Title: A Performance-Based Framework Consultation IA No: BEIS034(C)-20-EEL RPC Reference No: BEIS-5034(1) Lead department or agency: BEIS Other departments or agencies: N/A	Impact Assessment (IA) **Date:** 17/03/2021 **Stage:** Consultation **Source of intervention:** Domestic **Type of measure:** Primary legislation **Contact for enquiries:** businessenergyuse@beis.gov.uk

Summary: Intervention and Options

RPC Opinion: Awaiting Scrutiny

Cost of Preferred (or more likely) Option (in 2019 prices)			
Total Net Present Social Value	**Business Net Present Value**	**Net cost to business per year**	**Business Impact Target Status**
£310m	£482m	EANDCB -£35.3m	Qualifying provision

What is the problem under consideration? Why is government action or intervention necessary?

Market failures including externalities, information failures, behavioural barriers and split incentives, mean the operational performance of commercial and industrial buildings in terms of how well they use energy, is inefficiently poor, and not net zero consistent. This causes overuse of energy, and hence higher GHG emissions. A key part of resolving this is having a consistent means of assessing buildings' operational performance. Existing measures of building performance, such as the Energy Performance Certificate, do not adequately reflect their real performance, and this is particularly acute for larger buildings. Government intervention is required as this information must be developed at the level of the entire stock, and existing market-driven interventions cover a small minority of the stock.

What are the policy objectives of the action or intervention and the intended effects?

Delivery and Uptake

- The scheme must be able to provide accurate annual performance-based ratings for the buildings in scope of the scheme.
- The scheme should achieve widespread uptake from the buildings in scope.
- The responses of the buildings in scope must be able to be **monitored and analysed.**

Improvement and Engagement: From **day one** the scheme will at least:

- Inform and incentivise businesses to improve their energy-use,
- Encourage the **better use of buildings** (behaviour, controls, building management systems)
- Encourage greater **investment in buildings,** in fabric/HVAC (heating ventilation and air conditioning) measures, in a way that reflects and incentivises their **performance over time.**

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

- Do Nothing – Maintain current policy framework alongside aforementioned market driven ratings systems, which have limited uptake.
- Fiscal Options including subsidies or taxes based on building performance or emissions.
- Maintain an Energy Performance Certificate (EPC)-based framework.
- Extend the Display Energy Certificate (DEC) framework to private sector (from public).
- Introduce a Performance-Based Framework (PROPOSAL)

Proposed Option deals directly with information and behavioural market failures, in a way that the alternatives do not (see evidence base).

Will the policy be reviewed? It will be reviewed. **If applicable, set review date: 12/26**

Does implementation go beyond minimum EU requirements?		N/A		
Is this measure likely to impact on international trade and investment?		No		
Are any of these organisations in scope?	**Micro** Yes	**Small** Yes	**Medium** Yes	**Large** Yes
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent) **(2021-2038)**		**Traded:** -0.89	**Non-traded:** -2.08	

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible Minister: Lord Callanan  Date: 12/03/2021

Summary: Analysis & Evidence

Policy Option 1

Description: Option 1: Voluntary performance-based ratings for large private offices > 1,000m^2

FULL ECONOMIC ASSESSMENT

Price Base Year 2019	PV Base Year 2020	Time Period Years 18	Net Benefit (Present Value (PV)) (£m)		
			Low: 70	**High:** 190	**Best Estimate:** N/A

COSTS (£m) (2021-2038)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price (PV))	Total Cost (Present Value)
Low	N/A		7	120
High	N/A		16	290
Best Estimate	N/A		N/A	N/A

Description and scale of key monetised costs by 'main affected groups'

Main affected group is building owners (including landlords) who **voluntarily** (in this option) receive ratings and improve use of energy in response. Capital and installation costs of improving performance are the largest component (65%). Scheme operating costs (19%) including familiarisation costs, delivering & maintaining ratings, and scheme administration. The opportunity cost of capital (9%) and the increased operational costs of the upgraded energy systems (7%).

Other key non-monetised costs by 'main affected groups'

Possible search costs due to firms identifying energy service providers to help interpret and improve ratings.

BENEFITS (£m) (2021-2038)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price (PV))	Total Benefit (Present Value)
Low	N/A		11	190
High	N/A		27	480
Best Estimate	N/A		N/A	N/A

Description and scale of key monetised benefits by 'main affected groups'

Energy savings are the largest benefit (74%). These energy savings also yield distinct benefits from non-traded CO2e emissions reductions (15%), traded CO2e emissions reductions (6%) and air quality improvements (6%).

Other key non-monetised benefits by 'main affected groups'

There are also expected to be productivity and health benefits associated with the improved provision of heating/cooling in buildings. Reducing energy demand is likely to generate a benefit at the national level from improved energy security. Improved engagement with energy performance will also support the creation and maintenance of high-skilled jobs in the low-carbon economy. The data produced should improve market functioning (asset and rental markets) as prices better incorporate energy performance, as well as improving monitoring and targeting of future policy.

Key assumptions/sensitivities/risks	Discount rate (%)	3.5%

Assumes positive engagement with ratings (i.e. businesses improve performance due to rating information and benchmarking incentives). Cost levels for energy efficiency and heating technologies are consistent with our modelling assumptions. Costs of delivering ratings are broadly comparable to similar domestic and international policies. Energy and carbon prices are in line with central IAG projections. The long term impacts of COVID-19 on the economy and use of commercial buildings is unknown at this point.
Level of voluntary uptake is highly uncertain – so figures for this option are presented as a range.

BUSINESS ASSESSMENT (Calculated for Proposed Option)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs: N/A	**Benefits:** N/A	**Net:** N/A	

Summary: Analysis & Evidence

Policy Option 2

Description: Option 2: Mandatory performance-based ratings for large private offices > 2,000m^2

FULL ECONOMIC ASSESSMENT

Price Base Year 2019	PV Base Year 2020	Time Period Years 18	Net Benefit (Present Value (PV)) (£m)		
			Low: Optional	**High:** Optional	**Best Estimate:** 290

COSTS (£m) (2021-2038)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price (PV))	Total Cost (Present Value)
Low	N/A		N/A	N/A
High	N/A		N/A	N/A
Best Estimate	N/A		26	**460**

Description and scale of key monetised costs by 'main affected groups'

Main affected group is building owners (including landlords) who receive **mandatory** ratings and improve energy in response. Capital and installation costs of improving performance are the largest component (67%). Scheme operating costs (17%) including familiarisation costs, delivering and maintaining ratings and scheme administration. The opportunity cost of capital (9%) and the increased operational costs of the upgraded energy systems (8%).

Other key non-monetised costs by 'main affected groups'

Possible search costs due to firms identifying energy service providers to help interpret and improve ratings.

BENEFITS (£m) (2021-2038)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price (PV))	Total Benefit (Present Value)
Low	N/A		N/A	N/A
High	N/A		N/A	N/A
Best Estimate	N/A		42	**760**

Description and scale of key monetised benefits by 'main affected groups'

Energy savings are the largest benefit (75%). These energy savings also yield distinct benefits from non-traded CO2e emissions reductions (13%), traded CO2e emissions reductions (6%) and air quality improvements (5%).

Other key non-monetised benefits by 'main affected groups'

There are also expected to be productivity and health benefits associated with the improved provision of heating/cooling in buildings. Reducing energy demand is likely to generate a benefit at the national level from improved energy security. Improved engagement with energy performance will also support the creation and maintenance of high-skilled jobs in the low-carbon economy. The data produced should improve market functioning (asset and rental markets) as prices better incorporate energy performance, as well as improving monitoring and targeting of future policy.

Key assumptions/sensitivities/risks	**Discount rate (%)**	3.5%

Assumes positive engagement with ratings (i.e. businesses improve performance due to rating information and benchmarking incentives). Cost levels for energy efficiency and heating technologies are consistent with our modelling assumptions. Costs of delivering ratings are broadly comparable to similar domestic and international policies. Energy and carbon prices are in line with central IAG projections. The long term impacts of COVID-19 on the economy and use of commercial buildings is unknown at this point.

BUSINESS ASSESSMENT (Calculated for Proposed Option)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs: N/A	**Benefits:** N/A	**Net:** N/A	N/A

Summary: Analysis & Evidence

Policy Option 3 (Proposed)

Description: PROPOSED OPTION - Option 3: Mandatory performance-based ratings for large private offices > 1,000m^2

FULL ECONOMIC ASSESSMENT

Price Base Year 2019	PV Base Year 2020	Time Period 18	Net Benefit (Present Value (PV)) (£m)		
			Low: -120	**High:** 930	**Best Estimate:** 310

COSTS (£m) (2021-2038)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price (PV))	Total Cost (Present Value)
Low	N/A		25	450
High	N/A		42	760
Best Estimate	N/A		36	**650**

Description and scale of key monetised costs by 'main affected groups'

Main affected group is building owners (including landlords) that receive **mandatory** (in this option) ratings and improve energy efficiency in response. Capital and installation costs of improving performance are the largest component (60%). Scheme operating costs (26%) including familiarisation costs, delivering and maintaining ratings and scheme administration. The opportunity cost of capital (8%) and the increased operational costs of the upgraded energy systems (7%).

Other key non-monetised costs by 'main affected groups'

Possible search costs due to firms identifying energy service providers to help interpret and improve ratings

BENEFITS (£m) (2021-2038)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price (PV))	Total Benefit (Present Value)
Low	N/A		18	320
High	N/A		94	1690
Best Estimate	N/A		54	**970**

Description and scale of key monetised benefits by 'main affected groups'

Energy savings are the largest benefit (74%). These energy savings also yield distinct benefits from non-traded CO2e emissions reductions (15%), traded CO2e emissions reductions (6%) and air quality improvements (6%).

Other key non-monetised benefits by 'main affected groups'

There are also expected to be productivity and health benefits associated with the improved provision of heating/cooling in buildings. Reducing energy demand is likely to generate a benefit at the national level from improved energy security. Improved engagement with energy performance will also support the creation and maintenance of high-skilled jobs in the low-carbon economy. The data produced should improve market functioning (asset and rental markets) as prices better incorporate energy performance, as well as improving monitoring and targeting of future policy.

Key assumptions/sensitivities/risks	Discount rate (%)	3.5%

Assumes positive engagement with ratings (i.e. businesses improve performance due to rating information and benchmarking incentives). Cost levels for energy efficiency and heating technologies are consistent with our modelling assumptions. Costs of delivering ratings are broadly comparable to similar domestic and international policies. Energy and carbon prices are in line with central IAG projections. The long term impacts of COVID-19 on the economy and use of commercial buildings is unknown at this point.

BUSINESS ASSESSMENT (Proposed Option: Option 3)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs: 43.1	**Benefits:** 78.4	**Net:** -35.3	-176.5

Contents

1 Introduction

1. The UK was the first advanced nation to pledge in 2019 that the country will achieve net-zero greenhouse gas emissions by 2050. The COVID-19 pandemic has made delivering that objective even more important: to build a future economy that will thrive is to build a future economy that will be clean.

2. One of the most difficult challenges the UK faces on its decarbonisation pathway is the built environment. In commercial and industrial buildings, how we use energy will need to improve and how we heat our buildings will need to become sustainable. The UK has an older and more diverse building stock than many other advanced nations, which makes the challenge even more difficult, and delivering net zero effectively requires the decarbonisation of all buildings by 2050: there are no shortcuts.

3. There are approximately 1.66 million non-domestic buildings in England and Wales.[1] Though they are fewer in number than homes, non-domestic buildings vary significantly in type, size and use; and so, account for a third of UK emissions from buildings.[2]

4. The government has typically used the Energy Performance Certificate (EPC) to assess energy performance and carbon emissions in buildings. Through theoretical modelling, the EPC evaluates the standard of the building's fabric and services. If a building owner invests in improving their building's fabric or services, their EPC score should improve. Used in this way, the EPC has helped drive improvements in buildings over the last decade.

5. The EPC does not measure metered energy consumption and associated carbon emissions. That will depend on how well the building is being maintained and how effectively regulated and unregulated energy is used in the building in reality. Therefore a high EPC score is no guarantee that a building will use less energy and emit less carbon as a result.

6. In large and complex buildings in particular, the evidence is showing that there is almost no correlation between a building's EPC score and its actual energy and carbon performance in practice. This is a key strategic issue in delivering net-zero, given that carbon emissions are not equally distributed across non-domestic stock. Approximately 53% of the total energy consumed on an annual basis, comes from the largest 7% of buildings: those above 1,000m².[3]

7. In October 2019, the Government committed to consult on introducing a new scheme that would rate non-domestic buildings based on their actual energy consumption and carbon emissions. Alongside this Impact Assessment, the Government has published a consultation package that delivers on this commitment.

8. The consultation package sets out the Government's proposal to introduce a **performance-based rating framework** for commercial buildings above 1,000m².

9. Buildings owners and businesses would receive a performance-based rating (potentially illustrated through 1-6 stars). The rating is broadly based on two factors: **how is the building performing annually against their peers, and how is the building**

[1] ND-NEED 2020, Accompanying data tables, Table 1, Coverage: England and Wales. https://www.gov.uk/government/statistics/non-domestic-national-energy-efficiency-data-framework-nd-need-2020

[2] Final UK greenhouse gas emissions national statistics: 1990 to 2018. Table 19 (split by end-user category), 2018: https://www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics

[3] Internal BEIS analysis of ND-NEED 2020. England and Wales only

performing against the required net-zero trajectory for that building type. Building owners and businesses will be required to obtain a rating annually and disclose that rating publicly online.

10. The rating will provide relevant, contextualised and critical information, which can be used to put in place the right measures to improve the energy performance of the building in the short term, and support longer term decarbonisation. The rating will be disclosed publicly, which means all businesses and building owners will be accountable for how they are using energy. It sends a clear signal to businesses and buildings owners that, having legislated for net-zero by 2050, the Government is ready to recognise businesses and landlords who have a low annual carbon footprint, and drive improvements in those who consistently emit more carbon than their peers.

11. Where it has been implemented, this approach has delivered strong results in improving energy performance and reducing carbon emissions. For example, the National Australian Built Environment Scheme (NABERS) is a key international example, and the government is committed to recognising and implementing best practice where it has been proven to deliver results. The performance-based framework will look to build on the fundamental principles that has made those schemes successful, but these schemes will be by no means copied. Where there is space and it makes sense to be more ambitious, our proposals are more ambitious. Similarly, where principles have needed to be adapted to suit the UK market, they have been adapted.

12. The consultation package comprises of three documents, including this Impact Assessment. The first policy paper discusses the performance-based framework as a whole: it provides the market with the context to the policy, the strategic rationale, and advanced sight of how the policy could be applied across the range of the non-domestic building stock. The second policy paper is a shorter and more targeted consultation, which sets out how the scheme will be implemented in the office sector in phase 1 of the scheme.

13. The Government's preferred approach is to implement the scheme in phases. Alongside each consultation on a specific phase, there will be an accompanying Impact Assessment. This Impact Assessment, therefore, supports the performance-based framework in commercial and industrial offices above 1000m^2, rather than the overarching strategy paper. That paper is supported by a high-level technical annex.

14. The Government considers this approach to be pragmatic because there will likely be significant variations in how the scheme is applied to each sector. Non-domestic buildings, even within sectors, can be highly diverse. For the scheme to deliver improvements in energy use and to drive carbon emissions it must be flexible and able to suit the needs of each sector.

2 Problem Under Consideration & Rationale for Intervention

15. The Government has used the Energy Performance Certificate as the primary metric for assessing energy performance and carbon emissions in homes, as well as in commercial and industrial buildings. The EPC assesses carbon and energy performance through theoretical modelling and by evaluating the standard of the building's fabric and services.[4]

16. An EPC rating will always provide meaningful information about the quality of a building's fabric and services. However, the EPC does not capture *how* a building is used, which will have a significant impact energy performance (see section 9 for details). This is a key strategic issue as these buildings are responsible for a large proportion of the carbon emissions from the non-domestic stock, and therefore measuring their energy performance accurately will be crucial for decarbonising them. Approximately 53% of the energy consumed on an annual basis, comes from the largest 7% of buildings: those above 1,000m². These buildings also emit a similar proportion of the total carbon emissions.[5]

17. Further, without a means of assessing how well a building is used in practice, the potential to implement supplementary policies that incentivise buildings to optimise their performance, for example through better use of Building Management Systems or behavioural measure, is limited.

2.1 Market Failures

18. There are a range of market failures and other barriers to the improvement of the operational energy performance of large buildings[6]:

- The **Negative Externality** of climate impacts associated with greenhouse gas emissions mean energy prices do not fully reflect the impacts of energy use, causing over-use of energy, and underutilisation of low-carbon alternatives. This applies analogously to air quality impacts.

- **Incomplete Information** occurs where building occupiers lack information on its energy performance relative to other comparable buildings, its own potential performance, and the standard it will need to meet in the future to meet Net Zero. Incomplete Information also occurs where current occupiers lack information on the opportunities, benefits and costs of improved energy performance.

- **Asymmetric Information** occurs where prospective owner-occupiers, property investors or tenants have less information than existing owners/occupiers as to the current performance of a building. This means asset prices may fail to adequately capture the impact of improved performance, reducing incentives for owners to implement energy improving measures.

[4] Guidance on non-domestic EPC requirements and approach can be found here: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/666186/A_guide_to_energy_performance_certificates_for_the_construction_sale_and_let_of_non-dwellings.pdf

[5] Internal BEIS analysis of ND-NEED 2020. England and Wales only

[6] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65602/6927-energy-efficiency-strategy--the-energy-efficiency.pdf

- Low salience of energy efficiency can present an additional **behavioural barrier**.[7] This can exacerbate the information failures and externalities, by causing organisations fail to take potentially privately beneficial action because they perceive gains as too small to prioritise. For example, energy bills constitute only 3% of costs for most sectors, reducing their engagement.[8]

- **Misaligned or 'split' incentives** can occur in the rented sector when the costs of improving energy performance fall on owners, but the benefits of energy bill reductions go to tenants. Alternatively, costs incurred by current tenants may generate benefits for future tenants. Both issues disincentivise investment.

2.2 Rationale for Government Intervention

19. The rationale for government intervention rests on these market failures being too fundamental and systematic for the market to resolve them without intervention. In particular, information failures and externalities are difficult to overcome without systematic change at the level of the entire market, as prices cannot efficiently account for these omissions based on the actions of a minority of agents.

20. We also note that there are examples of non-government-driven interventions in the UK market, such as the Better Buildings Partnership's Real Estate Environmental Benchmark (REEB) and the Building Research Establishment's (BRE) Environmental Assessment Method (BREEAM).[9] These provide environmental performance ratings, with uptake on a voluntary basis. While these have had considerable success in their own right, they are necessarily voluntary which means they cannot feasibly achieve the level of coverage across the stock required to redress the underlying market failures. As a result, the government believes intervention is necessary.

2.3 Objectives of a Successful Intervention

21. The preceding rationale for intervention can be used to set-out the main objectives a successful intervention should target. These inform the specific objectives for phase 1, set out in section 4.3.

22. **Measuring Operational Performance**:

- Ensure market participants (including owners, renters and investors) have access to accurate annual building performance information.
- Achieve widespread uptake in targeted buildings.
- Produce informative, high quality data to monitor performance at individual building and stock level.

23. **Benchmarking and Disclosure**:

- Provide comparisons against benchmarks that fairly appraise buildings' performance, and consistently reward improvements in that performance.
- Publicly disclose data on building performance that is widely accessible and easy to understand, harnessing the benefits of reputational incentives to drive improvement.

[7] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/65601/6925-what-are-the-factors-influencing-energy-behaviours.pdf p.7

[8] Business energy statistical summary https://www.gov.uk/government/publications/business-energy-statistical-summary page 17

[9] For details on REEB see section 4. For details on BREEAM, see (www.breeam.com)

24. **Improving over time**:

- Inform and incentivise businesses to improve their energy use, through better use of and greater investment-in buildings**.**
- Generate active market engagement in delivering and improving ratings.
- Provide a basis for setting and monitoring outcomes-based targets at individual building and stock level.

3 Longlist Options and Alternatives to Regulation

25. **Retain Existing Framework:** This option would mean relying on existing government policies and other voluntary industry-led interventions. Overall, our evidence suggests this would not successfully address the rationale for intervention and would not deliver the majority of the potential for improved building performance. Existing industry-led interventions such as such as REEB and BREEAM are discussed in section 4.2. We discuss the impact of existing policies and trends in the counterfactual for the cost benefits analysis, which is discussed in section 5.3.1 (additional details in section 10.3).

26. **Fiscal Approaches**: A subsidy approach has been considered but it does not address the issues identified in section 2. For example, subsidies would likely work most effectively when encouraging the uptake of particular building fabric measures. While this approach encourages investment in buildings, this is only part of the solution and would not provide the incentive to improve the overall energy management of buildings. Subsidy would therefore only provide a partial solution and would not tackle the underlying information or behavioural problems that lead to underperformance.

27. Additionally, other related policies already make use of the targeted spending where it directly addresses market failures. For example, the Non-Domestic Renewable Heat Incentive (RHI) offers financial incentives to increase the uptake of renewable heat solutions, as the cost-effectiveness of these newer technologies still lags behind traditional heating options. Further, schemes targeted at Small and Medium Enterprises are under development, as finance is a key barrier to energy efficiency improvement in smaller businesses.[10]

28. Similarly, we do not feel that tax solutions address the issues identified in section 2. For example, directly internalising the externality on fossil fuels, such as via a tax, could mitigate the externality, but would not address the other market failures, such as the informational and behavioural barriers. Further, for any tax solution to drive abatement at the lowest possible cost, the other barriers limiting businesses' ability to improve the performance of their buildings would need to be overcome. Hence, the proposals considered in this consultation would support and enable a more efficient internalisation of the externality.

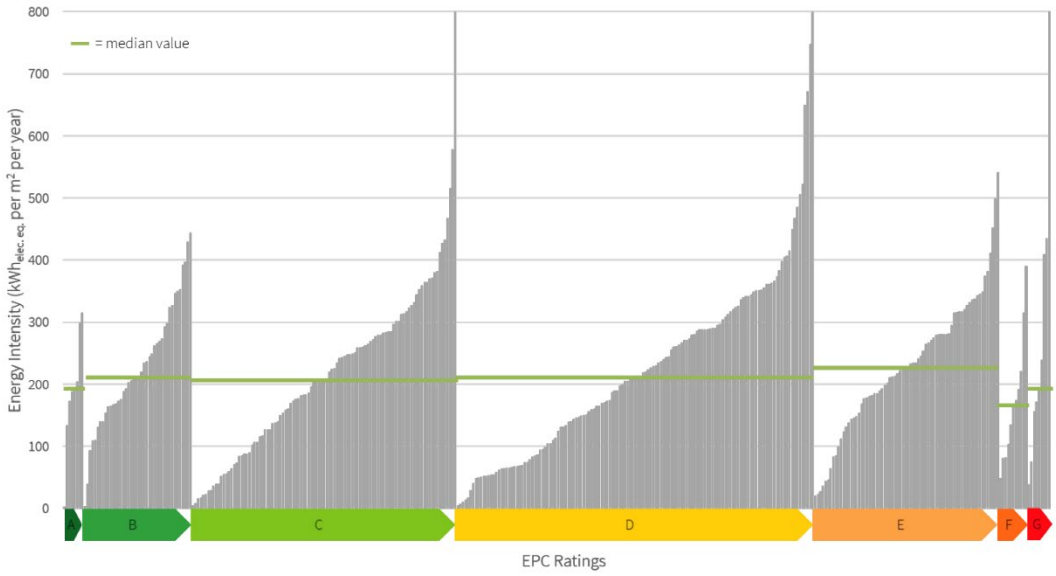
29. Lastly, we believe any fiscal approach (taxes, including tax breaks, or subsidies) could not be effectively implemented **based directly on performance,** without a fairly benchmarked and publicly disclosed measure of that performance. This measure would need strong industry buy-in on the methodology and approach of the rating, to ensure it is seen as a legitimate basis for fiscal incentives. This is also necessary to provide the information needed for business to effectively and efficiently respond to the incentive.

