Department for Levelling Up,
Housing & Communities

The Future Buildings Standard

2023 consultation on the energy efficiency requirements of the Building Regulations affecting New Non-Domestic Buildings

Consultation-Stage Impact Assessment

Signed by the responsible minister: Michael Gove **Date**: 6 December 2023

Title: 2025 changes to the energy efficiency requirements of the Building Regulations for new non-domestic buildings, 'The Future Buildings Standard' **IA No:** **RPC Reference No:** n/a **Lead department or agency:** The Department for Levelling Up, Housing and Communities (DLUHC) **Other departments or agencies:** The Health and Safety Executive (HSE)	Impact Assessment (IA) **Date: 13 December 2023** **Stage:** Consultation **Source of intervention:** Domestic **Type of measure:** Secondary legislation **Contact for enquiries:** FutureHomesandBuildingsStandards@levellingup.gov.uk

Summary: Intervention and Options

RPC Opinion: n/a

Cost of Preferred (or more likely) Option (in 2019 prices, 2020 present value)			
Total Net Present Social Value	**Business Net Present Value**	**Net cost to business per year**	**Business Impact Target Status**
£625m	£-1,056m	£110.6m	n/a

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

The UK's non-domestic buildings are currently largely heated by fossil fuel systems. The carbon emissions that result contribute to the greenhouse gas concentrations in the atmosphere, heating the planet. Decarbonising the UK's buildings will help to mitigate the UK's contribution to climate change and support government in meeting its legally binding target to achieve net zero emissions by 2050. Market failures including negative externalities mean that the problem will not be addressed without government intervention. The Building Regulations 2010 ("the Building Regulations") represent a proven method for overcoming these market failures.

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

The objectives of the policy are as follows. (i) Reduce the carbon dioxide emissions of new non-domestic buildings in line with government commitments to decarbonise by 2050. (ii) Transition away from the use of fossil fuels for heat and power by ensuring new buildings are "net zero ready". In other words, because they use electric or other renewable energy sources, no work will be necessary to allow these buildings to achieve zero carbon emissions when the electricity grid is fully decarbonised. (iii) Ensure that new buildings are high-quality and affordable, protecting occupants from high bills. (iv) Ensure that interventions to improve energy performance are cost-effective, affordable, practical and safe.

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

The 'Do nothing' option is to maintain the energy efficiency requirements of the Building Regulations as set in 2021. The proportion of new buildings constructed with carbon-free heating systems would continue to increase. However, many new buildings would continue to be built with fossil fuel heating systems into the late 2020s, 2030s, and beyond. Given the long lifetime of buildings, this option would make the Government's Net Zero target only possible with expensive widespread retrofit. Both the policy options considered involve uplifting the performance requirements for new non-domestic buildings in the building regulations. The proposed performance requirements include notional buildings with electric heating systems and more minor updates. The difference between the two policy options is that Option 1 also increases the coverage of solar photovoltaics of the notional buildings. This addition offsets the bill increases that result from the electrification of the heating systems. Our analysis found this benefit worth the capital costs.

Will the policy be reviewed? TBC. **If applicable, set review date:** 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)		**Traded:** 0.2	**Non-traded:** 14.5	

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: Michael Gove **Date**: 6 December 2023

Summary: Analysis & Evidence — Preferred Option (Option 1)

Description: Uplift to the energy efficiency requirements of the Building Regulations that improves the energy efficiency of new non-domestic buildings and delivers zero-carbon-ready buildings. This option increases the solar PV coverage in the notional building specifications. All figures are net present values over ten years of policy and a subsequent sixty-year building lifetime. All monetary figures in the text boxes are rounded to the nearest £10 million.

FULL ECONOMIC ASSESSMENT

Price Base Year 2022	PV Base Year 2025	Time Period Years 70	Net Benefit (Present Value (PV)) (£m)		
			Low: 663	**High:** 994	**Best Estimate: 829**

COSTS (£m)	**Total Transition** (Constant Price)	Years	**Average Annual** (excl. Transition) (Constant Price)	**Total Cost** (Present Value)
Low	8.6	1		**1,887**
High	12.9			**2,831**
Best Estimate	10.8			**2,359**

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

We estimate £2,350 million of increased capital, maintenance and replacement costs for new non-domestic buildings. Industry will also experience £10 million of familiarisation costs. Developers will incur both sets of costs, but may pass them on to building occupiers in the form of higher purchase costs or rents. These building occupiers will include local and national government in the case of public buildings. Over the longer term, development costs may become factored into land prices, and therefore passed onto landowners.

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

These changes may have a small impact on the demand and supply of new buildings. However, this effect is not expected to be substantial, so has not been monetised. The analysis has not monetised any increases in costs from reinforcing the electricity grid. Our analysis will consider these effects for the final Impact Assessment.

BENEFITS (£m)	**Total Transition** (Constant Price)	Years	**Average Annual** (excl. Transition) (Constant Price)	**Total Benefit** (Present Value)
Low	0.0	n/a		**2,550**
High	0.0			**3,825**
Best Estimate	0.0			**3,188**

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

We anticipate energy savings worth £930 million as a result of the energy performance improvements. These benefits will accrue to the building owners or occupants, but may be passed on to developers if occupiers are prepared to pay more for new buildings as a result. We anticipate carbon mitigation benefits worth £2,210 million and air quality improvements worth £50 million. These benefits will accrue to society at large, as everyone suffers less of the health impacts and other impacts of climate change and air pollution.

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

We expect the policy to facilitate further decarbonisation in addition to what is captured by the quantitative analysis. The added demand for low-carbon technologies will help bring down their costs over time and encourage innovation. There may also be network effects, for example if heat pumps are able to join fifth-generation heat networks. The benefits of this additional decarbonisation will accrue to society at large.

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

Consultants provided per-building estimates of the capital, maintenance and replacement costs, energy use, and carbon emissions. There is significant uncertainty in many of the assumptions used to scale up these per-building results. The floorspace projections and counterfactual assumptions for warehousing are particularly uncertain. The analysis assumes that developers would replace gas systems with gas under the counterfactual, but a sensitivity analysis explores the effect of varying this assumption.

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m, 2019 prices and 2020 PV: (Rounded numbers may not sum to rounded totals.)			**Score for Business Impact Target (qualifying provisions only) £m:**
Costs: 120	**Benefits:** 10	**Net:** -111	n/a

Summary: Analysis & Evidence Option 2

Description: Uplift to the energy efficiency requirements of the Building Regulations that improves the energy efficiency of new non-domestic buildings and delivers zero-carbon-ready buildings. This option leaves unchanged the solar PV coverage in the notional building specifications. All figures are net present values over ten years of policy and a subsequent sixty-year building lifetime. All monetary figures in the text boxes are rounded to the nearest £10 million.

FULL ECONOMIC ASSESSMENT

Price Base Year 2022	PV Base Year 2025	Time Period Years 70	Net Benefit (Present Value (PV)) (£m)		
			Low: (239)	**High:** (159)	**Best Estimate: (199)**

COSTS (£m)	**Total Transition** (Constant Price)	Years	**Average Annual** (excl. Transition) (Constant Price)	**Total Cost** (Present Value)
Low	8.6	1		**1,011**
High	12.9			**1,516**
Best Estimate	10.8			**1,264**

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

We estimate £1,250 million of increased capital, maintenance and replacement costs for new non-domestic buildings. Industry will also experience £10 million of familiarisation costs. Developers will incur both sets of costs but may pass them on to building occupiers in the form of higher purchase costs or rents. These building occupiers will include local and national government in the case of public buildings. Over the longer term, development costs may become factored into land prices, and therefore passed onto landowners.

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

These changes may have a small impact on the demand and supply of new buildings. However, this effect is not expected to be substantial, so has not been monetised. The analysis has not monetised any increases in costs from reinforcing the electricity grid. Our analysis will consider these effects for the final Impact Assessment.

BENEFITS (£m)	**Total Transition** (Constant Price)	Years	**Average Annual** (excl. Transition) (Constant Price)	**Total Benefit** (Present Value)
Low	0.0	n/a		**852**
High	0.0			**1,277**
Best Estimate	0.0			**1,065**

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

We anticipate negative energy savings (i.e. energy cost increases) worth -£1,040 million from the move to electric heating systems. These disbenefits will accrue to building owners or occupants, but may be passed on to developers if occupiers are prepared to pay less for new buildings. We anticipate carbon mitigation benefits worth £2,060 million and air quality improvements worth £40 million. These benefits will accrue to society at large, as everyone suffers the health impacts and other harms of climate change and air pollution.

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

We expect the policy to facilitate further decarbonisation in addition to what is captured by the quantitative analysis. The added demand for low-carbon technologies will help bring down their costs over time and encourage innovation. There may also be network effects, for example if heat pumps are able to join fifth-generation heat networks. The benefits of this additional decarbonisation will accrue to society at large.

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

Consultants provided per-building estimates of the capital, maintenance and replacement costs, energy use, and carbon emissions. There is significant uncertainty in many of the assumptions used to scale up these per-building results. The floorspace projections and counterfactual assumptions for warehousing are particularly uncertain. The analysis assumes that building occupiers would replace gas systems with gas, but a sensitivity analysis explores the effect of varying this assumption.

BUSINESS ASSESSMENT (Option 2)

Direct impact on business (Equivalent Annual) £m, 2019 prices and 2020 PV:			**Score for Business Impact Target (qualifying provisions only) £m:**
Costs: 54	**Benefits:** 20	**Net:** -74	n/a

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1. Introduction

Background and scope of the proposal

1.1. This Impact Assessment accompanies a consultation on changes which are to be made to the energy efficiency requirements of the Building Regulations, the calculation of energy efficiency target rates and the accompanying Approved Document guidance. The consultation sets out proposals relating to both dwellings and non-domestic buildings. This Impact Assessment focuses on the proposals for non-domestic buildings. DLUHC has published a separate Impact Assessment focusing on the proposals for domestic buildings.

1.2. Specifically, and as defined in the legislation, the energy efficiency requirements for non-domestic buildings means the requirements of regulations 23, 25A, 25B, 26, 26A, 26C, 28, 40, and 43 of and Part L of Schedule 1 to of the Building Regulations 2010[1].

1.3. The Building Regulations are a devolved matter and the changes in this Impact Assessment apply to England only.

1.4. The analysis which underpins this Impact Assessment focuses on the costs and benefits associated with improving the energy efficiency of non-domestic buildings at the point of construction. As such, the proposed policies will have an impact on the construction industry, manufacturers of construction products, and the building owners and occupants.

1.5. Enforcement of the Building Regulations is undertaken via the building control process.

1.6. The proposed policy changes are set out in the Government's consultation document *The Future Homes and Buildings Standards: Consultation on Changes to Part L (Conservation of Fuel and Power)*. The consultation considers two options to uplift the current energy efficiency standards for new non-domestic buildings. This Impact Assessment present both options.

[1] The Building Regulations 2010, https://www.legislation.gov.uk/uksi/2010/2214/contents/made

2. Problem Under Consideration

2.1. In June 2019 the UK became the first major economy to legislate for net zero greenhouse gas emissions, a target the Government committed to meeting by 2050. In addition to this commitment to reach Net Zero the UK has interim targets, which are set out in the Carbon Budgets and Net Zero Strategy.[2] In 2021 the Government laid legislation for Carbon Budget 6, which will require a 78% reduction in emissions by 2035, relative to 1990 levels.

2.2. Non-domestic buildings account for 9% of total UK emissions.[3] Carbon emissions have high social costs such as more frequent extreme weather, flooding, high temperatures, water shortages and loss of ecosystems. Buildings remain the second largest carbon emitter behind transport, with the Government's Net Zero Strategy indicating that in order to meet Carbon Budget 6 targets, buildings would need to reduce their emissions by more than half by 2035.[4] Switching to low-carbon sources of heat in new non-domestic buildings therefore represents a significant opportunity to reduce carbon emissions and support the achievement of the Government's targets. Additional solar photovoltaic (PV) coverage can support these changes whilst reducing energy costs for building occupiers.

