TRANSFORM-ER (TRANSFORM.ENGAGE.RETROFIT)

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Retrofit product certification: state of the market report

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Contents

Front cover photo credit: Ultrapanel's 'HausWrap' solution is an offsite manufactured panelised system to thermally insulate the roof and walls, customised via a 3D scan and configured to precisely fit each building

Preface

Jon Warren, Head of policy & innovation at Energiesprong UK

Streamlining certification for a thriving retrofit sector

The UK must retrofit two homes per minute to meet its 2050 net zero goals, while also ensuring warm, affordable, healthy homes for millions. However, the retrofit market is fragmented with complicated supply chains, labour shortages, rising costs, and inconsistent quality.

Transform-ER (Transform. Engage. Retrofit) is an Innovate UK-funded project tackling these barriers, aiming to enable the industry to upgrade one million homes annually by 2030. A key focus is streamlining certification processes for new retrofit solutions, including defining interoperability standards to cost-effectively meet demand.

Fundamental challenges with retrofit product certification

This report evaluates the current state of retrofit product certification; considering stakeholder input and funding needs and developing a certification state of the market report and pathway.

We've found that the current certification market for retrofit products can be confusing and time-consuming – both for existing manufacturers and new entrants to the market. Existing certifications are not always well suited to retrofit products, meaning innovation is being stifled for new solutions.

There have also been serious building safety failures, and the much-needed Building Safety Act will have an inevitable impact on certification processes. The need for residents to be – and feel - safe in homes that have been retrofitted is paramount so any changes to certification processes must address this.

Creating a practical path for industry-wide change

As well as identifying the main challenges in the current market, this report aims to help manufacturing partners identify gaps in the approvals structure and propose new testing routes to address these barriers.

The insights are informing Transform-ER's project proposal for changing the status quo, and any practical solutions will be demonstrated for industry-wide application. It also covers the current certification pathways and includes case studies of companies navigating these processes.

Executive summary

This document outlines the certification landscape for retrofit products and maps potential approval pathways. Some routes are regulatory-driven, while others are market-led with various drivers.

Key Findings

1. Certification routes are complex and time-consuming

- Numerous, seemingly overlapping certification routes create confusion, especially for new market entrants
- Some approvals are not strictly mandatory but are practically so due to market drivers. Relevant requirements for a product can be difficult for innovators to grasp if they are not experienced in the sector.

2. Retrofit product certification faces unique challenges, which is stifling innovation

- Existing certifications are not always well-suited for retrofit products, leading to delays in recognition
- There are no dedicated test standards for many retrofit products, frustrating manufacturers looking for certification
- PAS2035 and PAS2030, while improving quality in installation, are not intended for product certification.

3. The much-needed move towards integrated solutions adds complexity

- Moving towards integrated systems adds complexity to certifications, as multiple performance factors must be considered
- Manufacturer warranties may not cover integrated systems that diverge from original specifications
- Fire safety concerns and the new, important Building Safety Act add further certification considerations, especially for innovative solutions.

While it is beyond the scope of this report to consider all potential standards for new retrofit products, it may be necessary for new standards of some recognised form to be developed before verification or approval processes can commence. We will be looking at this during the Transform-ER project.

About Transform-ER

Transform-ER (Transform.Engage.Retrofit) is a game-changing, consortium-led project funded by Innovate UK that's tackling retrofit's biggest barriers to scale - enabling one million home upgrades every year by 2030. It's designed to create a cohesive, industrialised sector that delivers high-performance, cost-effective solutions through a standardised process.

Systemic change to tackle multiple, intertwined challenges
13 industry leaders are collaborating using the Demand-Develop-Deploy structure to:

- **Develop new digital tools and approaches to assessing portfolios**, categorising typologies, aggregating demand, identifying retrofit performance risk, and enabling standardisation - led by Ambue, Tallarna and Planarific.
- **Create a Community Interest Company** to provide an equitable and structured 'profit for purpose' market vehicle that can unlock new income streams, as well as foster culture change through increased collaboration - led by Energiesprong UK and Tallarna.
- **Streamline accreditation routes and prototyping products and kits-of-parts**, defining interoperability standards to cost-effectively meet demand - led by BRE, KIN Architects, Ultraframe, Tata Steel, Bow Tie Construction, and VundaHaus.
- **Form a Retrofit Rulebook** to document the activities in the project as case studies and set out clear guidance for other industry actors and those wishing to join the retrofit revolution – led by the MTC.

Social housing is the natural launch market and partners include the London Boroughs of Barking & Dagenham and Hammersmith & Fulham.

The result? A new industrialised retrofit system and marketplace that upgrades homes and improves lives – open to existing and new delivery partners – tested and ready to launch in 2025, alongside a wealth of learning to be shared widely with the industry.

Acronyms & abbreviations

AB	Approved body
AVCP	Assessment and Verification of Constancy of Performance
BBA	British Board of Agrément
BOPAS	Buildoffsite Property Assurance Scheme
BRE	Building Research Establishment
BSA	Building Safety Act
BSI	British Standards Institute
CE	Conformité Européenne
CIC	Community Interest Company
CPA	Construction Production Association
CPD	Continuous Professional Development
CPR	Construction Product Regulator
DESNZ	Department for Energy Security and Net Zero - UK Govt department
DLM	Data Light Measures
DLUHC	Department for Levelling Up, Housing and Communities
DOP	Declaration of Performance
ECO	Energy Company Obligation
EPC	Energy Performance Certificate
EN	European Norm
EPD	European Product Declaration
ETV	Environmental Technology Verification
EWI	External wall insulation
FiT	Feed in Tarriff
FPC	Factory Product Control
HEM	Home Energy Model
HRB	High Risk Building
HUG	Home Upgrade Grant
IM	Innovation Measures
ITT	Initial Type Testing
ISO	International Organisation for Standardisation (true origin isos meaning equal)
JCI	Joint Competency Initiative

LCA	Life Cycle Analysis
LRQA	Lloyd's Register Quality Assurance
M	Manufacturer
MCS	Microgeneration Certification Scheme
MMC	Modern Methods of Construction
NMAP	New Measures and Products
OPSS	Office for Product Safety and Standards
PAS	Publicly Available Specifications
PCDB	Product Characteristics Database
PCR	Product Category Rules
PI	Professional Indemnity
RdSAP	Reduced Data Standard Assessment Procedure
RICS	Royal Institute of Chartered Surveyors
SAM	Standards Alternative Methodology
SAP	Standard Assessment Procedure
SCH	System Certificate Holder
SEA	Sustainable Energy System
SEG	Smart Export Guarantee
SHDF	Social Housing Decarbonisation Fund
TAB	Technical Assessment Body
UKAD	UK Assessment Document
UKAS	UK Accreditation Services
UKCA	UK Conformity Assessment
UKTA	UK Technical Assessment

Background

A Sustainable Energy Association report from 2022[1] summarises the main challenges encountered by manufacturers of energy efficiency and low-carbon heating products to get innovative products into Government schemes (which are the main route to market). Some of the key issues from the SEA report relevant to the Transform-ER project and specifically to certification are:

- There is not a streamlined and well-signposted methodology for businesses to use to get their products certified and ready for Government schemes. Industry support is lacking, and the process requires time, cost and effort.
- It can be arduous getting new, innovative products recognised within the Government's Standard Assessment Procedure (SAP) – the tool used to assess the energy performance of dwellings.