[10] Energy efficiency scheme for small and medium sized businesses https://www.gov.uk/government/consultations/energy-efficiency-scheme-for-small-and-medium-sized-businesses-call-for-evidence

30. **Maintaining an EPC-based framework:** This fails to address key aspects of the rationale for intervention. Primarily, EPCs do not measure actual building performance. This means they do not directly incentivise buildings to optimise their actual energy performance, through better use of Building Management Systems, behavioural measures, or through a taking a holistic view of how the building will actually perform at design stage. Additionally, the EPC is part of the existing policy framework, and our analysis implies that there is still unexhausted, cost-effective potential to improve building performance, further implying that the EPC framework has not driven the available improvement in operational performance in the largest buildings.

31. This is supported by evidence which suggests that there is a limited relationship between energy intensity and EPC in large offices. Figure 1 shows no overall correlation between EPC band and energy intensity in the REEB database of approximately 800 large offices[11]. This is shown by the median energy intensity (horizontal line) being flat across the bands. It implies that across the range of EPC scores, (particularly E-B), a higher EPC score does not imply that the energy intensity of the building is better. Further discussion of the performance of the EPC, is included in section 9.1.

Figure 1: Energy Intensity and EPC Rating of REEB Offices[12]



32. **Extend the Display Energy Certificate Framework:** Currently public sector buildings over 250m² are required to get an annual Display Energy Certificate (DEC). The DEC provides a benchmarked operational energy use rating, and was introduced in 2008 as a low cost way of complying with the EU Energy Performance of Buildings Directive (EPBD)[13]. Consideration has been given to extending a DEC-based framework to cover commercial buildings. While we assume that some revisions to the DEC could be incorporated into the rollout, overall, we do not believe this option would successfully solve the problem under consideration, and that a successful intervention would need to be sufficiently different from the existing DEC to require the development of a new, bespoke rating approach.

[11] Data from the Better Building Partnership (BBP) Real Estate Environmental Benchmark (REEB) database. REEB Energy Snapshot 2019 pg 10. BBP and EPC evidence are discussed in section 9.

[12] Data from the BBP REEB database. BBP evidence is discussed in section 4. Further details on the weakness of the EPC are discussed in section 9.1.

[13] The Energy Performance of Buildings Directive. The DEC is discussed further in the Government Consultation, Improving the Display Energy Certificates regime for public buildings, closed 11 March 2015, p6. (https://www.gov.uk/government/consultations/improving-the-display-energy-certificates-regime-for-public-buildings)

33. Firstly, the DEC provides a relatively basic assessment of building performance. For example, performance benchmarks are not updated over time, nor does the DEC fully account for factors like operational hours, location, or occupancy. Consequently, the DEC framework does not fulfil the criteria set out in section 2.3. Importantly, extending the DEC to the private sector forgoes the opportunity to develop the methodology and approach closely with industry, for example, on crucial areas such as setting the benchmarks. Hence, these methodological issues significantly increase the risk that the rating is not seen as an investment-grade rating, potentially undermining industry engagement.

34. The DEC also only captures the energy use of the whole building, meaning the rating does not distinguish between the energy use under the specific control of landlords and tenants. This means it does not address the split-incentive problem outlined in section 2.1, so the information does not provide a clear signal or performance, weakening the incentive to act. Further, this is not consistent with international best practice, as discussed in section 4.

35. In the context of Net Zero, there are a number of features that the DEC does not currently consider that could form part of a Net Zero consistent rating. For example, it does not directly incorporate features like rewarding low carbon heat and flexible energy use. These, and other features, are considered in this consultation, and contribute to the argument that the DEC would not provide the strongest basis for a Net Zero consistent rating system.

36. Lastly, the role of the government in the DEC is not only to provide the rating system and methodology, but also recommendations on interventions. There is some risk that providing recommendations based on relatively limited performance information may be counterproductive, where it disincentivises building owners from engaging with the existing market for energy performance services. Particularly if it reduces consideration of the possible improvements to *how* the specific building is used.

4 A proposed Performance-Based Framework

37. Introducing an operational performance rating scheme to cover all large commercial and industrial buildings is the government's proposal. This section introduces the context for the scheme, the evidence from existing operational performance ratings and how an operational performance rating resolves the problem under consideration.

38. Details on scheme design and delivery are covered in the consultation documents. In short, buildings owners and businesses would receive a performance-based rating (potentially illustrated as 1-6 stars). The rating will look to be broadly based on two factors: how is the building performing annually against their peers, and how is the building performing against the required net-zero trajectory for that building. Building owners and businesses will be required to obtain ratings annually and disclose that rating publicly online.

4.1 Overview of the non-domestic building stock

39. The government's proposal is to introduce a rating covering the whole stock of large non-domestic buildings. Large buildings account for approximately 7% of the stock by the number of buildings, but approximately 53% of the energy use and associated emissions.[14] However, given the complexity and heterogeneity of this stock, we do not propose to cover all buildings simultaneously. The government plans to extend the performance-based framework across suitable non-domestic sectors in three phases, recognising that each sector will have different levels of readiness for adopting the scheme. The rollout of the scheme to the office sector will be **phase 1**, followed by phase 2 and phase 3 which will address the remaining sectors[15].

40. **As a result, the analysis in this Impact Assessment covers Phase 1, so applies only to the office sector.** Subsequent phases will have associated Impact Assessments.

41. As stated, **large** buildings (over 1,000m^2) account for approximately 7% of the number of commercial and industrial buildings, but approximately 53% of their energy use.[16] Large **offices** represent 13% of those large buildings, and account for approximately 16% of their energy use.[17]

42. Considering just these large offices in more detail, there are a number of important observations. Section 9.2 presents a more detailed overview of the stock. The main insights which inform the subsequent analysis are summarised below[18]:

    - Within the office sector, floor area is closely related to total energy use.[19]
    - A similar relationsip between size and energy-use holds within the large office sector, as we saw for commercial & industrial buildings in general. Large offices

[14] Internal BEIS analysis of ND-NEED 2020. England and Wales only

[15] For further details, see section11.

[16] Internal BEIS analysis of ND-NEED 2020. England and Wales only

[17] Based on BEIS analysis of BEES (2016). Excludes public buildings.

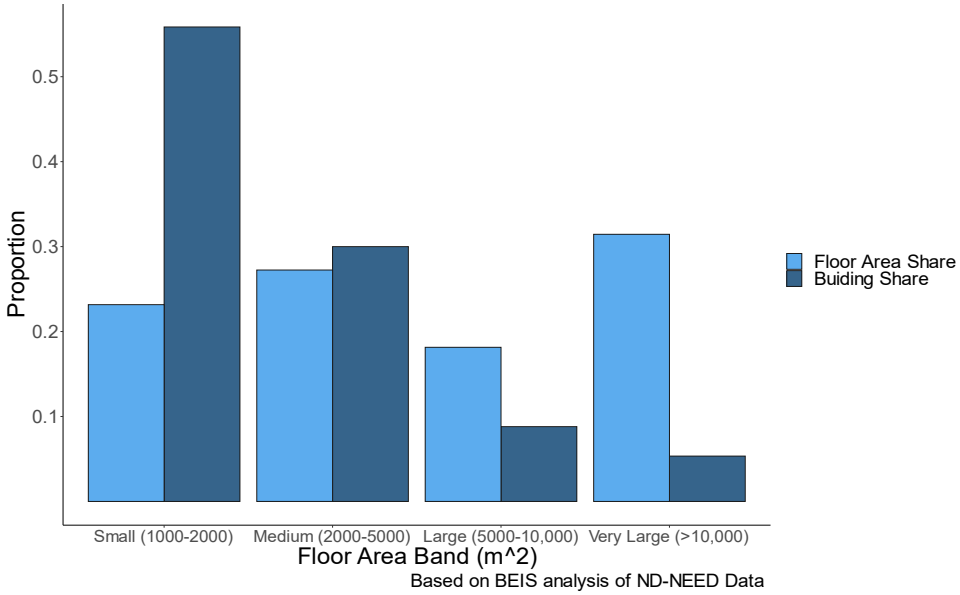
[18] The following figures describing the office stock are based on BEIS analysis of data from the ND-NEED framework and BEES. All figures refer to England and Wales and include public sector offices, as ND-NEED data does not currently differentiate between private and public offices. We do not expect this to impact the main conclusions, though may contribute moderately to the concentration in London, as discussed in section 9.2.

[19] Based on BEIS analysis of BEES (2016) and corroborated by BEIS analysis of ND-NEED data. Due to the ND-NEED methodology, using floor area provides us with a larger, more representative sample for the subset of large offices than using energy, while still providing a robust understanding of where energy is used.

(over 1,000m^2), represent 7% of the office stock by number, but cover around half of the floor area.[20]

- Further, *within the stock of large offices,* the largest buildings use a disproportionate share of energy, as summarised in Figure 2. This leads to two key observations:
  - Offices over 10,000m^2 represent only 5% of all large offices by number but constitute 30% of large office energy use.[21]
  - Offices between 1,000m^2 and 2,000m^2 represent 55% of large offices by number, but constitute under 20% of large office energy use.[22]
- The regional distribution of large offices is concentrated in London, which contains 34% of large office space by floor area, compared 11% on average across the commercial and industrial buildings stock.[23]
- We estimate there are approximately 10,000 large private offices in England and Wales[24].

Figure 2: Floor Area Bands of Large Offices (>1,000m^2)



43. The COVID-19 pandemic is undoubtedly changing, at least on a short-term basis, the utilisation of office space. Changes to the usage of all our buildings in light of COVID-19 will need to be considered as decarbonisation policies are developed and taken forward again, in both the short and long term. The Government is pursuing research and working with the Centre for Research into Energy Demand Solutions (CREDs)[25] to consider the impact on commercial and industrial buildings of COVID-19. However, while the country remains in the middle of the pandemic it is too early to say with any certainty what the longer-term impacts are likely to be.

[20] Internal BEIS analysis on ND-NEED 2020, Electricity and Gas only, Coverage: England and Wales.
[21] Based on BEIS analysis of BEES (2016) and corroborated by BEIS analysis of ND-NEED data.
[22] Based on BEIS analysis of BEES (2016) and corroborated by BEIS analysis of ND-NEED data.
[23] Based on BEIS analysis of BEES (2016) and corroborated by BEIS analysis of ND-NEED data.
[24] Internal BEIS analysis on ND-NEED 2020, Electricity and Gas only, Coverage: England and Wales.
[25] www.creds.ac.uk

4.2 Evidence and Policy Design

Figure 3: Overview of National Australian Built Environment Rating System NABERS

NABERS is an Australian rating system which assesses a buildings' energy performance, providing a rating from 1-6 stars. This rating is based on actual energy consumption, which is compared against a common standard (benchmark) for the performance of the building. The rating system (particularly the benchmarks) is designed to account for key variables, including a building's size, operational hours and whether it is rented, to make ratings fair, and comparable across the stock. NABERS also provide ratings for other aspects of a building's environmental impact, such as water use and waste management, but the NABERS **Energy** Rating is by far the most prominent. Similarly, although NABERS ratings exist for other sectors (including hotels and shopping centres), uptake is much lower than for offices.

The NABERS scheme is the main element of the wider Australian CBD (Commercial Building Disclosure) Programme. The programme was introduced in 1998, with the first significant uptake by office buildings on a voluntary basis happening in 2004. In 2011, the CBD programme placed a mandatory requirement on all offices over 2,000m² to have a valid NABERS rating when selling or letting the office space. In 2017, the threshold was lowered to 1,000m². NABERS ratings are valid for 12 months.

Throughout this period, the only explicit regulatory requirement imposed by the CBD programme has been the need to obtain and disclose a NABERS Energy rating (and in some cases a lighting assessment (TLA)). There has been no regulatory requirement for building owners/managers to improve their NABERS ratings. However, the public sector has played an important role in driving improvements. Across the Australian public sector there are minimum standards for rented property based on the NABERS rating, which have increased over time. This intervention is thought to have been important in incentivising positive engagement in the rented sector.
The consultation document discusses the core principles of NABERS. They are summarised below:

- NABERS ratings are based on actual energy consumption.
- NABERS ratings are clear, accurate, up-to-date, and reliable.
- NABERS allows like-for-like comparisons between buildings.
- NABERS ratings are aligned with responsibilities within the building.*
- NABERS was designed to support how the industry operated.

*This refers to the provision of base-building ratings and tenant ratings. NABERS provides these ratings designed for the rented sector which separately rate the energy that is the landlord's responsibility, and that of the tenant respectively. This makes the ratings fairer and mitigates issues of split incentives.

4.2.1 Evidence on Operational Performance Ratings

44. This section provides a short overview of the evidence on the overall impacts of operational performance rating schemes, particularly NABERS which provides a key example of international best practice. Evidence on specific assumptions, such as voluntary vs mandatory uptake and scheme costs are discussed individually in section 5.

45. Overall, there are a wealth of case studies demonstrating the potential benefits of optimised energy performance, which indicate there may be substantial energy savings that are achievable with limited capital expenditure by improving how a building is used. Additionally, there is also a large body of other quantitative and qualitative evidence on operational performance schemes, including NABERS, REEB and Energy Star[26].[27] Overall these find that bill savings, and environmental impacts of saving energy and

[26] For example, Innovate UK (2016) (Building Performance Evaluation Programme: Findings from non-domestic projects), or BBP case Studies https://www.betterbuildingspartnership.co.uk/resources as well as case studies from NABERS, and Energy Service Providers.

[27] A non-exhaustive list includes: Mims *et al* (2017) (Energy Analysis and Environmental Impacts Division Lawrence Berkeley National Laboratory), Mallaburn (2018) (A new policy framework for business energy efficiency), Bannister (2016) (Under the Hood of Energy Star and NABERS: Comparison of Commercial Buildings Benchmarking Programs and the Implications for Policy Makers), World Green Building Council.

resources are key motivators for improving performance. They also suggest that desires to follow best practice, and requirements to meet regulatory requirements are also important drivers.

46. On NABERS, evidence suggests participation in the scheme can generate a range of benefits including energy savings, emissions reductions and other improvements in asset value. For example, an independent review by the Centre for International Economics (CIE) found average energy intensity has fallen from by over 20%(~155 to ~110 kwh/m^2/year) and that high performing buildings have reduced energy use by up to 40%.[28] Further, it has been found that high performing NABERS (energy rated) buildings have lower vacancy rates, higher net income and capital values ($/sqm) and longer (weighted) average lease lengths.[29]

47. However, it is difficult to assess the proportion of the reductions in energy use that are *caused* by the scheme. That is because, as NABERS is primarily a metric, it is difficult to distinguish which reductions it has driven and which reductions it has just measured or reflected.[30] Overall, there is a wealth of evidence on the energy savings, carbon savings and wider benefits associated with participation in the scheme, and the potential for future gains. However, there remains a gap around evidence robustly identifying the specific proportion of those impacts which can be causally attributable to the scheme.

48. Certain aspects of the scheme have been identified as critical to its success. These include the availability of base-building and tenant ratings, government procurement standards and the move from voluntary to mandatory participation.[31] These have been considered when developing options for a UK scheme. This is discussed further in section 4.4 and in the Consultation document.

49. Another useful source of evidence is the Real Estate Environmental Benchmark (REEB) from the Better Buildings Partnership (BBP). REEB is a voluntary platform to allow users to measure, manage, and benchmark the energy performance of their buildings.[32] In terms of energy reductions achieved, REEB data shows reductions of 15-20% have been achievable for a large portion of participants over 5-6 years of participation, with annual reductions of 2-4%. Those participating since its inception (2010/11) have seen overall reductions of 26% (3.7% annually) on average.[33] Further, annual energy savings remain consistent over multiple years, indicating that continuity and consistency in the rating is important for maximising the achievable savings. However, REEB evidence may not be representative of England & Wales as a whole, which is discussed in section 9.1.

[28] CIE (2019) Independent review of the Commercial Building Disclosure Program, p. 4 (converts MJ to Kwh and rounds) http://www.cbd.gov.au/overview-of-the-program/cbd-review/cbd-2019-program-review

[29] Lee, *et al* (2017) Life cycle cost comparison of a high NABERS performing commercial building

[30] The CIE Report did estimate a counterfactual, still showing significant savings but more modest, however the robustness and generality of the results is not clearly demonstrated. In the wider literature the pattern is similar.

[31] Bannister (2012), NABERS: Lessons from 12 Years of Performance Based Ratings in Australia

[32] The Real Estate Environmental Benchmark (REEB) is a publicly available operational benchmark of environmental performance for commercial property in the UK.

[33] The Real Estate Environmental Benchmark: 2019 Energy snapshot, March 2020

4.3 Objectives for Phase 1

50. The objectives for delivery of phase 1 are:

- **Delivery and Uptake**
  - The scheme must be able to provide accurate annual performance-based ratings to buildings in scope of the scheme.
  - The scheme should achieve widespread uptake from the buildings in scope.
  - The responses of the buildings in scope must be able to be **monitored and analysed.**
- **Improvement and Engagement**

  The success of the scheme is dependent on ratings improving over time, which in turn will deliver energy and carbon savings. From **day one** the scheme will at least:
  - Inform and incentivise businesses to improve their energy-use,
  - Encourage the **better use of buildings** (behaviour, controls, building management systems)
  - Encourage greater **investment in buildings,** in fabric/HVAC(heating ventilation and air conditioning) measures, in a way that reflects and incentivises their **performance over time.**

4.3.1 How a performance-based framework achieves the policy objectives: Logic Map

51. To understand how a rating scheme can deliver on the policy objectives we have developed an initial logic map, which is presented in full in section 13. There is also a more detailed discussion of the assumptions and mechanisms, as well as how the development, operation and enforcement proposals are informed by previous policies and international best practice.

52. On the development of the scheme and ratings methodology, we recognise that industry buy-in will be essential, not only for improvements on the design of the scheme, but also to ensure the rating is seen as an investment grade indicator of performance, and one on which both occupants and investors can set ambitious and achievable targets.

53. Recent evaluation evidence on energy audits and reporting found that while existing regulatory approaches have produced reductions in energy use and increased engagement in energy efficiency, further gains remain possible.[34] In particular, it suggests that the sharing of best-practice, publication of benchmarks, use of public disclosure, and incentivisation of uptake of international building management standards, would all help organisations to further improve their energy use.[35]

54. These principles are central to the proposed design of a performance-based framework. In particular, benchmarking is at the core of the proposed methodology, meaning the rating can provide an understanding of how a building is performing relative to a comparable cohort, as well as against a Net Zero standard of operation. Public disclosure is also emphasised, allowing for the market to better incorporate information on performance, facilitating competitive drivers to improve ratings.

[34] Energy audits and reporting research, including the Energy Savings Opportunity Scheme (ESOS) – Phase 2 report. https://www.gov.uk/government/publications/energy-audits-and-reporting-research-including-the-energy-savings-opportunity-scheme

[35] ISO 50001 Certification is an international standard on establishing, implementing, maintaining and improving energy management systems.

4.4 Shortlist options

55. The shortlist of options considered in the cost-benefit analysis captures the impact of some of the key variables identified from the evidence and logic mapping. The difference between voluntary and mandatory uptake is important based on both the NABERS experience, and existing UK schemes such as REEB, as it has a potentially significant impact on the proportion of the stock covered. Similarly, the size threshold is an important variable in NABERS, and is important in the England & Wales context also, as discussed in section 4.1. It has a significant impact on the number of buildings in scope. We compare 1,000m^2 to 2,000m^2 both for comparability with NABERS and because it captures the diminishing returns from adding increasingly *smaller* buildings, in terms of the energy covered by the scheme.

    Option 0: Do nothing (counterfactual)

    Option 1: **Voluntary** performance-based ratings for large private offices > **1,000**m^2

    Option 2: **Mandatory** performance-based ratings for large private offices > **2,000**m^2

    Option 3: **Mandatory** performance-based ratings for large private offices > **1,000**m^2

56. Other important variables and aspects of scheme design are not included as quantified options in the IA, as we have focussed on those that have make the greatest difference to scheme impacts. However, these features are discussed throughout the IA and Consultation Document. For example, the impact of public sector engagement is considered in section 6.4 Further, important design features, such as the benchmarks and rating metric are discussed in the technical annex to the IA. However, at this stage, we cannot model the differences these technical specification choices make to the overall impact of the scheme in sufficient detail to differentiate them in the cost benefit analysis.

5 Analytical Approach

5.1 Costs and Benefits Considered

58. Table 1 summarises the costs and benefits considered in the IA. The approach to monetising the costs and benefits is discussed in section 10.

Table 1: Summary of Costs and Benefits

Agent	*Costs*	*Benefits*
Building Owner Occupiers	**Monetised** - Familiarisation - Compliance - Capital - Operational - Installation and hassle - Opportunity Cost of Capital	**Monetised** - Energy Savings[36] **Not-Monetised** - Comfort and productivity - Improved health
Building owners (rented)	**Monetised** - Familiarisation - Compliance - Capital - Operational - Installation and hassle - Opportunity Cost of Capital	**Not-Monetised** - Potential increase in property values/rents - Increase in tenant satisfaction - Reduced void periods - Reduction in long-term property maintenance costs - Reduction in letting costs/difficulties
Building Tenants (rented)	**Not-Monetised** - Potential increases in rents	**Monetised** - Energy bill savings **Not-monetised** - Comfort and productivity - Improved health - Increase in tenant satisfaction
Government & Scheme Provider	**Monetised** - Developing Scheme Methodology - Developing IT infrastructure for rating generation and disclosure - Training assessors - Scheme operational costs (includes enforcement and quality assurance)	**Not-Monetised** - Annual stock-level performance data - Supports capacity to improve targeting of future policies.

[36] Energy Bill savings are monetised, but they are included in the CBA using the social value of energy, per Green Book Guidance (HMT Green Book Supplementary Guidance: https://www.gov.uk/government/collections/the-green-book-supplementary-guidance)

Society	Includes all preceding costs	Includes all preceding benefits plus: **Monetised** - Carbon emission savings - Air quality improvements - Social value of energy savings **Non-Monetised** - Increase in security of energy supply - Increase in high-skilled jobs in the low-carbon economy

5.2 Modelling Approach

59. The BEIS Non-Domestic Buildings Model (NDBM) was used to model the impact of the scheme. The model structure and analytical approach are detailed in section 10 (Figure 11 provides a high-level model schematic). We developed quantitative and qualitative assumptions on the response of the stock and used the NDBM to identify a cost-effective technology pathway that was consistent with that behaviour. These results were then tested through sensitivities.