2.3. The Heat and Buildings Strategy[5] sets out the immediate actions and long-term signals proposed to reduce emissions from buildings. It recognises the need to do more to decarbonise the building stock by making buildings more energy efficient and by installing low-carbon heating systems. The strategy sets out a commitment to increase standards for new-builds in the 2020s to ensure they are ready for Net Zero, including through the Future Buildings Standard from 2025.

2.4. The Future Buildings Standard is intended to build on the 2021 Part L uplift, setting higher energy efficiency targets for new non-domestic buildings and acting as a key component of the UK Government's efforts to meet its Net Zero targets. Introducing the Future Buildings Standard will mean that the buildings constructed in the coming years will be fit for the future and better for the environment, typically with low-carbon heating, on-site renewable energy generation, and high fabric standards. Buildings constructed to the Future Buildings Standard will be zero-carbon ready, meaning they will decarbonise over time alongside the national grid without any further retrofit work.

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[2] Department for Energy Security and Net Zero and Department for Business, Energy and Industrial Strategy (2021), Net Zero Strategy: Build Back Greener, https://www.gov.uk/government/publications/net-zero-strategy

[3] Department for Business, Energy & Industrial Strategy (2023), 2021 UK Greenhouse Gas Emissions, Final Figures - Data Tables, https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2021
The end user categories "Commercial and miscellaneous combustion and electricity", "Public sector combustion", and "Public sector electricity" collectively account for circa 9% of the UK's territorial greenhouse gas emissions.

[4] Department for Energy Security and Net Zero and Department for Business, Energy and Industrial Strategy (2021), Net Zero Strategy: Build Back Greener, https://www.gov.uk/government/publications/net-zero-strategy

[5] Department for Energy Security and Net Zero and Department for Business, Energy and Industrial Strategy (2021), Heat and Buildings Strategy, https://www.gov.uk/government/publications/heat-and-buildings-strategy

3. Rationale for intervention

3.1. The Building Regulations should be used to support the Government's decarbonisation targets only where market failures mean that buildings would not otherwise decarbonise. Uplifts to the Building Regulations can help to overcome the following market failures that act as barriers to action:

- **Negative externalities:** organisations with offices, warehouses or other premises do not incur the full cost of the emissions they emit by heating and powering their buildings. The prices consumers pay for fuel do not reflect the social costs of greenhouse gas emissions and air pollution. Consumers may therefore choose fossil fuel heating systems even when the high social costs of these systems mean that a low-carbon alternative is socially optimal.

- **Split incentives:** for new non-domestic buildings, developers have limited incentives to build better-performing buildings as they do not typically enjoy the benefits. Lower energy bills, and the additional income from energy generated by renewable technologies benefit the building occupant or owner, which is often a separate organisation from the developer. Developers may not be able to sell a building for a premium to recover all the additional costs they accrue, despite the building being more energy efficient. These misaligned incentives mean that developers may fail to make improvements to the energy performance of buildings that benefit occupants.

- **Multiple equilibria:** A complex system like the construction industry can be held back from moving to a new, low-carbon equilibrium because of a failure of coordination. New, low-carbon technologies such as heat pumps are often initially more expensive than existing fossil fuel dependent technologies. Economies of scale and increased investment are likely to bring down the capital costs of these technologies over time. However, the costs to each actor of independently adopting a new technology may outweigh the benefits, preventing a socially optimal transition. Government intervention is justified in such a case to support a sector to transition from a high-carbon equilibrium to a low-carbon equilibrium, overcoming the coordination problem.

- **Imperfect information:** The first three market failures on this list address misaligned incentives. However, even if incentives were properly aligned and market prices reflected the high social costs of carbon emissions and air pollution, consumers might not respond by changing their choices. Owners and occupiers of buildings may not know that certain improvements are cost-effective. For example, owners of new non-domestic buildings may not choose better-performing ventilation even though it would reduce their energy bills. Consumers may also have misapprehensions about the effectiveness of low-carbon heating systems that lead them to overlook these technologies.

- **Bounded rationality and inertia:** Another reason that consumers may not choose cost-effective solutions is that they may be swayed by factors outside of 'rational' market incentives. Consumers and developers may prioritise familiarity and continuity or be swayed by social pressures to stick with certain practices or technologies, even when cost-effective alternatives exist.

3.2. The Building Regulations represent the appropriate point of intervention to overcome these market failures in the construction sector. Action at the point of build has the advantage of locking in low-carbon technologies and energy efficient design, reducing the overall energy demand of the building and avoiding the need to retrofit in the future.

4. Policy objectives and description of options considered

Policy objectives

4.1. The performance-based targets set through the Building Regulations and accompanying Approved Documents provide a useful mechanism to reduce the carbon emissions from non-domestic buildings. Setting the right standards will ensure the Government is on track to meet its 2050 Net Zero target.

4.2. The Future Homes and Buildings Standards consultation document, the associated draft Approved Documents and the National Calculation Methodology Modelling Guide together set out the full details of the proposed policy for the new energy efficiency requirements for new non-domestic buildings. The following paragraphs set out a summary of the proposals and their intended effects.

4.3. The policy objectives are as follows:

- Reduce the carbon dioxide emissions of new non-domestic buildings in line with government commitments to decarbonise by 2050.
- Transition away from the use of fossil fuels for heat and power by ensuring new buildings are "net zero ready". This means that, because they use electric or other renewable energy sources, no work will be necessary to allow them to achieve zero carbon emissions when the electricity grid is fully decarbonised.
- Ensure that new buildings are high-quality and affordable, protecting occupants from high energy bills.
- Ensure that interventions to improve energy performance are cost-effective, affordable, practical and safe.

The 'Do nothing' option

4.4. Doing nothing in this context would mean maintaining the energy efficiency requirements of the Building Regulations as set in 2021. The 2021 uplift set high standards for building fabric and building services. However, in some cases the building fabric and building services of the 2021 standard are below current industry practice. More importantly, under this option new buildings would continue to be constructed with fossil fuel heating systems into the late 2020s and 2030s. Given the long lifetime of buildings, this option would therefore make the Government's legally binding Net Zero target extremely difficult, possible only with widespread, expensive retrofit.

Option 1: Preferred Option

4.5. Our preferred option includes the following features:

- Uplift the energy performance requirements for new non-domestic buildings as follows.
  - Replace the gas system in the notional side-lit building[6] with a heat pump, district heating, or a fourth-generation heat network.

[6] Top-lit spaces have daylight illumination from above via rooflights; they are typically large-volume spaces such as warehouses and sports halls. Side-lit buildings spaces, by contrast, have daylight illumination from the side via windows; they include the majority of spaces in most building typologies such as offices, hotels and schools.

    - Replace the gas system in the notional top-lit building with electric radiant heating or a fourth-generation heat network.
    - Improve the airtightness of the notional top-lit building, bringing it into line with industry practice.
    - Increase the lighting efficacy and heat recovery efficiency in both notional building specifications.
    - Increase the rooftop PV coverage in the notional side-lit building from 20% to 40% of the foundation area.
    - Increase the rooftop PV coverage in the notional top-lit building from 40% to 75% of the foundation area.
- Introduce new energy efficiency standards for lifts and escalators.
- Repeal redundant parts of the regulations.
- Amend Part L of Schedule 1 of the Building Regulations to require the minimisation of greenhouse gas emissions as well as the conservation of fuel and power.
- Accounting for exceptional circumstances: remove the restriction on relaxing or dispensing with the requirement to meet the target CO_2 emission rate (one of the key energy efficiency standards in Part 6 of the Building Regulations).
- Introduce additional guidance for connection to heat networks.
- Introduce additional other guidance in the Approved Documents on low-carbon technologies and achieving high levels of energy efficiency.

Option 2: Alternative Option

4.6. Option 2 includes all the features presented in Option 1, without the proposed changes to the PV coverage in either the notional side-lit or the notional top-lit building i.e.:
- PV coverage in the notional side-lit building remains at 20% of the foundation area.
- PV coverage in the notional top-lit building remains at 40% of the foundation area.

How the options would meet the objectives

4.7. The primary change is the installation of low-carbon heating systems. The notional building approach allows for the choice of alternative technologies. However, we anticipate that developers will meet the requirement through heat pumps or heat networks in most side-lit buildings and electric radiant heating or heat networks in most top-lit buildings. These buildings will become zero-carbon as the electricity grid decarbonises between now and 2035.

4.8. The improvements to building fabric and building services will also reduce the energy use and hence carbon emissions of new buildings. The solar PV coverage added in Option 1 (see paragraph 4.5) would result in energy cost savings (set out in more detail in Section 6). These energy cost savings would offset the energy cost increases arising from the move to electric heating systems. This benefit comes at the cost of higher capital costs. However, we judge this benefit to be worth the costs, so Option 1 is our preferred option.

4.9. We consider the energy efficiency standards in both options to be achievable. Developers can meet the higher standards for fabric and building services using materials, construction techniques and products readily available on the market. The notional building allows some flexibility in meeting the performance standards, allowing designs to be tailored to the circumstances of each building, and supporting innovation.

Further detail on both policy options

Performance metrics to assess the energy performance of new non-domestic buildings

4.10. We have concluded that the existing metrics effectively support our policy priorities for the Future Homes and Future Buildings Standards. We therefore propose using the current metrics for setting performance requirements with no changes.

Uplift to the energy performance requirement for new non-domestic buildings

4.11. *The National Calculation Methodology Modelling Guide,* which DLUHC published alongside this Impact Assessment, sets out the proposed technical specifications of the notional buildings used for the Future Buildings Standard.

Updates to National Calculation Methodologies

4.12. We propose small updates to the National Calculation Methodology to address issues which stakeholders have raised. We have also made other updates to the SBEM and iSBEM building modelling software.

Changes to guidance for building fabric and fixed building services in new non-domestic buildings

4.13. The consultation document and Approved Document set out the changes to guidance on minimum standards for building fabric and building services in new non-domestic buildings. In a number of areas we have added guidance to Approved Document L to clarify the standards. These areas include the energy efficiency and commissioning of lifts and escalators which we propose should be included in the definition of fixed building services, updated minimum standards for internal lighting, and additional guidance on external lighting.

Amending parts of the regulations

4.14. We propose various additional changes to the Building Regulations to make the Regulations simpler and easier to navigate, and to reflect that reducing carbon emissions is a central aim of the Future Homes and Buildings Standards.

Accounting for exceptional circumstances

4.15. We are conscious that as energy efficiency requirements become stricter, there may be some buildings that cannot be designed to meet the standards. We are therefore proposing to remove the restriction on relaxing or dispensing with the requirement to meet the target CO_2 emission rate. This would mean (if regulations 25A and 25B are repealed as proposed) that developers could apply to their local authority, with appropriate evidence, to relax or dispense with any of the energy efficiency requirements, and the local authority would be required to judge whether the requirement were “unreasonable” in the circumstances.

Heat networks

4.16. We are proposing to support the expansion of heat networks where they are making demonstrable steps to decarbonise. We are proposing to link the ability for new buildings to connect to heat networks to the nature and quantity of low-carbon heat generation supplying the network. This approach would mean that, at a minimum, the heat required by any new buildings connected to a heat network would have to match the low-carbon heat generation capacity of the network. We propose that a 'sleeving' system should be used to implement this principle. The consultation document sets out more detail on the sleeving proposal.