A SEA workshop (December 2023) which also focused on Government-funded energy efficiency schemes, stated the following additional certification-related challenges:

- Excessive time and resources are required to identify key decision makers and to understand and get through the processes involved (including certification) when a manufacturer wishes their products to be eligible for installation within Government-funded retrofit schemes.
- Understanding the implications of retrofit standards, like PAS2035 and PAS2030, is difficult. They can have significant impact, and yet, are aimed at those delivering energy retrofit projects or installing products. Product manufacturers are often asked if they are 'PAS compliant', despite the standards not being intended for products.
- The current Government funded schemes that require PAS 2035/2030, focus on Whole House Retrofit projects, and are aiming to move away from the single measure solutions of the past. A significant issue around using innovative measures is that while manufacturers may be able to demonstrate that their product is safe to use and will save energy (as claimed or proven) it is less easy to demonstrate what happens when it is used in combination with other measures.

[1] Sustainable Energy Association (SEA), 'Helpful Information and Tips for Manufacturers and Innovators on Gaining Access to Government Energy Efficiency Schemes', 2022.

Some of the common issues/ barriers/ complexity from ongoing discussions with Transform-ER manufacturing partners/ stakeholders are given below. These reflect the 'state of the market' from a practitioner/ manufacturer perspective.

- The move from individual retrofit 'products' towards more integrated, pre-assembled 'systems/ solutions' often adds complexity to certifications/ approvals, since a wider range of performance characteristics typically need to be considered and there may not be test standards in place that cover the scope of such assemblies/ systems.
- In systems where 'off-the-shelf' components have been brought together to form an integrated solution, original manufacturer certifications and/ or warranties may not always be recognised/ upheld if the installation is deemed outside the original manufacturers' specifications. For the same reasons, new certification for the integrated product may also not be obtainable. Forming the necessary relationships and trust between such supply chain stakeholders to provide carried-through assurances or enable a new overall certification to be obtained can be challenging, or indeed unviable when systems are initially only manufactured at a small scale.
- Retrofit systems are often complex, outside common practice and questions about fire performance in particular (from insurers, Building Control) are a blocker to mainstream adoption for several of the manufacturers' products. Insurers will not cover the risk of fire with these systems without an assessment by a fire consultant (with suitable PI insurance) which is costly, design specific and not suited to innovation.
- Secondary issues include concern about structural compliance and robustness of interfaces/ joints with some systems. In particular, it can be very difficult for manufacturers to assure a system's performance in conjunction with a specific existing building to be retrofit, when the nature of the existing building can vary on a case-by-case basis (e.g. the fundamental construction, or the quality and condition of the underlying structure even if of a known construction type).
- Retrofit systems may have unusual details, junctions and interfaces not covered by existing guidance/ certification applicable for equivalent products/ systems commonly used in new build applications.

Importance of Standards

This document seeks to summarise the current state of the market for certification and recognised approval routes for construction products, with the view to 'map' the potential pathways along which innovative products (specifically for the domestic retrofit market in this case) may be required to progress.

Some of these may be a result of Regulatory requirements, but many are market led, with various drivers.

However, it must be recognised that there can be no conformity assessment programmes for products unless there are standards set for products to conform with. Problems arise when there is no standard covering a new product, or where it is not clear what standards should apply.

The British Standards Institute (BSI) is the National Standards Body for the UK, and they aid in the development of recognised standards by convening relevant stakeholders, i.e. manufacturers, regulatory science organisations and regulators, to produce a test standard based on consensus and consultation. This process inevitably takes time; often two to five years, depending on the complexity of the standard required.

In addition to formal 'British Standards', BSI also develop 'fast-track' standards (sponsored by organisations, such as trade associations) to support innovation and reduce time to market.[2] These include:

[2] BSI Standards Development.

- Publicly Available Specifications (PAS), representing new concepts becoming widely accepted. They require less consultation, and so are faster and less expensive to produce than a full standard. They are reviewed within 2 years to assess whether they should be revised, withdrawn, or formalised into full British Standards; and
- 'Flex Standards', which can produce guidance in developing sectors where there is less certainty about the best approach and good practice is expected to evolve. These may also evolve to become a PAS or full British Standard in due course.

Some standards and guidance may be produced by industry or special interest bodies without the involvement of BSI, and these may be accepted in the absence of formal standards. For example, BRE produces test standards that are referred to throughout industry, which are not British Standards.

It is beyond the scope of this document to consider the vast range of standards that may be applicable to innovative products entering the retrofit market, or indeed to consider where standards may be lacking, since the nature of innovation could take numerous forms.

But for some of the approval routes discussed in this document, it may be necessary for new standards of some recognised form to be developed before verification or approval processes can commence.

As a well-established, mid-sized manufacturer we were able to carry the commercial risk of our time-consuming certification journey. This would be extremely challenging for smaller companies."

Andrew Thomson, Technical Director at Ultrapanel Building Technologies.

See page 36 for in-depth case study into Ultrapanel's certification journey.

Overview of retrofit product certification and approvals market

Figure 1 on the next page provides an overview of the certification and approvals market for retrofit products, and sets out a pathway from mandatory through to voluntary schemes that a manufacturer may pursue. The following sections of this report provide further information on each of the certification/ approval routes and drivers set out in the figure.

At the top of the figure, various key industry drivers are mapped against the typical journey for a retrofit product from inception to eventual use. In turn, these set a number of performance requirements for products, broadly broken down into aspects of technical/ safety, energy and environmental performance.

A need to demonstrate the technical and safety performance of a product underpins every driver. In some cases, these requirements for products will be mandated but in many cases (particularly for innovative products) they will not and it will be for the manufacturer (or the market) to dictate what aspects are verified and by what means.

