Department for
Business, Energy
& Industrial Strategy

Improving the Energy Performance of Privately Rented Homes in England and Wales

Consultation Stage Impact Assessment

September 2020

Title: Improving the energy performance of privately rented homes in England and Wales **IA No:** BEIS023(C)-20-CG **RPC Reference No:** Not applicable **Lead department or agency:** Department for Business, Energy and Industrial Strategy **Other departments or agencies:** None	**Impact Assessment (IA)** **Date: 30 September 2020** **Stage:** Consultation **Source of intervention:** Domestic **Type of measure:** Secondary legislation **Contact for enquiries:** PRStrajectoryConsultation@beis.gov.uk
Summary: Intervention and Options	**RPC Opinion: N/A**

Cost of Preferred (or more likely) Option			
Total Net Present Social Value (2018 prices)	**Business Net Present Value** (2018 prices)	**Net cost to business per year** (2018 prices)	**Business Impact Target Status** Measure qualifies as
£0.3bn	£-12.2bn	£520m	Qualifying Provision

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

The Private Rented Sector (PRS) faces significant barriers to the adoption of energy performance improvement measures; 67 percent of PRS properties in England and Wales are below Energy Performance Certificate (EPC) Band C under the Energy Efficiency Rating (EER) metric. Due to the split incentive, whereby the landlord carries the investment cost and the tenant typically benefits from reduced fuel bills, there has been little incentive for landlords to carry out energy improvements. Government tightened regulations in 2018 requiring landlords to spend up to £3,500 to upgrade properties to a minimum energy efficiency standard of EPC Band E. However, continued Government intervention is needed to ensure that energy performance improvement measures continue to be carried out in this sector, helping deliver against the Government's statutory greenhouse gas emission reduction and fuel poverty targets as well as driving wider policy outcomes such as reduced energy bills and improved security of energy supply. It is expected that some of the costs to business will be offset by the Green Homes Grant, as well as potential indirect benefits to landlords from changes in property value.

What are the policy objectives and the intended effects?

This policy intends to further tighten the Energy Efficiency (Private Rented Property) (England and Wales) Regulations 2015 (hereafter 2015 Regulations) and improve the overall energy performance of the sector. Intended outcomes: make progress against Government's statutory fuel poverty target and deliver against the legislated net zero 2050 carbon target; reduce energy demand in the sector, lower energy bills and improve energy security; and improve thermal comfort and health.

What policy options have been considered, including any alternatives to regulation?

Alternatives to regulations, including providing information and fiscal incentives, have been considered and deemed insufficient on their own to overcome key market barriers hindering uptake of energy performance improvement measures in this sector. As a result, the Government is consulting on tightening the 2015 Regulations by placing a responsibility on landlords to meet an EPC (Energy Efficiency Rating, EER) Band C target by 2025 (new tenancies) and 2028 (all tenancies), subject to a cost cap of £10,000 inclusive of VAT.

Policy option 1: £5,000 (EER C); Policy Option 2: £10,000 (EER C); Policy Option 3: £15,000 (EER C); Policy Option 4: £15,000 (EER C and Environmental Impact Rating C).
Policy Option 2 is the preferred option, providing the best balance between policy outcomes (70% of properties in scope reach the new standard), whilst limiting average landlord capital spend to £4,700/property.

Will the policy be reviewed? It will be reviewed. **If applicable, set review date:** 2030

Does implementation go beyond minimum EU requirements?		N/A		
Are any of these organisations in scope?	**Micro** Yes	**Small** Yes	**Medium** Yes	**Large** Yes

What is the CO_2 equivalent change in greenhouse gas emissions over Carbon Budget 5?	**Traded:** -1.1 MtCO2e	**Non-traded:** -6.1 MtCO2e

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

Signed by the responsible minister:

Date: 24.09.2020

Summary: Analysis & Evidence — Policy Option 1

Description: Maximum spend of £5,000 per property, Energy Efficiency Rating C target.

FULL ECONOMIC ASSESSMENT

Price Base Year 2018	PV Base Year 2018	Time Period Years: 46	Net Benefit (Present Value (PV)) (£m)		
			Low: Optional	High: Optional	Best Estimate: -400

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. transition) (Constant Price)	Total Cost (Present Value)
Low	0	0	Optional	Optional
High	0		Optional	Optional
Best Estimate	0		180	8,200

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

The largest societal costs are the material, labour, and financing costs associated with installation of energy performance improvement measures (PV, £6.3bn), and the hidden costs associated with the installation of energy performance improvement measures (PV, £0.5bn), as well as other smaller costs. Landlords will also face a cost stemming from the time spent on compliance activities. Most of these costs are expected to be incurred by landlords.

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

None identified.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. transition) (Constant Price)	Total Benefit (Present Value)
Low	0	0	Optional	Optional
High	0		Optional	Optional
Best Estimate	0		170	7,800

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

Households that have energy performance improvement measures installed are the main affected group. They will benefit from energy savings (PV, £3.8bn), and increased comfort from warmer homes (PV, £1.1bn). Society will also benefit from improved air quality (PV £0.5bn) and reduced traded (PV £0.2bn) and non-traded (PV £2.2bn) greenhouse gas emissions.

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

The UK is likely to benefit from lower energy imports, and lower costs of meeting peak energy demand. Health impacts associated with the improved energy performance of properties treated under the regulations have been estimated at PV £0.4bn. This benefit has not been included in the cost benefit analysis as the methodology is still under review.

Key assumptions/sensitivities/risks — **Discount rate (%)**: 3.5 (years 1-30), 3.0 (>30 years)

The majority of landlords are compliant with the regulations and pre-requisite regulations requiring rented properties to have an Energy Performance Certificate at the point at which they are offered for rent; Capital costs that landlords face are in line with our capital cost central assumptions; Energy prices over time are in line with IAG central projections. Energy savings have been estimated using the Standard Assessment Procedure (SAP) with in use factors to account for the real-life performance of energy performance improvement measures. High / low scenarios have been estimated using different capital cost assumptions (see Annex B) as capital costs not only impact the NPV but also other key estimates under this policy. Further sensitivity analysis is provided in Section 8.

BUSINESS ASSESSMENT (Final Government Position)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only)
Costs:	Benefits:	Net:	
360	0	360	1389

Summary: Analysis & Evidence — Policy Option 2

Description: Maximum spend of £10,000 per property, Energy Efficiency Rating C target.

FULL ECONOMIC ASSESSMENT

Price Base Year 2018	PV Base Year 2018	Time Period Years: 46	Net Benefit (Present Value (PV)) (£m)		
			Low: Optional	High: Optional	Best Estimate: 300

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. transition) (Constant Price)	Total Cost (Present Value)
Low	0	0	Optional	**Optional**
High	0		Optional	**Optional**
Best Estimate	**0**		**340**	**15,800**

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

The largest societal costs are the material, labour, and financing costs associated with installation of energy performance improvement measures (PV, £12.7bn), and the hidden costs associated with the installation of energy performance improvement measures (PV, £0.6bn), as well as other smaller costs. Landlords will also face a cost stemming from the time spent on compliance activities. Most of these costs are expected to be incurred by landlords.

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

None identified.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. transition) (Constant Price)	Total Benefit (Present Value)
Low	0	0	Optional	**Optional**
High	0		Optional	**Optional**
Best Estimate	**0**		**350**	**16,100**

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

Households that have energy performance improvement measures installed are the main affected group. They will benefit from energy savings (PV, £7.3bn), and increased comfort from warmer homes (PV, £2.2bn). Society will also benefit from improved air quality (PV £1.7bn) and reduced traded (PV £0.3bn) and non-traded (PV £4.6bn) greenhouse gas emissions.

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

The UK is likely to benefit from lower energy imports, and lower costs of meeting peak energy demand. Health impacts associated with the improved energy performance of properties treated under the regulations have been estimated at PV £0.8bn. This benefit has not been included in the cost benefit analysis as the methodology is still under review.

Key assumptions/sensitivities/risks — **Discount rate**: 3.5 (years 1-30), 3.0 (>30 years)

The majority of landlords are compliant with the regulations and pre-requisite regulations requiring rented properties to have an Energy Performance Certificate at the point at which they are offered for rent; Capital costs that landlords face are in line with our capital cost central assumptions; Energy prices over time are in line with IAG central projections. Energy savings have been estimated using the Standard Assessment Procedure (SAP) with in use factors to account for the real-life performance of energy performance improvement measures. High / low scenarios have been estimated using different capital cost assumptions (see Annex B) as capital costs not only impact the NPV but also other key estimates under this policy. Further sensitivity analysis is provided in Section 8.

BUSINESS ASSESSMENT (Final Government Position)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only)
Costs:	**Benefits:**	**Net:**	
690	0	690	2579

Summary: Analysis & Evidence — Policy Option 3

Description: Maximum spend of £15,000 per property, Energy Efficiency Rating C target.

FULL ECONOMIC ASSESSMENT

Price Base Year 2018	PV Base Year 2018	Time Period Years: 46	Net Benefit (Present Value (PV)) (£m)		
			Low: Optional	High: Optional	Best Estimate: 3,200

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. transition) (Constant Price)	Total Cost (Present Value)
Low	0	0	Optional	**Optional**
High	0		Optional	**Optional**
Best Estimate	**0**		**400**	**18,200**

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

The largest societal costs are the material, labour, and financing costs associated with installation of energy performance improvement measures (PV, £14.8bn), and the hidden costs associated with the installation of energy performance improvement measures (PV, £0.7bn), as well as other smaller costs. Landlords will also face a cost stemming from the time spent on compliance activities. Most of these costs are expected to be incurred by landlords.

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

None identified.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. transition) (Constant Price)	Total Benefit (Present Value)
Low	0	0	Optional	**Optional**
High	0		Optional	**Optional**
Best Estimate	**0**		**470**	**21,400**

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

Households that have energy performance improvement measures installed are the main affected group. They will benefit from energy savings (PV, £8.7bn), and increased comfort from warmer homes (PV, £2.5bn). Society will also benefit from improved air quality (PV £4.6bn) and reduced traded (PV £0.3bn) and non-traded (PV £5.4bn) greenhouse gas emissions.

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

The UK is likely to benefit from lower energy imports, and lower costs of meeting peak energy demand. Health impacts associated with the improved energy performance of properties treated under the regulations have been estimated at PV £0.8bn. This benefit has not been included in the cost benefit analysis as the methodology is still under review.

Key assumptions/sensitivities/risks — **Discount rate**: 3.5 (years 1-30), 3.0 (>30 years)

The majority of landlords are compliant with the regulations and pre-requisite regulations requiring rented properties to have an Energy Performance Certificate at the point at which they are offered for rent; Capital costs that landlords face are in line with our capital cost central assumptions; Energy prices over time are in line with IAG central projections. Energy savings have been estimated using the Standard Assessment Procedure (SAP) with in use factors to account for the real-life performance of energy performance improvement measures. High / low scenarios have been estimated using different capital cost assumptions (see Annex B) as capital costs not only impact the NPV but also other key estimates under this policy. Further sensitivity analysis is provided in Section 8.

BUSINESS ASSESSMENT (Final Government Position)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only)
Costs:	Benefits:	Net:	
800	0	800	3085

Summary: Analysis & Evidence — Policy Option 4

Description: Maximum spend of £15,000 per property, Energy Efficiency Rating C and Environmental Impact Rating C target.

FULL ECONOMIC ASSESSMENT

Price Base Year 2018	PV Base Year 2018	Time Period Years: 46	Net Benefit (Present Value (PV)) (£m)		
			Low: Optional	High: Optional	Best Estimate: -1,700

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. transition) (Constant Price)	Total Cost (Present Value)
Low	0	0	Optional	Optional
High	0		Optional	Optional
Best Estimate	0		500	22,900

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

The largest societal costs are the material, labour, and financing costs associated with installation of energy performance improvement measures (PV, £18.8bn), and the hidden costs associated with the installation of energy performance improvement measures (PV, £0.8bn), as well as other smaller costs. Landlords will also face a cost stemming from the time spent on compliance activities. Most of these costs are expected to be incurred by landlords.

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

None identified.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. transition) (Constant Price)	Total Benefit (Present Value)
Low	0	0	Optional	Optional
High	0		Optional	Optional
Best Estimate	0		460	21,200

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

Households that have energy performance improvement measures installed are the main affected group. They will benefit from energy savings (PV, £7.9bn), and increased comfort from warmer homes (PV, £2.4bn). Society will also benefit from improved air quality (PV £2.8bn) and reduced traded (PV £0.1bn) and non-traded (PV £7.9bn) greenhouse gas emissions.

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

The UK is likely to benefit from lower energy imports, and lower costs of meeting peak energy demand. Health impacts associated with the improved energy performance of properties treated under the regulations have been estimated at PV £0.9bn. This benefit has not been included in the cost benefit analysis as the methodology is still under review.

Key assumptions/sensitivities/risks — **Discount rate**: 3.5 (years 1-30), 3.0 (>30 years)

The majority of landlords are compliant with the regulations and pre-requisite regulations requiring rented properties to have an Energy Performance Certificate at the point at which they are offered for rent; Capital costs that landlords face are in line with our capital cost central assumptions; Energy prices over time are in line with IAG central projections. Energy savings have been estimated using the Standard Assessment Procedure (SAP) with in use factors to account for the real-life performance of energy performance improvement measures. High / low scenarios have been estimated using different capital cost assumptions (see Annex B) as capital costs not only impact the NPV but also other key estimates under this policy. Further sensitivity analysis is provided in Section 8.

BUSINESS ASSESSMENT (Final Government Position)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only)
Costs:	Benefits:	Net:	
1000	0	1000	3868

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1. Problem under consideration

1. In June 2019 the UK government became the first major economy to legislate for net zero greenhouse gas emissions. The target requires the UK to bring its greenhouse gas emissions to net zero by 2050, compared to the previous target of at least an 80% reduction from 1990 levels. In addition to our Net Zero target, the UK has ambitious interim emission reduction targets, the Carbon Budgets, which currently require a 57% reduction in emissions from across the UK economy by 2032 compared to 1990's level.

2. The Clean Growth Strategy set out the Government's intention to look at a long-term trajectory for energy performance standards across the private rented sector (PRS), with the aim of as many private rented homes as possible being upgraded to Energy Performance Certificate (EPC) Band C by 2030, where practical, cost-effective and affordable.

3. Upgrading the energy efficiency of homes addresses a number of Government objectives directly, by:
    - **Tackling the root cause of fuel poverty**, making progress towards the Government's statutory fuel poverty targets;
    - **Reducing greenhouse gas emissions** in the domestic sector, contributing to the Government's legally binding emissions reduction targets;
    - **Lowering energy bills**, helping keep bills as low as possible for households; and
    - Reducing energy demand and contributing to ensuring that the UK has a **secure and resilient energy system**.

4. In addition to private rented properties being among the least energy efficient in the domestic housing stock, with an average SAP (under the Energy Efficiency Rating, or EER) score of 62.3 compared to an average of 63.2,[1,2] they also:
    - account for a **disproportionate number of households in fuel poverty** – in England around 25% of EPC D to G-rated PRS homes are fuel poor, whereas only 10% of the wider population are in fuel poverty[3];
    - represent some of the **coldest homes in the housing stock** – the most inefficient domestic properties are on average up to 2°C colder in winter than the most efficient homes, posing a risk to tenant health, with underheating more prevalent in inefficient and fuel poor homes[4] ;
    - contribute to **residential greenhouse gas emissions –** Homes are responsible for 15% of UK greenhouse gas emissions (or around 20% including electricity consumption) at present[5]. In 2018, private rented properties contributed around 11 MtCO2e (around 9 MtCO2e from below EER C properties), with an estimated annual spend on energy bills of over £6bn (of which £5bn is from below EER C properties)[6];
    - **significantly higher energy costs** of keeping warm than EER C households: on average, homes in England below EER C have an average modelled cost of energy (based on SAP) of around £500 more than EER C rated homes[7];
    - provide the opportunity to **improve the security of energy supply** through lowering energy consumption – the International Energy Agency estimates that that since 1990 energy efficiency

[1] The energy performance of domestic buildings is measured using Energy Performance Certificates (EPCs), which rate homes on a scale from A (very efficient) to G (very inefficient). Note This assumes the home is not under heated. More information can be found here: https://www.gov.uk/buy-sell-your-home/energy-performance-certificates.

[2] English Housing Survey 2018-19. Tables AT2.6 and AT2.7: https://www.gov.uk/government/statistics/english-housing-survey-2018-to-2019-headline-report

[3] https://www.gov.uk/government/statistics/fuel-poverty-detailed-tables-2020

[4] Page 5: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/789775/Comparison_of_theoretical_energy_consumption_with_actual_usage.pdf

[5] Table 3: https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-2018

[6] BEIS analysis using ECUK (Energy Consumption in the UK), EHS (English Housing Survey) and NEED (National Energy Efficiency Data-Framework) 2018 data

[7] Table AT1.5: https://www.gov.uk/government/statistics/english-housing-survey-2018-energy-report

improvements have reduced the UK's energy imports by around 25 million tonnes of oil equivalent, and reduced the UK's import bill by around $7 billion.[8]

5. This impact assessment supports the consultation seeking views on the Government's proposal to amend the Energy Efficiency (Private Rented Property) (England and Wales) Regulations 2015 (as amended), (from now on referred to as "PRS Regulations"). Under the current Regulations, which came into effect for all tenancies in April 2020, landlords of EPC Band F and Band G rated homes are currently required to invest, or co-invest, up to £3,500 in improving the energy performance of these properties to EPC Band E.

6. Despite CO2 emissions from homes having reduced by 15% compared to 1990 levels (16% for all GHG emissions from homes[9]), additional efforts are required to meet the government's greenhouse gas emission reduction targets, including Net Zero by 2050. The consultation sets out proposals which would significantly improve the energy performance of private rented sector homes in the 2020s.

[8] International Energy Agency Energy Efficiency Report (2015), available at: http://www.iea.org/publications/freepublications/publication/MediumTermEnergyefficiencyMarketReport2015.pdf

[9] https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2018

2. Rationale for intervention

1. The current PRS Regulations improve less than 300,000 of the worst performing PRS properties. The Clean Growth Strategy commitment of upgrading as many PRS properties as possible to EPC C requires further action.