60. Our modelling captures the potential from optimising building performance using behavioural and control measures from BEES. The limitations of this are discussed in section 10. Further, we do not solely restrict buildings to behavioural and control measures. We also include other efficiency, fabric and heating measures, such that the results of our modelling are consistent with the minimum fabric standard included in the performance-based rating. For further details on modelling and technology assumptions, see section 10.

5.3 Assumptions

Table 2: Summary of Key Assumptions

Assumption	Description
Counterfactual	Based on Energy and Emissions Projections (EEP 2019) and the Non-Domestic National Energy Efficiency Data Framework (ND-NEED 2020). [37] [38] Assumes a 6% reduction in total energy 2020-2030.
Onboarding	25% are onboarded in 2022, the remainder in 2023, with the first mandatory disclosure in 2024.
Policy Response Rate	Energy savings are achieved linearly over the first 5-6 years of ratings, implying that 100% of *compliant* buildings, comply by 2028.
Appraisal Period	2021-2038. Begins in first year costs are incurred and runs to the final year in which action is undertaken under the scheme, plus 10 years.

[37] EEP (2019) https://www.gov.uk/government/collections/energy-and-emissions-projections

[38] ND-NEED (2020) https://www.gov.uk/government/statistics/the-non-domestic-national-energy-efficiency-data-framework-nd-need

Level of Ambition	10% of stock target 30% savings. 70% target 15% savings. 20% do not improve their rating.
Rented Building Energy	Excluding the proportion of energy use attributable to tenants: **85%** of total large office energy use is assumed to be covered by the scheme.
Scheme Costs (compliance)	Costs are modelled bottom-up, using NABERS costs as a reference.
Voluntary vs Mandatory	Voluntary uptake is uncertain. We model a range of levels of engagement from: 10% of buildings accounting for 20% of energy use to 30% of buildings accounting for 50% of energy use

5.3.1 Counterfactual

61. For the counterfactual, we used the Energy and Emissions Projections (EEP) to capture the impacts of existing policies and developed future policies.[39] We compared this with the historic *large office* energy data from the Non-Domestic National Energy Efficiency Data-Framework (ND-NEED) to assess if the historic trends were consistent and concluded that the EEP projections should be a reasonable reflection of the large office sector.[40] Overall, we assume an 6% reduction in energy use over the period 2020-2030 for large offices.[41] This is largely driven by uptake of lighting measures, and a mix of other cost-effective technologies.

62. We have also considered overlaps with potential future policy programmes, which are not yet included in the EEP, where these may impact the large office stock - see Table 3 below.

Table 3: Potential Future Policy Interactions

Future Policy Area	Counterfactual Assumption
Update to Non-Domestic Private Rented Sector Regulations	This policy would deliver fabric measures in a portion of the rented stock. The interaction with the Private Rented Sector (PRS) regulations is discussed in section 11.
Public Sector Decarbonisation Ambition	Public sector buildings are not included in the current proposals. We consider them in section 6.4 we assume any energy and carbon savings from public sector buildings would be attributable to future public sector policies.

[39] EEP 2019 https://www.gov.uk/government/collections/energy-and-emissions-projections

[40] BEIS Internal Analysis of The Non-Domestic National Energy Efficiency Data-Framework (ND-NEED) data.

[41] Our model is a fixed-stock model, meaning it does not account changes in the stock such as new-build, demolished or re-purposed offices. Hence, absolute aggregate energy-use may differ, particularly towards the end of the appraisal period.

Non-Domestic Clean Heat	We assume building performance optimisation and cost-effective energy efficiency measures will be delivered *before* clean heat solutions in general. Hence, clean heat deployment will build on improved energy performance, so it does not appear in our counterfactual beyond that already in EEP.

5.3.2 Level of Ambition

63. Based on the evidence discussed in section 5, we expect to see significant variation in how buildings respond to the scheme. Some buildings may aim to maximise their ratings, while others will undertake limited action. We capture this variation by modelling three broad 'types' of response[42]:

    - A **high ambition group** (10% of the stock): these are the highest achieving group and target a high level of energy savings, at 30% on 2020 levels. They may already have better than average information on their energy use, but are expected to respond positively to the benchmarking, and disclosure mechanisms. They are modelled as drawing on a wide range of energy efficiency and HVAC technologies, while prioritising cost-effective bundles of measures.
    - A **medium ambition group** (70% of the stock): These buildings make up the majority of the stock, and target a moderate level of energy savings, at 15% on 2020 levels. They are modelled as only drawing on behavioural & controls measures, lighting and cost-effective fabric measures.
    - A **low ambition group** (20% of the stock): 15% receive ratings but do not act to improve them, and 5% do not receive ratings (non-compliers). These buildings are assumed to behave the same as in the counterfactual.

64. The relative size of the groups and the level of energy savings achieved are based on data from NABERS (such as section 4 of the CIE report[43]), the wider literature and BEES. They are tested further in sensitivities.

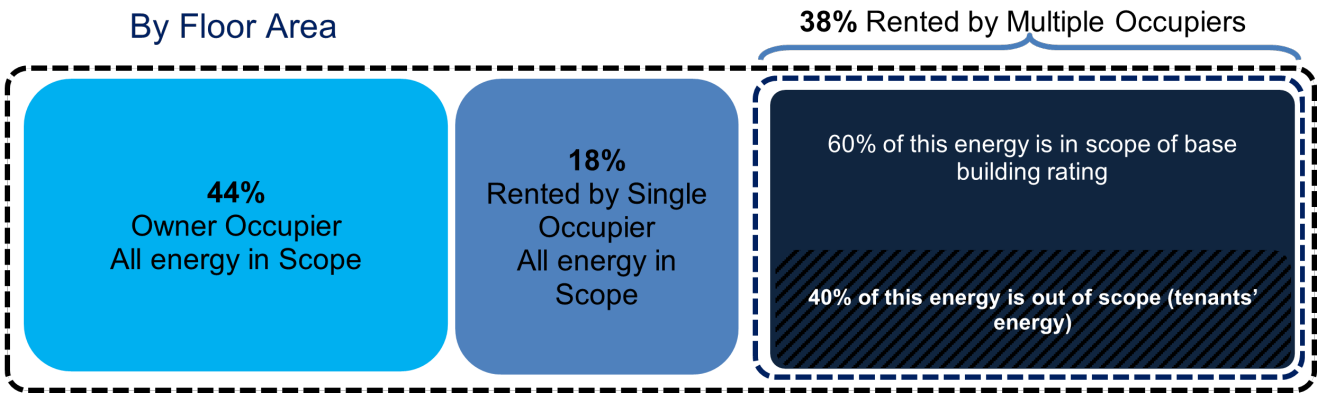
5.3.3 Rating Rented Buildings

65. To estimate the proportion of large-office energy which is in scope of the scheme, we need to establish which buildings will use whole-building ratings, and which will use base building ratings (these rating types are discussed in Figure 3). This is because the base building rating does not cover all of the energy used in the building, as it does not include the energy attributable to tenants' activities.

66. Figure 4 summarises our assumptions on the share of energy in scope of the ratings within individual buildings. This implies **85%** of total large office energy use would be covered by the scheme (**73%** of energy from large rented offices).

[42] We do not make assumptions about *which* buildings are captured in each category (for example, if they differ by size or tenure) as this is beyond what can be reasonably inferred from the evidence. Hence, we assume each group is a 'slice' of all buildings in scope.
[43] CIE (2019) Independent review of the Commercial Building Disclosure Program,

Figure 4: Summary of Multiple Occupancy Assumptions (by floor area)



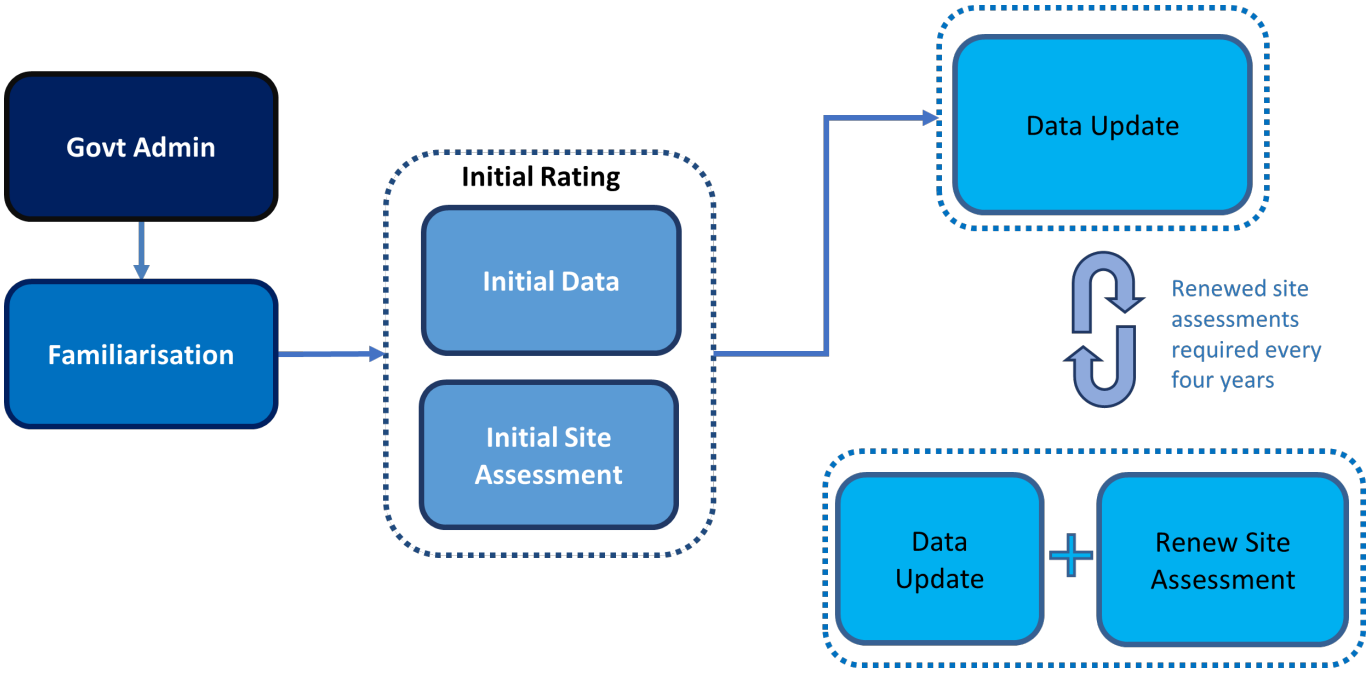
5.3.4 Scheme Costs

67. Scheme costs cover the costs of **operating** the scheme, **familiarising** with the regulations and **complying** with them. It does not include the costs of **improving** buildings' ratings.

68. The design of the scheme is covered in detail in the technical annex of the consultation document.

69. Under the proposed system, buildings would receive an **initial rating,** requiring operation data and a site assessment that lasts for four years. In the following three years, they **update** their rating**,** requiring the most recent building operation data and confirmation/updates of basic building information with the same quality standards imposed. After four years, when they next update they will require a **site review,** which includes a new site assessment, which again lasts four years.[44]

Figure 5: Cost Structure Diagram



[44] Under certain circumstances, building will be required to renew their 'full' assessments after fewer than four years, for example, if substantive changes are made to the building. In this IA, estimated costs assume buildings undertake full ratings every 4 years. The rationale for these proposals is set out in greater detail in the consultation document. For example, 4 yearly site assessments is consistent with existing policies such as ESOS.

70. In the cost-benefit analysis we use an estimate of the **average cost per building.** These costs are expected to differ for some portions of the stock, particularly by size, however, since most buildings are clustered around 1000-5000m^2, using the average building cost is a reasonable simplification.[45]

71. Government Administration Costs cover costs to central government to establish, monitor and develop the scheme, and include the training the initial pool of assessors.[46][47] Familiarisation costs assume compliance is carried out by a suitable professional, such as an energy manager of relatively high experience, at a yearly salary of £50,000 and estimate familiarisation takes 3 (working) days.[48] These assumptions give a familiarisation cost (in *time*) of £600-700 per rating.

72. The costs of delivering the ratings fall into three categories, summarised in Table 4:

Table 4: Summary of Compliance Cost Components

Cost Component	Description
Hassle	Time cost to businesses of gathering information, identifying an assessor, and interpreting the rating.
Producing Rating	Cost of obtaining a rating, from a provider in the market.
Processing Costs	The cost of delivering the scheme, on a per-rating basis. This includes fixed costs such as I.T infrastructure and maintaining the ratings methodology, as well as variable costs of processing the ratings such as quality assurance and enforcement.

73. To estimate these costs, we used the costs of NABERS[49] as a reference-point and adjusted to account for differences in scheme design, with further details set out in section 10.3. Our estimates cover the cost of delivering the services and are not estimates of the prices participants may pay. Prices will depend on the market for producing ratings and the delivery mechanism for the scheme.

74. Given this uncertainty, we estimate cost ranges, using the middle value in our central scenario, and testing the range in the sensitivity analysis (section 6.2). A key source of difference from NABERS is the changed proposals around site assessments. The **full rating** (updating data and renewing site assessment) is expected to be the most similar to a NABERS rating. The first rating, or "**initial rating"** is expected to have higher costs, particularly due to hassle costs for firms, and **updates to rating data** are expected to be substantively less costly to deliver, as they do not require the site assessment.

[45] Approximately 80% of *large offices* are under 3,800 m^2, 90% are under 6,400m^2. Offices over 10,000m^2 represent only 5% of all large offices. (BEIS analysis of ND-NEED Data, Coverage England and Wales)

[46] Under the performance-based framework, the government's role would be to manage the design of the scheme and to provide the necessary incentives, and regulations, for building owners to improve their ratings. This is expected to generate demand for market -delivered services which improve performance, which in turn should encourage growth and increase the number of high-skilled jobs in the low carbon economy.

[47] The training of assessors will not be carried out directly by government, but via the market, but are included in admin costs for simplicity. There is already an active market of DEC assessors and we expect this pool could form a basis for the pool of performance-based rating assessors.

[48] Prospectus website: https://www.prospects.ac.uk/job-profiles/energy-manager. This is broadly comparable to a facilities manager, who may also be undertaking this process. We use a wage near to the top of the range to reflect the complexity of larger buildings & additional employment overheads.

[49] CBD Review Draft Report (Sept 2019) p. 62 http://www.cbd.gov.au/overview-of-the-program/cbd-review/cbd-2019-program-review. Figures are originally in Australian Dollars, converted to sterling at 0.55$/£.

Table 5: Summary of Estimated Performance-Based Ratings Compliance Costs

Costs (£)	*NABERS*[50]	Initial Rating	Full Rating	Update Rating
Hassle	*550*	1,070 – 1,980	380 - 710	150 - 280
Producing Ratings	*1,815*	1,270 – 2,360	1,270 – 2,360	70 - 130
Processing Costs	*605*	420 - 790	420 - 790	210 - 390
Total (£ rounded)	***3,000***	**2,800-5,100**	**2,100-3,900**	**450-800**

75. Overall, we expect costs to be materially lower than for NABERS, even at the high end of our range. This is because we do not propose to require a site assessment in every year (only every 4 years) making the cost of updating the ratings in years between site assessments considerably lower, as it only requires an update to the main energy use and building data.

Table 6: Overall cost (including hassle costs) for 4 years coverage (£ rounded)

NABERS (4 years)	*£12,000*
A Performance-based framework (first 4 years)	£4,100 - £7,500
A Performance-based framework (subsequent 4 years)	£3,400 - £6,300

5.3.5 Voluntary vs Mandatory Uptake

76. Evidence from NABERS suggests that making the scheme mandatory was essential to achieve the highest possible energy savings. NABERS rating were made mandatory in 2010/11 and the size threshold was lowered from 2,000m^2 to 1,000m^2 in 2017/18.[51]

77. Voluntary uptake captured a relatively small number of buildings, however these tended to be larger buildings. Hence, we expect voluntary uptake could cover a relatively large portion of floor area and hence energy, though, achieving this engagement would take time, with NABERS' voluntary engagement taking over a decade to achieve.

78. Given the uncertainties around potential voluntary uptake, we estimate ranges for the proportion of buildings and energy captured by a voluntary scheme. In this IA, we do not try explicitly to identify which buildings may partake voluntarily, and instead base the results on those for the 1,000m^2 mandatory uptake[52], but weighted to reflect the likely prevalence of larger buildings. We estimate a low scenario where voluntary uptake captures 10% of large offices covering up to 20% of energy use, and a high scenario of 30% of large offices covering up to 50% of energy use. We assume scheme costs scale with the number of buildings, while the costs and benefits of energy improvements scale with their relative size.

[50] Note – we assume costs are delivered at competitive levels, hence the prices charged in NABERS reflect the costs of delivering the ratings. This may overestimate costs where they are delivered under imperfect competition.

[51] Figures primarily from Section 4 of the CIE (2019) Independent review of the Commercial Building Disclosure Program. http://www.cbd.gov.au/overview-of-the-program/cbd-review/cbd-2019-program-review

[52] This implicitly assumes savings are achieved at the same rate as the mandatory case. It also assumes the cost-effectiveness of voluntary response is broadly reflective of the whole stock, despite coming from generally larger buildings. This is due to the limitations of the sample-size of larger offices in BEES.

6 Analytical Results

6.1 Cost Benefit Analysis

Table 7: Summary of Options Considered in CBA

Option	Mandatory/Voluntary	Size Threshold	Public/Private
Option 1	**Voluntary**	1000 m^2	Private
Option 2	Mandatory	**2000 m^2**	Private
Option 3	**Mandatory**	**1000 m^2**	Private

79. For reference, Table 7 provides a summary of the options considered in the cost benefit analysis. Table 8, Table 9 and Table 10 summarise the main results from the cost-benefit analysis.

Table 8: *Cost Benefit Summary*
All Figures Present Value (£m 2019)

	Option 1	Option 2	Option 3
Costs	120-290	460	650
Benefits	190-480	760	970
Net Present Value	**70-190**	**290**	**310**
Benefit Cost Ratio	1.58-1.65	1.63	1.48

Table 9: *Emissions and Energy Savings Summary*

	Option 1	Option 2	Option 3
In 2030, Traded Emissions Saving (Mt)	0.02 - 0.04	0.06	0.08
In 2030, Non-Traded Emissions Saving (Mt)	0.03 - 0.07	0.10	0.15
In 2030, Total Emissions Saving (Mt)	0.05 - 0.11	0.17	0.23
CB5 Traded Emissions Saving (Mt)	0.08 - 0.20	0.34	0.40
CB5 Non-Traded Emissions Saving (Mt)	0.15 - 0.37	0.51	0.75
CB5 Total Emissions Saving (Mt)	**0.23 - 0.58**	0.85	1.15
2030 Total Energy Savings (Twh)	0.28 - 0.71	1.07	1.42
Non-Traded Carbon Cost-Effectiveness (£/t)	(-133) – (-101)	-135	-80

Table 10: Cost-Benefit Analysis Disaggregation
All Figures Present Value

	Option[53] 1	Option 2	Option 3
Costs			
Capital and Installation (net)	65%	67%	**60%**
Operational	7%	8%	7%
Scheme Costs and Familiarisation	19%	17%	**26%**
Opportunity Cost of Capital	9%	9%	8%
Benefits			
Energy Savings	74%	75%	74%
Value of non-traded emission savings	15%	13%	15%
Value of traded emission savings	6%	6%	6%
Value of air quality savings	6%	5%	6%

80. Results for a voluntary scheme (option 1) are presented in a range, reflecting intrinsic uncertainty around the proportion of buildings who would engage with the scheme, and the strength of their response to the ratings. This option has a marginally higher benefit-cost ratio than mandatory options, however the net present value, and impacts on carbon and energy are considerably lower, particularly at the lowest end.

81. Contrasting options 2 and 3, lowering the size threshold to 1,000m^2 generates a modest increase in the net present value, and a slight decrease in the benefit cost ratio. This is expected, as offices between 1,000-2,000m^2 number 50% of offices over 1,000m^2, but only cover around 25% of the floor area.[54] Hence, we see the share of costs associated with scheme operation and compliance rise, as these costs depend on the number of buildings, while capital costs and associated benefits depend more on the amount of energy in scope (related to floor area).

82. However, comparing options 2 and 3 we also see significant increases in non-traded carbon savings (50%) and gross energy savings (30%). This implies that although the additional benefits of lowering the threshold do diminish, a threshold of 1,000m^2 still offers significant benefits over higher thresholds, both in terms of energy savings and social welfare.

83. Overall, **option 3** is our preferred option from the shortlist.

[53] Average of High and Low voluntary uptake scenarios

[54] See Figure 8

6.2 Sensitivity Analysis

Table 11: Summary of Quantitative Sensitivity Dimensions

Dimension	**Low** (Worst Case)	**Central**	**High** (Best Case)
Energy Prices	Low	Central	High
Capital and Installation Costs	Central + 20%	Central[55]	Central -20%
Scheme operating costs	Central + 30%	Central	Central - 30%
Strength of Building Response (energy savings targeted by each ambition band)	Ambition Bands: Low - 0% Medium: 7.5% High: 15%	Ambition Bands: Low - 0% Medium: 15% High: 30%	Ambition Bands: Low - 0% Medium: 15% and 25% High: 40%
Opportunity Cost Capital	Costs recovered over 3 years, at rate of 10%.	Costs recovered over 2 years, at rate of 8.5%.	Costs recovered over 2 years, at rate of 3.5%.

84. Table 11 summarises the quantitative sensitivity dimensions considered in this IA. We present quantitative sensitivity results for the government's proposed option 3[56]. The **high and low scenarios in the IA** are then constructed by varying all of these dimensions simultaneously.

85. Table 12 summarises the full high and low sensitivity results. The results show a moderate negative NPV in the worst case, which is driven by a scenario with high costs of delivering ratings, which generate a relatively low impact on energy use, at high costs. Conversely, the high scenario shows a considerably larger NPV, driven by high levels of energy savings against relatively low costs of delivering ratings.

