



Future Homes Standard: changes to Part L and Part F of the Building Regulations for new dwellings – comments from CREDS

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CREDS (Centre for Research into Energy Demand Solutions) responds to consultations and calls for evidence from government, agencies and businesses, providing insight and expertise to decision-makers.

This submission was written by the following CREDS members: Tadj Oreszczyn (UCL), Robert Lowe (UCL), Nick Eyre (University of Oxford), Paul Ruyssevelt (UCL) and Gesche Huebner (UCL), and answers questions 1-11, 13-14, 16-23, 32, 34 and 63-64 relating to changes to Part L.

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The full consultation response is below and has also been submitted via the online portal.

Q1 – Do you agree with our expectation that a home built to the Future Homes Standard should produce 75-80% less CO₂ emissions than one built to current requirements?

A carbon target of 75-80% as proposed does not have any real meaning during a period of rapid decarbonisation of energy supply, which the construction sector has no control over. This should be framed in terms of the features of Future Homes Standard dwellings:

- that make it possible to connect to a range of future zero carbon energy carriers; and
- that minimise cumulative CO₂ emissions on the path to zero carbon.

Q2 – We think heat pumps and heat networks should typically be used to deliver the low carbon heating requirement of the Future Homes Standard. What are your views on this and in what circumstances should other low carbon technologies, such as direct electric heating, be used?

Heat pumps are the only technology that can immediately deliver very significant reductions in domestic heating energy. The transition to all dwellings being heated by heat pumps however, has to be managed carefully. This transition is however easiest to undertake in new buildings, which can play an important role in developing the market for the technology.

Direct electric heating should only be used in new dwellings with exceedingly low space heating energy demand.

Q3 – Do you agree that the fabric package for Option 1 (Future Homes Fabric) set out in Chapter 3 and Table 4 of the impact assessment provides a reasonable basis for the fabric performance of the Future Homes Standard?

The fabric package for Option 1 is not demanding enough. The main focus of Part L should be the fabric standard. This is the one thing that is very difficult to change during the lifetime of the building.

The priority must be to get dwellings to comply in practice to the standard. The heat loss of many new buildings is twice what is regulated. The proper installation of insulation in a building has the greatest benefit per unit of embodied carbon. Regardless of the level at which the fabric standard is set, buildings should comply with the intent and not just the letter of the regulation.

Beyond this, the standard should be set at a level intended to jointly minimise costs associated with CO₂ emissions during the transition to zero carbon, and the total cost of the dwelling and upstream infrastructure that is needed to get to zero. The consultation document does not provide evidence that the problem has been viewed in this way.

Also, the fabric package should include window shading at least as good as 2+1 windows with integral shading.

Q4 – When, if at all, should the government commence the amendment to the Planning and Energy Act 2008 to restrict local planning authorities from setting higher energy efficiency standards for dwellings?

- (a) In 2020 alongside the introduction of any option to uplift to the energy efficiency standards of Part L
- (b) In 2020 but only in the event of the introduction of a 31% uplift (option 2) to the energy efficiency standards of Part L
- (c) In 2025 alongside the introduction of the Future Homes Standard
- (d) The government should not commence the amendment to the Planning and Energy Act

Answer – (d)

This is a very complicated question requiring the following to be considered.

Local authorities have driven forward the building regulations agenda and have played an important role as a test bed for future regulations. This is in part because central government has not shown strong leadership.

However, there is considerable historic evidence demonstrating that when local authorities set standards, they do not have the resources to either develop technically the most appropriate standard or to enforce them appropriately (Ref: C,N, Marien, "[Design Intent compared with Performance in Practice: Residential Heat Networks with Combined Heat and Power](#)" [University of Cambridge PhD thesis, 2019](#)). In addition to this it is clear that the construction sector is not meeting current standards, having additional complexity by introducing different standards in different parts of the UK will simply make this task more difficult.

So, the answer to this question depends on the levels of ambition central government sets in Part L, and the level of funding that local government has to support the development and

policing of its own standards. The most effective solution will be for central government to work with local authorities to develop a coherent and logical set of regulations that can be delivered and enforced within the whole energy system context of the UK.