2. There are a range of market failures and barriers to energy performance improvements in the domestic PRS, which provide a rationale for Government intervention in the private rental market (further detail is set out in Annex A). These include:
    - **misaligned incentives**: such as where the costs of upgrading a property fall to landlords but the benefits of lower energy costs and/or a warmer home accrue to the tenant, with the landlord not necessarily being able to capture the benefits through increases in rent;
    - **externalities:** such as energy prices not fully reflecting the climate change costs of burning fossil fuels, or the public health benefits of warmer homes not fully accruing to those who pay for energy performance upgrades;
    - **incomplete information:** such as landlords or tenants not having a good understanding of the benefits of energy performance or what can be done to improve it;
    - **credit constraints:** whereby lower income households can be 'locked in' to energy inefficient homes without the means to either make upgrades themselves or move to a more efficient home; and
    - **wider economic benefits:** such as health, job creation, and GDP benefits from better energy performance not being captured by landlords.

3. The above barriers are exacerbated by relatively high tenant turnover in the PRS. Around 41% of private sector tenants have lived in their current home for less than 2 years, with 71% of tenants being in their current property for less than 5 years. Around 88% of private renters had been resident in their own home for fewer than 10 years; this compares to 56% for social renters and 36% for owner occupiers.[10] Furthermore, the Private Landlord Survey suggests that landlords are unwilling to offer longer term tenancies – only 40% of landlords are willing to offer tenancies longer than 12 months without a break clause[11]. Most major energy performance improvements, such as solid wall or floor insulation, take longer time periods for the full benefits to accrue. This means that even if the above barriers can be overcome, the tenant is likely to have moved on before the full benefits can be experienced by them.

4. Without further Government intervention to improve the energy performance in the Private Rented Sector through amending regulations that currently only affect EPC F&G rated properties it is likely that these barriers will continue to prevent the take up of energy performance improvement measures, with negative consequences for the Government's fuel poverty and greenhouse emissions reduction objectives and targets.

[10] English Housing Survey, https://www.gov.uk/government/statistical-data-sets/social-and-private-renters
[11] Private Landlord Survey, Table AT3.6:
https://www.gov.uk/government/publications/english-private-landlord-survey-2018-main-report

3. Policy objectives

1. Effective operation of the domestic PRS regulatory framework will support two of the Government's statutory objectives:

    1) **Making progress towards fuel poverty targets**: raising energy performance standards in the PRS to EPC Band C helps achieve the Government's target of fuel poor homes to energy efficiency Band C by 2030.[12] The Regulations would therefore make a positive contribution to the Government's fuel poverty commitments for England[13] as well as the Welsh Government's own statutory target[14].
    2) **Reducing energy demand and greenhouse gas emissions**: GHG emissions from homes have reduced by 16% compared to 1990 levels[15]. Improving the energy performance of privately rented homes will further cut energy use and the greenhouse gas emissions that result from it, contributing to the Government's climate change commitments, including Net Zero by 2050.[16] Reduced energy use also supports the transition to low carbon heating systems by reducing the size and cost of the energy system required.

2. In addition, in the Clean Growth Strategy laid before Parliament in 2017[17], Government committed to look at a long term trajectory to improve the energy performance standards of privately rented homes in England and Wales[18], with the aim for as many of them as possible to be upgraded to EPC Band C by 2030, where practical, cost-effective and affordable.

3. The installations driven by amending the PRS Regulations will also contribute to a number of broader Governmental objectives:

    - **Increase the security of the UK's energy supply**: reducing domestic energy use means lower demand for imported fuels and power generation, including at times of peak energy demand.

    - **Support economic growth, jobs in the green construction industry and investment**: Increased demand for energy efficiency measures is likely to support productivity growth and jobs within the green construction industry and the wider supply chain. Greater competition within these markets may also spur innovation, lowering the end costs of installing measures, and help sustain jobs. There could be benefits in the wider macro-economy associated with some of the bill savings experienced by households being spent on other goods and services.

    - **Improving public health outcomes**: the least energy efficient homes are typically also the coldest homes (see Figure 7), and cold homes can lead to poor health outcomes, with a resulting resource pressure on health services. Furthermore, there is evidence that fuel poor households are more likely to underheat their homes[4]. Improving the energy performance of energy inefficient PRS homes will lead to improved health outcomes for households and generate resource savings for health service providers.

4. The policy proposed in this IA links closely with other commitments and work in train to meet them, and other policy areas being developed. These are outlined in the Consultation.

[12] The Government has a statutory target to raise as many fuel poor homes as reasonably practicable to energy efficiency Band C by 2030. The fuel poverty target for England is measured using the Fuel Poverty Energy Efficiency Rating (FPEER), which is based on the same Standard Assessment Procedure methodology used to generate an EPC rating for domestic properties. More information is available here: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/332236/fpeer_methodology.pdf

[13] For more information see: DECC (2015) *Cutting the cost of keeping warm – a fuel poverty strategy for England*, https://www.gov.uk/government/publications/cutting-the-cost-of-keeping-warm; Welsh Government (2010) *Fuel poverty strategy 2010*, http://gov.wales/docs/desh/publications/100723fuelpovertystrategyen.pdf

[14] The National Assembly for Wales recently ran a consultation on fuel poverty: http://senedd.assembly.wales/mgConsultationdisplay.aspx?Id=369

[15] Table 3: https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2018

[16] For more detail on the UK Government's climate change commitments, see: https://www.gov.uk/guidance/carbon-budgets

[17] https://www.gov.uk/government/publications/clean-growth-strategy

[18] Energy efficiency in Scotland and Northern Ireland is devolved.

4. Rationale for regulation and policy options

4.1 Rationale for regulation and alternatives considered

1. The 2015 Private Rented Sector Regulations Impact Assessment[19] first outlined the rationale for regulation as a means of overcoming the barriers identified in Section 2. The primary rationale continues to be that regulation is necessary to overcome the misaligned (or split) incentives that are particularly prevalent in the PRS – such as where the costs of improvements fall to landlords, but tenants are the main beneficiaries. The PRS Regulations require a property to reach a certain EPC Band (currently EPC Band E under the EER metric), and future legislation options include targets under EER, EIR, or a combination of the two.

2. A number of alternative approaches to regulation have been considered and either assessed as being unlikely to drive energy performance improvements or there is evidence to demonstrate that they have limited impact. These include:

    - **Improving information**: The 2018 Private Landlord Survey shows that fewer than five per cent of landlords rent out properties as a full-time business,[20] and over half of all landlords do not use an agent for either letting or management services[21]. This makes providing consistent information to the market as a whole complicated. This is exacerbated by landlord inertia even when information is provided.
    - **Subsidising upfront costs**: PRS homes have been eligible for upgrades under a succession of Government funded schemes and obligations on energy suppliers (such as the Energy Company Obligation (ECO) that provide funding for upgrades[22]). However, take up has consistently been disproportionately low. For example, the PRS accounts for around 20% of the housing stock, but under 15% of measures delivered under ECO2T were in the sector.[23] Subsidising costs alone appear to be insufficient to overcome barriers in the PRS.
    - **Fiscal incentives**: Between 2004 and April 2015 landlords were able to claim a tax deduction of up to £1,500 per property for improvements under the Landlord's Energy Saving Allowance, which had limited uptake due to limited landlord awareness of the scheme at the time.
    - **Voluntary action / self-regulation**: The diverse nature of PRS landlords and the fact that the majority do not belong to a landlord association limits the scope for effective voluntary standards that cover the whole market. Some Local Authority-led voluntary accreditation schemes have resulted in landlords signing up to minimum energy performance standards; however, take up has again been relatively low compared to the size of the market.

[19] Section 4.1, see: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/401382/150202_PRS_Final_Stage_Revised_For_Publication.pdf

[20] AT1.13: https://www.gov.uk/government/publications/english-private-landlord-survey-2018-main-report

[21] Table AT1.20: https://www.gov.uk/government/publications/english-private-landlord-survey-2018-main-report

[22] For further detail on the Energy Company Obligation see: https://www.gov.uk/government/consultations/energy-company-obligation-eco-help-to-heat

[23] Household Energy Efficiency Statistics (2016, November): https://www.gov.uk/government/statistics/household-energy-efficiency-national-statistics-headline-release-november-2016

4.2 Policy options

3. Regulation continues to be the Government's preferred means of driving energy performance improvements in the domestic PRS, due to the barriers set out in Section 2 and the issues with alternatives to regulation set out in Section 4.1. As a result, the Government intends to consult on amendments to the PRS Regulations, as summarised below:

0. Core policy proposal:

a) Raising the energy performance standard to Energy Performance Certificate (EPC) Energy Efficiency Rating (EER) Band C;
b) A phased trajectory for achieving the improvements for new tenancies from 2025 and all tenancies from 2028;
c) Increasing the cap on the cost of investment required per property to £10,000 (inclusive of VAT); and
d) Introducing a 'fabric first' approach to energy performance improvements.

1. Alternative policy proposal:

a) A more stretching policy scenario to help deliver more ambitiously against Carbon Budget 5 (CB5), setting an EPC target based on both cost and carbon (EER C and Environmental Impact Rating, EIR C), with an increased cost cap of £15,000 (inclusive of VAT);

2. Compliance and Enforcement:

a) A suite of proposals to encourage compliance with the PRS regulations, strengthening enforcement options, and amending the existing exemptions framework.

4. For further detail on these proposals, see Consultation 'Improving the energy performance of privately rented homes', published alongside this document.

5. The policy options considered in the Impact Assessment (IA) are:

- **Policy Option 0: Do Nothing**. No amendments would be made to the current PRS Regulations, and few further energy performance improvements would be expected in PRS properties (see Section 6.3 for further detail on expected take up under this option).
- **Policy Option 1: Raise the standard to EPC C and introduce a cost cap of £5,000**. Landlords would be required to upgrade their properties to at least EER Band C on their EPC or incur costs of no more than £5,000 (in current prices) per property in improving the energy performance to as close to this level as possible.
- **Policy Option 2 (preferred option): Raise the standard to EPC C and introduce a cost cap of £10,000**. Landlords would be required to upgrade their properties to at least EER Band C on their EPC or incur costs of no more than £10,000 (in current prices) per property in improving the energy performance to as close to this level as possible.
- **Policy Option 3: Raise the standard to EPC C and introduce a cost cap of £15,000**. Landlords would be required to upgrade their properties to at least EER Band C on their EPC or incur costs of no more than £15,000 (in current prices) per property in improving the energy performance to as close to this level as possible.
- **Policy Option 4: Introduce a raised standard, using a dual metric, and introduce a cost cap of £15,000 under a dual metric approach**. Landlords would be required to upgrade their properties to at least EER Band C and EIR Band C on their EPC or incur costs of no more than £15,000 (in current prices) per property in improving the energy performance to as close to this level as possible.

6. Policy option 2 (£10,000 cost cap, EER C) strikes the optimum balance between the achievement of policy objectives and the affordability for landlords. It is expected to save 6.1 MtCO2e over Carbon Budget 5; bring around 900,000 low-income households to EPC band C; and save tenants an average of £220 on their annual energy bills - all whilst limiting the average cost to landlords to £4,700 per property. This balance between achieving policy objectives and impact on landlords is the rationale for the preferred option.

5. Analytical approach

5.1 Modelling the stock

1. The National Household Model (NHM) was used to model the installation of measures in the domestic housing stock and their associated energy savings using a SAP-based energy calculation. The model starts with the properties in scope of the EPC targets, i.e. all properties that are not at EPC Band C and those in scope of the Regulations (see Section A.2 for further details). Measures were then installed in descending order of SAP point increase per £ spent until either the property had reached EPC C, no further measures were suitable, or the cost cap had been reached. Note that this cost cap was modelled as if it increases in line with inflation and the Consultation is seeking views on this aspect of the policy design. If the cost cap does not increase in line with inflation policy impacts will be lower. In-use factors, which account for the difference between modelled and observed energy savings, were used to estimate real life energy savings associated with installed measures.

2. Note that in reality, landlords may choose to install measures that do not maximise their SAP score or achieve EPC Band C at the lowest cost. However, the proposed Regulations would require landlords to improve their properties to EPC C if that is possible under the cost cap and our modelling approach shows an optimal way they could achieve that. The outputs from this model were then used to assess the impact of the PRS consultation options. The estimated costs and benefits assume 90% compliance from landlords; either installing measures or registering a valid exemption. This compliance rate is uncertain and discussed in more detail in Section 9. Further details of the stock modelling approach can be found in Annex B.

5.2 Counterfactual

3. The impacts of the proposed PRS Regulations were assessed against a 'business as usual' baseline – the counterfactual. There are two main aspects to the counterfactual that affect the net costs and benefits (including the direct ones to business), improvements that occur as a result of natural replacement, and those delivered from current government policies. Some measures may also be installed by landlords in the absence of further policy, though we have assumed the number would be small.

4. Replacement of existing lighting with low energy lighting is taken from the modelling underpinning Ecodesign. Uptake of conventional heating measures assumes replacement with Ecodesign compliant condensing boilers as existing boilers reach the end of their lifetimes. Modelling accounted for policy overlaps with these proposed regulations. This includes the amendment to the PRS Regulations in 2018 (which will improve the standard of properties at lower levels of energy performance, resulting in fewer measures required in these properties to achieve a higher level of energy performance) and also ECO3, which runs until the end of March 2022[24].

5. This counterfactual was used as the baseline both for the cost-benefit analysis in Section 6 and also the provisional Equivalent Annual Net Direct Cost to Business outlined in Section 7.

5.3 Appraisal period and the re-installation of measures

6. The proposed PRS Regulations are planned to come into force from 2025 and will continue indefinitely. From April 2025, properties will only be required to meet the regulations when a new tenancy agreement is agreed on the property. From April 2028, all properties in scope of the regulations will need to meet the regulations regardless of the tenancy status. For the analysis presented here, it is assumed that installations occurred from the start of 2025 and spread the installation of measures over 2025 to 2028, based on estimates of tenant turnover in the private rented sector. Although there are likely to be some installations before this, even moderate levels of early installations will not significantly impact the analysis. The appraisal period ends

[24] https://www.ofgem.gov.uk/environmental-programmes/eco/contacts-guidance-and-resources/eco-guidance-and-associated-documents

at the start of 2070, the point at which all measures installed at the start of 2028 will have reached the end of their assumed lifetimes. This is in line with the previous MEES amended regulations Impact Assessment[25] which also resulted in the installation of measures with an assumed 42 year lifetime.

7. By the end of the appraisal period in which measures were installed due to the proposed regulations, all of the measures installed in 2028 will have come to the end of their lifetimes. Some measures have a relatively short lifetime, though. For instance, low energy lighting has an estimated lifetime of 10 years and gas boilers a lifetime of 12 years. The Regulations will still apply, and it is assumed that landlords will replace measures on a like-for-like basis as they expire. This is an assumption that enables the counterfactual and policy impact to be assessed over time on a consistent basis, although there may be differences in replacement behaviour in practice. These reinstallation costs and benefits are attributed to these regulations and apportioned on a pro-rata basis up to the end of the appraisal period. Counterfactual measure installations, for example boilers, are also assumed to be reinstalled during the policy appraisal period but are not attributed to the PRS Regulations.

8. When considering both the original installation and later re-installation of measures it is assumed that landlords seek to achieve a rating of EPC Band C only and do not go beyond that. Were landlords to choose to install measures to achieve a higher level of energy performance than is required, this would not be a direct result of the regulations.

5.4 Categories of costs and benefits analysed

9. A range of costs and benefits have been considered. These have been summarised in Table 1.

Table 1: Categories of costs and benefits analysed

Group that costs or benefits fall to	Type of cost/benefit	Included in cost-benefit analysis or described qualitatively?
Costs		
Landlords (businesses)	• Capital cost of installing measures	Monetised in social cost-benefit analysis
	• Operating costs, excluding fuel use (e.g. annual maintenance of solar PV)	
	• Hidden costs of installing measures, such as the time required to research measures and oversee installation	
	• Familiarisation costs of understanding the Regulations	
	• Costs in proving compliance with the regulations and applying for an exemption when this is not possible	
	• Opportunity costs, quantified as a potential return on private capital	
Local authorities	• Cost of enforcing regulations (note that this is assumed to be the same as for the existing PRS Regulations)	
Tenants	• Hidden costs of installing measures, such as the time required to clear rooms or learn new systems	
	• Potential rent increase as a result of installing measures	Private cost, not included in social cost-benefit analysis

[25] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/760313/IA_-_Energy_Efficiency__Private_Rented_Property___England.pdf

Group that costs or benefits fall to	Type of cost/benefit	Included in cost-benefit analysis or described qualitatively?
Benefits		
Landlords (businesses)	• Property value differential as a result of making improvements	Private benefit, not included in social cost-benefit analysis
	• Potential rent increase as a result of installing measures	
Tenants	• Lower energy costs	Private benefit, not included in social cost-benefit analysis
	• Improved thermal comfort in homes (comfort taking)	Monetised in social cost-benefit analysis (also a private benefit)
	• Improved health outcomes as a result of warmer homes	Quantified, but not included in the cost-benefit analysis as methodology still under review.
Society	• Lower energy use	Monetised in social cost-benefit analysis
	• Improvements in air quality from lower fuel use	
	• Reductions in greenhouse gas emissions	

6. Policy impact

6.1 Cost-benefit analysis

1. Table 2 summarises the main quantifiable costs and benefits of the policy. They have been monetised and discounted in line with HM Treasury's *Green Book*[26] and supplementary guidance on valuing energy use and greenhouse gas emissions.[27] The impacts have been modelled using BEIS's National Household Model, details of which can be found in Annex B, alongside the key assumptions and overall modelling approach.

2. The value placed on changes in greenhouse gas (GHG) emissions is currently under review, now the UK has increased its domestic and international ambitions. Accordingly, current central carbon values are likely to undervalue GHG emissions, though the scale of undervaluation is still unclear. The potential impact of placing a higher value on GHG emissions can be illustrated by using the existing high carbon values series, in addition to the prescribed central values (also shown in Table 2). HMG is planning to review the carbon values during 2020.

3. Table 2 also shows the equity weighted NPV after taking account of the subset of society receiving the benefits and paying the costs. Note that the costs and benefits are highly dependent on rates of compliance with the policy. Further results across a wide uncertainty range can be found in Section 8.