Table 12: Summary Sensitivity Results (Option 3)

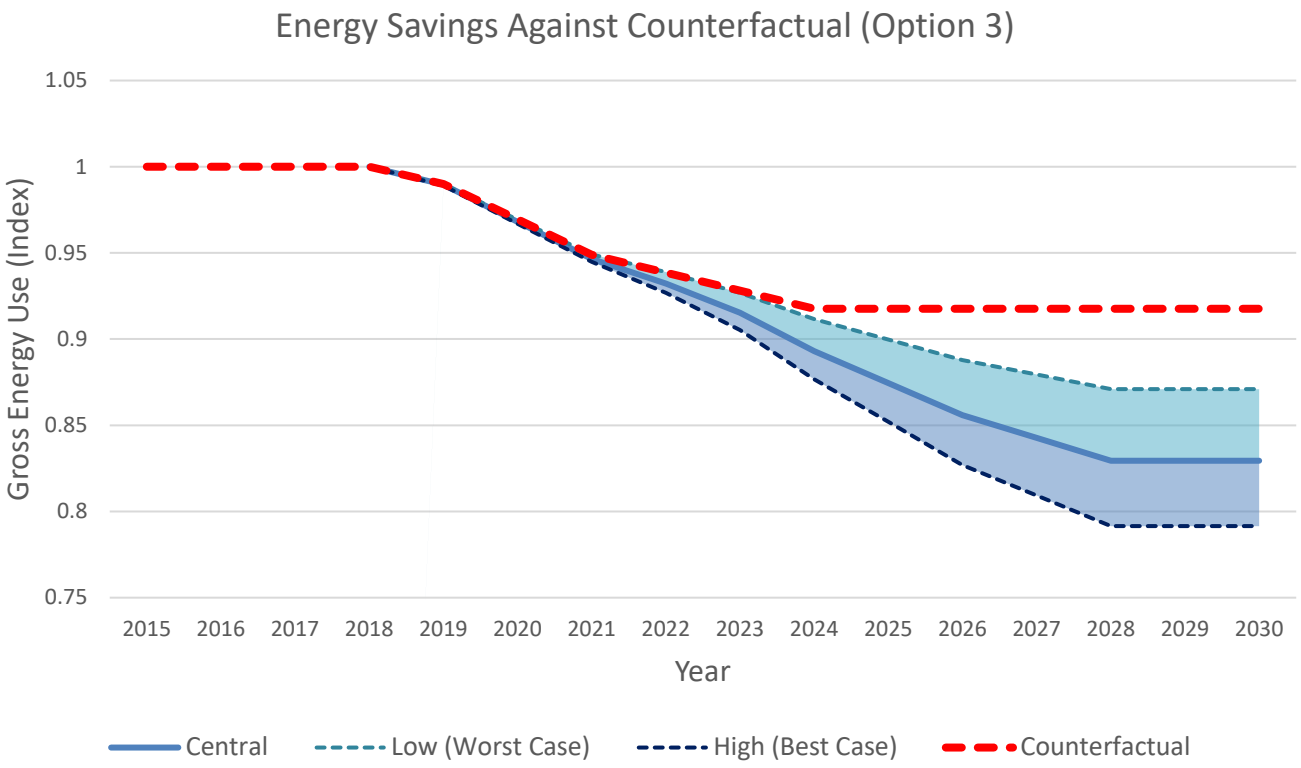
	High	**Central**	**Low**
NPV (£m)	**930**	**310**	**-120**
BCR	2.2	1.5	0.7
CB5 NT Emissions Savings (Mt)	1.1	0.75	0.52
Energy Savings (2030) (TWh)	2.02	1.42	0.80

[55] Based on BEES capital and installation costs, supplemented by updated BEIS evidence on non-domestic HVAC systems.

[56] For options 1 and 2, as the underlying modelling approach is the same across the options. Further, the assumptions that are varied as sensitivities do not behave fundamentally differently across the modelling of the options.

86. Figure 6 shows the impact on energy use in the high and low scenarios. We see that while the low scenario still implies a further reduction of around 7% on 2020 levels, this is not considerably higher than the counterfactual. Conversely, the high scenario reflects a significant improvement over time of over 20% on 2015 levels, or approximately 16% on 2020 levels. For further details on the sensitivity analysis see section 10.

Figure 6: Modelled Energy Impact



6.3 Business Impacts

6.3.1 Small and Micro Business Assessment (SaMBA)

87. Table 13 shows the estimated breakdown of business occupants by size in large offices.[57] It shows the impact on micro businesses should be negligible, and the impact on small enterprises should be relatively small also. This applies to the costs of rating the buildings, which are related to the share of building number. It also applies to the costs (and benefits) of reduced energy use, which are related to the share of floor area/energy use. Overall, large businesses are expected to bear a significant majority of the impacts. For higher size thresholds, the distribution of business sizes is expected to shift further towards larger businesses.

[57] This breakdown is based on BEIS analysis of BEES data. It is based on headcount. As part of developing evidence on business occupants we will look into alternative definitions.

Table 13: Business Occupant Size Breakdown

	Micro (1-9)	Small (10-49)	Medium (50-250)	Large (250+)
Building Number (%)	1%	9%	19%	71%
Floor Area (%)	0%	4%	14%	81%
Energy Use (%)	0%	5%	11%	84%

88. Those costs incurred are not expected to fall disproportionately on smaller businesses. Familiarisation and hassle costs may be proportionately lower for larger companies, due to economies of scale where they own/manage multiple buildings. Further, we expect the costs of delivering ratings to be higher for larger buildings, which we also expect to be owned or occupied by the largest companies, reducing proportionate costs on smaller businesses.[58] Similarly, the costs of reducing energy are strongly related to the size of the building, though we note there is no requirement to undertake capital investments, reducing the potential burden on small businesses.

89. Other factors that may mitigate impacts on smaller business occupants include the products offered by energy service providers. Holistic products may minimise the familiarisation and hassle costs incurred directly by occupants, though the financial costs of ratings would remain. Additionally, schemes to support for SMEs to improve their energy efficiency are being developed, mitigating the costs of improving performance.[59]

90. Lastly, our modelling suggests improving building performance can provide significant energy bill savings, providing a net financial gain (for details, see section 6.3.2).

91. It should be noted, there is some uncertainty around these figures, as the sample size is relatively small (see section 7 for discussion). Hence, small and micro businesses are considered together. However, the figures are consistent with expectations given the threshold of 1,000m^2 captures only the largest 7% of offices.[60]

92. An additional risk comes around multiple occupancy. BEES does not include data on whether buildings have multiple occupants. We expect that where offices have multiple occupants, a higher proportion of them may be small, or possibly micro businesses. However, at this stage while we do not have conclusive sub-building evidence on the buildings under multiple occupancy, we do expect buildings under multiple-occupancy to be largely in the rented sector (section 10.3.5). If this assumption holds, then any micro or small business captured in multiple tenancy buildings (as tenants) are likely to have no obligations under the current proposals, though may incur indirect benefits from improved building performance.

93. Lastly, in the rented sector, building owners may also be small businesses in themselves. We do not have evidence on the ownership structure of large rented offices at this stage, however we are developing our evidence on the ownership of non-domestic property[61], which will help us to better understand this subset of buildings. Evidence from the British Property Foundation suggests ownership of commercial

[58] See section 10.3.7 for details.

[59] Such as the Energy Efficiency Scheme for Small and Medium Sized Businesses https://www.gov.uk/government/consultations/energy-efficiency-scheme-for-small-and-medium-sized-businesses-call-for-evidence
And: Boosting Access for SMEs to Energy Efficiency (BASEE): Competition https://www.gov.uk/government/publications/boosting-access-for-smes-to-energy-efficiency-basee-competition

[60] Internal BEIS analysis on ND-NEED 2020, Electricity and Gas only, Coverage: England and Wales.

[61] BEIS is developing research on non-domestic commercial leases that will inform development of the final stage impact assessment.

property in the UK is dominated by overseas investors, investment funds, institutional investors and Real Estate Investment Trusts, covering roughly 80% by value.[62] The remainder is spread over potentially smaller investors such as unlisted property companies and charities. Further, we expect the *large* commercial properties in scope of the scheme are more likely to be owned by *larger* property owners. Additionally, though some of these institutions may be small in terms of head count, we expect their portfolios to be managed with the aid of larger numbers of staff, such as property management companies. Hence, we believe the hassle costs are unlikely to be disproportionate, and given the value of large commercial assets, the costs of maintaining the ratings is not expected to be disproportionate.

94. Impacts on voluntary & community bodies (VCBs) are not directly estimated, as the BEES sample size of large offices is too small to robustly identify relatively small subpopulations such as VCBs. However, we are looking at developing an approach using ND-NEED data to improve data on the distribution of occupants within large offices, improving evidence on small and micro businesses, as well as VCBs, however this has not been completed for the consultation stage impact assessment.

95. **Overall, our proposed approach to small and micro businesses is:**

- We expect a small minority of businesses impacted to be small and micro occupiers.
- Where these businesses are renting the property (as tenants), they face no regulatory requirements under the current proposals.
- In the event that small and micro businesses are owner occupiers:
  - We propose to provide mechanisms for government to cover the cost of maintaining a valid rating for small and micro enterprises.
  - We propose to use both measures of headcount, and turnover, such that only those business for whom maintaining a rating is both financially and practically disproportionate would be eligible.
  - We would not provide additional support through a performance-based framework to cover the cost of improving ratings, though this would be supported by aforementioned schemes being developed to support smaller businesses in improving their energy efficiency[63].
- Where the businesses that are letting the property (as owners/landlords) are small or micro businesses, we do not expect the burden of compliance to be disproportionate.

96. We welcome views on the evidence and proposed mechanisms around small and micro businesses through the consultation. This includes on issues such as how we define business size. We also welcome views on whether we should consider exemption for smaller businesses, though we believe that since improving operational performance offers benefits for businesses who engage positively, we should not exclude businesses.

[62] BPF Report (2017) https://propertyindustryalliance.org/property-data-report/

[63] Such as the Energy Efficiency Scheme for Small and Medium Sized Businesses https://www.gov.uk/government/consultations/energy-efficiency-scheme-for-small-and-medium-sized-businesses-call-for-evidence
And: Boosting Access for SMEs to Energy Efficiency (BASEE): Competition https://www.gov.uk/government/publications/boosting-access-for-smes-to-energy-efficiency-basee-competition

6.3.2 Equivalent Annual Net Direct Cost to Business (EANDCB)

97. The proposed regulations impose costs on building owners to obtain and maintain ratings. There are also costs associated with improving energy performance.

98. Direct costs include:
    - Costs of obtaining and maintaining ratings[64]
    - Capital cost of measures
    - Operational cost of measures
    - Installation and hassle costs associated with measures

99. Direct benefits include the energy bill savings.[65]

Table 14: EANDCB Figures

Figures (£m 2019 prices, discounted to 2020)	
EANDCB	**-£35.3**
NPV to Business	£482
Business Impact Test Score	-£177

100. The EANDCB is negative, reflecting the positive private NPV. This is because the investments from firms in the modelling more than cover the costs, including hassle, installation and delivering the ratings. Estimated energy bill savings in 2030 are approximately £116m.

101. The impact on businesses also depends on their response to the policy. Those that respond by improving performance can achieve bill savings that exceed the cost of maintaining the rating and the costs they incur in improving their performance, as demonstrated by the positive NPV to businesses. However, those that do not respond to the rating, would incur the cost of the ratings without the associated benefits.

6.4 Public Sector Impacts

102. Currently public sector buildings over 250m² are required to get an annual Display Energy Certificate (DEC) based on 12 months of recent energy consumption. Our current proposals would not include mandatory ratings for the public sector.

103. However, as discussed in section 4, a factor in the success of the NABERS scheme in Australia was that the public sector led by example, by only procuring offices with a high minimum standard NABERS rating. This made it clear to the market that a NABERS rating would be the common currency for office performance in Australia, and buildings must be high performing to secure public sector tenants. This put pressure on the wider market to ensure that they delivered the actual improvements that landlords required.

104. Hence, we have considered the potential impact of public sector engagement in the scheme. We are currently considering changing guidance for buildings in the central government estate to promote uptake of ratings, as well as considering using public sector buildings as part of the piloting and development of the rating. The rating would

[64] We use the estimated scheme costs as indicative of costs faced by businesses, though final prices will depend on the market for ratings and the scheme provider (section 10.3). These do not include government costs relating to the scheme.

[65] Other benefits such as improved productivity, health and increases in asset value are not included. These are unmonetized in this CBA, although would constitute direct benefits.

also be available on a voluntary basis for any building in the wider public sector.

105. At this stage it is difficult to robustly quantitatively estimate of the final scale of public sector engagement through these mechanisms. Hence, we provide an upper bound on the cost of public sector engagement and its impact on the CBA results to supplement the qualitative considerations.

106. **Costs to public buildings:** we estimate there are approximately 3,000 large offices across the whole public sector[66] (for details, see section 9). These sites already have an annual cost to obtain a DEC.[67] However, under the performance-based framework this cost would likely increase moderately, as set out in section 5.3, due to the higher standard of the rating and advanced quality control. We estimate the net cost (including hassle costs) per year for a public building would be approximately £600 (as discussed in section 5.3, performance-based ratings costs are subject to some uncertainty).

107. **Benefits to public buildings:** public sector buildings are also expected to be covered by a number of high ambition policies, including the Public Sector Decarbonisation Scheme (PSDS)[68], and supplementary policies such as the Public Sector Low Carbon Skills Fund[69]. Hence, given the ambition of these spending schemes, we make a conservative assumption and **do not include additional energy savings** over and above those delivered by the future public sector policy programme. In reality, we do expect that incorporating public buildings into a whole-stock framework for benchmarking, public disclosure and monitoring, would offer benefits to public buildings, but it is not feasible to assess how much this may change the performance of public buildings beyond the already high ambition of the future public sector policy trajectory.

108. **Benefits to private buildings:** The industry has also expressed that incorporating public buildings onto the scheme could drive benefits in the private sector, as the ambitious decarbonisation agenda for the public sector presents opportunities to drive the wider market. As public sector offices invest in the 2020s to improve their performance and emissions, the experience of improving star ratings in public sector offices will accelerate the market's ability to improve the star rating of all offices. A common rating scheme, which is modern and reliable, gives the market a clear and trusted currency for those improvements. However, again, at this stage it is difficult to robustly quantify these impacts, so we make a conservative assumption and **do not include monetised benefits** from improved private sector performance.

109. Overall, we estimate the total present-value net social costs of transitioning all large public offices to the new framework would be approximately £24m over the appraisal period (2021-2038). This provides the upper bound of the net social cost of the ratings.

110. Lastly, contrasting option 3 with and without the cost of transitioning public buildings, the impact on the main cost-benefit analysis results is small. The NPV remains positive and only falls by 8%. The benefit-cost ratio is also very stable, and the policy remains cost effective at reducing carbon.

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[66] Internal BEIS analysis on ND-NEED 2020 and BEES 2016, Coverage: England and Wales.

[67] We assume a cost of approximately £600 on average based on figures from section 2.2 of "Exploring the Use of Display Energy Certificates" on costs of renewing the DEC. https://www.gov.uk/government/publications/exploring-the-use-of-display-energy-certificates

[68] PSDS is a £1bn scheme providing grants for public sector bodies to fund energy efficiency and heat decarbonisation measures. https://www.gov.uk/government/publications/public-sector-decarbonisation-scheme-psds

[69] https://www.gov.uk/government/publications/public-sector-low-carbon-skills-fund

Table 15: Cost-Benefit Analysis Results Including Public Sector

	Option 3	Option 3 (Including Public Sector)
Costs	650	680
Benefits	970	970
Net Present Value	**310**	**290**
Benefit Cost Ratio	1.48	1.42
Lifetime Non-Traded Carbon Cost-effectiveness (£/t)	-80	-64

7 Risks and Uncertainties assumptions

7.1 Risks

7.1.1 Data and Evidence

111. Due to sample size restrictions, the BEES sample of large, private offices does not include any over 10,000m^2. These buildings make up a small minority of buildings (<5%) but a larger proportion floor area (>25%) and hence energy use. This means our analysis may *underestimate* the potential gains from the policy by under-representing the buildings for whom the cost of the rating is smallest relative to the energy savings.

112. As discussed, we are working to improve our evidence on non-domestic tenancies. Hence, our current evidence on multiple occupancy is based on analysis of building and hereditament-level data from ND-NEED. The risks of this method are discussed in section 9.

7.1.2 Modelling Assumptions

113. The NDBM[70] estimates a cost-effective package of technologies to achieve a given level of energy savings. Buildings may choose other technology packages, and this is discussed further in section 10.4. In general, if the assumption that buildings respond using cost effective bundles of measures, holds, then differences with the modelling should give comparable, if not better, results in terms of the overall cost-effectiveness of the response.

114. It was not feasible to explicitly model the both the behavioural incentives of a performance-based framework and a minimum fabric standard list simultaneously. However, our modelling approach includes fabric measures where they are most cost-effective. This suitably captures the interaction between the two mechanisms, as business will be incentivised and equipped to identify those fabric measures which most impact real performance, and to ensure that installation and operation are conducted in a way that maximises operational impact.

115. The response-rate to the policy may be faster/slower depending on how quickly buildings achieve the energy savings. In general, this has a relatively small impact. The *level* of energy saving achieved has a significant impact on the cost-benefit analysis for the scheme, however the exact timings would have a small impact, if the same overall level of savings is achieved, hence a quantitative sensitivity is not presented. The main impact would be on carbon budgets. If buildings are considerably slower to respond than expected, there is a risk this would reduce savings in the earlier carbon budget periods,

[70] Section 10.1

particularly CB5 (2028-32).

116. Our modelling assumes buildings respond by targeting a level of total energy use, which captures their level of response. In practice, buildings may decide how to respond using other metrics, or combinations of metrics, such as targeting a star rating, energy intensity, or targeting at portfolio-level rather than building-level. However, as long as the resulting behaviour is equivalent/comparable to that assumed in the modelling, this does not pose an additional risk to the analysis.

7.1.3 Cost-Benefit Analysis Assumptions

117. As discussed in section 10.3, in this IA we assume 5% of buildings do not receive ratings, however there is uncertainty as to the final proportion of non-compliance. However, the number of buildings covered in phase 1 is relatively small, so we expect enforcement to be relatively effective. If a greater proportion of buildings do not comply, we expect this to largely be comprised of buildings with the *lowest* engagement, moderating the impact on energy savings.

118. Our counterfactual assumes a faster rate of reduction in energy over the period 2019-2026 than seen historically in 2012-2019. This is informed by the EEP and reflects the increasing ambition of existing policies, and other wider trends in energy use. This is a conservative approach, meaning we assume a high level of energy savings in the counterfactual, so we do not expect trends in the counterfactual to significantly exceed those modelled. However, if we have overestimated the counterfactual savings, this would generally improve the efficacy of our policy. This is because the level of energy savings modelled are based on historic data on the absolute performance improvements under comparable schemes. Hence, if the counterfactual overestimates the savings achieved by existing trends and policies, then the gross impact under the scheme is expected to be similar, meaning net additional impact of the scheme would be higher. Changing the counterfactual savings is not explicitly tested in the sensitivities, however the sensitivity on the strength of buildings' response provides comparable insights.[71]

119. We do not include responses from any buildings under 1,000m^2 (or under 2,000m^2 in option 2). In principle these buildings may be able to be rated on a voluntarily basis once the scheme is established. However, while there is some evidence of uptake from smaller buildings in NABERS, there is not enough detail on these responses to inform a robust quantitative approach at this stage. For example, we do not know the level of response from these buildings, or how their decisions were influenced by aspects specific to NABERS, such as expectations about changes in the mandatory floor area threshold. Hence, in this IA we make the conservative assumption of assuming no voluntary engagement from smaller buildings. We have not included the impact of uptake of tenant ratings at this stage for analogous reasons, as well as because we are developing our evidence on tenancies in non-domestic buildings[72].

120. Our cost estimates use NABERS as a reference-point, with adjustments for differences in scheme design, such as the higher costs for the initial onboarding ratings, and the lower costs from reducing the frequency of site assessments (for further details see section 10.3). However, the final costs depend on the final scheme design, and on the scheme delivery body. They will also depend on the market for producing ratings, which will determine a key component of the cost. Ensuring there is competitive provision of ratings is important to ensure the prices businesses face are appropriate given the real

[71] The main difference is that reducing the baseline savings makes the deployment of the cheapest technologies attributable to the policy, improving the results relative to the sensitivity tested.

[72] BEIS is developing research on non-domestic commercial leases that will inform development of the final stage impact assessment.

cost of delivering the ratings. For example, ensuring there is a sufficient body of suitably qualified assessors will be important for delivering the ratings in the most cost-effective manner. The sources of differences in cost between NABERS and a performance-based framework are discussed in section 10.3.

7.1.4 Other assumptions

121. We have not explicitly included a rebound effect, as this is inconsistent with the mechanism of the policy and evidence used. The mechanism is designed to directly improve operational performance, so it is inconsistent to simultaneously assume that savings from energy efficiency measures would produce rebound effects that counteract the improvement in performance. Further, the levels of savings used in the IA draw on historic data from existing operational performance schemes, which would already include any potential rebound effects.

122. We do not include additional costs associated with improving the metering in buildings. Previous schemes such as the Suppliers' Advanced Meter roll-out are expected to have covered much of the level of metering required for performance-based ratings. There remains some risk around the level of metering and submetering required to successfully rollout tenant ratings, and this will be considered as we develop our evidence on tenancies in non-domestic buildings.

7.2 Uncertainties

123. The ongoing Coronavirus (COVID-19) outbreak has significantly changed working patterns. Most relevant to this IA is the current significant shift to remote working, rather than office-based working. At this stage it is too early to assess the medium and long-term implications this could have on important variables such as the size, usage and location of the UK office stock. Hence, in this impact assessment we have not included quantitative assessments of these impacts.

7.3 Optimism Bias

124. Our approach to optimism bias in the impact assessment is integrated throughout the analysis, by taking intentionally conservative approaches on several core assumptions. For details on modelling assumptions, and where conservative assumptions have been used to mitigate optimism bias, see section 10.3. The main cases are summarised below:
    - Our counterfactual is relatively conservative, assuming a relatively high level of energy savings due to existing policies and trends.
    - Our assessments of the costs of delivering the scheme include conservative assumptions, such as ignoring scale economies in the delivery of groups of site assessments, and familiarisation costs. We also use NABERS costs for 2,000m^2 buildings as our reference, though the costs are substantively lower for 1,000m^2 - 2,000m^2, who are a large proportion of buildings in scope.
    - Evidence from case studies and energy service providers indicate that there may be relatively large energy savings that can be made with very low expenditure, through how buildings are used. However, as we lack evidence on this which can be robustly generalised to the stock, so use more conservative assumptions on behavioural and control measures from BEES, as set out in section 5.2.
    - We present a range on the voluntary uptake scenario, capturing both the uncertainty, and high risk of optimism bias presented by overestimating voluntary uptake in that option.

125. Given this integrated approach, we have not also applied a further optimism bias adjustment, though we welcome evidence on the level of optimism of our assumptions, such as cost assumptions, through the consultation.

8 Monitoring and Evaluation

126. Monitoring of participation in the scheme will be undertaken by the scheme administrator. Alongside this there will be an evaluation of the processes, outcomes and impact of the scheme conducted by external evaluators. This evaluation will use a range of approaches to assess what has happened during the scheme and the impact on businesses and scheme outcomes.

127. The main external factors that are expected to have an impact on the success of the evaluation include:
- Interactions with other business energy policies;
- Economic and business planning uncertainty, particularly after COVID-19;
- Wider policy environment;
- Corporate Social Responsibility policies;
- Business Rationalisation.

128. The evaluation will include work to assess and refine the external factors and the extent to which they have impacted on the scheme.

129. The full evaluation is expected to use a theory-based approach combined with quasi-experimental analysis to assess whether the original scheme objectives have been met. The evaluation will also include early insight into implementation and the response by scheme participants and other stakeholders to inform the development of the scheme. The details of the evaluation will be scoped during Stage 1 of the evaluation. The evaluation will be in three phases, and the structure will include reviews of the evaluation plans. This will allow the flexibility to incorporate changes to the aims and questions of the evaluation as well as the method used to successfully assess the scheme as a whole. A preliminary evaluation plan is presented in section 14.

