



Department of

Finance

An Roinn

Airgeadais

www.finance-ni.gov.uk

The Building Regulations (Northern Ireland) 2012

PUBLIC CONSULTATION DOCUMENT C.2

Draft Consultation Regulatory Impact Assessment for amendment of Technical Booklet Guidance to Part F (Conservation of fuel and power)

October 2021

[This page is intentionally blank]

DRAFT

Title: Regulatory Impact Assessment for amendment of Technical Booklet Guidance to Part F (Conservation of fuel and power)	Regulatory Impact Assessment (RIA)		
	Date: August 2021(Draft)		
Lead department or agency: Department of Finance (the Department)	Type of measure: amendment to statutory guidance		
	Stage: Draft		
Other departments or agencies:	Source of intervention: Domestic NI and EU directive 2010/31/EU		
	Contact details: Building Standards Branch		
	Properties Division, 6 th floor Goodwood House 44-58 May Street, Belfast BT1 4NN		

Summary Intervention and Options

What is the problem under consideration? Why is government intervention necessary?	
<p>Amendments to the Department's Technical Booklet guidance are required to ensure that building work takes energy efficiency and carbon impacts into account, as developers are insufficiently incentivised to take these impacts into consideration otherwise. An uplift to the guidance is also expected to provide a more robust interpretation of 'nearly zero-energy building' (NZEB) requirements for new buildings as required by regulation 43B (Nearly zero-energy requirements for new buildings) of the Building Regulations, which implemented Article 9 (Nearly zero-energy buildings) of the Energy Performance of Buildings Directive 2010/31/EU.</p>	
What are the policy objectives and the intended effects?	
<p>The objective is to improve operational emissions performance and energy efficiency standards for new buildings. The proposals also need to take into account local industry capacity and forthcoming amendments in other regions, likely to be replicated here in subsequent uplifts.</p>	
What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)	
<p>Option 1 – Do Nothing Option 2 – A 25% emissions rating 'betterment' for new dwellings and a 15% emissions rating betterment for new buildings other than dwellings. Option 3- A 40% emissions betterment for new houses, 25% for new flats and 15% for new buildings other than dwellings Options 2 and 3 include improved minimum acceptable fabric insulation standards to prevent renewables or low carbon heating unduly relaxing the building fabric performance.</p> <p>Option 3 is the preferred option as it provides a better net present value return.</p>	
Note	If applicable, set review date:

Cost of Preferred (or more likely) Option		
Total outlay cost for business £m	Total net cost to business per year £m	Annual cost for implementation by Regulator £m
£292.9M (undiscounted) for 10 years of building and 60 years of maintenance / replacement	£3.7m/annum (undiscounted)	£101k/annum (undiscounted)

Does Implementation go beyond minimum EU requirements?	N/A ✓		YES	
Are any of these organisations in scope?	Micro Yes ✓ No	Small Yes ✓ No	Medium Yes ✓ No	Large Yes ✓ No

Approved by: _____ Date: _____

Summary: Analysis and Evidence Policy Option 1

Description: **Do nothing**

ECONOMIC ASSESSMENT (Option 1)

Costs (£m)	Total Transitional (Policy)		Average Annual (recurring)	Total Cost
£0	(constant price)	Years	(excl. transitional) (constant price)	(Present Value)
Low	Optional		Optional	Optional
High	Optional		Optional	Optional
Best Estimate	N/A		N/A	N/A

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

Option 1 - Do nothing, imposes no monetised costs on the main affected groups.

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

Option 1 - Do nothing, imposes no direct costs on the main affected groups.

Benefits (£m)	Total Transitional (Policy)		Average Annual (recurring)	Total Benefit
	(constant price)	Years	(excl. transitional) (constant price)	(Present Value)
Low	Optional		Optional	Optional
High	Optional		Optional	Optional
Best Estimate	N/A		N/A	N/A

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

Option 1 - Do nothing, produces no additional benefits for the main affected groups.

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

Option 1 - Do nothing, produces no additional non-monetised benefits for the main affected groups.

Key Assumptions, Sensitivities, Risks

Costs do not factor in impact costs arising from a failure to reduce emissions output of new buildings.

BUSINESS ASSESSMENT (Option 1)

Direct Impact on business (Equivalent Annual) £m			
Costs: N/A	Benefits: N/A	Net: N/A	

Cross Border Issues (Option 1)

How does this option compare to other UK regions and to other EU Member States (particularly Republic of Ireland)?

This option compares poorly to other UK regions, where uplifts have already occurred in 2013-15 and with further uplifts proposed. RoI delivered substantial uplifts to provide demanding 'nearly zero-energy building' standards in 2019.

ECONOMIC ASSESSMENT (Option 2)

Costs (£m)	Total Transitional (Policy)		Average Annual (recurring)	Total Cost
	(constant price)	Years	(excl. transitional) (constant price)	(Present Value)
Low	Optional	1	Optional	Optional
High	Optional		Optional	Optional
Best Estimate	£152k- training and adaptation costs (year 1 only)		£16.5M construction (yr 1-10) £3.6M maintenance (yr 5-70) – (both values undiscounted)	£221.5M Net Present Costs after 70 years

Description and scale of key monetised costs by ‘main affected groups’

Option 2 –

- The main cost burden of additional construction costs will fall on developers, although this may be taken into account within land prices over the medium term. In this case, the long-term burden would fall to land owners.
- Where the uplifted emissions performance requirements lead to provision of onsite renewable generating technologies, building owners will have increased maintenance and replacement costs over the buildings lifetime.
- Enforcement bodies and designers will have increased assessment costs with additional manual checks of assessments.

Other key non-monetised costs by ‘main affected groups’

Option 2

- Grid reinforcement costs (this is a wider policy area, likely to be impacted by measures/market expectations in the round e.g. for Electric Vehicle chargepoints etc).

Benefits (£m)	Total Transitional (Policy)		Average Annual (recurring)	Total Benefit
	(constant price)	Years	(excl. transitional) (constant price)	(Present Value)
Low	Optional		Optional	Optional
High	Optional		Optional	Optional
Best Estimate	£0		£10.4 undiscounted (yr 1-70)	£245.5 Net Present Benefits after 70 years

Description and scale of key monetised benefits by ‘main affected groups’

Option 2 – The main benefits will accrue to building energy bill payers with reduced energy bills. Society will benefit from air quality and a lowered rate of carbon emissions than would otherwise occur (these have been monetised in the assessment).

