



BSI Net Zero Week webinars

Insights from the Built Environment's journey to net zero

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Inspiring trust for a more resilient world.

Towards Net Zero



In a series of insight-packed webinars, BSI's Net Zero Week presented a multi-sector view of the collective challenges and what's being done to tackle them.

This webinar in BSI's Net Zero Week focused on the Built Environment.

The Built Environment's Journey to Net Zero webinar was hosted by Anthony Burd, Head of Built Environment at BSI.

He began with the Climate Change Committee's sector-by-sector analysis of UK greenhouse gas (GHG) emissions, showing the built environment (BE) sector has seen gradual improvements since 2000.

But how does that compare with other sectors? Between 2008 and 2018, the power sector reduced its emissions by 100Mt but building emissions fell by only 18Mt. We clearly have a long way to go in the BE sector, and there are lessons we can learn.

How BE emissions break down

BE is responsible for around 40% of all the UK's emissions. "That's something we have to address – and there's no silver bullet," said Ant. "It's going to take a mix of policy levers, regulations and progressive clients."

He showed a breakdown of these emissions, describing the UK's 27 million existing homes are "the elephant in the room":

- New construction: 48 MtCO₂e
- Existing buildings: 182 MtCO₂e (138 from operational energy uses and 44 from plug loads and cooking)
- Transport: 119 MtCO₂e

"Put all this together and we certainly have a challenge,"

ended Ant. "But today we'll be hearing some potential solutions."

During the session we covered three topics:

Topic one: Part L (Energy) - Building Regulations Update

Topic two: New Retrofit Standards

Topic three: Managing Carbon in Infrastructure: the role of PAS 2080

Part L (Energy) - Building Regulations Update

First to speak was Dr Gavin Dunn, Chief Executive of the Chartered Association of Building Engineers and Chairman of the Future Homes Standard Working Group, Building Regulations Advisory Committee (BRAC).

His topic was a major piece of work on how building regulations are going to respond to the UK's carbon agenda. The 'Part L 2020 and Future Homes Standards Review' will set out the minimum regulatory standards for new builds in England, and the other three UK nations are undertaking similar work.

Arising out of the UK's 2017 Clean Growth Strategy and Grand Challenge, Part L picks up some key elements:

- Continued decarbonization of the electricity grid
- Phasing out of fossil fuels in new homes
- Future-proofing all new homes for low-carbon heating (e.g. heat pumps, heat storage)
- A move away from gas cooking
- Retrofitting existing homes to make them low-carbon and climate-resilient

From that will come a change to regulation and minimum standards. It will be a two-stage process leading to a new Future Homes Standard in 2025, but this first update is intended to build in the learnings so far.

Decarbonizing the electricity grid

There is a major shift from gas to electricity as the main source of heating, as electricity becomes much cleaner and renewable energy capacity grows. Regulations will have to respond, future-proofing homes for future generations when gas has run out.



Topic one

Unintended consequences: overheating homes

“The 2006-2013 Part L delivered many positive results,” said Gavin.

“But some things happened that we didn’t intend. And one of the key unintended consequences we must address is overheating.”

From improved insulation to airtightness, current practice in home design is causing more frequent overheating. The negative impacts range from energy demand in air-conditioning to poor sleep quality. “And in vulnerable people, it can even be deadly,” said Gavin. “A CIBSE’ report predicts that if nothing is done, by 2050 we’ll see 4,500 people a year dying of overheating in the home.”

Climate change is exacerbating the problem. If we don’t act, evidence suggests that around 50% of UK homes will run the risk of overheating.

Unintended consequences: ventilation

Another issue to fix is ventilation. There is clear evidence that the ventilation in our homes has become very poor, which has serious health implications – and as we move forward to homes with much better energy performance, we risk under-ventilating still further. So Part F will also address this.

Unintended consequences: the performance gap

“This is a really tricky one,” said Gavin.

“We’re designing homes to achieve a certain energy performance, but in reality they use a lot more. It’s called the performance gap.”