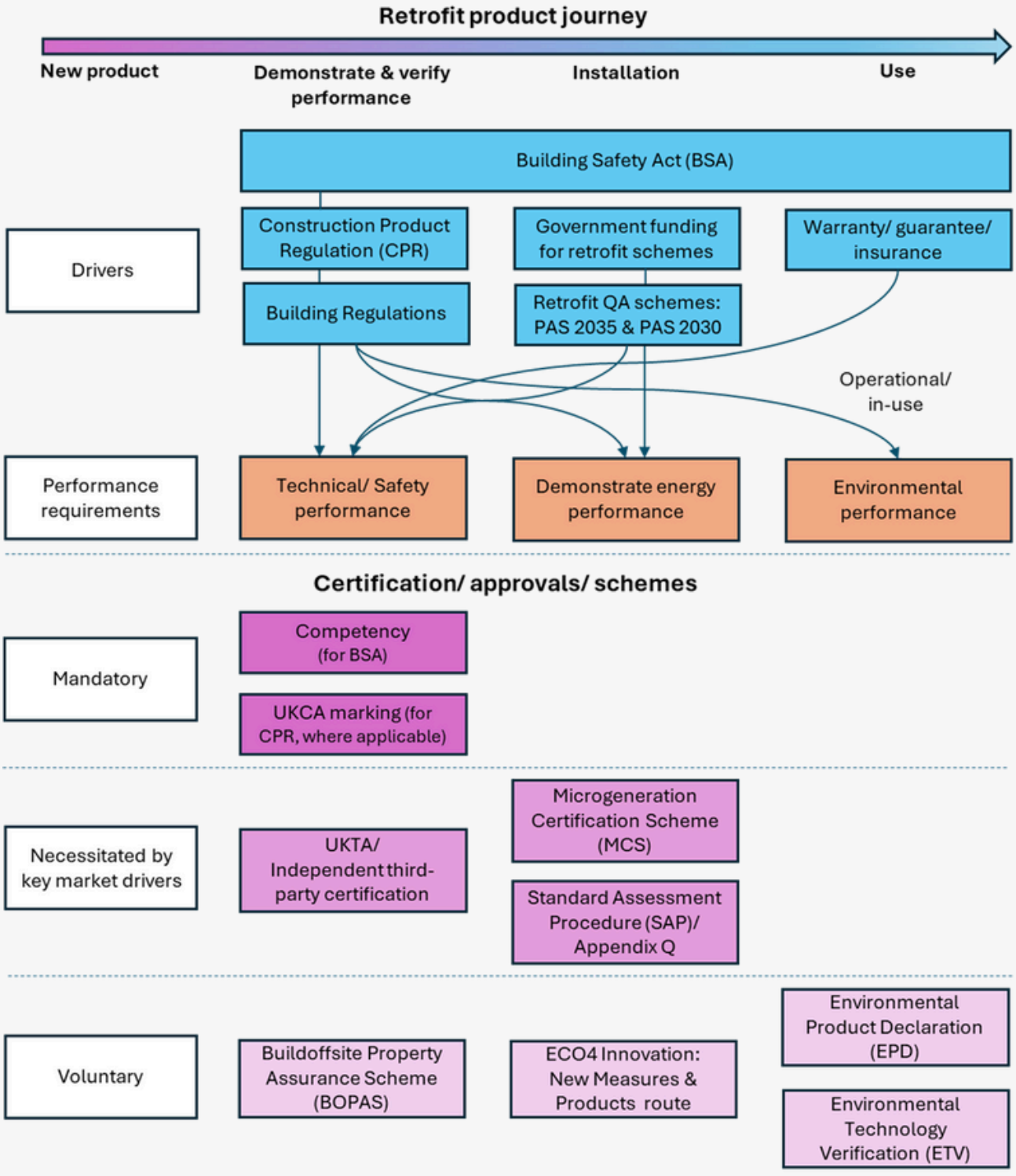


Figure 1: certification and approvals market for retrofit products

Detail on certification/ approval routes

The compliance requirements and processes for construction products are often complex and difficult to track for the different stakeholders involved in a construction project (builders, components manufacturers, government bodies etc).

A lack of information and standardised approach towards compliance and routes to market can lead to issues along the product development journey, such as rework, redesign and reengineering, should they fail validation at the end of the process. This generates higher costs and timeframes and delays the product's launch into the market, resulting in significant revenue losses.

There are various routes to compliance for different products to be used in the UK market. UKAS-accredited bodies provide testing and certification services to the construction industry via third-party certification. The available routes are discussed in this section to introduce defined paths to product validation and certification following the current standards and regulations for construction products.

Competency

One of the most significant issues faced by the construction industry as it works to deliver safer and more sustainable buildings is competence. In construction, there is no consistent way to recognise which individuals are competent with specific products.

Consequently, new methods need to be established to ensure everyone working in the building supply chain is sufficiently skilled in their role and appropriately qualified to make the decisions they make.

The recently published British Standard BS 8670[3] sets out a code of practice covering core criteria for building safety in competence frameworks. It champions the principles set out in the Building Safety Act and PAS 2035, etc, that people have the right to expect that buildings and their immediate environment are designed, built, and maintained in a way that is safe.

Competence of all who provide services and products throughout the life of a building is key to achieving this outcome.

[3] BSI, BS 8670-1:2024, 'Competence frameworks for building safety – Part 1: Core criteria – Code of practice', British Standards Institute, 2024

The intention of the Standard is to underpin the core criteria for competency that is then contextualised within sector-specific frameworks, to ensure appropriate scope and levels of competence (in relation to building safety) for defined roles and tasks. The core criteria represent the shared understanding necessary to ensure that individuals working on buildings can act responsibly and contribute to safe outcomes under four key headings:

- Fire safety, structural safety and public safety.
- Managing building safety (e.g. risk in occupation, safety during procurement).
- Knowledge management and communication (i.e. golden thread of information through a building lifecycle).
- Buildings systems and products (i.e. viewing buildings as interconnected systems, recognising significance of installation quality).

The expectation is that existing competency frameworks/ schemes can be mapped against the core competencies to ensure a consistent cross-sector approach is followed.

Some parts of the construction sector already have robust processes in place.

For example, those involved in the installation and maintenance of gas heating systems must be registered with Gas Safe by law.

Commissioning a Gas Safe registered installer to carry out work therefore gives the end-user confidence that their gas boiler and heating system is safe to use.

There are numerous other Government-recognised competency schemes in place that are approved under the Building Regulations (England and Wales) and allow installers to self-certify certain building works for which they are registered. Competency scheme membership requires installers to demonstrate that they meet prescribed Minimum Technical Competence requirements, and they hold adequate public liability insurance for their installations (and professional indemnity insurance if they are involved in the design of an installation). Individuals are assessed by Scheme Operators via audits and may require continuous professional development (CPD) to maintain ongoing registration.

There is a central register[4] of competent person scheme operators, covering competence in electrics, glazing, gas, heating, insulation, roofing, plumbing, ventilation/air conditioning, and renewables.

4 Competent Person Scheme register.

In addition, the Microgeneration Certification Scheme (MCS) certifies installers to be competent to install low carbon heat measures, and PAS 2030 Certification Bodies certify installers to carry out specific retrofit measures. These certifications are required to install retrofit measures under Government-supported initiatives. Certification via one of these schemes also generally provides certification under a relevant product sector scheme (i.e. these schemes set additional requirements over and above the other schemes).

However, the installation of innovative products may not fall within the scope of existing schemes. In an attempt to deal with this gap for the facades sector, and in response to the Hackitt Review[5], a Joint Competency Initiative (JCI) white paper has been published, 'Achieving competence in the building envelope sector'.[6]

This aims to provide a benchmark standard relating to competencies for all Individuals working in or for specialist subcontractors, consultants and material and system manufacturers that operate in, and deal with, the building envelope sector of the construction industry.

The Construction Products Association (CPA) has also published a white paper[7]setting out a single standard for the built environment to determine, demonstrate and recognise construction product competence.

This would apply to individuals and organisations across the built environment, including those who supply, use, or otherwise work or interact with construction products.

The aim is to ensure that everyone understands construction product competence in the same way, including manufacturers, merchants, designers, contractors, project managers, surveyors and many others along the supply chain. This standard comprises five core levels of competence, as well as a methodology for mapping these consistently to the respective competence frameworks of different built environment industries.

It is expected that new competency requirements will come into force via the Building Safety Act. Product manufacturers will need to ensure that the installation and use of their products is covered by an appropriate competency scheme.

5 Hackitt. J, 'Building a safer future: Independent review of building regulations and fire safety: Final report', HMSO, May 2018.

6 JCI for Building Envelope Sector, White Paper - 'Achieving competence in the building envelope sector', May 2023.

7 CPA, 'Built environment – proposed construction product competence standard – white paper', Competence Steering Group Working Group 12: Construction Product Competence, September 2022.

UK Conformity Assessment (UKCA)

UKCA is the new UK equivalent of the European CE Mark. Products placed for sale in Great Britain (excluding Northern Ireland) that are covered by the Construction Products Regulation (CPR – see later) are required to meet the new UKCA marking regime. All existing harmonised European standards became UK 'designated standards'. They are identical, however they may diverge if changes are made in the future. Rules around affixing the new UK marking are equivalent to current CE marking.

Products covered by the CPR include:

- Cement, building lime, admixtures and aggregates
- Structural bearings
- Traffic furniture
- Pipes
- Thermal insulation
- Gas and electrical appliances
- Manhole and inspection covers
- Masonry
- Structural Timbers
- Geotextiles and Waterproofing membranes
- Chimneys
- Precast Concrete
- Fire protection products
- Windows and doors
- Glass
- Road Surfacing.