Table 2: Estimated costs and benefits of policy options (Present Value, £bn, 2018 prices), 2025 – 2070[28]

Type of cost or benefit	£5,000	£10,000	£15,000	£15,000 CC
Capital costs of installing measures	6.3	12.7	14.8	18.8
Operational costs	0.2	0.1	0.1	0.1
Hidden costs	0.5	0.6	0.7	0.8
Opportunity costs	1.0	1.9	2.3	2.8
Familiarisation and compliance costs for landlords	0.2	0.2	0.2	0.2
Costs of enforcement to LAs	0.1	0.1	0.1	0.1
Total Costs (A)	**8.2**	**15.8**	**18.2**	**22.9**
Value of energy saved	3.8	7.3	8.7	7.9
Value of increased comfort in the home	1.1	2.2	2.5	2.4
Value of improvement in air quality	0.5	1.7	4.6	2.8
Value of traded greenhouse gases saved	0.2	0.3	0.3	0.1
Value of non-traded greenhouse gases saved	2.2	4.6	5.4	7.9
Total Benefits (B)	**7.8**	**16.1**	**21.4**	**21.2**
Net Present Value (B – A)	*-0.4*	*0.3*	*3.2*	*-1.7*
Benefit:Cost Ratio (B / A)	*0.95*	*1.02*	*1.18*	*0.93*
Net Present Value: Green Book high carbon prices	***0.8***	***2.9***	***6.2***	***2.5***
Net Present Value: Equity weighted (central rent scenario)	*1.3*	*3.5*	*6.9*	*4.8*

4. Table 2 shows that the capital cost of installing measures represents the largest overall cost and is around 75 to 80 per cent of total modelled costs. Hidden costs (for example, the time cost of researching appropriate upgrades, overseeing installations or tenant costs of moving household items to accommodate upgrades) and opportunity costs (which capture the cost of foregone investment due to landlords being required to invest in

[26] HM Treasury (2019). *The Green Book*. Available at: https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent

[27] BEIS (2018). *Valuation of energy use and greenhouse gas (GHG) emissions*. Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

[28] Figures may not add up due to rounding.

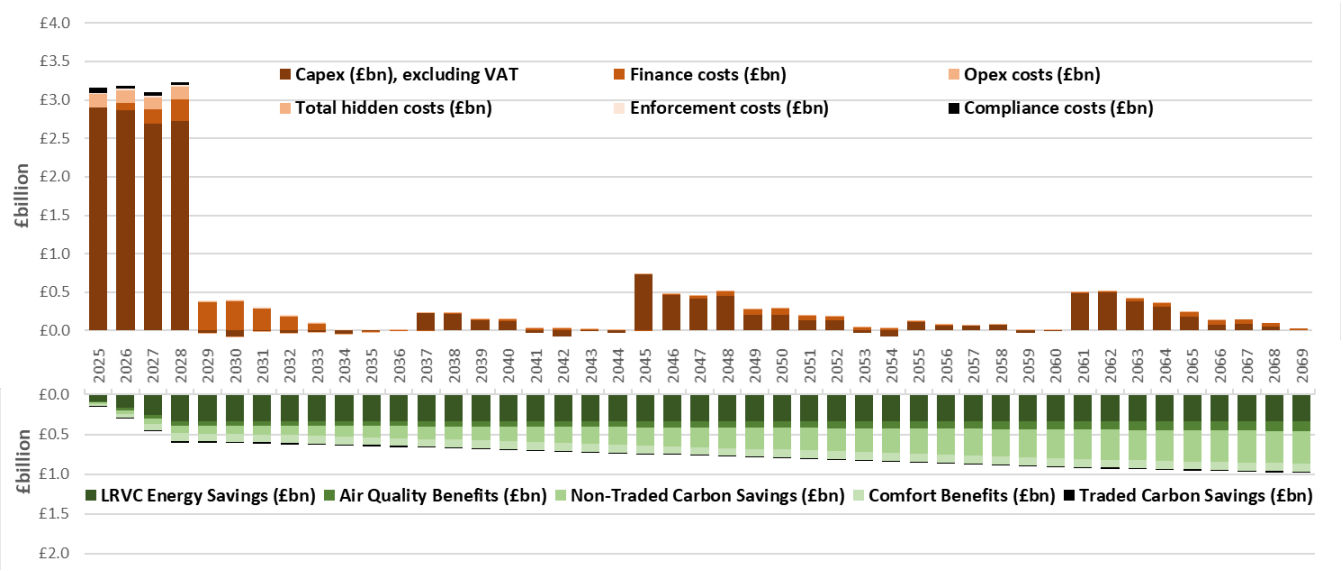
energy performance instead of elsewhere in the economy) are smaller, but still significant. Option 4, with a dual EER C EIR C metric, costs significantly more in capital cost than Option 3, with a single EER C metric, under the same £15,000 cost cap. This is as a result of a more ambitious target as well as more properties in scope of the regulations.

5. The value of the energy saved and non-traded greenhouse gas savings are the greatest monetised benefit, driven by the number and type of measures installed. The benefits in terms of improved householder comfort and air quality are all driven by the changes in the amount and type of energy used in the home. Option 4, the dual metric EER C EIR C scenario, shows that a possible trade-off can exist between monetised energy savings and greenhouse gas emissions savings; compared to Option 3, more greenhouse gas emissions are saved but monetised energy savings are lower. This is a result of the difference in measures being installed as landlords choose the most cost-effective measures to meet the different policy target under the same cost cap. Section 6.3 presents the modelled measure installations for each of the scenarios.

6. Overall, the NPV is positive for all cost cap options under the EER C options apart from the £5,000 cost cap. Option 4 has a negative NPV, although all four options have a positive NPV under high carbon price assumptions, which increases the estimated carbon saving benefits. The higher carbon price assumptions result in larger increases in NPV for the higher cost cap options and the metrics that favour more carbon-saving measures to be installed.

7. Figure 1 shows the annual costs and benefits included in the NPV. Figure 1 highlights the scale of the initial installation cost of measures occurring over 2025 to 2028 in line with when landlords would be required to install measures to meet the PRS Regulations, and in later years the reinstallation cost of measures at the end of the original measure lifetimes. Costs are sometimes slightly negative when policy costs are lower than they would have been under the counterfactual scenario, for example LED lighting installed as part of this policy that would no longer need to be upgraded later.

Figure 1: Annual un-discounted costs and benefits included in the NPV (Present Value, £bn, 2018 prices), where costs are positive numbers and benefits are negative numbers, for the EER C £10,000 cost cap option



8. In addition to the results presented above, not all of the impacts of the Regulations can be monetised as part of the cost-benefit analysis, but are important to consider when determining the appropriate level of a cost cap. The following sections outline these other, contextual impacts. The costs to business, including the Equivalent Annual Net Direct Cost to Business (EANDCB), are outlined in Section 7.

6.2 Cost-benefit analysis (equity weighted)

9. It is important to consider the relative impacts on different subsets of society, their ability to afford the policy costs, and the additional utility received from the monetised policy benefits. Equity weighting considers that landlords have an above median income whilst tenants have a lower than median income. Therefore, landlords have a higher ability than tenants to pay any costs arising from the Regulations, but will also receive a lower gain than tenants from the policy benefits outlined in Table 2. Equity weights are calculated in line with the Green Book methodology[29], with both median landlord and tenant income derived from the English Housing Survey data.

10. Section 6.8 considers the possibility of rent changes as a result of amending the Regulations. The scenario modelled in Table 3 assumes that landlords will pass on any bill savings as rent increases whilst tenants would benefit from increased comfort in the property. However, there is considerable uncertainty in this scenario and additional low and high scenarios are discussed in more detail in Section 6.8.

Table 3: Estimated costs and benefits of policy options (Present Value, £m, 2018 prices), 2025 – 2070[30]

Type of cost or benefit (£m)	£5,000	£10,000	£15,000	£15,000 CC
Non-equity weighted				
Non-equity weighted total costs	8.2	15.8	18.2	22.9
Non-equity weighted total benefits	7.8	16.1	21.4	21.2
Non-equity weighted NPV	***-0.4***	***0.3***	***3.2***	***-1.7***
Benefit: Cost Ratio	*0.95*	*1.02*	*1.18*	*0.93*
Equity weighted (central rent scenario)				
Equity weighted total costs	6.6	13.0	14.7	17.2
Equity weighted total benefits	8.0	16.5	21.6	22.0
Equity weighted NPV	***1.3***	***3.5***	***6.9***	***4.8***
Benefit: Cost Ratio (B / A)	1.20	1.27	1.47	1.28

11. From Table 3, it is clear that, when accounting for equity weights, the NPV is higher than the non-equity weighted NPV, and positive for all options. This is as a result of the equity weighted costs being lower due to the majority of policy costs falling onto the landlord, in particular the capital cost of installing measures. In many ways, this is a better representation of the net benefit to society than the non-equity weighted NPV.

12. Benefits when using equity weights are fairly equal to the non-weighted equivalent policy option. Increases in the value of comfort taking for tenants are approximately equal to the net decrease in utility as a result of rent increases in the central scenario whereby tenants value the increase in rent more than the utility gain to landlords – rent changes are not a feature of the non-equity weighted NPV as they are a transfer payment. Similarly, whilst VAT on measure costs is not included in the non-equity weighted NPV, it is included in the equity weighted NPV. For the most recent PRS Impact Assessment[31], it was shown that equity weighting both increased monetised benefits but lowered costs. This effect occurred because there was little evidence that a small subset of the PRS landlords (around 6% of PRS homes are EER Band F&G) had market power to increase rents.

[29] Page 80. https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent

[30] Figures may not add up due to rounding.

[31] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/760313/IA_-_Energy_Efficiency__Private_Rented_Property___England.pdf

6.3 Number of homes reaching the target and measures installed

13. Table 4 outlines the number and type of measures installed as a result of amending the regulations. The measures installed are net estimates, excluding those measures that would have been installed in absence of the Regulations (for example under the natural replacement of boilers). Low carbon heating is modelled under Air Source Heat Pump assumptions (see Table 32 and Table 33).

14. The modelling approach assumes that landlords seek to achieve the target (either EER C or EER C / EIR C) in a cost-effective way. The model used assumes that measures are installed in order of SAP points per £ spent, which results in the most cost-effective measures for each property being installed. This represents a realistic approach to which landlords may choose to install energy efficiency measures, but other methods have been considered in the sensitivity analysis (Section 8).

Table 4: Estimated number and type of measures installed as a result of the Regulations, millions, 2025-2028

Type of installation	£5,000	£10,000	£15,000	£15,000 CC
Loft insulation	0.62	0.63	0.62	0.68
Cavity Wall Insulation	0.46	0.48	0.48	0.52
Solid Wall Insulation	0.18	1.08	1.11	1.16
Floor insulation	0.93	0.67	0.68	0.82
Draught-proofing	0.44	0.43	0.45	0.62
Low carbon heating	0.00	0.21	0.35	0.70
Heating Controls	1.19	0.60	0.59	0.84
Hot Water Cylinder Insulation	0.30	0.31	0.31	0.34
Low energy lighting	0.29	0.16	0.18	0.26
Double glazing	0.13	0.09	0.09	0.15
Solar photovoltaics	0.38	0.27	0.28	0.23
Solar thermal	0.05	0.11	0.11	0.12
Total	**5.19**	**5.44**	**5.79**	**6.90**

15. Table 5 shows the proportion of PRS households[32] in scope of the regulations, i.e. not currently at the required target and require an EPC, that are estimated to be able to achieve the required EER C and, for the dual metric option, EER C/EIR C. The table also shows those that can't achieve this target but still need to install measures up to the cap level to prove compliance. This assumes 90% compliance, though this is uncertain (see Section 9 for more details).

Table 5: Estimated proportion of PRS homes in scope that do / do not achieve the required target by 2028

	£5,000	£10,000	£15,000	£15,000 CC
Percentage of PRS homes in scope meeting EER C	42%	70%	74%	73%
Percentage of PRS homes in scope not reaching EER C but taking some action	48%	20%	16%	17%
Percentage of PRS homes in scope meeting EER C/EIR C	25%	52%	56%	70%
Percentage of PRS homes in scope not reaching EER C /EIR C but taking some action	65%	38%	34%	20%

16. Table 5 shows that meeting a higher cost cap results in more properties in scope able to reach the target. The dual metric option also shows a lower proportion able to meet the more difficult target (EER C / EIR C) despite the average spend per property being higher.

[32] This covers those in scope of the regulations – properties that are not required to have an EPC are exempt from the regulations.

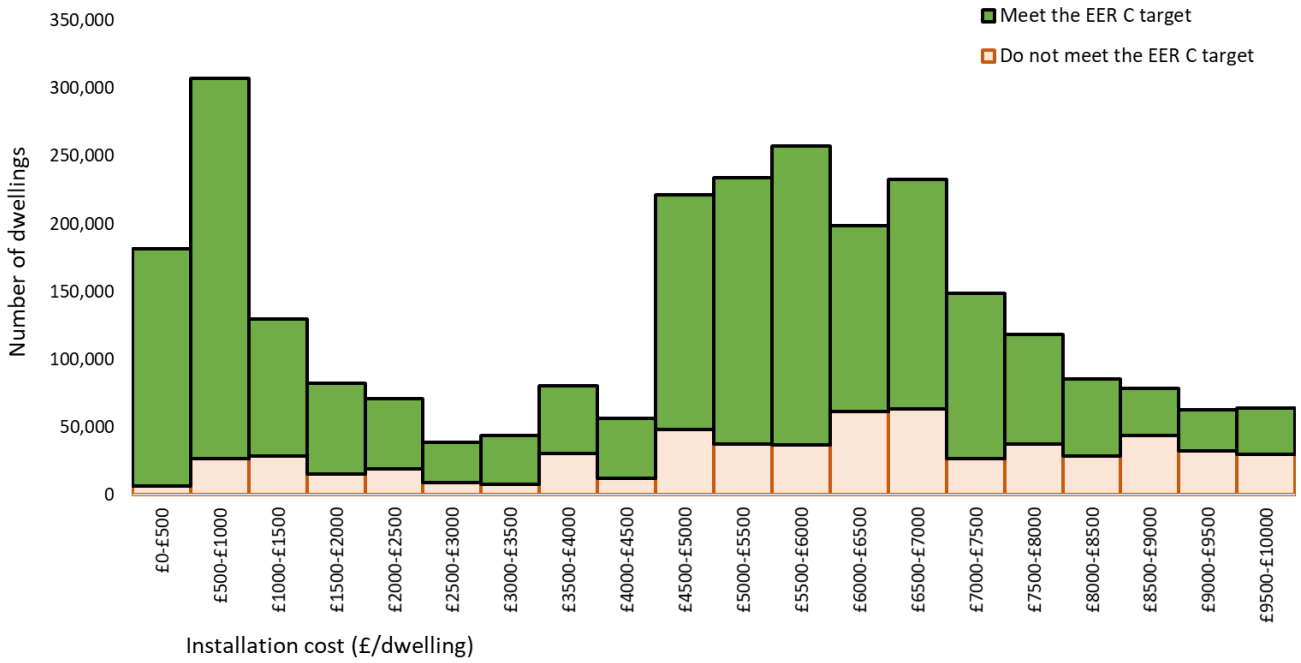
17. A comparison between the proportion of all PRS properties at EPC C or above is shown in Table 6. The final row differs from the figures presented in Table 5 because Table 5 only shows those properties in scope of the proposed PRS Regulations. Table 6 accounts for the homes out of scope of these regulations but also includes all properties already at the required standard; this results in the overall PRS proportion at EPC C being greater than shown in Table 5.

Table 6: Estimated proportion of all PRS homes at EPC (EER) Band C

	£5,000	£10,000	£15,000	£15,000 CC
Percentage of PRS properties at EPC C in 2008	10%	10%	10%	10%
Percentage of PRS properties at EPC C in 2018	33%	33%	33%	33%
Percentage of PRS properties at EPC C in 2028	60%	75%	78%	75%

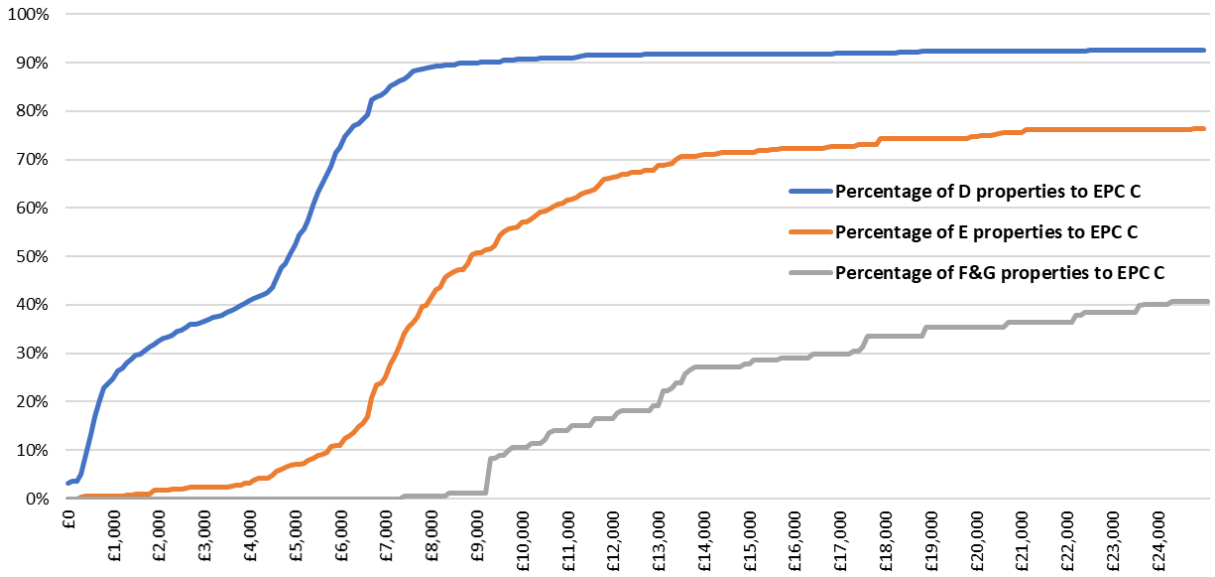
18. Figure 2 shows the number of properties that are able to meet the EER C target for the £10,000 cost cap option, split by the capital cost of measures installed. Many properties can meet the EER C target with less than £1,000 spent on energy efficiency measures, although the distribution also shows higher spend is required for lots of properties in scope. The required spend will differ for many reasons, but the key reason is the current EPC rating of the property – lower EPC Bands will have to, on average, spend more to get to EPC C than those at higher EPC Bands.

Figure 2: Number of properties split by capital cost of measures (including VAT) and whether or not the property can meet the required EER C standard (under the £10,000 cost cap)



19. Figure 3 presents the percentage of the PRS reaching EPC C at each cost cap, by starting EPC Band. It shows that higher proportions of properties at higher EPC Bands can reach EPC C at each cost cap. At the £10,000 cost cap, around 90% of EPC D properties can reach EPC C but only around 10% of the remaining F&G properties can reach EPC C.

Figure 3: Percentage of compliant properties in scope reaching EPC C at each cost cap, by starting EPC band



6.4 Impact on fuel poverty

20. Under the current Low Income High Cost (LIHC) measure of fuel poverty[33], 11% of all households in England are fuel poor. For PRS, 19% of households fuel poor, of which 94% are in FPEER[12] Bands D-G[34]. PRS has the highest proportion of fuel poor of all tenures, with the average fuel poverty gap of PRS D to G EER-rated households around £350 compared to an average of £321 across England, which shows that PRS households typically require a larger reduction in their fuel costs to move out of fuel poverty than those in other tenures.

