 and awarded funds for inter peak savings for projects in which the technology could be installed before either the 2016-17 or 2017-18 winter peak periods. In response to stakeholder feedback and early evaluation findings, a number of key changes were introduced before launching Phase II to encourage greater participation:

The required peak demand reduction per project was reduced from 100kW to 50kW.

[19] 'Deemed savings' use savings calculation methodology from BEIS provided calculation spreadsheets.
[20] Only one participant still delivering has installed meters for part of the project.

- Organisations could choose to implement their project two years after their application rather than having to deliver in the winter period immediately after a successful auction outcome.
- Additional BEIS support was provided during the application stage of the process, including reviewing and assessing applications prior to formal submission.
- Up to 40% of promised kW impacts could remain unspecified when applying for the auction, enabling changes to sites and technologies being proposed.
- Evidence requirements were simplified.
- A more up-front payment schedule was implemented, with the first 20% of the funds being paid on projects once technology installation was demonstrated.

For any projects in both Phases that did not deliver the contracted kW savings, the total payment to the organisations in question reduces 2% for each 1% below the contracted capacity.

More information on the scheme – including the detailed process and rules governing participation – can be found here: https://www.gov.uk/guidance/electricity-demand-reduction-pilot.

## 2.3 The evaluation

This is an independent evaluation of the EDR pilot, conducted for the Department for Business Energy and Industrial Strategy (BEIS) by DNV GL in partnership with Databuild and CAG. An interim evaluation report was published in February 2017[21]. The interim report covered all project and research activity conducted up to August 2016. The final report covers this and all activity conducted subsequently – including the final round of participant interviews, the Wider Population Survey, CBA and Capacity Market work.

### 2.3.1 Objectives

The evaluation was commissioned to satisfy the aims of the pilot and to address five high-level questions (HLQs) and a number of more specific Evaluation Questions (EQs) that sit under these (see Appendix 3), addressed throughout this report:

- HLQ1: What outcomes can be attributed to the scheme and were they as intended?
- HLQ2: Through what levers and mechanisms has the scheme contributed to these outcomes? For whom and under what circumstances?
- HLQ3: Was the EDR pilot scheme cost-effective?
- HLQ4: Which aspects of the scheme's design and implementation account for the findings of HLQ2 and HLQ3?
- HLQ5: What can we conclude about the viability of EDR in the CM, and what lessons can we draw about any future electricity demand reduction scheme?

[21] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/589835/EDR_Pilot_-_Interim_Evaluation_Findings_Report_Feb_2017.pdf

The overall hypothesised Theory of Change was that organisations motivated by financial support, reputation / CSR, BEIS relations and / or environmental goals would choose to participate in the EDR scheme with projects that are larger, accelerated and / or would not have happened at all without the EDR scheme.

### 2.3.2 Overall approach

The evaluation has been conducted alongside the pilot delivery, drawing upon evidence from a variety of sources, including:

- 587 telephone interviews with organisations that have engaged, to varying degrees, with the EDR pilot and data provided by organisations through the scheme's online application portal. Appendix 5 provides further detail on the number of interviews and surveys that were undertaken.
- Five interviews with members of the BEIS Operations and Policy team that managed the delivery of the EDR pilot across phases I and II (autumn 2016 and winter 2017/8).
- The Wider Population Survey; a survey of 750 organisations that were potentially within the target audience for the EDR pilot, comparable in energy use and size to pilot participants, but who did not fully participate in the EDR scheme. The survey was conducted across July – September 2017.
- Fifteen interviews with a selection of firms offering aggregator services[22]. The sample was purposeful, with contacts being selected from a variety of sources, including Ofgem's aggregator list and suggestions from BEIS's stakeholders.
- A Cost Benefit Analysis (CBA) to assess if participation in the EDR pilot resulted in a net financial benefit for individual participants as well as to determine whether the total benefits unlocked by the pilot outweighed the costs of running the pilot.
- A literature review and interviews with policy makers in other countries to draw comparisons and recommendations from other international energy efficiency and demand reduction schemes.

The evaluation combines several theoretical and analytical approaches to provide credible evidence as to whether, how, and why the scheme influenced organisation behaviour. A range of techniques have been implemented – including Qualitative Comparative Analysis (QCA)[23] and contribution tracing[24] – as part of an approach informed by realist evaluation principles[25]. See the appendices 9 and 10 for further details on the implementation of these approaches.

The evaluation was delivered concurrently with the pilot implementation; this report represents final findings derived from the research activities as outlined above.

[22] Third-party organisation who bring energy customers together with the objective of obtaining better prices, service, or other benefits when acquiring energy or energy efficiency related services.
[23] Which compares outcomes and conditions to discern correlations between them and therefore draws inferences about how the conditions affect the outcomes.
[24] A project-by-project examination, assessing per case 'clues' we would expect or not expect to see if the EDR scheme was having the desired impact.
[25] As per Tilley & Pawson (1997): https://uk.sagepub.com/en-gb/eur/realistic-evaluation/book205276

### 2.3.3 Limitations

These findings should be reviewed with the following limitations in mind.

An almost complete census of full participants was gained, as well as good representation of those at other stages of the process. However, some samples were small and therefore findings regarding these groups or the scheme in general are more difficult to extrapolate or generalise to the wider population, albeit separate research was conducted with the wider population through the WPS to provide insight on action and behaviours outside the participants. That said, the overall evaluation findings and theory (e.g. in the Theoretical Framework and Context Mechanisms and Outcomes) can be made generic in similar circumstances.

- Each interview was conducted with one individual, generally the named contact on EDR forms. In the few cases where the original applicant had left the organisation, the best placed person within the organisation was interviewed. This meant that some information was not always available to the new contact (e.g. early decision making in relation to the pilot). However, in most cases the respondent was able to answer most questions.
- Information provided in interviews was (by definition) self-reported and therefore may be subject to some personal bias. Use of other primary and secondary sources sought to ensure a range of sources to triangulate and validate this.
- The majority of participants across phases 1 and 2 used deemed spreadsheets to estimate savings, however the accuracy of these calculations was not addressed by this evaluation.
- Whilst aggregators were interviewed (some at varying stages of the EDR evaluation and some as part of the separate aggregator research), their clients were not, so their views on attribution, satisfaction with (or even knowledge of) the process, and wider benefits were not captured.
- As the participating EDR projects almost entirely comprised of lighting measures, this made certain comparative analysis and conclusions around types of action on other energy measures much more limited. There was far less diversity between participating projects than originally expected.
- At the time of writing five organisations were still delivering winter 2017-18 projects, meaning the final kW impacts of these projects have not been confirmed, and their projects have not been included in the cost benefit analysis.

### 2.3.4 Report Structure

This report draws upon the evidence in the different components of the evaluation (described above) to most comprehensively answer the evaluation HLQs and EQs.

**Section 3** comprises the achieved outcomes and attribution of those that participated in the EDR pilot, feeding into a cost-benefit assessment of the EDR pilot.

**Section 4** summarises some of the key findings of the Wider Population Survey, exploring EDR pilot target audience profile and their eligibility and propensity to participate in EDR (or an energy efficiency scheme).

**Section 5** explores the similarities and differences between the EDR pilot and the GB C M and whether EDR could fit into the CM.

**Section 6** provides key conclusions on the scheme and summary answers to the HLQs and EQs that form the basis of the evaluation.

More information and evidence underpinning the findings can be found in the appendix to the report.

# 3 The EDR pilot impact and contribution

This section provides findings on the impact of the EDR pilot (in terms of both kW reduction and wider benefits), contribution (how the EDR pilot influenced the projects taken through the scheme), and resource and costs for participants. It also discusses the factors that were important to organisations choosing to participate in the scheme (from self-reported and wider evidence).

## 3.1 Key participation characteristics


**Figure 4: Key characteristics of all 22 pilot participants across both phases**

## 3.2 Scheme contribution: how, who and to what extent?

This section explores in greater detail the extent to which – and how – the scheme influenced the projects and observed outcomes. It also explores the underlying reasons for this i.e. why the scheme influenced some organisations in different ways to others. This was conducted

through a mixture of typical qualitative analysis of participant and non-participant responses on motivations and the influence of the EDR pilot, as well as more structured realist evaluation of the core theory (as outlined in the executive summary) both these responses and wider profile variables. Scheme influence was explored with organisations that signed a participant agreement and delivered a project. Analysis undertaken is described in more detail in the appendices.

### 3.2.1 Extent of impact

Two analytical approaches - QCA and process tracing - were used to assess the evidence provided by participants (both through interviews and scheme data) to triangulate evidence and ensure a systematic, robust way of analysing the data to explore scheme participation and influence. Process tracing was used to assess scheme contribution whilst QCA was particularly focused on the factors that affected participation or non-participation.

Figure 4 provides a per-project breakdown of the extent to which pilot projects were deemed to be attributable to the scheme as a result of process tracing analysis.

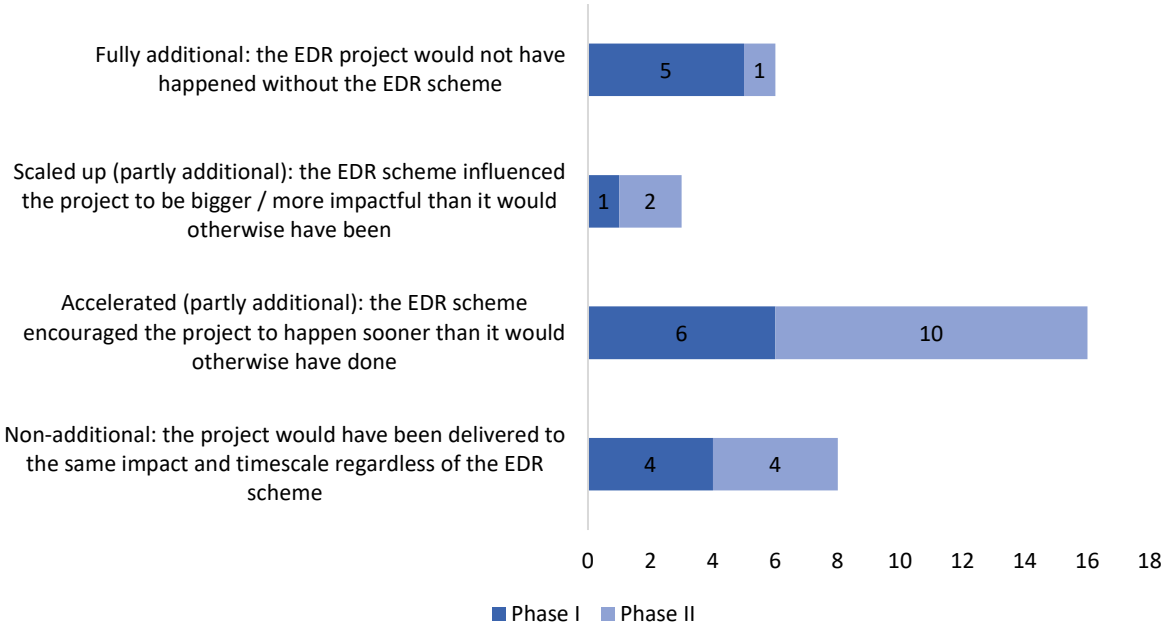


**Figure 5: Scheme contribution, assessing additionality of projects, from fully to non-additional (n=33 projects)**

Figure 5 shows most participants reported that the pilot scheme sped up implementation (i.e. time-shifted impact) rather than generated impact where none would otherwise have been realised. This acceleration of projects and impacts was an intended effect of the scheme. However, it was also common for participants to feel that they would have implemented their project within a couple of years outside the scheme.

## 3.3 Exploring attribution levels

### 3.3.1 Additional: the project would not have happened at all without EDR support

For the respondents reporting that a project would not have gone ahead without the scheme, all reported that the financial support was necessary to secure backing for the project. Whilst the contribution to overall project cost was not necessarily substantial, the funding did help tip the balance in terms of required rate of return and / or assurance regarding the business case. All stated that they needed the money to allow the project to progress and that by implication this could not be obtained through another source, even if they waited until the next budget year. All also had organisational rules on payback which meant that unless they could bring in financial support and reduce the payback of the project, they could not progress with it.

Two participants with fully attributable projects were aggregators, indicating the value of the scheme to organisations with potentially smaller internal reserves and the need to persuade external third parties to sign up to a project:

> "EDR was very crucial at the time of closing the deal, because the majority of the clients were worried about outlay."

The three main barriers to the EDR pilot enabling truly additional projects were limitations of the scheme process itself:

1. **Time available**: several participant organisations – and many non-participants – reported that they would not have had time in the scheme timeframe to design a new project from scratch. Only two organisations put entirely new projects into the scheme, neither led to full participation. The other potential effect of the scheme timeframe was organisations applying for (relatively) straightforward LED lighting projects, which they were commensurately likely to feel would have happened anyway to some degree.

2. **Funding amount**: Many participants reported that the amount received was useful but not substantial enough to be decisive in whether a project was implemented or not. Where they could estimate, most participants felt that the EDR pilot had probably contributed to somewhere between 10-15% of total project costs though some said the contribution was as little as 3%. This reduced the likelihood of respondents applying with complex or costly technologies that they would otherwise not progress and would have been more likely to be additional.

3. **Level of challenge**: Most organisations across both Phases – even those using specialist external consultants – found the process, data requirements, and format (both the forms and auction) challenging. As discussed later in this section, it seems likely that the scheme predominantly engaged those organisations already active on energy efficiency in a number of ways (existing project, dedicated resources etc.), but was conversely off-putting to organisations with minimal expertise or resources, for whom support may have been more important and impactful.

### 3.3.2 Scaled-up: project was made larger or more ambitious for the EDR pilot

Within the EDR pilot there were three fully participating projects[26] where the organisations reported that participation in the EDR pilot had led them to make their projects more impactful.

[26] There were also three projects which did not ultimately go ahead for which the EDR had made the planned project 'better', through consideration of different technologies or a different type of the same technology.