The complication arises because building regulations cover only regulated energy such as heating and lighting. There are many other impacts that aren’t regulated, from the number of iPhones being used to the number of people in the home. “Actual energy use in homes can vary by 200%,” said Gavin. “But even when we take those factors into account, research shows there’s another difference that can’t be explained. And that’s what’s behind the performance gap.”

It’s possible that the gap happens when a poorer-quality product is substituted for the architect’s recommendation. There might also be some areas of SAP that should be improved. “But either way, it’s something we must work on so the homes we’re designing will actually perform in practice.”

In 2012 the government warned it would regulate if this problem wasn’t fixed. “And what I’m hearing is that we’re getting to that point,” Gavin said. “The upcoming changes will include some factors that will help this, and 2025 could see some strict regulations that housebuilders will have to comply with to demonstrate the performance of homes.”

Topic one

Conservation of fuel and power: where are we?

The government consultation begun in 2019 has been interrupted by the pandemic, but it received over 3,000 responses. The feedback was very supportive, particularly from housebuilders. But many said the changes weren't going far enough or fast enough – a sign that this is all likely to happen quite quickly.

A second piece of work has been delayed by the pandemic, Brexit and the 2019 general election. This includes the overheating work and the work on existing homes. The first phase of this has been consulted on and could be implemented as early as the end of 2021.

A big step in the right direction: the Future Homes Standard

In simple terms, the Future Homes Standard 2025 is a revision to Parts L and F of the building regulations. It requires:

- The end of fossil fuel use in new builds, including for cooking
- 75-80% less carbon than one built to the current 2013 regulations

This is a major change – and a big step in the right direction. Every home will have a carbon target and an energy target, and there will be minimum standards for fabric performance and services efficiency. All three will need to come together to achieve a home that's low carbon and high performance, but also affordable to run.

What's ahead?

For obvious reasons it's hard to predict the year ahead, but Gavin believes we could still see:

- a 31% improvement in carbon performance
- improved fabric performance and the use of renewables to get there
- targets for high-performing double glazing, minimum wall-U values etc

Changes to Part F: fixing ventilation

Returning to the planned changes to the Part F ventilation requirements, Gavin said the evidence was quite damning.

“All the research shows that compliance is very poor, and it's just being overlooked by the industry.”

Changes to the compliance future are twofold:

- 1** A simple prescriptive approach, specifying ventilation size by room. Anything more than the most basic systems will require commissioning certificates and documentation passed up to the homeowner, creating accountability and transparency in the whole process.
- 2** A shift in building air permeability testing. At the moment we sample test; the proposal is to have every home tested.

Topic one

Fixing the performance gap

There isn't an easy fix for the performance gap. But 2020 will start to create greater transparency, through:

- a new type of compliance report, Building Regulations England Part L (BREL)
- the use of photographs to verify on-site construction
- a requirement for sign-off by OCDEA and the developer before going to building control

Changes to transitional arrangements

To prevent new homes being built to out-of-date standards, more stringent transitional arrangements are coming in. Any updates to regulations will apply to any building not started within 12 months, and transitional arrangements will now apply to individual buildings, not developments. This will result in much faster implementation than previous regulation changes.

Key takeaways

- 1** To be successful, the switch to electricity as a main heat source will also require a step-change in fabric performance.
- 2** There are questions over market capacity to deliver heat pumps at the required scale and performance.
- 3** This year's steps to address the performance gap are a good start, but we expect stricter requirements in 2025.
- 4** Tighter transactional arrangements could mean much faster adoption into mainstream practice.
- 5** The next key challenge is improving the performance of existing homes.

New Retrofit Standards

The second speaker was Dr Peter Rickaby, Principal Research Associate and Business Manager of the UK Centre for Moisture in Buildings, and Technical Director of The Retrofit Academy Centre of Excellence.

Peter's focus was on retrofitting existing buildings. He said that technical standards are critical to the safe delivery of the national retrofit strategy. Getting to net zero will be impossible without improving the performance of our existing building stock – especially as over 80% of the buildings now standing will still be here in 2050.