21. In the future, fuel poverty is expected to be measured by including households which are both low income and below the target level of building energy performance (FPEER Band C).[35] Table 7 shows the estimated impact of the policy options on the proportion of all households and PRS households that are both below FPEER[12] Band C and low income compared with what the modelling predicts will be the baseline figure before the policy options come into force. The change in this proportion of households shown in this table is therefore as a result of this policy *only*, and is not an estimate of what these figures would be in 2028 when combined with the baseline figure in 2017 as it does not include other government policies that improve the energy performance of owner occupied or social housing sectors. It has not been possible to estimate the impact on fuel poverty in Wales due to data limitations.

Table 7: Estimated impact of PRS policy options on all households and the PRS (England only)

	Households that are both low-income and below FPEER Band C in 2017	Percentage point (and absolute) change in the proportion of households that are both low income and below FPEER Band C by 2028[36]			
		£5,000	£10,000	£15,000	£15,000 CC
All tenures	15.8%	-2.4%	-3.9%	-4.1%	-4.0%
Private Rented Sector	30.7%	-10.8%	-18.4%	-19.6%	-18.7%

22. Table 7 shows that the proportion of low income, below FPEER C PRS households falls dramatically for all PRS cost caps – this is as a result of many properties able to achieve EER Band C (see Table 5), which by definition of FPEER[12], is at least equal to the EER Band. This improvement of low income households to FPEER Band C is

[33] One of the areas government is consulting on is the measure of fuel poverty: https://www.gov.uk/government/consultations/fuel-poverty-strategy-for-england

[34] https://www.gov.uk/government/collections/fuel-poverty-statistics

[35] https://www.gov.uk/government/consultations/fuel-poverty-strategy-for-england

[36] This analysis has assumed that the same households have remained as 'low income' as defined in the 2015 Fuel Poverty Strategy, with the modelled scenarios raising the FPEER Bands of these households.

particularly significant at £10,000, whereby many more properties can reach Band C under the cost cap, which was also shown in Figure 2.

23. The impact on fuel poverty is smaller for all tenures because it shows the impact of a PRS policy only, but the impact is still significant because the private rented sector has a relatively high proportion of low income, below FPEER C households compared to other tenures. Again, there is a trade-off with the dual metric option between bill and greenhouse gas emission savings, whereby the measures chosen substitute some bill savings for greenhouse gas savings. Therefore, the £15,000 single metric improves more homes to FPEER Band C than the £15,000 dual metric option despite a higher average spend on measures in the latter.

24. Table 8 shows the increase in the proportion of low-income households that can achieve FPEER Band C at different cost cap options. Note that not all PRS low income households in scope of the proposed amended regulations will be moved to FPEER Band C. Similar to Table 7, the impact on low income PRS homes is large, and increases as the cost cap increases. Estimated bill savings under different cost caps for tenants are included in Table 13.

Table 8: Estimated impact of PRS policy options on low income households (England only)

	Low-income households in all FPEER Bands	**Low-income households at FPEER Band C or above in 2017**	**Percentage point (and absolute) change in low-income households at FPEER Band C or above by 2028[37]**			
			£5,000	**£10,000**	**£15,000**	**£15,000 CC**
All tenures	5,870,000	37.5%	+10.2%	+16.4%	+17.3%	+16.6%
		2,200,000	+530,000	+900,000	+960,000	+920,000
Private Rented Sector	1,960,000	28.4%	+26.9%	+46.1%	+49.0%	+46.9%
		560,000	+530,000	+900,000	+960,000	+920,000

6.5 Impact on health outcomes

25. Living at low temperatures poses a risk to health, with a range of negative morbidity and mortality impacts associated with exposure to the cold. The Marmot Review Team report on cold homes and health[38], in addition to the Hills Fuel Poverty Review[39], set out the strong body of evidence linking low temperatures to these poor health outcomes. Making energy performance improvements in homes can improve the health of the occupants, for example by reducing their risk of cardiovascular and respiratory diseases from warmer internal temperatures.

26. BEIS has monetised the health benefits associated with making these energy performance improvements using BEIS's Health Impacts of Domestic Energy Efficiency Measures (HIDEEM) model (more details on this model can be found in Annex B). The model considers exposures to indoor temperature and indoor air quality. Any change in these exposures affects rates of cold related diseases affecting rates of morbidity and mortality. Any reduction in diseases or increase in life expectancy is measure as a Quality Adjusted Life Years (QALYs) and monetised in accordance with Department of Health guidance on health valuation[40].

27. The methodology has yet to be incorporated into Green Book appraisal guidance so the monetised health impacts are not currently included in the cost-benefit analysis. At present it is not possible to quantify the potential savings to health provision services (such as the NHS) from improving the energy performance of homes, although these are expected to be significant in reality.

[37] This analysis has assumed that the same households have remained as 'low income' as defined in the 2015 Fuel Poverty Strategy, with the modelled scenarios raising the FPEER Bands of these households. The percentage increase is applied after counterfactual installations and the PRS Regulations have been modelled.

[38] Marmot Review Team (2011). *The Health Impacts of Cold Homes and Fuel Poverty*. Available at: http://www.instituteofhealthequity.org/projects/the-health-impacts-of-cold-homes-and-fuel-poverty

[39] Hills (2011). *Fuel Poverty: The Problem and Its Measurement*. Available at: http://eprints.lse.ac.uk/39270/1/CASEreport69%28lsero%29.pdf

[40] See: https://www.gov.uk/government/publications/green-book-supplementary-guidance-health

28. Table 9 presents the estimated impacts to tenants' health from improving their homes energy performance. Overall, the monetised health benefits are expected to be around £0.9bn for the lead option. Note that only measures with benefits totalling above £50m are listed in the table below.

Table 9: Estimated value of improvements in tenant health (net of the counterfactual), £m, 2018 prices, discounted

Measure	£5,000	£10,000	£15,000	£15,000 CC
Loft Insulation	40	50	40	50
Floor Insulation	80	60	60	70
Cavity Wall Insulation	110	120	120	130
Solid Wall Insulation	100	580	600	620
Double Glazing	50	30	30	50
Total	**380**	**830**	**850**	**920**

6.6 Impact on greenhouse gas emissions

29. Table 10 summarises the estimated impact of the amended PRS Regulations over 5-year periods covering Carbon Budget 4 (2023 – 2027) and Carbon Budget 5 (2028 – 2032). Because the proposed amendments would apply to new tenancies from 2025, the policy saves greenhouse gas emissions in both Carbon Budget 4 and Carbon Budget 5. Note that the traded sector emission savings are lower under the dual metric option due to the installation of low carbon heating which increases electricity use relative to the single metric options.

Table 10: Estimated savings in greenhouse gas emissions (net of the counterfactual), MtCO2e

MtCO2e	£5,000	£10,000	£15,000	£15,000 CC
Carbon Budget 4 – Traded Sector	0.3	0.5	0.5	0.3
Carbon Budget 4 – Non-traded Sector	0.9	1.8	2.1	3.2
Carbon Budget 5 – Traded Sector	0.6	1.1	1.2	0.5
Carbon Budget 5 – Non-traded Sector	3.0	6.1	7.1	10.4

6.7 Impact on the private rental market

30. This section discusses some of the key potential impacts on the private rental market, including the size of the market and rents. A more detailed discussion of costs and benefits to landlords and tenants is presented in Section 6.8.

Size of the PRS

31. The same proportion of landlords intended to reduce their portfolio or leave the PRS entirely in 2018 as they did in 2010, a period where tax changes were introduced and the PRS in England and Wales grew from around 3.9 to 5.0 million households. However, while the proportion of landlords looking to reduce their portfolio or leave the PRS remains the same, they represent a higher proportion of tenancies than they did in 2010. This suggests future growth in the sector may be slower than in recent years, though studies[41] have also shown that regulations do not necessarily lead to a smaller PRS. It is also worth noting landlords are likely becoming more professional and therefore able to anticipate and react to future regulatory changes. Landlords owning only one property has decreased from 78% to 45% from 2010 to 2018, though part of this change may be due to methodological differences between the 2010 and 2018 surveys[42].

32. Although some landlords may not have the savings required to comply with the regulations by the time they take effect, there are expected to be products available which would help landlords borrow money against the value of their assets in order to fund the energy performance improvements. The majority of buy to let

[41] Including one from the London School of Economics (Scanlon & Whitehead, 2016) and another from the University of Cambridge (2012).

[42] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/775002/EPLS_main_report.pdf

mortgages are interest only[43] and borrowing £5,000 (less than the average amount landlords might need to spend to comply, under the lead policy option) to fund the improvements over a 25-year mortgage period at a 4% interest rate would cost around £200/year in interest payments. It is unlikely this level of additional expenditure would cause affordability issues for landlords or result in them being forced out of the sector, assuming they are able to access this sort of financing.

33. There may still be landlords who are unable to recover their capital expenditure quickly enough and wish to exit the PRS. In these cases the property will either:
    - be bought by another landlord, which would not affect the balance of supply and demand in the PRS;
    - be bought by an owner occupier and result in the property moving from the PRS to the owner occupier sector, which could result in no change in the balance of supply and demand in the PRS (both falling) if it is bought by a previously renting household; or
    - be bought by an owner occupier but not change the demand for PRS housing if it is bought by someone outside the PRS sector, reducing supply relative to demand.

    This third case could change the balance for PRS supply and demand, which could lead to some households struggling to find alternative rental accommodation if their landlord leaves the market. The extent of the impact will also be affected by other supply and demand factors such as future house prices, future migration trends, changes to planning rules, house building, tax changes, interest rates, housing benefit, and the availability of social housing. We are seeking further evidence around the potential impact of this policy on the size of the PRS in the consultation.

34. Certain areas may be more acutely affected by landlords choosing the leave the sector, in particular, areas where a greater proportion of tenants are unable to pay higher rents. Figure 4 illustrates the density of PRS housing benefit claimants to PRS households, which can be seen as a proxy for ability to pay higher rents. The darker the shade of the local authority, the denser the PRS market is in housing benefit tenants and the more chance there is that landlords leaving the PRS will negatively affect these tenants. Table 11 shows the local authorities with the highest proportion of PRS households claiming housing benefits. Of the dense housing benefit PRS markets, about 1 in 4 are also areas where landlords have small profit margins after accounting for costs associated with renting and mortgage payments[44]. Due to the lack of alternative higher income tenants, and low profit margins, these areas would be at the highest risk of landlords selling their properties as a result of these regulations. These local authorities account for about 0.8% of the English PRS market.

Figure 4: Proportion of PRS households claiming housing benefits

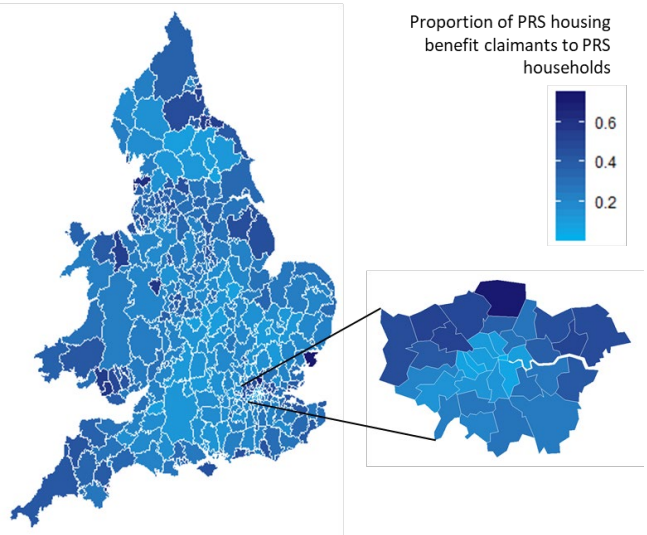


Table 11: Local authorities with highest percentage of PRS households claiming housing benefit

Local authority	Percentage of PRS households claiming housing benefits
Tendring	73%
Blackpool	71%
Enfield	69%
Wyre	62%
Middlesbrough	62%
Knowsley	62%
Castle Point	60%
Torbay	60%
Bridgend	59%
Telford and Wrekin	59%

[43] https://www.cml.org.uk/news/news-and-views/the-black-and-white-of-buy-to-let-what-does-the-data-show/

[44] Internal BEIS analysis using average rent from VOA July 2019 Local Reference Rent data and landlord rental costs from a study by the University of Cambridge (2014). This assumes that a density of 0.5 or greater is considered a dense housing benefit PRS market. https://england.shelter.org.uk/__data/assets/pdf_file/0005/1039550/University_of_Cambridge,_Understanding_Landlord_Business_Models.pdf

Market rents

35. In a transparent rental market with good information and informed consumers, landlords should in theory be able to command a rent premium as a result of offering prospective tenants a property with lower energy costs. However, the extent to which this might occur is unclear if the energy performance of a significant proportion of the PRS was improved. This aspect will be further explored in the evaluation and monitoring of the policy (see Section 9 for further details). As such three scenarios are presented to reflect three possible rental price outcomes.

36. ***Low scenario.*** Under the low scenario, it is assumed that none of the costs associated with energy performance improvements are passed onto tenants. PRS Landlords typically have greater financial wealth than both non-landlord homeowners and the general adult population, with over a quarter (26%) holding £70,000 or more[45]. This can also be shown by the mean and median value of total financial assets held by PRS landlords, which was £75,100 and £20,500 respectively, over twice as high as the figures for non-landlord homeowners (£36,900 and £8,100 respectively) and all adults aged 16 or more (£23,000 and £2,300 respectively). This indicates that PRS landlords typically have access to a significant amount of financial wealth in addition to the value of the properties they own and may not need to increase rents, especially if the improvement in energy performance is captured by an increase in property value. EPC band C properties currently typically sell for 6% more than EPC band D properties[46].

37. ***Central scenario.*** As part of the ambition to improve all homes to EPC Band C, the role of green finance is being explored. Availability of these products would likely mean interest payments lower than the average bill reduction the improvements would make, which helps make the case landlords may be able to increase rents by the expected bill savings. This would allow them to finance the improvements and recover some of their capital expenditure, while tenants would still be better off due to the improved comfort in the home.

38. ***High scenario.*** While the Hedonic Pricing Study[47] did not find a statistically significant relationship between rent levels and EPC bands below Band D, it did find that properties with an EPC rating of C commanded a 5% rent premium compared to those with a rating of D. It is unclear whether this same rent premium would apply if a significant proportion of the PRS was improved to an EPC rating of C but does allow us to place an upper limit on potential rent increases as a result of the Regulations at around 5%.

39. The extent to which landlords pass cost onto tenants is likely to vary according to factors such as landlord finances, tenant demand, types of tenants, and availability of finance products. The impact on tenants of increased rent will also vary depending on the circumstances of the tenant. According to the English Housing Survey (2018), 29% of PRS tenants find it difficult to pay their rent, of which 8% find it very difficult to pay their rent. These tenants are of high concern if located in areas where landlords are at higher risk of selling, due to their inability to find and afford alternative accommodation. Tenants that are low-income and in high demand markets are also at higher risk due to their declining ability to compete with higher income tenants, especially due to tightening Local Housing Allowance restrictions[48]. There are an estimated 28,000 benefit claimants in the UK's 10 most demanded areas for renting properties (around 0.6% of English PRS)[49].

6.8 Costs and benefits for landlords and tenants

40. The costs and benefits to landlords and tenants have been assessed. The monetised costs include capital costs and hidden costs, while the monetised benefit include the estimated property value uplift and energy savings. The costs and benefits of several rent increase scenarios have also been presented as described in Section 6.7.

[45] Strategic Society Centre (2013) *Understanding Landlords a study of private landlords in the UK using the Wealth and Assets Survey* – derived from the nationally representative dataset*: the Wealth and Assets Survey 2008-10*

[46] BEIS and the University of Cambridge (2020) *Do house prices and rents in the private sector reflect energy efficiency levels?* https://www.gov.uk/government/publications/house-prices-private-sector-rents-and-energy-efficiency-levels

[47] BEIS and the University of Cambridge (2020) *Do house prices and rents in the private sector reflect energy efficiency levels?* https://www.gov.uk/government/publications/house-prices-private-sector-rents-and-energy-efficiency-levels

[48] Crisis Homelessness Monitor England (2018) https://www.crisis.org.uk/ending-homelessness/homelessness-knowledge-hub/homelessness-monitor/england/the-homelessness-monitor-england-2018/

[49] Analysis using DWP May 2019 Housing Benefit claimant data and following article https://www.propertyreporter.co.uk/landlords/where-has-the-uks-highest-rental-demand.html

There is evidence[50] suggesting that further benefits to landlords may include the reduction in void periods, the reduction in rent arrears as a result of lower tenant bills, and reduced maintenance costs, though these are harder to accurately quantify.

41. Landlords are the group that would bear the greatest costs that arise from amending the Regulations, as they would be responsible for funding the upfront cost of the installations required. They are also large potential beneficiaries as improving the energy performance of their properties could result in a significant increase in property value, based on results from the Hedonic Pricing Study[51]. Table 12 shows the estimated average capital cost per property (in nominal terms) to landlords of either upgrading it to the required target or making as much progress as possible within the cost cap. It also shows the associated average hidden costs and average increase in property value. This compares against average (mean) gross rental income in the D to G-rated PRS of around £9,000 – £10,000 per year per property, based on the 2017 English Housing Survey, although there is significant variation across landlords.

Table 12: Estimated average costs and benefits to landlords from amending the Regulations (2018 prices)[52]

Average (mean) cost per property with measures installed	£5,000	£10,000	£15,000	£15,000 CC
Average capital cost for those achieving the required standards or above	£2,200	£4,400	£4,900	£5,300
Average cost for those making as much progress as possible towards the required standard	£2,500	£5,800	£7,400	£9,700
Average landlord hidden cost per property	£170	£240	£260	£290
Average property value differential	£3,100	£5,400	£6,100	£5,600
Increase in rent received in 2028 (low)	£0	£0	£0	£0
Increase in rent received in 2028 (central)	£110	£220	£260	£230
Increase in rent received in 2028 (high)	£230	£390	£410	£410

42. The average capital cost for landlords per home does vary between those that are able to achieve the target compared to those that cannot. This is because those that do not reach the target will need to install all the measures they can under the cost cap, while some of the properties that can reach EER C may have only needed one or two cheaper measures to improve their SAP score enough – this is shown in Figure 2 whereby many homes can reach EER C with less than £1,000 capital cost. It is interesting to note that the average capital cost to landlords is often significantly lower than the cost cap. Also, landlords who are VAT registered would be able to claim VAT back, further reducing the costs shown above. The energy performance improvement costs can also be reclaimed against capital gains tax upon eventual sale of the property.