Regarding the powers of local authorities, if district heating is to play a significant role in our future low carbon supply, the powers local authorities have will be critical. Countries with significant district heating have strong powers to enforce the use and effectiveness of district heating.

Q5 – Do you agree with the proposed timings presented in figure 2.1 of the consultation showing the Roadmap to the Future Homes Standard?

- (a) Yes
- (b) No – the timings are too ambitious
- (c) No – the timings are not ambitious enough

Answer – (c)

The UK has a massive task to undertake if it is to deliver zero carbon within its budgets. New buildings must play their role in delivering this target. Many buildings today are not meeting the currently specified fabric targets and this must be rectified urgently. The calling of a climate emergency requires action at rates not previously undertaken and the proposed timeline does not suggest anything has changed.

The fact that the consultation on existing buildings has not even be released suggests that government is not acting appropriately for the seriousness of the problem.

The 2025 revision of Part L, should plan to make all dwellings cooling-ready.

Q6 – What level of uplift to the energy efficiency standards in the Building Regulations should be introduced in 2020?

- (a) No change
- (b) Option 1 – 20% CO₂ reduction
- (c) Option 2 – 31% CO₂ reduction (the government's preferred option)
- (d) Other

Answer – (d)

If I buy a new house today, it must be zero-carbon ready for 2050. Plus, new homes must also be built with the systems that deliver the lowest available carbon emissions now, to minimise cumulative emissions between now and 2050. This is because to tackle climate change it is not where we are in 2050 that is important, but the cumulative emissions between now and 2050.

Homes built to the new standard should be fit for use in a 2050 net-zero world. Although there is some uncertainty regarding which of the many options may be available in 2050. There is currently one that is fully tested and has had global deployment and hence the most robust. This is wind-generated electricity, with storage, running heat pumps which directly feed heat into a home, or via a district heating network. For this system to operate most efficiently, at minimum cost and for maximum comfort it is essential that the building heat loss is appropriate for the most cost-effective operation of this heat pump system.

People buying a new home do not expect to have to change the building fabric or internal heat distribution network in the first 30 years. Therefore, the focus of the regulations should be to guarantee that these are delivered at the most appropriate level (future-proofed, most cost-effective system) for heating by a heat pump in a net-zero world. There should be space for storage, to provide flexibility at dwelling level.

For new buildings which do not already have a gas infrastructure it is not clear why from a technical point of view you would install one. Only heat pumps provide the massive reduction in heat demand (one third) and burning gas (either methane or hydrogen) is dangerous, plus it adds additional moisture that has to be ventilated if used in cooking. If gas is not permitted via regulation and the only energy vectors are electricity or delivered heat than the regulations can become much simpler both to specify and police.

Not only is this essential for the 'future homes' purchaser, it is important we take this step for the UK economy. The UK off-gas retrofit sector is about three times the size of Denmark, big enough to support thriving markets for stand-alone heat pumps, and grouped heat pumps. Cost and inconvenience associated with district heating or beefed-up electricity are unlikely to be excessive, due to i) high dwelling densities in small areas ii) low congestion above-and-below ground in small conurbations, and iii) space for grouped heat storage. There is a case for using off-gas new development to spearhead the transfer of new skills and technology. This would also contribute to levelling up the UK economy.

The priority needs to be to obtain the appropriate cost-effective building heat loss in practice. The biggest challenge will be eliminating the performance gap. However, we believe this will in effect become self-regulating. Heat pumps, unlike boilers, are very sensitively priced by heat kW output. The bigger the heat loss the more expensive the heat pump: developers will want to reduce their costs and so install the minimum sized heat pump. This will mean they

need to get the fabric right. However, if they do not deliver the fabric performance the building will be cold. The biggest U-value wins are now in delivering as-built U-values. Regarding windows, the priority will need to be window shading as well as heat loss reduction.