130. The evaluation will collect data from the key stakeholders and participants in the scheme through surveys and qualitative interviews. In order to assess the impacts of the scheme there may need to be additional data collected from businesses that are not in scope of the scheme, in order to support understanding of the counterfactual. The data collected to provide the ratings themselves will contribute a significant amount of the information needed for the evaluation, including information on building and occupier characteristics, and data over time on energy use. We may need to collect additional data dependent on the quantitative methods employed, such as data on historic energy use.

131. A key consideration in determining the timing of the evaluation will be the strength of response to the policy. The annual ratings should support effective monitoring and provide an up-to-date indication of the strength of buildings' response. Hence, if the overall response is weaker than expected, or the data suggest specific subsections of the stock are not responding as expected, it may be beneficial to amend the timings of the evaluation to deliver evidence to support the development of the policy.

9 Annex 1: Data and Evidence

9.1 Building Performance and EPC – Evidence

132. A useful evidence source on EPC performance is data from the Better Building Partnership's (BBP) Real Estate Environmental Benchmark (REEB)[73] which is an operational benchmark of environmental performance for commercial property in the UK. Their data cover approximately 800 (almost exclusively large) offices.

133. Figure 1 (reproduced) shows there is no relationship between energy intensity and EPC in the REEB sample. Figure 7 shows that this also applies to the carbon intensity, where there is a slight but weak relationship, in which the total variation across the bands is considerably smaller than the variation within them.

Figure 1: Energy Intensity and EPC Rating of REEB Offices[74]

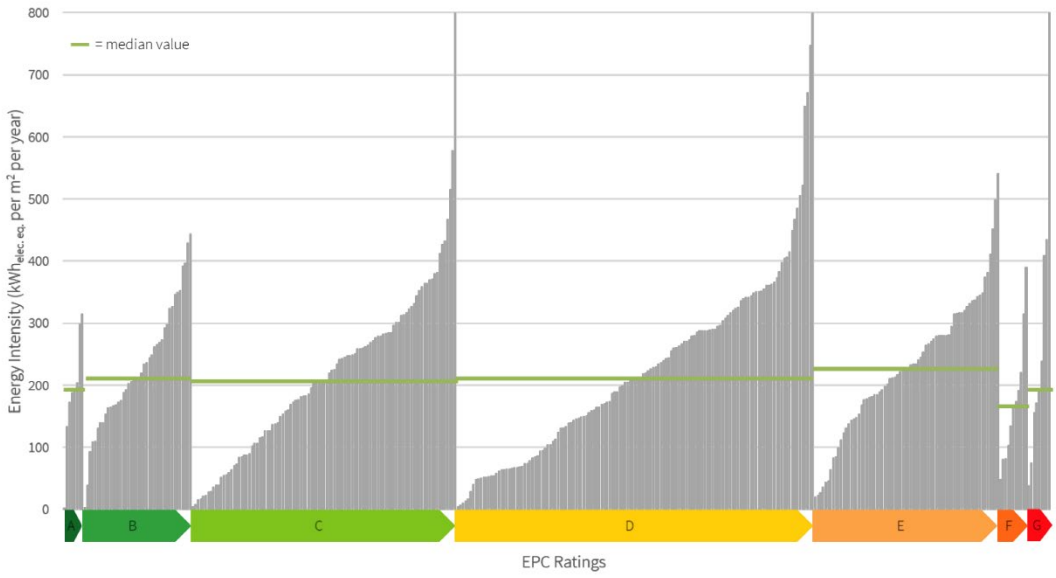
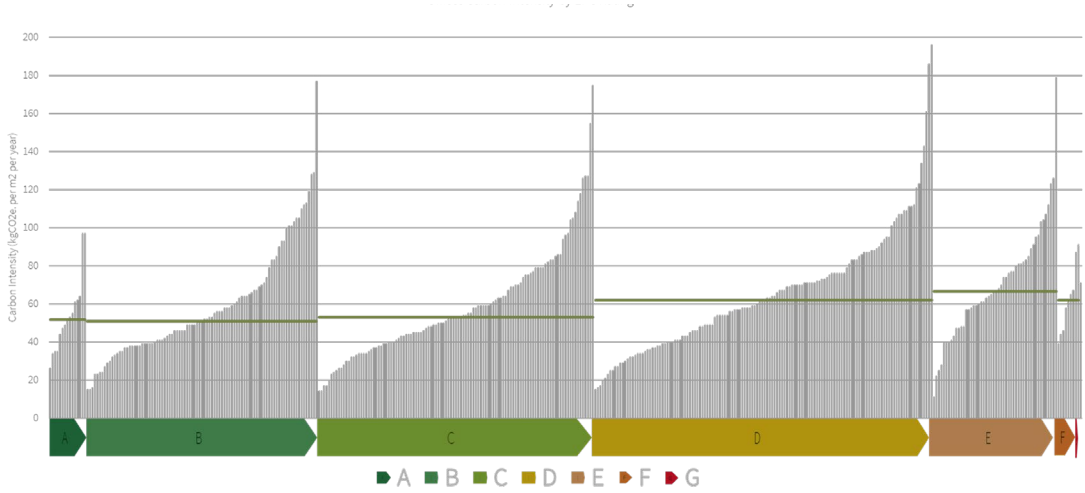


Figure 7: Carbon Intensity and EPC Rating of REEB Offices[75]



[73] The REEB Energy Snapshot (2019) provides a good overview of REEB and its results. https://www.betterbuildingspartnership.co.uk/node/129

[74] Data from the Better Building Partnership (BBP) Real Estate Environmental Benchmark (REEB) database. REEB Energy Snapshot 2019 pg 10.

[75] Better Buildings Partnership, Real Estate Environmental Benchmark data request.

134. However, REEB evidence has some similar limitations to evidence around NABERS, although it also has the advantage of applying to the contemporary UK context. An important limitation is that participants of REEB are not a randomly selected sample of office buildings. Comparing the REEB sample against the entire stock, we conclude that the sample in REEB is a reasonable cross-sectional reflection of the large office stock along key variables, though with identifiable biases, discussed below.[76]

135. One the one hand, REEB results may show better performance than that achievable from the whole non-domestic stock. It overrepresents larger buildings, and likely has some selection bias from being a voluntary standard, so may overrepresent those with higher pre-existing engagement on building performance issues. Conversely, it may underestimate the potential gains from a stock-wide metric, as it does not fully capitalise on the reputational drivers of benchmarking and disclosure because it does not publicly disclose building-level comparisons and ratings.

136. This bias may also apply to the EPC results, however this does not significantly undermine the conclusions. The biases identified mean we may expect REEB buildings to have higher engagement with energy issues in expectation. However, if this were the case, we would still expect a successful measure of energy performance to show poorer performance in those buildings assigned lower ratings, even if those poor performing buildings were underrepresented relative to the population, in a given sample. However, we do not see this, instead seeing similar distributions of energy and carbon intensity across all EPC bands in the sample.

137. Lastly, we are conducting further research into the performance of the EPC across the stock, particularly large buildings. This includes research and internal analysis using ND-NEED data, and data from the PRS PIR. The preliminary results of these all support the conclusions, and we will look to continue to develop these evidence sources alongside the consultation.

138. We also note, that while we do not believe it is suitable for the largest buildings in the stock, as set out in the consultation we believe the EPC-based framework is appropriate for the majority of non-domestic buildings, which are smaller, and individually use a smaller proportion of energy. Measuring fabric efficiency provides insight into how to improve a building, and EPC ratings are comparatively lost cost to deliver and maintain. However, for the largest buildings in the stock, it is appropriate to use an improved measure of building performance, and although this is more costly to deliver, the benefits from improved measurement, benchmarking and public disclosure justify this cost, as these largest 7% of buildings constitute 53% of energy use.[77]

9.2 Additional data on large office stock

139. The following figures describing the office stock are based on BEIS analysis of data from the ND-NEED framework and BEES. All figures refer to England and Wales and include public sector offices, as ND-NEED data does not currently differentiate between private and public offices. The impacts of this are discussed below.

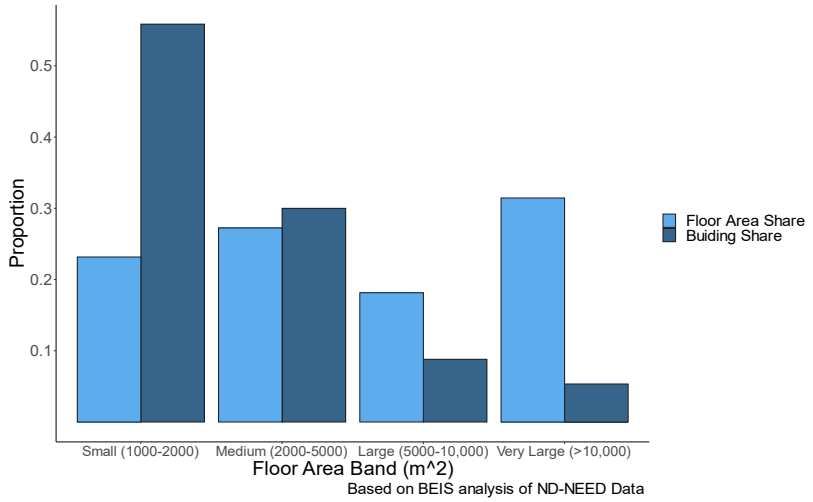
140. Within the office sector, floor area is closely related to total energy use. We therefore use floor area here as a proxy for energy use as we have stock-level data on floor area.

[76] Comparing REEB data to BEIS analysis of ND-NEED data: by floor area, REEB is has a similar proportion of buildings from 2,000m^2-10,000m^2, though *underrepresents* the smaller offices (1,000m^2-2,000m^2) and *overrepresents* the largest offices 10,000m^2+ (these comprise over 50% of the REEB sample by floor area). It also overrepresents buildings in London to a moderate degree.

[77] Internal BEIS analysis on ND-NEED 2020, Electricity and Gas only, Coverage: England and Wales.

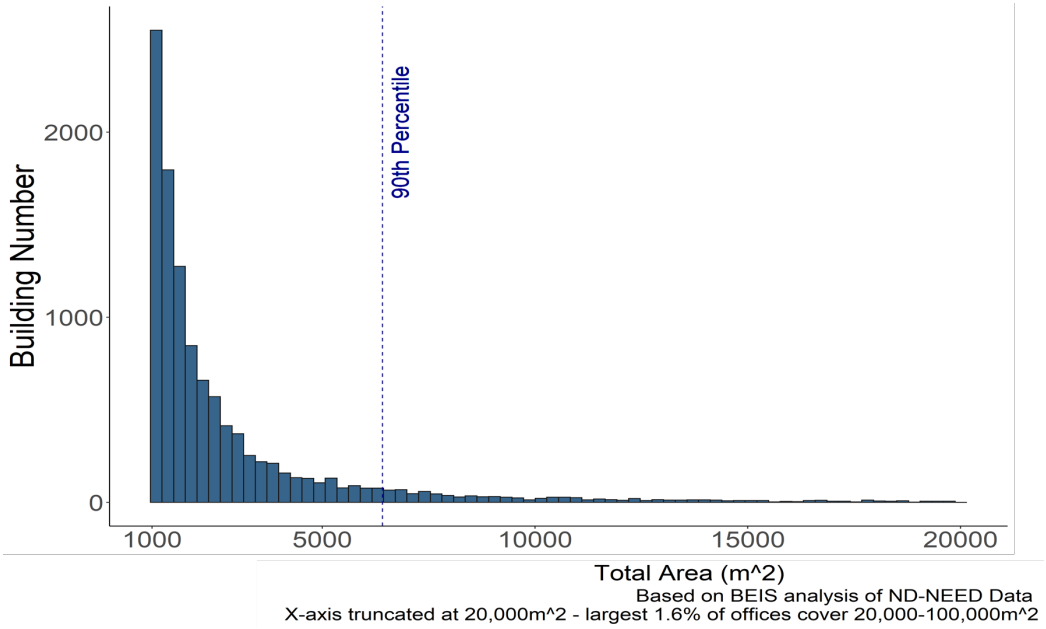
Similar to the non-domestic stock as a whole, large offices (over 1,000 m^2) are 7% of the office stock by number, however they cover around half of the floor area.[78] A similar relationship also holds within the stock of large office itself. For example, buildings *over* 5,000m^2 account for approximately 15% of large offices by number, but approximately 50% of energy use from large offices.[79] Figure 8 shows the largest offices account for a small proportion of the stock, but a larger proportion of the floor area.

Figure 8: Floor Area Bands of Large Offices (>1,000m^2)



141. It is useful to have a detailed understanding of the distribution of offices over 1,000 m^2, as this is a key variable for understanding the burden of compliance costs. Figure 9 shows it is highly concentrated at the lower end, with approximately 80% of large offices being under 3,800 m^2 and 90% under 6,400m^2. Offices over 10,000m^2 represent only 5% of all large offices by number.

Figure 9: Histogram of Large Office Floor Area



142. To estimate the number of buildings in scope of the regulations, we use data from the ND NEED framework, supplemented by BEES. We estimate there are 13,000 offices

[78] Internal BEIS analysis on ND-NEED 2020, Electricity and Gas only, Coverage: England and Wales.

[79] Internal BEIS analysis on ND-NEED 2020, Electricity and Gas only, Coverage: England and Wales.

over 1,000m^2 in England and Wales and approximately 20%of these are in the public sector based on BEES. [8081] As discussed, ND-NEED data does not allow us to differentiate between private and public buildings, however we do not expect the size and distribution of public offices to be fundamentally different to the private sector. This approach is summarised in Table 16.

Table 16: Estimated Number of Large Offices in Scope

	Private Offices	Public Offices	**Total**
Number (rounded)	10,000	3,000	**13,000**

143. We focus on buildings above 1000 m^2 for the following reasons: when we include buildings in a smaller size threshold, we see an increase in the number of buildings but a much smaller change in floor area captured. When we compare a 2000m^2 and a 1000m^2 threshold (options 2 and 3) the floor area covered increases **by 30%,** but the number of buildings **doubles**, as can be seen in Figure 8. However, there is already a negative impact on the cost-effectiveness and BCR of the policy, as the benefits depend on energy consumption (related to floor area), but the compliance costs depend on the building number. Moving from 1,000m^2 to 750m^2, only adds approximately 10% additional floor area, but approximately 40% more buildings. To add a further 30% more floor area would require *more than doubling* the number of buildings again; roughly equivalent to a 500m^2 threshold.[82]

144. Furthermore, we have been guided by international best practice on ambition, in particular the Australian NABERS scheme which has been established for over a decade, but only lowered its mandatory threshold to 1,000m^2 in 2017 (Figure 3). We believe a 1000m^2 threshold (as per option 3) is a desirable and deliverable high ambition threshold for our scheme. Increasing the ambition of the mandatory threshold beyond this from the scheme's inception could be argued to lack credibility. Additionally, it is important to note that ratings would be available for buildings under 1000m^2 on a voluntary basis.

145. The regional distribution of large offices is concentrated in London, with 28% of buildings by number, and 34% by floor area. This concentration is greater than the average across the non-domestic stock, where London reflects approximately 15% of building numbers and approximately 11% of floor area, however this is not unexpected given the density of large offices in areas such as Westminster, the City of London and Canary Wharf. [8384] Hence, the inclusion of public buildings in the data may add a moderate upward bias to the estimated share of large private offices in London (due to the inclusion of areas such as Westminster), however given public offices are expected to be a minority, we expect the main conclusions to hold.

[80] Internal BEIS analysis on ND-NEED 2020 and BEES 2016, Coverage: England and Wales.

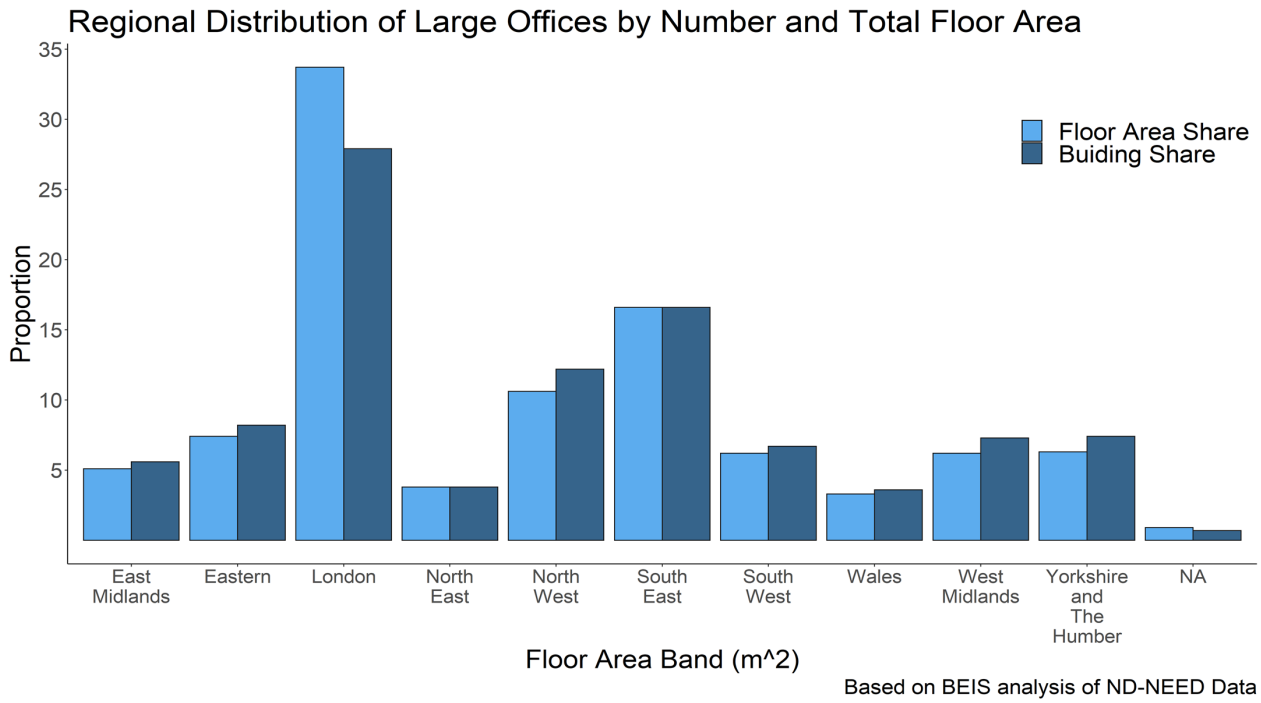
[81] BEES (2016) & Internal BEIS analysis on ND-NEED 2020 and BEES 2016, Coverage: England and Wales

[82] Internal BEIS analysis on ND-NEED 2020.

[83] Internal BEIS analysis of ND-NEED 2020 & BEES (2016)

[84] See Section 12 for additional detail on the regional distribution.

Figure 10: Regional Distribution of Large Offices



9.3 ND-NEED

146. The Non-Domestic National Energy Efficiency Data-Framework (ND-NEED 2020) provides data on the energy use of non-domestic buildings. It uses data from the Valuation Office Agency (VOA) on buildings, alongside data on metered energy use and data on businesses such as size and sector.

147. Our current evidence on multiple occupancy is based on analysis using hereditament-level VOA data from ND-NEED.[85] This method is discussed in section 10.3.5.

148. This may **underestimate** multiple occupancy as a small proportion of the hereditaments in the data could not be matched to a building. Hence, there may be some buildings with multiple hereditaments which are not captured in the 20% figure.

149. Conversely, it may **overestimate** the level of multiple occupancy as hereditaments include delineations which may not constitute multiple occupancy in a way what requires a tenant rating. For example, parking areas may be counted separately where they are not contiguous with the main building. However, this should only occur when there **are** multiple occupiers, as, in general, single occupiers are counted as a single hereditament. Therefore, though the *number* of hereditaments may be overestimated, this should only apply to buildings which have multiple occupants anyway. Therefore, the share of buildings with a single hereditament versus multiple hereditaments would remain a reasonable proxy of multiple occupancy.

150. Hence, overall, we expect on balance that our approach would underestimate multiple occupancy, hence why we use a higher assumption in the central scenario modelling.

[85] See the VOA website for further details on hereditaments https://www.gov.uk/guidance/rating-manual-section-3-valuation-principles/part-1-hereditament.

151. We crossed referenced key cross-sectional statistics from BEES on the non-domestic buildings stock with figures based on ND-NEED data and were satisfied that they gave robust and consistent results.[86]

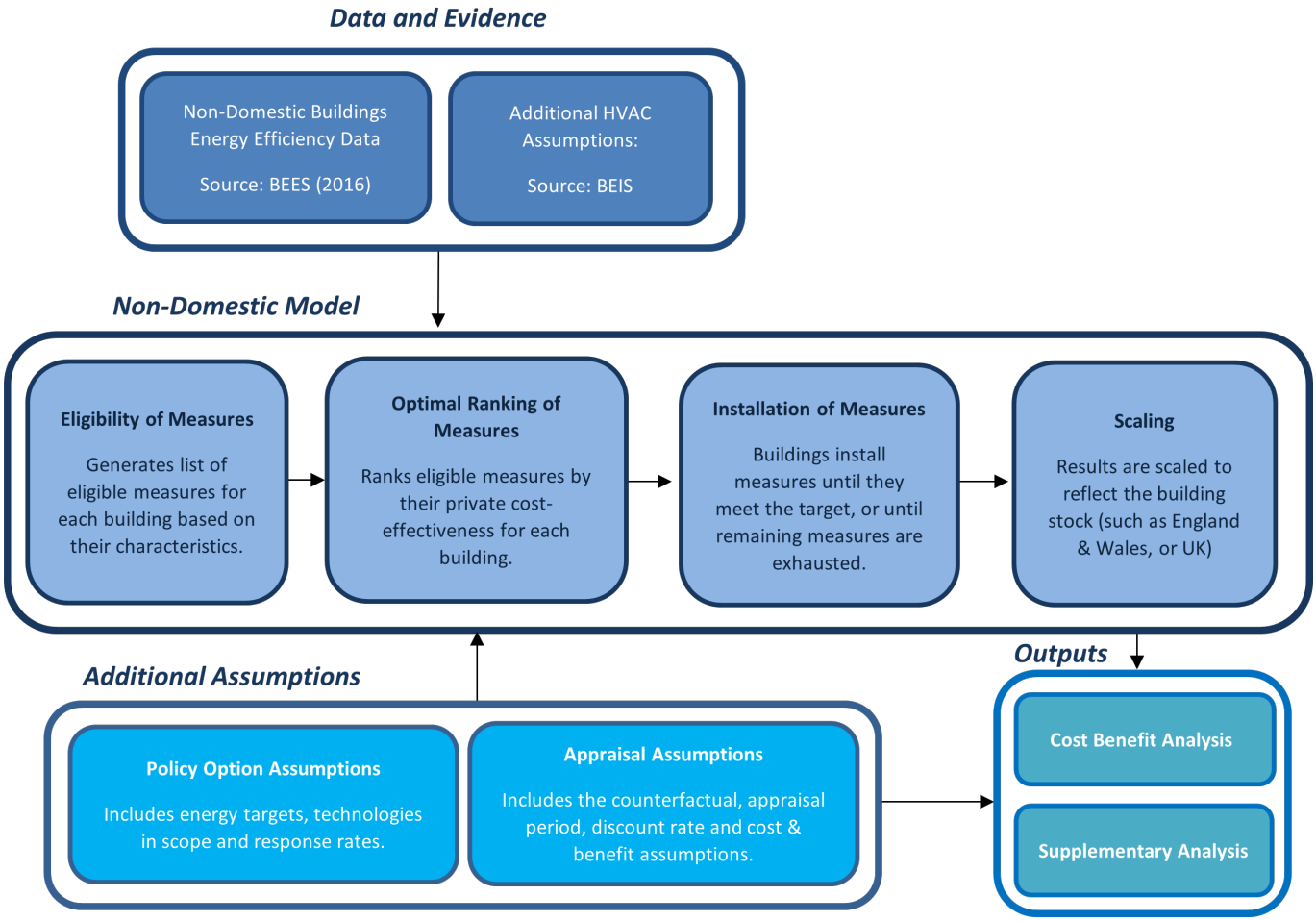
10 Annex 2: Modelling Approach and Results

10.1 Non-Domestic Buildings Model

152. The Non-Domestic Buildings Model (NDBM) is a BEIS-owned model based on evidence from BEES, and other internal BEIS evidence. It is used to model the costs and impacts of energy efficiency and heat decarbonisation technology pathways in the non-domestic stock. We use the model to capture the impacts of the scenarios set-out in the IA, including estimating cost-effective technology bundles that are used to understand the potential response of buildings to the rating scheme.