This was through including more buildings or sites in the project, as the additional funding supported this, or bringing more specific site projects within required rate of return:

> "There was a positive impact of EDR in widening the scope of the project. We had done some initial investigation and the [return on investment] had been large on some sites that we had parked previously."

These projects were multi-site, often with similar sites (enabling them to add more relatively easily) and were deemed lighting projects. This suggests that making a project more impactful is most easily done when the organisation has a project that can be easily enhanced, replicated and involves technology whereby the added impacts can be relatively quickly calculated. The EDR pilot also helped to enhance some projects because the requirement to achieve a certain level of kW savings at Winter Peak meant that several organisations had to bring additional sites into their applications when the original composition was for whatever reason not eligible or feasible.

The same limitations of scheme design as discussed for the top level of attribution were also likely in effect here. Organisations may – with increased time or incentive – have been able or willing to enhance the scale or ambition of their projects in terms of both size and technology. One respondent commented that they had not been aware of the technology they installed until this was investigated as part of the EDR pilot.

The scheme also required significant changes to be made to the majority of projects that went through the pilot; however, such requirements usually led participants to reduce proposed project scope and impact – such influence did not necessarily translate to additional demand reductions.

### 3.3.3 Accelerated: the project happened sooner than it would have without the EDR pilot

For the 'accelerated project' group, the scheme accelerated either the whole projects' completion date or at least the rate of implementation e.g. the number of individual sites on which action was happening at any time:

"It kind of brought the timescales a lot tighter, whereby we were trying to do 30-odd sites in a few months as opposed to over a period of time."

The EDR pilot accelerated projects in three ways:

1. Through the funding **bringing a project (or specific sites) within required rates of return**: in these cases, respondents were often unsure as to whether they would otherwise have sought out alternative external funding, waited for increased allocation of internal funding (e.g. a new budget round), waited for technology costs to reduce or whether decision makers would ultimately have relented on the rate of return. The difference was usually fairly marginal (less than half a year improvement due to EDR funding). The scheme exerted this type of influence where organisations had very strict rules around rate of return (so even a small improvement to 'jump the hurdle' was important), and no additional internal budget to allocate to energy efficiency projects.
2. **Moving projects 'up the priority list'** even where they were within organisational rates of return, either through the funding making the project payback more attractive or giving it increased profile or endorsement through 'Government backing'. The scheme being time limited increased the urgency for approval. This type of influence

seemed to occur within organisations that had: a) relatively small budgets for energy efficiency activity or a pot for all types of activity for which energy projects had to compete with other areas of the organisation; b) an internal energy manager or team that were fairly new or peripheral, and felt the need to boost the internal recognition of and focus upon energy efficiency opportunities more generally; c) an organisation that has formal or informal objectives around being seen to engage with Government, whereby the EDR pilot would attract the attention and support of decision makers to projects.

3. By **forcing the project to be delivered within a certain timeframe** (to qualify for funding). Some respondents felt both internal and external stakeholders could be influenced more powerfully to meet milestone deadlines and ensure delivery:

"[It] put pressure on project teams. We can respond to delays / issues by saying 'we need to do this now because this is tied to funding and there is a time scale on it…it's going to have to be done so you're going to have to sort it out'."

These respondents felt that without the EDR pilot's influence there could have been slippage due to reduced impetus and pressure to deliver:

> "We didn't develop the project for EDR – we already knew we needed LED lights in the warehouse – but it wasn't a totally independent project either. The timelines helped keep the suppliers and contractors 'in line' and on time. It also helped us meet our return on investment goals."

One third of accelerated projects would – according to respondents – have been implemented within the next twelve months anyway; for another third, the project would have been implemented between one and three years later. For the remaining third, respondents could not predict the likely delivery point of the project in the absence of the scheme. For some, especially the latter group, there is a degree of supposition on their part that they would have found 'another way' to part-fund the project and / or make the case to decision makers or decision makers would have relented. Especially where respondents reported that the project concept had been around for some time, these would potentially not have happened at all unless other unforeseen circumstances necessitated it.

### 3.3.4 Non-additional: the project would have gone forward in the exact same manner, regardless of the EDR pilot's support

There were eight projects where the contact reported that they would have delivered the project an identical level and type of action, and within the same timescales, without the scheme. In these cases, they had viewed the scheme as funding for something they were planning to do anyway and none had found the process to be too onerous (all were proposing lighting replacement). Three of the organisations were aggregators with a number of projects ready to put into the scheme and extensive experience of delivering these types of projects and bidding for funding. One had already successfully bid into – and then withdrawn from (due to timings) – Phase I, so they already had a project ready to go.

A larger group of organisations did not progress to full participation (i.e. dropped out or withdrew), but essentially viewed the scheme as additional funding for action that would be happening anyway. In these cases, the project was already approved internally, sometimes driven by wider considerations than energy (e.g. health and safety). These organisations often decided the reputational and financial benefits of continuing to participate did not outweigh the administrative costs and effort.

### 3.3.5 Influence beyond EDR pilot participants

The evaluation identified six cases where projects initially participating but ultimately taken forward outside of the scheme were reported to have been influenced by the EDR pilot:

- For three projects, the scheme improved the business case for the project. In one case, this was through indicating Government support for the project. In another, the scheme reminded the organisation to emphasise the increased cost of – and so savings from – peak electricity use. In the third case, information gathered for the EDR application was useful for a subsequent energy efficiency programme bid:

  > "We'd effectively done all the work and were very confident that the numbers were right and it would pay back."

- For two projects, the scheme encouraged the organisation to explore a type of project that they would not previously have considered: in one case lighting in a car park and in another motors for pumps and fans in the organisation's building.

- In one case the EDR pilot was reported to have accelerated the project by encouraging the organisation to gather data necessary for assessment of whether or not to implement their project.

Respondents could not assess the peak demand reduction arising from these projects, as peak demand reduction had not been their main motivation. The impact tables in this report therefore do not include these non-funded (but somewhat attributed) project impacts.

Several non-participant organisations were not successful in getting EDR pilot funding and said that their project had been slower or smaller in scale (so likely not EDR pilot eligible)– or not taken forward at all – because of this. This indicates the importance of the scheme to the success of their project.

## 3.4 Explaining full participation: success factors

The sections above highlighted a number of hurdles for organisations to overcome in order to fully participate. QCA found no one factor that was 'sufficient' for participation. Instead, analysis highlights a combination of often interdependent factors, all of which seem to be 'necessary' for full participation. Overall, the scheme seemed to work for those organisations that met the following characteristics:

### 3.4.1 Having a project idea at the outset

All organisations that fully participated had developed the project to some degree prior to finding out about the scheme. Whether organisations had such an appropriate project was in part simply a matter of chance.

However, this factor is not sufficient to explain full participation. First, evidence from the Wider Population Survey indicates that a large number of organisations have been installing energy efficiency measures in the last few years (see Section 3). Secondly, potentially participating projects were at a range of stages, from fully designed and costed, to early formulation. There remained substantial work to put a project into the scheme process, and the value of the scheme often lay in getting this work to happen more quickly or when it would not otherwise have happened.

Some organisations progressed to some degree in the scheme without having a pre-existing project, albeit none of these organisations fully participated. All such projects were either rejected at application review or withdrawn because the organisation anticipated rejection of the application (generally due to either being underdeveloped or due to revised kW savings calculations that were no longer eligible for scheme participation). These same organisations did not have significant senior level involvement.

### 3.4.2 Alignment with the EDR pilot's timescales

By definition, all organisations taking a project through the full scheme process met the EDR pilot's timescales. However, they were better placed to do so when they had not only a project concept, but also one that required relatively minimal work to fit within the requirements of the scheme.

For many organisations there was insufficient time between finding out about the EDR and having to apply; few organisations had a project ready to input and ability to commit resource at short notice. Timescales were still tight for some organisations that had to provide few clarifications on their application. Organisations were also better placed to comply with timescales where they were willing to invest sufficient resource; i.e. where the perceived benefits of participation outweighed the costs.

Timescales were less likely to adversely affect participation where the lead contact or team enjoyed sufficient autonomy to progress to some degree with the scheme outside of director sign off. This was especially true for dedicated energy teams that explore opportunities like the EDR pilot as part of their day-to-day role.

Organisations without projects in the pipeline or less flexible procedures need time to allocate capital and projects for certain financial years, so need more notice than the EDR pilot gave, especially in Phase I. One commented that it so happened that they had the project conceived and budget allocated anyway, but getting this at short notice would have been very difficult:

> "Some of our projects have too long of a timeline to fit the EDR project – might take several years to get everything done and things change along the life of the project."

### 3.4.3 A dedicated resource for the project

All fully participating organisations had a dedicated internal resource (either an individual or team) and / or external consultants to lead the application and reporting process, emphasising the importance of significant resource being available to allocate to the scheme. Having dedicated energy managers or consultants allowed for greater flexibility in allocating resource to completing EDR requirements, autonomy for these individuals or teams, and even in some cases an expectation that bidding for things like EDR support would be part of their core role.

Some organisations did not have spare resource at the time of finding out about the opportunity, but decided that the opportunity was strategically important enough to divert resource.

The importance of individual drive to complete the process was illustrated by one respondent:

> "The first round was put through by a young graduate who was very switched on to this sort of stuff. He presented it to the directors and explained what needed to be done. We needed to have someone with the skills to get it through internally and then for implementation: this high level of paperwork can be difficult to handle – contractors are

> used to scribbling down a few things, but for this it needed to be spot on. So it was mainly having the right people with the ability to persevere with it and get everything into line."

### 3.4.4 A stated strategic commitment to energy efficiency

This correlates with participant organisations; however, its importance alone in relation to choosing to participate in the EDR pilot is likely to be limited. Nevertheless, it is likely to be the basis for many organisations having a project at the time and maintaining a dedicated energy resource so is necessary. Organisations – especially those in the public sector – often had strong drivers to reduce costs and work towards carbon reduction targets.

There were seeming juxtapositions between large and well-resourced organisations claiming strong commitment to energy efficiency, but equally claiming to need a relatively small amount of EDR funding to overcome the hurdle of required payback. This implies limited commitment to energy efficiency on the part of these organisations, through limited budgets for energy activity or unwillingness to allow projects that are marginal on payback.

These are the four factors that seemed central to all cases of full participation and 'necessary' for it. They also support the contribution story that the EDR pilot often supported projects that generally would have happened anyway, albeit many would not have come forward as quickly. The preceding conditions could reasonably be viewed as 'hygiene factors', i.e. conditions that are necessary for participation but not sufficient to explain it. However, it is the combination of these factors that seemed to be the common link between full participants in the EDR pilot.

### 3.4.5 Other success factors?

As highlighted through interviews across previous stages of the evaluation (and included in the interim evaluation report), organisations sometimes had wider motivations to participate that were not financial: reputation, experience or changing attitudes. However, these wider benefits of participating may be somewhat retrospective where organisations observed them at some point during the process but misremembered them as being drivers at the outset; not all motivations described in later evaluation stages were cited in early stages when organisations were first choosing to participate. Similarly, there was a distinction between motivations given unprompted by organisations as main motivations (which tended to be financial) compared to those prompted or tested for. These organisations could tolerate a perceived onerous application process or minimal funding post-auction, as there were benefits over and above those that would fall out of considering the basic resource burden vs incentive payment.

Access to alternative external financial support – in particular Salix Finance[27] for the public sector – led to several organisations being more willing to drop out of the process on the basis that they had another external source of funding that covered a much higher percentage of project costs. Conversely, some organisations eligible for Salix still chose the EDR pilot as this provided a grant rather than a loan.

A high proportion of participants (over 90%) also had previous experience of engaging with Government schemes on energy efficiency. Though this experience may have helped, it may have simply been a function of these organisations being large businesses that are more likely to – and for some schemes, are required to – participate. In addition, few participants cited this as a basis for their organisation having been able to fully participate.

[27] https://www.salixfinance.co.uk/

### 3.4.6 Participants reflecting on their participation

To help to triangulate the analysis of factors important to participation, participants were asked to attempt to explain why their organisation had chosen to participate, and did so successfully when other organisations like them (similar sector, size, energy demand, etc.) had not. Their responses endorsed the assessment of key conditions and success factors outlined above, in particular the importance of:

- **Dedicated resource** (the most commonly cited factor):

  "We have an internal energy services department so it's what they do full time. Plenty of resources while others may not."

- **Expertise to understand and respond to the opportunity**:

  "I think a lot of other local authorities don't have the benefit of a retained technical partner, so they wouldn't have had someone who could decipher the mechanics of the programme and understand it. I think a lot would have looked at it and wouldn't have understood the focus of the funding mechanism and would have decided not to commit. They would have decided to look at Salix or something else instead."

- **A pre-existing project** that can be easily slotted into scheme requirements:

  "Some companies similar to us might have been going through a Phase where they weren't focusing on something like this."

Finally, there was a suggestion of a more intangible factor regarding the 'right' type of individual or team being in place within an organisation. This person or team having the time to participate was important, but also important was their willingness to engage properly with the scheme, promote the project and scheme to any required management and see it through to a positive outcome. Although not cited by respondents as a success factor, this would help to explain why organisations that enjoy ostensibly very similar success factors have not engaged.

## 3.5 Other key features of the EDR pilot

### 3.5.1 Changes between Phases I and II

The key changes made between Phases are described in Section 2.2 of this report, but were collectively designed to widen eligibility and increase BEIS support to participants. The evaluation informed a number of pilot changes, which were made before the launch of Phase II.

All the changes were welcomed by Phase II applicants, especially those that had knowledge or first-hand experience of Phase I requirements. However, there were still some core elements of the scheme that had proved problematic for potential Phase I participants which were not changed sufficiently for most organisations to re-address the issue of cost vs. reward in Phase II. These were mainly the level of detail required in the application and reporting processes and low incentive amounts.