Other key non-monetised benefits by ‘main affected groups’

Option 2 – The following potential benefits have not been monetised

- Health benefits to building occupants from improved thermal comfort.
- Benefits to industry from additional construction activity, e.g. production of additional construction products and materials.
- Wider consequential benefits accruing from improved electricity grid infrastructure.
- Benefits to building owners from avoidance, or reduction, of future retrofit measures, if needed for zero carbon emission programmes.

Key Assumptions, Sensitivities, Risks

Option 2- Key assumptions

- Future energy pricing, carbon and air quality benefits for years 2022-2092 are assumed to be in line with central case valuations from *BEIS HMT Green book supplementary guidance on valuations of emissions and energy savings*.
- Energy reductions are assumed consistent with outputs from NCM energy performance assessment software (e.g. SAP)
- No ‘rebound’ effects are included, as it is assumed similar comfort levels would have been provided in the current standards
- A phased-in build rate of 10%, 50% and 88% for years 1-3
- A mix of fuel use is assumed in line with Annex C in this document
- Non-domestic assumptions are provisional and are principally based other Impact Assessment of other

nations (notably England's Part L 2013 Impact Assessment), with initial assessment only of the ratio of fabric to renewables improvements.

- Business costs assessment assumes 100% of dwelling construction costs are developer led and that 33% of dwelling revenue costs (principally maintenance and replacement of photovoltaics) are for rental sector (based on NI Housing Condition Survey headline figures). Benefits from all domestic energy savings are assumed to accrue to tenants and not included in the Business assessment.

BUSINESS ASSESSMENT (Option 2)

Direct Impact on business (Equivalent Annual) £m			
Costs: £6.0m	Benefits: £0.4m	Net: -£5.6m	NPVs to 2022 prices

Cross Border Issues (Option 2)

How does this option compare to other UK regions and to other EU Member States (particularly Republic of Ireland) ?

It is not straightforward to directly compare proposals with other administrations, as there is different relevant software and methodologies operating in the various cases. However, in broad terms, these proposals are intended as an interim step which should require new dwellings to perform, on average, better than those under England's or Wales' current equivalent regimes. New build non-domestic standards will be on average better than England, although not necessarily across all type of buildings. It has not been possible, at this stage, to compare to Wales' non-domestic standards (which has an additional 'primary energy' performance metric), nor to standards in Scotland, but the expectation is that the Option 2 and 3 proposals should be reasonably close to their current positions.

The GB nations (England, Wales and Scotland) are all planning future uplifts, which are likely to exceed these proposals. The Department plans to further review the position in light of the outcome of these developments.

Overall new build energy efficiency standards in RoI are still likely to be higher than under the proposed interim proposals, but the changes to limiting insulation standards for building fabric bring alignment in this limited respect, at least.

DRAFT

ECONOMIC ASSESSMENT (Option 3)

Costs (£m)	Total Transitional (Policy)		Average Annual (recurring)	Total Cost
	(constant price)	Years	(excl. transitional) (constant price)	(Net Present Value)
Low	Optional	70 (10 construction, 60 maintenance)	Optional	Optional
High	Optional		Optional	Optional
Best Estimate	£152k- training and adaptation costs (year 1 only)		£19.6M construction (yr 1-10) £4.3M maintenance (yr 5-70) (both values undiscounted)	£253.5M Net Present Costs after 70 years

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

Option 3- as Option 2, however the increased benefits are due to a requirement for a 40% betterment of the current emissions rating for new houses, rather than a 25% betterment proposed under Option 2.

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

Option 3- as Option 2

Benefits (£m)	Total Transitional (Policy)		Average Annual (recurring)	Total Benefit
	(constant price)	Years	(excl. transitional) (constant price)	(Present Value)
Low	Optional	70	Optional	Optional
High	Optional		Optional	Optional
Best Estimate	£0		£15.7M undiscounted (yr 1-70 inc)	£375.4 Net Present Benefits after 70 years

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

Option 3- As option 2, however there would be an increased benefit to bill payers in houses and to society in general through reduced emissions and improved air quality.

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

Option 3- as option 2

Key Assumptions, Sensitivities, Risks

Option 3- As option 2

BUSINESS ASSESSMENT (Option 3)

Direct Impact on business (Equivalent Annual) £m (NPV over 70 year assessment period)				
Costs: £7.1M	Benefits: £0.4M	Net:- £6.7M		NPVs at 2022 prices

Cross Border Issues (Option 3)

How does this option compare to other UK regions and to other EU Member States (particularly Republic of Ireland) ?

As option 2, however there would be some improved performance with respect to new homes' emissions and running costs.

[This page is intentionally blank]

DRAFT

Evidence Base (for summary sheets)

Contents

SECTION		PAGE
1	INTRODUCTION	8
2	BACKGROUND	9
3	SUMMARY OF AMENDMENTS	10
4	SUMMARY OF COSTS AND BENEFITS	11
5	MONETISED ASSESSMENT; CONSIDERATIONS AND ASSUMPTIONS	12
6	OTHER IMPACTS AND RISKS	20
7	MONITORING AND REVIEW	22
8	CONSULTATION	23
ANNEX A	Cost Information	25
ANNEX B	Outcomes for typical dwellings	28
ANNEX C	Dwelling type and fuel mix assumptions	31

1. INTRODUCTION

- 1.0 The Department of Finance has policy responsibility for maintaining the Building Regulations.
- 1.1 The Building Regulations apply to most building work and are made principally to secure the health, safety, welfare and convenience of people in or about buildings, further the conservation of fuel and power, further the protection and enhancement of the environment and promotion of sustainable development.
- 1.2 The regulations set mainly functional requirements and are supported by Technical Booklets giving guidance, including performance standards and design provisions, relating to compliance with specific aspects of the Building Regulations for the more common building situations.

Purpose and intended effect of measures

- 1.3 The main purpose and effect of the amendment is to improve the energy efficiency and emissions performance of new buildings.

Scope

- 1.4 This Consultation stage Draft Regulatory Impact Assessment (RIA) addresses an amendment of Part F (Conservation of fuel and power) Technical Booklets F1 and F2. The proposals apply most specifically to new buildings, setting additional uplifted guidance where regulation 43B (Nearly zero-energy requirements for new buildings) applies.