Note, the decision to ban gas in new buildings will be very controversial, and fiercely opposed by the gas industry (boiler manufacturers, etc) because they will see this as a tipping point and they have massive potential losses. However, the purpose of regulation is to deliver homes which are fit for the future and the logic for new buildings is we believe very clear. The new build market is really where you want to stimulate UK's heat pump installation and manufacturing industry and it is very hard to see how we will deliver zero carbon as a country if we do not immediately stimulate that market. New build is by far the most sensible and cost-effective case as it avoids the gas infrastructure cost. Also, significant numbers of apartments are already built without gas, so what is being proposed is already happening.

Q7 – Do you agree with using primary energy as the principal performance metric?

- (a) Yes – primary energy should be the principal performance metric
- (b) No – CO₂ should remain the principal performance metric
- (c) No – another measure should be the principal performance metric

Answer – (c)

House builders have no control over CO₂ emissions or primary energy factors. These are largely controlled by the energy supply industry and will have to change radically, independently of house builders. It is not logical to focus on something that will be a moving target in the future. The problem also gets much simpler if, as suggested in the answer to Q6 gas is not permitted. Part L should therefore evaluate energy use (kWh per annum) as the main metric, and in the future probably peak power consumption (kW) of a house. These things are also easy to measure in use, i.e. the metered energy consumption of a property.

Q8 – Do you agree with using CO₂ as the secondary performance metric?

- (a) Yes
- (b) No

Answer – (b)

This answer however depends on adopting our response to Q6. If gas is permitted than yes, because the task is not just to get to zero by 2050. It is to emit the smallest cumulative amount of CO₂ on the way to 2050.

This has the disadvantage of being a can-of-worms – but it is the right can-of-worms. To do it would require taking account of the likely rate of decarbonisation of different energy vectors between now and 2050, and the marginal CO₂ cost of insulation etc. added to the dwelling during construction.

Q9 – Do you agree with the proposal to set a minimum target to ensure that homes are affordable to run?

(a) Yes

(b) No

Answer – (b)

Affordability is not a suitable regulatory mechanism. Future energy prices will change in a very unpredictable way. Plus, it is unclear what advantage it has over a kWh/m² target if only electricity is permitted.

We must simplify our regulations, not make them more complicated to understand and enforce.

This is only an issue because gas heating is an option. If you remove gas heating as an option for new buildings then the regulatory framework is simplified and you just use delivered kWh/m².

Q10 – Should the minimum target used to ensure that homes are affordable to run be a minimum Energy Efficiency Rating?

(a) Yes

(b) No

Answer – (b)

Not if the energy efficiency rating is based on fuel cost for the reasons explained in our answer to Q9.

Q11 – Do you agree with the minimum fabric standards proposed in table 3.1?

If you do not agree with any one or more of the proposed standards, please explain your reasoning and provide evidence to support this.

The regulatory fabric standards for the next few years should be based on a systematic review of the life cycle carbon emissions and costs of additional fabric insulation compared to the life cycle carbon emissions and costs of offshore wind generation.

The UK has a limited carbon budget to allocate between now and 2050. This budget needs to be allocated in the most efficient way. As the supply side decarbonises the critical factor will be is it cheaper to invest in more insulation or more supply.

The fabric standard should also prevent overheating by the application of appropriate window shading factors, equivalent to a 2+1 window with integral shading.

Q13 – In the context of the proposed move to a primary energy metric and improved minimum fabric standards, do you agree with the proposal to remove the fabric energy efficiency target?

(a) Yes

(b) No

Answer – (b)

The current proposal permits a worse level of fabric insulation than currently allowed. Because of the lifetime of the building fabric the priority should be to get the fabric efficiency correct. Hence, the need for a fabric standard.

Q14 – Do you agree that the limiting U-value for roof-lights should be based on a roof-light in a horizontal position?

(a) Yes

(b) No

Answer – (a)

Yes, but with the minimum roof-light standard being the same as vertical glazing. Roof-lights are potentially a very useful way to get light into a building, but they are also potentially a real challenge for overheating if not correctly specified. They should be expected to provide the same level of insulation as vertical glazing.