Despite some remaining challenges, the changes overall made the process less onerous and more likely to end in success for those organisations that applied; a quarter of Phase II projects would not have been eligible for funding in Phase I. But surprisingly, Phase II saw fewer

registrations and applications, despite the numerous rule changes designed to encourage more interest (though this was also linked to more effective dissuasion of unsuitable / ineligible projects), and saw a similar level of ubiquity for lighting projects. This was, in part, an effect from Phase I. The first Phase had captured many of the potentially interested and eligible organisations; some Phase I participants said they did not have the capacity to participate again in Phase II. Additionally, some organisations had been discouraged by Phase I and did not investigate Phase II – or any of the positive changes made – as a consequence of their previous experience, so were unaware of the differences between the Phases.

Pilot changes were made to encourage participation and more diverse projects. However, Phase II Winter 2017-18 projects were very similar to the Phase II Winter 2016-17 projects in terms of both project profile (lighting technology) and level of attribution. Two projects started during 2016 but took some time to complete and the participants therefore felt more comfortable with an extended timetable:

> "We chose 2017-18 as there were quite a few streetlights to put in."

There was a possibility that a project may not have been taken forward without the extra year. However, no respondent stated this. Some organisations used the extra year simply because it was offered and made the project easier, but they did not say they could not have implemented the project in the first year. It is plausible, therefore, to say they would not have implemented the project through the scheme, but this would not be additional.

As stated by organisations that did not register or apply in Phase II and so were unaffected by any changes, the primary issues were lack of (perceived) eligibility, a lack of time to investigate the scheme and design a suitable project or amend an existing one, and concern about the auction format leaving them with no funding.

Of those organisations that applied in both phases, some still felt the process was quite onerous though all found it easier than in Phase I. However, they were on their second run through the process, so some elements may have seemed easier for them simply because it was not new.

### 3.5.2 Auction outcomes

Despite the auction outcomes potentially being affected by the small number of bidders, in both Phases most organisations perceived it (and so treated it) as a truly competitive auction. However, some organisations had become aware of the low level of participation and bidding in Phase I and responded accordingly in Phase II. A small number were subsequently dissatisfied with the auction outcome as they would have bid higher in hindsight. However, the majority were pleased to receive what they had bid.

- In Phase I the weighted average bid was £229/kW, with the lowest being £94/kW and four organisations bidding at the maximum of £300/kW.
- In Phase II the weighted average bid was £203/kW, with the lowest being £48/kW and four organisations bidding near the maximum of £300/kW (including two applications that bid at £299/kW).

All participants were asked about their bidding strategy. The most common approach was a balance between an amount that would meaningfully support the project with an estimate of what other organisations may bid (and therefore attempting to undercut that). However, there were a wide range of approaches overall based upon organisation and project circumstances:

- Bidding the lowest £/kW that still makes participation costs (time and money) or business case viable.
- Basing their bid upon the average of Phase I bids.
- Where submitting applications for multiple projects, varying bids across a range in the hope of guaranteeing at least some success.
- Specifically calculating the bid to achieve a certain level of benefit:

  "We calculated it to give the client approximately a year off their payback."

- Bidding at the maximum £/kW, either on the basis that if bidding they may as well go for the largest possible amount, or (in Phase II) because they were aware of the low participation in Phase I, and the fact that all participants got the amount they bid for.

### 3.5.3 Response to Penalties

Several participants under-delivered and therefore had penalties applied to their award amounts. However, one organisation discovered asbestos in some of the areas proposed for action and so cancelled the work without penalty.

Participants had mixed feelings about the penalty; on the one hand they understood why this was in place (i.e. stopping organisations claiming incentives from projects that never went ahead or over-bidding and because of the potential security of supply impacts of non-delivery of capacity) but the penalty for being under the target was seen as being a further risk in the initial cost-benefit calculation made by target organisations. It was also noted that there was no increased payment for projects that over-delivered, though this was not a source of dissatisfaction (such projects would benefit from increased electricity bill savings compared to their bids).

### 3.5.4 Technology selection: why LED lighting?

Over 80% of all scheme *applications* for Phases I and II were for LED lighting technology, while all but one of the successful participating *projects* were for LED lighting technology. Organisations with a non-lighting application generally had either already implemented LED lighting or had insufficient lighting to meet the kW threshold. Participants were asked to explain the reasons for their choice of technology and what might encourage non-lighting applications.

The explanation provided by all respondents was that this technology was the least expensive and most straightforward that was eligible for the scheme; this was an important consideration in a number of ways:

- The project would likely not need much amendment to fit within scheme requirements, and if it did then such changes would be relatively straightforward.
- Replacement of light fixtures (rather than simply bulb replacements) was one of a number of technologies that enabled deemed calculation of predicted impact; participants felt this was much easier than sourcing metered data:

  > "we only wanted to do deemed as metered looked too time consuming, and lighting was the only project [we could implement] that could be deemed."

- Being a relatively straightforward installation; this reduced the chance of the activity being delayed or derailed in some way.
- Reduced chance of predicted savings not being delivered, as these are fairly easily guaranteed based upon hours of use and not subject to a wider number of variables (such as weather).

Several also highlighted that the nature of the scheme had restricted their ambitions:

> "We were originally going to do metered savings, but once we did the costings, it was higher than the value of the grant… the idea is great. Having to deliver it, and how much time and energy and effort it takes, I think, could be reviewed."

The Wider Population Survey indicated that 94% of organisations are considering, or have delivered, a lighting project in the past year. For comparison purposes, the most common non-lighting measure (air conditioning) was mentioned 62% of the time. There is therefore a question of why – especially for projects being considered - any such organisations did not apply to the EDR pilot. Based upon the analysis above, the likely mechanism at play is that the perceived risks outweigh the perceived rewards; organisations perceive the application input required for other technologies to be greater than that for a deemed lighting project, and perceive that the lighting carries greater reliability in achieving savings.

## 3.6 Impact

### 3.6.1 Energy savings and additionality

There are four categories of energy (kW) savings outlined in this report:

- **Estimated savings** contracted in the Participation Agreements, by participants using BEIS spreadsheet-based deemed calculators, before the projects commenced.
- **Estimated savings of funded projects**. These are the subset of savings contracted in Participation Agreements of those projects that received funding from BEIS (i.e., did not drop out before delivery).
- **Delivered savings**. Savings from projects as they were actually installed (as not all participants delivered their projects as planned). These were calculated by participants after their projects were completed.
- **Attributable savings**. The delivered savings that are directly attributable to the EDR pilot and would not have happened without support. This is a subset of the above, calculated by the evaluation team.

In order to determine whether savings were attributable to the pilot, evidence from interviews and administrative data was analysed, assigning projects to one of four categories of attribution as defined below. This approach used a realist based approach and utilised multiple sources of data to triangulate attribution. For additional details see Section 3.3 and Appendix 10.

- **Fully additional**: fully attributable to the EDR pilot, where the project would not have happened at all without the EDR pilot.

- **Accelerated (partially additional):** The project happened sooner than it would have without the EDR pilot.
- **Scaled up (partially additional):** Project was somehow made larger or more ambitious for the EDR pilot.
- **Non-additional**: Project was not attributable to the EDR pilot; the project would have gone forward in the exact same manner, regardless of the EDR pilot support.

### 3.6.2 Phase I and Phase II kW savings

Winter peak kW reduction from the EDR pilot is presented below. A number of organisations dropped out of the scheme, meaning the estimated savings are different from the delivered savings; both are shown in table 1 below. As Winter 2017-18 Phase II projects are still delivering, delivered and attributable kW savings are not reported below for those projects.

**Table 1: kW savings in the first year after project implementation, across both phases**

| Year | Estimated kW | Estimated kW (funded projects) | Delivered kW (funded projects) | Additional delivered kW (funded projects) |
|---|---|---|---|---|
| Phase I (winter 15/16 projects) | 4,518 | 2,229 | 2,289 | 2,162 |
| Phase II (winter 16/17 projects) | 10,559 | 6,208 | 5,821 | 1,845 |
| Phase II (winter 17/18 projects) | 12,495 | 12,272 | 10,760 | - |

Where organisations withdrew their project from the scheme, this was usually due to a realisation that they were no longer eligible or due to a change of circumstances. Project drop out was high in both phases, but was much more common in Phase II than Phase I, indicating that additional BEIS support offered in Phase II was more effective in helping organisations to realise when their applications were ineligible. Additional details on reasons for drop out are available in Section 4.6.3.

Additional details on calculation methods are presented in Appendix 6.

### 3.6.3 Wider benefits

The following show the type and extent of wider benefits recognised by those delivering EDR pilot projects, beyond the kW reductions and their commensurate energy cost reductions. These benefits came out of participant interviews and self-reported benefits in their Final Reports submitted to BEIS.

- **Reduced maintenance**: almost all respondents recognised this as a benefit of the project, based upon the length of time the new technology – usually LED lighting – is expected to last compared to their previous lighting[28]. However, few were able to quantify this in terms of a staff time or equipment cost saving:

  > "We should see a reduction in people attending the site for maintenance and the maintenance engineers would be remote - hence less mileage, and emissions."

- **Reduced disposal costs**: future waste disposal was likely to be less frequent (due to improved LED lifetime over the previous lighting technology) and certain previous technologies were subject to the Waste Electrical and Electronic Equipment Directive and so disposal was more costly:

[28] Though at least one respondent had encountered new bulbs that needed to be replaced long before the manufacturers stated lifetime.

> "Disposal might be simpler (e.g. less transport involved in disposing of old lamps)."

- **Enhanced productivity**: this benefit was usually theoretical and hard to quantify, at least in the short term. As the vast majority of projects across both Phases were lighting upgrades, such benefits related to one or more of the following: employees being able to work better due to improved visibility[29] and improved health and safety (fewer accidents, or reduced risk of accidents), leading to reduced absenteeism.

- **Enhanced customer footfall**: three retail and service sector participants felt that customers would have a more pleasant experience, and hypothesised that in the future this could lead to increased footfall, more purchases, greater repeat visits. However, this was again theoretical and no respondent citing this benefit could point to evidence of such an effect at the time of evaluation.

- **Indirect energy reduction**: as well as the direct effect of the installed technology on peak demand reduction, this technology would also lead to reductions in other technologies. For example:

> "Old style lighting used to generate more heat, so in summer, the new system will require less air-con."

- **Wider energy efficiency awareness**: two respondents reported that participation in the scheme had raised awareness of – and encouraged the organisations to investigate – wider technologies than previously. Although at the time of interviewing, none of the organisations were able to cite specific projects that have arisen from the organisational changes influenced by the scheme, the examples indicate a longer term legacy effect of the programme and participation in it.

> "It perhaps opened our eyes to the scope for pursuing more ambitious energy efficiency projects."

The lack of quantification of these wider benefits is in part an issue of timing; organisations cannot know what the effect of the new technology will be without potentially several years of monitoring and comparison to baselines. Additionally, many did not hypothesise on wider benefits until asked to do so near the end of the project (the Final Report asked participants to quantify other, non-energy benefits). Almost all participants struggled to assign specific values to these wider benefits as they did not have baseline measurements from before project installation. Many organisations do not closely monitor some of these wider benefits and will always struggle to attach precise financial or numerical benefits to them.

The fact that so few attempt to calculate an impact is interesting, even for outcomes that will be ostensibly logged as part of organisational policies (such as health and safety), especially where energy projects are marginal in terms of meeting required payback and wider benefits may have made this calculation more favourable.

Overall, however, the acknowledgement of the likelihood of wider benefits from attributed projects equates to wider EDR pilot impacts, as well as potential additional selling points for action on any scheme supporting energy efficiency activity.

[29] Though several respondents did cite the improved light output of the lights as evidence in this regard.

Financial considerations were the most common in organisations' reasoning for exploring and participating in the scheme. Reputation, although mentioned by most organisations (15), was usually a small influencing factor:

- Internal: increasing the focus upon and profile of energy efficiency:

  > "It's given me leverage with senior staff, it's helped to get buy-in and shown that there is backing within Government for energy efficiency projects."

- External: being seen to be at the forefront in this area, either for reputation with customers or Government:

  > "There is a certain amount of corporate marketing that can be done off the back of it"

- However, one organisation did state reputation as being the primary driver:

  > "We would have participated for £50."

Internal leverage tended to be about the importance of energy efficiency generally as opposed to peak demand. However, five respondents reported that participation had increased awareness of the issue of peak demand and the likelihood of ongoing action to reduce it:

> "Participation in EDR has led to more consideration of the issue of peak demand. Moving forward we anticipate looking more at the issue of how we might reduce peak demand."

One respondent placed potential power outages as an issue on their risk register as a result of being involved with the EDR pilot. Many respondents – including full participants, non-participants and dropouts - felt their organisation was already engaged with the need for peak demand reduction prior to the scheme. This view could be supported by the fact that all participant organisations had projects at some stage prior to the scheme, though energy cost reduction more generally – as opposed to peak reduction specifically – was usually cited as the primary driver for this.

## 3.7 Cost Benefit Analysis of the EDR pilot

The evaluation conducted a cost benefit analysis to determine if participation in the EDR pilot resulted in a net financial benefit for individual participants ("participant analysis") as well as to determine whether the total benefits unlocked by the pilot outweighed the costs of running the pilot ("societal analysis"). The CBA is not designed to inform the comparative performance of the EDR pilot vis-à-vis other GB or international EDR support schemes as it was focused only on the EDR participants (and not other theoretical schemes).

A key challenge in capturing the costs and benefits attributable to the EDR pilot was that not all projects are fully attributable to the pilot ("additional"), since some projects would have gone ahead without EDR pilot, although possibly in a different form or timeframe. Across Phase I and Phase II, we find projects that can be considered fully additional (i.e. they would not have taken place without the pilot), non-additional (i.e. would have taken place without the pilot), accelerated (i.e. EDR pilot funding brought forward delivery of the project), and scaled-up (i.e. EDR funding allowed the participant to increase the original scope of a project).