Implementation & Transitional Arrangements

4.17. We will implement the changes through secondary legislation and updates to the Approved Document. We are consulting on two options for implementation:

- A 6-month period between (i) the laying date of the Future Homes and Buildings Standards regulations and publication of full technical specification and (ii) the regulations coming into force
- Up to 12 months between (i) the laying date of the Future Homes and Buildings Standards regulations and publication of full technical specification and (ii) the regulation coming into force

4.18. We do not have a preferred option. Both options would be followed by a 12-month transitional period.

4.19. Transitional arrangements for new buildings will only apply to buildings where a building notice, initial notice, or an application for building control approval accompanied by appropriate plans has been submitted prior to the regulations coming into force, and where work has then commenced on that individual building within twelve months of the regulations coming into force.

5. Analytical Approach

5.1. To estimate the overall costs and benefits of the proposed policy changes, DLUHC analysts have taken the following steps. (The rest of this chapter provides more detail on each step.)

5.2. First, we commissioned modelling from our consultants in industry[7] of the capital costs, energy use and related carbon dioxide emissions of a building constructed to each possible standard. We gathered this evidence for seven typical building 'archetypes', or representative typical buildings. The three standards considered were Part L 2021,[8] Part L as per Option 1, and Part L as per Option 2.

5.3. Our consultants then produced assumptions about the amount of floorspace to be built each year, allocating it all across the seven building archetypes analysed. In collaboration with the consultants, we made assumptions for the proportions of buildings that developers would construct to each of the proposed standards in each year under the counterfactual. These assumptions allowed us to scale up the capital costs, energy usage, and emissions from a per-square-metre basis to an economy-wide basis. Comparing these results for each policy option against the 'Do nothing' option allowed us to estimate the costs and benefits of each option. Finally, we added estimates of familiarisation costs to our headline results for each policy option.

5.4. Given the long lives of the buildings affected there is considerable uncertainty about future values. We explored the effect of this uncertainty using sensitivity analyses: see Appendix C. We created a high set of estimates by increasing the total costs and benefits by 20%. We created a low set of estimates in the opposite way. In addition to this overall sensitivity analysis, we used targeted sensitivity analyses to explore the impact on the results of varying particular assumptions: see Appendix C.

Assumptions applicable to all analysis

5.5. This Impact Assessment follows the approach to valuing energy use that the Green Book recommends. The analysis uses the fuel prices, traded and non-traded carbon values and emission factors from the April 2023 update to the Green Book's supplementary guidance on valuing energy use and greenhouse gas emissions for appraisal.[9] The 30 November 2023 update came too late for us to incorporate its numbers into our analysis. However, we do not expect that using the new numbers would affect the main conclusions. The final Impact Assessment will use the latest guidance.

5.6. The analysis of business impacts (e.g. Table 6) values energy savings using retail prices. The social analysis, meanwhile, values energy savings at the variable rate. The difference

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[7] An AECOM-led consortium comprising, AECOM, Currie and Brown, Adroit Economics, Four Walls, Pollard Thomas Edwards and Mary Livingstone (sole trader)

[8] In this section and the remainder of the document the shorthand 'Part L' is used to describe all relevant changes to energy efficiency standards including those in the building regulations, the notional building specification and the approved documents.

[9] Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

between these sets of prices reflects that the retail energy savings enjoyed by the occupier of an energy efficient building do not fully capture the social benefit. The analysis valued the benefit of exporting generated electricity to the grid using a weighted average of the rates of Ofgem's Smart Export Guarantee.[10] We projected these rates forwards and converted them into long-run variable cost prices using the fuel prices in the Green Book supplementary guidance. Through the consultation process, we intend to refine our assumptions on the benefits of the electricity that non-domestic buildings generate and export to the grid.

5.7. We have used a discount rate of 3.5% for the first thirty years of the building's life and 3% for subsequent years.

5.8. The prices shown below are in 2025 base year, 2022 prices, apart from the EANDCB and Business Impact Target calculations. Table 6 presents these figures in 2019 prices and 2020 present value, as per official guidance.[11]

Building archetypes and floorspace projections

5.9. Table 1 sets out the seven building archetypes whose capital costs, energy use and carbon dioxide emissions DLUHC analysed.

Table 1: Building archetypes used for analysis

Building archetype	**Wall type**	**Floor type**	**Floor area (m²)**
Office: deep-plan, air-conditioned	Metal frame	Raised	12,100
Office: shallow-plan, naturally-ventilated	Masonry	Ground-contact	2,160
Hotel	Masonry	Ground-contact	1,087
Hospital	Metal frame	Ground-contact	13,387
Secondary School (includes sports facilities)	Masonry	Ground-contact	7,864
Retail Warehouse	Metal frame	Ground-contact	4,962
Distribution Warehouse	Metal frame	Ground-contact	4,962

5.10. We commissioned Adroit Economics to use evidence from planning data[12] to estimate the amount of new non-domestic floorspace that developers would build each year. Seeing that planning approvals were fairly stable, and for lack of good evidence on how they might evolve, the consultants used the evidence from the last three years. They projected these figures as constant into the future.

[10] Ofgem (2022). Ofgem Smart Export Guarantee (SEG) Annual Report 2021-22, Available at: https://www.ofgem.gov.uk/publications/smart-export-guarantee-seg-annual-report-2021-22

[11] HMG (2021) Impact Assessment Calculator User Guide, https://www.gov.uk/government/publications/impact-assessment-calculator--3

[12] Unpublished

5.11. Our consultants applied an adjustment to the numbers of applications to reflect that only around 79% of planning approvals are constructed each year.[13] They then reduced the resultant figures by 10% to reflect that around that proportion of approved planning applications would be for conversions rather than new buildings.[14] These adjustments were applied equally across building archetypes.

5.12. The planning data is broken down into around a hundred building categories, including less common building types such as squash courts and crematoria. The consultants assigned each specific building category to one of the seven building archetypes, according to the characteristics of its energy use. This matching allowed the consultants to allocate all the total floorspace expected to be built to one of the seven building archetypes in Table 1. We used the same assumption that we made for the 2021 Final Impact Assessment, that 50% of new warehousing is unheated. We intend to refine this assumption through the consultation process for the final Impact Assessment.

5.13. These calculations imply that warehousing will make up over half of the floorspace to be built, even after removing unheated spaces from the analysis. In previous Impact Assessments, DLUHC has not assumed that warehouses would contribute such a large portion of the projected new floorspace. The floorspace projections in the 2021 analysis used older data and a less direct method than looking at planning applications, so we are confident that these assumptions are more accurate. However, we aim to refine these assumptions further for the final Impact Assessment. We would welcome evidence to inform these assumptions, particularly on the proportion of new warehouse floorspace that is heated.

5.14. Table 2 sets out the floorspace projections that resulted from this independent analysis.

Table 2: Assumed projection of floorspace by most relevant building archetype

Building archetype	Annual New Build Estimate (sqm)
Office: deep-plan, air-conditioned	1,100,000
Office: shallow-plan, naturally-ventilated	700,000
Hotel	400,000
Hospital	200,000
Secondary School (includes sports facilities)	800,000
Retail Warehouse	400,000
Distribution Warehouse	3,200,000

Source: Adroit Economics

5.15. These estimates of new build completions were provided by an independent consortium. They are indicative and should be used for appraisal purposes only. They do not represent an official forecast of changes in supply. These estimates do not account for changes of

[13] Based on a comparison of dwelling starts (sourced from DLUHC's Live Tables) and the number of dwelling planning permissions (based on unpublished planning data). We assumed that the same factors would prevent planning approvals being constructed for non-domestic building projects as for the construction of homes, so the proportion would be the same.

[14] According to consultant analysis of unpublished planning data

use, conversions or demolitions, which are all elements of net change in stock. They also do not capture the impact of policy interventions that could increase the industry's capacity to build new buildings. Assessing these phenomena is outside the scope of this Impact Assessment.

Phase-in assumptions and transitional arrangements

5.16. Table 3 sets out the assumptions used in this analysis for the proportion of new non-domestic buildings which will be built to the proposed 2025 standards in each year. These assumptions take into account the effect of transitional arrangements, discussions with industry and the experience of our consultants in this sector.

5.17. For modelling purposes, the analysis assumes the Government will lay the legislation for the Future Buildings Standard in 2024, and it will come into force in 2025. For modelling purposes, the analysis therefore considers the first year of the policy to be 2026.

5.18. For new non-domestic buildings, there is a longer time lag between planning and completion than there is for homes. Consequently, the non-domestic profile trails the domestic. The Impact Assessments for the 2021 uplift to Part L assumed that 5% of new domestic buildings would be built to the standard in the first year of the policy and that non-domestic buildings' phase-in would trail by exactly a year. For domestic buildings, we have revised down the first year of the policy from the 5% assumed for Part L 2021 to 0%, based on emerging internal evidence (see Future Homes Standard Impact Assessment). We do not have the evidence for non-domestic buildings in the second year of the 2021 uplift, so there is not the same justification to reduce to 0% the proportion of non-domestic buildings to be built to the Future Buildings Standard in its second year. We will continue to gather evidence on the uptake of the 2021 uplift to Part L to allow us to refine all these assumptions for the final Impact Assessment.

5.19. This Impact Assessment uses the same phase-in assumptions for non-domestic buildings as the final Impact Assessment for the non-domestic 2021 Part L uplift. We therefore no longer assume that the non-domestic phase-in assumptions are the same as the domestic assumptions but a year later.

5.20. We are consulting on two options for the transitional arrangements: see Paragraph 4.17. The analysis in this document is based upon an assumption of a twelve-month period between the laying of the regulations and the regulations coming into force. We have not repeated the analysis under the assumption of a six-month coming into force period, but we would expect the effect on the results to be negligible.

Table 3: Phase-in assumptions

Year of policy	0	1	2	3	4	5 onwards
	2025	2026	2027	2028	2029	2030 onwards
% works captured by 2025 uplift	0%	0%	5%	50%	95%	100%

Counterfactual

5.21. Some new buildings would meet the proposed new standards anyway, so would not be affected by the policy. DLUHC analysts therefore needed to make assumptions about how many buildings developers would build each year, under each scenario, to each of the following standards (in increasing order of stringency):

a) Part L 2021
b) The Future Buildings Standard, as defined by Option 2
c) The Future Buildings Standard, as defined by Option 1

5.22. Appendix A sets out the assumptions that the analysis used. Adroit Economics recommended these assumptions based on an assessment of the following sources:

i. Analysis of the Energy Performance Certificate database
ii. A review of Local Authorities' approaches (as per the 2021 Impact Assessment)
iii. A review of the sustainability commitments of some of the largest or most active developers of commercial property (updated since the 2021 Impact Assessment)
iv. Consultant experience of the industry

Side-lit buildings: Energy Performance Certificate database

5.23. The Energy Performance Certificate database provides information[15] on the uptake of heat pumps in new non-domestic buildings. We used this information to inform our counterfactual assumptions for side-lit buildings, whose notional building includes heat pump systems. The evidence indicated that side-lit buildings fell into two broad categories in terms of their uptake of heat pumps. Around 30% of new offices appear to be built with heat pumps, compared with around 60% of other side-lit buildings.

5.24. No such data was available on the uptake of electric radiant heating systems. For warehouses we therefore followed a similar approach to the one taken for the final Impact Assessment for the 2021 Part L uplift, led by local plans.

Top-lit buildings: Local Authority approaches

5.25. The Building Regulations set energy efficiency performance standards for new non-domestic buildings nationally. In certain circumstances local plans can set standards beyond the national requirements. The Greater London Authority, through the London Plan, has set out commitments for all new developments to have at least a 35% reduction beyond the baseline of the Building Regulations.[16] The vast majority of developments built under the London Plan use carbon-free heating systems.

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[15] Unpublished

[16] Greater London Authority (2021): The London Plan
https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf

5.26. According to the latest data from the Valuation Office Agency (2022)[17], 6% of industrial floorspace is in London. We therefore assumed that 6% of new floorspace would be built in London and so would go beyond the Future Buildings Standard.