Objective

- 1.5 The overall objective of the amendment is to improve new build energy performance and reduce emissions, taking into account that proposals coming forward in other regions and energy assessment software under development by the UK government will inform measures subsequently.
- 1.6 The uplift is intended as a meaningful interim step, striking a balance between the need for immediate action (given the last meaningful uplift was in 2012), the capacity of industry locally, the ambition of low or zero carbon buildings in the future and the outcome of wider policy developments, such as the Department for the Economy's Energy Strategy.
- 1.7 The amended guidance should also provide a more robust approach to the current 'nearly zero-energy building' (NZEB) requirements, as required under regulation 43B (Nearly zero-energy requirements for new buildings), which implements Article 9 of the Energy Performance of Buildings Directive (2010/31/EU).

2. BACKGROUND

- 2.1 Part F (Conservation of fuel and power) of the Building Regulations exists to ensure reasonable standards of energy efficiency are implemented when relevant building work is carried out. The Building Regulations (Northern Ireland) Order 1979 (as amended) provides the powers for these regulations. The Order requires that any standards set should be considered to be 'reasonably attainable' by the Department.
- 2.2 Part F further implements certain minimum energy performance aspects of the Energy Performance of Buildings Directive (2010/31/EU) (EPBD). The EPBD was amended by Directive 2018/844/EU (EPBD 3). New software is currently under development by the UK government and associated uplifts to building regulations will be required to implement all the technical requirements of EPBD 3. At the same time, the Executive has agreed a number of cross-departmental exercises, notably work on an Energy Strategy (led by DfE) and on Green Growth (led by DAERA). The uplifts to the Part F Technical Booklets proposed at this stage are intended to ensure local standards are not further delayed whilst the outcome of these wider developments is considered.
- 2.3 A provisional phased programme of Part F uplifts was published in the Energy Strategy Options Consultation and the Department will further consult on these in a discussion document consultation subsequent to this consultation.

Further background is provided in Section 1 of the main Consultation Document C.2

Rationale for government intervention

- 2.4 Government intervention is needed to ensure that building work takes energy efficiency and carbon impacts into account, as developers are normally insufficiently incentivised to take these outcomes into consideration otherwise.
- 2.5 An uplift to the guidance should also provide a more robust interpretation of EPBD and NZEB related requirements for new buildings.

3. SUMMARY OF AMENDMENTS

- 3.1 It is proposed to uplift the minimum energy efficiency standards for new buildings. Three options have been considered –
- **Option 1:** do nothing;
 - **Option 2:** require NZEB buildings to better the current Target carbon dioxide Emissions Rate (TER) outputs by 25%, in the case of new dwellings, and 15%, in the case of new non-domestic buildings; and
 - **Option 3:** require NZEB buildings to better the current Target carbon dioxide Emissions Rate (TER) outputs by 40% in the case of new houses, 25% in the case of new flats, and 15%, in the case of new non-domestic buildings.
- 3.2 Options 2 and 3 also propose to –
- uplift limiting fabric standards for new buildings to prevent excessive relaxation of building envelope insulation standards (particularly where additional renewables are provided); and
 - encourage a greater degree of air tightness testing, including no longer accepting an air permeability value of $15\text{m}^3/(\text{m}^2\cdot\text{h})@50\text{Pa}$ for certain untested new single houses or small non-domestic buildings $<500\text{m}^2$.
- 3.3 It is proposed to retain the existing software with the new requirements applied as manual checks/adjustments of the current outputs. Where emissions savings or offsets are provided through electrical savings (or on site renewable generation at the building), emissions reductions in practice are likely to be less than the 40%, 25% or 15% betterments, as the current software does not reflect recent decarbonisation of the grid.
- 3.4 **Option 3 is the preferred option** with a better overall return on investment. It would deliver more carbon savings and provide better reductions in energy bills, albeit with higher build costs for developers.

Further detail can be found in Section 2 of the main Consultation Document C.1

4. SUMMARY OF COMPLIANCE COSTS & BENEFITS

Option 1

4.1 Option 1 is considered to have no costs and no benefits. It is not considered to provide an adequate response to climate change issues and fails to improve NZEB outcomes. It has been discounted from further assessment.

Options 2 and 3

4.2 Table 1 provides a summary of the outcome of the Impact assessment analysis, with significant overall benefits of £122M over the 70 year assessment period for Option 2 and the preferred Option 3.

Table 1: summary of total costs and benefits

Item	Option 2 (£M)	Option 3 (£M)	Accrual years	Impacts who?
Transition costs	£0.15	£0.15	year 1	industry and enforcement
Construction costs	£164.9	£196.3	years 1-10	developers
Replacement and maintenance costs	£233.3	£278.1	years 5-70	building owners
Total costs (undiscounted)	£398.4	£474.1		
Total costs (discounted Net Present Cost)	£221.5	£253.4		
Energy savings	£508.1	£812.5	years 1-70	bill payers
Carbon savings (traded)	£12.1	£20.0	years 1-70	society generally
Carbon savings (non-traded)	£165.0	£213.1	years 1-70	society generally
Air quality savings	£42.6	£54.7	years 1-70	society generally
Total benefits (undiscounted)	£727.8	£1,100.0		
Total benefits (discounted Net Present Benefit)	£245.5	£375.4		
Total value NPV (NPV discounted)	£32.6	£121.9		
Total value (NPV discounted) to industry only	-£154.0	-£185.3		

- 4.3 The undiscounted capital cost impact to developers for the measures totals around £165M for Option 2 and £196M for Option 3 over the first 10 years of the policy. As noted above, some of this may be taken into account in land price valuations over time, and, as regulation 43B (NZEB) has been in place for some time without any cost impact to date on developers, it is expected that industry should be primed to accept this impact. An alternative analysis would be that the construction price increase may pass on, at least to some degree, in new-build price or housing supply pressures.
- 4.4 The Net Present Value impact on 'industry only' also includes the new additional maintenance and replacement costs for all non-domestic buildings and for 33% of the new build dwellings, on the basis that landlords will have to fund the ongoing PV maintenance and replacement over the 60 year cycle presumed.
- 4.5 Both Option 2 and Option 3 appear to be cost-effective both in terms of impacts on individual buildings and overall, with Option 2 providing a NPV benefit of £32.6M and Option 3 a benefit of £121.9M. We believe this difference is mainly due to efficiencies of scale with larger PV installations anticipated under Option 3, noting the energy savings are less under option 2, but maintenance costs will be similar.
- 4.6 Non-monetised benefits are noted in Section 6.