For fully additional projects, all costs and benefits are included in the analysis. For projects that were accelerated to fit within the EDR pilot's timescales, the analysis captures (through discounting future costs and benefits) the net impact of projects being delivered sooner than they would have been without the EDR pilot. For scaled up projects, benefits and costs pertain only to the incremental size of the application attributed to the pilot. For non-additional projects, participant benefits and costs only include the EDR payment and hassle costs while in the societal analysis, no costs or benefits are included for non-additional applications (as they would have happened anyway).

Participants in the EDR pilot have not always been able to fully inform the precise additionality status of their projects or provide full data on costs and benefits. For this reason, the evaluation has made some assumptions in its treatment of additionality, as well as in estimating and allocating costs. Appendix 7 provides a full overview of our assumptions. The discussion of the CBA results below also reflects on these assumptions and the possible limitations they present to this assessment.

The following sections summarise the results for the participant and societal analysis across Phases I and II.

### 3.7.1 Main Results – Participant CBA

The participant CBA focussed on the costs and benefits of the EDR pilot, as viewed by the participants in the scheme. See Appendix 7 for further information on the assumptions in quantifying these costs and benefits as well as other modelling assumptions. These included:

Benefits:

- EDR payment;
- Bill savings;
- Reduced maintenance or bulb and fitting replacement costs; and
- Other costs and benefits (such as maintenance or productivity improvements) were not included except where participants could assign values to these.

    - In Phase I, participants were only able to provide qualitative discussion of such effects, whereas in Phase II, some participants were able to provide quantitative information.

Costs:

- Cost of equipment, delivery and installation;
- Changes to operational costs;
- 'Hassle' costs (labour invested in scheme participation); and
- Financing costs.

Every participant had a positive NPV.

Table 2 and Table 3 below provide the results for the CBA and show an overall positive NPV for both Phase I and Phase II (Winter 2016-17) projects of (coincidentally) just over £9m. This means that the benefits of participating in the EDR pilot outweighed the costs for participants,

which is true on aggregate as well as for all individual participants across Phases I and II. Hence, for participants, the EDR pilot can be considered value for money/cost effective?.

**Table 2: Phase I Participant CBA – Summary results (£2018)**

| NPV from pilot | Pilot Benefits | Pilot costs |
|---|---|---|
| £ 9.7m | £ 12.2m | £ 2.5m |

**Table 3: Phase II Participant CBA – Summary results (£2018)**

| NPV from pilot | Pilot Benefits | Pilot costs |
|---|---|---|
| £ 9.0m | £ 11.4m | £ 2.4m |

Although the overall benefits arising for Phase I and Phase II are similar, the average net benefit realised across each Phase II project is around twice that of Phase I, since the number of Phase II projects is half that of Phase I. This is partially due to project 3 in Phase II, which was very large and had a very high NPV (£7M).

The largest individual contributing factor to participant benefits is the projected saving on the energy bill over the duration of the project's lifetime, accounting for over 80% of all benefits in both Phase I and Phase II.

### 3.7.2 Other observations and limitations in the analysis

In comparing Phases I and II, it is worth noting that where there were 5 fully additional projects in Phase I, whilst there were none in Phase II Winter 2016-17[30]. In Phase I, the 5 fully additional projects jointly accounted for £7.1m of the total NPV, with one project giving an NPV of £3.4m. The remaining £2.6m of NPV for Phase I is split between 11 projects of differing additionality. In Phase II, where only part of the cost and benefits for Phase II applications are attributed to the EDR pilot (due to additionality); it is worth noting that over 75% the positive NPV in Phase II (£7.0m of £9.0m) can be associated with a single scaled up project, for which only one-third of the benefits are credited to the EDR pilot. This project involved an aggregator working on behalf of a large client with installations across many sites and it is due to its sheer scale that this project shows by far the largest NPV across all projects assessed to date.

As a general observation, applications classed as (fully) additional yield the highest NPV per kWh (or kW). For these applications the NPV reflects the full value attributable to the pilot scheme. Applications that are "accelerated" or "scaled up" show lower NPVs per kWh, since only part of the benefits of these applications are attributed to the pilot scheme. However, it is important to consider that the results for these projects strongly depend on our assumptions (see Appendix 7) and participants' self-reported information in defining "accelerated" and "scaled up" – since almost no participant provided specific information to prove how accelerated or scaled up their project was.

[30] Although not included in the analysis, there were additional projects in Phase II but they were in the Winter 2017-18 delivery group.

Non-additional applications give the lowest values for NPV per kWh, since the NPV for these applications is based only on the difference between the payment received under the pilot scheme and the hassle costs incurred for participation in the scheme. However, it is worth noting that all non-additional applications still have positive NPVs, indicating the EDR payment outweighs the administrative burden.

Besides the majority of projects in Phases I and II involving LED lighting, there is little to report in terms of trends or commonalities across projects, because of the small number and homogeneity of projects. Much of the CBA results for individual participants depends on the scale of the project, which determines the energy bill saving potential (the primary driver of benefits), and the additionality status, which determines the share of benefits that counts towards the EDR pilot. The logic for these factors is straightforward, and how they apply to individual projects is coincidental.

### 3.7.3 Main Results - Societal CBA

The societal CBA assessed whether the EDR pilot delivered a net benefit for society at large, based on the following benefits and costs:

Benefits:

- Avoided fuel costs;
- Avoided carbon emissions; and
- Avoided air quality costs.

Costs:

- Pilot administration costs;
- Participant capital expenses;
- Participant hassle costs (labour invested in scheme participation); and
- Other costs quantified by participants (Phase II only).

The results for each phase are presented in the tables below. The biggest contributor to the CBA outcome is avoided fuel costs, reflecting a reduction in (the costs of) electricity generated and accounting for over 90% of total benefits in both Phase I and II.

Scheme administration costs drop significantly from Phase I to Phase II, which may reflect that the costs to start the scheme were comparatively high and have been allocated to Phase I. Comparing the results between phases, we note that most costs and benefits are in the same relative order of magnitude (providing roughly the same contribution to the results in each phase). In an enduring regime these would likely be considered start-up costs and not specific to any single round of funding.

A further point to note is that in Phase II a small amount of “other costs” is captured – which in Phase I was captured qualitatively as participants were unable to assign numerical values to these other costs or benefits. The amount is a negative £4.5k, reflecting that some Phase II participants reported small costs savings, but is otherwise not a significant factor in this CBA.

**Table 4: Phase I Societal CBA results (£2018)**

| Net present value | |
|---|---|
| **Total "societal" benefit from pilot** | **£15.8m** |
| Avoided fuel costs | £14.4m |
| Avoided carbon costs | £1.0m |
| Avoided air quality costs | £3.2m |
| **Total costs from pilot** | **£4.1m** |
| BEIS - Scheme Administration | £1.9m |
| Participant - Capital expenses | £2.2m |
| Participant - Hassle costs | £0.02m |
| Participant - Other costs | £- |
| **Total Societal NPV** | **£11.7m** |

**Table 5: Phase II Societal CBA results (£2018)**

| Net present value | |
|---|---|
| **Total benefit from pilot** | **£6.8m** |
| Avoided fuel costs | £6.2m |
| Avoided carbon costs | £0.4m |
| Avoided air quality costs | £0.2m |
| **Total costs from pilot** | **£2.4m** |
| BEIS - Scheme Administration | £0.3m |
| Participant - Capital expenses | £2.1m |
| Participant - Hassle costs | £0.1m |
| Participant - Other costs | -£0.005m |
| **Total Societal NPV** | **£4.3m** |

### 3.7.4 Hypothetical Scenarios – Full Additionality and No EDR Pilot

As a broad reference to gain insight into the full potential and added value of the EDR pilot, the evaluation carried out the CBA calculations for the hypothetical scenarios in which (1) all

projects were fully additional and therefore all costs and benefits are attributed to the pilot, and (2) the EDR pilot never took place, meaning that only projects that are not fully additional to the pilot would have taken place, and in their original scope and timing. The tables below provide the results for these scenarios.

**Table 6: Participant CBA results – 'Full Additionality' & 'No EDR' (£2018)**

| Participant CBA summary | Full additionality | | No EDR | |
|---|---|---|---|---|
| | **Phase I** | **Phase II** | **Phase I** | **Phase II** |
| Total participant benefits | £29.1m | £56.0m | £17.0m | £44.9m |
| Total participant costs | £7.9m | £11.0m | £5.4m | £8.4m |
| **Total Participant NPV** | **£21.2m** | **£45.0m** | **£11.5m** | **£36.5m** |

The total NPVs in Table 6 exceed the NPVs for the main results, both for participants and society at large, and across both Phase I and II. There are a number of factors at play leading to this result, the principle factor being that the main results look at the incremental value of the EDR pilot, whereas the scenarios regard the full values for a set of (hypothetical) project scopes and timelines. As a result, the relative emphasis on the primary value driver kWh reductions translating into bill savings for participant analysis or avoided fuel costs for societal analysis is increased – resulting in overall higher NPVs. In the 'No EDR' scenario, benefits increase further because scheme administration costs and hassle costs do not exist.

Insights regarding the potential of an EDR pilot scheme such as the one under evaluation suffer from the aforementioned limitations, principally the limited number of projects and the reliance on assumptions to define projects' additionality status. However, the figures do provide some valuable insights in that across Phase I and Phase II, a total value of around £50m would have been created without the EDR pilot (the figure is broadly similar for participants and society). This confirms that across a limited number of projects, industrial and SME entities are indeed exploring the potential value of EDR projects, and the role of the pilot (or a support mechanism in general) may be more of an accelerator of value, rather than a creator of value. This supports findings of the Wider Population Survey (more details in Section 3) that many organisations are undertaking lighting projects without any government incentives. This is also reflected by the fact there are only a small number of fully additional projects participating in the EDR pilot so far. However, at totals of around £67m, the 'full additionality' scenario suggests that a scheme like the EDR pilot could provide considerably more value if it succeeds in directing funding to projects that would be truly additional, for instance in overcoming economic barriers or awareness barriers that prevent feasible projects from being implemented.

In summary, the EDR pilot delivered NPV positive projects, both from a social and private perspective. This was broadly driven by a small number of highly cost effective projects, with other projects having a much smaller NPV. Additionality is a key driver of NPV, and benefits are significantly higher if full additionality is achieved.

# 4 Non-participation and a view of the wider EDR target audience

Section 2 covered the impact, benefits, costs and attribution amongst those projects that participated in the EDR pilot and completed the process. This section draws upon the findings from interviews with partial participants[31] and a survey of the wider population of large businesses[32]. The survey in particular explored the profile of the wider population with a specific focus on characteristics either identified through the process evaluation, or hypothesised to be important in decision making behaviour regarding participation in the EDR pilot or similar types of schemes.

A number of reasons were identified as to why large organisations, who have the potential to deliver eligible projects, did not choose to participate in the pilot. The findings have implications for any future targeting of this group as per HLQ5, which asks what lessons can we draw about any future electricity demand reduction scheme from this pilot.

Only 4% of organisations who registered interest applied for the pilot. Meaning a large number of organisations did not engage with the pilot scheme and – as noted in conversations with the BEIS Operational team – participation levels were not as high as first anticipated. This section therefore explores:

- The profile organisations who did not delivery projects through the EDR pilot, but who in theory could have. With a focus on their energy management processes, current energy consumption and peak demand, and the current level of energy efficiency activity being undertaken.
- A further understanding of business culture around energy efficiency and some potential barriers to EDR participation.
- The extent to which the ostensible target market did not (or chose not to) participate in the EDR pilot and why. This draws upon both the survey and the evaluation work focusing specifically on non-applicants and non-participants.
- The extent of interest in various hypothetical scheme scenarios offered to the survey respondents, comprising different levels of payback/incentive levels and required participation resource costs.

## 4.1 Wider Population Survey summary method

The Wider Population Survey comprised a quantitative telephone survey of large businesses across a range of sectors. In this instance, a large business is defined as one with over 250

[31] These include organisations that engaged with the scheme, but did not fully participate, e.g. those invited but declining to participate, those that registered interest or submitted an application but did not participate, and those that have dropped out of the scheme.
[32] In this instance, a large business is defined as one with over 250 full-time employees and energy consumption costs in excess of £100,000

full-time employees and energy consumption costs in excess of £100,000[33] and thus may, in theory, have been eligible for the EDR pilot. This allowed a better understanding of energy efficiency actions and motivations in large organisations, exploring the potential effects of different combinations of financial incentives and scheme administrative resource burden in hypothetical energy efficiency schemes. The key objectives of the Wider Population Survey were to:

- Build upon the evidence gained from the evaluation of the EDR pilot, and to inform a number of specific evaluation questions, gaining understanding of the target audience of the pilot (usually large businesses), their resources, motivations to act on energy efficiency, and the level of engagement/awareness of the EDR pilot. Understanding what energy efficiency action organisations are taking outside the EDR pilot was also a valuable piece of evidence to inform the evaluation and additionality assumptions of the pilot.
- Provide a snapshot of current electricity demand reduction action and interest in a number of hypothetical energy efficiency schemes. The survey tested two dimensions by altering the level of payback and resource burden of participation[34].

The survey explored organisation profile (size, activities etc.), organisational attitudes and existing action on energy efficiency, typical conditions of action (e.g. lead times and preferred payback periods), propensity to act based upon the support scenarios prompted, and preferences on specific features of support (e.g. financial mechanism). A full list of survey questions is included in Appendix 11.

The sampling frame comprised a mix of large public and private sector groups drawn from the Inter-departmental Business Register (IDBR) from the Office of National Statistics[35]. Eligible organisations were large energy consumers i.e. those who could deliver a project with demand reduction of at least 50kW, defined for the purposes of this survey as organisations with energy consumption costs around £100k/annum[36].

The survey included organisations that contract out energy procurement or management to energy service companies or similar. Further organisational profile factors were explored at the start of the interview (e.g. tenure, electricity consumption, or site activity splits). Organisations could be screened out of the survey based upon ineligible consumption or if the organisation's energy consumption was entirely managed externally. The survey ran from the end of June to mid-September 2017.

