October 20

Building Regulations Part L Review: Changes to Part L: Standards for Existing Dwellings- Consultation Impact Assessment

Contents

1. Summary

Policy changes considered in this impact assessment

1.1 This assessment considers the impact of proposed changes to Part L and F of the building regulations regarding standards for existing dwellings in Wales; the proposals for a new Part S and the transposition of EPBD into the building regulations.

1.2 The costs and benefits of the proposed changes have been assessed over a 70-year appraisal period. The costs and benefits are net of those that would be incurred under the current regulations.

Proposed changes

1.3 The following changes are considered in this report:

- Raising the Part L standards for works in existing dwellings
- Raising the Part F standards for works in existing dwellings
- Introducing Part S standards to mitigate overheating in new dwellings.
- Transposing or aligning with relevant requirements from the Energy Performance of Buildings Directive (EPBD) – all building types

Part L Changes – existing dwelling impacts

1.4 The following table presents the Net Present Value of the proposed changes to Part L for Existing Dwellings.

Table 1.1: Net Present Value of proposed changes to Part L (£m)						
	Extensions	**Windows**	**Doors**	**Conservatories**	**Conversions**	**Boiler Plus**
Capital costs	21.046	36.065	6.163	14.512	2.946	42.918
Energy costs	-4.898	-11.258	-4.608	-2.925	-0.302	-24.133
Replacement costs	1.940	-	-	-	0.338	-
Total financial costs	**18.088**	**24.807**	**1.556**	**11.588**	**2.983**	**18.785**
Carbon and air quality costs	-8.234	-14.255	-5.834	-4.941	-0.510	-22.388
Total costs including carbon and air quality improvement	**9.815**	**10.552**	**-4.279**	**6.646**	**2.473**	**-3.603**
Tonnes of carbon saved (tonnes)	*104,031*	*166,986*	*68,342*	*62,129*	*6,411*	*285,617*

Part F Changes – existing dwelling impacts

1.5 The following table presents the Net Present Value of the proposed changes to Part L for Existing Dwellings.

Table 1.2: Net Present Value of proposed changes to Part F (£m)	
	Background Ventilators
Capital costs	0.926
Energy costs	-
Replacement costs	-
Total financial costs	-
Carbon and air quality costs	**0.926**
Total net costs including carbon and air quality improvement	-
Tonnes of carbon saved (tonnes)	**0.926**

Part S proposals – mitigating over heating in new dwellings

1.6 The following table presents the Net Present Value of the proposed Part S Standards for New Dwellings.

Table 1.3: Net Present Value of proposed Part S (£m)	
	Mitigating Overheating
Capital and replacement costs	34.170
Energy costs	-5.213
Maintenance costs	-
Total financial costs	**28.956**
Carbon costs	-0.238
Mortality costs	-20.593
Productivity costs	-10.759
Total net costs including carbon, mortality and productivity improvements	**-2.634**

Transposing EPBD requirements into building regulations

1.7 The following table presents the Net Present Value of transposing requirements of EPBD into Building Regulations.

Table 1.4: Net Present Value of Transposing EPBD requirements into Building Regulations (£m)		
	Self-Regulating Devices (SRD)	**BACS**
Capital Costs	46.202	4.551
Energy Costs	-24.767	-12.882
Replacement Costs	-	-
Maintenance Costs	-	-
Total financial costs	**21.435**	**-8.331**
Carbon and air quality costs	-26.175	-4.913
Total net costs including carbon and air quality improvement	**-4.740**	**-13.244**
Tonnes of carbon saved (tonnes)	*319,389*	*57,341*

2. Policy options considered

2.1 Improvements are considered with regard to the following elements:

- Part L Standards for Existing Dwellings
  - = Extensions
  - = Windows
  - = Doors
  - = Conservatories
  - = Conversions
  - = Boiler Plus
  - = EPBD: Domestic Buildings - Self-Regulating Devices (SRD)
- Part L amendments for Non-Domestic Buildings
  - = EPBD: Building Automated Control Systems (BACS)
  - = EPBD: Technical Building Systems
  - = EPBD: Non-Domestic Buildings - Self-Regulating Devices (SRD)
- Part F Standards for Existing Dwellings
  - = Background Ventilation
- Part S Standards for New Dwellings
  - = Mitigating Overheating.

Part L Standards for Existing Dwellings

Domestic extensions

2.2 The Part L 2014 review aligned the standards for domestic extensions with the mandatory limiting fabric parameters for new dwellings. It is now proposed to improve the standards for domestic extensions to align with similar improvements proposed for the limiting fabric parameters for new dwellings in the recent stage 1 consultation. Consideration was given to further the improvement of standards for extensions, up to the elemental values in the new-build recipe, however, the recipe is a performance based approach and the elemental fabric specifications for new dwellings are flexible as long as the limiting fabric parameters are achieved or exceeded. Furthermore, there may be practical and cost issues in achieving the same fabric performance as the new-build recipe in space constrained extensions.