5. MONETISED ASSESSMENT; CONSIDERATIONS AND ASSUMPTIONS

Methodology and assumptions

- 5.1 The assessment considers 10 years of building and a subsequent 60-year period of costs and benefits, to ensure that the full savings from building fabric improvements are taken into account. Costs include the additional maintenance and replacement costs for building services additions (photovoltaic arrays and the additional costs incurred if replacing a heat pumps rather than a boiler¹) over the 60 year lifespan of the assessment.
- 5.2 A phasing in approach was applied to account for the build-out of building regulations applications already made or in progress at the time of introduction on the revised policy. This assumes the new Part F guidance will apply to 10% of the buildings constructed in Year 1, rising to 50%, 88%

¹ A small percentage of heat pump installations has been assumed - see Annex C for further detail on the relative mix.

and then 100% in years 2, 3 and 4 respectively. This may be revised in the final assessment stage.

- 5.3 Similarly, an annual 'learning rate' discount was applied to the costs for new additional equipment (notably photovoltaics and heat pumps) over the first 10 year period. A 4% discount of year 1 costs is applied annually to photovoltaics for 10 years (in keeping with England's recent Part L assessments²) and we have applied a similar discount of 1% of year 1 costs to heat pump costs for 10 years also, which we believe is conservative by comparison.
- 5.4 Monetised carbon, energy cost savings and air quality benefits were assigned for each year of the 70 year assessment period in accordance with the central case values in BEIS *Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal*. The BEIS guidance values carbon savings using UK average values which escalate as years progress, with forward looking UK net zero 2050 expectations modelled in. This is applied using traded values for electricity and non-traded carbon values for all other fuels, as large scale electrical power providers should already be included in emissions trading arrangements.
- 5.5 The BEIS guidance requires energy efficiency savings to be calculated on the basis of 'variable' rather than 'retail' costs. By way of example, the 2022 retail cost for electricity under the guidance is 21.5p/kWh (notably high by comparison to actual retail prices available in NI over recent years), but the variable cost is 10.9p/kWh, once the 'fixed' costs of the electricity provision (infrastructure, power providers' profits and the lost tax revenues etc) are taken into account. The bill payer will benefit by the full retail cost saving, but for the purposes of the impact assessment the benefit to society is deemed on the basis of variable costs only. This is quite different to day-to-day 'pay-back' assumptions from a consumer perspective, but normal for this type of macro-economic assessment.
- 5.6 Air quality benefit factors are costed on the default national averages provide in the BEIS toolkit, rather than any specific urban or rural condition values.
- 5.7 Costs and monetised benefits in future years are then discounted to provide a Net Present Value (NPV) in accordance with *NI Guidance on Appraisal and Evaluation of Expenditure* and *HM Treasury Green book* assumptions.

² See England's [Future Homes Standard consultation stage Impact Assessment](#).

5.8 This applies a discount rate of 3.5% to the first 30 years and then 3.0% subsequently to both costs and benefits to reflect the decreased value of future investment when compared to today.

- Where a Net Present Cost (NPC) is noted, the value discounts back for the present cost estimates only.
- Where a Net Present Benefit (NPB) is noted the value discounts back for the present benefits estimate only.
- Where a Net Present Value (NPV) is noted, this discounts for the present overall value (benefit minus cost).

Sensitivity and wider impacts generally

5.9 Given the length of the assessment period and the numerous assumptions made, any impact assessment should be treated with caution, rather than providing a definitive or a proven case.

5.10 A sensitivity analysis has not yet been carried out, but we will consider further if this would be proportionate for final impact assessment stages. The assumptions in the assessments are numerous and include:

- modelled assessment of energy performance (rather than an assured, or guaranteed, performance outcome).
- construction costs (these can fluctuate).
- use of BEIS forecast energy, carbon and air quality price values, projecting 70 years forward.
- use of HMT Green Book Net Present discount factors (3.5% for years 1-30, 3% thereafter).
- an assumption of no rebound effect from thermal comfort taking or other reasons (e.g. home occupiers living with homes heated to higher temperatures than current new-build homes would be).

5.11 The assessment does not monetise more speculative costs or benefits beyond carbon, energy and air quality. For example, retrofit upgrades to building fabric to deliver a zero-carbon building stock by 2050 are uncertain at this stage, so are not included. Similarly, potential benefits from improved health outcomes from more thermally comfortable building stock, or wider benefits of fuel poverty reduction, are not included.

Sectors impacted

5.12 Construction costs are expected to be borne by developers while maintenance and replacement costs will normally fall to building owners. Tables of the values used are provided in Annex A. Building

managers/occupiers will benefit from the energy cost savings (at retail rather than the variable rates), whilst society benefits from the carbon reduction and air quality improvements.

- 5.13 In general, the increased construction costs may be taken into account in developer's land valuations over the longer term. An alternative analysis may point to housing supply pressures. However, likely macro-economic benefits, such as increased employment, from improved output in construction, product manufacturing, replacement and maintenance sectors are not assessed under the current impact assessment methodology.
- 5.14 In terms of the overall impact on industry, the energy savings from non-domestic buildings are taken to be the only counter-acting benefit. Industry also has burdens over the longer term as landlords (or non-domestic building owners/tenants) would be faced with maintaining and replacing the additional renewables anticipated. The overall NPV for industry (only) over the 70 year assessment period is therefore a net cost to 'industry' of some £185M under Option 3, and £154M under Option 2 over the 70 year period. Annualised, this equates to £5.6M (option 2) or £6.7M (option 3) per year.
- 5.15 Grid connectivity and additional costs for reinforcement to support export capable connections are not included in the assessment. The proposals do not require grid export, but highlight a likely performance gap where a renewable generating technology is installed but an export connection has not been provided. This issue sits outside the scope of the Department, and is likely to be considered in the context of wider changes, such as electric vehicle charging points, the wider electrification of heat and accommodation of micro-generation more generally.
- 5.16 Embodied carbon impacts of the additional materials needed to deliver the energy efficiency benefits are not included in the assessment.
- 5.17 The overall position on these wider potential impacts is in line with assessments of other administrations doing similar work. Whilst valuation of such costs and benefits is not explicitly included, wider potential impacts are recognised, at least qualitatively, alongside the monetised costs and benefits (see Section 6- non-monetised impacts).

Dwelling characteristics and build rates

- 5.18 EPC Register data was used to provide typical local building sizes. This suggests that the typical new-build dwelling here is significantly larger than the dwelling sizes used in England's assessments. This occurs across all dwelling types (flats (64 m² here vs 60m² in UK, mid-terrace and semi-detached (104 m²vs 84.4m²)), but was most significant in detached homes

which average here at 190 m² in contrast to the equivalent size used in England's equivalent assessments of 114 m².