Q16 – Do you agree with the proposal of removing the fuel factors to aid the transition from high-carbon fossil fuels?

(a) Yes

(b) No

Answer – (a)

Fossil fuel burning should not be permitted in new buildings so there is no need for a fuel factor.

Q17 – Do you agree with the proposed changes to minimum building services efficiencies and controls set out in table 3.2?

Answer – No, proposed standard does not go far enough for gas boiler. Yes, for heat pump.

If you do not agree with any one or more of the proposed changes please explain your reasoning and provide evidence to support this.

The UK has committed to zero carbon by 2050. All buildings designed today will be around in 2050. It is not possible to be zero carbon if fossil fuels are burnt at the building. New buildings should therefore not include any fossil fuel burning appliances.

Regarding the SCOP of heat pumps, the MCS database lists the manufacturers SCOP/SPER @ flow temp 50°C for 1286 heat pumps. The median is 3.35 and the standard deviation is 0.6. Therefore, a minimum SCOP of 2.8 would only exclude a small number of products (the worst 16%).

However, the performance of heat pumps in cold weather is probably more important than the SPF.

Q18 – Do you agree with the proposal that heating systems in new dwellings should be designed to operate with a flow temperature of 55°C?

- (a) Yes
- (b) No – the temperature should be below 55°C
- (c) No – dwellings should not be designed to operate with a low flow temperature
- (d) No – I disagree for another reason

Answer – (d)

Most heating systems will perform more efficiently at lower temperatures and this is easiest to design into a new building. Low operating temperatures are also likely to have longer term system benefits, such as allowing cheaper upstream heat storage, easier integration of waste heat into district heating systems and cheaper deployment of large scale solar. This is a strategic option that is likely to pay off across a wide range of possible futures.

Q19 – How should we encourage new dwellings to be designed to operate with a flow temperature of 55°C?

- (a) By setting a minimum standard
- (b) Through the target primary energy and target emission rate (i.e. through the notional building)
- (c) Other

Answer – (a)

It is most robust to be explicit about what is required and all buildings will need to move away from fossil fuel burning.

Q20 – Do you agree with the proposals to simplify the requirements in the Building Regulations for the consideration of high-efficiency alternative systems?

- (a) Yes
- (b) No

Answer – (b)

High efficiency systems that do not depend on fossil fuels should be the only option for new buildings.

Q21 – Do you agree with the proposal to adopt the latest Standard Assessment Procedure, SAP 10?

(a) Yes

(b) No

Answer – (a)

We do not have time to develop a new system, we must make the best use we can of SAP and adapt it as we go along. The main output should be the kWh/m² and not a carbon rating or logarithmic function of fuel price.

Q22 – Do you agree with the proposal to update the source of fuel prices to BEIS Domestic energy price indices for SAP 10.2?

(a) Yes

(b) No

Answer – (b)

Fuel cost should not be the main output of SAP, it should be a secondary output and so could be updated.

Q23 – Do you agree with the method in Briefing Note – Derivation and use of Primary Energy factors in SAP for calculating primary energy and CO₂ emissions factors?

(a) Yes

(b) No

Answer – (b)

The main function of SAP should not be to guess what will be happening to the energy system it should focus on accurately assessing the building's energy performance.

Q32 – Do you agree with our proposed approach to mandating self-regulating devices in new dwellings?

(a) Yes

(b) No

Answer – (a)

Q34 – Do you agree with proposed guidance on providing information about building automation and control systems for new dwellings?

(a) Yes

(b) No

Answer – (a)

Q63 – Do you agree with the proposal to specify the version of Part L that the home is built to on the EPC?

(a) Yes

(b) No

Answer – (a)

It is important that there is transparency about the vintage of the regulations.

Q64 – Do you agree Approved Document L should provide a set format for a home user guide in order to inform homeowners how to efficiently operate their dwelling?

(a) Yes

(b) No

Answer – (a)

In parallel with the user guide, the as-built SAP calculation, in summary form, and in full with all its inputs (pressure test, commissioning tests on ventilation systems) should be made available to all home owners and leaseholders as a matter course.