Windows and doors

2.3 The Approved Document sets energy efficiency for windows and doors (where new, replaced or enlarged). As the current Approved document, it is proposed that they continue to align with those for extensions. Hence, the minimum standard for windows and doors is proposed to be improved from U=1.6 W/m2.K to U=1.4 W/m2.K.

Conservatories

2.4 A conservatory or porch is exempt from the energy efficiency requirements where it meets specific requirements, one of which is being thermally separate from the heated area of the dwelling. A

conservatory or porch is considered to be thermally separate where the existing walls, windows and doors between the dwelling and the conservatory or porch are left in place or, if they are removed, their replacements meet standards set out in the Approved Document. These latter standards currently align with those of extensions and it is proposed that this continues to be the case - thus these standards will be improved to align with the improvements for extensions identified in the preceding paragraphs.

Conversions

2.5 A conversion describes when part of a dwelling, which previously was not subject to the energy efficiency requirements, is converted into a heated space, for example a loft conversion (this is described as a 'change in energy status' in the Building Regulations). In the case of a conversion, a retained thermal element is an existing element that becomes a thermal element where previously it was not, for example a gable wall in a loft conversion. If the thermal performance of the retained element is poorer than a threshold value specified in the Approved Document, it is recommended that upon conversion the thermal performance is upgraded to at least a minimum standard also defined in the Approved Document. Further guidance is now proposed in the draft Approved Document to highlight the potential moisture risks when upgrading retained elements and makes recommendations for the risk to be assessed and mitigated by a person who is competent to do so. In addition, it is proposed that all standards for roofs now align with the standard for pitched roofs with insulation at ceiling levels of U=0.16 W/m2.K as there is no significant technical or economic reason for the standards to be different; previously the standard for pitched roofs with insulation between the rafters and for flat roofs were U=0.18 W/m2.K. We are also proposing that all of these proposals apply to a material change of use, as similar issues apply (for example, where the building is now used as a dwelling, where previously it was an unheated building e.g. a barn.

Boiler Plus and future proofing

2.6 In December 2016, the UK Government consulted on a range of policy proposals, collectively known as 'Boiler Plus', to give consumers more choice over the way they heat their homes and more control over their energy bills. As a result, additional minimum standards came into force from April 2018 in England only and the details were included in the Domestic Building Services Compliance Guide. The Welsh Government is now consulting upon introducing these requirements in Wales via the Building Regulations.

2.7 The new minimum performance standard for domestic gas boilers in Wales homes is proposed to be set at 92% ErP. The proposed standard will also make timers and room thermostats an explicit requirement for all gas and oil systems.

2.8 When a gas combination boiler is installed, an additional energy efficiency measure is proposed to be required. This requirement is flexible to allow a suitable choice to be made that reflects the diverse nature of the housing stock, and the needs of the household. The energy saving technologies that can be used to comply are:

- Flue gas heat recovery systems;
- Weather Compensation;
- Load Compensation;
- Smart controls featuring automation and optimisation functions.

2.9 Further details describing the rationale for these changes can be reviewed in the UK Government consultation: https://www.gov.uk/government/consultations/heat-in-buildings-the-future-of-heat.

2.10 Where a heating system is to be replaced it is to be designed to 55 degrees centigrade to help future proof existing dwellings for low carbon heating systems. Where it is not feasible to install a space heating system which can operate at this temperature (for example, where there is insufficient space for larger radiators) the space heating system should be designed to the lowest design temperature possible which will still meet the heating needs of the dwelling.

EPBD – Self Regulating Devices

2.11 A self-regulating device is a device or system that automatically controls the output of heating and/or cooling emitters to independently control the temperature in each room, (or, where justified, a heating and/or cooling zone[1]) where heating and/or cooling is provided by a fixed building service.

2.12 In order to align with the EPBD requirement, the proposed changes is to ensure that, when a heating system is replaced, the dwelling is equipped with self-regulating devices for the separate regulation of the temperature in each room or designated heating zone of the building unit, where technically and economically feasible.

2.13 A common way of achieving this requirement in practice for existing homes would be having thermostatic radiator valves (TRVs) on radiators in each room, which are often already installed as standard practice.

Part L amendments for Non-Domestic Buildings

EPBD – Building Automated Control Systems (BACS)

2.14 A building automation and control system is a term used for a centralised system installed to monitor and control a building's environment and services i.e. its heating, ventilation, air conditioning, lighting and other systems (such as security alarms and lifts).

2.15 To align with the EPBD requirement, the proposed change will mean:

- If a new building has a space heating or air-conditioning system with an effective rated output of greater than or equal to 290 kW, a building automation and control system must be installed to specifications as per below;
- If an existing building has a space heating or air-conditioning system with an effective rated output greater than or equal to 290kW, a building automation and control system being replaced or installed should meet the specifications below.