- 5.19 Uplifts here will therefore have a significantly greater impact on both developers' costs per dwelling and likewise with monetised benefits. It also implies that there may be opportunity, in some cases, for capital cost increases to be recovered by building slightly smaller homes, which, in turn would also reduce total energy use. This opportunity would not apply in the social sector, where dwelling designs are commissioned to conform to Department for Communities' (DfC) guidance and of course comes with consequences of spatial losses.
- 5.20 Having reviewed the DfC Housing Statistics and EPC data, we have based the assessment on a stable build rate of 7985 homes per year.
- 5.21 The proposals allow for a whole building area weighted approach to fabric construction, such that the proposed limiting U-values may be adjusted, provided there are consequential improvements to other elements. The modelling therefore assumes wall U-values of 0.21W/m²K under the new proposals, with roof and floor U-values at 0.13 W/m²K and 0.15 W/m²K respectively, as this provided a more cost-effective approach.
- 5.22 This was tested against the geometry of the building forms assessed in each case, and occasional minor adjustments (usually to window U-values) were made to ensure the new limiting U-value performance standard was achieved on the whole building basis.

Typical outcomes for dwellings

- 5.23 Under the preferred Option, construction cost increases range from £1048 for a 64 m² flat to £4317 for a 190 m² detached house. This is based on a build-mix of gas and oil dwellings with PV, along with a low number of heat pump led solutions to provide for situations where PV may not be viable (see Annex C). Overall capex cost increases for oil and gas homes were in the range of £16-28/m². Costs for heat pump related proposals were in the region of £33-67/m², with the higher costs arising in smaller properties where hot water storage would not otherwise have been required.
- 5.24 Examples of typical outcomes for new dwellings are modelled in Annex B.

Buildings Other than Dwellings

- 5.25 At this stage, the Department is investigating if we can more accurately quantify the potential non-domestic impacts. We would be grateful for any SBEM/DSM modelled assessments, which particular sectors may wish to provide. We would also appreciate data (space, geometry and specifications) of 'typical' buildings industry feels would be impacted, or where the level of uplift may be difficult to obtain in practice, as at present we foresee no such issue.
- 5.26 Data on build rates for buildings other than dwellings is less readily available than for dwellings. Our best assessment of the overall stock stems from an analysis of EPC data on 'level 4' and 'level 5' assessments, (level 3 assessments are not permitted for new constructions). Individual buildings listed on the EPC extract were reviewed to exclude any buildings which were evidently not new, where the level 4 or 5 assessment had been carried out for other reasons (e.g. an existing complex building would require a level 4 or 5 assessment for rental).
- 5.27 The review of the EPC register data suggests that the number of newly erected buildings built each year averages 117. (Years 2017-19 were analysed, as 2020 was impacted by the Covid pandemic.)
- 5.28 The EPC data suggests a local new-build rate of 163778 m²/year for new non-domestic buildings. The mean 'average' building would, therefore, be 1400 m², but clearly there would be very wide variation around this.
- 5.29 We have discounted the total floor area impacted by 37.4% in consideration of the public sector contribution to the new build rate, which has been estimated from the EPC data. Public procurement guidance already requires standards well in exceedance of the new uplift we are proposing, so these buildings would be unaffected by the uplift.
- 5.30 We are working on a preliminary estimate that the non-domestic proposals might lead to photovoltaic arrays being provided on a basis of some 2.2% of the floor area of new buildings. This is based on previous proposals (not taken forward) in England's Part L 2013 impact assessments for non-domestic buildings, which equated to a 20% uplift in emissions performances for new non-domestic buildings. This comprises 9% from the Part L 2013 fabric uplifts (which we propose to exceed; at least in terms of the new limiting U-values proposed) and the additional 11% from PV arrays which were applied at a rate of 5.4% of the floor area of the building (assumed to be at a rate of 154W/m²K).

- 5.31 Our current assumption is that the proposed fabric improvements would deliver 10.5% of the betterment required in emissions, with the 4.5% improvements from PV equating to 2.2% of the floor area of buildings (on average). This would total around 410kWp of additional PV installation per year from year 4 onwards, discounted by the aforementioned lead in rates of 10%, 50% and 88% for years 1 to 3 respectively.
- 5.32 The impact of the fabric improvements is difficult to assess as the geometry of non-domestic building types is so variable. We have modelled various representative configurations and we believe that the proposed values should deliver overall U-value outcomes that are largely in line with 'whole-building' U-value data which was retrievable from the EPC register³.
- 5.33 The fabric measures, also appear to be roughly in line with the current average standards built today when compared to as-built information provided by district council building control. The uplift to limiting fabric standards is nonetheless critical to limit potential reductions in fabric efficiency if on-site renewables are used, and to ensure the worst performing fabric is improved to at least that of the average constructed today.
- 5.34 At most, we think costs should be between £5-10/m² floor area due to fabric requirements (cost modelling on flats in a block of similar size to the 1400 m² non-domestic 'average' building suggests a cost of £6.55/m² for fabric improvements, which provides some comparison) and around £4/m² floor area, due to PV provision. We would be interested if industry could provide any further evidence around this.

Training and adaptation costs

- 5.35 A budget one-off training and adaptation cost of £152,000 has been estimated for industry and district council building control. This is based on 3% of the costs for similar measures in England's 2013 Part L (Conservation of fuel and power) Final Stage Impact Assessment, on a simple comparison to England's population. The assumptions behind this, point to a day's external assessment training disseminated through industry and enforcement bodies, which is further disseminated through internal training with further allowances for builders' reworking and adaptation adjustments.

Enforcement and professional costs

- 5.34 The amendments will continue to be enforced by district councils through the existing mechanisms and sanctions provided through the Building Regulations (Northern Ireland) Order 1979 (as amended) (the 1979 Order).

³ EPC data is difficult to analysis as it provides only whole building U-value assessments, which are therefore highly dependent on the building geometry.