Some products requiring a UKCA mark do not require a third-party assessment. However, the self-certification procedure and requirements are different for each individual product, so it can be difficult to gather all relevant information and design the risk assessment correctly.

One of the main requirements of the CPR is the system (level) of 'Attestation of Conformity' for a product. There are five systems (levels) and all require the manufacturer to have a factory production control (FPC) system, the type and extent of which is determined by the relevant product standard and initial type-testing (ITT).

Attestation of Conformity systems depend on the level of safety required of a product in installation and use. For safety-critical products (such as structural products), the process usually involves testing, inspection and certification by an Approved Body (AB). For less safety-critical products, the CE marking may allow more activities to be carried out by the manufacturer, with less third-party involvement. The processes involved in attaining each system and who is responsible for those tasks are shown in Table 1. (M = manufacturer, AB = Approved Body).

Task	Attestation of Conformity				
AVCP system level	1+	1	2+	3	4
Factory Production Control	M	M	M	M	M
Initial Type Testing	AB	AB	M	AB	M
Initial Inspection	AB	AB	AB		
Continuous Surveillance	AB	AB	AB		
Audit Testing	AB				

Table 1: Assessment & Verification of Constancy of Performance system activity assignment

Products not covered or not fully covered by a designated standard may be covered by a technical assessment document (see UKTA below).

Conformity assessment must be undertaken by a UK Approved Body (AB). To affix the UK marking, businesses must comply with all relevant requirements under the Construction Products Regulation (CPR) 2011 as retained in UK law. Until 30 June 2025, in GB both the UK marking and CE marking will be recognised. Manufacturers will either need to:

- affix the UK marking using a UK Approved Body, or
- affix the CE marking with UK(NI) indication using a UK approved body, or
- affix the CE marking using an EU recognised notified body.

Conformity Assessment Bodies (Approved Bodies)

For Approved Bodies (AB) to provide UKCA verification, approval is overseen by the UK Accreditation Service (UKAS). There are numerous UK-based Approved Bodies, though not all test against all of the product categories covered by designated standards.

For example, some may specialise in fire testing, while others may specifically deal with heating appliances. There may therefore be limited verification organisations (and therefore increased competition for services) for some product categories.

A list of UKAS accredited Approved Bodies, as of April 2023, was published in the independent review of the construction products test regime for DLUHC and included 53 organisations.[8]

8 DLUHC, 'Testing for a Safer Future. An Independent Review of the Construction Products Testing Regime', Department for Levelling Up, Housing & Communities, 2023

A selection of these, covering a range of relevant product categories, include:

- BRE Global
- British Board of Agrément (BBA)
- BSI Assurance UK Ltd
- BSRIA
- Cambridge Fire Research
- Intertek Testing & Certification Ltd
- KIWA Ltd
- LRQA Verification Ltd
- Lucideon Ltd
- Construction Products Certification
- SGS UK Ltd
- BTTG
- TUV
- UK International (UK) Ltd
- University of Salford
- Warringtonfire Testing and Certification Ltd

The above-mentioned review estimated that the number of UK companies producing products covered by the CPR (i.e. that will require UKCA marking) was 5,000-10,000, representing only around a third of products marketed in the UK, leaving 20,000-30,000 products unregulated.

A further 10,000-12,000 companies had products covered by voluntary certification schemes.

UK Technical Assessment (UKTA)

The UKTA route is a voluntary process and is a market-driven alternative procedure for construction products not covered by designated standards. Such products can be UKCA marked using a UK Assessment Document (UKAD) prepared by a Technical Assessment Body (TAB), which will have a section listing the mandatory tests based on the Construction Products Regulation (CPR) Basic Requirements, as listed below.

- Mechanical Resistance and Stability
- Safety in Case of Fire
- Hygiene, Health and the Environment
- Safety in use
- Protection against noise
- Energy economy and heat retention
- Durability, serviceability and identification

The TAB performs a technical assessment based on manufacturer data and test reports and the product must demonstrate compliance with the UK Building Regulations. If the product is deemed fit for its intended use, the TAB issues a UKTA to support the UKCA marking. The BBA (Approved Body listed in the previous section) was the first TAB in the UK to be authorised to issue UKTAs.

Independent third-party certification

40-50% of firms with products not covered by the CPR subscribe to voluntary third-party certification schemes. The scope of such certifications will be market-led (rather than dictated by the CPR), and hence may be more specific or limited than UKCA marked products. Such routes offer flexibility for manufactures, allowing them to obtain recognition for the aspects of most importance to their customers.

Components and systems must be tested and assessed by accredited third-party test providers and certification bodies, independent of the design and manufacturing teams. This will determine whether the product is fit for purpose for its intended use. Some Approved Bodies that offer UKCA services also offer separate certification services to manufacturers.

Some of the schemes that follow will be classed as forms of independent third-party certification, while others may offer a form of 'recognition' of performance, for example, but are not strictly certification schemes.

Microgeneration Certification Scheme (MCS)

The Microgeneration Certification Scheme certifies microgeneration products and installations in the UK, specifically small-scale renewable and low carbon heat and power solutions, to assure consumers of their quality. Certified products are listed on the MCS website.[9]

It is also a requirement for installers to use MCS certified products and to be MCS certified installers. The MCS 025 competency standard explains how installers can achieve MCS certification.[10]

Though not mandatory for all microgeneration products or services, the MCS is an eligibility requirement for some existing schemes and funding, such as the Boiler Upgrade scheme, which requires heating installers to be MCS certified in order to make the grant application on a client's behalf, and the Smart Export Guarantee, which builds on the previously existing Feed-in Tariff (FiT).

Smart Export Guarantee (SEG) mandates that licensed energy suppliers with more than 150,000 customers will have to pay for any energy exported to the grid by households with renewable microgenerators and requires these to be MCS or equivalently certified.

9 Microgeneration Certification Scheme website.

10 MCS 025, 'The MCS competency standard'

If the installation and installer are not MCS certified, they should be accredited in accordance with EN 45011 or EN ISO/IEC 17065:2012. Where low carbon or renewable energy systems covered by the scope of the MCS are included in a PAS 2035 retrofit, they will need to be installed, commissioned and handed over in accordance with the MCS. According to ECO4 guidance by Ofgem, a standards requirement for New Materials or Products is that they must be deliverable under MCS or PAS 2030:2019.[11]

Appendix Q (for SAP adoption)

The Standard Assessment Procedure (SAP) is the UK Government's National Calculation Methodology for assessing the energy performance of dwellings. It has been developed and maintained by BRE since 1993. SAP is an asset rating assessment, which utilises standard assumptions (heating patterns and occupancy profiles) to enable dwellings of different types, occupancy and location to be compared in a consistent way.

When energy performance assessments are carried out on existing homes, it is accepted that information on some aspects will not typically be available, and a 'reduced data' version of the SAP software – RdSAP – is most commonly used in practice.

This requires a reduced number of data entries for calculations, and makes certain assumptions for properties based on their age and construction. SAP is used to facilitate various national, devolved and local government policies including Building Regulations and for the production of Energy Performance Certificates (EPCs).

To assess a building's energy performance, information is needed that describes the energy performance of the building fabric and building services. Product performance data is either generic ('type data'), or specific, from validated individual product performance tests ('product data'). Product performance data is held in the Product Characteristics Database (PCDB), which is referenced within SAP software to perform energy calculations. For new technologies that cannot be readily assessed by the published SAP methodology, the 'Appendix Q' mechanism can be used.

SAP Appendix Q has been developed to enable the performance data from new technologies that do not fit within the traditional product classification categories of the PCDB to be integrated into the existing SAP assessment calculation for energy efficiency evaluation.