43. The capital costs (materials + labour + VAT) that fall on landlords outlined in Table 12 are only those costs that are subject to the cap. Landlords are also likely to bear the majority of the hidden costs of installing measures, such as researching which measures would be appropriate, contacting installers about undertaking the work, and 'make good' costs post-installation.[53]

44. Table 12 also shows the potential increase in property value, assuming that a property increasing its energy performance rating has an increase in value that is the same as the difference in value observed between properties with different SAP scores analysed in the Hedonic Pricing Study. The study found a 0.119%

[50] https://www.sustainablehomes.co.uk/publication/touching-the-voids/

[51] BEIS and the University of Cambridge (2020) *Do house prices and rents in the private sector reflect energy efficiency levels?* https://www.gov.uk/government/publications/house-prices-private-sector-rents-and-energy-efficiency-levels

[52] Please note: these figures are based on each cost cap rising with inflation. Modelling assumes that the value of the cost cap remains at the set value in 2018 prices, regardless of inflation.

[53] In keeping with recent PRS Regulations Impact Assessments and others involving the installation of domestic energy efficiency measures (such as the January 2017 Energy Company Obligation Impact Assessment), hidden costs are estimated using the 2009 report by ECOFYS *The Hidden Costs and Benefits of Energy Efficiency and Carbon Saving Measures*, available at: http://webarchive.nationalarchives.gov.uk/20111011153039/http://www.decc.gov.uk/assets/decc/what%20we%20do/supporting%20consumers/saving_energy/analysis/1_20100111103046_e_@@_ecofyshiddencostandbenefitsdefrafinaldec2009.pdf

difference in property value per percentage difference in SAP score. Note that this study does not model increases in the EIR score, which may result in underestimating the benefits of the dual metric option in comparison with the single metric options. A previous study[54] also found the effect of an EPC label on property price and there is a growing global body of evidence[55] showing a link between a property's energy performance and its value. While it is clear that there is a difference in the value between properties with different energy performance ratings, it is less clear that improving the energy performance of a property will result in an increase in property value.

45. The three rent increase scenarios described in section 6.7 are also quantified in Table 12. These show varying levels of additional rental income for landlords depending on how much of the costs they are able to pass onto tenants. These same scenarios are also presented in Table 13 as potential costs to tenants.

46. Tenants would also be negatively affected to some degree by the hidden costs of installing energy performance measures (such as clearing rooms before measures are installed), though these are more than offset by a year's worth of bill savings as shown in Table 13, and in most cases works will be carried out between tenancies so the costs shown here are likely an overestimate[56]. Under the lead option of £10,000 the average bill saving in 2028 is £220. This will be higher for tenants in more energy inefficient properties – a property moving from EPC D to EPC C will on average save £150, whereas a property moving from EPC E to EPC C will save on average £350 in 2028. Section 6.5 sets out the estimated value of improvements in tenant health.

Table 13: Estimated average costs and benefits to tenants from amending the Regulations (2018 prices)

Average (mean) cost per property with measures installed	£5,000	£10,000	£15,000	£15,000 CC
Average tenant hidden cost per household	£50	£50	£50	£60
Average (mean) annual energy bill saving per household in 2028	£110	£220	£260	£230
Increase in rent paid in 2028 (low)	£0	£0	£0	£0
Increase in rent paid in 2028 (central)	£110	£220	£260	£230
Increase in rent paid in 2028 (high)	£230	£390	£410	£410

6.9 Equalities Impact

47. This section provides an analysis of how different groups of people will be affected by the policy, in line with the government's guidance on the Equality Duty. This guidance suggests the distributional impact of policies should be evaluated with regards to their impact on social groups with certain characteristics, namely:
    - Age
    - Disability
    - Gender reassignment
    - Pregnancy and maternity
    - Race – including ethnic or national origins

48. Equality analysis of this policy is limited to those characteristics captured by the English Housing Survey[57]. These are age (Table 14), ethnic minorities (Table 15), and disabilities (Table 16). The tables show that PRS households are more likely to be younger, and from an ethnic background than the country as a whole. As a result, this policy will disproportionately benefit these groups. Conversely, PRS households are less likely to have a household member with a long-term illness or disability.

[54] https://www.gov.uk/government/publications/an-investigation-of-the-effect-of-epc-ratings-on-house-prices
[55] https://ec.europa.eu/energy/sites/ener/files/documents/20130619-energy_performance_certificates_in_buildings.pdf
[56] The bill savings estimates are based on central scenario from the latest published energy price projections in the Green Book supplementary guidance on valuation of energy use and greenhouse gas emissions for appraisal.
[57] English Housing Survey: https://www.gov.uk/government/statistics/english-housing-survey-2018-to-2019-headline-report

Table 14: Percent of the stock by age of household reference person (England only)

Age of household reference person	16-24	25-34	35-44	45-54	55-64	65 of over
PRS	11.1%	29.9%	26.1%	15.4%	9.2%	8.4%
All tenures	3.0%	14.1%	17.3%	19.2%	17.1%	29.3%

Table 15: Percent of the stock by ethnicity of household reference person (England only)

Ethnicity of household reference person	White	Black	Indian	Pakistani or Bangladeshi	Other
PRS	82.9%	4.2%	3.1%	2.4%	7.5%
All tenures	88.1%	3.5%	2.3%	2.3%	3.8%

Table 16: Percent of the stock by whether a member of the household has a long-term illness or disability (England only)

Member of the household with a long-term illness or disability	Yes	No
PRS	26.5%	73.5%
All tenures	34.0%	66.0%

6.10 Summary of Impact of all policy options

Table 17: Summary of Impact of all policy options

Policy Option cost cap	Net Present Value (£bn)	Percentage of in scope PRS homes reaching the required target by 2028	Estimated percentage-point change in low income PRS households at FPEER Band C in England at 2028	Estimated total value of improved tenant health (£bn)	Estimated average capital cost to landlords (£/property with measures installed)	Estimated average property value differential (£/property with measures installed)	Estimated average annual energy bill savings (£/property with measures installed)	Non-traded carbon savings over CB5 (MtCO2e)
£5,000	-0.4	42%	+26.9%	0.4	£2,400	£3,100	£110	3.0
£10,000	0.3	70%	+46.1%	0.8	£4,700	£5,400	£220	6.1
£15,000	3.2	74%	+49.0%	0.8	£5,300	£6,100	£260	7.1
£15,000 CC	-1.7	73%	+46.9%	0.9	£6,200	£5,600	£230	10.4

7. Business impact

7.1 Equivalent Annual Net Direct Cost to Business & Business Impact Target

1. The proposed amendments to the PRS Regulations will result in increased costs to landlords, who are assumed to all be businesses (see Section 7.2) in keeping with previous regulations affecting the sector[58]. Similar to the amendment of the PRS Regulations in 2018, these proposed amendments would be a Regulatory 'In' measure, as landlords will bear the costs of measure installation directly.

2. Direct costs determined to be in scope are:
    - **Capital costs of installations** (parts, labour, and VAT[59])
    - **Opportunity costs**
    - **Compliance costs** (the cost of time taken by landlords to prove compliance with or apply for an exemption from the regulations plus familiarisation with amended regulations)
    - **Hidden/hassle costs of installations**
    - **Operating costs**, excluding fuel (i.e. maintenance of central heating and solar PV only)

    Although landlords may see increased rental yield and asset value, these are not classed as direct benefits and are therefore not in scope of the Equivalent Annualised Net Direct Cost to Business (EANDCB). These indirect benefits have been quantified in Section 6.8 and have the potential to reduce the net impact on landlords.

3. The direct costs and benefits to business are therefore the sum of each of the 6 components above, over the appraisal period of the policy (46 years). The main assumptions and evidence sources used for each component are set out in Annex B, with the rent scenarios in Section 6.7. Using the Department for Business, Energy and Industrial Strategy's Impact Assessment Calculator,[60] the provisional EANDCB of all policy options are set out in Table 18 below, alongside the Business Net Present Value and Business Impact Target score[61]. Note that the potential property value differential has not been included.

Table 18: EANDCB and Business Net Present Value (£m), 2018 prices

	£5,000	£10,000	£15,000	£15,000 CC
Total Net Present Social Value (2018 prices)	*-400*	*300*	*3,200*	*-1,700*
Business Net Present Value	-6,600	-12,200	-14,600	-18,300
Net direct cost to business per year	280	520	620	770
Score against the Business Impact Test	1389	2579	3085	3868

7.2 Small and Micro Business Assessment

4. Table 19 sets out an estimate of the portfolio size for domestic landlords, drawing on data from the Ministry of Housing, Communities and Local Government's Private Landlord Survey.[62] This shows that, in 2010, the majority (78%) of domestic landlords owned a single property and 1% of landlords owned 25 or more properties. This dynamic has shifted somewhat, with less than half of landlords owning a single property in 2018.[63]

[58] For example, see the 2018 Amended Energy Efficiency Regulations: final stage Impact Assessment (https://www.gov.uk/government/consultations/domestic-private-rented-sector-minimum-level-of-energy-efficiency)
[59] VAT is not counted in the cost-benefit analysis (Table 2) as it is a transfer from landlords to the Exchequer, but landlords face this direct cost and therefore VAT is included as part of the capital costs when calculating the EANDCB.
[60] Available at: https://www.gov.uk/government/publications/impact-assessment-calculator--3
[61] The BIT is a cross-government target for the reduction of regulation on business.
[62] https://www.gov.uk/government/collections/english-private-landlord-survey
[63] This distribution is based on all PRS properties. Similar data for properties that are specifically, 'F' or 'G' rated are not available.

Table 19: Estimated distribution of property portfolios for private landlords

Number of properties	1	2-4	5-9	10-24	25-100	>100
2010 - proportion of private landlords	78%	17%	3%	1%	1%	0%
2018 - proportion of private landlords	45%	38%	10%	5%	1%	0%

Classification of PRS Landlords as small and micro businesses

5. As most landlords in the domestic PRS own fewer than five properties, it seems appropriate to make the conservative assumption that all landlords in the domestic sector should be classified as small or micro businesses for the Small and Micro Business Assessment, given that the definition of a small or micro business is less than 50 employees.

6. There are estimated to be between 2.2 and 2.8 million private landlords in England.[64] It should also be noted that while small and micro businesses comprise most of the sector, only landlords owning the least energy efficient properties (those EER D-G rated) are required to make any improvements to their properties.

Rationale for the non-exclusion of small and micro businesses from the Regulations

7. All domestic landlords are classified as small and micro business for the purpose of this assessment; therefore, their exclusion would remove most, if not all, of the intended benefits of the policy. Many of the costs incurred by landlords as a result of the Regulations are likely to be on a per-property basis – meaning that landlords with small property portfolios (and therefore deemed to be small or micro businesses, as discussed above) will not be disproportionately burdened by the Regulations.

8. With the costs of understanding the Regulations, however, there are clear economies of scale – with landlords with large property portfolios able to spread the costs of installation or organising finance over many properties. However, these represent a very small proportion of the total costs to landlords.

Mitigating the impact on small and micro businesses

9. The majority of domestic landlords are small and micro businesses. 45% of landlords have just one property and a further 38% own between two and four properties.[65]

10. Under the preferred policy scenario, Government proposes to raise the energy performance standard to EPC Band C, increasing the cost cap on the cost of investment required per property to £10,000 (inclusive of VAT). Proposals also set out an alternative increased cost cap of £15,000, achieved by a requirement on landlords to reach a dual metric of both EER Band C (cost metric) and also the environmental impact rating (EIR) Band C (carbon metric). The predicted average cost per property is £4,700 (preferred policy scenario) and £6,200 (alternative policy scenario), so significantly lower than the suggested cost caps.

11. As with the current PRS Regulations, the establishment of a cost cap on the cost of investment is designed to moderate the effect of a requirement on these businesses to improve any sub-standard rental property to a minimum of EPC Band C, even where no third party funding is available. However, funding is likely to be available in at least some cases, and includes Green Deal finance, supplier obligation funding, and other third party funding such as local authority grants. For example, Green Deal finance enables consumers to borrow money to fund energy performance improvements and pay back loans over time through their electricity bills. Whilst government ended public funding in 2015, the Green Deal scheme remains open to consumers, including landlords. In addition, the Energy Company Obligation (ECO3) places an obligation on the largest energy suppliers to improve the energy performance of homes. The current scheme is focussed on supporting fuel poor, low income and vulnerable households, will run until March 2022, and is open to home owners. More detail on third party funding available to landlords can be found on the Simple Energy Advice website.[66]

12. The existing PRS Regulations provide a limited number of temporary exemptions to the prohibition on letting property with an EPC rating of F or G to protect landlords where it is not technically advisable, or financially

[64] Pg. 57: https://www.gov.uk/government/publications/english-private-landlord-survey-2018-main-report.
[65] https://www.gov.uk/government/publications/english-private-landlord-survey-2018-main-report
[66] https://www.simpleenergyadvice.org.uk/grants

feasible, to bring those properties up to an EPC Band E. Government proposes to carry forward the exemptions framework. As part of this review, Government is further considering landlord affordability and is seeking views from stakeholders whether an affordability exemption for landlords with £1,000 or less in annual taxable profit from rent and required to spend in excess of £10,000 (under the alternative policy scenario) should be introduced.

8. Risks and uncertainties

1. The impacts of amending the PRS Regulations are uncertain due to a range of factors. The main factors identified are the capital cost of measures, other costs, energy prices, carbon prices, the way in which landlords install measures, the stock in scope, and the compliance rate. The sensitivities around the lead option, EER C at a cost cap of £10,000 have been assessed below.

8.1 Capital costs

2. The extent to which landlords make energy performance improvements will depend on the costs they face against the proposed cost cap. The analysis in this IA draws on the most up to date evidence available on capital costs, but these may change in future – for example as a result of innovation. The High and Low NPV estimates for the £10,000 cost cap reflect the impact of using different capital cost assumptions (low and high respectively, according to a ±30% range). Capital cost assumptions are altered to estimate the High and Low scenario of the preferred option, because capital costs not only have a significant impact on the NPV but also on other key variables, such as the cost to landlords and the proportion of PRS properties achieving EER Band C. Table 20 provides additional detail on the impact that varying the capital cost assumptions have on key estimates under the £10,000 cost cap.

3. The Green Book guidance on optimism bias[67] suggests that real costs for construction projects in standard buildings may be as much as 24% higher than initially estimated, as a result of appraisers being overly optimistic. The high sensitivity presented here also provides an indication of the policy impact if adjusting for a 30% optimism bias.

Table 20: Estimated NPV, percentage of homes reaching EER Band C, and average costs under the £10,000 cost cap, for different capital cost assumptions

	Low cost assumptions	Central cost assumptions	High cost assumptions
Net Present Value (£bn)	8.1	0.3	-3.4
Benefits (£m)	21.2	16.1	14.2
Costs (£m)	13.1	15.8	17.6
Percentage of homes in scope achieving EER Band C	74%	70%	65%
Percentage of homes in scope acting but not achieving EER Band C	16%	20%	25%
Average (mean) capital costs for properties in scope	£3,800	£4,700	£5,400

4. The sensitivities in Table 20 show that if the costs landlords face are higher than those assumed under the central scenario, fewer would achieve Band C. Higher costs of measures mean that more landlords would find that they could not make further progress towards Band C without breaching the cost cap, and this is reflected in the lower proportion of properties reaching Band C compared to the central scenario. Under a scenario where costs of measures are lower, a larger number of landlords can achieve Band C within the cost cap.

5. The higher the cost of measures, the higher the average capital cost for those achieving Band C. There is also a negative NPV for the high cost assumptions, with the low-cost scenario having the highest NPV. Table 21 shows the number and type of measures installed under the three capital cost assumptions. Higher capital costs typically lead to fewer of each measure installed, although there will be cases where more measures are installed because a more expensive measure is now too costly and therefore out of scope for an individual property. At lower costs, properties able to make the target under central assumptions will end up spending less, whilst some additional properties will now be able to meet the target under the cost cap.

[67] https://www.gov.uk/government/publications/green-book-supplementary-guidance-optimism-bias

Table 21: Estimated number of measures installed under the £10,000 cost cap, for different capital cost assumptions

Type of installation	Low costs	Central scenario	High costs
Loft insulation	0.62	0.63	0.62
Cavity Wall Insulation	0.48	0.48	0.48
Solid Wall Insulation	1.12	1.08	0.99
Floor insulation	0.67	0.67	0.69
Draught-proofing	0.46	0.43	0.45
Low carbon heating	0.37	0.21	0.15
Heating Controls	0.63	0.60	0.59
Hot Water Cylinder Insulation	0.30	0.31	0.31
Low energy lighting	0.21	0.16	0.19
Double glazing	0.11	0.09	0.07
Solar photovoltaics	0.26	0.27	0.31
Solar thermal	0.09	0.11	0.13
Total	**5.80**	**5.44**	**5.31**

8.2 Other costs

6. Although the majority of the costs of this policy are related to the capital costs, there are other costs and uncertainties beyond these. Table 22 shows the impact of increasing or decreasing these costs by 30%.

Table 22: Estimated NPV of central policy option under low, central, and high other cost assumptions

	Low other cost assumptions	Central other cost assumptions	High other cost assumptions
Net Present Value (£bn)	0.6	0.3	0
Benefits (£bn)	16.1	16.1	16.1
Costs (£bn)	15.4	15.8	16.1

8.3 Energy prices

7. Future energy prices are uncertain, and as outlined above the value of energy saved by the amended regulations is a major driver of the benefits. Throughout this Impact Assessment the central price projections are taken from the Green Book supplementary Guidance on valuing energy and greenhouse gas emissions. Table 23 shows the sensitivity of the analysis to “high” and “low” price projections.

Table 23: Estimated NPV of central policy option under low, central, and high energy price assumptions

	Low energy price assumptions	Central energy price assumptions	High energy price assumptions
Net Present Value (£bn)	-1.6	0.3	1.5
Benefits (£bn)	14.2	16.1	17.3
Costs (£bn)	15.8	15.8	15.8

8. Low energy prices could result in a negative NPV, which is a result of reduced monetised energy saving benefits and the value of comfort.

8.4 Carbon prices

9. The value placed on changes in greenhouse gas (GHG) emissions is currently under review, now the UK has increased its domestic and international ambitions. Accordingly, current central carbon values are likely to

undervalue GHG emissions, though the scale of undervaluation is still unclear. The potential impact of placing a higher value on GHG emissions can be illustrated by using the existing high carbon values series, in addition to the prescribed central values. HMG is planning to review the carbon values during 2020. Table 24 presents a comparison with the high carbon price from the Green Book. It shows significant increases in the value of policy benefits, which is as a result of the value of traded and non-traded carbon savings increasing. Note that the current carbon value methodology assumes frictionless global carbon trading[68].