New quality assurance plans for domestic retrofit

The UK Domestic Retrofit Quality Assurance framework started with the Each Home Counts review. This was commissioned in 2015 after disappointing results from previous programmes. Poorly-conducted work was damaging both buildings and people's health; for instance, the disastrous Preston scheme where shoddy retrofitting rendered over 300 homes uninhabitable. This would later peak with the Grenfell tragedy of 2017.

The Each Home Counts review set out to tackle those problems. It made 27 recommendations, including introducing a quality mark. This resulted in the adoption of TrustMark as the quality mark for domestic retrofit. It would demonstrate that retrofit work done on UK dwellings met certain technical standards and requirements, enabling us to eliminate the performance gap and produce better outcomes.

The key role of PAS 2035

Central to the system is PAS 2035, the non-domestic retrofit standard that sets out best practice. It covers:

- retrofit coordination
- risk assessment
- dwelling assessment
- improvement option evaluation
- requirements to produce medium-term improvement plans
- requirements for design
- an evaluation process, in order to avoid unintended consequences

PAS 2035 was developed to address the problems that had led to the Each Home Counts review. But it's only part of the story. It requires compliance with many other standards, from BS 5250 on controlling condensation to BS 7913 on historic buildings.

“So with TrustMark requiring compliance with PAS 2035, and PAS 2035 requiring compliance with so many other standards, all the best practice standards we could find are brought into play,”

Topic two

The BSI Retrofit Standards Framework

A group of experts formed the BSI Retrofit Standards Task Group. They created the BSI Retrofit Standards Framework, with seven objectives in mind:

- 1 Improve the functionality and durability of buildings
- 2 Improve the comfort and wellbeing of occupants
- 3 Improve energy efficiency
- 4 Reduce environmental impact
- 5 Protect and enhance architectural heritage
- 6 Minimise the performance gap
- 7 Avoid unintended consequences

The BSI Retrofit Standards Framework ranges from the TrustMark and an industry code of conduct, to a customer charter and multiple BSI and other standards.

At the centre sits PAS 2035, specifying the retrofit process and how to implement it. The process is designed to embed best practice in the retrofit industry, and to protect consumers' homes and health from poor practice. The goal: to restore the industry's quality and output, and the confidence of government, finance and the public.

Next: PAS 2038

During the two-year transition period for PAS 2035, BSI has been working on the non-domestic retrofit standard PAS 2038, to be published in March 2021.

There are 2m non-domestic premises in England and Wales. Covering offices, shops and industrial buildings, they span everything from corner shops to The Shard. So it's a huge challenge to write a standard for retrofits across so many different types of premises.

PAS 2038 will cover all non-domestic buildings, so it builds in multiple options to deal with variations in scale. The process it sets out is similar to PAS 2035, without the different risk paths for high, medium and low risks. It also includes extra options for larger buildings.

Traditionally constructed and protected buildings are especially vulnerable to careless improvement. So PAS 2038 specifies additional requirements for lead assessors and designers and requires consideration of the architectural, cultural and historic context.

"If the building is significant, it also requires a heritage impact assessment."

Peter added that PAS 2038 will also support a tranche of BEIS policy initiatives designed to help drive the non-domestic stock towards zero carbon alongside the domestic stock. "It's the first brick in the wall for achieving that."

Managing Carbon in Infrastructure: the role of PAS 2080

Last to present was Maria Manidaki, Net Zero Lead and Principal Investment Planning Advisor at Mott MacDonald.

The Treasury's 2013 Infrastructure Carbon Review, commissioned by the Green Construction Board, was the first attempt to show that cutting carbon also cuts costs – by unlocking innovation, increasing efficiency and contributing to climate change mitigation.

A key recommendation was to develop a PAS for carbon management in infrastructure. As a result, PAS 2080 was published in 2016 as the first management specification around carbon management in infrastructure. Its focus was to provide a common framework for the value chain's different players; this would help create a consistent approach to carbon management, reducing carbon and costs in infrastructure projects.