- 5.35 Additional costs to district councils will vary depending on the specifics of each application, but only very limited additional time will be required for the new manual checks on the betterment of the TER, the new limiting U-values and to confirm that the default value of 15 for air tightness has not been applied.
- 5.36 The nature of these will vary with each application. For example, rather than complying with individual limiting U-values, a whole building U-value calculation may provide a more cost effective route to compliance for developers. This might require an additional 20-30 minutes plan checking by the district council, depending on the details of the scheme.
- 5.37 The new checks have developed with a view to minimising the additional assessment burdens. They are also expected to be short term in nature and should be unnecessary if software providers adapt the current products (which the Department would support) or when new software is adopted alongside further uplifts in 2022/23. Other values, such as air tightness should be easily picked up within this time as these are normally checked by building control currently.
- 5.38 Additional building regulations application costs to industry will also depend on the nature of the application and which Schedule of the Building (Prescribed Fees) Regulations (Northern Ireland) 1997 (as amended) applies to the work. More complex and larger schemes are likely to fall under Schedule 3 of these regulations, attracting additional fees in proportion to the additional costs of the work.
- 5.39 Professional fees impacts are not normally included in Impact Assessments as they are not directly related to the construction cost, but are calculated on the basis of the time and expertise needed to complete the work.
- 5.40 Nonetheless, on this occasion we have added 1.5% of the additional capital costs impacts for new houses and 2.5% of other building types to account for the combined impact of professional and enforcement cost impacts. This may be further reviewed at final impact stage.
- 5.41 The percentage is lower for houses, in part, because houses are charged at a fixed Schedule 1 rate, so the building regulations application fee won't change for houses - (a building regulations fees review is looking at this, separately) and, in part, because housing fees are likely, on average, to be more competitive or to have lower overall levels of professional design input than more complex buildings.
- 5.42 A preliminary standalone £101k impact on regulators (building control) has been identified on the cover sheet of this assessment, on the basis that an additional 15 minutes plan checking per house may be required (noting many houses will be of a multiple type on any given development) at a cost rate of £56.62/hour. Non-domestic buildings and flats are considered self-funding as they are likely to be subject to Schedule 3 fees, based on the

cost of the works, with the additional works cost leading to a fee increase to fund the additional plan checking time.

DRAFT

6. OTHER IMPACTS AND RISKS

- 6.1 The assessment does not monetise more speculative costs or benefits beyond carbon, energy and air quality. Whilst such assessment is considered disproportionate, (especially when other regions assessments similarly limit monetisation) it is important to acknowledge the wider impacts and complexities around the proposals.
- 6.2 A wide range of complex and inter-related potential impacts may accrue under all options. These include;

Option 1 (do nothing)

- Failure to address climate change mitigation measures under the UK Climate Change Act and other commitments may lead to reputational damage to the investment context for the region generally.
- The extent and depth of future retrofit measures would be likely to increase, if decarbonisation of the existing building stock is required for 2050 net zero carbon emissions targets. Action on new build now is likely to cost significantly less than future retrofit (albeit that subsequent steps to new build performance standards are still expected).
- Local construction industry practices and skills capacity would be likely to fall further behind other regions making subsequent measures to net zero standards for new buildings more difficult to achieve.
- Local construction product industries would not be supported to innovate for a low carbon future as much as other options or in other regions.
- There is a risk that current Part F TER requirements could be met through provision of renewables, which are becoming cheaper to deploy, with a consequential option to worsen fabric standards in local construction.
- Wider potential health and potential deprivation reduction benefits would not occur.

Option 2 and 3

- Increased construction costs may be a disincentive to new construction investments.
- Rather than being properly taken into account in land prices, construction costs may be passed on to building purchasers and in turn, to rents, offsetting energy savings to bill payers.
- Electricity grid reinforcement will be required in many cases, particularly if larger or multiple connections for exporting renewables are to be provided. (Such provision may be required by the market in any case; for example to support EV charging points in new buildings, or because renewables may be attractive solution for developers as renewables costs decrease.)
- Economic benefits from lower energy bills may impact positively on deprivation, provided rent increases or other costs do not offset the benefit.
- Health benefits may accrue from more easily heated homes- this can assist elderly, fuel-poor or vulnerable living with chronic conditions in particular.

- The extent of future retrofit costs for low carbon outcomes should be reduced (this depends very much on what standard of retrofit is expected for delivery of net zero).
- Local industry will have a clearer incentive to invest in lower carbon and more energy efficient outcomes.
- Additional design time may be required to optimise building solutions. This may benefit designers and improve local expertise.

Note on fuel poverty

- 6.3 The extent of the benefit may be greater for an individual household transferring from an existing property, (where it was within the definition of fuel poverty), to a new home constructed to the proposed new standard. However, the proposals are unlikely to be of significance in relation to overall numbers of households suffering fuel poverty as it is assumed that the fuel bills in new homes currently being built would already be likely to remove a household from fuel poverty.
Note - where a heat pump led solution is deployed, such savings are much more limited, as the fuel used (electricity) is more expensive than the higher carbon alternative (gas).

Rural impact assessment

- 6.4 A separate rural impact assessment has been carried out and is provided as part of this consultation.
- 6.5 Rural buildings are likely to be off gas-grid and reliant on fuels more carbon intensive than gas, with a consequentially greater reduction in emissions required.
- 6.6 The Department estimates these costs range from £105 (£1.01/m²) for a mid-terrace dwelling under Option 2 to £532 (£2.80/m²) for a detached dwelling uplifted in line with Option 3. In both cases these costs are extra to the gas-led equivalent.
- 6.7 These costs/m² should be less in the case of buildings other than dwellings, as the level of 'betterment' (15%) is significantly less than is proposed for domestic buildings.
- 6.8 These cost impacts are considered acceptable in the context of the overall construction costs and will also apply in urban situations where the higher carbon fuel is proposed. The improvements will also lead to greater running cost savings in rural buildings.
- 6.9 Measures to more thoroughly address the use of higher carbon fuel factors are expected in future uplifts and this marginal step will help mitigate this later adjustment to some degree.

Further detail is provided in the Rural Needs Impact Assessment C.5

Equality impact screening

- 6.10 A Section 75 Equality Impact Assessment screening exercise was carried out and is published alongside the consultation (see Equality Impact Assessment Screening (C.6)). No equality concerns are noted, rather improved insulation and lower bills may help people vulnerable to cold temperatures.

Micro & small firm's impact

- 6.11 The cost impacts, as a percentage of current build costs, are expected to be reasonably equal in all sectors (small, medium and large developers). The uplifts have been set with a view to balancing improved performance with the evolution of widespread and commonly used technologies, with an appropriate balance in mind.
- 6.12 Smaller developers may have less capacity to invest in adopting emergent technologies and systems, whilst developers of larger buildings and blocks of flats may need to invest in more innovative solutions where a G98 level of export application is of minimal benefit.