2.16 A building automation and controlled system installed in a new or existing building to meet the requirements in the paragraph above must be capable of carrying out all of the following functions:

- Fully complies with EN ISO 16484;
- Continuously monitors, logs, analyses and allows for adjusting energy use;
- Benchmarks the building's energy efficiency, detects losses in efficiency of technical building systems, and informs the person responsible for the facilities or building management about opportunities for energy efficiency improvement;
- Allows communication with connected technical building systems and other appliances inside the building and be interoperable with technical building systems across different types of proprietary technologies, devices and manufacturers.

2.17 NOTE: A BS EN 15232 Class A Rated type system would meet these requirements.

2.18 Where a building automation and control system is installed, as well as meeting the requirements above, its control capabilities should be appropriate for the building, its expected usage, the expected

[1] A heating and/or cooling zone is a treated area of a building (i.e. an area with either heating or cooling or both) which is on a single floor and has homogenous thermal parameters and homogenous temperature regulation requirements. This can include adjacent spaces which are not physically separated from each other e.g. open plan kitchen and living area.

technical knowledge of the building automation and control system user, and the building services specification. The system should be appropriately sized.

EPBD: Technical Building Systems

2.19 The amendment to the EPBD introduced a new requirement related to technical building systems[2]. The policy requires that when a technical building system is installed, upgraded, or replaced, that the energy performance of the altered system is assessed and the results provided to the building owner.

2.20 The analysis assumes that this is already standard industry practice, so mandating the requirement will have minimal impact.

EPBD: Self-Regulating Devices (SRDs)

2.21 Similar to the requirement for domestic buildings, in order to align with the EPBD requirement, the proposed changes is to ensure that, when a heating system is replaced, a non-domestic building is equipped with self-regulating devices for the separate regulation of the temperature in each room or designated heating zone of the building unit, where technically and economically feasible.

2.22 In general, when replacing a heat generator in an existing non-domestic building, it is a reasonable provision to also install SRDs. Hence, in such cases, the analysis assumes that SRDs will be commonly installed in current practice and the mandating of SRDs will have minimal impact.

Part F Standards for Existing Dwellings

Part F: Background Ventilators

2.23 AD F specifies that when work is carried out on an existing building, the rest of the building should not be made less satisfactory in relation to the (Part F) requirements than before the work was carried out. It is not proposed to change this intention.

2.24 However, current guidance only includes commentary on the specification for background ventilators in replacement windows. AD F does not provide guidance for other energy efficiency measures for situations where work is likely to reduce the ventilation rate (e.g. replacement doors, roof insulation, wall insulation and draught proofing), and could lead to the dwelling being under-ventilated, as part of a retrofit.

2.25 The proposal is to expand the existing guidance to cover the most common circumstances where energy efficiency measures (EEMs) are likely to reduce background ventilation levels and recommend necessary additional ventilation provisions.

2.26 Where energy efficiency measures are likely to significantly reduce the air permeability of the dwelling, then the policy proposals are to recommend ventilation as for new homes.

Part S Standards for New Dwellings

Part S: Overheating

2.27 Overheating in homes occurs when the local indoor thermal environment presents conditions in excess of those acceptable for human thermal comfort or those that may adversely affect human health.

2.28 Overheating in buildings has been highlighted as a key risk for the health and productivity of people and businesses in the UK. It is estimated that there are about 2,000 heat-related deaths each year in

[2] A technical Building System is defined as technical equipment for space heating, space cooling, ventilation, domestic hot water, built-in lighting, building automation and control, on-site electricity generation, or a combination thereof, including those systems using energy from renewable sources, of a building or building unit.

England and Wales. This number is expected to triple to over 7,000 by the mid-century, as a result of climate change[3].

2.29 Part L1(a)(ii) of the Building Regulations already requires that provisions should be made to limit heat gains in buildings. However, this is solely aimed at conserving energy use and avoiding CO2 emissions associated with active cooling rather than the health and comfort risks to occupants.

2.30 It is proposed that a new part of the Building Regulations (Part S) is introduced which will focus on overheating risk. Part S will comprise of the following requirement to mitigate overheating risk:

- (1) Dwellings shall be designed and constructed in such a way as to provide reasonable mitigation from the risk of summertime overheating; and
- (2) Any mitigation measures shall be safe, secure and reasonably practical for occupants.

2.31 A new requirement is proposed requiring the provision of information to the building owner about any system(s) the building uses to mitigate overheating risk and their maintenance requirements, so that the system(s) can be operated effectively in a practical, safe and secure manner.

[3] https://www.theccc.org.uk/wp-content/uploads/2015/06/6.736_CCC_ASC_Adaptation-Progress-Report_2015_FINAL_WEB_250615_RFS.pdf

3. Overall methodology

3.1 This section sets out the overall approach, key considerations, methodology and sources used to assess the proposed policy changes.