The importance of starting early

Maria explained that the biggest opportunities for reducing carbon and costs come early in the process. "So PAS 2080 sets out a carbon reduction hierarchy that encourages people to challenge carbon and think ambitiously on how to achieve reductions at the very first strategic and planning stages," said Maria. "Maybe there's an option to build nothing? Or build less by reusing existing assets or challenging existing assets standards but by aiming to achieve the same outcome? Then, if you have to build, you can 'build clever' with lower carbon materials and 'build efficient' using alternative construction or operational techniques."



Topic three

Wide scope

One of the most important aspects of PAS 2080 is the scope of the emissions it covers:

- Capital carbon (emissions from building an asset)
- Operational carbon (emissions from operating that asset)
- User carbon (emissions related to the users of infrastructure)

This is important because asset owners and their supply chains have direct control of the first two but can have an important influence on the user emissions. User carbon has often been overlooked, but it could make a massive contribution to emissions. So PAS 2080 requires us to consider whole-life carbon and to justify any exclusions on the basis of materiality.

Maria then talked through how PAS 2080 addresses the different components of the carbon management process: continual improvement, baseline and target setting, quantification, and monitoring and reporting. For each, it sets the requirements that will give the greatest chance of carbon reductions.

“But all this only works if we have the right leadership and governance in place, so the PAS has an important section on leadership early on. The idea is to create a culture of challenge, where everyone in the supply chain keeps challenging each other to come up with innovative low carbon low cost solutions.”

Although asset owners are the key levers of carbon and cost reduction, the PAS gives equal weight to the supply chain. If we are to achieve low carbon, we need aligned objectives and enablers to make reductions happen.

Topic three

Achievements so far

Maria summarized the industry's achievements since the PAS's publication in 2016. A recent review by the Green Construction Board Infrastructure Working Group shows that:

- more infrastructure owners and Tier 1 suppliers have been following the PAS 2080 principles
- there has been a stronger push from the supply chain to influence low-carbon and low-cost decisions
- the UK's net zero target has increased interest in PAS 2080 including at the higher tiers of the value chain such as regulators and asset owners
- more international organizations are following the principles of the PAS

Five ways we could improve

- 1 Real behaviour change instead of box-ticking to achieve verification:** this could be done by strengthening some of the PAS's behavioural clauses like Leadership and Governance as well as providing more guidance on how to gradually build maturity.
- 2 Better alignment in the value chain through common goals:** this could mean strengthening the points on procurement and incentives.
- 3 A switch to systems thinking:** we need to look beyond capital and operational carbon and up our game at the system level, which is key for a net zero ambition.
- 4 Early focus on whole-life:** to avoid wrong decisions, we need a whole-life carbon assessment at the strategic planning stage without forgetting the user carbon.
- 5 Better guidance on GHG removals and maximising co-benefits:** GHG removals are a key component for Net Zero as well as other co-benefits such as social value and biodiversity gain; we should consider those in future revisions of the PAS or the guidance.

You can watch the [webinar on demand](#). Find out more on the [BSI Net Zero page](#)

Why choose BSI?

Climate change has emerged as one of the biggest challenges of our time. Several factors have prompted countries around the world to commit switching to low-carbon economies. It's estimated that warming above 2°C will expose nearly 3bn people to severe climate risk. If warming can be cut to 1.5°C this figure could be halved.

Despite progress in recent years there is still much work to be done. The Paris Agreement aims to achieve net zero balance in the second half of this century and seeks accelerated action from governments across the globe to meet this goal.

Major milestones have already been defined. For example, by 2025, a full net-zero policy package must be in place, and by 2035 almost all new investments (such as cars and heating systems) should be zero-carbon. Further details will be added in the coming months to maintain the UK's credentials ahead of COP26.

As energy costs continue to rise and climate change concerns grow in the public consciousness, low-carbon technology will play a significant role in the world's future plans. It is no longer a question of if the UK will fully embrace the low-carbon economy. Rather, how efficiently we can manage the transition.

The recent global events provide a unique opportunity for many to 'Build Back Better', embedding sustainability with real commitment and in a manner, which evidence each individual effort and strengthen the global effort. Now is the time for action.

So, how will your organization play its part in the energy revolution towards net zero? BSI is here to help with a full range of tailored solutions to support your [Net Zero journey](#).

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