11 Ofgem, 'ECO4 Guidance: New Measures and Products V1.2: Guidance', April 2024.

Performance information is determined by testing against a specification agreed by the Government Department for Energy Security and Net Zero (DESNZ), BRE, the relevant manufacturer(s) and industry sector representatives.

As new versions of the SAP tool develop, products recognised via the Appendix Q route are typically adopted into the PCDB. Historically, SAP was updated every 3 to 4 years. However, the current version (SAP 10) replaced the previous 2012 version after a 10-year interval, since the intermediate 2016 version consulted upon in 2017 was not implemented by Government.

SAP is due to be replaced in 2025 by the Home Energy Model (HEM) to implement the Future Homes Standard. While HEM will represent a complete overhaul of the energy model compared with SAP 10, it is still intended that a procedure equivalent to that of Appendix Q will exist for new technologies that cannot readily be assessed by HEM.

SAP Appendix Q application process

When a new product enquiry is made via Appendix Q, an initial feasibility assessment is carried out by BRE to establish whether the technology is within the scope of SAP (i.e. relevant to regulated energy emissions within the Building Regulations/ Standards) and if it can be assessed within the existing SAP approach.

If it is within the scope of SAP but cannot currently be assessed within the traditional product categories, a scoping study is carried out to define the evidence that will be required to demonstrate the product's energy saving benefit in the context of SAP.

This may involve simulation modelling, laboratory testing and/or field trials, as appropriate. The duration to achieve approval can therefore be highly variable depending on the nature of the innovation under review; in some cases, provision of laboratory test data may be acceptable and viable within a relatively short timeframe.

However, for technologies with a human behavioural aspect, field trials are generally required to demonstrate real-world performance. The extent of field trials necessary varies depending on the complexity of the product and the potential variability in performance introduced by behavioural factors.

Field trials may therefore vary from a few installations (1-10) to 100+ to obtain data of statistical significance; the latter obviously being more costly and time consuming for manufacturers.

Once this evidence is available, this is assessed, the relative energy saving agreed, and implementation is approved by DESNZ. A calculation spreadsheet and guidance for Domestic Energy Assessors on how the product should be incorporated into SAP (or RdSAP) assessments is then developed by BRE and uploaded onto the National Calculation Methodology support website.

ECO4 Innovation: New Measures and Products (NMAP) route

The Energy Company Obligation 2022 to 2026 (ECO4) 'New Measures and Products' (NMAP) route incentivises innovation measures in areas such as insulation, low carbon heating and smart thermostats, through the Standards Alternative Methodology (SAM), Data Light Measure (DLM), and Innovation Measure (IM) routes.[12] NMAP is optional but these routes are designed to provide recognition through project scores for measures that would normally not be captured under ECO.

Ofgem is the ECO4 administrator, and they also appoint a Technical Advisory Panel to assess any proposals for NMAP, including whether or not the measures meet the product installation requirements of the scheme and how much of a performance uplift the measure will be acknowledged to make to a property.[13]

The SAM route awards partial project scores to new technologies that can be delivered under PAS 2030:2019 and MCS, but that aren't covered by SAP's existing standard measure types. Evidence of cost savings must be equivalent to the level required for inclusion as a space heating measure in SAP Appendix Q. SAM applications can also be made for measures with existing DLM scores, if further evidence is gained that demonstrates cost savings and the SAM criteria is met.

DLM is a route for technologies that are not deliverable as an existing measure. There is a reduced evidence requirement compared to the SAM route, such as small-scale field trials (5+properties) or calculations or modelling to demonstrate cost savings. The DLM will result in a new data light measure type and a set of partial project scores, enabling scores to be produced for new measures that would normally be below the data threshold for recognition in SAP.

The technology needs to be certified to a recognisable standard by an ISO/IEC 17065:2012 accredited organisation. DLM has a scheme-wide cap of 5,000 per measure type and each supplier's share of that is equivalent to their share of the overall ECO4 target (which is allocated proportionally to their relative share of the domestic gas and electricity market).[14]

12 Ofgem, Energy Company Obligation 2022-26 (ECO4) Guidance: New Measures and Products.

13 BEIS & DESNZ, 'ECO 2022 to 2026: guidance on applying for demonstration actions, innovation score uplifts and in-situ performance', September 2022.

14 Ofgem, 'ECO4 Guidance: Supplier Administration, October 2022.

The IM route can award an uplift to measures that show improvement over other similar measures that are deliverable under ECO. The application must include specific products that will then be promoted via a published description if the measures are deemed innovative, along with either a 25% or 45% score uplift.

The guidance for IM evidence is less defined, as it is judged more on a case-by-case basis and requires the direct comparison of the measure against comparable measures in ECO4. General criteria could include increased annual cost savings, decreased cost of installation, or an improved overall environmental impact of the measure.

Note that these routes are only relevant to the ECO4 scheme. However, the evidence requirements may potentially be built upon over time to support a SAP Appendix Q application, since the routes are broadly structured around demonstration of performance in SAP.

Environmental Product Declaration (EPD)

Environmental Product Declarations (EPDs) are a 'type III' environmental certification for goods and services, standardised by EN 15804 and ISO 14025.

They are a voluntary declaration, measuring the environmental impact of a product throughout its lifecycle using Life Cycle Analysis (LCA) data, but must be verified by a third party to be useable and published in an EPD database such as the EPD registry[15] and Greenbook Live.[16]

LCAs use peer-reviewed Product Category Rules (PCR) documents in line with the European standard EN 15804, ISO 14025, and other related international standards for the EPD to be certified. A PCR is the documented set of instructions used for creating an EPD consistent with the relevant category of a product or service by providing guidance on stages of life the LCA needs to consider, and the type of unit the product should be assessed as.

Where no PCR exists for the category the product fits into, a new one can be created by programme operators. As the PCR is published as part of the EPD, it is possible to categorise and compare products with similar EPDs.

Any sustainability professional can help generate and analyse data about the inputs for a product, energy consumed, and any chemical process emissions, but a programme operator is needed to verify and publish it.

15 EPD Registry.
16 GreenBook Live.

The LCA report itself does not have to be publicly available and there is no minimum environmental performance needed to have an EPD, but the EPD document will include the LCA results. Programme operators, or verifiers, can be found on the EPD database[17] and include BRE, IBU (The Institut Bauen und Umwelt), and Oneclick LCA.
There are several types of EPDs, the most common being the single-company, single-product EPD, which contains the information for one product from one manufacturer (but can be for multiple factories).

EPDs for multiple products, or group EPDs, are also available for similar products by the same manufacturer. EPDs can also be made for upcoming products as long as the owner has EPDs for a similar product, and the EPD is updated after the first year. (New products would need to be in manufacture for data to be available to support the EPD).
Sector EPDs are developed by industry associations and declare an average EPD data of products from multiple companies in a defined sector or region.

Though not a mandatory requirement, manufacturers may want EPDs to provide a comparison of their product's environmental performance in a market that grows in awareness of sustainable practices.

Currently there are no regulatory drivers in the UK to make EPDs mandatory, but there are green building schemes and opportunities for green investment bonds and financing (which could potentially be used for retrofit going forward) that could be positively impacted by the use of EPDs. This could be something that develops as a future driver as the market becomes increasingly self-regulatory in the hopes of achieving carbon transparency.

Environmental Technology Verification (ETV)

Environmental Technology Verification (ETV) is a flexible process designed to help innovators and developers validate 'added value' environmental claims and gain market recognition for their products (i.e. it covers a more general 'performance' scope than an EPD's specific focus on lifecycle carbon impacts). It is meant for innovative technologies not covered by existing standards in the 'Energy', 'Materials, Waste & Resources' or 'Water treatment and monitoring' categories, that are better for the environment than relative alternatives and are market ready.