3.2 The assessment considers the impact of different elements of the proposed policy changes on different building types:

- The assessment of the amendments to Part L and Part F applies to existing residential buildings, including extensions, conversions, and changes of use,
- The assessment includes amendments to Part L for non-domestic buildings in relation to the transposition of EPBD requirements (BACS, SRDs and Technical Building Systems),
- The assessment of the introduction of Part S applies to new dwellings.

3.3 The methodology is similar to that used to assess the impact of policy changes to Part L and F of the building regulations in Wales for New Dwellings.

3.4 In summary, the assessment:

- (i) Estimates the additional costs to builders/ householders/ occupiers, of the proposed policy changes, over and above the current situation (the counterfactual) (as defined by BR2014);
- (ii) Estimates the additional benefits likely to derive from the proposed policy changes, over and above the current situation;
- (iii) And then deducts (ii) from (i) to calculate the net policy cost.

Types of costs considered in the assessment

3.5 This analysis assesses the following types of policy cost for a 'typical dwelling', compared to the counterfactual (BR2014):

- Capital costs;
- Maintenance costs;
- Energy costs;
- Replacement costs.

3.6 The costs are derived as follows:

- Capital, maintenance and replacement costs – unit costs (in current prices) are estimated for the life of the building or on the effective lifespan of the element of the building that is being changed. Unit costs have been calculated by cost consultants based on specifications developed by the technical advisors[4]. Change in costs due to anticipated future learning rates for each asset are based on the same assumptions used for the England Part L new homes analysis. Boiler Plus unit costs are the same as those used in the England Impact Assessment;
- Energy usage – estimates of the impact of changes in energy usage are based on a combination of (i) calculations undertaken by the technical advisors and (ii) relevant published reports. For Boiler Plus the estimated impacts on energy use have been taken directly from the Impact Assessment undertaken in England. For BACS the estimated impact of energy use is based on data provided in BS 15232 Annex A Table A.1;

[4] The team of cost consultants and engineers that have provided the technical input includes AECOM, Currie and Brown, RLF and SCMS Associates

- Energy, Greenhouse gas emissions and air quality costs – valued using the HMT Greenbook Supplementary Guidance: Valuation of energy use and greenhouse gas emissions for appraisal (updated March 2019).

Types of benefits considered in the assessment

3.7 Two environmental benefits are quantified:

- Carbon emissions;
- Air quality.

Some of the proposed changes result in a cost saving, such as reduced energy demand, which could be considered to be a benefit. However, for the purpose of the appraisal, all financial benefits have been accounted for in the cost assessment.

Types of buildings considered in the assessment

3.8 The unit cost assessment for domestic buildings has been undertaken using an average house (Semi Detached House 84m^2 TFA).

3.9 The unit cost assessment for installing BACS in non-domestic buildings has been undertaken for offices, local government buildings, education buildings and hotels. The minimum size of a building that will require a heating/cooling system of greater than 290kW, was estimated by the consultants based on energy use per sqm of floorspace.

Appraisal period

3.10 Costs and benefits are assessed over a 70-year period (2021-2090) as follows:

- The analysis assumes a 10-year policy period (2021-30), the period over which changes are made to buildings in scope;
- The impact of these changes, in many cases, will continue beyond 2030 however. To capture these longer-term impacts, the assessment calculates impacts of changes based on the effective lifespan of the element of the building that is being changed. This is to ensure that all costs and benefits associated with the change are included in the assessment. For example, for extensions, the appraisal is over the 60-year life of the building whereas for windows the appraisal is over the 30-year life of the window;
- Phase in Assumptions – the analysis assumes that policy is introduced in 2021.

Sequence of calculations

3.11 The following sequence is applied:

- Costs and benefits are first assessed for an average building type;
- The costs and benefits of each policy option across Wales are then calculated by multiplying the individual building costs and benefits by the estimated number of elements that are expected to be installed over a 10-year period.

Discount rates used

3.12 The results are presented in present value terms using the HM Treasury's standard discount rates:

- Costs – 3.5% for the first 30 years:
- Costs – 3.0% for the remainder up to year 70.

4. Extensions

Results

4.1 Table 4.1 sets out the results of the analysis for extensions.

Table 4.1: Results	Net Present Value (£m)
Capital Costs	21.046
Energy Costs	-4.898
Replacement Costs	1.940
Maintenance Costs	n/a
Total financial costs	**18.088**
Carbon and air quality costs	-8.234
Total costs including carbon and air quality improvement	**9.815**
Tonnes of carbon saved (tonnes)	*104,031*

Cost breakdown per extension

4.2 The analysis assumes that the cost per extension will increase by a total of:

- £88.65 increase in cost of windows and doors (replaced after 30 years);
- £250.94 increase in the cost of other building fabric (assumed 60-year lifespan, so not replaced).