The survey interviewed 750 large businesses using a sector-based sampling framework and then weighted to population of 7,097 large organisations, achieving whole sample results accurate to ±3.5 percentage points at the 95% confidence level.

[33] The £100,000 value is how this was presented to respondents and the basis upon which screening occurred. BEIS specified £100k as an approximate bill size for a potentially eligible organisation in terms of peak kW reduction potential.

[34] On the basis that these were agreed with BEIS to be key drivers in scheme participation and had been for EDR in particular. Resource burden relates to the amount of administrative time the scheme would require of participants (completing paperwork, etc.).

[35] The Inter-departmental Business Register: https://www.ons.gov.uk/aboutus/whatwedo/paidservices/interdepartmentalbusinessregisteridbr

[36] Based on the assumption that a potential future scheme is likely to have a minimum requirement of 50kW to ensure value for money for government incentives. However, as even energy managers are unlikely to know kW reduction potential, around £100k in annual energy bills was assumed to be a sensible cut-off point.

The survey excluded those who had signed a participation agreement for the EDR pilot, but not those that had reached stages prior to that. The latest statistics estimate there were 9,825[37] organisations / enterprises with over 250 employees in the UK in 2017. We weighted to 7,097 to reflect the valid population of interest (excluding those with energy consumption under £100k and those that participated in the EDR pilot).

There were a small number of limitations with the WPS:

- The survey was only conducted with one individual per organisation. Although this individual was well-placed, they still in some cases provided a subjective opinion as a sole representative of a large organisation; a different respondent may have had a different view. In addition, whilst all respondents could answer most questions, there were certain questions that were more difficult, particularly around organisational energy consumption.
- Statistics based upon the whole sample are accurate to within about ±3.5 percentage points at the 95% confidence level, but per sector statistics have larger confidence intervals and should be treated with more caution. Not all statistics reported comprise significant differences.
- The initial survey targeted a higher number of office type premises than we were able to survey. This is mainly due to a large ineligibility of this sector; many organisations initially contacted had energy consumption below the threshold which meant interviews for this sector in particular were lower than originally set out in the sampling plan.
- The team had to use a database matching service as individual names and contact details were not provided in the IDBR. This meant that certain matched organisations became easier (in theory) to sample rather than those for whom matches could not be found. However, the survey covered all sample comprehensively and contacts were found through phone screening as to minimise this effect.

## 4.2 Organisational profile of the wider population

### 4.2.1 Factor 1: Target market tenure

All those fully participating in the EDR pilot either owned or had long-term leases on their properties that allowed them to act autonomously. The survey – including statements from renting respondents – showed tenure can be an important influence on energy action as it affects how much an occupant organisation can act autonomously, what measures are seen as feasible, and so raises the issues of split incentives. Where the tenant pays the utility bill, the landlord has no immediate financial interest in taking action (aside from abiding by minimum standard regulations). While the tenant has little power to effect change as they do not own or manage the main energy consuming equipment in their building. There is therefore unwillingness or inability of occupant companies to effect change.

Aside from construction (where the sites are, by definition, rarely the company's own) the two lowest levels of ownership are retail and offices, affecting the response to electricity demand reduction action amongst these two groups.

[37] https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/datasets/ukbusinessactivitysizeandlocation

### 4.2.2 Factor 2: Target market energy management processes

All pilot participants had dedicated energy management resource, either an individual or team, to manage the EDR application, and this was seen by participants as a crucial factor for full participation in the scheme.

When comparing this to the wider population; 35% of organisations had a dedicated energy manager either on or off site, whilst 65% did not, though almost all of the latter had management by someone who has energy as part of a wider remit.

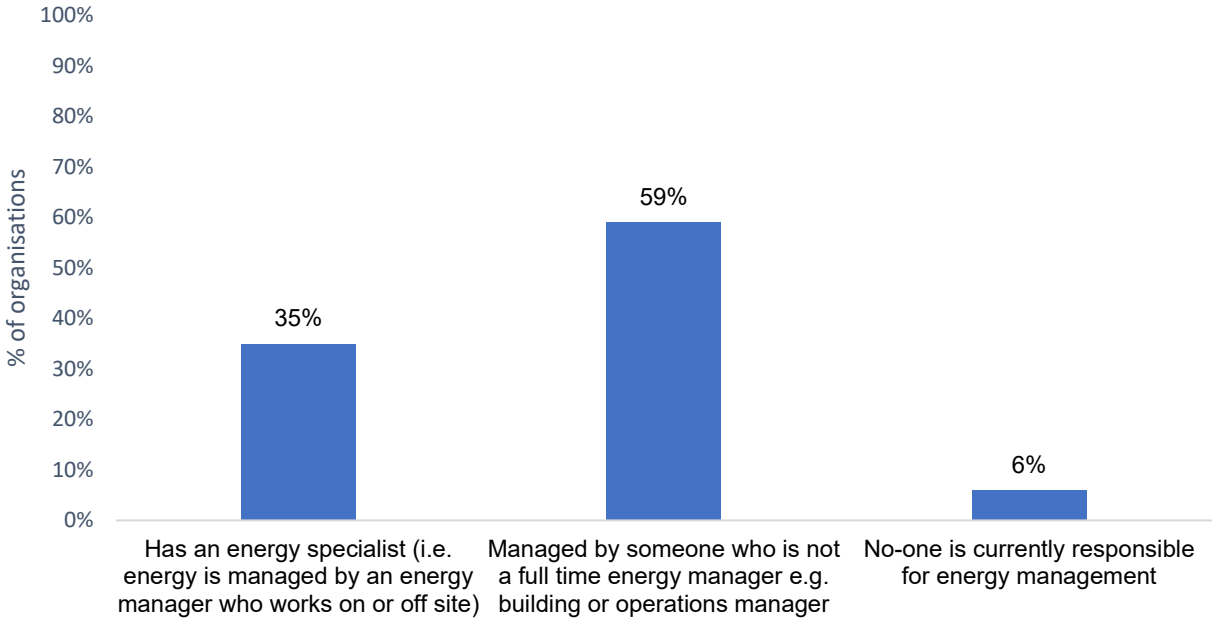


**Figure 6: Energy management structure amongst the wider population (n=750)**

The sector seemingly most likely to have an energy specialist in-house (or at least access to one) was the public sector. Energy specialists were also relatively common (+30%) in manufacturing and construction.

### 4.2.3 Factor 3: Target market electricity consumption (eligibility)

For almost all (95%) of the survey respondents, electricity costs comprised more than 25% of total energy costs. However, in some cases, organisations would still have struggled to meet the minimum kW savings required by the pilot. Especially if electricity consumption is spread across various technologies, adding to the complexity of implementing an electricity demand reduction project.

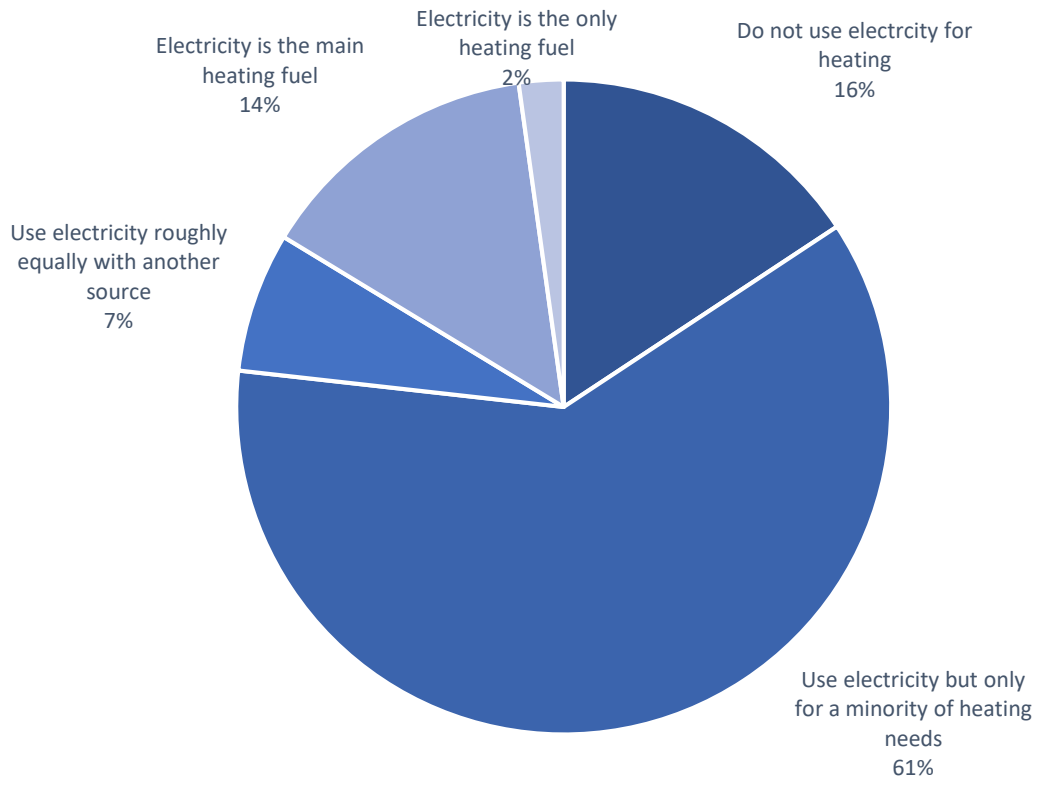


**Figure 7: The extent to which organisations use electricity for heating (n=750)**

Figure 6 demonstrates that 84% of survey respondents use electricity for heating in some degree, though in most cases (61%) this is for a minority of heating needs. There was no particular pattern in terms of the type of business using electricity for this purpose, though this does highlight an opportunity for support to reduce electricity consumption arising from heating.

EDR pilot participants had to achieve electricity savings during winter peak periods. Almost all survey respondents (99%) had at least some winter peak electricity consumption (the other 1% are closed during winter - e.g. certain holiday companies - or do not operate after 4pm). Lighting was the most commonly cited technology used during peak periods, but around a third of respondents were using other prompted measures as well.

### 4.2.4 Factor 4: Target market energy attitudes and awareness

Like tenure, energy costs and attitudes are theorised to be strong contextual factors influencing likelihood of taking action to reduce electricity consumption and participation in the EDR pilot. All respondents to the survey were asked to rate the extent to which energy costs are a concern for their organisation on a scale of 1 (not at all) to 5 (a great extent).

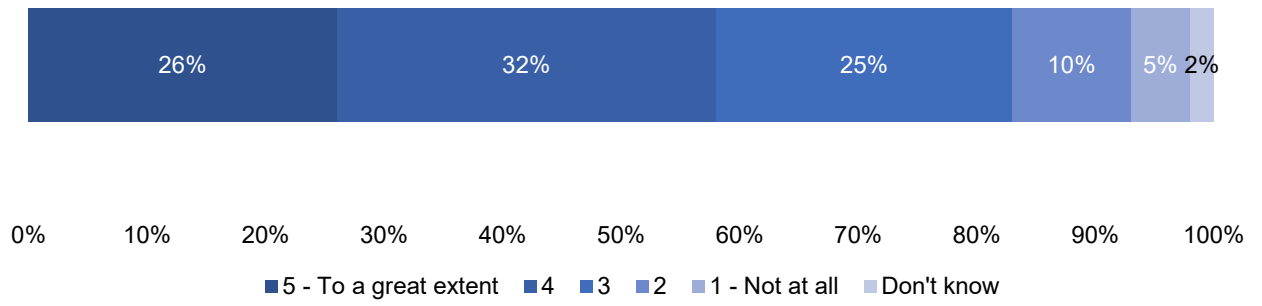


**Figure 8: Concern around energy costs amongst organisations in the Wider Population Survey (n=750)**

Overall, 58% rated energy as a significant concern (rated 4 or 5), while 25% rated energy as being of neutral importance (rated 3). 15% of organisations rated energy as a low concern (1 or 2). However, concern about energy costs does not necessarily equate to 'importance attached' to energy as a cost. For example, an organisation may view energy as an important area and have taken lots of action to reduce consumption and therefore not be 'concerned' about it.

A significant positive correlation as found between concern for energy costs and percentage of overall business costs being spent on energy. Organisations rating concern at 3 or below had energy totalling to less than 15% of their total costs, while those rating concern at a 4 or 5 included some organisations with energy costs as high as 60% of total costs.

Concern also tended to correlate with actual cost e.g. a business' energy costs might only be 1% of total costs, but if they were in the millions (£) these costs were still worthy of consideration.

Respondents in the office-based sector were the least concerned with energy costs (i.e. had the highest proportion of 'not at all' (1) ratings). This is likely to be due to a combination of energy being a low percent of total costs, as well as many of these businesses paying for energy bills as part of their rent (i.e. serviced or inclusive offices). Furthermore, these types of buildings are more likely to have restrictions in the structure of the tenancy agreement, which can include fixed payment and restrictions over what modifications and retrofits tenants can undertake.

Respondents were also asked two questions about the extent to which their organisation was (a) aware of the range of energy efficiency measures that are possible, and (b) have taken the decision to implement those actions.