17 EPD Database.

It is an independent verification process according to the ETV General Verification Protocol and ISO 14034 standard. It is not a certification scheme, but instead ensures that a product's environmental claims are true and verified.

ETV provides independent proof, from an industry respected organisation, that the product is fit for purpose and overcomes customer caution about the reliability of manufacturer's own performance claims. It gives financiers and customers the confidence they need to invest in a product. It also saves the time and expense of repeating tests and demonstrations for different clients.

ETV providers work alongside an applicant to develop and implement a bespoke verification plan. Upon successfully completing the verification, a Statement of Verification is issued that sets out the verified performance claim and the verification report.

BRE Global is a UKAS accredited ETV verification body in the categories of 'Energy', and 'Materials, Waste & Resources'. James Hutton Ltd is a UKAS accredited verification body in the category of 'Water treatment and monitoring'.

Buildoffsite Property Assurance Scheme (BOPAS)

The Buildoffsite Property Assurance Scheme (BOPAS) is an independent third-party accreditation of modern methods of construction (MMC) manufacturers and their associated construction systems (applicable in both new construction and retrofit).

The BOPAS scheme was jointly developed by Buildoffsite, the Royal Institute of Chartered Surveyors (RICS), Lloyd's Register Quality Assurance (LRQA) and lenders. It aims to address concerns and perceived risks associated with innovative methods of construction and products.

The main purpose of BOPAS was to provide assurance to the lenders that 'innovatively' constructed properties will be sufficiently durable to be readily saleable throughout the duration of two mortgage terms, which may equate to a minimum of 60 years. It also assures that the structural integrity will not have a negative impact on mortgage security during that term. The process assessment is risk-based, designed to benchmark MMC providers against best practice in terms of competency, methodology and risk management and it is intended to serve as a vehicle for standardisation across the offsite sector of the construction industry.

The scheme provides assurance of the safe and competent delivery of offsite products and systems conforming to contract specifications. This is achieved through compliance with the requirements detailed in the standard, spanning systems, processes and procedures, and handover interfaces, from design through offsite manufacture and construction/ assembly to client handover. All operational elements are tested against the arrangements for sustaining quality, dealing with environmental and project changes and the control measures that are applied to mitigate all such delivery risks.

The manufacturers involved in the development of MMC systems are audited and assessed to ensure that the construction systems are validated for integrity, durability and performance. The systems must be delivered using processes which conform to current good/ best practices defined in the BOPAS standard, to ensure they consistently meet customer expectations.

Drivers for various certification/ approval routes

Building Safety Act

In the wake of the Grenfell Tower fire tragedy, building safety has rightly come under increased scrutiny. Secondary legislation enacting the Building Safety Act (BSA) will inevitably place additional burdens on many aspects of construction. It is likely that many of the schemes discussed throughout this report may undergo revisions to align with the implementation of the BSA. However, it must not be assumed that compliance with such schemes will necessarily assure compliance with the BSA, and matters of building safety will need to be specifically assured by competent persons.

The Building Safety Act (BSA) received Royal Assent in April 2022. This landmark legislation aims to improve safety and standards in all buildings with more protection for residents. It should be noted that although there is an emphasis on those categorised as 'higher-risk buildings', it is aimed at all building work in all types of buildings. In particular, the Act requires higher competence and accountability across all building works that are subject to the Building Regulations.

Note: Higher-risk Buildings (HRBs) are defined as buildings at least 18 meters in height or that have at least seven storeys and contain a minimum of two residential units, or a hospital or care home (England); in Wales the requirement is for a minimum of one residential unit.

The Primary Objectives of the Act are to:

- Enhance safety standards.
- Streamline accountability.
- Improve oversight and compliance.

Two key aspects covered by the Act will be:

- To ensure that all products used in buildings are safe in their application, and
- To impose competence requirements on those carrying out building work.

All products made available to the UK market will fall under a regulatory regime (a general product safety requirement) even if they are not currently captured by the Construction Product Regulations.

In addition, if a product is deemed to be 'safety-critical', it will be brought in line with the CPR. Guidance on the scope against which manufacturers must consider and prove their product to be safe, and the criteria for a product to be classed as safety critical, are still to be published. New Construction Product Regulations will be introduced to replace the existing regulations and the National Regulator for Construction Products will operate within the Office for Product Safety and Standards (OPSS) to oversee the new regulatory scheme with extensive enforcement powers.

Although it was raised in a House of Commons Select Committee pre-legislative scrutiny report that the Government might consider requiring manufacturers to state how a product may perform when combined with other products, the Government's response[18] stated it would be impractical to impose such a duty on manufacturers. After all, it would be almost impossible to test every product in combination with every other product that it might ever be used with. While there will likely be some benefit in additional testing of products in combination (e.g. common situations) to provide assurances of safety, ultimately, there is likely to remain a reliance on the competency of designers/ engineers to apply their expertise and experience alongside any available evidence from testing.

Under the Act, the Regulator also has the authority to enforce competence requirements on individuals undertaking building work. The Act defines competence as 'possessing the appropriate skills, knowledge, experience, and behaviours,' and mandates that all individuals engaged in design, construction, refurbishment, and maintenance work must demonstrate competence in their respective roles.

Note: The term designer, under the BSA, extends beyond the traditional meaning and includes anyone who provides information at the point of sale, specification, or use of a particular product. This can also extend to other parties involved in auditing or giving guidance in relationship to a project.

Note that this is a brief overview of the anticipated impacts of the Building Safety Act in relation to construction products and does not constitute advice; further information on the Act should be directly consulted.[19] [20]

18 Building Safety Bill; Government response to pre-legislative scrutiny by the Housing, Communities and Local Government Select Committee, July 2021

19 DLUHC, 'Guidance: The Building Safety Act'. Department for Levelling Up, Housing and Communities, July 2022.

20 Building Safety Act 2022 Explanatory notes.

Construction Product Regulation

The Construction Products Regulation (CPR) lays down harmonised rules for the marketing of construction products. Originally an EU-level regulation, it has been maintained in the UK post-Brexit. The Regulation provides a common technical approach to assess the performance of construction products and requires manufactures of products covered by the Regulations to make a Declaration of Performance (DOP). The declaration must be supported by a process of assessment and verification. This varies depending upon the nature of the product, with a graduated system ranging from a simple self-performed check, through to a more rigorous exercise conducted or overseen by independent Approved Bodies. Approved Bodies are accredited by the United Kingdom Accreditation Service (UKAS) - the National Accreditation Body.

Each construction product covered by a designated standard requires a DOP and has to be UKCA marked to be sold in the UK. (Note that in Northern Ireland, the terminology of the former EU regulation will continue to apply, i.e. CE marking).

However, it should be noted that only products for which there is a designated standard in place are covered by the CPR.

Where other, non-designated standards are available, UKCA marking via the UKTA process may voluntarily be obtained so products can carry a recognised Declaration of Performance to provide assurances to specifiers etc.

In addition, a 'kit' comprising components that need to be put together, will only be covered by the CPR if made by a single manufacturer – if an assembly is not the overall responsibility of a single manufacturer, it falls outside the definition of a kit, and therefore ceases to be covered by the Regulation.

The current scope of the CPR is expected to be extended with the enactment of the Building Safety Act, as discussed above.