Benefit breakdown per extension

4.3 The analysis assumes that the benefits for a typical extension will be:

- 151 kWh of gas saving per annum (or 129kWh of saving when comfort taking[5] is accounted for).

Number of extensions per annum

4.4 To estimate the additional impact of the policy across all dwellings in Wales, the analysis assumes:

- 7,200 extensions are constructed per annum;
- This is based on the assumption that 0.5% of dwellings in Wales build an extension each year;
- This assumption is based on the mid-point of the assumption range (0.1% to 0.8%), referenced in the 2013 Part L Impact Assessment.

[5] Comfort taking refers to the rebound effect of households spending some of the gas bill savings on increasing the room temperature

5. Windows

Results

5.1 Table 5.1 sets out the results of the analysis for windows.

Table 5.1 Results of the analysis for windows	Net Present Value (£m)
Capital Costs	36.065
Energy Costs	-11.258
Replacement Costs	-
Maintenance Costs	-
Total financial costs	**24.807**
Carbon and air quality costs	-14.255
Total costs including carbon and air quality improvement	**10.552**
Tonnes of carbon saved	166,986

Cost breakdown per dwelling

5.2 The analysis assumes that the cost per dwelling will increase by a total of:

- £10 additional cost per sqm;
- Equating to £147 per dwelling.

Benefit breakdown per dwelling

5.3 The analysis assumes that the benefits for a typical dwelling will be:

- 120 kWh of gas saving per annum (or 102kWh of saving when comfort taking[6] is accounted for).

Number of windows replaced per annum

5.4 To estimate the additional impact of the policy across all dwellings in Wales, the analysis assumes:

- That 8 windows (14.65 sqm) are replaced per dwelling;
- That 28,600 dwellings replacing windows per annum (this equates to 2% of total stock);
- The assumption of 2% of stock is in line with the number of notifications reported by the relevant Competent Person Schemes.

[6] Comfort taking refers to the rebound effect of households spending some of the gas bill savings on increasing the room temperature

6. Doors

Results

6.1 Table 6.1 sets out the results of the analysis for doors.

Table 6.1: Results of the analysis for doors	Net Present Value (£m)
Capital Costs	6.163
Energy Costs	-4.608
Replacement Costs	-
Maintenance Costs	-
Total financial costs	**1.556**
Carbon and air quality costs	-5.834
Total costs including carbon and air quality improvement	**-4.279**
Tonnes of carbon saved (tonnes)	*68,342*

Cost breakdown per dwelling

6.2 The analysis assumes that the cost per dwelling will increase by a total of:

- £20 additional cost per door.

Benefit breakdown per dwelling

6.3 The analysis assumes that the benefits for a typical dwelling will be:

- 39 kWh of gas saving per annum (or 33kWh of saving when comfort taking[7] is accounted for).

Number of doors replaced per annum

6.4 To estimate the additional impact of the policy across all dwellings in Wales, the analysis assumes:

- 35,800 dwellings (2.5%[8]) replace doors per year.

[7] Comfort taking refers to the rebound effect of households spending some of the gas bill savings on increasing the room temperature

[8] Consultants' working assumption

7. Conservatories

Results

7.1 Table 7.1 sets out the results of the analysis for conservatories.

Table 7.1: Results of the analysis for conservatories	Net Present Value (£m)
Capital Costs	14.512
Energy Costs	-2.925
Replacement Costs	-
Maintenance Costs	-
Total financial costs	**11.588**
Carbon and air quality costs	-4.941
Total costs including carbon and air quality improvement	**6.646**
Tonnes of carbon saved (tonnes)	*62,129*

Cost breakdown per dwelling

7.2 The analysis assumes that the cost per dwelling will increase by a total of:

- £53 for a conservatory which is thermally separate from the adjoining house, and is exempt from energy efficiency requirements;
- £340 for a conservatory that is not thermally separate, and therefore not exempt[9].

Benefit breakdown per dwelling

7.3 The analysis assumes that the benefits for a typical dwelling will be:

- Savings for exempt conservatories have not been quantified;
- 151 kWh of gas saving per annum for non-exempt conservatories (or 129kWh of saving when comfort taking[10] is accounted for).

Number of conservatories installed per annum

7.4 To estimate the additional impact of the policy across all dwellings in Wales, the analysis assumes:

- 8,600 dwellings (0.6%) add a conservatory per year[11];
- The analysis assumes that 50% are thermally separate from building and that 50% are not thermally separate.

[9] For the purpose of this analysis the additional cost and energy savings for a non-exempt conservatory is assumed to be the same as that for an extension since the proposed standards will be the same. However, it is acknowledged that the design and size of a conservatory may differ from an extension.
[10] Comfort taking refers to the rebound effect of households spending some of the gas bill savings on increasing the room temperature
[11] Estimated based on the proportion of dwellings with a conservatory (18%) and assuming a 30-year life.