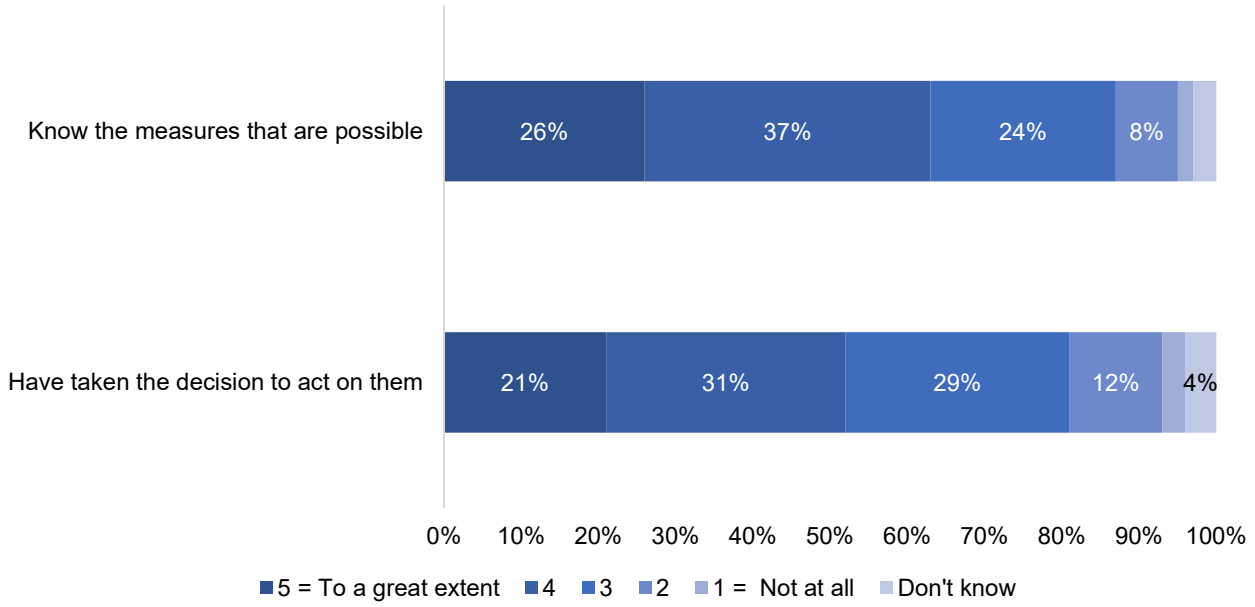


**Figure 9: Respondent rating of organisational awareness and decision making regarding energy efficiency opportunities (n=750)**

Around two thirds of respondents deemed their organisations very aware of the range of energy efficiency opportunities for them (i.e. rated at a 4 or 5), whilst just over half of all respondents felt their organisations had significantly acted on this (i.e. rated at a 4 or 5).

There was no statistically significant difference in the answer to this across a number of profile variables, including sector, presence of a dedicated energy professional, importance attached to energy, or tenure. However, there is a seeming correlation between no action and low awareness, suggesting awareness is a barrier to action for some organisations. Presumably many of the respondents will have undertaken a mandatory energy assessment[38], but still rated awareness at 3 or below.

### 4.2.5 Factor 5: Target market energy action implemented / planned

All survey respondents were prompted with a number of potential energy efficiency upgrades and were asked to state to what extent they had implemented or were at planning to implement these, providing further indication of their propensity to act. Overall, 96% had taken or were planning to take at least one of the prompted actions. Although internal lighting retrofits were the most common action to have been implemented (by over 80% of respondents), at least a third of respondents had acted on at least one of the following; insulation, electric heating, cooling, hot water and renewables.

The survey did not explore the influence of any other schemes or policies upon these actions, but these projects were at least implemented outside of the EDR pilot. In addition, the fact that action largely comprised lighting retrofits reflects the EDR participant profile; the EDR pilot was not generating more innovative action than the wider population was achieving on its own.

[38] The Energy Savings Opportunity Scheme (ESOS), for more information, visit: https://www.gov.uk/guidance/energy-savings-opportunity-scheme-esos

## 4.3 Project profile

### 4.3.1 Factor 6: Wider population typical project lead time

Project lead time was important to EDR pilot participation as previous research with participants and non-participants stated that this affected both enthusiasm to engage with the scheme and then to progress to full participation.

Respondents to the survey were asked about the typical development time of projects to reduce energy use in the organisation, and asked to think of a recent example to base this upon. Although respondents considered a variety of measures (with variable lead times) the average across all responses was around 11 months, which would be well within the EDR pilot's timescales.

While overall responses ranged from 1 month through to 5 years, most (three quarters) estimates were between 6 and 18 months; as implied for Factor 5, many of these were likely to be lighting projects.

A third of the sample said their energy project had taken 12 months or more, emphasising the need (as in Phase II) for a longer lead time or rolling application window. Observing similar participation rates between Phase I and II applicants does not mean that increasing the lead time for Phase II was not at all helpful but (a) could be longer; (b) could include time for design of a project (not just delivery) (c) be offered in addition to a rolling application window.

Another dimension influencing project timelines - as reported by scheme participants - is organisational decision-making cycles (i.e. what time of the year they are making investment decisions) as well as how long it takes between considering the investment and implementation. However, these decision-making cycles were not explored within the survey.

### 4.3.2 Factor 7: Wider population typical expectations on payback and resource

As highlighted in the evaluation of the EDR pilot, likely resource intensity was cited as a key reason for non-participation and drop out from the EDR pilot. Furthermore, non-participants stated that the required time investment wasn't worth the amount of funding. Therefore, survey respondents were asked about general tolerances around payback and resource intensity for implementation of energy efficiency projects and participation in schemes.

## 4.4 Payback

On payback, 62% could quantify a typical payback level. Amongst the remaining 38%, payback varied considerably depending upon the specific technology and how essential it is. For example, where technology needs to be upgraded, organisations tend to tolerate much higher payback levels, or even make decisions irrespective of payback:

> "There is no standard; it depends on how the firm is performing and what the project is."

Where respondents could quantify payback, the responses ranged from 0.5 to 15 years; public sector organisations with no profit incentive tended to have higher payback tolerances. The average quantified payback limit was four years; almost a third (31%) said an energy project always had to be less than 4 years payback.

## 4.5 Resource

Of the survey respondents, only 26% could quantify a typical tolerable level of resource burden. Amongst the other 74%, tolerable resource intensity varied considerably, not only upon the specific technology but also how much financial support a scheme may deliver. For example, the larger the funding opportunity, the greater the resource intensity they may tolerate:

> "This would vary depending on what benefits we can get from it."

Where respondents could quantify tolerable resource intensity[39], the responses ranged from 1 to approximately 100 working days, with an average of 12 working days. Those with energy specialists tended to have slightly higher resource intensity tolerance (an average of 16 days vs. 11 for those without a specialist). Although this kind of work is arguably part of their normal job expectations. Three quarters of all respondents said resource allocation would depend upon the individual scheme.

Although determined from a small sample size (n=26), those in rented properties had substantially lower payback level and resource intensity tolerance than those who owned their property or had long-term leases. Claims made by survey respondents supports wider research[40], that many renters will have short term contracts and therefore do not wish to invest in projects with long paybacks.

### 4.5.1 Other factors affecting propensity to take energy efficiency action

Survey respondents were also asked an open-ended question about factors other than payback or resource intensity that might influence their decision on whether to participate in a scheme. Responses – not pertinent to specific sectors - included:

- **Potential marketing value / reputational benefit**: either from being seen to implement the technology or be seen to participate in a scheme:

  > "We would be more likely to take part if there is some easily publicised aspect to it."

- The extent to which it **delivers against carbon targets**, which in turn may deliver further financial or marketing impacts, as stated by a public sector respondent:

  > "We would be more likely if the project focused on carbon reduction as this helps meet government targets."

- **Tenure**: as per findings above the general implication was that participants would be more likely to act or participate at owned sites (or those with long leases).
- **Timing**: implementation timelines are also very important when utilising (or not) a particular scheme or undertaking a project.
- **Suppliers and installers**: whether the organisation trusted that they would be able to find a good supplier and / or installer.

[39] 24% of respondents could quantify tolerable resource intensity.
[40] https://publications.europa.eu/en/publication-detail/-/publication/ae5716d7-fb39-11e7-b8f5-01aa75ed71a1/language-en

- **Demonstration**: if the technology is commercially viable or proven.

  > "We want to see some evidence that the technology works."

- **Planning permission and building regulations**: if a scheme complemented the requirements of these policies.
- **Disruption** to the property or core activity on site:

  > "It depends on whether something will affect production."

- **Size of the required initial outlay**: if too high, this could be a barrier to action.

A factor not cited or considered by respondents to the survey, but was cited as important to EDR pilot participants, is the level of support provided during the programme (albeit this is somewhat linked to scheme resource burden). The support from BEIS staff was regularly mentioned by participants as a positive component to the pilot, though it seems respondents only registered the value of this in retrospect.

A number of the factors above were cited in relation to whether a particular technology would be chosen, which some respondents conflated with the question about EDR participation more generally. However, the list of factors provides a useful summary of the range of decisions that would need to be taken in the two-stage process of deciding upon an energy efficiency project and then a scheme which may facilitate the implementation of that.

### 4.5.2 Utilising Energy Services Companies (including Aggregators)

An energy service company (ESCO) is a commercial or non-profit business providing a broad range of energy solutions, including design and implementation of energy efficiency projects, retrofitting, energy infrastructure outsourcing, power generation, and energy supply. ESCOs (and Aggregators) are a potential route for a larger population of organisations to implement projects and were anticipated to be key participants in the scheme.

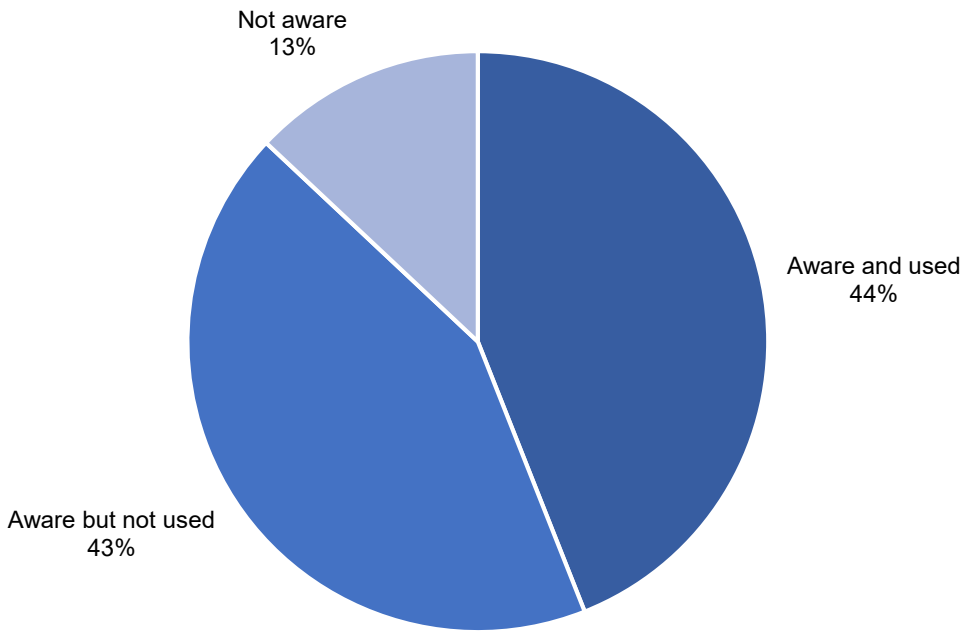


**Figure 10: Awareness and use of ESCOs amongst WPS respondents (n=750)**

87% of survey respondents reported a general awareness of ESCOs and 44% (51% of those aware) have used such companies. Organisations with energy specialists and who have implemented a number of energy projects seemed slightly more likely to have heard of ESCOs.

Evidence from the evaluation (interviews with 15 energy aggregators; see Appendix 5d) found that energy efficiency aggregation is usually an element of a wider service offer for aggregators and it will continue to have that role.

Most aggregators provide this service on an ad-hoc basis, usually for economies of scale rather than to access policies or programmes. Participation in government schemes has generally been relatively low, with the exception of the public sector energy efficiency loans scheme. Where aggregators knew of the EDR pilot, their reason for not fully participating was often due to the requirements of the process (deadlines, required percentage project impact certainty), whereby several dropped out, viewing the uncertainty as too high (especially with certainty around a percentage of project impact) and the reward level as too low to be of interest.

Commensurate with their views on the EDR pilot, longer deadlines, reducing the risk of penalty and greater reward would seem to be useful measures towards increasing participation, albeit not necessarily a broader range of projects. Aggregator views on incentivisation tend to focus upon how more client energy efficiency activity could be encouraged than client policy participation in particular. Financial support to incentivise activity was cited, though this varied between aggregators as to the form it should take (tax benefits, grants, loans, etc.). Other wider ideas from aggregators included adjusting some building regulations to encourage certain standards and actions, as well as greater expert advice supporting aggregators and engaging clients.

## 4.6 Stated reasons for non-take up of the EDR pilot

35% of survey respondents had heard of the EDR pilot and 6% (17% of those aware) had engaged (e.g. registered interest) but had not fully participated.

As part of the wider evaluation, a number of interviews with non-participants were conducted (i.e. organisation who has engaged but not signed a participants agreement). There were commonalities in the reasons stated by non-participants and wider population survey respondents for not participating in the pilot.

The key barriers cited by Phase I non-participants were a combination of the perceived challenges of the scheme requirements (e.g. the tight timetable and 100kW threshold), coupled with an unwillingness to invest the necessary time and resource. Even where they could potentially invest resource to design an eligible project, there was unwillingness due to the perceived risks of the competitive funding process and the low financial rewards (relative to the project cost and commitments required). Therefore a key barrier to participation was an unfavourable calculation of cost vs reward.

This confirmed initial hypotheses regarding reasons for non-registration. There were disproportionate numbers of non-registering organisations without a pre-existing project (increasing perceived effort), and/or only finding out about the scheme close to the deadline (and felt that they could not allocate adequate resources).

> “We felt that for the incentives being offered by [BEIS], the bureaucracy was too burdensome and we had sufficient funds in our own budget, so we just did the project without applying.”

For Aggregators, in Phase I in particular, the time constraints were even more pronounced, as they were required to gain the agreement of sometimes multiple third parties prior to expending resource upon the scheme. This was still true in Phase II despite the reduced minimum kW requirements and increased flexibility in the application process.

A proportion of survey respondents and non-participants (across both phases), reported a lack of awareness of the scheme. For those that were sent marketing materials from BEIS, either communications did not get through (bounced emails) or were not picked up.