Table 24: Estimated NPV of central policy option under high carbon prices

	Central carbon price assumption	High carbon price assumption
Net Present Value (£bn)	0.3	2.9
Benefits (£bn)	16.1	18.7
Costs (£bn)	15.8	15.8

8.5 Optimisation approach

10. Assumptions are made on how landlords will install measures. Currently, it is assumed that measures will be installed in order of SAP points per £ spent on capital costs. This assumes that landlords choose to install energy performance improvement measures in a near-optimal cost-effective way. However, it is difficult to predict how each landlord will select measures. One alternative approach could be that landlords choose to install the cheapest measures first, as shown in Table 25.

Table 25: Estimated NPV of central policy option under an alternative optimisation approach

	Central optimisation (SAP/£)	Low cost measures first
Net Present Value (£bn)	0.3	-1.0
Benefits (£bn)	16.1	14.8
Costs (£bn)	15.8	15.8

11. Table 25 highlights that any deviation from a cost optimal approach in installing measures could negatively impact the NPV – cheaper, less optimal measures may improve SAP scores but might not be the best approach in achieving the EPC target at cheapest cost compared to a different package of measures.

8.6 Stock in scope

12. 10 per cent of the stock in scope is currently removed to account for HMOs (Houses in Multiple Occupation) and listed buildings not requiring an EPC and therefore exempt from the regulations. Table 26 compares NPVs where twice as many households are removed from those in scope, and an assumption that none of the PRS EPC band D to G households are out of scope. The modelling cannot identify these properties in the stock, and therefore the stock in scope changes act proportionally across costs and benefits.

Table 26: Estimated NPV of central policy option under different stock in scope assumptions

	Double stock out of scope	Central assumption	No stock out of scope
Net Present Value (£bn)	0.3	0.3	0.3
Benefits (£bn)	14.3	16.1	17.9
Costs (£bn)	14.0	15.8	17.5

8.7 Compliance rate

13. The rate of compliance with the policy is uncertain. Section 9 discusses the compliance seen in related policies and the additional enforcement proposed in the consultation for this policy. Based on that analysis high and low compliance rates of 100% and 50% have been assumed. The 50% low sensitivity is extremely unlikely as it

[68] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/245334/1_20090715105804_e__carbonvaluationinukpolicyappraisal.pdf

is based on the current 65% (2018) awareness rate of the existing EPC E regulations coupled with the 80% compliance rate seen with the Housing Health and Safety Rating System (HHSRS). Awareness of the current EPC E regulations is increasing, and the EPC C regulations will cover significantly more landlords so awareness should be higher. Also, the enforcement proposed in the consultation is much stronger than under HHSRS. Table 27 shows the impact of the uncertainty range. As expected, a lower compliance rate reduces both the costs and benefits resulting in a lower NPV. It is assumed that policy impacts scale proportionally with the rate of compliance.

Table 27: Estimated NPV of central policy option under different compliance rate assumptions

	50% compliance	90% compliance	100% compliance
Net Present Value (£bn)	0.1	0.3	0.4
Benefits (£bn)	8.9	16.1	17.9
Costs (£bn)	8.8	15.8	17.5

8.8 Solid Wall Insulation

14. The current Regulations acknowledge that certain wall insulation systems may not be suitable in certain situations, even where they have been recommended for a property. Furthermore, some landlords may choose not to install SWI due to changing the aesthetics of the property. To account for this, it is assumed that 25% of older properties that are more likely to be affected are out of scope for SWI. Sensitivities around this assumption are shown in Table 28. When fewer properties are excluded from in scope of SWI, the NPV is improved – this is because SWI may be a more cost optimal measure in these properties.

Table 28: Estimated NPV of central policy option under different SWI exclusion assumptions

	50% of pre-1929 properties out of scope for SWI	Central assumption (25%)	0% of pre-1929 properties out of scope for SWI
Net Present Value (£bn)	-0.2	0.3	0.9
Benefits (£bn)	15.1	16.1	18.7
Costs (£bn)	15.3	15.8	17.8

8.9 Combination of risks and uncertainties

15. Table 29 compares the NPV under central assumptions against a scenario which results in the lowest and highest NPV based on the findings from Sections 8.1 – 8.8. The high NPV scenario assumes the following: low capital cost assumptions, low other cost assumptions, high energy prices, high carbon prices, measures installed in order of highest SAP point per £ increase, no removal of SWI as a measure in scope for some older properties, no stock removed from in scope, and high compliance. The low NPV scenario assumes high capital cost assumptions, high other cost assumptions, low energy prices, central carbon prices, the installation of low-cost measures first, more SWI is removed from in scope for some older properties, all stock in scope, and low compliance. The low NPV scenario also assumes the use of TrustMark certified installers, which adds around £500 to modelled costs per property.

Table 29: Estimated NPV of central policy option under maximum high and low sensitivities

	Low NPV scenario	Central assumptions	High NPV scenario
Net Present Value (£bn)	-4.8	0.3	18.0
Benefits (£bn)	6.4	16.1	34.1
Costs (£bn)	11.2	15.8	16.1

16. Government acknowledges the importance of ensuring that energy efficiency upgrades are performed to the highest standard, as well as the importance of landlords having flexibility to choose their preferred installer. Accordingly, Government is consulting on whether TrustMark should be incorporated into the energy performance improvement works required by the PRS Regulations.

9. Monitoring and evaluation

9.1 Monitoring and evaluation of related policies

Ongoing evaluation of PRS EPC E Regulations

1. The original PRS minimum standard regulations were laid in 2015 and required landlords to improve their properties to at least EPC E the first time they re-let the property after April 2018, provided that the improvements could be made at 'no cost to the landlord'. These regulations were approved in the expectation that 'Pay As You Save funding', as provided by Green Deal finance, would be available to fund a significant proportion of the required improvements. Subsequent shifts in the funding landscape meant that only a minority of landlords could have installed measures at 'no cost'. To ensure the regulations delivered their original objectives they were amended in 2018 to require a landlord contribution up to a £3,500 cost cap.

2. Although the amended PRS EPC E Regulations only came into force last year, and did not apply to all properties until April 2020, interim findings from the first phase of the evaluation[69] can provide some useful insight into the extent to which landlords are likely to comply with the regulations. 87% of landlords surveyed said they would comply with the amended regulations by improving their properties (others said they would also comply with the regulations by registering an exemption), compared to 1% who said they would not comply with the regulations and continue to let out their property. However, awareness of the regulations was still fairly low in 2018, at 65%, though this is believed to have increased based on smaller sample research.

3. The evaluation has also found landlords to be motivated in complying with the regulations for three main reasons: "to avoid negative consequences of non-compliance, pre-existing plans to upgrade their property, and a general compliance mindset". Most of the current non-compliance appears to be a result of a lack of awareness or uncertainty around how to correctly comply with the regulations.

4. Government continues to monitor landlord's awareness of the PRS regulations and has taken important steps to increase awareness and understanding of the regulations. Information about the PRS Minimum Energy Efficiency Standard now features on the Simple Energy Advice website and the EPC Register[70]. BEIS has also published detailed guidance designed to support landlords to meet their obligations under the private rented property minimum energy efficiency standard provisions in the Regulations here and here. Government is seeking views on what further steps can be taken to increase awareness and understanding of the PRS Regulations as part of the consultation on increasing the minimum standard and will take appropriate action in response to stakeholder feedback.

5. Government intends to publish a Post-Implementation Review of the existing amended PRS regulations in 2021. The findings of this review will be considered alongside the approach taken to strengthen the minimum energy efficiency standard.

6. This consultation is being published ahead of that review to help with long-term certainty and plannability, the importance of which has been repeatedly emphasised by stakeholders. Government needs to consult on strengthening the minimum energy efficiency standard now to give landlords sufficient time to save and prepare for the improvement works, and to provide the supply chain with adequate time to build the capacity and capability needed to meet the future demand. Advance notice of the forthcoming regulations will allow landlords to undertake energy efficiency improvements at the most convenient time for them and their tenants. It will also help prevent bottlenecks developing in the supply chain.

Housing Health and Safety Rating System (HHSRS)

7. The 2004 Housing Act gave Local Authorities power to penalise landlords with properties that had a category 1 hazard. The Housing Health and Safety Rating System (HHSRS) aids the identification of hazards in rented property, defining a range of hazards and severity. According to the English Housing Survey, 691,000 PRS

[69] *Domestic private rental sector minimum energy efficiency standards: interim evaluation*
https://www.gov.uk/government/publications/domestic-private-rental-sector-minimum-energy-efficiency-standards-interim-evaluation
[70] https://find-energy-certificate.digital.communities.gov.uk/

properties have a category 1 hazard, meaning around 15% of landlords are non-compliant with the HHSRS. Pessimistically assuming all of these homes are also homes below EPC C would mean that 20% of landlords in scope of the PRS EPC C Regulations are non-compliant with the HHSRS.

9.2 Compliance under PRS EPC C regulations

8. The extent to which these preliminary findings from the amended PRS EPC E Regulations evaluation applies to the EPC C Regulations is highly uncertain. Although the principles of the policy are the same, the EPC C Regulations will cover more households and have a higher cost cap. There will also be significantly more awareness of the policy by 2025 due to the higher number of properties affected (the majority of the PRS, or 10 times as many properties) and related policies in other parts of the domestic sector. In particular, proposals around requiring lenders to achieve an average EPC rating across their portfolio will likely result in them encouraging landlords to comply with the PRS Regulations as this would help them meet their own targets.

9. Similarly, it is unclear how comparable HHSRS is to the PRS EPC C Regulations. The two share similarities in the potential scale of works required to comply with the regulations and the penalty for failing to comply, however, the HHSRS is currently very difficult to enforce, relying on checks from Local Authorities or tenants reporting landlords.

10. The consultation also proposes options for improving enforcement for the PRS EPC C Regulations including:
    - Raising the fine level to £30,000 (from £5,000 at present), which will significantly increase the negative consequences of non-compliance.
    - A compliance and exemptions database. This will make it significantly easier for Local Authorities to identify landlords who have complied with the regulations, and therefore those who have not.
    - Better access to open EPC data. This will allow Local Authorities to easily find the EPCs of landlords to assess whether or not they have complied with the regulations.
    - Powers requiring agents or online platforms not to advertise or let properties that do not comply with the PRS Regulations. This will ensure agents and online platforms only work on behalf of landlords who are compliant with the regulations.
    - Increased tenant powers. This would give tenants greater power to request non-compliant landlords carry out the energy performance improvements and allow them to seek redress for the higher energy bills that would have resulted from non-compliance.

11. This improved enforcement is likely to contribute to a higher rate of compliance than that seen under the HHSRS. However, the higher expenditure required may mean more landlords try to evade the law than those surveyed so far for the PRS EPC E evaluation. For this IA, a non-compliance rate of 10% has been assumed. As this is an uncertain assumption, views on compliance and the proposed enforcement are sought through the consultation.

9.3 Proposed monitoring and evaluation of PRS EPC C regulations

12. An evaluation of the PRS Regulations commenced in June 2017, however, the amendments proposed in this IA take place after the existing evaluation contract is set to end. This section sets out how the current evaluation could inform approaches which could be replicated for the amendments set out in this IA.

13. The evidence provided by the existing evaluation will be reviewed in advance of these policy amendments coming into force in 2025. It is expected that a similar evaluation will be commissioned to assess impact and landlord experiences, including primary data collection through interviews and surveys as well as quasi-experimental impact analysis. This evaluation would assess impact against the core scheme objectives of Making progress towards fuel poverty targets and Reducing energy demand and greenhouse gas emissions, as well as the wider impacts on the housing market. The outputs will be timed to support a post-implementation review which is likely to be required 5 years after the regulations come into force.

Existing evaluation

14. A process evaluation is underway to understand the impact of the current regulations on landlords, agents and tenants. These interviews and surveys will continue through to summer 2022 and are therefore able to understand the reactions to announcements of policy intentions to tighten the regulations. This may give early insight into the levels of compliance that might be achieved.

15. The impact evaluation is being conducted through quantitative analysis of existing datasets. It is likely that these methods will still be possible in the late 2020's to support an evaluation of the proposals set out in this IA. How these could be implemented are set out below:

    - **Energy performance of the PRS housing stock**, including establishing the causation between the regulations and any observed impacts. This will be conducted using the English Housing Survey and Welsh Housing Conditions Survey data to assess the number of properties improving to the target EPC rating. It is also possible to interrogate the EPC database to identify the number of PRS properties lodging a below standard EPC after the date of these regulations coming into force. The current evaluation will also confirm whether it is possible to use national housing surveys from Scotland (pending outcome of proposals to introduce their own minimum standards by 2030) and Northern Ireland as counterfactuals through which the impact of these regulations can be disaggregated from a general shift towards a more energy efficient housing stock.

    - **Wider impacts on landlords and the property market**, including the number of PRS properties, property purchase and rental prices. The size of the PRS sector can be assessed using the English Housing Survey. Purchase prices can be assessed using data from the UK Land Registry while rental prices can be assessed using data from providers such as HomeCo and Calnea Analytics. This data is linked to public versions of the EPC database, socioeconomic datasets from the Office for National Statistics, to allow for relevant controls to be included in the modelling. This approach has been used successfully to assess if EPC ratings have an impact on property prices[71], however, the current evaluation will be the first to use it for policy evaluation. The feasibility will be confirmed by 2023 when the analysis is completed.

16. Across the impact evaluation it will be necessary to consider the appropriate timing for the different analyses. If the policy implementation is staggered (with new/renewed tenancies triggering compliance several years in advance of all PRS properties), then the full impact assessment will be delayed until after the regulations are fully in force. There will be additional delays in waiting for the data itself, as an example the English Housing Survey is only available 18 months after the end of the financial year of interest.

[71] Fuerst F. and H. Adan (2017) Do House Prices and Rents in the Private Rented Sector Reflect Energy Efficiency Levels? London: BEIS

Annex A. Scale of the problem and rationale for intervention

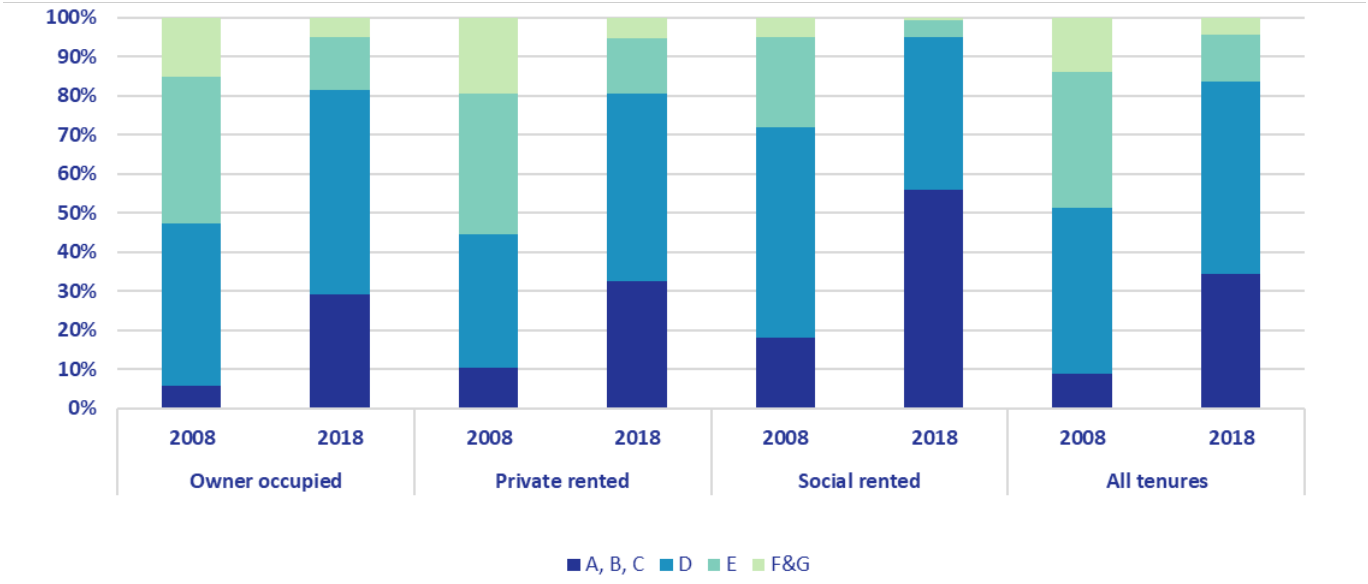
A.1 Scale of the problem

1. There were an estimated 5.0 million domestic PRS properties in England and Wales (the latest available data from the 2018-19 English Housing Survey and StatsWales[72]) comprising around 20 per cent of the total domestic housing stock. This makes it the second largest form of tenure after owner occupied.

2. The Government's official means of measuring energy performance in buildings is the Standard Assessment Procedure (SAP)[73], which rates domestic properties on a scale from 1 (very high energy costs or emissions, depending on whether using EER or EIR) to 100 (very low energy costs or emissions). This scale is in turn banded on a scale from 'G' (very high energy costs or emissions) to 'A' (very low energy costs or emissions). Between 1996 and 2018 the average SAP rating in the PRS increased from 43 (an EER Band E) to just over 60 (an EPC Band D).

3. Figure 5 shows the distribution of EPC (EER) ratings by tenure in 2008 and 2018 for England, and 2008 compared with 2017-18 for Wales. Although there has been a reduction in the proportion of F/G PRS properties over this period, this will partly be due to the growth in the PRS sector with more new build and energy efficient properties entering the sector. There remains a stock of older properties in the PRS which have the lowest energy ratings of all domestic properties. The sector has a high proportion of dwellings constructed pre-1919 – 33 per cent compared with 20 per cent in the owner-occupied sector and seven per cent in the social housing sector (Figure 6). Older properties tend to be the costliest to treat, have a lower SAP score, and often require solid wall insulation to achieve a high SAP score. The EPC ratings across tenures is very similar between England and Wales.