5.27. For the 2021 Impact Assessment, DLUHC checked which Local Authorities have requirements to meet the 'Excellent' standard set of the Building Research Establishment Environmental Assessment Method (BREEAM)[18]. Not every building achieving BREEAM 'Excellent' would be compliant with the Future Buildings Standard. However, such a Local Authority requirement is a good indication of a local policy environment that makes it difficult for developers to construct new buildings to 2021 standards or older. On this basis, we excluded from our analysis new buildings expected to be built under Local Authorities with these requirements.

5.28. DLUHC identified the thirty Local Authorities which had the highest average new non-domestic build rates over the last five years. We used internal analysis of Valuation Office Agency Local Authority time series data to identify the group. We then sampled these Local Plans to see which had included requirements to meet BREEAM 'Excellent' or equivalent commitments requirements. The sample represented around 25% of the total non-domestic building stock.

5.29. The analysis concluded that 17% of Local Authorities in the sample had voluntarily committed to BREEAM 'Excellent' or equivalent. We then applied this proportion to the whole new non-domestic stock outside London, with the assumption that all others would continue meeting the 2021 energy efficiency requirements.

5.30. Adroit Economics assesses that Local Authorities' requirements will not have changed significantly since this analysis was carried out for the 2021 Impact Assessment.

5.31. Applying this 17% to the 94% of warehouse floorspace outside of London implies that a further 16% of warehouse floorspace would meet the Future Buildings Standard under the counterfactual. Adding 16% to the original 6% yields an England-wide total of 22% of new warehouse floorspace meeting the Future Buildings Standard.

5.32. We based our assumptions on the counterfactual for warehouses on evidence that is less direct than the evidence we used for side-lit buildings. These assumptions therefore come with greater uncertainty. For this reason, we have performed sensitivity analysis on the effect of changing the counterfactual assumptions for warehouses: see Appendix C. We intend to refine the counterfactual assumptions for the final Impact Assessment and would welcome evidence from consultees to inform this process.

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[17] https://www.gov.uk/government/statistics/non-domestic-rating-stock-of-properties-2022

[18] Buildings Research Establishment (2023), How BREEAM Works, https://bregroup.com/products/breeam/how-breeam-works/#:~:text=A%20BREEAM%20assessment%20uses%20recognised,criteria%20from%20energy%20to%20ecology.

Organisational trends to Net Zero

5.33. Industry and planning consultants fed back in extensive discussions that corporate occupiers of non-domestic buildings are very interested in decarbonisation. These organisations demand that developers meet standards well above the proposed Future Buildings Standard. For this reason, most developers considered in our analysis have a commitment to achieve Net Zero for all developments by 2040 or earlier.

5.34. This demand is particularly strong for large developments and for offices. In these cases the potential tenant will often be a large corporation that has committed to zero carbon by a set date. Most office/mixed-use developers therefore have a commitment to achieve Net Zero by 2030 or earlier.

5.35. The warehouse developers appear to have a longer-term commitment to Net Zero, but with interim targets for low-carbon construction. NHS England has committed to an 80% reduction in emissions from NHS owned hospitals by 2032.[19]

Experience of the industry

5.36. We used the above evidence to estimate the percentage of floor area likely to meet the FBS standards currently, informed by expert industry input from Adroit Economics and AECOM. As outlined above, the analysis assumes that 22% of new warehouse floorspace would meet the Future Buildings Standard under the counterfactual in 2025. To reflect the upward trends, the analysis assumes some increase in standards between now and the 2025 counterfactual. The analysis assumes that under the counterfactual in 2025, 40% of offices, 70% of other side-lit buildings, and 26% of top-lit buildings would meet the Future Buildings Standard.

5.37. For simplicity we split these percentages evenly between Option 1 and Option 2, based on expert judgment that this broadly reflected the uptake of solar photovoltaics. For example, the analysis assumes that 40% of offices would meet the Future Buildings Standard under the counterfactual in 2025. We split this proportion into 20% of offices meeting the Future Buildings Standard as defined by Option 1 and 20% meeting the standard as defined by Option 2.

5.38. The final step was to use the evidence on organisational trends to Net Zero to project these starting points forward to 2034. We created these trends based on expert analysis of the proportions of developers with commitments to Net Zero by 2030 or Net Zero by 2040. Appendix A sets out the profiles that resulted.

Gas replacement

5.39. Building owners might choose to replace a heating system with a different kind of system once it comes to the end of its life. Whether building occupiers would replace gas systems with gas or electric systems under the counterfactual is a complex question. DLUHC analysts judged that most of the reason that gas boilers might be replaced by electric

[19] https://www.england.nhs.uk/greenernhs/a-net-zero-nhs/#:~:text=For%20the%20emissions%20we%20control,reduction%20by%202036%20to%202039.

systems was developers' anticipation of regulation. We judged that assuming that building occupiers would replace gas with electric systems in the counterfactual would therefore ignore this important effect of regulations like the Future Buildings Standard. We decided that assuming that all gas systems would be replaced by gas under the counterfactual would be a better simplifying assumption than assuming they would be replaced by electric systems. However, we carried out a sensitivity analysis in which we recreated the headline results on the alternative assumption: see Appendix C.

Impacts of the standards for lifts, escalators and lighting

5.40. As part of the Future Buildings Standard, we propose that guidance be added to Approved Document L on the energy efficiency and commissioning of lifts and escalators which will be included in the definition of fixed building services.

5.41. We consider this guidance to be in line with current industry practice for new buildings, so we anticipate the impacts of this guidance will be negligible. We consider the same to be true for the updated minimum standards for lighting. We will test these assumptions through the consultation.

Appraisal Time and Asset Life

5.42. The appraisal period of the policy is ten years. This approach is consistent with other Impact Assessments associated with the construction industry, including the Impact Assessment undertaken for changes to the energy efficiency requirements in 2021.

5.43. For the analysis of new buildings, the analysis assumes a lifetime of sixty years. The total appraisal period is seventy years so that the analysis assesses the full sixty-year lifetime of a building constructed in Year Ten. For building fabric insulation (external walls, floors, roofs) the assumed asset life is sixty years, except for external windows which we assigned an asset life of thirty years. These assumptions are in line with values provided in Appendix E of *BS EN 15459 Energy performance of buildings – Economic evaluation procedure for energy systems in buildings*.

5.44. The analysis assumes the following asset lifetimes:

- 15 years for gas boilers
- 20 years for light fittings and ventilation equipment
- 20 years for thermostatic radiator valves (TRVs) to align with the asset life for heat emitters
- 10 years for lighting controls

5.45. The analysis only considered the elements of lifecycle costs that differed from the costs incurred in the counterfactual. For example, we excluded general repair and decoration costs from the analysis, as these would be common to all new constructions, irrespective of the energy performance options presented in this document.

5.46. We assigned replacement costs to each component within a specification, thereby enabling us to model individually the lifecycle costs of components with different life-expectancies. For example, the modelling of air-source heat pump replacements did not include the replacement of associated electricity supply components. These components should last longer than heat pumps, so we assessed them separately with their own replacement costs and cycles. The replacement costs included an allowance for the disposal of the end-of-life components.

5.47. Consequently, the analysis estimates the ongoing costs associated with maintenance and replacement, along with the benefits from energy savings and associated air quality and carbon savings, over a sixty-year period for each building. We have applied learning rates to account for reductions in costs for less mature technologies.

Compliance

5.48. In some buildings, there can be a gap between the designed and as-built performance, known as the 'performance gap'. Buildings that appear to meet the energy performance standards fully through the paperwork submitted can fall short in reality due to several reasons. One reason is that occupants may use buildings in different ways to those assumed at the design stage.

5.49. Standard practice when estimating the impacts of a regulation is to assume 100% compliance. On this basis, this analysis assumes that buildings are constructed and operated as the regulation intends.

5.50. However, we are aware of the risk that a performance gap arises for the Future Buildings Standard. We intend to explore the extent and implications of this risk through the consultation process.

5.51. In the final Impact Assessment, we also intend to perform sensitivity analysis of what different percentage performance gaps would mean for the results of our analysis. A performance gap would likely mean that our modelling would underestimate the energy use of buildings under the counterfactual and buildings under the policy by the same proportion. In this case, the estimates of the percentage reductions in energy use would not be affected. However, our analysis would underestimate the absolute energy savings from the change.

Heat Networks

5.52. For modelling purposes, the analysis assumes that every new building follows one of our seven uniform building archetypes, which follow the technologies specified in the standard, non-heat network, notional building specifications.

5.53. Heat networks are the most likely alternative heating and hot water technologies, to the heat pumps and direct electric heating included in the standard notional buildings. Although a specific 'heat network' notional building is used where buildings are connected to heat networks, the specification of the notional building is very similar to the standard notional building. As a result, differences in carbon emissions and other factors are likely to be small between heat and this analysis has not attempted to quantify any effect of buildings being connected to heat networks.

Standing charges

5.54. The modelling of energy costs has focussed on variable charges only. However, occupiers of non-domestic buildings also pay fixed charges that depend upon the sizes of their gas and electricity connections. We expect the Future Homes Standard to have an important effect on domestic standing charges because almost all new homes will no longer be connected to the gas grid. We have been able to estimate the size of this impact by using evidence on domestic standing charges: see Future Homes Standard Impact Assessment. However, for non-domestic buildings the evidence is limited and the benefits of forgoing the gas standing charges may be largely outweighed by increases in electricity standing charges.

5.55. DLUHC is aware of no market-wide representative data on the standing charges paid by non-domestic buildings. Non-domestic charges are not capped, so vary significantly depending upon the size of each connection, location and various other factors including even the credit rating of the commercial customer. Furthermore, we anticipate that developers will continue to install some new non-domestic buildings with gas connections for non-regulated uses such as cooking and industrial processes.

5.56. To give a high-level indication of the possible impact on standing charges of the policy, we examined what the impacts would be if certain plausible assumptions held:

i. The ratio between the average standing charge and the average variable charge is the same for each non-domestic archetype as for the average home.
ii. As for a home, the average impact for a non-domestic building of moving onto a single-fuel tariff would be to increase the electric standing charge by seven percent.

5.57. Our consultants provided some illustrative assumptions for the proportions of new buildings of each archetype that would install gas connections for non-regulated uses only. We assumed that these new buildings with gas connections would pay the same standing charges as new buildings under the counterfactual.

5.58. Bringing these assumptions together implied that an overall saving on standing charges would result from the Future Buildings Standard. However, under these assumptions the net effect would be small, as the saving on gas standing charges would be largely outweighed by the increases in electricity standing charges. Given the lack of robustness of these estimates and their lack of material impact on the overall results of this Impact Assessment, we do not report the analysis here. However, we intend to refine this analysis for the final Impact Assessment. We will also more broadly consider the impacts on the electricity grid of increased electricity demand and supply from new non-domestic buildings. As ever, we would welcome challenge or evidence from consultees to inform this process.

6. Estimated costs and benefits

Headline results

6.1 Tables 4 and 5 provide a quantitative summary of the impacts of this policy, relative to the 'Do nothing', in which the 2021 Part L uplift is maintained.

6.2 The figures in Tables 4 and 5 are net present values over ten years of policy followed by sixty years of building lifetime using 2022 prices and 2025 present value.[20] The tables present negative net present values in brackets; these numbers represent costs. The figures represent the aggregate impact across the mix of building types.

6.3 The impacts of the policy are driven largely by the heating systems and PV coverage in the notional buildings. Option 1 delivers significantly greater benefits to occupiers than Option 2 as the solar PV coverage offsets energy consumption. Net electricity consumption therefore decreases, leading to energy savings worth £930 million.[21] Conversely, Option 2 increases energy bills, costing occupiers £1,040 million due to electricity being more expensive per unit than gas, and the absence of offsetting from solar PV. There is therefore a net £2,000 million difference between the options in terms of bill savings.