Pilot participants on the other hand, had contrasting circumstances: e.g. having a pre-existing energy efficiency project or idea at the outset of the EDR pilot, knowing that project could align with the EDR pilot’s timescales, and having dedicated resources for the project.

Negative experiences of Phase I could also be a barrier; some respondents in Phase II had previous experience in Phase I, which they had found challenging. In many such cases, there was no attempt to familiarise with scheme revisions before deciding not to register.

### 4.6.1 Not applying

The most common issue for those that registered but did not then apply for the EDR pilot was the realisation that they would struggle to qualify. Ineligibility was still a common barrier at application stage. Many organisations had registered interest without in-depth investigation of the scheme requirements and rules, often because they had limited time and wanted to make sure they didn’t exclude themselves from the opportunity through not registering.

Some organisations were aware at registration stage that they did not already have an eligible project but hoped to further develop projects after registering, but had ultimately realised an eligible application was not going to be feasible. This was the situation for a number of aggregators who had hoped to use time between registration and application to build client relations and activities. One aggregator reported finding this challenging due to negative client perceptions of the proposed project or technology and a lack of client understanding of the scheme.

Tight timescales and a lack of resources were commonly cited as barriers by those registering interest but not applying; the extent of the scheme requirements had become clearer as organisations engaged with the application stage guidance:

> "It was going to be a nightmare to pull together. I have got to be able to justify spending my time and each site team's time pulling that information together, then putting the bid together."

As explored in the sub-section below, where these two factors did not seem to be an insuperable issue, organisations generally had a pre-existing project developed to some extent and resource to draw upon. The latter often depended upon organisational commitment to energy efficiency or recognition of the opportunity to invest, as these organisations were more likely to have staff with energy efficiency projects in their remit.

### 4.6.2 Rejected applications

The number of rejected applications fell from 21 in Phase I to just 6 in Phase II. The additional support from BEIS in Phase II had a positive effect on the quality of applications and / or the support was effective in dissuading ineligible projects.

In Phase I, respondents struggled with the monitoring and verification requirements, and so, in some cases, were unable to demonstrate how savings would be achieved, or miscalculated that a project was eligible when it was not. For example, some applications confused energy (kWh) with power (kW) in their calculations. There were also a number of instances of organisations including lamp-only replacement in their applications; this measure was ineligible in deemed projects and its removal brought the projects below required kW thresholds. There were also two instances of projects being brought below the threshold by elements that had a payback period less than two years.

Some organisations may never have been eligible or had the potential to participate, and therefore the process was effective in filtering these out relatively early on (albeit sometimes following substantial input from both BEIS and the organisation). In some of these cases, applicants had either not properly read the requirements or had not understood them. These organisations stated that they had not had the time to properly read and digest the guidance, or did not understand exactly what was being asked for. This was not directly linked to expertise; in Phase I, two respondents with rejected applications said that the application was completed by external consultants and even they found the process and guidance time consuming and challenging. That said, a fair conclusion may be drawn that the scheme guidance – certainly in Phase I – may not have been user friendly.

### 4.6.3 Withdrawing from the scheme

Where organisations withdrew their project from the scheme, this was usually due to a realisation that they were no longer eligible, or – as hypothesised – due to a change of circumstances, so saw little value committing more time and effort to the process.

Pre-application withdrawal was much more common in Phase II than Phase I, indicating that additional BEIS support offered in Phase II was more effective in helping organisations to realise when their applications were ineligible.

The other main reason given for withdrawal was a re-assessment of reward vs. anticipated effort of continued participation. As stated above the scheme guidance may have been, in certain areas, complicated, but the reassessment in some cases, seemed to be due to organisations not having fully engaged with scheme guidelines at the beginning of their involvement. For example, not knowing the maximum bid allowable at auction, not realising the scheme is targeting kW rather than kWh, or not realising funding did not cover 100% of total project costs. In one case an organisation withdrew post-application due to the payback criteria (minimum two years) being too restrictive, again indicating minimal engagement with scheme guidelines at the outset. As with rejected applications, the reasons for organisations not having clarified this information earlier did not seem to be linked to expertise or resource. Although, in all but two cases, there was minimal senior input (despite all cases being large multi-site projects), which might imply many of these projects were at greater risk of withdrawal upon further internal scrutiny.

## 4.7 Hypothetical support tested in the Wider Population Survey

The above findings set out the various reasons why organisations chose not to fully participate in the EDR pilot. This sub-section reports on potential engagement in energy efficiency schemes amongst the wider population.

Respondents were asked to answer questions in relation to an energy efficiency measure they were considering, but had not yet implemented. If they could not think of one, an auto-generated measure was provided for their consideration from a list of technologies (see Appendix 5e for further details).

Each organisation was then asked to provide a baseline rating of their likelihood of implementing that measure if there was no supporting policy or scheme, on a scale of not likely (1) to very likely (10). The survey then asked each respondent to provide a rating of their likelihood to implement that measure under different situations, where the level of two factors - payback and resource burden - varied.

The purpose of this was twofold: 1) to provide insight into preferences and so why they might not have participated in the EDR pilot; 2) to indicate what level of resource requirement and incentive might persuade organisations to participate in a future scheme.[41]

As expected, generally organisations reported higher likelihood ratings when they were offered some level of incentive, compared to no incentive. Likelihood of engaging also increased the greater the incentive that was offered. However, likelihood of implementing projects was overall fairly low (30%), even when the maximum incentive was offered.

The survey demonstrated that both factors – payback and resource use – have an effect upon likelihood-of-action rating. High resource use is only justifiable for many when the payback

[41] There may have been a slight anchoring effect i.e. each scenario given will be compared by respondents to something they heard before, with the respondent possibly concluding their rating should be progressively higher as each scenario sounds better. This would result in similar proportions of respondents choosing similar scores despite different scenario sets because those (better scores) were the only choices remaining.

reduction becomes significant enough. Equally if the payback is quick enough, organisations are much more tolerant on required resource - the days spent can be justified based on the reward. When asked to choose which of the two elements was more important, more respondents chose a reduced payback (incentive) than resource use (27% versus 4%), though the majority (68%) said they could not decide between the two. As indicated by the above reasons for non-participation, organisations will conduct a cost-reward calculation in deciding whether to participate.

Again, supporting evidence from the pilot evaluation that organisations were more likely to act where:

- They were familiar with the measure being considered (especially if it was lighting) and knew what energy efficiency action could be taken within their organisation.
- Tenure allowed them to be autonomous in decision-making.
- Payback levels met their requirements and they had resources to put into a scheme.
- They were already concerned about energy consumption and had an individual or team who were focused on this.

### 4.7.1 Types of financial support

As described in the introductory section of this report, the EDR pilot was set up to provide grants where the price per kW reduced would be decided through a competitive auction.

Where organisations explored the detail of the EDR pilot sufficiently, the perceived uncertainty of an auction was another consideration weighing against scheme participation in their calculation of risk and reward. The survey therefore explored wider population preference for the type of financial support provided (they could choose multiple types if they were open to more than one).

The results indicate that by far the most popular support (73% chose this) was a direct grant, though two-fifths (40%) of the sample were open to an auction-based grant. Those who interacted with the EDR pilot to at least some extent were no more likely to choose the auction than those who did not interact at all with the EDR pilot. Even those who participated in the EDR pilot did not necessarily view this approach as the optimal way to distribute funding. See Appendix 5e for graphical presentations of these and additional results from the WPS.

# 5 Capacity Market viability

## 5.1 Structural barriers to EDR in the CM

### 5.1.1 Pricing and auction format

The 2014 T-4 CM auction had a clearing price of £19.40/kW[42] and the 2016 T-4 auction cleared at £22.50/kW[43]. More recently, the 2018 T-4 CM auction has cleared at a record low price of £8.40/kW. In comparison, weighted average prices in the EDR pilot were £229/kW in Phase I and £203/kW in Phase II – with the lowest winning bid receiving £48/kW. (Although the differences in eligibility criteria between the two mean that the numbers are not directly comparable).

If energy efficiency was able to participate in the annual CM auctions there is the potential that the bid price into the annual auction would be lower than the EDR pilot as energy efficiency participants could secure funding on an annual basis. However as currently designed, funding would not be guaranteed from one year to the next, as the clearing price of the CM can fluctuate. In contrast, the EDR pilot offered a one-time payment with the maximum price equivalent to a 4 year agreement priced at the current CM price cap of £75/kW. At 2014 CM prices, projects would need to win an agreement every year for over 11 years to receive levels of funding similar to that provided by the EDR pilot with additional risk that the market could change substantially over time as new technologies are developed.

Even with incentives of up to £300/kW, EDR pilot participants noted that incentives covered only a small percentage of total costs, especially relative to the effort the scheme required. As described in previous sections, the EDR pilot was undersubscribed, compared to the estimated EDR technical potential, and therefore the weighted average price (with 10 organisations bidding at, or very near, the maximum of £300/kW) may not be truly representative of the actual price in a fully subscribed auction. However, those with a project going forward regardless of scheme participation (i.e. non-additional projects) may be inclined to accept lower funding amounts or higher penalties.

If energy efficiency was included in the CM and bid at similar levels to those in the EDR pilot, it is unlikely that many projects would successfully clear in an auction when competing against generation, DSR and storage. Owing to the highly competitive nature of the market, energy efficiency projects that could compete successfully in the CM are more likely to be easy to implement and inexpensive projects or projects that may have progressed regardless of any additional funding. These are unlikely to be innovative or truly additional projects; although they may be scaled up or accelerated to fit timelines (as in the EDR pilot). Projects that are innovative or in some way riskier generally need higher levels of incentives to encourage them. The competitive nature of an auction is unlikely to provide this.

It is also plausible that introducing energy efficiency would make the CM auctions more competitive and result in even lower clearing prices than currently seen, although this would require a significant drop in the prices observed in the EDR pilot auctions. Multiple potential

[42] https://www.emrdeliverybody.com/Capacity%20Markets%20Document%20Library/T-4%202014%20Final%20Auction%20Results%20Report.pdf

[43] https://www.emrdeliverybody.com/Capacity%20Markets%20Document%20Library/Final%20Results%20Report%20-%20T-4%202016.pdf

EDR pilot participants were deterred by the auction format itself. If EDR was to be successfully introduced to the CM, these participant concerns would have to be addressed. As it stood, the auction was viewed as an added layer of complexity and introduced further risk of their bid being rejected (even if their application was accepted).

There are a number of aspects of the CM that would need to be re-designed in order to accommodate EDR, this would entail costs and may therefore not be proportionate given the low likelihood of EDR winning CM agreements in the current design. A balance must be struck between ensuring an efficient allocation of funding that provides good value for money by funding inexpensive projects, whilst also stimulating additional projects.

### 5.1.2 Metering and evaluation

The CM requires that participating units are metered and these meters are used to determine under or over delivery against the obligations of the mechanism. The EDR pilot differed to the CM by allowing metering or the use of deemed savings calculators, provided by BEIS for common technologies, to assess delivery.

As discussed earlier, almost all EDR pilot participants elected to use the deemed savings calculators. The metering requirements were a significant barrier sited by EDR pilot participants when asked why they did not undertake more innovative projects. Some EDR pilot participants reported being confused by the metering approach and ensured their chosen technology did not have to use this approach:

> "We only wanted to do deemed as metered looked too time consuming".

Participants in the CM auctions are required to meter. For comparison purposes, nearly a quarter of the capacity procured during the first Transitional Arrangements (TA) auction dropped out during the testing process, most siting the stringency of the testing process as the reason. However, almost all of the remaining participants in the first TA auction did report that participation was still beneficial, despite the additional costs from metering and testing[44]. While metering was certainly viewed as a challenge by EDR pilot participants, TA participation demonstrates it is not an impossible obstacle to overcome.

Many of the organisations that investigated the EDR pilot had concerns around the penalties associated with under delivery. For any projects that did not deliver the savings predicted, the payment reduces 2% for each 1% reduction in kW. Several participants had penalties applied. The CM contains two different forms of penalties for under/non-delivery. The first is known as a 'termination fee' and applies to new build capacity which has won a capacity agreement in an auction but is then not available in time for the deliver year. If EDR were to be included in the CM as currently designed, the termination fees for not delivering the capacity in time may be much higher than the penalties in the EDR pilot (where participants received no funding if they did not deliver at least 50% of the contracted capacity savings). Further, there is no partial termination in the CM, so if participants did not deliver their full capacity or were delayed by even a small margin they would face a full fine and potential full termination of their CM agreement.

[44] See: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/671594/Evaluation_of_the_Transitional_Arrangements_for_Demand-Side_Response_-_Phase_2_Executive_Summary.pdf

The second form of penalties are applied during a delivery year to all capacity with a capacity agreement that does not deliver their capacity during a time that the electricity system is stressed. These stress event penalties are currently set at 1/24th of the relevant auction clearing price for each kW not delivered (albeit subject to a monthly cap of 200% of monthly CM revenue and 100% of annual CM revenue). They are an important element of the CM, as they help ensure that capacity procured through the CM is available and delivers when required.

## 5.2 International comparisons

There are Capacity Markets in which energy efficiency successfully competes with generation and DSR at auction. However, the regulatory frameworks and subsidies available in these markets (such as PJM and ISO New England) are different to GB. For example, while they, like the UK, have additional legal obligations that require energy suppliers to invest in, and operate, energy efficiency schemes, some US states even have a 'loading order' for procuring energy that means energy efficiency must be considered before the construction of additional generation[45]. The magnitude of supplier obligations in US markets also tends to be significant larger than current supplier obligations in the UK. As a result, the revenue that suppliers receive from bidding energy efficiency schemes into PJM and ISO New England's capacity markets is not a main funding source, but rather a supplementary revenue stream for their schemes. The energy efficiency schemes in the USA are mostly funded through a charge on customer's bills or directly from the federal government; funding from a capacity market generally makes up a small amount of the scheme's total budget. Any support for EDR, which allows access to multiple subsidies, would need to consider issues around potential over-cumulation of aid.