Figure 5: Distribution of EPC Ratings by Tenure in a) England (2008 and 2018) and b) Wales (2008 and 2017-18)[74]

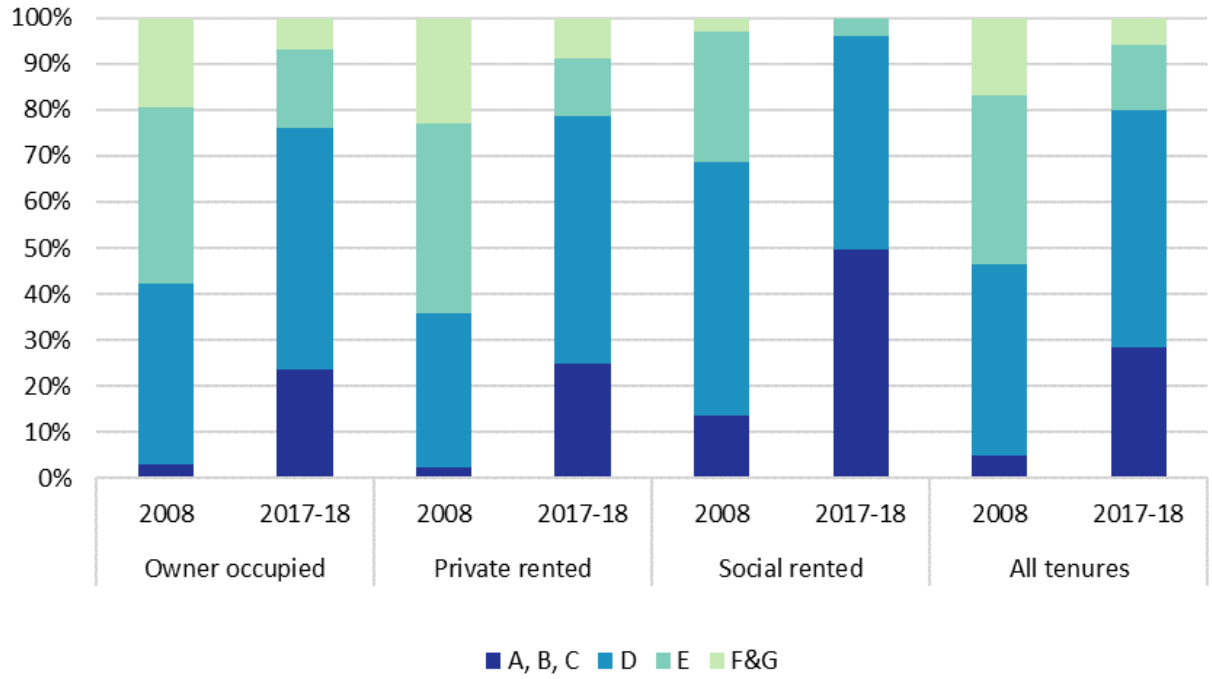


Source: English Housing Survey 2018-19

[72] Figures for Wales taken from https://statswales.gov.wales/Catalogue/Housing/Dwelling-Stock-Estimates/dwellingstockestimates-by-localauthority-tenure

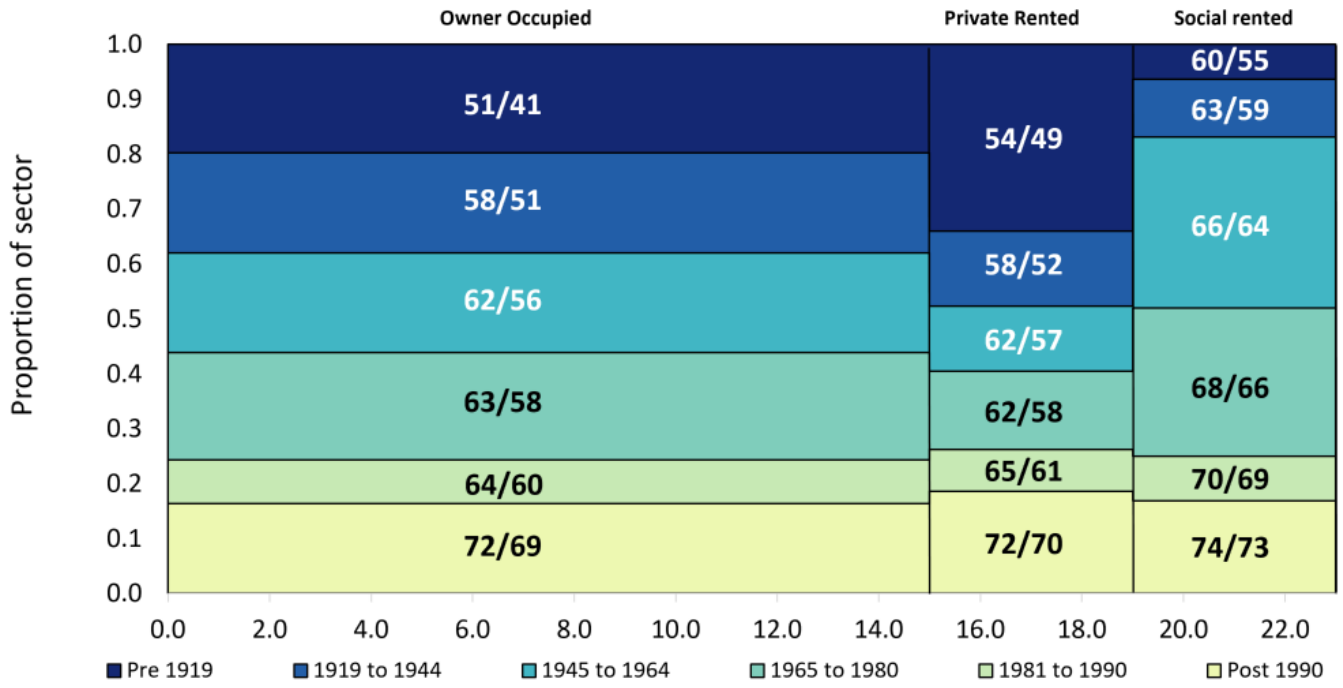
[73] For further information see: https://www.gov.uk/guidance/standard-assessment-procedure

[74] For Welsh data, the proportion of F&G rated social rented in 2008, B&C rated private rented in 2008 and social rented below EPC E in 2017-18 is based on small sample sizes and is therefore less robust and should be treated with caution.



Source: Welsh Housing Conditions Survey 2017-18 [75]

Figure 6: Distribution of properties by dwelling age and housing tenure (England), 2017. Mean EER/EIR score included within the chart.



Source: English Housing Survey 2017 [76]

4. The English Housing Survey produces statistics on the number of PRS properties in England using dwelling and household weights. Dwelling weights include properties which are vacant. However, given that PRS properties

[75] https://gov.wales/ad-hoc-statistical-requests-16-december-2019-3-january-2020. For Welsh data, the proportion of F&G rated social rented in 2008, B&C rated private rented in 2008 and social rented below EPC E in 2017-18 is based on small sample sizes and is therefore less robust and should be treated with caution.

[76] Note that some of the more detailed statistics were not yet available from the 2018-19 EHS. The 2017-18 EHS was been used for these instead.

that are vacant include properties between let[77], dwelling weights are used to estimate the number of PRS properties in scope of the regulations – this is because it cannot be assumed that this property will be unoccupied when any regulations come into force.

5. Based on the 2017-18 English Housing Survey, if all properties in England and Wales in the PRS were required to obtain or display an EPC when they are let out, it is estimated that around 10 per cent of domestic PRS properties in England and Wales are out of scope of the regulations.

A.2 Properties not in scope of the regulations

6. The PRS Regulations only apply to those properties that are let on assured, regulated or domestic agricultural tenancies and which are legally required to have an Energy Performance Certificate (EPC) when they are marketed for let (or for sale). EPC exclusions for certain buildings are set out in the accompanying MHCLG guidance documents[78], and typically apply to Houses in Multiple Occupation (HMOs) and certain listed buildings/ancient monuments. However, the PRS Regulations do apply where a legally required EPC exists for the property and only part of the property is let (such as an individual room within a House in Multiple Occupation). The PRS regulations also apply to listed buildings that are legally required to have an EPC. We are seeking views on properties not in scope in the consultation.

Houses in Multiple Occupation (HMOs)

7. A property is classified as a House in Multiple Occupation[79] if at least three tenants live in the property, forming more than 1 household, where tenants share toilet, bathroom, or kitchen facilities. Local authority statistics published by MHCLG[80] for England combined with Welsh government estimates of HMOs in Wales[81] suggest that around 10% of PRS properties in England and Wales fall under this definition of HMO. Whether an HMO is required to obtain an EPC depends on the set-up of the property and/or tenancy agreement.

Listed buildings and ancient monuments

8. Data on the specific tenure of these building types is not available. However, according to the 2018-19 English Housing Survey the PRS accounts for around 24% of privately owned homes (with the other 76% being owner occupied), therefore a pro-rata estimate for the PRS would mean that around 24,000 privately rented properties are either a listed building or ancient monument (of the 100,000 within the private domestic sector). Not all of these will be exempt from the legal requirement to have an EPC at point of let (or sale), but even if all were exempt, this would still represent less than 1% of the PRS housing stock.

9. Combining HMOs with EPC exempt listed buildings and ancient monuments, 10% of PRS properties from our modelling of the impacts of amended PRS Regulations are excluded.

A.3 Rationale for Government intervention

Market failures and behavioural barriers

10. There are a range of barriers that prevent households making energy performance improvements to their homes, with some particularly relevant to the Private Rented Sector. These have been well documented in previous PRS Impact Assessments,[82] but can be summarised as follows:

- **Misaligned incentives** – for properties in the PRS, the costs of installing energy performance measures traditionally fall to landlords, while the benefits of lower energy bills and a warmer property usually fall to

[77] Page 56: https://www.gov.uk/government/statistics/english-housing-survey-2018-to-2019-headline-report
[78] https://www.gov.uk/government/publications/energy-performance-certificates-for-the-construction-sale-and-let-of-dwellings
[79] For a definition of a HMO, see: https://www.gov.uk/house-in-multiple-occupation-licence
[80] https://www.gov.uk/government/statistical-data-sets/local-authority-housing-statistics-data-returns-for-2016-to-2017
[81] https://statswales.wales.gov.uk/Catalogue/Housing/Hazards-and-Licences/HousesInMultipleOccupation-by-Area
[82] For example, see the 2017 Consultation Impact Assessment (Section 2): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/669214/PRS_Consultation_stage_IA.pdf

tenants. This generates a split-incentive, whereby landlords have little motivation to invest in upgrading the energy performance of their property as they do not enjoy the benefits. In principle, in a well-functioning market, rent levels should fully reflect differences in a property's energy performance. This would overcome the issue, however the presence of other market failures, such as imperfect information on the costs and benefits of energy performance improvement measures, mean rents may not fully reflect differences in energy performance.

- **Externalities** – households generate carbon emissions through using energy in the home (e.g. heating). They experience the benefit of doing so (e.g. a warm home), but the climate change costs resulting from the emissions are not fully reflected in the price they pay. This leads to overconsumption of fossil fuel-based energy and low demand for energy performance improvements because the costs and benefits to society of energy use are not aligned.

- **Incomplete or asymmetric information** – the energy performance improvement market is characterised by a lack of trusted information for consumers, who are not well informed about energy performance improvement measures. Householders may not be aware of the potential benefits or be less well informed about the performance of measures as well as the measures themselves than those looking to sell them. In the absence of perfect information, households do not consider future energy performance improvement expenditure, leading to less demand. As a result, households tend to underinvest in otherwise profitable energy performance improvement projects.[83]

- **Access to capital** – the upfront cost of energy performance improvement measures mean landlords must choose between investing in them or using the same money for other purposes (the 'opportunity cost').

Wider Economic Benefits

11. By upgrading the energy performance of properties in the PRS to EER C, there are wider benefits that come with such an upgrade. These benefits have impacts greater than just on the PRS and will enhance society and the economy as a whole:

- **Health improvements** – These benefits are explored using the HIDEEM model produced by UCL. By improving the energy performance of the PRS, occupier's health will improve with a lower morbidity rate and a decrease in the effects of respiratory, cardiovascular & rheumatic illnesses. Mental health is also a wider benefit, as a report by the Energy Saving Trust[84] states that following the installation of energy efficient measures, self-reported states of depression and anxiety fell by 48%.

  Human capital – Human capital is the economic value of a worker's experience and skills, including factors such as health, education & experience. Improved energy performance leads to better health which in turn tends to lead to greater education for workers, both of which will improve human capital. This relates back to economic benefits as higher levels of human capital on average lead to higher wages where higher disposable incomes can be invested in both energy performance and heating homes to a higher temperature. Human capital is an area of economics that is becoming more prevalent and increasing energy performance is likely to increase labour productivity and support the economy.

- **Macroeconomic benefits –** The aforementioned report by the Energy Saving Trust lists several macroeconomics impacts of improving energy performance, including increased GDP, job creation and increase in house value. For example, every €1.4m invested in energy efficient measures, 32.6 jobs are created.

12. While tenants have the option to invest in energy performance upgrades themselves, short tenancy lengths can mean that in many instances they are unlikely to live in a property long enough for the benefits of improved energy performance to be worth the initial investment. Table 30 shows that around a quarter of

[83] Aydin, Brounen & Kok (2018): https://sustainable-finance.nl/upload/researches/Aydin-Et-Al-Information-Asymmetry.pdf
[84] Energy Saving Trust (2015) "Capturing the 'multiple benefits' of energy efficiency in practice: the UK example" can be found here. https://www.energysavingtrust.org.uk/blog/are-we-failing-understand-wider-benefits-energy-efficiency

tenants have lived in their current place of residence for under a year, and the median length of stay for all tenants is around two years.

Table 30: Length of residence in the Domestic Private Rented Sector

	< 1 Year	*1-2 Years*	*2-3 Years*	*3-5 Years*	*5-10 Years*	*10-20 Years*	*20-29 Years*	*> 30 Years*
Private Renters (%)	26	15	14	17	17	8	2	2

Source: English Housing Survey, 2018-19

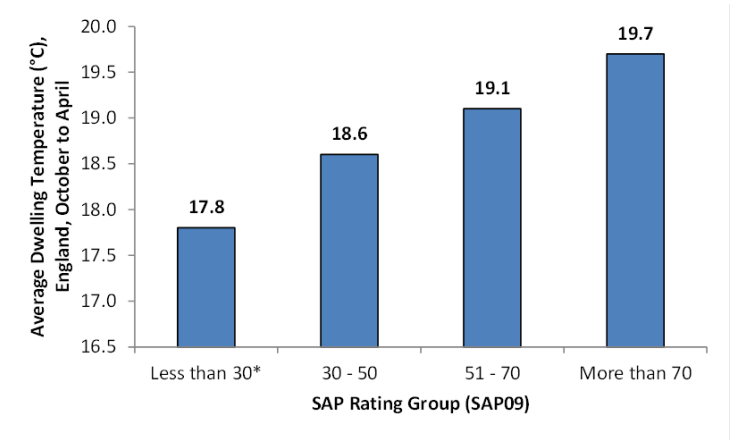
Equity considerations

13. The above barriers to improving energy performance are compounded by concerns that a disproportionate share of PRS homes, and in particular those with a lower energy performance rating are lived in by households in fuel poverty. In England around 11% of all households are fuel poor, but 19% of all PRS households are fuel poor, and 26% of D-G-rated (using FPEER) PRS households are fuel poor[85]. D-G-rated PRS households also have an average fuel poverty gap of £350 compared to an average of £321 across all households. Households on lower incomes typically face the greatest trade-offs between using their constrained resources to adequately heat their homes and spending on other basic essentials. Upgrading the energy performance of the dwelling is the most sustainable and cost-effective means of alleviating fuel poverty.

14. Living at low temperatures poses a risk to health, with a range of negative morbidity and mortality impacts associated with exposure to the cold. The Marmot Review Team report on cold homes and health[86] and the Hills Fuel Poverty Review[87] set out the strong body of evidence linking low temperatures to these poor health outcomes – in particular the cardiovascular and respiratory illnesses that drive the number of excess winter deaths each year (around 50,000 in England and Wales in 2017/18, the highest number recorded since 1975/76).[88]

15. Poor energy performance standards, and high energy costs driven by poor energy performance, have been shown to be robustly linked to lower indoor temperatures (see Figure 7). Households in the PRS facing barriers to upgrading their energy performance risk being 'locked in' to low temperatures and the subsequent negative health outcomes. Improving the energy performance of homes has been demonstrated to improve indoor temperatures significantly, reducing the risk to tenants of poor health outcomes.

Figure 7: Average dwelling temperatures during winter heating season (2011), by SAP rating group[89]



[85] https://www.gov.uk/government/statistics/fuel-poverty-detailed-tables-2019

[86] Marmot Review Team (2011). *The Health Impacts of Cold Homes and Fuel Poverty*. Available at: http://www.instituteofhealthequity.org/projects/the-health-impacts-of-cold-homes-and-fuel-poverty

[87] Hills (2011). *Fuel Poverty: The Problem and Its Measurement*. Available at: http://sticerd.lse.ac.uk/dps/case/cr/CASEreport69_Executive_Summary.pdf

[88] Office for National Statistics (2018). *Excess Winter Deaths Statistics*. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/excesswintermortalityinenglandandwales/2017to2018provisionaland2016to2017final#main-points

[89] The SAP scale (1 – 100) is used to determine EPC bands. For example, Band G covers ratings 1 to 20, F covers 21 to 38 and so on. The group "Less than 30" refers to the very least efficient homes (all G-rated and some F-rated).

Annex B. Modelling approach

1. This annex sets out the modelling approach used in this impact assessment, the detail of the costs and benefits analysed in the cost-benefit analysis, and any other key assumptions made.

Background to the National Household Model (NHM)

2. The National Household Model (NHM) was used to model landlord actions under the proposed PRS regulations. The NHM is a discrete event simulation model that allows us to install various measures in different houses and estimate the impact. For example, all uninsulated lofts could be insulated and the associated costs and energy savings assessed. The model is based on the English Housing Survey (EHS), an annual survey of thousands of households in England which, when taken together, represent all the different types of house in the country. Certain houses from the EHS are replicated to represent the Welsh housing stock.

3. The NHM models energy-related behaviour for domestic dwellings using a SAP-based energy calculation. SAP tends to overestimate energy consumption, and therefore potential energy savings, in less efficient homes. Part of this overestimation stems from occupants of less efficient homes rarely heating them to the same level as assumed under SAP. In order to account for this, the SAP-based energy savings estimates are aligned with the real-life energy savings of different measures using in-use factors. Note that these in-use factors are currently under review.

Overview of modelling approach

4. The policy was modelled by selecting properties below the EPC target and installing measures in descending order of SAP point increase per £ spent until either the property had reached EPC C, no further measures were suitable, or the cost cap had been reached. Note that this cost cap was modelled as if it increases in line with inflation and the Consultation is seeking views on this aspect of the policy design. If the cost cap does not increase in line with inflation policy impacts will be lower. The impacts of the proposed PRS Regulations were assessed against a 'business as usual' baseline – the counterfactual. There are two main aspects to the counterfactual that affect the net costs and benefits (including the direct ones to business), improvements that occur as a result of the natural replacement, and those delivered from current government policies. Some measures may also be installed by landlords in the absence of further policy, though the number of installations is assumed to be small.