6.4 Both options increase capital costs because heat pumps have higher capital costs than gas systems and because of the improvements in lighting efficacy, heat recovery efficiency and fabric. Electric radiant heating systems have lower capital costs than gas systems, but these savings are outweighed by the capital cost increases elsewhere. For Option 1, the gain in energy bill savings from solar PV comes at the expense of even higher capital costs of £2,350 million. Option 2 is cheaper for developers than Option 1 by £1,100 million, with capital cost increases of £1,250 million.

6.5 The large capital costs and, in the case of Option 2, increases in energy expenditure mean that both options have a net financial cost. In other words, before the impacts on wider society are taken into account, the policy has a negative net present value. We estimate the net financial cost of the policy to be £1,430 million for Option 1 and £2,310 million for Option 2.

6.6 Both options deliver substantial carbon savings. In Option 2, there are carbon savings of 14.0 $MtCO_2e$, worth £2,060 million. Option 1 delivers slightly higher carbon savings due to the extra solar PV, delivering 14.7 $MtCO_2e$, worth £2,210 million.

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[20] Discounting converts costs and benefits into present values by allowing for society's preference for now compared with the future. Analysts use discounting to compare future values in terms of their value in the present, the base year of the proposal. For example, if Projects A and B have identical costs and benefits but Project B delivers a year earlier, time preference gives Project B a higher present value because it is discounted by a year less than project A. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1063330/Green_Book_2022.pdf

[21] This section presents all monetary figures as rounded to the nearest £10m. Rounded numbers may not sum to rounded totals.

6.7 Adding in the large carbon benefits and smaller air quality benefits of the policy produces a positive social net present value for Option 1 of £830 million. We estimate the net present social value of Option 2 to be -£200 million. Without the bill savings that come from the extra PV coverage, carbon savings are not sufficient to outweigh the costs.

6.8 For new buildings, developers will incur the capital costs, but may pass them on in the form of higher purchase costs or rents. Over the medium-to-long term, development costs may become factored into the land prices and therefore passed onto landowners. However, in the short term developers are unlikely to pass the costs on in this way. For public buildings, local or national government will incur the cost, as will the higher fuel bills. For all types of buildings, wider society will benefit from reduced carbon emissions and improved air quality.

6.9 The majority of the carbon savings in both options come from the non-traded sector, through the mitigation of gas consumption.[22] The savings in non-traded carbon under Option 1 come at a cost of £101/tCO_2e, while the savings under Option 2 come at a slightly higher cost of £163/tCO_2e.[23]

6.10 In all cases, the abatement cost per tonne is below the social cost of carbon emissions, £252/tCO_2e in 2023 and rising each year. This comparison indicates that the carbon abatement of both options represents value for money.

Table 4: Summary of costs and benefits to society, monetary units (£m, 2022 prices and 2025 PV). The table presents costs in brackets to indicate that their net present value is negative.

	Option 1	Option 2
Transition costs	(11)	(11)
Energy savings	934	(1,043)
Capital, maintenance, and replacement costs	(2,348)	(1,253)
Total financial benefit/(cost)	**(1,425)**	**(2,307)**
Carbon savings – non-traded	2,164	2,164
Carbon savings – traded	43	(100)
Total carbon savings	**2,207**	**2,064**
Air quality savings	47	43
Total carbon and air quality savings	**2,254**	**2,108**
Net benefit/(cost)	**829**	**(199)**

[22] 'Traded emissions' come from installations covered by the UK Emissions Trading Scheme (ETS), whereas 'non-traded emissions' are those which do not fall within scope of the UK ETS: https://www.gov.uk/government/publications/participating-in-the-uk-ets/participating-in-the-uk-ets

[23] For information about how we quantify and value energy and greenhouse gas emissions, including an explanation of the cost-effectiveness metric, please see this document: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1129242/valuation-of-energy-use-greenhouse-gas-emissions-for-appraisal.pdf

Table 5: Summary of costs and benefits to society, non-monetary units. The table presents negative values in brackets.

	Option 1	Option 2
Amount of gas saved (GWh)	79,251	79,251
Amount of electricity saved (GWh)	25,619	(49,044)
Amount of CO_2 abated – non-traded ($MtCO_2e$)	14.5	14.5
Amount of CO_2 abated – traded ($MtCO_2e$)	0.21	(0.48)
Total carbon savings	**14.7**	**14.0**
Cost effectiveness – non-traded (£/tCO_2e)	92	163
Cost effectiveness – traded (£/tCO_2e)	n/a	n/a

Business Impacts:

6.11 Table 6 presents the equivalent annual net direct cost to business and the net present value to business (EANDCB). For ease of comparison with other Impact Assessments, the table presents the figures in 2019 prices and 2020 present value. The EANDCB is calculated over ten years. The policy has a positive net cost to business under each option, as the calculations do not include the carbon benefits. Section 7 discusses the costs to business in more detail.

Table 6: Business impacts over ten years (£m, 2019 prices and 2020 PV)

	Option 1	Option 2
Equivalent annual net direct cost to business (EANDCB)	111	74
Net present value to business	-1,056	-703

Non-monetised benefits

6.12 We expect the policy to facilitate further decarbonisation in addition to that captured by the quantitative analysis. The added demand for low-carbon technologies will help bring down their costs over time and encourage innovation. There may also be network effects, for example if heat pumps are able to join fifth-generation heat networks. The benefits of this additional decarbonisation will accrue to society at large.

Administrative burden

6.13 Administrative burden is the cost to business from having to provide supplementary information due to legal requirements.

6.14 Administrative burden would be reduced by the proposal to repeal regulations 25A and 25B. Regulation 25A requires people carrying out building work to consider whether it would be feasible to use “high-efficiency alternative systems” during construction. Regulation 25B stipulates that new buildings must be “nearly zero-energy" buildings. We are proposing to repeal these regulations since in our view they will become redundant once the Future Homes and Buildings Standards have been introduced. Homes and non-domestic buildings will be ‘zero-carbon ready’, meaning that no further work will be necessary to ensure they have zero carbon emissions as the electricity grid continues to decarbonise. Low-carbon heating will be installed in the vast majority of new buildings, and renewable energy generation will be widespread. For these reasons, we believe that regulations 25A and 25B will be redundant once the Future Buildings Standard is introduced.

6.15 We have not identified any additional administrative burden arising from the policy.

Additional capital costs

6.16 Table 7 shows the increase in capital costs from achieving the 2025 requirements, compared with the existing 2021 standards. Appendix B provides a further breakdown of the costs of the different elements.

Table 7: Estimates of additional capital costs

	Increase in capital costs			
Building type	**Option 1**		**Option 2**	
	(£/m² GIFA, 2022 prices)	%	(£/m² GIFA, 2022 prices)	%
Deep-plan, air-conditioned office	74	2.1	67	1.9
Shallow-plan, naturally ventilated office	96	3.9	84	3.4
Hospital	63	1.4	58	1.3
Hotel	111	3.7	99	3.3
Secondary school	93	3.1	72	2.4
Retail Warehouse	113	6.3	53	3.0
Distribution Warehouse	109	6.0	49	2.7
Average (based on build mix)	**99**	**4.1**	**61**	**2.5**

Sources: Currie & Brown provided cost estimates; Adroit Economics provided new build estimates.

Transition Costs

6.17 As well as the costs of meeting the regulations, businesses will incur costs from transitioning to the new regulations. We have identified two transition processes that businesses will have to undertake: (i) familiarisation with the new regulations, and (ii) the creation of new building designs.

6.18 DLUHC analysts and consultants considered whether the training of heat pump installers might also represent a transition cost of the Future Buildings Standard. The Government has a suite of polices in place to support the supply and installation of heat pumps. We expect that the costs of training engineers to become heat pump installers would be covered by those policies.

Familiarisation costs

6.19 As for the 2021 Impact Assessment, for this analysis Adroit Economics used the following process to estimate the familiarisation costs that are likely to occur:

i. Identification of the types of business/organisation that will be affected
ii. Identification of the types of familiarisation activity
iii. Discussion among consultant consortium to identify the time and cost likely to be required, based on industry experience and data from the Office for National Statistics
iv. Scale-up of costs across the industry based on the number of businesses / organisations

6.20 The types of profession that will incur familiarisation costs include the following:

- Energy Consultants
- SBEM Assessors
- Contractors
- Architects
- Engineers (energy modellers)
- Building Control

6.21 The required familiarisation activities include the following:

- Preparing training course material
- Delivering/attending training courses
- Self-study

6.22 Developers and associated professional services personnel will require training to ensure that the designs of future buildings comply with the new regulations and that they procure appropriate components. The analysis also assumes that building control personnel would require training to enable them to assess the building applications and work to the new standards.

6.23 Our analysis to estimate the familiarisation costs divides the changes to be introduced by the Future Buildings Standard as follows:

a) **Requirements:** changes to the notional building and minimum standards
b) **SAP/SBEM:** the adoption of the new versions of the Standard Assessment Procedure (SAP) and SBEM as the approved methodologies for calculating energy efficiency
c) **Other changes**, including tweaks to how the regulations are written

6.24 DLUHC estimated the total familiarisation time required per professional activity by multiplying the expected familiarisation time per person by the number of affected persons in each category. We then estimated the total familiarisation costs of the policy by multiplying the familiarisation time required per professional activity by average hourly employment cost estimates.[24] Adroit Economics gathered the employment cost estimates from the Office for National Statistics.[25]

6.25 Table 8 sets out our estimates of the numbers of organisations in each category to be affected by the changes.

Table 8: numbers of organisations to be affected by the changes in each category. Note: these rounded estimates may not sum to the rounded total.

Organisation category	**Estimated number of organisations to incur familiarisation costs**
Energy consultant	280
Engineer - energy modeller	380
Designers - architects	3,300
Designers - engineers	1,030
Heat pump commissioning	470
Contractors and Developers	15,290
Building Control	440
Planners	450
Total	**21,600**

6.26 Table 9 (overleaf) sets out our estimates of the average familiarisation time requirements per firm, by organisation category.

[24] ONS (2023), Earnings and Hours Worked Occupation by Four-Digit SOC, https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/occupation4digitsoc2010ashetable14

[25] ONS (2020 Q3), Index of Labour Costs per Hour, Seasonally Adjusted, https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/indexoflabourcostsperhourilchseasonallyadjusted

Table 9: familiarisation time required by firm, by policy change, and in total (hrs)

Organisation category	Policy change			**Total**
	Requirements	Drafting of regulations	SBEM	
Energy consultant	61	30	24	**91**
Engineer - energy modeller	14	3	8	**25**
Designers - architects	2	0	0	**2**
Designers - engineers	53	44	44	**141**
Heat pump commissioning	26			**26**
Contractors and Developers	13	0	1	**14**
Building Control	10	10	27	**47**
Planners	-	-	15	**15**

6.27 Table 10 sets out our estimates of the total familiarisation costs by policy change, by organisation category and in total.

Table 10: Estimated total familiarisation costs

Estimated total familiarisation costs, by professional activity (£m)	Requirements	Drafting of regulations	SBEM	**Total**
Energy consultant	0.34	0.16	0.13	**0.64**
Engineer – energy modeller	0.16	0.03	0.09	**0.27**
Designer – architect	0.20	0.03	0.02	**0.25**
Designer – engineer	1.59	1.32	1.32	**4.23**
Heat pump commissioner	0.22	-	-	**0.22**
Contractors and developers	4.18	0.26	0.13	**4.57**
Building Control	0.09	0.09	0.24	**0.43**
Planner	-	-	0.14	**0.14**
Total	**6.77**	**1.77**	**2.21**	**10.75**

6.28 The analysis assumes that adding extra solar PV coverage to the notional building would not impose extra familiarisation costs on businesses. The estimated familiarisation costs are therefore equal across the options. Adding solar PV coverage to the notional building may impose some extra familiarisation costs above the costs of familiarising to the other aspects of the policy. We will therefore seek to refine the approach for the final Impact Assessment.