Most of these energy efficiency schemes are rebate programmes that provide set incentives for various types of technologies. The rebate amount varies by technology type and allows the scheme designers to offer differing incentive levels to technologies they are more or less interested in. (For example, the scheme may pay larger incentives to innovative heat pump projects and lower incentives to lighting projects that are less likely to be additional.)

The majority of players in the USA capacity markets are aggregators (or energy suppliers or distributors acting as aggregators) and not direct participants. Only about 4% of PJM's members are direct participants. In the US at least, aggregators are key to the larger participation of energy efficiency in a capacity market landscape.

This combination of legal requirements and additional funding sources for energy efficiency is a very different landscape to that in which the EDR pilot operated.

## 5.3 The role of aggregators

The EDR pilot had limited participation from aggregators, particularly in Phase I (although in the first year of Phase II 95% of the delivered capacity came through aggregators and in the second year of Phase II 57% of delivered capacity). However, aggregation in the Capacity Markets, such as with demand side response (DSR), is more common and increasing. Many non-participating aggregators interviewed in this evaluation reported that the current

[45] http://www.energy.ca.gov/2005publications/CEC-400-2005-043/CEC-400-2005-043.PDF

government support for energy efficiency is not sufficient for them to justify offering energy efficiency aggregation services and that DSR is more profitable:

> "There is a benefit [to energy efficiency] but not in the capacity market… DSR is easier to sell, easier to monetise."

Part of this is linked to the pilot nature of EDR; many aggregators interviewed stated that uncertainty about the future of EDR prevented them from developing energy efficiency as a service offering.

However, aggregators may be key to unlocking energy efficiency potential at a scale that could bid into the capacity market and help support security of supply. As stated above, both PJM and ISO New England's capacity markets are heavily reliant on aggregators and have very few direct participants.

As detailed in Section 4, administrative burden was a barrier for many attempting to participate in the EDR pilot. The kW threshold was also a commonly cited barrier. Aggregators can help by taking the administrative burden away from direct participants and also have the ability to streamline the application process by grouping many projects together. There are a limited number of organisations in GB that meaningfully contribute large kW reductions on their own; however further lowering the kW threshold is unlikely to deliver sufficient savings to make an impact. Aggregators can encourage additional participation by bidding in a portfolio comprised from many smaller energy efficiency projects.

An increase in energy efficiency aggregators would likely reduce the resources required from scheme managers; during Phase II of the EDR pilot many of the successful projects required significant support and guidance from the BEIS Operations team. This level of support is unlikely to be practical, nor cost effective, in an enduring regime.

If the scale of activity was large enough, aggregators may even be able to encourage more innovative projects by packaging them with low risk energy efficiency projects to reduce overall portfolio risk.

## 5.4 Summary

In summary, government would need to make design and operational changes to the mechanism before EDR could participate in the CM. Therefore, given the results of our evaluation and research into international schemes, EDR appears to be better suited to a separate scheme to the CM (or potentially through a separate auction, such as was the case for DSR), or if energy efficiency projects can leverage multiple sources of funding. Aggregators are also key to the success of energy efficiency in a competitive capacity market. However, BEIS may conclude that the cost and effort of running a separate scheme may not be viable in the long term, as many EDR pilot participants needed significant support from the BEIS Operations team for their projects to successful secure funding in the EDR pilot auction. However, introducing energy efficiency to the CM or a separate scheme may have implications for the security of supply, which are important to consider and would potentially enable energy efficiency to compete with generation to reduce future capacity requirements in GB.

# 6 Key conclusions

The principal aim of policy pilot is to highlight what works and what does not work in relation to the intended aims of the policy. The findings of this evaluation raise a number of considerations relating to the EDR pilot and wider implications for policy makers in encouraging demand reduction activity. Most focus around balancing risk, effort and reward to increase participation. In this section, key conclusions and how they answer the key evaluation HLQs are provided.

## 6.1 Scheme impact

The EDR pilot scheme achieved additional impacts of 2,162 kW peak reduction in Phase I and 1,845 in Winter 2016-17 of Phase II[46]. Despite paying for only one winter of savings, these projects will deliver multiple years of electricity savings, as the effective useful life of all technology installed under the scheme is 10 years or longer. It also delivered a potential number of wider benefits through the funded projects e.g. productivity, maintenance costs, reduced absenteeism and health and safety.

The scheme was cost effective across both Phases for both society and the majority of participants. The scheme represented good value for money for society (and therefore government) with a positive social NPV.

All participants had positive NPVs, regardless of their attribution type. For the majority of participants, the projects in the scheme represented good value for money.

**Value to society from the EDR pilot includes reduced carbon emissions and improved air quality from a reduction in gas fired generation. Overall societal NPV from the EDR pilot amount to £10,568,741 in Phase I and £4,179,909 in Winter 2016-17 Phase II.**

However, the scheme has required substantial resource from organisations that participated (to any degree). Some organisations chose to drop out rather than devote the required level of resource; others said it had significantly impacted their assessment of whether EDR pilot participation was 'worth it'. If the scheme had run year on year this level of resource would likely have been lower – making cost benefit assessments more favourable – as organisations became more comfortable with the process. The higher participation likely in an enduring year-on-year scheme may also enable the scheme to support the greatest savings at peak at least cost. **As the pilot auctions were undersubscribed, the EDR pilot may not have supported the greatest savings at least cost.**

## 6.2 Scheme contribution and success factors

The EDR pilot addressed key barriers to energy efficiency projects for many participating organisations (either a direct need for funds or indirectly through improving the business case for action). The most common influence of the EDR pilot was in accelerating the participating

[46] Winter 2017-2018 projects were not included as final savings estimates and final reports were not available at time of writing.

project, though in some cases it had also ensured the project went ahead (or on a larger scale) when it otherwise would not have.

The evaluation did highlight a small number of cases in which the respondent would have taken the same action in the same timescale regardless for the EDR pilot. In addition, the Wider Population Survey showed that many organisations have been able to take recent action outside the EDR pilot, on the same technologies and in the same timeframe; this clearly indicates that there are other motivations to action outside the EDR pilot.

The necessary conditions for full participation (set out in section 2) were a combination of having an eligible project at the right point of implementation, sufficient resource to take it forward in the scheme timescales, and an organisational strategic interest in or commitment to energy efficiency.

The EDR pilot scheme supported – almost entirely – LED lighting projects. This raises the question, particularly in the context of survey findings showing the wider level of action on lighting, of the extent to which the EDR pilot provided additionality to such projects. It is possible the scheme is perceived as a way of helping organisations to implement projects they would otherwise have done anyway, rather than prompting consideration of what else could be made possible.

The support from the BEIS Operations team running the EDR pilot was generally praised. Many participants felt that assistance from BEIS was very helpful when applying and filling out scheme paperwork (such as the Measurement and Verification plan and updates, OV report, etc.). Almost all Phase II participants stated that the BEIS Operations team's in-depth and on-going support to them had been valuable. However, this level of in-depth support would not be sustainable in an enduring regime, which would be likely to have many more participants.

## 6.3 Non-participation

Whilst scheme incentives were sufficient to attract some organisations to apply, this number was small in the context of those expressing initial interest and original pilot scheme expectations. Some of these stated barriers endorse the hypothesis that organisations will reason against participating in the EDR pilot based upon perceived eligibility.

**The greatest initial barrier to the EDR pilot was simply awareness**; 65% of the Wider Population Survey sample were not aware of the EDR pilot. There are a number of other key barriers to participation in the EDR pilot, from hygiene factors (e.g. they don't meet EDR pilot requirements) through to more circumstantial issues (e.g. not having a project concept in place when the EDR pilot was announced, assessment of risk vs reward etc.).

**Most non-participating organisations perceived the scheme eligibility requirements, particularly in Phase I, to be too challenging**. Only a fraction of the theorised target audience could access the EDR pilot as it was designed. Primarily, this was due to the focus on required electrical peak demand reduction and level of kW abatement. There is a point at which reducing the kW threshold would not provide value for BEIS or the energy bill payers, in terms of the ratio of resource invested to kW delivered. However, it is possible if the application process and its review was streamlined BEIS could fund even small projects.

The scale of the EDR pilot's reward vs measure cost, and the large amount of resource burden (or hassle cost) the process required, would seem to be key barriers to organisations once they overcome initial barriers such as awareness and project size eligibility criteria. This

endorses the hypotheses **that hassle and low return on investment were significant factors in choosing not to participate in the scheme**. As the funding levels were not modified between Phase I and Phase II, this barrier persisted even after adjustments were made to make Phase II more appealing.

**It was hoped that ESCOs and Aggregators could support a significant number of projects in the EDR pilot. While there was some evidence of organisational interest in using ESCOs as well as ESCO or Aggregator interest in EDR, only a handful of aggregators participated. They did, however, provide a majority of the Phase II delivered savings**.

**The auction, while testing the type of approach used in the CM, was off-putting to some potential participants, both in terms of the perceived risk of not getting any funding and perception of it adding unnecessary complexity to the process** (e.g. being an additional step to understand).

## 6.4 Lessons learned and key thoughts on future support

A lower level of input required of participants, both in terms of stages of the process and the amount (and complexity) of data required, might encourage more organisations to participate. Whilst complexity was somewhat reduced for Phase II, participants continued to comment that the scheme had required a substantial time investment. There also seemed to be a barrier as application documents required specifics of the project before implementation and required participants to have a sufficiently developed idea to apply.

**Giving a longer lead time – and guaranteeing year-on-year funding – could give organisations the space (and certainty) to develop projects, and potentially more ambitious projects, involving technologies other than lighting**. The scheme set out some rigidity for rules and deadlines which discouraged potential applicants, and proved to be difficult to administer in practice. However, potential participants would need to know that option was available (in Phase I of the EDR pilot it was not). It would still need to fit in with decision making cycles in terms of timing of application.

Energy costs did not tend to occupy a high priority level with about half of target audience organisations. On this basis, lowering energy use within organisations may require energy service companies and policy makers to target organisations in ways that change the language and focus of how they are engaged.

Although an incentive such as grant funding or loans may still require a competitive process, it would be viewed by potential participants as much more straightforward and – if a long term loan scheme in which the repayments are recycled – could be less demanding of organisations as well as self-perpetuating.

Incentives paid by the EDR pilot (which generally represent the greatest scheme cost to government) are in line with the costs of other schemes investigated in Texas[47] and Switzerland[48] but significantly lower than schemes in California[49]. **Overall they represent good value for money when compared to other schemes' prices per kW or kWh;**

[47] Incentives of Texas commercial schemes range from $175 to $350 per kW.
[48] Incentives of Swiss proKilowatt scheme average CHF 0.04 per kWh.
[49] Incentives of California schemes rage from $0.19 to $0.34 per kWh.

**however these other schemes are more mature and have been much more successful in encouraging participation so this should not be the only metric of comparison**.

**As the EDR pilot and CM are currently designed, it is unlikely EDR would be viable in the GB CM**. Overall, the pilot had low participation; introducing EDR into the CM would likely exacerbate many of the previously mentioned issues that participants and potential participants had with the EDR pilot. For many, the value case of EDR pilot participation seemed more hassle than the reward was worth.

There is a significant gap between current CM clearing prices and EDR payments, although it should be recognised that the prices are not directly comparable given the differing eligibility criteria. The 2016 T-4 Capacity Auction cleared at £22.50 and the most recent CM auction cleared at £6.95/kW[50] while weighted average prices in EDR were £229/kW in Phase I and £203/kW in Phase II, although EDR projects in Phase II were successful at £48/kW. This suggests that the full cost of EDR supported in the pilot may be too high to win an agreement in the CM. It is also possible that energy efficiency projects could be financed by bidding into the CM over multiple years (as these projects will deliver savings of their entire lifetime, not just one year). **However, at current rates projects would need to win agreements in the CM for many consecutive years (or be given longer contracts) to receive a similar amount of funding as was provided by the EDR pilot**. Introducing energy efficiency to the CM may reduce prices even lower by increasing the competition for funding. Penalties applied in the CM may also be higher than those applied in the EDR pilot, although it will differ on a case by case basis. The EDR penalty for non-delivery was a loss of 2% of the total grant for every 1% of peak savings not delivered (with no funding received where projects delivered 50% or less of the contracted capacity savings). For the CM, termination fees for not delivering the capacity on time may be much higher than this (£5000-£35000/MW or for consistency with the pilot this translates to £5-£35/kW) and there are no partial terminations, meaning that even if operators miss capacity by a small margin they still face full fines and a termination of their capacity agreement. In addition, the CM also has further penalties for built capacity with an agreement that does not deliver during a stress event.

Multiple potential participants were deterred by the auction format itself, which would be a key component if EDR was introduced to the CM. The auction was viewed as an added layer of complexity and introduced further risk of their bid being rejected (even if their application was accepted). Whilst there are other markets (such as PJM and ISO New England, both in the USA), where energy efficiency successfully competes with generation in capacity mechanisms, these markets have obligations that require suppliers to invest in energy efficiency schemes that are greater than those in the UK. The funding suppliers receive from bidding their energy efficiency schemes into PJM and ISO New England's capacity markets is not a main funding source, but rather a supplementary source of income for their schemes. This is a very different situation than the EDR pilot's current design, which did not allow revenue stacking. In GB, the stacking of subsidies from different schemes as seen in PJM and ISO-NE would need to consider the cumulation State Aid rules.

**Government would need to consider a number of design and operational changes to the CM before EDR, as supported in the EDR pilot, could be viable in it**. Given the results of our evaluation and research into international schemes, EDR would likely be most successful in a separate auction to the CM (as in the pilot) or if energy efficiency projects can leverage

[50] https://www.emrdeliverybody.com/Capacity%20Markets%20Document%20Library/T-1%20Provisional%20Results%20Report.pdf

multiple sources of funding and are generally bid in by aggregators (as in PJM and ISO New England's markets).

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