Building Regulations

The main mechanism for regulating building works in England and Wales are the Building Regulations 2010, in Scotland the Building (Scotland) Regulations 2004, and the Northern Ireland Building Regulations 2012 (all as amended). The Regulations are supported by a series of Approved Documents (England & Wales), Technical Booklets (NI) or a Technical Handbook (Scotland) that provide guidance to practitioners on how the Regulations can be met, and standards in relation to construction products.

This section refers specifically to the wording of the England & Wales regulations, which requires building materials to be appropriate for the circumstances in which they are used, and to adequately perform the functions for which they are designed.[21]

The necessary characteristics of a product to deliver these requirements are defined in standards, and the Approved Documents set out statutory guidance on tests and certifications related to compliance with the requirements of the Regulations. A Local Authority (Building Control) may also request testing or sampling of work to satisfy themselves of compliance with the Regulations.

The purpose of many of the certification and approval schemes discussed above will fundamentally be to demonstrate that products will comply with the relevant requirements of the Building Regulations.

Government funding schemes (e.g. ECO, SHDF)

SAP is used as a means of demonstrating the energy efficiency improvements of retrofit measures for government funding programmes, such as the Energy Company Obligation (ECO), Home Upgrade Grant (HUG) and Social Housing Decarbonisation Fund (SHDF).

As noted earlier, such funding schemes are often seen as a key driver and hence route to market for innovative retrofit products, and so there is a need for the energy benefits of such products to be quantifiable within the SAP energy calculation methodology.

For some products, the route for recognition within SAP will be relatively straightforward. For example, insulation products used within a wall, roof or floor construction will have a declared thermal conductivity (λ) value that is captured within the overall thermal performance 'U-value' for the given element, which is entered into SAP. For more traditional building services (heating systems), they may be assessed and data held in the Product Characteristics Database (PCDB) to feed into calculations. Where an innovative product is not otherwise readily incorporated in the SAP calculation, manufactures will need to follow the Appendix Q route (described above) to try to achieve recognition in SAP, for subsequent consideration as an acceptable retrofit measure for the above Government-funded schemes.

ECO4 also introduced the New Measures and Products (NMAP) route as a means of facilitating the incorporation of innovative products that could not be represented in SAP, and so would otherwise not be eligible measures under the scheme.

21 Building Regulations 2010 with 2018 amendments (England), Approved Document Regulation 7, 'Materials and workmanship', HM Government, 2018.

Current Government funding schemes such as ECO4 (the fourth iteration of ECO funding) and others also set a requirement for retrofit schemes to use TrustMark registered businesses (i.e. work to PAS 2030) and adopt PAS 2035 retrofit quality protocols, the implications of which relating to certification/ approvals are discussed below.[22]

PAS 2035 and PAS 2030

This section considers versions of PAS 2035[23] and PAS 2030[24] up to 2023, which are the current versions at the time of writing. Subsequent versions may have different requirements.

PAS 2035 is an overall quality standard for retrofit implementation, which assigns a number of roles and requirements for key aspects of the retrofit.

These include an overall Retrofit Coordinator, who is required to manage and oversee all aspects of planning, implementing and handing over works, as well as Retrofit Assessors, Designers and Installers. There are no direct requirements on products/ materials set out in PAS 2035, but there are some indirect implications for products.

For example, there is a requirement for the Retrofit Designer to confirm that the specified materials and products are compatible with the building and with each other. This is largely in relation to the moisture open versus moisture closed nature of some construction products, to ensure compatibility of materials and to avoid the potential risk of interstitial condensation at interfaces between moisture open and closed materials.

It is also to ensure that the installation of separate measures that might connect or interact complement each other, e.g. windows designed so that reveals can be insulated when EWI is applied. It is stated that the design and specification should be consistent with any relevant product manufacturers' installation instructions and with any relevant British or European standards or normative documents of any product or system. However, PAS 2035 does not set any specific standards.

PAS 2035 also requires that installation of energy efficiency measures should be carried out in accordance with PAS 2030 (below) or applicable Microgeneration Certification Scheme (MCS) standards in the case of low carbon technologies or renewable energy systems.

22 Ofgem, 'Energy Company Obligation (ECO)'.

23 BSI, PAS 2035:2023, 'Retrofitting dwellings for improved energy efficiency – Specification and guidance', BSI, 2023

23 BSI, PAS 2030:2023, 'Installation of energy efficiency measures in existing dwellings – Specification' BSI, 2023

Retrofit Installers must be members of an independent industry quality assurance scheme, and such a scheme should require that:

- Systems and their components are subject to independent technical approval from a UKAS accredited body
- Systems are covered by independent guarantees of the materials and products used and any designs prepared by system providers.

This also therefore sets indirect requirements for technical approvals and guarantees on products for use in a PAS 2035 compliant retrofit. Note that PAS 2035 does not set specific requirements for warranties/ guarantee durations, and just states that these should be handed over to occupants on completion of the retrofit works. However, the warranty requirements themselves may set specific duration requirements (see below).

PAS 2030 focuses on the installation of energy efficiency retrofit measures. It includes measure-specific annexes on installation requirements according to product categories. If an innovative product does not fit within one of these categories, it will not be possible to state that installations comply with PAS 2030. Installers will also need to be registered with TrustMark.

The authors are aware that the BSI Retrofit Standards Task Group are exploring updates to PAS 2030 and PAS 2035, particularly to overcome the barriers to the use of innovative retrofit products that are not covered by the existing PAS 2030 Annexes.

It is noted that the structure of PAS 2035 – with allocated roles and responsibilities across a retrofit and requirements for appropriate competencies – should set a grounding of good practice when new requirements of the Building Safety Act are implemented. However, unless PAS 2035 is subsequently updated to specifically address any new requirements resulting from the Act, it will not necessarily ensure compliance with the Act, and matters of building safety will need to be specifically assured by competent persons.

Warranties/ guarantees

A warranty from a product installer or manufacturer offers the consumer a repair if something is faulty or goes wrong. An insurance backed guarantee underwrites an installer's guarantee/ warranty, and provides consumers with protection where a trader who provided the service ceases to trade and can no longer honour their guarantee. TrustMark registered businesses (i.e. those able to provide works under Government funding schemes) are required to provide customers with 'an appropriate level of financial protection' for a minimum of two years (with many insulation products carrying 25 year guarantees), with currently approved mechanisms including:[25]

- Bluedrop Services (NW) Ltd
- Cavity Insulation Guarantee Agency (CIGA)
- Home Insulation and Energy Systems Quality Assured Contractors Scheme (HIES)
- The Installation Assurance Authority Ltd (IAA)
- Qualitymark Protection
- Solid Wall Insulation Guarantee Agency (SWIGA).

Similarly, MCS requires that installers of MCS products must provide an insurance backed guarantee on installation work for a minimum of two years. Relevant schemes quoted by MCS include:[26]

- Consumer Protection Association (CPA)
- Installsure (previously GGFi)
- Home Improvement Protection (HIP)
- HomePro
- Independent Warranty (IWA)
- QANW
- Qualitymark Protection
- Installation Assurance Authority (IAA)

To obtain such a guarantee, relevant products may require UKCA marking or other independent technical approval. Under the SWIGA scheme for example, work must be completed by a registered SWIGA Installer, who installs a SWIGA System Certificate Holder (SCH) solid wall insulation system. In order to become a SCH, a company must meet technical, quality and procedural requirements. This includes the system having BBA certification or equivalent. It also includes a requirement to assess the competency of installers, and to hold a 'standard detail register' for all certified systems.[27]

There are other schemes that are intended to support manufacturers with products that potentially fall outside the 'typical' coverage of the schemes mentioned above, that provide warranties and assurance to customers, including the BOPAS scheme for offsite manufactured products, for example.