Creation of new building designs:

6.29 This analysis does not attempt to estimate the costs of redesigning buildings in response to the Future Buildings Standard. Developers update their designs regularly anyway, especially for non-domestic buildings, where standard designs are less common than for dwellings. At this stage, we have not found an effective way of distinguishing the redesign costs that would result from the policy from the costs that developers would incur anyway. We will revisit this approach for the final Impact Assessment. As ever, DLUHC would welcome any evidence that would help us refine our analysis.

7. Business impacts

7.1 This section discusses the impacts of the policy that fall on businesses. Capital and transition costs are all expected to fall on the building developer, with maintenance and replacement costs falling on the occupier. As developers and occupiers are mostly businesses, most of the costs of the policy fall on business. The exception is the case of public buildings, most importantly schools and hospitals.

7.2 Our analysis assumes that the public-private split among new schools and hospitals will follow the same approximate pattern as in the current stock.[26] To this end, the business-focussed analysis excluded 90% of the expected new-build school floorspace and 80% of the expected new-build hospital floorspace.

7.3 In line with Impact Assessment guidance, the analysis values the energy savings in the social cost-benefit analysis presented using the long-run variable price of electricity and gas (to avoid the inclusion of transfer payments in the Impact Assessment). For the purposes of estimating the costs and benefits to business, the analysis instead values energy bill increases at the retail price.

7.4 In line with Green Book guidance, the numbers in Table 11 cover the first ten years of the policy only. This appraisal period captures the majority of costs incurred by business from the regulation uplift, as many of the bigger costs, particularly capital and installation, occur in the first ten years of the policy. For maintenance costs of new non-domestic buildings, the analysis will only include maintenance costs occurring in the first ten years. The analysis will include no replacement costs for new buildings in the calculation, as we assume no replacements will occur in the first ten years. For ease of comparison, all Impact Assessments produced this Parliament present the business impacts figures in 2019 prices and 2020 present value.

7.5 Businesses occupying the buildings will experience the changes in average energy expenditure from the new requirements, except for publicly-owned non-domestic buildings. Meanwhile, reduced carbon emissions and improved air quality are societal benefits, so this business-focussed analysis does not include them.

Table 11: Business impacts over ten years (£m, 2019 prices and 2020 PV). (Table 11 is the same as Table 6.)

	Option 1	Option 2
Equivalent annual net direct cost to business (EANDCB)	111	74
Net present value to business	-1,056	-703

Impact on small and micro businesses

7.6 We estimate that 99.6% of England's 56,610 building and development enterprises and 98.8% of England's 12,910 architectural practices are small or micro. Table 12 breaks

[26] Schools: https://explore-education-statistics.service.gov.uk/data-tables/permalink/67961e79-5204-410e-b521-13d6f647ba33 ; Hospitals: Valuation Office Agency data

down the numbers of small (10-49 employees) and micro (0-9 employees) businesses in the affected sectors. These England-only figures are from the UK Business Counts dataset of the Office for National Statistics, broken down by employment band and SIC code[27], rounded to the nearest five. Given data limitations, some of the businesses included below may not be specific to non-domestic buildings. Equally there will be other professions that we have been unable to include that are involved in the development of new non-domestic buildings. Therefore, the figures should be treated with caution, only used as indicative of magnitude.

Table 12: Number of Small and Micro Businesses in scope of the regulation changes (England)

Business (SIC code)	Micro businesses	Small businesses	Total number of businesses	Small and micro businesses as % of total
Builders and developers	54,125	2,270	56,610	99.6%
Architects	11,850	910	12,910	98.8%

7.7 For the 2021 Part L uplift, DLUHC commissioned Adroit Economics to explore whether small developers would be disproportionately affected by the proposed changes. They based their conclusion that these businesses would not be disproportionately affected on the following findings, which also apply to the Future Buildings Standard.

a. **Small builders/developers:** Adroit concluded that the extent to which small builders and developers would be disproportionately impacted by the changes would be negligible. When contracting, it is typical for small builders to work on a procurement basis with the necessary technical work taken on by others. The builder will therefore buy in the necessary expertise and pass on the cost. The experience of firms working in DLUHC's consultancy consortium confirms this ability for small builders to pass on these costs. Additionally, small and micro builders do not typically engage in the planning and development of non-domestic buildings.

b. **Small architects:** Adroit concluded that the extent to which small builders and developers would be disproportionately impacted by the changes would be negligible. We expect familiarisation costs to be similar across the industry irrespective of size of practice. Smaller practices typically rely on less formal means for information exchange than larger firms, so possibly require fewer formal training events than larger firms. If anything, Adroit therefore judged that small and micro architectural firms were likely to require similar amounts of time per head to larger businesses.

7.8 Based on meetings they previously conducted with regional developers' groups, Currie and Brown also judged that small and micro businesses were unlikely to be affected disproportionately by the changes. Small and micro builders were broadly familiar and

[27] Standard Industrial Classification (SIC) of Economic Activities is a five-digit code used by the ONS to classify businesses' main area of economic activity, and group businesses by the categories of economic activity in which they are engaged.
ONS (2021), Nomis Official Census and Labour Market Statistics, https://www.nomisweb.co.uk/query/select/getdatasetbytheme.asp

comfortable with these technologies. The small sample studied appeared to have secured good costs from their supply chain, unlike larger builders.

7.9 We intend to use the consultation process to gather up-to-date information about differences in the effects of the regulations for small businesses.

Mitigating the impact on small and micro businesses

7.10 As set out above, DLUHC expects the regulation to have only a proportional impact on small or micro businesses. Therefore, there is no specific mitigation planned for these businesses. DLUHC will, however, continue to engage proactively with industry, including representatives of small and micro businesses, as the Future Buildings Standard is introduced.

8. Wider Impacts

8.1 This Impact Assessment has set out the direct costs to businesses and society, such as capital, replacement and maintenance costs. It has also set out the wider societal benefits, such as better air quality and lower emissions. There are, however, several ways in which the Building Regulations may have indirect, wider impacts. This section explores these impacts.

Wider economic impacts

Supply chain effects

8.2 The principal market affected by this policy is the market for the development of new non-domestic buildings. Supply chains will likely need to change the types and number of their products. For example, the Future Buildings Standard will mean that manufacturers of lighting will need to increase the efficacy of their products in order to continue to supply new buildings. These suppliers are likely to experience an increase in capital costs. The need to develop and employ different construction techniques and methods may also result in additional time and financial cost to suppliers. As we expect the changes in costs to affect all building contractors equally, any competitive effects in the market for building development are likely to be negligible.

8.3 Most significantly, the Future Buildings Standard will lead to an increase in demand for heat pumps and electric radiant heating systems, and a decrease in demand for gas systems. Option 1 would produce an increase in the demand for solar photovoltaics. The Government has a suite of polices in place to support the supply and installation of heat pumps.

Innovation

8.4 The setting of higher performance standards, combined with the flexibility for developers to choose technologies to meet these standards, should encourage innovation.

8.5 As the cumulative production of such technologies rises, learning rate effects, coupled with competition, should bring down the unit cost. We have built this learning effect into the modelling of costs.

International trade

8.6 The proposed performance-based standards do not mandate specific technologies or products to be used.

8.7 However, domestic manufacturers (for example of ventilation systems) are likely to change their products and practices to follow Approved Document guidance. If these firms are unable to absorb the additional costs and export some of their products, exports could fall as domestic goods become less competitive. The extent of this effect depends on a wide range of factors, including whether the market is predominantly domestic or international, whether England has a comparative advantage or disadvantage in these goods, the required standards overseas, and the price of goods on the international market. Conversely, the innovation-promoting effects mentioned above could boost the UK's exports, especially if the innovation took place in sectors where the UK has a comparative advantage.

Housing supply

8.8 Measures proposed for new non-domestic buildings will impact the construction industry more generally, but we do not anticipate these will result in impacts on housebuilding and housing supply.

Supply of non-domestic buildings

8.9 Given the relatively small increases in capital costs expected to arise from the policy (see Table 7), we expect any impact on the viability of projects to be negligible. Furthermore, in Option 1, the energy savings mean that developers are likely to be able to pass on some of the capital cost increases to their customers. We intend to explore these impacts further through the consultation process for the final Impact Assessment.

Social Impacts

Health and wellbeing impacts

8.10 The Part L Uplift in 2021 provided significant improvements to fabric efficiency. Increased energy efficiency will improve people's health and quality of life by lowering the costs of achieving comfortable indoor temperatures. Both the 2021 standards and the proposed 2025 standards have high fabric efficiency and are likely to provide similarly high levels of thermal comfort. For this reason, we do not anticipate any additional health or wellbeing benefits from the Future Buildings Standard.

Environmental impacts

8.11 The environmental impacts of this policy, mitigated carbon emissions and improved air quality, are its most important impacts. The environmental impacts are therefore covered in the main results of this Impact Assessment.

9. Equalities assessment

9.1. Under the Equalities Act 2010, all public authorities are required to have due regard of the need to:

a. Eliminate unlawful discrimination, harassment and victimisation and other conduct prohibited by the Act.
b. Advance equality of opportunity between people who share a protected characteristic and those who do not.
c. Foster good relations between people who share a protected characteristic and those who do not.

9.2. This means there is a statutory duty to consider the impacts of the policy changes outlined in this Impact Assessment on people with the protected characteristics of age, disability, gender reassignment, marriage or civil partnership, pregnancy and maternity, race, religion or belief, sex, and sexual orientation.

9.3. As part of the consultation, we are seeking feedback on any potential impacts of the proposals on persons who have a protected characteristic. We will carefully analyse the responses we receive and where appropriate, the final policy will be amended and mitigating measures put in place. In addition to the consultation responses, further sources will also be used during the final policy development process to identify any potential impacts on persons who have a protected characteristic. This includes extensive engagement with a wide range of stakeholders and a review of correspondence that has been received in relation to the proposals.

10. Monitoring and evaluation

10.1. The need for a statutory review clause to monitor and evaluate the impacts of the policy after five years will be determined once the final policy has been agreed. The final Impact Assessment will set out the rationale for this decision and the full details of the monitoring and evaluation strategy. Engagement with industry will likely form a key part of the strategy.

Appendix A – Standards Uptake Assumptions

Main analysis

A.1. Tables A.1-A.9 set out the proportions of new-build floorspace that the main analysis assumes developers would build to each standard under each option. Paragraphs 5.21-5.38 explain how DLUHC arrived at these assumptions.