8. Conversions

Results

8.1 Table 8.1 sets out the results of the analysis for conversions.

Table 8.1: Results of the analysis for conversions	Net Present Value (£m)
Capital Costs	2.946
Energy Costs	-0.302
Replacement Costs	0.338
Maintenance Costs	-
Total financial costs	**2.983**
Carbon and air quality costs	-0.510
Total costs including carbon and air quality improvement	**2.473**
Tonnes of carbon saved (tonnes)	*6,411*

Cost breakdown per dwelling

8.2 The analysis assumes that the cost per dwelling will increase by a total of:

- £165 for an Internal Wall Insulation risk assessment for a typical loft conversion[12];
- £159 to meet the proposed standards for a conversion.

Benefit breakdown per dwelling

8.3 The analysis assumes that the benefits for a typical dwelling will be:

- Benefits of risk assessment not quantified in this analysis;
- 96 kWh of gas saving per annum for typical loft conversion with insulation at rafter level (or 82kWh of saving when comfort taking[13] is accounted for).

Number of conversions installed per annum

8.4 To estimate the additional impact of the policy across all dwellings in Wales, the analysis assumes:

- 1,400 dwellings (0.1%) undertake a loft conversion per annum[14];
- 50% of loft conversions with insulation are at rafter level.

[12] Costs derived through discussions with expert practitioners. The costs for a retrofit assessment vary and it is assumed that a whole-house approach is being adopted by those undertaking risk assessments. The Internal Wall Insulation (IWI) risk assessment is suggested as being in the region of 25% to 35% of the whole-house fee. For a one-off house, the fee is likely to be in the region of £550. Therefore, the range for the IWI risk assessment being between £140 and £190. We have used £165 as the mid-point cost per property.

[13] Comfort taking refers to the rebound effect of households spending some of the gas bill savings on increasing the room temperature

[14] Calculated based on estimate that 5% of stock have loft conversions; typical house is 50 years old = average rate of 0.1% p.a.

9. Boiler Plus and Future Proofing

Results

9.1 Table 9.1 sets out the results of the analysis for Boiler Plus

Table 9.1: Results of the analysis for Boiler Plus	Net Present Value (£m)
Capital Costs	42.918
Energy Costs	-24.133
Replacement Costs	-
Maintenance Costs	-
Total financial costs	**18.785**
Carbon and air quality costs	22.388
Total costs including carbon and air quality improvement	**-3.603**
Tonnes of carbon saved (tonnes)	*285,617*

9.2 The costs/benefits of replacement heating system (relative to the counterfactual) have not been quantified for the consultation stage impact assessment.

Cost breakdown per dwelling[15]

9.3 The analysis assumes that the cost per dwelling will increase by a total of:

- £150 to install a load compensator; or
- £30 to install a learning thermostat.

Benefit breakdown per dwelling

9.4 The analysis assumes that the benefits for a typical dwelling will be:

- 371 kWh of gas saving per annum for dwellings that install load compensators (315kWh of saving when comfort taking[16] is accounted for); or
- 68kWh of gas savings per annum for dwellings that install learning thermostats (58kWh of saving when comfort taking[17] is accounted for).

Number of additional energy saving devices

9.5 To estimate the additional impact of the policy across all dwellings in Wales, the analysis assumes:

- 5% of boilers are replaced per annum (72,000 boiler replacements p.a.)[18];
- Of these, it is assumed that 55,400 (77%) of replacement boilers are combi boilers (based on market sales data);
- When installing a combi system, there is also a requirement to install additional energy saving devices, the two most common of which are a load compensator or a learning thermostat. The analysis assumes a 50/50 split between these two, based on the English impact assessment[15] .

[15] The unit costs and benefits for the changes as a result of Boiler Plus are based on the assumptions set out in the England Boiler Plus IA
[16] Comfort taking refers to the rebound effect of households spending some of the gas bill savings on increasing the room temperature
[17] Comfort taking refers to the rebound effect of households spending some of the gas bill savings on increasing the room temperature
[18] Estimate of boiler replacement is based on market data for boiler sales

10. Part F: Ventilation

Results

10.1 Table 10.1 sets out the results of the analysis for Part F: ventilation

Table 10.1: Results of the analysis for background ventilators	Net Present Value (£m)
Capital Costs	£0.926
Energy Costs	-
Replacement Costs	-
Maintenance Costs	-
Total financial costs	**£0.926**
Carbon and air quality costs	-
Total costs including carbon and air quality improvement	**£0.926**
Tonnes of carbon saved (tonnes)	-

Cost breakdown per dwelling

10.2 Two categories of ventilation improvement level are proposed by policy, category B and A, depending on the extent to which air permeability is expected to be reduced.