7. MONITORING AND REVIEW

- 7.1 The Department has quarterly meetings (Building Control Liaison Meetings) with the 11 District Councils in Northern Ireland who are responsible for enforcing the requirements of the Building Regulations. Feedback from them on how the new requirement is working in practice will be ongoing.
- 7.2 The UK Ministry of Housing communities and Local Government (MHCLG) undertakes reviews of amendments made to the Building Regulations. The outcomes of these reviews, additional research undertaken by MHCLG (on behalf of England and the devolved administrations) and developments in other administrations, including the Republic of Ireland, will inform the need for further amendments to the Building Regulations.
- 7.3 It is also normal practice for the Department to investigate experiences a reasonable time (usually about 5 years) after implementation, to monitor how the changes are working in practice. In the case of Part F, however, further and ongoing work is anticipated to deliver uplifts in Part F and related areas (such as ventilation, overheating etc) in line with the Department's provisional programme (see Section 1 of the main Consultation Document (C.1)).

8. CONSULTATION

Government consultation

- 8.1 Building Standards Branch (BSB) has been involved in discussions with officials in other administrations and is mindful of the ongoing work on England's Part L proposals in particular. The intention is to move as quickly as possible to take up the new software that will become available once these proposals are established. The uplift under consideration here is intended to assist in this process, and to provide a platform for ongoing uplifts in standards.
- 8.2 The consultation has been issued with Executive approval, having been circulated to other Departments.

Building Regulations Advisory Committee

- 8.3 There is a statutory duty to consult the Northern Ireland Building Regulations Advisory Committee (NIBRAC) and such other bodies as appear to the Department to be representative of the interests concerned. This has been the principal forum for the Department's liaison with industry to date in developing these proposals.
- 8.4 The Department wishes to thank NIBRAC members and advisors who agreed to contribute specialist advice to NIBRAC via its technical sub-committee.

Public Consultation

- 8.5 BSB has an extensive database of names of individuals and organisations that have expressed a specific interest in building regulations and technical guidance. As well as directly contacting stakeholders with a known interest, this consultation exercise will also be promoted on the BSB Building Regulations homepage of the DoF website.
- 8.6 The public consultation period will run for 10 weeks, **closing on 19th December 2021.**

CONTACT POINT

This Regulatory Impact Assessment, and the Departments Response to Public Consultation, may be downloaded from www.finance-ni.gov.uk/articles/building-regulations-consultations or a hard copy may be obtained from Consultation Co-ordinator at :

Department of Finance
Properties Division
Building Standards Branch
6th Floor, Goodwood House
44-58 May Street

Belfast
BT1 4NN
Tel 028 9025 7048
Email: info.bru@finance-ni.gov.uk

DRAFT

Annex A- Cost Information

Table A.1- Fabric costs (dwellings)

Element	Specification	Unit	Cost adjustment (£ per unit)
Building Fabric			
External Wall - (brick/block outer leaf, 100-150mm cavity, dense blockwork)			
Insulation platinum bead fill, brick/block outer leaf	0.29 W/m ² K (presumed current min mix)	m ² of wall	no change
	0.21 W/m ² K (current average)	m ² of wall	£4.50
Additional taken as 100-120mm PIR insulation in lieu of EPS bead in cavity	0.18 W/m ² K (n/a provided for information only)	m ² of wall	£18.00
	0.15 W/m ² K (n/a provided for information only)	m ² of wall	£21.00
Ground/Exposed Floor	0.15 W/m ² K (current average + presumed current min mix)	m ² of floor	no change
	0.14 W/m ² K (current EPC average)	m ² of floor	no change
	0.12 W/m ² K	m ² of floor	£3.70
Roof- mineral wool at joist level	0.15 W/m ² K (min compliance)	m ² of roof (plan area)	no change
	0.14 W/m ² K (current EPC average)	m ² of roof (plan area)	negligible change
	0.13 W/m ² K	m ² of roof (plan area)	£1.30
	0.12 W/m ² K	m ² of roof (plan area)	£1.50
Windows- uPVC	price per 0.1Wm ² K improvement	m ² of openings	£10.00

Table A.2- Services Capital Costs (dwellings)

Element	Specification	Unit	Cost adjustment (£ per unit)
Services- capital costs			
PV panels Roof mounted. Year 1 costs (note a 4% reduction/annum is applied for first 10 years ⁴)	Fixed cost for systems <4kWp	per installation	£1,100
	Variable costs for systems <4kWp	per kWp installed	£700
	Variable costs for systems >4kWp	per kWp installed	£970
Gas fired boiler	(savings where a heat pump is installed)	flat (combi)	(£1,500)
		terrace (combi)	(£1,700)
		semi	(£1,400)
		detached	(£1,400)
Heat pumps (monoblock type) ⁵	(note 1% reduction/annum for first 10 years)		
4kW Air source HP (64m ² flat)	supply and install within 10m of dwelling	Nr	£4,000
6kW Air source HP (104m ² house)	supply and install within 10m of dwelling	Nr	£4,850
10kW Air source HP (190m ² house)	supply and install within 10m of dwelling	Nr	£5,500
Unvented DHW cylinder	where ASHP is in lieu of combi boiler	Nr	£1,000
Low temperature radiators and pipework- additional over conventional high temperature radiator system	Flat - 6 no. radiators, terrace/semi - 11 no. radiators, detached - 19 no. radiators	per radiator	£75

⁴ Based on England's future Homes Impact Assessment

⁵ Heat pump costs are based on limited local estimates only.

Table A.3 Additional Maintenance Costs

Element	Frequency	Cost adjustment (£ per unit)
Additional Maintenance costs		
PV replacement	30 years	as capital cost
ASHP replacement	20 years	as capital cost
Invertor replacement	12 years	18% of PV cost
Maintenance PV arrays-house	5 years	£100
Maintenance PV arrays-block of flats	5 years	£220
Maintenance PV arrays-non-domestic (4.7kWp-typical)	5 years	£200
ASHP servicing	as gas boiler	£0

Annex B- Typical outcomes for dwellings

- B.1 The following Tables B1-B12 below illustrate typical additional capital costs, running costs (at retail value) and carbon performance for dwellings under Options 2 and 3.
- B.2 Modelling, to secure the 25% or 40% betterment factors was carried out in SAP 2009. Running cost and emissions were then converted to the latest factors from Table 12 of SAP 10.1 (used for England’s current consultations). These ‘factors’ are therefore UK averages, consistent with current SAP policy, rather than NI specific.
- B.3 Decarbonisation of the electrical grid is not reflected in SAP 2009 values. This means that a lower emissions ‘betterment’ is achieved in practice if savings are provided through electrical measures, such as photovoltaics. This is reflected in the emissions outcomes in the tables based on SAP 10.1 (as noted above).
- B.4 Allowance has been made for an additional hot water storage tank in the case of mid-terrace and flats where a heat pump solution is proposed.
- B.5 The tables illustrate the opportunity for significant emissions savings potential from heat pump led solutions, but with increased capital and running costs.