Do nothing

Warehouses

Table A.1: Standards uptake assumptions for warehouses under the 'Do nothing' option

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BR2021	71.0%	68.0%	65.0%	62.0%	59.0%	56.0%	53.0%	50.0%	47.0%	44.0%
Option 2	14.5%	16.0%	17.5%	19.0%	20.5%	22.0%	23.5%	25.0%	26.5%	28.0%
Option 1 or beyond	14.5%	16.0%	17.5%	19.0%	20.5%	22.0%	23.5%	25.0%	26.5%	28.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Offices

Table A.2: Standards uptake assumptions for offices under the 'Do nothing' option

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BR2021	58.0%	56.0%	54.0%	52.0%	50.0%	48.0%	46.0%	44.0%	42.0%	40.0%
Option 2	21.0%	22.0%	23.0%	24.0%	25.0%	26.0%	27.0%	28.0%	29.0%	30.0%
Option 1 or beyond	21.0%	22.0%	23.0%	24.0%	25.0%	26.0%	27.0%	28.0%	29.0%	30.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Secondary schools, hotels and hospitals

Table A.3: Standards uptake assumptions for secondary schools, hotels and hospitals under the 'Do nothing' option

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BR2021	28.0%	26.0%	24.0%	22.0%	20.0%	18.0%	16.0%	14.0%	12.0%	10.0%
Option 2	36.0%	37.0%	38.0%	39.0%	40.0%	41.0%	42.0%	43.0%	44.0%	45.0%
Option 1 or beyond	36.0%	37.0%	38.0%	39.0%	40.0%	41.0%	42.0%	43.0%	44.0%	45.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Option 1

Warehouses

Table A.4: Standards uptake assumptions for warehouses under Option 1

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BR2021	71.0%	64.6%	32.5%	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Option 2	14.5%	15.2%	8.8%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Option 1 or beyond	14.5%	20.2%	58.8%	96.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Offices

Table A.5: Standards uptake assumptions for offices under Option 1

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BR2021	58.0%	53.2%	27.0%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Option 2	21.0%	20.9%	11.5%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Option 1 or beyond	21.0%	25.9%	61.5%	96.2%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Secondary schools, hotels and hospitals

Table A.6: Standards uptake assumptions for secondary schools, hotels and hospitals under Option 1

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BR2021	28.0%	24.7%	12.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Option 2	36.0%	35.2%	19.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Option 1 or beyond	36.0%	40.2%	69.0%	97.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Option 2

Warehouses

Table A.7: Standards uptake assumptions for warehouses under Option 2

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BR2021	71.0%	64.6%	32.5%	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Option 2	14.5%	19.4%	50.0%	77.9%	79.5%	78.0%	76.5%	75.0%	73.5%	72.0%
Option 1 or beyond	14.5%	16.0%	17.5%	19.0%	20.5%	22.0%	23.5%	25.0%	26.5%	28.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Offices

Table A.8: Standards uptake assumptions for offices under Option 2

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BR2021	58.0%	53.2%	27.0%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Option 2	21.0%	24.8%	50.0%	73.4%	75.0%	74.0%	73.0%	72.0%	71.0%	70.0%
Option 1 or beyond	21.0%	22.0%	23.0%	24.0%	25.0%	26.0%	27.0%	28.0%	29.0%	30.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Secondary schools, hotels and hospitals

Table A.9: Standards uptake assumptions for secondary schools, hotels and hospitals under Option 2

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BR2021	28.0%	24.7%	12.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Option 2	36.0%	38.3%	50.0%	59.9%	60.0%	59.0%	58.0%	57.0%	56.0%	55.0%
Option 1 or beyond	36.0%	37.0%	38.0%	39.0%	40.0%	41.0%	42.0%	43.0%	44.0%	45.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

High warehouse counterfactual scenario

A.2. Tables A.10-A.12 set out the proportions of new-build floorspace that developers would build to each standard under each option, as assumed by the 'high warehouse counterfactual scenario'. Under this scenario, the proportions of new warehouses meeting the Future Buildings Standard in the situation in which it is not introduced is higher than the main analysis assumes. Appendix C explains how DLUHC arrived at these figures. The sensitivity analysis made the same assumptions as the main analysis for the other building types.

Do nothing

Table A.10: Standards uptake assumptions for warehouses under the 'Do nothing' option in the 'high warehouse counterfactual' scenario

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BR2021	61%	57%	54%	50%	47%	43%	40%	36%	33%	29%
Option 2	20%	22%	23%	25%	27%	29%	30%	32%	34%	36%
Option 1 or beyond	20%	22%	23%	25%	27%	29%	30%	32%	34%	36%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Option 1

Table A.11: Standards uptake assumptions for warehouses under Option 1 in the 'high warehouse counterfactual' scenario

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BR2021	61%	54%	27%	3%	0%	0%	0%	0%	0%	0%
Option 2	20%	20%	12%	1%	0%	0%	0%	0%	0%	0%
Option 1 or beyond	20%	25%	62%	96%	100%	100%	100%	100%	100%	100%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Option 2

Table A.12: Standards uptake assumptions for warehouses under Option 2 in the 'high warehouse counterfactual' scenario

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BR2021	61%	54%	27%	3%	0%	0%	0%	0%	0%	0%
Option 2	20%	24%	50%	73%	73%	72%	70%	68%	66%	65%
Option 1 or beyond	20%	22%	23%	25%	27%	29%	30%	32%	34%	36%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Low warehouse counterfactual scenario

A.3. Tables A.13-A.15 set out the proportions of new-build floorspace that developers would build to each standard under each option, as assumed by the 'low warehouse counterfactual scenario'. Under this scenario, the proportions of new warehouses meeting the Future Buildings Standard in the situation in which it is not introduced is lower than the main analysis assumes. Appendix C explains how DLUHC arrived at these figures. The sensitivity analysis made the same assumptions as the main analysis for the other building types.

Do nothing

Table A.13: Standards uptake assumptions for warehouses under the 'Do nothing' option in the 'low warehouse counterfactual' scenario

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BR2021	82%	79%	77%	74%	72%	69%	67%	64%	62%	59%
Option 2	9%	11%	12%	13%	14%	16%	17%	18%	19%	21%
Option 1 or beyond	9%	11%	12%	13%	14%	16%	17%	18%	19%	21%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Option 1

Table A.14: Standards uptake assumptions for warehouses under Option 1 in the 'low warehouse counterfactual' scenario

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BR2021	82%	75%	38%	4%	0%	0%	0%	0%	0%	0%
Option 2	9%	10%	6%	1%	0%	0%	0%	0%	0%	0%
Option 1 or beyond	9%	15%	56%	96%	100%	100%	100%	100%	100%	100%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Option 2

Table A.15: Standards uptake assumptions for warehouses under Option 2 in the 'low warehouse counterfactual' scenario

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BR2021	82%	75%	38%	4%	0%	0%	0%	0%	0%	0%
Option 2	9%	14%	50%	83%	86%	85%	83%	82%	81%	80%
Option 1 or beyond	9%	11%	12%	13%	14%	16%	17%	18%	19%	21%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Appendix B – Cost Breakdown

B.1. Currie & Brown's cost specialists developed these cost estimates, drawing on evidence from their internal cost datasets, recent published cost data and information provided by suppliers.

B.2. The cost analysis attempts to reflect nationally typical costs from Q2-3 2022. The analysis considers the costs of developers with design development, construction processes and a supply chain that are all reasonably efficient. The costs that individual organisations incur will vary according to the organisations' procurement strategies, the location of their activity and the detail of their products. These variations in design, location and delivery method could result in a cost range of +/-c.20%. Notwithstanding these variations, the proportional uplifts associated with moving from one specification to another are likely to be similar across different market segments.[28]

B.3. To provide context to the cost variations assessed in the study, Currie & Brown estimated an indicative overall build cost (£/m^2) for each building archetype, using internal data. This figure is indicative of the level of cost Currie & Brown could expect for a building built in accordance with the requirements of Part 2021. The build cost should be taken as indicative only, as it is sensitive to a wide range of design and specification variables in addition to the variations discussed previously.

B.4. Table B.1 presents base costs for future years in 2022 prices, subject to adjustments for learning for technologies that have not yet reached a mature market position. Construction costs can vary considerably and rapidly with market conditions, particularly where activity levels result in a change in the availability of skills and materials. In these situations, it is fairly typical to see a large (several percentage points) change in overall costs over a period of months.

B.5. Table B.1 includes details of the cost information for the specification options for new non-domestic buildings, including any variations between building types. The numbers include costs only for those specifications that vary between the considered options, including the 'Do nothing' option in which the 2021 standards are maintained.

[28] Cost increases may be outside the described range for highly bespoke designs. However, these buildings are typically more expensive to build, so the relative impact on build costs may be similar or smaller than for typical buildings constructed in higher volumes.

Table B.1: Cost data for elements that vary between the selected specifications for new non-domestic buildings

Element	Specification	Unit	New cost (£ per unit)
Airtightness – warehouses only	5 $m^3 m^2$ hr	m² Gross Internal Floor Area	£0
	3 $m^3 m^2$ hr		£8.5
Light fittings - general	95 llm/cW	m² lit floor area	£76
	105 llm/cW		£86
	150 llm/cW		£121
	170 llm/cW (Warehouses only)		£121
Light fittings - display	95 llm/cW	m² lit floor area	£45
	105 llm/cW		£60
	120 llm/cW		£72
Ventilation heat recovery	76%	m^3/second delivered air	£9081
	80%		£9413
Gas boiler	93%	kW capacity	£50
Air source heat pump		kW capacity	£495
High temperature air source heat pump		kW capacity	£668
Heating sundries (gas system) – flue, gas supply, pumps, controls, etc		m² Gross Internal Floor Area	£13
Heating sundries (heat pump system) – power supply, pumps, controls, etc		m² Gross Internal Floor Area	£9
Instantaneous point of use hot water		m² serviced floor area	£2
Radiant panel heaters (gas fired)		m² serviced floor area	£24
Radiant panel heaters (electric)		m² serviced floor area	£19
Roof mounted - photovoltaic panels mounted on frames on accessible concrete flat roof	Variable costs	Per kWp installed	£1,218

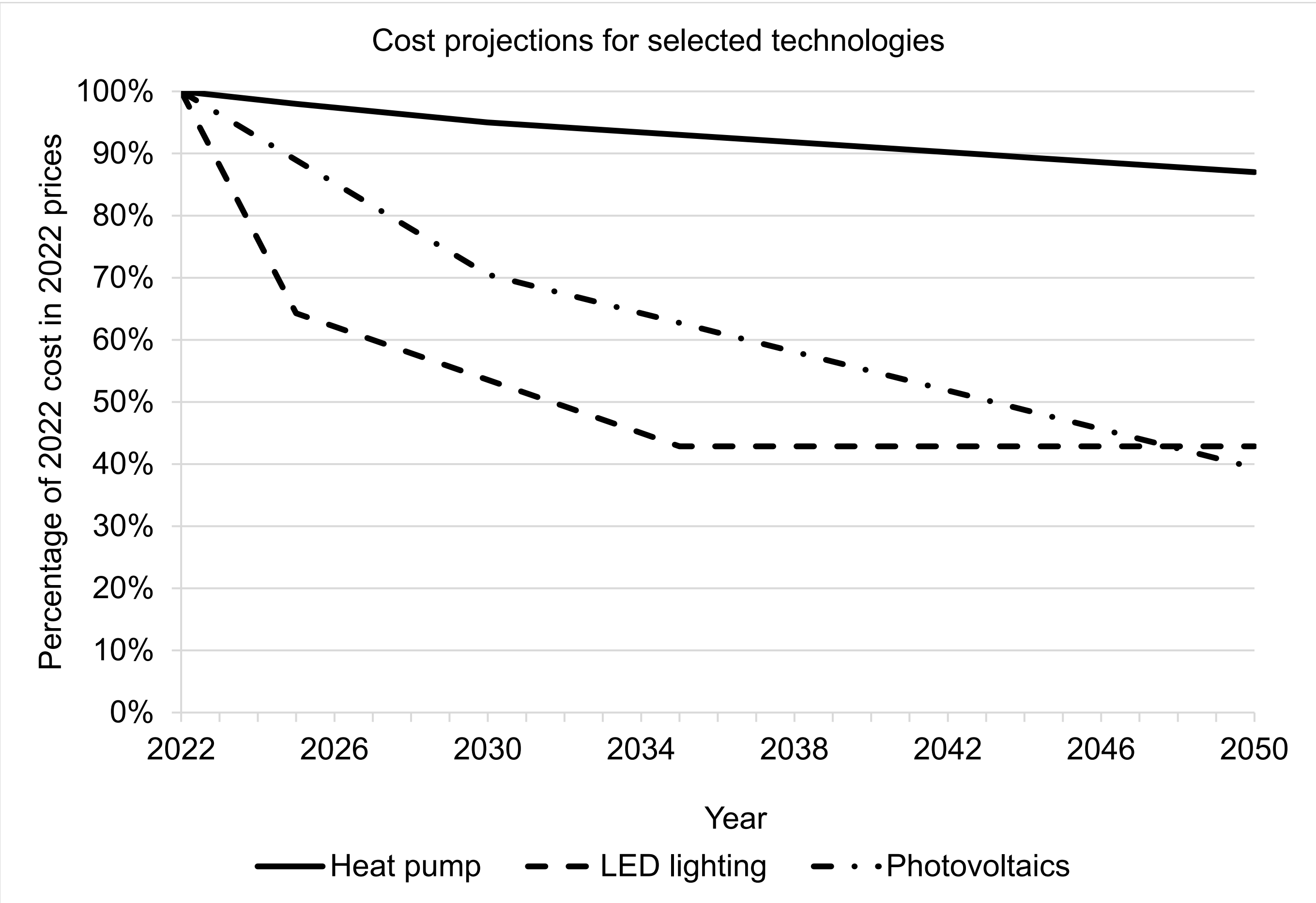
Cost projections

B.6. Currie and Brown assigned cost projections to each specification option to capture any expected change in the current cost over time. For many building elements they applied no adjustment to the current costs because the technology is mature and unlikely to experience a significant reduction in cost per unit of performance. This assumption does not imply that cost will not change, only that we do not expect it to change by an amount disproportionate to the wider construction cost base.