153. Figure 11 shows a simplified structure of the model, and how it fits into the overall modelling approach.

Figure 11: Model Approach Schematic



154. Additionally, as discussed in section 4, there is a body of case study evidence that suggests that a significant level of energy savings could be achievable in many buildings by improving *how* they are used, potentially with very low capital expenditure. However, we lack evidence on this which can be robustly generalised to the whole stock. Hence, we use more conservative assumptions on the costs and benefits of optimising the

[86] We are continuing work to update and improve our data and evidence. As a result of this, some of the statistics cited here may change in future iterations of the analysis.

performance of buildings through better operation, based on BEES. We take the behavioural and control measures in BEES as our proxy for the costs and impacts of 'optimised' building performance, as these are generalisable to cover the entire stock. Maximally deploying these technologies can yield up to a 16% reduction in total energy-use, with an estimated payback of 1.5 years.[87]

10.2 Cost and Benefit Assumptions

155. Familiarisation costs are monetised using the opportunity cost of the time of the individuals expected to undertake familiarisation. We use an annual salary of £50,000 prorated. For details see section 10.3.

156. Compliance costs are monetised using the expected cost of delivering the ratings. This is a combination of time costs, business overheads and administrative costs. For details see section 10.3.

157. Capital and Operational costs are estimated using the market prices for energy efficiency and HVAC measures from BEES (2016). Installation/hassle costs are monetised by applying a hassle factor to capital and operational expenditure, which vary by technology between 10-20%, using assumptions from BEES.[88] These are included in the capital and operational expenditure figures.

158. The opportunity cost of capital captures the costs to society of diverting businesses' resources to energy efficiency from other productive means. This is additional to the opportunity cost of the capital itself, as it covers the social value of the real return those business could have made on the capital if it were invested in the activities of the business. This is captured by assessing the value of the interest payments a business would have paid to finance that capital, assuming they finance it at a rate equivalent to the real return they could generate.[89] A return of 8.5% over two years is used, based internal BEIS appraisal guidance on private returns to capital, and using the average 2-year payback period for investments in the modelling.

159. Energy savings, carbon emissions reductions and air quality impacts are all valued using Green Book appraisal values.[90]

10.3 Modelling Assumptions

10.3.1 Counterfactual

160. For the counterfactual we produced an estimate of the future total energy-use of large offices. We took the EEP as a starting point, as this provides both historical and projected energy use for the commercial sector, taking account of existing policies and developed policies.[91] However, the EEP does not provide estimates specific to large offices. Hence, we compared the historic *commercial* energy data from the EEP, with the historic *large office* energy data from ND-NEED. This allowed us to assess if the historic trends were consistent, and hence whether the EEP *projections* would be a reasonable

[87] BEIS analysis of BEES (2016) data.

[88] These costs are also assumed to cover the cost of identifying effective interventions. For the higher levels of ambition these costs may be higher.

[89] This amounts to essentially assuming efficient, risk-neutral capital markets.

[90] Green Book Guidance (HMT Green Book Supplementary Guidance - https://www.gov.uk/government/collections/the-green-book-supplementary-guidance)

[91] EEP 2019 https://www.gov.uk/government/collections/energy-and-emissions-projections

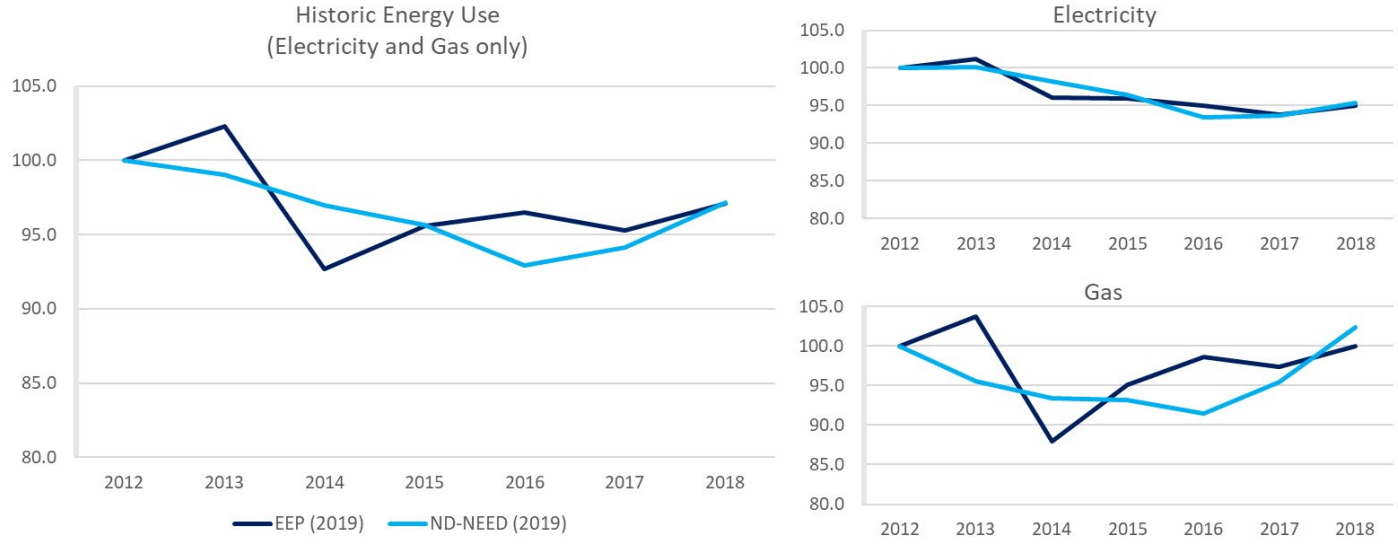
reflection of the large office sector. This process is summarised in Table 17.

Table 17: Summary of Data used for Counterfactual

Data Source	Historic Energy (2012-2018)	Projected Energy (2019-2030)	Specific to Large Offices
ND-NEED	✓	X	✓
EEP (commercial)	✓	✓	X
Modelled Baseline	(✓)	(✓)	(✓)

161. The EEP shows a moderate reduction in energy consumption of 3-4% on 2012 levels over 2012-2018, as shown in Figure 12. This trend is consistent with the ND-NEED data for large offices over the same period.[92] We also considered electricity and gas separately, as these represent over 95% of energy use in large offices.[93] The relationship is particularly strong for electricity. Hence, we judged that the EEP data provided a suitable basis for estimating the large office counterfactual.

Figure 12: Comparison of EEP and ND-NEED Indexed to 2012



162. The modelled counterfactual updates the BEES energy-use data from 2015 to 2020, and then projects forward over the modelling period. We use electricity and gas consumption as the basis, and the assumed energy use from 2015-2020 is relatively flat, with a slight dip at the end of the period. The projected energy-use from EEP has a U-shape over the period 2021-2030. This is driven by assumptions on the end of the lifetimes of existing policies.[94] In our modelled counterfactual, we assume savings from existing policies are 'locked-in', which amounts to assuming that future policies will at least maintain the level of savings achieved by current policies.[95] Overall, we assume an

[92] Both series are indexed to 2012.

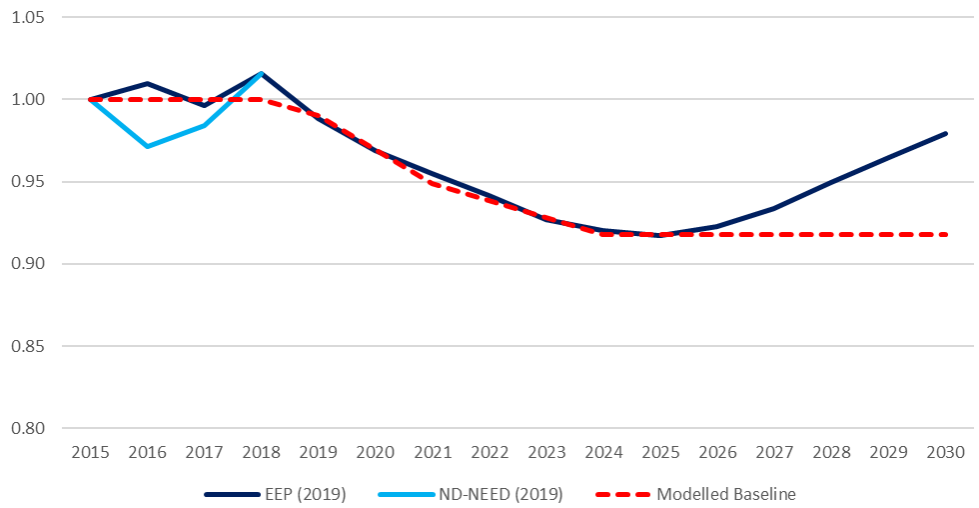
[93] Large office fuel use is approximately 67% Electricity, 28% Gas and 4% other sources – BEIS analysis of BEES (2016) data.

[94] EEP assumes policy savings expire after a finite period. Hence, since EEP does not make assumptions about future policies, energy-use begins to rise towards the end of the modelling period. Economic growth assumptions also contribute to the increasing energy use.

[95] This is a conservative assumption, as the performance-based framework is designed to be a key driver of sustained performance improvement, so maintaining the energy savings from existing policies over time may be partially attributable to a performance-based framework, as well as its additional reductions.

6% reduction in energy use over the period 2020-2030 for large offices, summarised in Figure 13.[96]

Figure 13: Modelled Counterfactual Indexed to 2015



163. The counterfactual energy trajectory is modelled assuming buildings use the most cost-effective technologies, as these are most likely to be motivated by existing policies. The modelling results in approximately 75% of counterfactual expenditure on lighting and thermal controls, with 25% on a combination of other efficiency measures, with limited use of longer payback fabric measures.

164. We have also considered overlaps with potential future policy areas which are not yet developed enough to be included in the EEP, where these may impact the large office stock. These are summarised in Table 18.

Table 18: Potential Future Policy Interactions

Future Policy Area	Counterfactual Assumption
Update to ND Private Rented Sector Regulations	This policy would deliver fabric measures in a portion of the rented stock. The interaction with the PRS regs is explored in section 11.
Public Sector Decarbonisation Ambition	Public sector buildings are not included in the current proposals. We consider them in section 6.4 we assume any energy and carbon savings from public sector buildings would be attributable to future public sector policies.
Non-Domestic Clean Heat	We assume building performance optimisation and cost-effective energy efficiency measures will be delivered *before* clean heat solutions in general. Hence, clean heat deployment will build on improved energy performance, so it does not appear in our counterfactual.

[96] Our model is a fixed-stock model, meaning it does not account changes in the stock such as new-build, demolished or re-purposed offices. Hence, absolute aggregate energy-use may differ, particularly towards the end of the appraisal period.

10.3.2 Level of energy savings achieved:

165. Based on the evidence discussed in section 4, we expect to see significant variation in how strongly buildings respond to the scheme. Some buildings may aim to maximise their ratings, while others will undertake limited action. We capture this variation by modelling three broad 'types' of response:[97]

- A **high ambition group** (10% of the stock): these are the highest achieving group and target a high level of energy savings, at 30%. They may already have better than average information on their energy use, but are expected to respond positively to the benchmarking, and disclosure mechanisms. They are modelled as drawing on a wide range of energy efficiency and HVAC technologies, while prioritising cost-effective bundles of measures.
- A **medium ambition group** (70% of the stock): These buildings make up the majority of the stock, and target a moderate level of energy savings, at 15%. They are modelled as only drawing on more cost effective fabric, lighting and behavioural/controls measures.
- A **low ambition group** (20% of the stock): 15% receive ratings but do not act to improve them, and 5% do not receive ratings at all (non-compliers). These buildings are assumed to behave the same as in the counterfactual.

166. The relative size of the groups and the level of energy savings achieved are based in part on the results in section 4 of the CIE report, as well as the wider literature and BEES.[98]

167. The **medium ambition** group are assumed to achieve 15%energy savings, which is moderately lower than the average savings seen in REEB and NABERS, reflecting that some energy reduction potential will already have been achieved by previous and existing policies.[99] However, it still reflects a substantial potential gain that is in-line with evidence from BEES, case studies and existing operational performance ratings.

168. For the **high ambition** and **low ambition** groups, we assume a narrower distribution than seen in NABERS in terms of the *size* of these groups. For the lowest performers, this is because we expect that where buildings increased energy-use under the NABERS scheme, this was likely driven by changing end-uses, which are out of scope of our modelling rather than reductions in performance.[100] Hence, we assume 20% of buildings will not achieve savings over and above the counterfactual. Similarly, we assume a smaller number of buildings achieve the highest savings, reflecting the shorter time we are considering for building response, as well as mitigating optimism bias.

169. These assumptions are important and based on judgement from a wide variety of evidence. Hence, they are subject to uncertainty and so are considered in the sensitivity analysis.

10.3.3 Onboarding Rate:

170. It is too early to provide finalised timings for the delivery of the ratings system, buildings being onboarded onto the scheme and the initial disclosure of ratings, as these all depend on the outcome of the consultation and on the scheme delivery partner.

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[97] We do not make quantitative assumptions about *which* buildings are captured in each category (for example, if they differ by size or tenure) as this is beyond what can be reasonably inferred from the evidence. Hence, we assume each group is a 'slice' of all buildings in scope.

[98] CIE (2019) Independent review of the Commercial Building Disclosure Program,

[99] These percentage are assumed to apply to the 2020/21 level of energy-use. See assumptions on the counterfactual for additional details.

[100] See section 10.3 on the counterfactual for additional details.

However, for the cost-benefit analysis it is necessary to make preliminary assumptions about these timings, though these are subject to change and we welcome views on timings through the consultation. These are set out in the table below.

Table 19: Summary of Building Onboarding Assumptions

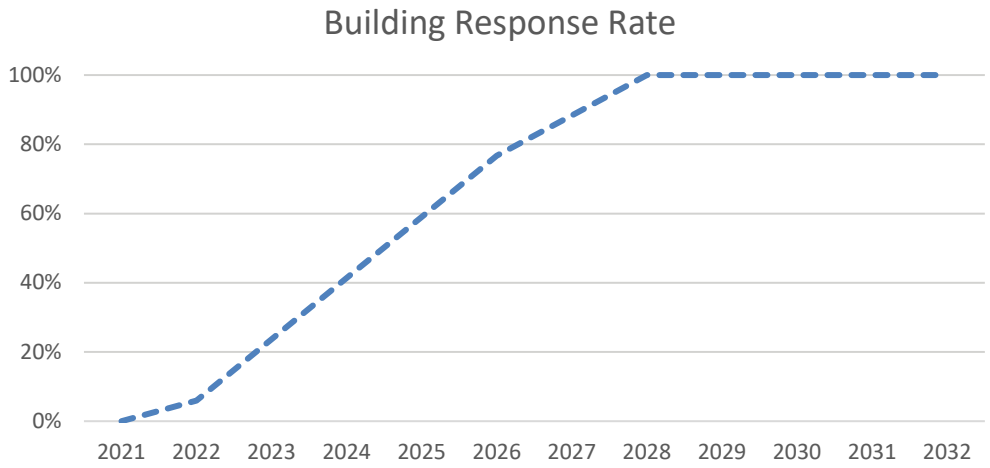
Year	Onboarding Share	Assumption
2021	0%	Scheme under development. While there may be some early responders, for this IA we assume no buildings respond to the policy until ratings are in place.
2022	25%	Ratings scheme piloted and ratings likely become available. A minority of buildings receive ratings before the 2023 deadline.
2023	75%	All remaining buildings are onboarded in 2023, using their past 12 months of data.
2024	0%	The first mandatory disclosure of ratings.

10.3.4 Policy Response Rate:

171. We also need to estimate the timeline over which our estimated energy savings will be achieved. As previously discussed, evidence from both REEB and NABERS suggests energy savings could continue for many years after the initial rating, with some building potentially exceeding the levels of energy reductions considered in this IA. In both cases, the level of energy savings consistent with this IA (15-20%) are generally achieved 5-6 years after the initial rating.[101]

172. For this impact assessment we assume energy savings are achieved linearly over the first 5-6 years of ratings, with those getting ratings earlier also achieving savings over the shorter time frame, reflecting their proactive engagement. This implies that 100% of those buildings *who we expect to comply,* will do so by 2028.

Figure 14: Building Response Rate Assumption



[101] REEB 2019 energy snapshot https://www.betterbuildingspartnership.co.uk/node/129 p. 7
NABERS 2017/18 annual report www.nabers.gov.au/file/686/download?token=cEbSODu1 p. 25

173. This also dictates the **appraisal period.** In this impact assessment, we use the period 2021-2038. This begins in the first year costs are incurred (scheme development costs begin in 2021) and runs to the final year in which action is undertaken under the scheme, plus 10 years, in line with Green Book Guidance.[102]

10.3.5 Rating of Rented Buildings

174. To estimate the proportion of large-office energy which is in scope of the scheme, we need to establish which buildings will use whole-building ratings, and which will use base building ratings.[103] This is because the base building rating does not cover all of the energy used in the building, as it does not include the energy attributable to tenants' activities. We established tenant energy use factors based on industry expert judgment, using BEES end use data, finding the most tenant intensive end uses were small power, lighting and ICT. We estimate the proportion of energy captured in a base building rating is **60%**.[104]

175. We assume that buildings will only act to reduce energy which is captured in their rating.[105]

176. Firstly, owner occupied buildings are all assumed to use whole-building ratings. **44%** of large office floor space is in owner-occupied buildings, with **56%** in rented buildings.[106] Within those rented buildings, if a building has a single occupant, we assume it will obtain a whole-building rating.[107]

177. Hence, we must establish what proportion have multiple occupants. To estimate this, we use VOA data from the NDNEED framework. VOA data contains data on hereditaments, which in general, are parts of a building used for a single common use, by a single occupant. A building with a single occupier and a single use will be one hereditament. We use buildings which are comprised of multiple hereditaments as a proxy for multiple occupancy.[108] Note we assume all of these multiple-occupancy buildings are in the rented sector.

178. We estimate the percentage of large offices with multiple hereditaments is **15%**. However, those with multiple hereditaments are larger than average, and so are expected to use a larger share of energy. Therefore, we use the share of floor area as a proxy for their share of energy use, and we estimate the percentage of *floor area* in large offices with multiple hereditaments is **20%**.[109] However, we expect this somewhat

[102] Our modelling assumes measures are re-installed at the point of expiry. This continues until the end of the appraisal window, at which point most measures part-way through their operational lifetime. Hence, to ensure we do not overestimate social costs by failing to include the full lifetime of benefits, the capital is prorated by lifetime assuming a linear amortisation, and rebated in the cost-benefit analysis. In short, if a measure is only 60% through its lifetime in 2038, then 40% of the capital value is rebated. Extending for 10 years beyond the final year of the policy response, allows us to capture the sustained time profile of benefits from energy and carbon savings. Then, using the capex pro-rating allows us to correctly account for any further outstanding capital value.

[103] See Figure 3 for details

[104] This implies 40% of energy is associated with tenant uses, which is consistent with NABERS which notes tenant energy use can account for around 50% of the total office building's energy use (https://www.nabers.gov.au/tenancy).

[105] This is a conservative assumption, one of the mechanisms through which the ratings work is raising salience. This could reasonably extend to energy used by tenants, even if their use is not included in the rating. However, we assume this energy savings potential would not be unlocked without the other mechanisms of the rating, such as providing information and disclosure.

[106] BEES (2016)

[107] This assumes that tenants renting the entire building are responsible for all of the buildings' energy-use. Some building owners may retain responsibility for some systems, for example heating/ventilation, However, we assume these are a minority of cases.

[108] See section 9 for details on this method and limitations. (The assumption that single occupants comprise single hereditaments comes from para 1 in section: Single and multiple hereditaments)

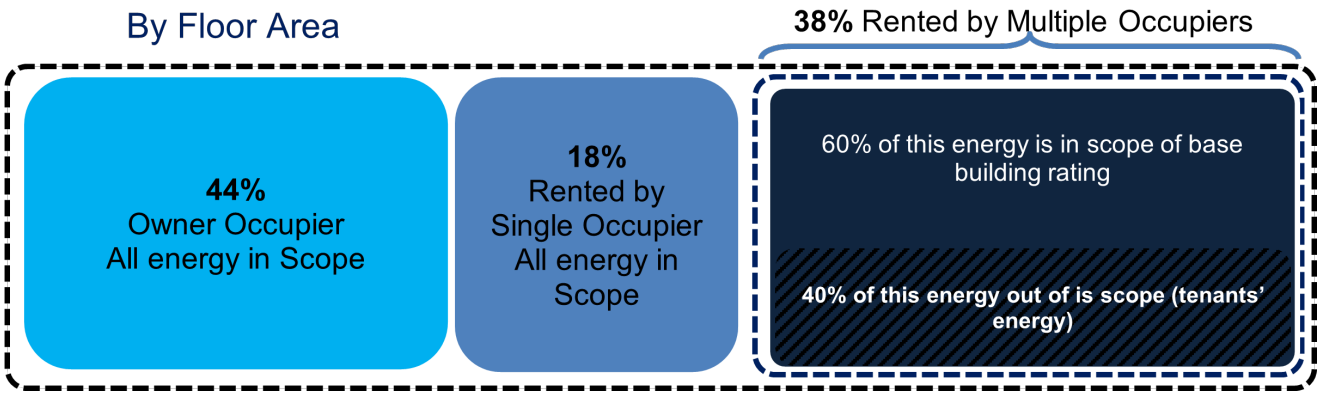
[109] BEIS analysis of NDNEED and BEES Data indicates the share of floor area is a good proxy for the share of energy use.

underestimates the share of multiple occupancy buildings.[110]

179. To arrive at a central value, we combine this estimate with an upper bound assumption that all large rented offices have multiple occupants (**56%** of floorspace)**.** We expect the true value is closer to the lower bound, however, to be conservative, we use the average, hence assuming **38%** of energy used in large offices is used in those with multiple hereditaments.