10.3 The two systems which will deliver the required ventilation improvements are:

- Natural ventilation system comprising 12 x 5000mm2 background ventilators (slot-type in head of window), 1 x 15 l/s intermittent fan in bathroom, 1 x 30 l/s intermittent fan in utility room, reconfigure existing canopy in kitchen to duct to outside;
- Continuous mechanical ventilation comprising 7 x 5000mm2 background ventilators, 1 x 8 l/s continuous extract in bathroom, 1 x 8 l/s fan in utility room, 1 x 13 l/s extract fan in the kitchen.

10.4 Different combinations of these systems can be used to achieve the categories of required ventilation improvement. The costs of these are as follows:

- Category B: £1,550 for natural ventilation or £1,480 for continuous mechanical ventilation per home.
- Category C: £1,320 for continuous mechanical ventilation per home.

10.5 **Note:** The lower cost for Category C is due to background ventilators being installed during window manufacture.

Benefit breakdown per dwelling

10.6 The benefits of improved ventilation (relative to the counterfactual) have not been quantified for the consultation stage impact assessment.

Number of EEM installed per annum requiring improved ventilation

10.7 To estimate the additional impact of the policy across all dwellings in Wales, the analysis assumes:

- Solid Wall Insulation will be the main energy efficiency measure (EEM) that could result in the need for improved ventilation;
- Data suggests that there were around 300 external wall installation projects in 2017/18 with no internal insulation works.

- The analysis assumes that 25%[19] of these projects will require improved ventilation, split evenly between natural ventilation and mechanical ventilation.

[19] Consultant's working assumption

11. Reducing risk of overheating in new homes

Results

11.1 Table 11.1 sets out the results of the analysis for reducing risk of overheating in new homes

Table 11.1: Results of the analysis for reducing the risk of overheating	Net Present Value (£m)
Capital and replacement costs	34.170
Energy Costs	-5.213
Maintenance Costs	-
Total financial costs	**28.956**
Carbon and air quality costs	-0.238
Mortality impact	-20.593
Productivity impact	-10.759
Total costs including carbon and air quality improvement	**-2.634**

Cost breakdown per dwelling

11.2 The analysis of the proposed policy estimates that new flats will incur an additional capital cost of:

- £1,542 per dwelling for single aspect flats;
- £3,120 per dwelling for dual aspect flats.

11.3 Under the counterfactual the analysis assumes that a proportion of flats will install air conditioning to mitigate overheating starting in 2026, and gradually increasing to 27% of flats by 2080. The assumed capital cost for these dwellings is assumed to be:

- £6,770 per dwelling for single aspect flats;
- £7,291 per dwelling for dual aspect flats.

Benefit breakdown per dwelling

11.4 There are two types of benefits identified:

- Life years saved;
- Productivity improvements.

11.5 The impact of overheating expected to increase over time and the modelling undertaken by AECOM has estimated the life years saved per dwelling as a result of the policy. The estimates are for two time periods to reflect the anticipated impact of climate change.

Table 11.2: Life years saved per dwelling		
	2020-2040	2041-2090
Single aspect	0.0011	0.0016
Dual aspect	0.0004	0.0007

11.6 The proposals to reduce overheating should also mean less sleep disruption for residents resulting in productivity improvements. The following assumptions have been used to estimate the productivity impacts:

Table 11.3: Productivity reduction due to overheating as % of GDP per resident of dwellings 2041-2090

		Policy		Counterfactual	
		2020-40	2041-2090	2020-40	2041-2090
Including daytime occupancy	Dual aspect	0.00%	0.02%	0.00%	0.03%
	Single aspect	0.00%	0.02%	0.00%	0.03%
No daytime occupancy	Dual aspect	0.00%	0.03%	0.08%	0.18%
	Single aspect	0.00%	0.03%	0.04%	0.11%

Number of dwellings impacted per annum

11.7 The analysis assumes that all new build flats (1,400 per annum) will be impacted by the policy. The analysis assumes that:

- 25% will be single aspect designs and that 75% dual aspect;
- 33% of flats will include daytime occupancy and conversely that 67% will have no daytime occupancy.

12. EPBD: Self-Regulating Devices

Results

12.1 Table 12.1 sets out the results of the analysis of self-regulating devices.

Table 12.1: Results of the analysis of self-regulator devices	Net Present Value (£m)
Capital Costs	46.202
Energy Costs	-24.767
Replacement Costs	-
Maintenance Costs	-
Total financial costs	**21.435**
Carbon and air quality costs	-26.175
Total costs including carbon and air quality improvement	**-4.740**
Tonnes of carbon saved (tonnes)	*319,389*

Cost breakdown per dwelling

12.2 The analysis assumes that the cost per dwelling will increase by a total of:

- £25 per Thermostatic Radiator Valve installed.

Benefit breakdown per dwelling

12.3 The analysis assumes that the benefits for a typical dwelling will be:

- 155 kWh of gas saving per annum for dwellings that already have TRV installed in most used rooms (or 132kWh of saving when comfort taking[20] is accounted for);
- 447 kWh of gas saving per annum for dwellings that have no TRV already installed (or 380kWh of saving when comfort taking[21] is accounted for).