B.7. For less mature specifications, Currie and Brown assessed the potential for future reductions in cost through learning. This analysis generated these projections using published cost projections or by applying appropriate learning rates to global market projections.

B.8. Figure B.1 shows the future cost projections of technologies where learning rates were applied: heat pumps, LED lighting and photovoltaic panels. These cost projections are relative to 2022 costs and do not account for other economic and market factors that will impact costs over this period (e.g., market conditions, interest and exchange rates, skills availability and commodity prices).

Figure B.1 Projected variation in base costs as a result of learning



Appendix C – Sensitivity Analysis

C.1. There is uncertainty in all the various assumptions that feed into the cost-benefit analysis. DLUHC analysts have therefore explored the sensitivity of the results to changes in the assumptions. An overall sensitivity analysis explored the general effect of uncertainty by varying total costs and benefits. The counterfactual assumptions for warehouses are particularly uncertain (see paragraphs 5.24 – 5.32), so a specific sensitivity analysis explored the effect of varying these assumptions. The same is true for the replacement of gas systems under the counterfactual (see paragraph 5.39).

Overall uncertainty range

C.2. The analysis presented in Tables C.1 and C.2 created simple ranges around the net present value estimates for Options 1 and 2. For each option, we calculated the high estimates by increasing the estimated total costs and benefits by an indicative twenty percent and decreasing the estimated total costs and benefits by the same proportion. We calculated the low estimates in the opposite way.

Table C.1: Overall uncertainty range for Option 1

	Option 1		
(£m)	High estimate	Central-case estimate	Low estimate
Total costs	2,831	2,359	1,887
Total benefits	3,825	3,188	2,550
NPV	994	829	663

Table C.2: Overall uncertainty range for Option 2

	Option 2		
(£m)	High estimate	Central-case estimate	Low estimate
Total costs	1,516	1,264	1,011
Total benefits	1,277	1,065	852
NPV	-239	-199	-159

Warehouse counterfactual

C.3. The analysis presented in Tables C.3 and C.4 explores the effect of the uncertainty as to the standards to which developers would build warehouses under the counterfactual.

The 'low warehouse counterfactual' scenario assumes that 16% of new warehouses would be built to Option 2 or beyond in the counterfactual in 2025. This assumption is ten points lower than the 26% assumed in the central analysis.
Whereas the central analysis assumes that this percentage would increase by 3 points per year, the low-counterfactual analysis assumes it would increase by 2.5.

The 'high warehouse counterfactual' scenario assumes that 36% of new warehouses would be built to Option 2 or beyond in the counterfactual in 2025. This assumption is ten points higher than the 26% assumed in the central analysis.
Whereas the central analysis assumes that this percentage would increase by 3 points per year, the high-counterfactual analysis assumes it would increase by 3.5.

As in the main analysis, in all cases the proportion of new warehouses built to Option 1 or Option 2 is split evenly between the two options.

Table C.3: Effect on the results for Option 1 of varying the warehouse counterfactual. Summary of costs and benefits to society, monetary units (£m, 2022 prices and 2025 PV). The table presents costs in brackets to indicate that their net present value is negative.

Option 1			
	Low warehouse counterfactual	Central-case assumptions	High warehouse counterfactual
Transition costs (£m)	(11)	(11)	(11)
Energy savings (£m)	822	934	1,046
Capital, maintenance, and replacement costs (£m)	(2,565)	(2,348)	(2,132)
Total financial benefit/(cost) (£m)	(1,753)	(1,425)	(1,098)
Carbon savings - non-traded (£m) Carbon savings - traded (£m)	2,601 31	2,164 43	1,728 54
Total carbon savings (£m)	2,632	2,207	1,782
Air quality savings (£m)	56	47	38
Total carbon and air quality savings	2,688	2,254	1,820
Net benefit/(cost) (£m)	935	829	723
Amount of gas saved (GWh)	95,300	79,251	63,202
Amount of electricity saved (GWh)	19,849	25,619	31,389
Amount of CO_2 saved - non-traded ($MtCO_2e$)	17.4	14.5	11.5
Amount of CO_2 saved - traded ($MtCO_2e$)	0.15	0.21	0.26
Amount of CO_2 saved - total ($MtCO_2e$)	17.6	14.7	11.8
Cost effectiveness – non-traded (£/tCO_2)	104	101	98
Cost effectiveness – traded (£/tCO_2)	n/a	n/a	n/a

Table C.4: Effect on the results for Option 2 of varying the warehouse counterfactual. Summary of costs and benefits to society, monetary units (£m, 2022 prices and 2025 PV). The table presents costs in brackets to indicate that their net present value is negative.

Option 2			
	Low warehouse counterfactual	Central-case assumptions	High warehouse counterfactual
Transition costs (£m)	(11)	(11)	(11)
Energy savings (£m)	(1,300)	(1,043)	(786)
Capital, maintenance, and replacement costs (£m)	(1,388)	(1,253)	(1,118)
Total financial benefit/(cost) (£m)	(2,699)	(2,307)	(1,914)
Carbon savings - non-traded (£m) Carbon savings - traded (£m)	2,601 (122)	2,164 (100)	1,728 (79)
Total carbon savings (£m)	2,479	2,064	1,649
Air quality savings (£m)	52	43	34
Total carbon and air quality savings	2,531	2,108	1,684
Net benefit/(cost) (£m)	(168)	(199)	(230)
Amount of gas saved (GWh)	95,300	79,251	63,202
Amount of electricity saved (GWh)	(60,348)	(49,044)	(37,740)
Amount of CO_2 saved - non-traded ($MtCO_2e$)	17.4	14.5	11.5
Amount of CO_2 saved - traded ($MtCO_2e$)	(0.59)	(0.48)	(0.38)
Amount of CO_2 saved - total ($MtCO_2e$)	16.8	14.0	11.2
Cost effectiveness – non-traded (£/tCO_2)	159	163	170
Cost effectiveness – traded (£/tCO_2)	n/a	n/a	n/a

C.4. Assuming a counterfactual scenario in which more warehouses would take up the standard anyway reduces the magnitude of most of the impacts of the policy. The carbon savings, air quality benefits, gas savings, and capital cost increases of Option 1 all diminish as the uptake of the standard under the counterfactual increases.

C.5. Less intuitively, the electricity savings and energy savings of Option 1 increase as the counterfactual assumptions increase. As the counterfactual assumptions increase in this model, the proportion of new buildings constructed to Part L as defined by Option 2 increases under the counterfactual. Because buildings constructed to this standard include electric heating systems but no extra solar PV coverage, they have higher net electricity consumption than buildings constructed to Part L 2021. Therefore, the more buildings are constructed under the counterfactual to Part L as defined by Option 2, the greater the energy savings from moving to Option 1.

C.6. Because Option 2 produces an increase in net electricity consumption, the results of this sensitivity analysis follow the more intuitive pattern. All the impacts of Option 2 diminish in magnitude as the counterfactual assumptions increase.

Replacement of gas boilers

C.7. The analysis presented in Tables C.5 and C.6 explores the effect of varying the assumption around the replacement of gas systems at the end of their lives under the counterfactual: see paragraph 5.39.

Table C.5: Effect on the results for Option 1 of assuming that building occupiers replace gas with electric systems at the end of their lives. Summary of costs and benefits to society, monetary units (£m, 2022 prices and 2025 PV). The table presents costs in brackets to indicate that their net present value is negative.

	Option 1	
	Gas replaced by gas (central-case)	Gas replaced by electricity
Transition costs (£m)	(11)	(11)
Energy savings (£m)	934	1,054
Capital, maintenance, and replacement costs (£m)	(2,348)	(2,103)
Total financial benefit/(cost) (£m)	(1,425)	(1,060)
Carbon savings - non-traded (£m) Carbon savings - traded (£m)	2,164 43	767 50
Total carbon savings (£m)	2,207	817
Air quality savings (£m)	47	22
Total carbon and air quality savings	2,254	838
Net benefit/(cost) (£m)	829	(221)
Amount of gas saved (GWh)	79,251	19,786
Amount of electricity saved (GWh)	25,619	44,990
Amount of CO_2 saved - non-traded ($MtCO_2e$)	14.5	3.6
Amount of CO_2 saved - traded ($MtCO_2e$)	0.21	0.26
Amount of CO_2 saved - total ($MtCO_2e$)	14.7	3.9
Cost effectiveness – non-traded (£/tCO_2)	101	310
Cost effectiveness – traded (£/tCO_2)	n/a	n/a

Table C.6: Effect on the results for Option 2 of assuming that building occupiers replace gas systems with electric systems at the end of their lives. Summary of costs and benefits to society, monetary units (£m, 2022 prices and 2025 PV). The table presents costs in brackets to indicate that their net present value is negative.

	Option 2	
	Gas replaced by gas (central-case)	Gas replaced by electricity
Transition costs (£m)	(11)	(11)
Energy savings (£m)	(1,043)	(923)
Capital, maintenance, and replacement costs (£m)	(1,253)	(1,007)
Total financial benefit/(cost) (£m)	(2,307)	(1,941)
Carbon savings - non-traded (£m) Carbon savings - traded (£m)	2,164 (100)	767 (93)
Total carbon savings (£m)	2,064	674
Air quality savings (£m)	43	19
Total carbon and air quality savings	2,108	692
Net benefit/(cost) (£m)	(199)	(1,249)
Amount of gas saved (GWh)	79,251	19,786
Amount of electricity saved (GWh)	(49,044)	(29,673)
Amount of CO_2 saved - non-traded ($MtCO_2e$)	14.5	3.6
Amount of CO_2 saved - traded ($MtCO_2e$)	(0.48)	(0.43)
Amount of CO_2 saved - total ($MtCO_2e$)	14.0	3.2
Cost effectiveness – non-traded (£/tCO_2)	163	558
Cost effectiveness – traded (£/tCO_2)	n/a	n/a

C.8. As expected, assuming a counterfactual scenario in which building occupiers replace gas systems with electric systems diminishes the impacts of the policy. The carbon savings, air quality benefits, gas savings, and capital cost increases of Option 1 all diminish. These benefits of decarbonising heating and hot water decrease when more buildings are using electric systems anyway.

C.9. However, the electricity savings and energy savings of Option 1 are higher when gas is replaced by electricity under the counterfactual. Assuming that gas systems would be replaced by electric systems under the counterfactual means that electricity consumption is greater under the counterfactual. Changing this assumption increases the benefits of moving to Option 1 because electricity consumption is offset by greater solar PV coverage under this option.

C.10. Option 2 does not offer this offsetting, so the electricity consumption increases diminish as one might expect when the proportion of buildings using electricity anyway increases.