180. This implies **85%** of total large office energy use would be covered by the scheme (**73%** of rented buildings).

Figure 15: Summary of Multiple Occupancy Assumptions (by floor area)



10.3.6 Ratings Structure

181. Scheme costs cover the costs of **operating** the scheme, **familiarising** with the regulations and **complying** with them. It does not include the costs of **improving** buildings' ratings. There are 5 components of the scheme costs:
- Government administration
- Familiarisation
- Initial Ratings
- Update Ratings
- Full Rating (Update Rating + site assessment).

182. Under the proposed system, buildings would receive an **initial rating,** requiring operation data and a site assessment that lasts for 4 years. In the following three years, they **update** their rating yearly**,** requiring the most recent building operation data and confirmation/updates of basic building information, with the same quality standards imposed. After four years, when they next update they will require a **full rating,** which includes a new site assessment, which again lasts 4 years.[111] This is summarised in Figure 16. We expect initial ratings to have higher costs than full ratings, and updates to ratings to have lower costs, due to the lack of a site assessment.

Figure 16: Example of Ratings Schedule

Year	**1**	2	3	4	**5**	6	7	8	**9**
Rating	**Initial**	Update	Update	Update	**Full**	Update	Update	Update	**Full**
Site Assessment	**Yes**	No	No	No	**Yes**	No	No	No	**Yes**

[110] See section 9 for details on this method and limitations.

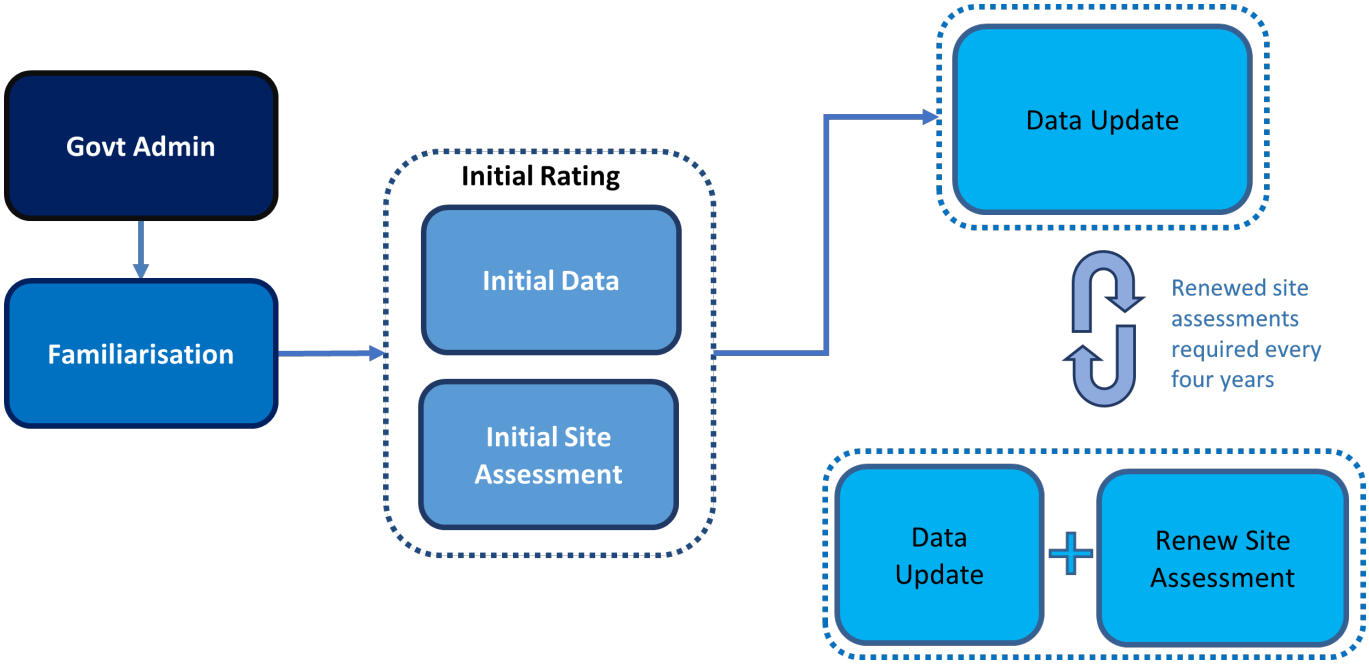
[111] Under certain circumstances, building will be required to renew their 'full' assessments after fewer than four years, for example, if substantive changes are made to the building. In this IA, estimated costs assume buildings undertake full ratings every 4 years.

183. In the cost-benefit analysis we use an estimate of the **average cost per building** associated with complying with the scheme. These costs are expected to differ for some subsections of the stock**,** such as for the largest buildings. However, since most buildings are clustered around 1000-5000m^2, using the average building cost is a reasonable simplification.[112]

184. Economies of scale could mitigate some of these costs. For example, where businesses own and operate portfolios of buildings, familiarisation of a few individuals may cover multiple buildings. Similarly, the costs of carrying out site assessments may fall if multiple buildings are covered together. However, these economies of scale are difficult to quantify. Hence, in our central assessments we make the conservative assumption that a distinct individual is required to familiarise for each building on the scheme, and that the full costs of producing a rating apply to each building.

10.3.7 Scheme Costs

Figure 17: Cost Structure



Government Administration Costs

185. These cover the additional headcount required in central government to establish, monitor and develop the scheme. It also covers the costs of training the initial pool of assessors[113]. Based on analysis of information from the ESOS evaluation[114] we assume a pool of around 1000 assessors would be sufficient for the competitive provision of ratings. For this impact assessment we assume the costs of delivering the training for these assessors is comparable to DEC training, so assume £1,000, which these costs incurred in 2021 and 2022 in the cost benefit analysis.

[112] Approximately 80% of *large offices* are under 3,800 m^2, 90% are under 6,400m^2. Offices over 10,000m^2 represent only 5% of all large offices. (BEIS analysis of ND-NEED Data, Coverage England and Wales)

[113] The training of assessors will not be carried out directly by government, but via the market, but are included in admin costs for simplicity. There is already an active market of DEC assessors and we expect this pool could form a basis for the pool of a performance-based framework assessors.

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

Familiarisation Costs

186. Familiarisation costs are captured using assumptions around **who** in an organisation needs to familiarise with regulations, and **how long that will take**. We assume the individual familiarising is a suitably qualified professional, such as an energy manager of relatively high experience, at a yearly salary of £50,000[115] and estimate familiarisation takes 3 (working) days. This includes the time taken to:
    - Read and understand the regulations, including what is required of the building and when.
    - Understand the rating system methodology, and what the ratings mean.
    - Understand how to carry-out and obtain a rating and demonstrate compliance.
    - Engage any other relevant decision-makers (e.g. finance, building owners, facilities managers)

187. These assumptions give a familiarisation cost (in *time*) of £600-700 per rating.

Rating Costs – NABERS Context

188. To contextualise the costs of delivering the ratings, it is useful to understand the costs associated with the NABERS scheme.[116]

Table 20: Summary of NABERS Compliance Costs

Cost Component	Description	AUSD ($)	Sterling (£)
Hassle	Time cost to businesses of gathering information, identifying an assessor.	1000	550
Producing Rating	Cost of obtaining a rating, from a provider in the market.	3300	1815
Processing Costs	The cost of lodging a rating with the ratings agency. [117]	1100	605
Total		**5400**	**2970**

189. These cover the full costs to buildings of undertaking a NABERS rating. While we expect the scope and delivery of performance-based ratings to be similar to NABERS, it will not be identical, so costs will differ. Key differences include:
    - Performance-based ratings would allow site assessments to cover multiple ratings, significantly reducing the cost of maintaining a valid rating over time, relative to NABERS.
    - NABERS has a mature market for producing ratings, hence costs may be lower than for a newly established scheme.
    - The performance-based rating is also expected to have larger coverage than NABERS potentially offering significant economies of scale, such as on costs

[115] Prospectus website: https://www.prospects.ac.uk/job-profiles/energy-manager. This is broadly comparable to a facilities manager, who may also be undertaking this process.

[116] CBD Review Draft Report (Sept 2019) p. 62 http://www.cbd.gov.au/overview-of-the-program/cbd-review/cbd-2019-program-review. Figures are originally in Australian Dollars, converted to sterling at 0.55/£.

[117] The latest NABERS admin cost schedule **for offices** is slightly different to this $1,100 figure:
- $1,219 for tenant ratings (all sizes) or for whole or base-building ratings (>2,000m^2)
- $610 for whole or base-building ratings (1,000-2,000m^2)

associated with I.T infrastructure and maintaining the ratings methodology, reducing processing costs.[118]

- NABERS is an established scheme, and hence processing costs may be lower than for a newly established performance-based rating.
- Other aspects of scheme delivery, such as procurement, quality assurance processes, enforcement, accreditation, and disclosure may also cause costs to differ.

Rating Costs – A Performance-Based Rating

Table 21: Summary of Compliance Cost Components

Cost Component	Description
Hassle	Time cost to businesses of gathering information, identifying an assessor, and interpreting the rating.
Producing Rating	Cost of obtaining a rating, from a provider in the market.
Processing Costs	The cost of delivering the scheme, on a per-rating basis. This includes fixed costs such as I.T infrastructure and maintaining the ratings methodology, as well as variable costs of processing the ratings such as quality assurance and enforcement.

190. In this IA we estimate cost ranges, using the middle value in our central scenario, and testing the range in the sensitivity analysis.

Table 22: Summary of Performance-based Rating Compliance Costs

Costs (£)	*NABERS*	Initial Rating	Full Rating	Update Rating
Hassle	*550*	1070 - 1980	380 - 710	150 - 280
Producing Ratings	*1815*	1270 - 2360	1270 - 2360	70 - 130
Processing Costs	*605*	420 - 790	420 - 790	210 - 390
Total (£ rounded)	***3000***	**2800-5100**	**2100-3900**	**450-800**

191. For both producing ratings and processing them, these estimates cover the cost of delivering the services, and are not estimates of the prices participants may pay. Prices will depend on the market for producing ratings and the delivery mechanism for the scheme. For example, the provision of partial-review ratings may be incorporated in these prices. Further, these include time/search costs to find a ratings provider but do not include tine/search costs due to firms identifying energy service providers to help interpret and improve ratings

192. Beginning with the **full rating:** this is expected to be the most comparable in cost to a NABERS Energy rating.
    - **Hassle costs** are estimated bottom-up, using NABERS as a guide. We estimate there would be 2-3 days of time per rating to identify a suitable ratings provider, gather data, assist with the site-assessment and interpret the new rating.[119]

[118] NABERS currently completes 1,700-1,800 office energy ratings per year, while we expect roughly 5x this number under a performance-based framework (Table 5). https://nabers.info/annual-report/2018-2019/office-energy/

[119] Uses the same assumptions as for familiarisation costs about who may undertake this work.

- The costs of **producing the rating** will be driven by the site-assessment costs and the overheads of the service providers. These are currently assumed to be comparable to NABERS, as until there is a market for performance-based ratings it is difficult to assess the cost structure. The range captures +/- 30% on this level.
- **Processing costs** are also difficult to assess until the delivery partner is identified. Our initial bottom-up calculations implied a lower level of cost to process the ratings than for NABERS, in part because of economies of scale, however in this impact assessment we make a conservative assumption and use the NABERS processing cost as our central estimate, with a +/- 30% range.

193. In comparison, the **Initial Rating** is expected to have higher costs.

- **Hassle costs** are assumed to be significantly higher. We estimated the time at approximately 3 times that of the full ratings.
- **The cost of producing the ratings** may vary. Evidence from the ESOS scheme suggests that prices of audits rose where there was concentrated activity around the compliance deadline.[120] However, this does not necessarily reflect higher costs to produce the ratings themselves, though it does raise important considerations for the deployment of the scheme. Hence, we assume the same costs and range as for the full ratings.
- **Processing Costs** are assumed to remain consistent.

194. Lastly, the **Update Costs** are expected to be substantively lower.

- **Hassle costs** are reduced, in particular identifying a provider is assumed to be faster (for many this could be the same provider as for the full rating).
- The costs of **producing the rating** are assumed to be very low, as it only requires updating energy-use data and confirming basic information about the building. These costs are assumed at £100, though these may be incorporated into the full (or initial) ratings.
- **Processing Costs** are expected to be lower for update ratings, as less information is required. We assume they are half that of a full rating.

Table 23: Overall cost (including hassle costs) for 4 years coverage (£ rounded)

NABERS (4 years total)	*£12,000*
A Performance-based framework (first 4 years total)	£4,100 - £7,500
A Performance-based framework (subsequent 4 years total)	£3,400 - £6,300

10.3.8 Voluntary vs Mandatory Uptake

195. Evidence from NABERS suggests that making the scheme mandatory was essential to achieve the highest possible energy savings. NABERS rating were made mandatory in 2010/11 and the size threshold was lowered from 2,000m^2 to 1,000m^2 in 2017/18.[121]

[120] Research on energy audits and reporting, including the Energy Savings Opportunity Scheme (ESOS), section 7.1, p. 71. https://www.gov.uk/government/publications/energy-savings-opportunity-scheme-esos-evaluation-of-the-scheme

[121] Figures primarily from Section 4 of the CIE (2019) Independent review of the Commercial Building Disclosure Program. http://www.cbd.gov.au/overview-of-the-program/cbd-review/cbd-2019-program-review

196. **Voluntary uptake captured a relatively small number of buildings.** Once the voluntary scheme was established (approximately 2004-2009) the average annual number of ratings was approximately 350, compared to approximately 1700 in 2017/18. Hence the voluntary volume was approximately 20% of the mandatory volume.

197. **However, these tended to be larger buildings.** Over 2000-2010, approximately 70% of new buildings that had received a NABERS rating were over 5000m^2 (particularly over 10,000m^2). This fell to around 20% by 2017-2019. However, in 2017/18 there was still an increase in the number of new ratings in larger buildings, but this was offset by the influx of 1,000m^2 to 2,000m^2 buildings. This is consistent with evidence from REEB.[122]

198. **Hence voluntary uptake could cover a relatively large portion of floor area.** Before it was made mandatory, NABERS coverage reached approx. 60% of Australian office's net lettable area, and evidence from the US suggests 40-50% of floor area can be rated voluntarily. [123][124]

199. **However, achieving this engagement takes time.** NABERS' voluntary engagement took over a decade to achieve. We expect voluntary engagement in the UK may be faster than this. Engagement on climate is deeper and more widespread than 20 years ago, particularly in the context of Net-Zero. Further, market-led projects like BREEAM and REEB, as well as the range of products offered by energy service providers, demonstrate a relatively high level of existing 'voluntary' engagement on operational performance.[125] However, it remains possible voluntary engagement could be low for many years.

200. Given the uncertainties around potential voluntary uptake, we estimate ranges for the proportion of buildings and energy captured by a voluntary scheme. In this IA, we do not try explicitly identify which buildings may partake voluntarily, and instead base the results on those for the 1,000m^2 mandatory uptake, but weighted to reflect the likely prevalence of larger buildings. [126] We estimate a low scenario where voluntary uptake captures 10% of large offices covering up to 20% of energy use, and a high scenario of 30% of large offices covering up to 50% of energy use. We assume scheme costs scale with the number of buildings, while the costs and benefits of energy improvements scale with their relative size.

10.4 Sensitivity Analysis Approach

201. **Energy and carbon price** ranges are used based on Green Book Supplementary Guidance.[127] These are applied to the valuation of energy savings and carbon.

202. **Capital, operational and installation costs**: the range reflects the uncertainty around the capital and installation costs in BEES. This uncertainly arises in part because BEES costs are approximations for different building types, so will vary from building to building. Further, our IA assumes buildings implement the most cost-effective package

[122] Section 4.

[123] Bannister et al (2016), Under the Hood of Energy Star and NABERS: Comparison of Commercial Buildings Benchmarking Programs and the Implications for Policy Makers

[124] Bannister (2012), NABERS: Lessons from 12 Years of Performance Based Ratings in Australia

[125] Bannister (2012) also identifies key factors behind NABERS' voluntary uptake as the base-building/tenancy split, government procurement standards, increased salience corporate sustainability among investors and a general shift of efficiency increasingly being considered a core business value. In general, these features/trends are reflected in the proposed scheme and England & Wales context.

[126] This implicitly assumes savings are achieved at the same rate as the mandatory case. It also assumes the cost-effectiveness of voluntary response is broadly reflective of the whole stock, despite coming from generally larger buildings. This is due to the limitations of the sample-size of larger offices in BEES.

[127] HMT Green Book Supplementary Guidance https://www.gov.uk/government/collections/the-green-book-supplementary-guidance

of measures based on the net private benefits. While we expect businesses will consider the cost-effectiveness of measures when responding, the way they do this in practice would affect the technologies chosen. For example, using a hurdle rate for the internal rate of return may lead to different technologies than a focus on maximising bill savings, or on minimising payback. Hence the costs of achieving a given level of energy savings may vary. Further, the methodology of the ratings is yet to be determined. Design aspects, such as whether the rating is passed on energy intensity, carbon intensity or an alternative metric, may also impact the technologies deployed.[128] As well as considering the range in Table 11, we also tested how much capital and installation costs would need to rise to turn the central NPV negative; finding they would need to be 70% higher.

203. **Scheme operating costs** (including compliance and familiarisation) contain multiple assumptions and it is not practical to vary these assumptions individually, however we expect ranges of +/- 20-30% are reasonable for the main cost components.[129] Hence, in the sensitivity analysis we use a relatively conservative assumption and consider a range of +/- 30% on total scheme costs (familiarisation, compliance and scheme operation). As well as considering this range, we also tested how much scheme operating costs would need to rise to turn the central NPV negative; finding they would need to be 185% higher (approximately 3x higher).

204. **Strength of Building Response** can be captured through two variables: the relative size of the 'ambition' groups, and the level of energy savings they target. The impacts of each are similar, so it is sufficient to consider one. We consider the level of energy savings targeted, as this also provides information about how social cost-effectiveness varies as we increase the savings in individual buildings. We produce two variants of the high scenario. One considers *just* the high ambition group achieving the maximum savings found in the evidence, at 40%. The other also includes the medium ambition group achieving a substantively higher level of savings, at 25%. We produce a single low scenario, in which energy savings targets are halved.

205. The strength of building response captures the uncertainty around a number of assumptions. Foremost is the strength of response to the key incentives of the scheme, driven by mandatory rating, benchmarking, information and public disclosure. However, it also captures the potential benefits to private buildings of comparability with the public sector and other factors influencing business engagement with energy, such as increasing consumer pressure to improve their climate impacts.

206. **Opportunity Cost Capital** depends not only on the level of capital expenditure, but also how long capital is diverted from other productive applications, and what the return on those are. These assumptions depend on both quantitative evidence and theory. Time to recover costs depends on the average payback on measure packages, which is 2-3 years in the modelling. The rate of foregone return on capital is varied between a high private rate (10%) and a lower social rate (3.5%).

10.5 Sensitivity Analysis Results

207. Table 24 summarises the full high and low sensitivity results. The results show a moderate negative NPV in the worst case, which is driven by a scenario with high costs of delivering ratings, which generate a relatively low impact on energy use, at high costs. Conversely, the high scenario shows a considerably larger NPV, driven by high levels of

[128] These alternatives are discussed in the Consultation.

[129] This is the range on the *average cost of the average building* complying with the scheme, not the range of costs experienced by all buildings. Referring to Figure 2, approximately 80% of *large offices* are under 3,800 m^2, 90% are under 6,400m^2.

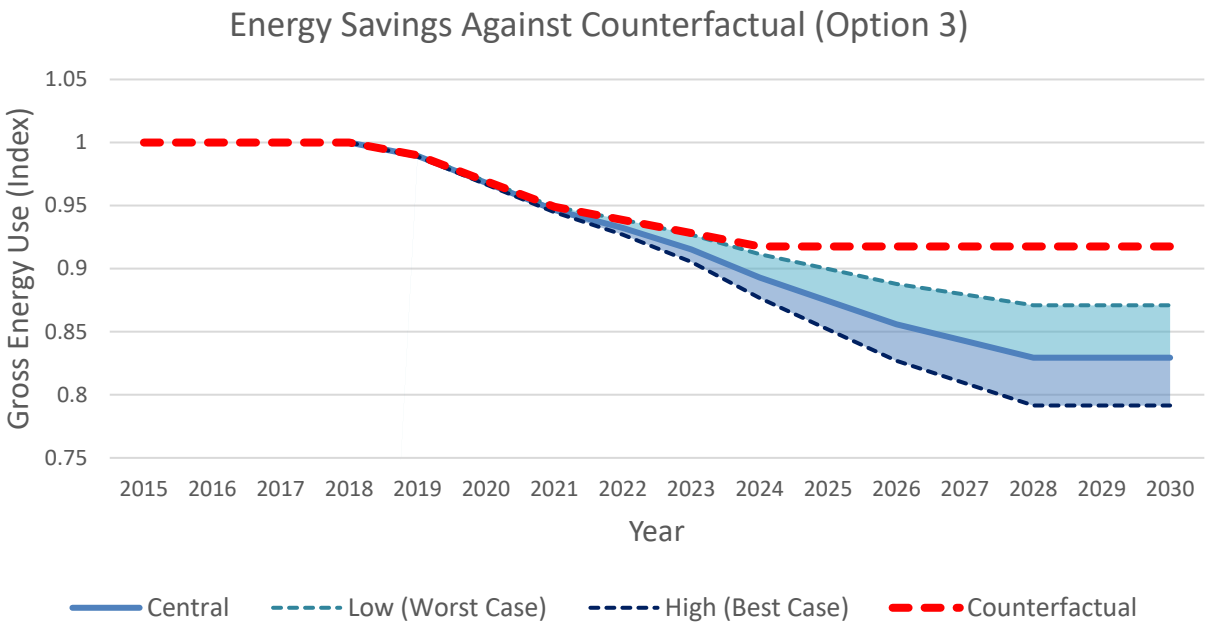
energy savings against relatively low costs of delivering ratings.

Table 24: Summary Sensitivity Results (Option 3)

	High	Central	Low
NPV (£m)	**930**	**310**	**-120**
BCR	2.2	1.5	0.7
CB5 NT Emissions Savings (Mt)	1.1	0.75	0.52
Energy Savings (2030) (TWh)	2.02	1.42	0.80
NT Lifetime Carbon Cost Effectiveness(£/T)	-227	-80	121

208. Figure 18 shows the impact on energy use in the high and low scenarios. We see that while the low scenario still implies a further reduction of around 7% on 2020 levels, this is not considerably higher than the counterfactual. Conversely, the high scenario reflects a significant improvement over time of over 20% on 2015 levels, or approximately 16% on 2020 levels.

Figure 18: Modelled Energy Impact



209. Figure 19 shows the impact of each individual sensitivity on NPV for the preferred option. Table 25 and Table 26 summarise the distribution of costs and benefits.

210. From Figure 19 we can see that the combined magnitude of the sensitivities (the high and low scenarios) is substantially larger than each individual sensitivity. This is expected, as the sensitivity dimensions generally reinforce each-other, such as higher capital costs combined with higher opportunity costs of capital. That said, not all sensitivities reinforce in all scenarios. For example, the lower ambition in the low scenario, which mitigates the impact of higher capital costs, as buildings undertake less investment. On the other hand, the benefits of higher ambition in the high scenario are

reinforced by the lower capital costs, as the additional effort can be achieved more cheaply.