Number of Self-Regulating Devices installed per annum

12.4 To estimate the additional impact of the policy across all dwellings in Wales, the analysis assumes:

- 5% of boilers are replaced per annum (72,000 boiler replacements p.a.);
- Typical dwelling has 9 radiators that could be fitted with TRV;
- 50% of dwellings already have TRV installed on all radiators;
- 30% of dwellings have TRV already installed on 5 radiators (i.e. in most used rooms);
- 20% of dwellings have no TRV installed.

[20] Comfort taking refers to the rebound effect of households spending some of the gas bill savings on increasing the room temperature

[21] Comfort taking refers to the rebound effect of households spending some of the gas bill savings on increasing the room temperature

13. EPBD: Building Automated Control Systems (BACS)

Results

13.1 Table 13.1 sets out the results of the analysis of building automated control systems (BACS).

Table 13.1: Results of the analysis for BACS	Net Present Value (£m)
Capital Costs	4.551
Energy Costs	-12.882
Replacement Costs	-
Maintenance Costs	-
Total financial costs	**-8.331**
Carbon and air quality costs	-4.91
Total costs including carbon and air quality improvement	**-13.244**
Tonnes of carbon saved (tonnes)	*57,341*

Cost breakdown per building

13.2 The analysis assumes that to upgrade from a Class C to a Class A BACS will be;

- An average cost of £244,000 per building.

Benefit breakdown per building

13.3 The analysis assumes that the benefits for a typical building of installing a compliant BACS will be a:

- 30% energy saving compared with the counterfactual.

Number of additional Class A BACS installed per annum

13.4 To estimate the additional impact of the policy across all dwellings in Wales, the analysis assumes:

- Total number of buildings in scope is calculated by estimating number of buildings with heating of over 290kW based on floor area and data on energy use per floor area;
  - = 95% of new buildings/refurbishments with space heating or air-conditioning system over 290kW will already be installing Class A BACS (counterfactual) – so will incur no additional costs
  - = 5% of new buildings/refurbishments with space heating or air-conditioning system over 290kW will be installing (a non-compliant) Class C BACS (counterfactual) – so will be required to upgrade to a Class A system
    - Average of 0.6 additional new buildings installing a Class A BACS system per annum
    - Average of 1.5 additional existing buildings undertaking a refurbishment and replacing an existing BACS system with a Class A BACS system per annum.

14. Specific Impact Tests

Competition Assessment

14.1 The policy will primarily impact on the section of the construction industry undertaking works on existing domestic buildings along with the supply chains for construction materials used in those projects.

14.2 As a result of higher standards for existing buildings, builders and installers would have to comply with the more stringent targets and as a result would see costs rise. As the increase in costs will affect all builders broadly equally, any competitive effects in the market in Wales are likely to be negligible.

14.3 The Part L uplift option for 2021 assume some improvement in fabric and services specifications. If fabric energy efficiency had been improved in isolation, this could have given manufacturers of products which impact on fabric performance (insulation, windows) an advantage over those involved in manufacturing and supplying building services (e.g. boilers, lighting); however, this is not the case. Furthermore, flexibility is provided in a way that developers can meet the higher performance standards, which should ensure that no one product or manufacturer can dominate any part of the market.

Housing Supply

14.4 This policy is not expected to impact on the supply of new housing because the majority of the proposals are targeted at existing dwellings.

Innovation

14.5 Particularly with respect to raising the Part L standards, there should be the potential for new firms to enter the market due to the flexibility for builders and installers to choose building technologies to meet these standards. This should encourage innovation among manufacturers.

Small firms impact test

14.6 These costs should affect all contractors broadly equally, whether large or small.

14.7 Small businesses in the housing sector principally comprise builders, installers, architects, engineers and other technical specialists. The impacts of a change in building standards are likely to be most significant for builders as any change in costs will affect their cost of business. For other parties, impacts are most likely to comprise a short term need to understand and revise practices to reflect the new requirements, however this is unlikely to be above the level that would be typically expected as part of ongoing professional development.

14.8 We intend to use the consultation process to gather up-to-date information about differences in the effects of the regulations on small business.

Environmental impact assessment

14.9 The main assessment described in this report assess the impact on the environment.

Social impact assessment

14.10 Some health benefits are likely to derive from reduced energy use. Health and economic benefits are expected to derive from reduced overheating.

14.11 There are improvements in indoor air quality, and consequently occupant's health and well-being, from the proposed changes to Part F. Improved indoor air quality arises as a result of better air distribution between rooms and simplification of the guidance which should deliver greater compliance and reduce the risk of under-ventilation.

14.12 There are also potentially beneficial improvements in health and quality of life from the effect of increased energy efficiency on thermal comfort.

Rural impact assessment

14.13 Assessing rural impacts means determining whether the impacts on rural areas will be different to those for urban areas, and whether there are specific local or regional effects.