5. Replacement of existing lighting with low energy lighting is taken from the modelling underpinning Ecodesign. Uptake of conventional heating measures assumes replacement with Ecodesign compliant condensing boilers as existing boilers reach the end of their lifetimes. Policy overlaps are modelled alongside these proposed regulations. This includes the amendment to the PRS Regulations in 2020 (which will improve the standard of properties at lower levels of energy performance, resulting in fewer measures required in these properties to achieve a higher level of energy performance) and also ECO3, which runs until the end of March 2022[90]. Policies that may be in place for the PRS beyond ECO3 are not currently know and are therefore not taken into account.

Detailed modelling approach

6. There are four main steps to modelling the impact of the PRS Regulations: deriving the 2025 stock; modelling the counterfactual (installations expected to happen anyway); modelling the policy; and calculating the net impact of the policy.
    - Modelling the counterfactual in order to derive the modelled stock of in-scope PRS properties for the beginning of 2025:
        - The NHM starts with the housing stock from the 2014 EHS.

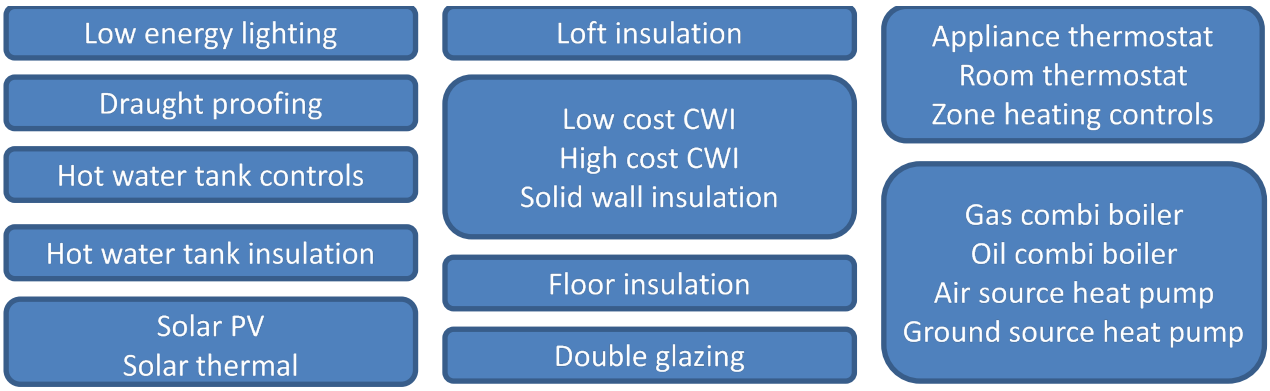
[90] https://www.ofgem.gov.uk/environmental-programmes/eco/contacts-guidance-and-resources/eco-guidance-and-associated-documents

- Measures are then installed in line with installations from National Statistics[91] for years where this information is available.
- Incandescent / halogen bulbs are replaced with low energy lighting at a rate of 6% each year to the end of 2020, at which point it increases to 13% until the end of 2024 (in line with Ecodesign estimates of lighting upgrades).
- Boilers are also replaced at a rate of 7% each year to the end of 2024.
- The previous PRS EPC E regulations are modelled in 2020, installing measures up to a £3,500 cost cap in EPC F and G properties.
- ECO3 installations are modelled from 2019 to 2022, based on a projection of installations to date in the PRS.

- Modelling the counterfactual from 2025:
  - This starts from the derived model stock of in-scope PRS properties at the end of 2024.
  - As with the modelled stock derivation, the annual 13% incandescent / halogen lightbulb replacement rate continues until 2030 (again, in line with Ecodesign estimates of lighting upgrades).
  - Boiler replacement also continues at a rate of 7% each year.
  - No other counterfactual installations are assumed.
- Modelling the scenario from 2025:
  - On top of the counterfactual outlined above, the PRS EPC C regulations are modelled from 2025 to 2028.
  - Each year, 25% of the PRS properties below EPC C are selected and have measures installed in descending order of SAP point increase per £ until either the property has reached EPC C, the cost cap has been reached, or no more measures remain.
  - Measures are split into 2 parts – cost effective fabric measures, which need to be installed first, followed by the rest of the measures, which can be installed once the cost effective fabric measures have been installed. This is to reflect a 'fabric first' principle. Not following a fabric first principle may result in a different installed measure mix and associated costs and benefits. Up to one measure from each of the groups shown in Figure 8 can be selected.
- Once both a counterfactual and scenario model scenarios have been produced, the net impact of the policy can be calculated by subtracting the counterfactual from the scenario. This accounts for bringing forward the installation of measures that would have happened if the policy had not been implemented. Finally, the results are scaled to our expected stock in scope (see Annex A for description). By carrying out this scaling outside the NHM, a more robust sample size could be maintained within the NHM.

7. The output from the model allows the changes which have occurred as a result of the policy to be examined by comparing the stock before and after the policy measure installations. Changes over the entire policy appraisal period, net of the counterfactual, are assessed to calculate the net present value of the policy.

Figure 8: Each package of installed measures can include a measure from each box



[91] Household Energy Efficiency Statistics (including technical potential update), available at: https://www.gov.uk/government/collections/household-energy-efficiency-national-statistics

B.1 Costs and benefits included in the cost-benefit analysis

8. **Installation costs**. This is the largest individual cost of the Regulations. When installations come to the end of their life, it is expected that replacement will be made. It is assumed that installation costs are incurred again at that stage and these costs are included in the NPV.

9. Some cost reductions have been assumed for particular measures:
    - Solid wall installation is expected to cost 20% less than current prices by 2025. This reflects the likely impact of the ECO3 innovation element and increased focus on solid wall insulation driving innovation and cost reduction.
    - Floor insulation is expected to cost 10% less than current prices by 2025, reflecting further advances in installation techniques.
    - Solar PV systems are assumed to continue to fall in price at a rate of 1.3% each year, based on projections by Parsons Brinckerhoff.[92]
    - In practice, technological improvements and increased competition may lower the costs of installing other energy performance measures and therefore lower the costs of the Regulations. Costs are not assumed to rise over time, as it is assumed that the supply chain can meet the additional demand for energy performance measures.

10. **Operational costs**. Covers the annual cost of running heating measures and solar PV installations. These costs include servicing and maintenance costs (see Section B.2 for further details).

11. **Opportunity Costs**. Supplementary guidance to the Green Book on valuing energy use and greenhouse gas emissions[93] suggests that when capital is tied up in a specific project, alternative profitable use of such capital is ruled out and there is a foregone social benefit. Opportunity costs have been included in this impact assessment at a rate of 3.0% over 5 years.

12. **Hidden costs**. These include the time taken by landlords to research potential installations, to liaise with the installer, prepare the property for installation, oversight of the installation, as well as clean-up or redecoration costs associated with the installation. Some hidden costs may also fall to the tenant, for example, clearing rooms where work is required or learning how to use new systems. A detailed breakdown of the different costs associated with installing different measures was used to allocate the split between landlord and tenant for different measures. These costs are estimated to be small in the majority of cases and may overestimate costs where installations occur in void periods.

13. **Cost of understanding the regulations**. Landlords will face costs in understanding the Regulations. The cost to landlords is associated with the time they spend reading the guidance. This is assumed to take, on average, one hour for domestic landlords. There may be a cost to letting agents in understanding the Regulations, though these are likely to be small and have not been monetised.

14. **Compliance costs**. Landlords will also incur a time cost in demonstrating compliance or applying for an exemption from the regulations when this is required (see Section B.2 for further details).

15. **Cost of using TrustMark certified installers**. The requirement to use TrustMark installers is being consulted on and the impact of this is explored in Section 8. It is assumed that adhering to TrustMark would, on average, add £500 onto the cost of installations in each property. This cost is not assumed to be additional to the cost cap so in effect results in less of the cost cap that can be used on the measures themselves. Though not yet modelled, works under TrustMark would be carried out to a higher standard. The central scenario does not currently include the use of TrustMark certified installers as there are a variety of ways through which TrustMark could be incorporated, including non-regulatory options that may nudge landlords towards using

[92] Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/456187/DECC_Small-Scale_Generation_Costs_Update_FINAL.PDF

[93] Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

TrustMark certified installers rather than requiring it. Government is keen to hear views from stakeholders on their preferred approach.

16. **Enforcement costs**. Local authorities will be required to administer and enforce the PRS Regulations, however, there is uncertainty in the costs required to do so, given the scale of the proposed amendments. The costs modelled for this consultation Impact Assessment include the estimated administration costs to local authorities, and the cost of an exemptions register. Ongoing enforcement pilots being carried out by several Local Authorities will help provide better estimates for these costs.

17. **Energy savings benefits**. The installation of energy performance improvement measures reduces energy used. This has been monetised in accordance with Green Book supplementary guidance on valuing energy use and GHG emissions.

18. **Air quality improvements and reductions in greenhouse gas emissions benefits**. The reduction in the amount of energy used improves air quality and reduces traded and non-traded greenhouse gas emissions. Reductions in greenhouse gas emissions help meet the UK's legally binding emission reduction targets, while improvements in air quality reduce adverse health impacts, and other long-term environmental impacts. These benefits have been calculated in accordance with Green Book supplementary guidance.

19. **Comfort taking benefits**. Energy performance improvement measures reduce the amount of fuel required to deliver a given level of energy service, meaning that some households will heat their homes to a higher temperature, for a longer period, or heat more rooms in their homes. This is valued at retail energy prices which act as a proxy for the willingness of consumers to pay for the additional comfort.

B.2 Key input assumptions

Capital costs

20. Table 31 presents the cost of the different measures (excluding heating) which may be applied to properties[94]. Since the previous PRS regulations impact assessment, this cost data has been combined with an assessment of the average area treated for different property types to produce cost models that scale the cost of particular measures to the property. This allows for a much more granular representation of measure cost, which is useful when assessing policies with cost caps or payback period thresholds. Note that these cost models were fitted to the underlying data and therefore may appear different to cost models built up from the individual components of an installation.

21. For Solar PV installations, capital costs are calculated as a function of roof area based on data from Renewable Energy Consumer Code (RECC)[95].

Table 31: Non-heating central capital cost assumptions used in the modelling (2018 real prices)

Measure Description	Fixed cost (£)	Unit cost	Units for unit cost
Loft insulation	160	5.2	£ / m^2 treated
Low cost cavity wall insulation	270	3.2	£ / m^2 treated
High cost cavity wall insulation	1700	30	£ / m^2 treated
Solid wall insulation (external)	4100	36.3	£ / m^2 treated
Double/secondary glazing	1130	146.1	£ / m^2 treated
Floor insulation	0	20.4	£ / m^2 treated
Draught proofing	40	1	£ / m treated
Low energy lights	0	3.5	£ / bulb
Hot water cylinder insulation (tank)	20		
Cylinder (hot water tank) thermostat	190		
Appliance thermostat	190		

[94] https://www.gov.uk/government/publications/domestic-cost-assumptions-what-does-it-cost-to-retrofit-homes
[95] For more information, see: https://www.recc.org.uk/

Room thermostat	220		
Zone controls	730		

Table 32 shows capital cost assumptions for gas, oil boiler and air source heat pump installations for a particular capacity. The capital cost used in the model varies according to capacity and was derived from an internal study completed at the start of 2018, which involved interviews with installers, manufacturers, and other industry association input on the costs of heat generation measures and controls.

Table 32: Central capital cost assumptions for heating measures used in the PRS modelling (2018 real prices)

kW Capacity	Gas Boiler	Gas with First Time Central Heating	Oil Boiler Upgrade	Oil with First Time Central Heating	Air Source Heat Pump
8					£9,584
24	£2,700	£4,590	£4,392	£6,149	

22. High and low capital cost assumptions of ±30% on the prices above was used to estimate our low and high NPV scenarios in Section 8. This range captures the likely range of costs based on evidence from commissions research and observed delivery data.[96]

Operational costs

23. Operating costs relate to the annual maintenance of heating systems and solar PV. Drawing on assumptions used for the most recent Energy Company Obligation and Feed-in Tariff Impact Assessments (for central heating and solar PV respectively), cost assumptions of £100 per year for central heating and £24 per kW of installed capacity for solar PV are used.

Landlord costs of understanding the regulations and compliance

24. One hour of familiarisation time is assumed to be required for each landlord in order for them to understand the amended PRS Regulations.

25. It is assumed that landlords would need to spend an hour to prove compliance for each property they were able to improve to EPC C. It is also assumed they would need to obtain a new EPC accounting for the improvements made, at a cost of £60 and an additional hour of time. If a landlord was unable to improve a property to EPC C, it is assumed an hour of time is required to file the necessary exemption and a that a new EPC would also be required.

26. The majority of PRS properties are owned by landlords owning fewer than 5 properties. These landlords are likely to use their rental income as supplementary income to their main job and are likely to do much of the work required around these regulations in their free time. The Department for Transport estimates the value of free time at £6.18/hr[97], and this has been used to monetise the time costs outlined above. There will be some professional landlords who may carry out this work or hire staff to carry out this work. While this group is likely to have a higher value associated with their time taken for familiarisation and compliance, they represent a minority of landlords and will also benefit from economies of scale. As a result, using the median salary for a property professional is likely to overestimate costs.

Hidden costs of installations

27. The hidden costs of installing measures are drawn from the ECOFYS report[98] tailored to the characteristics of the whole PRS stock. This report details the additional time taken to install different measures. The value of

[96] For more information, see: https://www.gov.uk/government/publications/domestic-cost-assumptions-what-does-it-cost-to-retrofit-homes and https://www.gov.uk/government/consultations/energy-company-obligation-eco3-2018-to-2022

[97] Values of time and vehicle operating costs: http://webarchive.nationalarchives.gov.uk/20140304105410/http:/www.dft.gov.uk/webtag/documents/expert/pdf/U3_5_6-Jan-2014.pdf

[98] See the ECOFYS (2009) "The hidden costs and benefits of domestic energy efficiency and carbon saving measures" report for further details

landlord time follows the same assumption as the landlord compliance cost. Although it is likely that landlords would carry out work during void periods, a hidden cost to tenants as if they were living in the house is conservatively assumed. The value of tenant time also follows the same value of free time as landlords. The hidden costs are summarised in Table 33.

Lifetime of measures

28. The lifetime of measures used in the PRS modelling are shown in Table 33.

In-use factors

29. In-use factors scale the SAP energy savings so that they better represent the observed savings of particular measures. In-use factors from Ofgem have been used where available[99]. The in-use factors for other technologies have been taken from other internal data sources on the real-world effectiveness of particular measures and discussions with BEIS scientists. These in-use factors are shown in Table 33.

Table 33: Hidden costs, in-use factors, and measure lifetimes assumed in the PRS modelling (2018 prices)

Energy performance improvement measure	Estimated hidden cost to landlords (£)	Estimated hidden cost to tenants (£)	In use factor	Lifetime (years)
Loft insulation	65	65	0.65	42
Cavity Wall Insulation	75	20	0.65	42
Solid Wall Insulation (external)	205	15	0.67	36
Floor insulation	75	55	0.85	42
Draught-proofing	55	0	0.85	10
First Time Central Heating	80	30	-	42
Boilers	25	0	0.75	12
Air source heat pump	160	30	0.75	20
Heating Controls	30	10	0.5	12
Hot Water Cylinder Insulation	5	0	0.85	10
Hot Water Thermostat	30	10	0.9	12
Low energy lighting	5	0	1	10
Double glazing	75	0	0.85	20
Solar PV	130	25	1	30

B.3 Additional modelling assumptions

Solar PV

30. The PRS model includes **Solar Photovoltaic (PV)** panels in the selection of measures which can be applied to homes as part of the policy. With this type of measure, however, factors such as roof coverage, efficiency, and total energy produced and/or sold back to the National Grid have to be considered to accurately reflect the impact this measure's inclusion may have on SAP ratings and greenhouse gas emission savings. Considerable research, testing and collaboration with BEIS engineers and scientists has been undertaken, and assumptions on efficiency and proportion of generation exported are consistent with those used in modelling for Feed-in Tariffs. This results in the following assumptions being included in the model;

    - the proportion of roof area that can be covered by Solar PV per household is assumed to be 30%,
    - 50% of the energy produced by the panels is assumed to be used by the household with the other 50% being exported back to the grid,
    - the efficiency of any Solar PV installation is taken to be 12%,

http://webarchive.nationalarchives.gov.uk/20121217150421/http:/www.decc.gov.uk/assets/decc/what%20we%20do/supporting%20consumers/saving_energy/analysis/1_20100111103046_e_@@_ecofyshiddencostandbenefitsdefrafinaldec2009.pdf

[99] https://www.ofgem.gov.uk/system/files/docs/2018/01/eco2t_measures_table_-_jan_2018_-_v1.2.pdf

- the take-up of the measures is capped at 50% of the total stock under assessment - this accounts for households with unsuitable orientation, overshadowing, etc.

First time central heating

31. The application of first-time central heating is applied as a function of boiler installation size and cost. By default, the National Household Model accounts for the cost of FTCH based on floor area. For the PRS, this has been modified to incorporate data on delivered costs of FTCH that are used for ECO modelling. This applies scaling factors to the cost of boiler installations to account for the additional costs a landlord may incur through installing a central heating system – such as new radiators, piping work and labour costs. These scaling factors are based on delivery data from the Warm Front Scheme.

Health benefits

32. Over recent years BEIS has been collaborating with a team of leading experts from University College London and London School of Hygiene and Tropical Medicine to develop a model to estimate the change in occupants' health from the installation of energy performance improvement measures (resulting from changes in the indoor temperature and pollutant exposure). The model that was developed is the Health Impacts of Domestic Energy Efficiency Measures (HIDEEM) model.

33. HIDEEM uses the English Housing Survey as a basis for the analysis. The model is built from a number of inter-related modules covering a building's permeability properties and individual health conditions. Pollutants included in the model that impact on health are particulate matter, tobacco smoke, radon gas and mould growth. The health conditions linked to these pollutants include heart and circulatory diseases, cancers and strokes, as well as respiratory illness and common mental disorders. HIDEEM uses the Quality Adjusted Life Year (QALY) method to monetise these health impacts. This involves placing a value on the change in a person's health over time. More details on HIDEEM can be found in Section 6 of the analytical annex to Fuel Poverty: A Framework For Future Action[100].

[100] Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211137/fuel_poverty_strategic_framework_analytical_annex.pdf