211. From Table 25 and Table 26 we can see that the distribution of costs varies more across the sensitivities than the benefits. This is because the sensitivities tend to asymmetrically impact the costs, while the impact on benefits are all derived from the energy savings, which tend to maintain a similar distribution over fuels in the sensitivities. The biggest trend in the costs, which is exemplified by the full high and low scenarios, is that in the sensitivities associated with the high scenario, scheme costs make up a smaller share of costs against capital costs. Conversely, in the low scenario sensitivities, scheme costs make up a much larger proportion of costs, reaching as high as 50% of costs in the worst sensitivities. The key insight from this is that if the response to the scheme is weak, the costs of rating the buildings may not be offset by consummate gains from energy savings, so ensuring a strong, positive response is essential to deliver value money.

Figure 19: Summary of Individual Sensitivity Impact (all figures PV £m 2019)

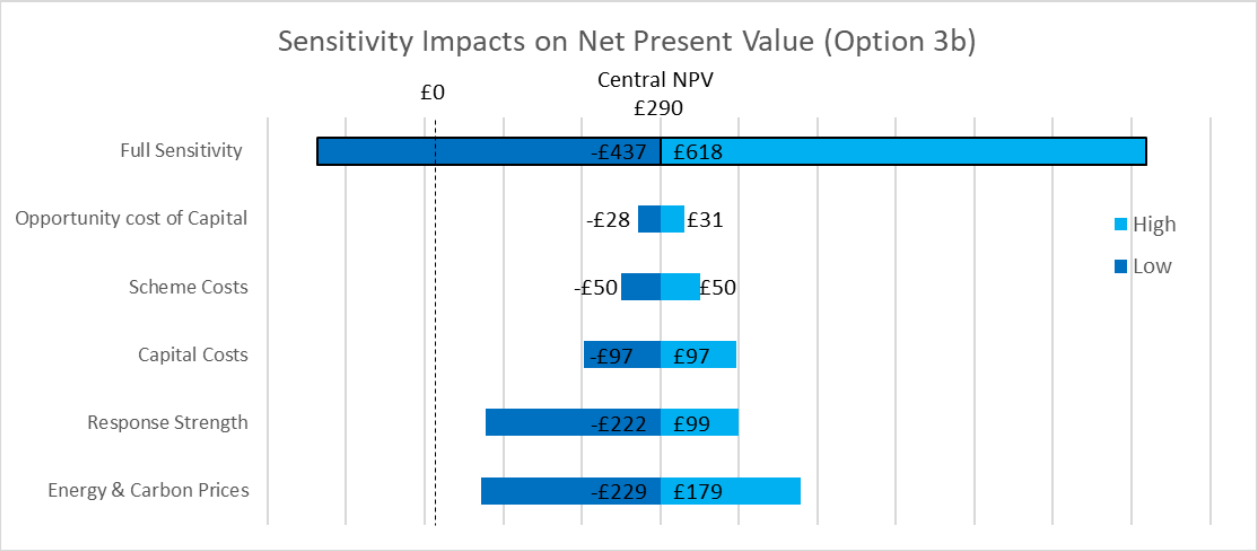


Table 25: Sensitivity Analysis - Cost Distribution

Costs	Capital and Installation	Operational	Scheme Costs and Familiarisation	Opportunity Cost of Capital
Central (option 3)	**58%**	**6%**	**28%**	**8%**
High	71%	9%	16%	4%
Low	39%	3%	49%	8%
Low OCC	63%	7%	27%	3%
High OCC	57%	6%	25%	12%
Low Scheme Costs	65%	7%	20%	9%
High Scheme Costs	55%	6%	31%	7%
High Capital Costs	62%	7%	22%	8%
Low Capital Costs	56%	6%	30%	7%
High Engagement (all)	67%	8%	16%	9%
High Engagement (top 10%)	61%	7%	24%	8%
Low Engagement	40%	4%	51%	5%
Low Fuel Price	61%	6%	25%	8%
High Fuel Price	59%	7%	27%	8%

Table 26: Sensitivity Analysis - Benefits Distribution

Benefits	Energy Savings	Value of non-traded emission savings	Value of traded emission savings	Value of air quality savings
Central (option 3)	**74%**	**15%**	**6%**	**6%**
High	70%	17%	8%	5%
Low	73%	16%	3%	8%
Low OCC	74%	15%	6%	6%
High OCC	74%	15%	6%	6%
Low Scheme Costs	74%	15%	6%	6%
High Scheme Costs	74%	15%	6%	6%
High Capital Costs	74%	15%	6%	6%
Low Capital Costs	74%	15%	6%	6%
High Engagement (all)	75%	14%	6%	6%
High Engagement (top 10%)	74%	15%	6%	6%
Low Engagement	67%	24%	4%	6%
Low Prices	79%	10%	4%	7%
High Prices	69%	19%	7%	5%

11 Annex 3: Policy Delivery and Implementation

11.1 Legislative requirements

212. The performance-based framework will require primary legislation to become a mandatory requirement. There will also be some features of the scheme that will need to be set out either in secondary legislation, guidance, or scheme rules. This is covered in further detail in the Consultation document.

11.2 Delivery

213. **A delivery partner will be required** to operate and maintain this scheme based on the agreed design of the scheme following consultation. We expect to begin the initial commercial process of engaging with the market after the consultation, with a view to tendering in Q3/Q4 2021 should the scheme progress. A pilot phase is planned, and expected to run from 2022.

214. Our proposal on the Government's role in the scheme is that Government ownership and intervention should be targeted only where Government involvement is essential. We consider this to be managing the scheme administrator, engaging closely and continuously with the industry, and providing the right incentives to improve ratings (and therefore actual building performance) over time. We recommend that the market drives building improvements, with buildings owners using industry experts to generate tailored recommendations. We consider this approach more likely to deliver the right interventions for each building, and to optimise energy reductions.

11.3 Performance-based framework and PRS

215. The consultation also covers a proposal that aims to consolidate the non-domestic PRS requirements (EPC B by 2030) with this scheme. Under this option, where a rented building is onboarded, their current EPC will be used to determine a set of measures that they will be required to install by 2030. This will simplify their compliance requirements, reduce costs, and still meet their original EPC B requirements as they will be required to install the identified cost-effective measures.[130]

216. This means that qualitatively, we expect the impact of the performance-based framework on large offices to produce higher energy savings and be more cost-effective, as it directly incentivises improvements in performance, as well as a comparable standard of fabric. We have also considered the potential impact of removing all large buildings from the PRS MEES framework, and this is presented in the technical annex to the PRS package.

217. However, we have not provided quantitative assessments of the impact of removing large offices *specifically,* as this requires us to estimate the impact of the PRS regs on an extremely small subset of the population. There are a number of analytical challenges with assessing the impact this may have:

- The analyses cover different portions of the stock. Performance-based framework includes both rented and owner-occupied large offices, while PRS only includes

[130] The modelling approach for this is discussed in section 10

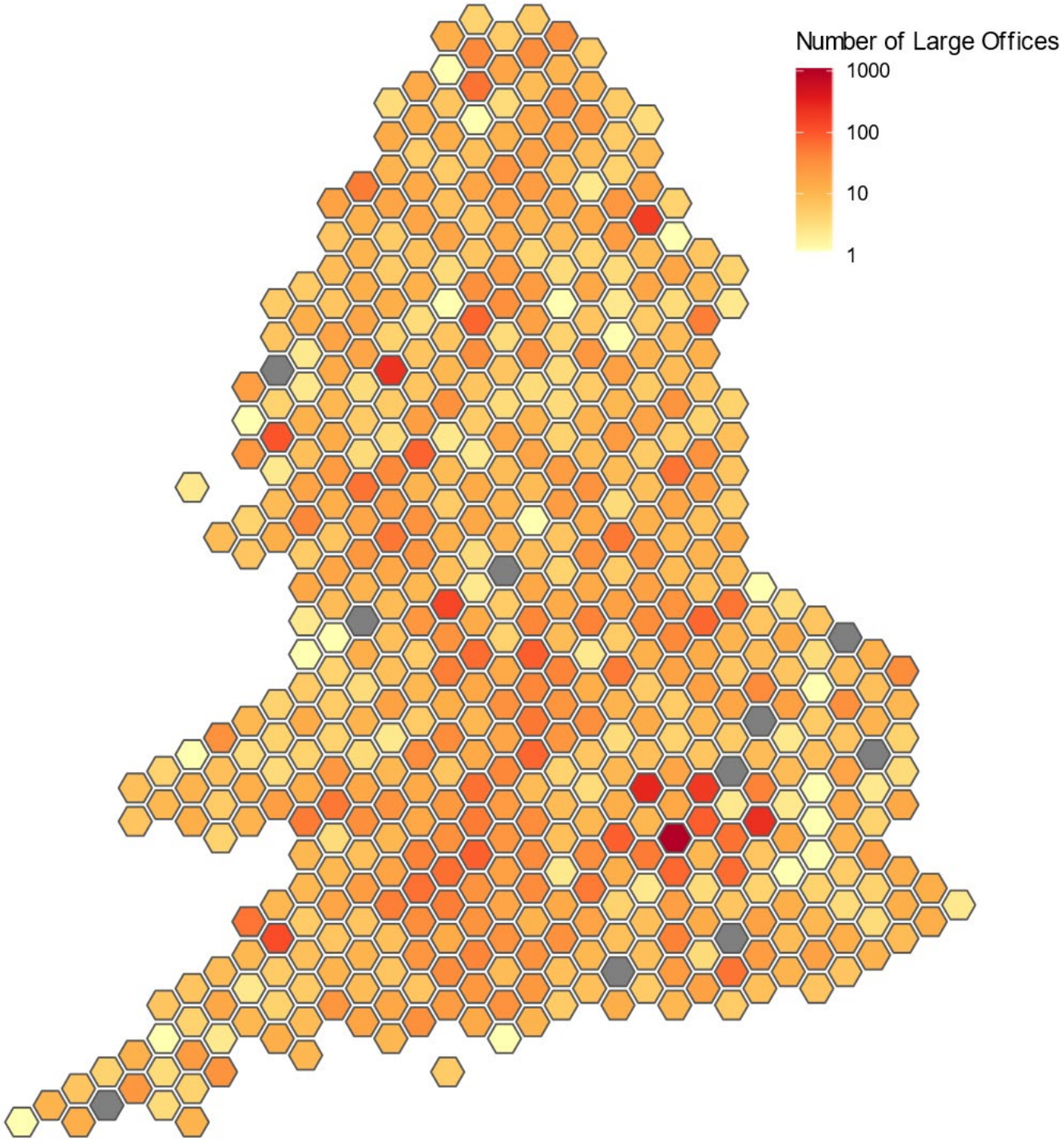
rented buildings, but from all sizes and sectors. We do not have a sufficiently large subsample of large, privately owned, rented offices with available EPC data for the modelling approach of the PRS-regulations to be applied robustly to this subset of the stock in isolation.

- Additionally, as discussed throughout this IA, a drawback of the EPC, and hence an EPC-based minimum standard, is that the EPC band is not a strong indicator of energy performance for large non-domestic offices. Hence, although modelling may attribute relatively high energy savings to EPC-B consistent measures, the limitations of the EPC metric mean there is some risk around the extent to which those energy savings would achieved in practice.
- Further, there are many differences in the modelling approaches between the two schemes. In particular, the counterfactuals are very different. The PRS counterfactual applies to the entire non-domestic private rented sector, and assumes lower energy savings overall than we have assumed for the performance-based framework, based on the evidence set out in section 10.3. Other differences include the modelling of the replacement of existing fossil-fuel heating systems, higher compliance assumptions in PRS, and more conservative cost assumptions in the performance-based framework.

218. Hence, it was not possible to provide robust, directly comparable figures such as the NPV, net energy savings and CB5 carbon impacts associated with large rented offices under PRS. However, as discussed, the design of the performance-based framework, and our broader understanding of the evidence on EPCs provides a strong basis for believing that performance-based ratings will provide a more effective framework for improving the performance of large rented offices.

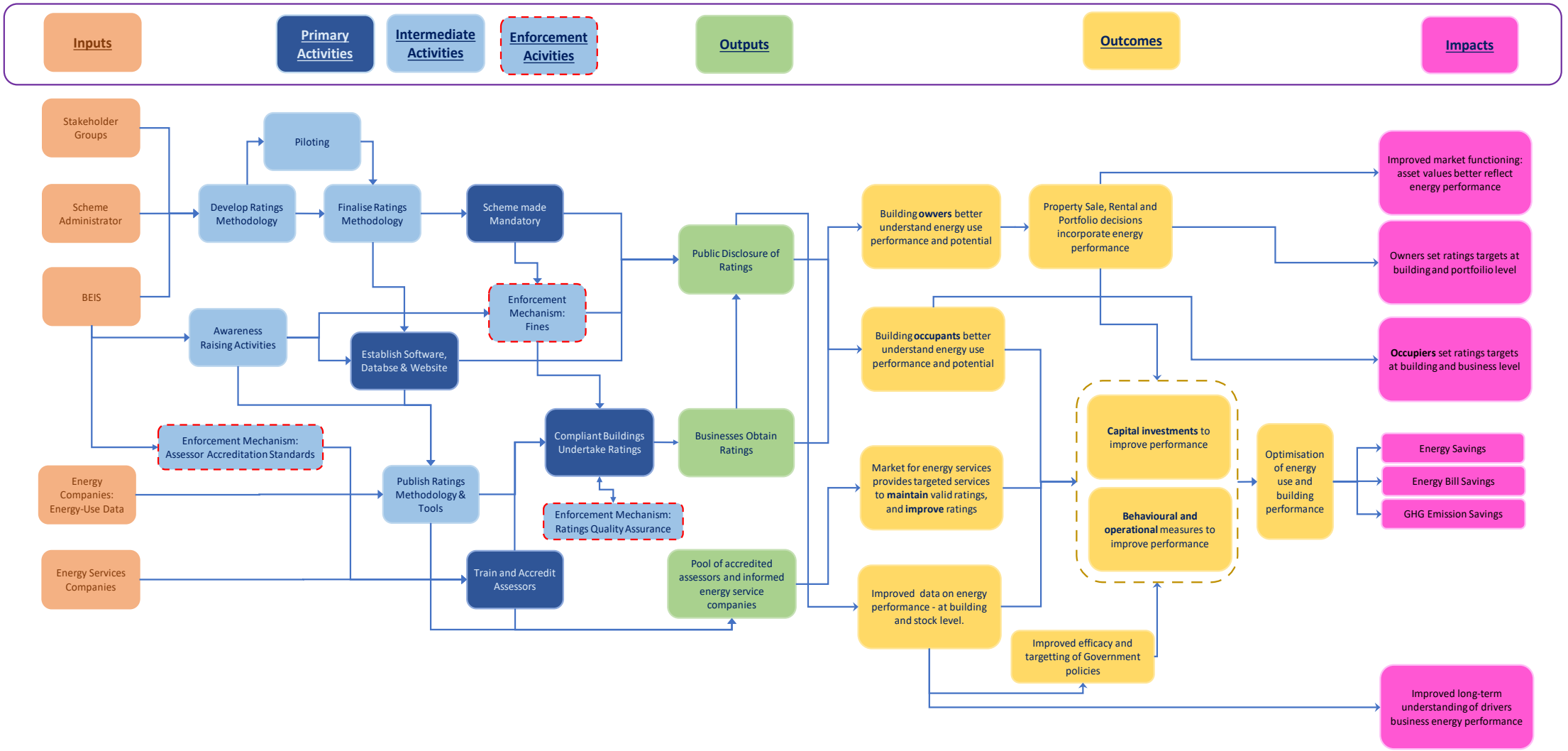
12 Annex 4: Geographic Distribution[131]

Figure 20: Heat Map of Large Offices by Number
Grouped by Westminster Parliamentary Constituency



[131] NB- a small number of regions with no large offices are rendered in grey. Data from BEIS analysis of ND-NEED Data. Shapefile from https://www.arcgis.com/home/item.html?id=15baaa6fecd54aa4b7250780b6534682. Hex map shows constituencies as equal area hexagons.

13 Annex 5: Logic Map



Input and Activities Assumptions

219. For ratings from energy suppliers can be obtained and appropriately assigned to buildings (base building use and tenant use metering)

220. Market for energy services engages in understanding the metric, and proactively training assessors.

221. Enforcement through fines requires accurate data on which buildings should be rated, and must be effectively carried out to ensure rapid, high compliance.

222. Enforcement supported through quality assurance and assessor accreditation standards requires a robust centralised method to determine if ratings and accreditation have been carried out appropriately.

Input to Outputs Assumptions

223. To deliver ratings, there needs to be a sufficient pool of appropriately accredited assessors to ensure competitive prices for undertaking ratings from day one. This requires early engagement from the market for energy services, and sufficient time between the development of the rating and the deadline for onboarding.

224. For businesses to obtain ratings, there also needs to be and effectively administered fines to ensure high compliance.

225. Impactful public disclosure requires that I.T. Infrastructure makes ratings easy to find and understand.

Outputs to Outcomes Assumptions

226. For building owners and occupiers to better understand their energy-use, the coverage and data-quality from the scheme must be sufficient to provide a clear understanding of relative performance (against other buildings) and absolute performance against Net Zero consistent operational performance.

227. Building owners and occupiers must actively engage with the metric, understand its interpretation, and take positive action to improve ratings. This requires that public disclosure, and the nature of benchmarking are sufficient to give the rating salience for senior decision-makers in companies, as well as building operators.

228. Private sector engagement must be sufficient that energy service companies can competitively offer products to maintain rating compliance and deliver sustained improvements in ratings.

229. The information provided by the scheme should also improve understanding of the efficacy of measures, by providing buildings with a clearer signal of how their performance is impacted by measures.

Outputs to Outcomes Assumptions

230. For asset values to better incorporate building performance, disclosure and benchmarking must allow for widespread understanding of the relative performance of buildings, and senior engagement must extend beyond current occupiers to investors.

231. For credible and impactful targets to be set based on the rating, the rating must be perceived as a high-quality indicator of performance, requiring strong quality assurance and industry buy-in to the methodology.

232. For the changes incentivised through the scheme to deliver substantive energy savings, the rating must successfully reward meaningful improvements in performance, punish reductions in performance and be robust to 'gaming'. It must also provide a consistent signal over time to ensure those improvements are maintained over time.

14 Annex 6: Evaluation Plan

233. This section sets out the initial considerations for an evaluation of the scheme. The evaluation will aim to assess the effectiveness and response to the early stages of the scheme, including assessing the pilot of the ratings system as well as the processes, outcomes and impacts of the main scheme. The findings would be used to support a post-implementation review of the scheme (timings will depend on the results of the consultation). It is expected to address the following high-level evaluation questions.

234. High-level evaluation questions:

- **What are the outcomes and impacts of the scheme?**
    - To what extent (in which ways and in which contexts) have ratings been effective in delivering energy efficiency savings across non-domestic buildings?
    - To what extent (in which ways and in which contexts) have ratings influenced organisational energy efficiency policy and practice and the market for non-domestic rentals?
- **What is the overall cost-effectiveness of the scheme?**
- **How effective and efficient has the delivery of the scheme been?**
- **What is the wider learning from the evaluation?**
    - What can we learn for any potential future iterations of performance-based ratings?
    - What is the wider learning for energy efficiency policy in the non-domestic sector?

Table 27: Evaluation timings and outputs

Evaluation Stage	Timings	Aims	Main research methods
Evaluation Stage 1 (early insight, scoping and impact feasibility)	Based on a pilot commencing in 2022. Length, timing and nature of pilot will be agreed with the scheme administrator.	Insight from pilot of rating Scoping for next stages of evaluation Feasibility study on impact methodology	Qualitative research Development of theory of change / workshops Quasi-experimental methods
<u>Main evaluation</u> Evaluation Stage 2 (process evaluation)	Evaluation of Phase 1 – covering rollout to office sector.	To understand implementation of scheme and compliance costs (via research with all key stakeholder groups). Provides evidence for future tranches of the policy	Baseline survey research Qualitative research
<u>Main evaluation</u> Stage 3 (impact evaluation)	Evaluation for PIR expected to commence approximately two years before PIR deadline. (PIR timings will depend on the results of the consultation)	Provides evidence for PIR on costs, benefits and impacts. Assesses additionality and extent outcomes can be attributed to the policy	Follow-up survey research Additional qualitative research Cost-benefit analysis Quasi-experimental analysis

235. **Costs and resources:** The evaluation is expected to cost up to £400,000 and across all phases it will run for around four years.[132] This will require social researcher expertise plus the input of economist and policy staff across the evaluation. An evaluation of this size would usually require 1 x GSR SEO and 0.5 GSR G7.

236. **Potential methodologies:** The exact nature of the main evaluation will be determined during phase 1 (scoping). However, the key methodologies and approaches that are expected to be used across the evaluation include:

- Theory-based approach - to address questions about whether the intervention caused an impact, how and why it occurred, how context (e.g. external factors) may have influenced outcomes and help understand to what extent results are generalizable. Although this approach would allow attribution of causality, this approach by itself would not allow the scale of the effects to be determined.
- Quasi-experimental analysis (QEA) – this analysis could in combination allow the estimation of the energy savings benefits of the scheme to support a cost-effectiveness assessment of the scheme. However, since the proposed scheme will be applied universally across a single population (large offices) this lacks a natural comparison group to form a counterfactual. There will need to be a feasibility study to assess whether comparison groups can be constructed with sufficient data availability to conduct a QEA.
- Surveys of participants/ assessors – to allow the collection of sufficient data to compare subgroups of the office population and understand the response to the scheme.
- Qualitative research with key stakeholders especially assessors, building owners and scheme participants – to understand in-depth how they have responded and why.

237. In addition, a Realist Evaluation approach could be used to aid in attribution of the policy. The scheme is likely to apply across the whole of the large office population. This means that there will be reduced opportunity to create suitable counterfactual or control groups to estimate the additionality of the scheme. In this analytical situation, realist evaluation can support the understanding of what elements of the policy do and do not work in achieving its intended objectives, for whom and under what circumstances.

238. **Data and Methodological considerations to date:** The provision of ratings will provide a considerable amount of key monitoring data, though the exact details depend on the final design of the ratings methodology. Key data is likely to include:

- Annual energy use by fuels
- Floor area
- Occupancy level
- Operational hours
- Energy/heating system information
- Tenure (rented) and Occupancy (multiple occupancy)
- Public private ownership & occupancy
- Region (geography)
- Sector, age, end-uses, on-site renewables, flexible energy-use provisions

[132] The central NPV associated with phase 1 of the scheme is approx. £310m, making the evaluation costs only approx. 1% of the net value, which is broadly proportionate. The evaluation will likely also lay foundations for evaluation of later phases of the scheme, providing considerable additional benefits.

239. **Other data sources** that are available and expected to be used in the evaluation include:
    - Non-Domestic Energy Performance Certificates (EPCs)
    - Display Energy Certificates (DECs)
    - Non-domestic National Energy Efficiency Framework database (ND-NEED)