Detached house- 190m²

Table B1: modelled additional capital costs (£); detached house

	Current Part F	Option 2	Option 3
Gas (+PV)	£0	£2980	£3295
Oil (+PV)	£0	£3295	£4217
Heat pump	n/a	£6390	£6390

Table B2: modelled annual running costs (£); detached house

	Current Part F	Option 2	Option 3
Gas (+PV)	£636	£484	£376
Oil (+PV)	£693	£490	£353
Heat pump	n/a	£641	£641

Table B3: modelled annual emissions (kgCO_{2e}); detached house

	Current Part F	Option 2	Option 3
Gas (+PV)	2796	2550	2422
Oil (+PV)	3889	3514	3350
Heat pump	n/a	497	497

Semi-detached/end terrace house - 104m²

Table B4: modelled additional capital costs (£); semi-detached house

	Current Part F	Option 2	Option 3
Gas (+PV)	£0	£2171	£2605
Oil (+PV)	£0	£2346	£2913
Heat pump	n/a	£4723	£4723

Table B5: modelled annual running costs (£); semi-detached house

	Current Part F	Option 2	Option 3
Gas (+PV)	£400	£304	£246
Oil (+PV)	£432	£312	£237
Heat pump	n/a	£381	£381

Table B6: modelled annual emissions (kgCO_{2e}); semi-detached house

	Current Part F	Option 2	Option 3
Gas (+PV)	1658	1497	1428
Oil (+PV)	2267	2055	1964
Heat pump	n/a	295	295

Mid-terrace house- 104m²

Table B7: modelled additional capital costs (£); mid-terrace house

	Current Part F	Option 2	Option 3
Gas (+PV)	£0	£1998	£2397
Oil (+PV)	£0	£2103	£2782
Heat pump	n/a	£5250	£5250

Table B8: modelled annual running costs (£); mid-terrace house

	Current Part F	Option 2	Option 3
Gas (+PV)	£368	£294	£226
Oil (+PV)	£398	£286	£278
Heat pump	n/a	£351	£351

Table B9: modelled annual emissions (kgCO_{2e}); mid-terrace house

	Current Part F	Option 2	Option 3
Gas (+PV)	1490	1368	1306
Oil (+PV)	2033	1877	1794
Heat pump	n/a	272	272

'Average' flat - 64m²

- B.4 Figures for flats are based on the average of a central, end-gable, mid and top floor flat in a block of 16 flats (4 flats/floor). An 11kWp PV array is assumed to be acting at block level. This PV array impacts on the emissions and running costs, although in reality the energy cost savings would accrue to the management costs of the block.
- B.5 Outcomes for heat pump fuelled flats show a higher running cost than a gas or LPG fuelled solution currently, however this is substantially less than the running cost of a current solution if the flat was electrically heated (£687) and it still achieves a SAP2009 'B' rating in all flat types assessed (top floor gable etc). The bulk of the additional running costs lie in water heating costs where the heat pump may not be as efficient (compared to its space heating performance). More specialised systems, focussed on water heating, might be deployed in practice to address this. This again points to the issues with heat pumps, and the Department will consider these issues further in subsequent phases of its programme.

Table B10: modelled additional capital costs (£); flat

	Current Part F	Options 2&3
Gas (+ block PV)	£0	£1137
LPG (+ block PV)	£0	£1137
Heat pump	n/a	£4303

Table B11: modelled annual running costs (£); flat

	Current Part F	Options 2&3
Gas (+ block PV)	£256	£183
LPG (+ block PV)	£375	£297
Heat pump	n/a	£444

Table B12: modelled annual emissions (kgCO_{2e}); flat

	Current Part F	Options 2&3
Gas (+ block PV)	992	872
LPG (+ block PV)	1135	1010
Heat pump	n/a	344

Annex C- Dwelling and fuel mix assumptions

- C.1 The following tables provide the presumed mix of new-building dwellings by type (detached, semi-detached, mid-terrace and flat) and by fuel use (gas, oil, heat pump) used in the modelling. The percentage mixes by type are developed from on-construction EPC data.
- C.2 The modelling presumes a small increased uptake towards heat pump led solutions for houses will occur under option 3.

Table C.1 - build and fuel mix for Option 2 dwellings - modelling assumptions.

OPTION 2 25% uplift to all dwellings	Percentage of type	Percentage of total build mix
DETACHED DWELLINGS		39.62%
Gas boiler and PV array	68%	26.9%
Oil boiler and PV array	27%	10.7%
ASHP in lieu of gas boiler (no PV)	5%	2.0%
total	100%	
SEMI- DETACHED DWELLINGS		46.13%
Gas boiler and PV array	71%	32.8%
Oil boiler and PV array	26%	12.0%
ASHP in lieu of gas boiler (no PV)	3%	1.4%
total	100%	
MID-TERRACE DWELLINGS		3.52%
Gas boiler and PV array	82.5%	2.9%
Oil boiler and PV array	16%	0.6%
ASHP in lieu of gas boiler (no PV)	1.5%	0.1%
total	100%	
FLATS		10.73%
Gas boiler and PV array	82%	8.8%
LPG boiler and PV array	8%	0.9%
ASHP in lieu of gas boiler (no PV)	10%	1.1%
total	100%	

Table C.2 - build and fuel mix for Option 3 dwellings - modelling assumptions.

OPTION 3 40% uplift to houses 25% to flats	Percentage of type	Percentage of total build mix
DETACHED DWELLINGS		39.62%
Gas boiler and PV array	68%	26.9%
Oil boiler and PV array	25%	9.9%
ASHP in lieu of gas (no PV)	7%	2.8%
weighted average	100%	
SEMI- DETACHED DWELLINGS		46.13%
Gas boiler and PV array	70%	32.3%
Oil boiler and PV array	25%	11.5%
ASHP in lieu of gas (no PV)	5%	2.3%
weighted average	100%	
MID-TERRACE DWELLINGS		3.52%
Gas boiler and PV array	82%	2.9%
Oil boiler and PV array	15%	0.5%
ASHP in lieu of gas (no PV)	3%	0.1%
weighted average	100%	
total		
FLATS		10.73%
Gas boiler and PV array	82%	8.8%
LPG boiler and PV array	8%	0.9%
ASHP in lieu of gas (no PV)	10%	1.1%
weighted average	100%	