25 TrustMark, 'Approved financial protection mechanisms'.

26 MCS Service Company Ltd, 'Insurance backed guarantee products'.

26 SWIGA, 'System Holder Membership'.

Conclusions

There are numerous certification routes discussed in this report. Many of these appear very similar to each other (and in fact are, but exist to serve different market drivers), hence it is understandable why new entrants to the construction products sector may feel overwhelmed and find it difficult to understand what is required to successfully take a product to market.

The approvals that a manufacturer seeks may, to some extent, be influenced by key market requirements and may therefore be seen to be more or less 'mandatory' (i.e. they are not strictly mandatory, but are practically so if the manufacturer wants a product to be successful in the market).

One such example is recognition of product performance for energy-related measures in SAP calculations (potentially requiring application via the SAP Appendix Q route), if there is a desire or intention for products to be eligible under various Government funding mechanisms.

While some manufacturers may seek a particular certification to distinguish themselves in the market, the additional volume of voluntary schemes may confuse new entrants as to what is mandatory and what is merely desirable (or indeed not necessary at all).

It may be expected that there will be specific routes and test regimes related to products intended for retrofit applications, but this is largely not the case. The PAS 2030 and 2035 retrofit standards seek to guide a high quality, low risk retrofit approach. However, the product-related certification and accreditation routes described in this report apply equally to products for new build or retrofit.

The main issue likely to be confronted by manufactures is that test standards related specifically to retrofit do not (yet) exist. Manufactures may therefore face frustration, if with the best intentions they wish to obtain a widely recognised mark of technical performance approval for their product(s) (e.g. UKCA marking) but are stifled by a lack of relevant standards applicable to their product to form the basis of required testing.

This is likely to drive only the gradual evolution of existing products, and act as a barrier to the introduction of significantly new and innovative solutions.

The introduction of the Building Safety Act will inevitably place additional burdens on manufactures to demonstrate the safety of their products and provide a framework to assure the competency of anyone installing them. The extent of this requirement will be revealed in due course. There can be no argument against this being an important and valuable step to improve public safety in and around buildings.

However, there appears to be a recognised disparity in the desire to be able to assure how a product will perform (from a safety perspective) in combination with other products, and the practical limitations of expecting manufacturers to make provision for all possible eventualities. It therefore seems likely that to some extent at least, and particularly in retrofit applications where there is not necessarily consistency in the construction and materials that a product may be used in combination with, there will still be reliance on design professionals assuring the use of products against their own professional indemnity (insurance) to satisfy compliance with Regulatory requirements.

Case studies

Ultrapanel Building Technologies

"As a well-established, mid-sized manufacturer we were able to carry the commercial risk of our time-consuming certification journey. This would be extremely challenging for smaller companies." Andrew Thomson, Technical Director at Ultrapanel Building Technologies

The company

Established in 1983, Ultraframe was the first offsite manufacturer of precision engineered roofing systems, starting with conservatories and moving into solid roof home extensions.

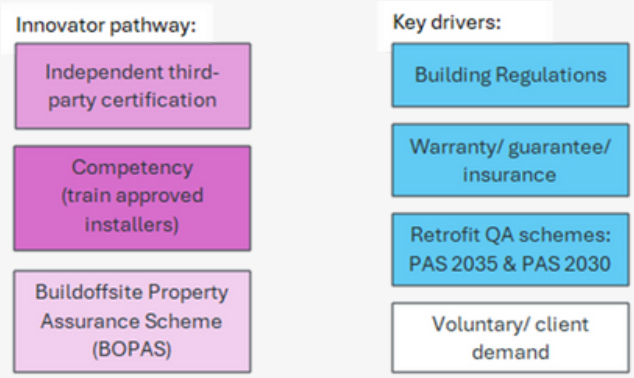
The product

A panelised hybrid steel and timber insulation system for roofs and walls. It was originally used in new build but has recently moved into the retrofit market too.

The timeline

3 years for new build, an additional 9 months for retrofit product

The following approval routes and drivers for Ultrapanel relate directly to the certification pathway overview in Figure 1.



Choosing a certification path

"We produce a panelised hybrid steel and timber system for roofs and walls. We'd always considered the potential for wider use, including in retrofit, but our initial focus was the new build sector.

So, our initial certification journey began here. There were no requirements for mandatory CE/ CA marking for the system, and it was not particularly obvious from the outset what other approvals or certificates may be required for our system to enter the new build market."

Ultrapanel recognised that being able to offer an NHBC **warranty** would be a valuable selling point, so it voluntarily undertook NHBC Accepts certification.

NHBC Accepts reviews innovative systems to ensure they meet the NHBC Standards, so the system can be covered by their warranties (for new homes). However, it is not an independent accreditation scheme or performance guarantee.

When working through the Accepts process, NHBC requested additional **third-party verification** relating to the offsite/ factory-based manufacturing process for the roof product. Ultrapanel therefore sought certification via the British Board of Agrément (BBA). The resulting BBA approval demonstrates product performance to be fit for purpose, particularly in relation to meeting the requirements of the Building Regulations.

Making the shift to retrofit

"Our entry into the retrofit market was brought forward when we got the opportunity to participate in the Mayor of London's Retrofit Accelerator – Homes Innovation Partnership."

Since Ultrapanel's roof product had achieved BBA certification, this was viewed positively for a potential transition to a retrofit product.

However, without formal approvals being in place for retrofit, an early working relationship was built with the Local Authority Building Control department to approve the use of the roof product on a site-specific basis.

Building Control informed Ultrapanel of what was required to satisfy themselves of the product's suitability. However, this proved quite an onerous process over time and included requirements for fire engineers to review construction details as well as a need to undertake further physical fire testing to cover construction details for the retrofit application that were not typical for a new build product, for example, the materials and detailing adopted at a party boundary junction.

In addition, since there was no independent third-party verification in place for use of the roof in retrofit applications, it was not possible to obtain a warranty for the demonstration dwellings, and Ultrapanel had to 'self-insure' these installations.

Ultrapanel is currently in the process of seeking third-party certification for the retrofit product. This will be required to obtain an appropriate **warranty** for TrustMark approved retrofit works, which is a requirement of the **PAS 2030/ PAS 2035** process, and ultimately a doorway into Government-funded retrofit schemes. The requirements of PAS 2030 and PAS 2035 therefore have an indirect knock-on impact on product manufacturers.

The big barriers in the certification process

"As a mid-sized manufacturing company, we've been able to carry the commercial risk, but this would be extremely challenging for smaller companies. There are also ongoing fees to maintain certificates."

The **third-party approval** process (across both new build and retrofit products) is costly and takes a considerable amount of time for manufacturers to receive approval for their products. It therefore poses a commercial risk for businesses, considering it is generally required for certification to be in place before the new product can be widely accepted into the market (from a Building Regulations approval and warranty perspective, as noted above).

Approval of Ultrapanel's new build product took three years to complete. The subsequent approval for the retrofit product, with the company having a better understanding of the process and having carried out initial approval (and associated testing) on the new build product, is expected to take approximately nine months.

The unique challenges of retrofit certification

"Because the product is a 'system' of components rather than an individual component, the approval process is more complex. In addition, the process is delayed if any changes are made to the product - this is understandable since the certificate needs to represent the final product.

But it highlights the difficulties that we as manufacturers face when trying to achieve necessary approvals to take a new product to market but are still learning and developing the product based on early installation experiences."

The certification process has also been more onerous for the retrofit product than the new build product, as there are more construction details to address in retrofit applications, and many are different to equivalent details for new build, so there is limited opportunity to reuse existing collateral.

In the case of the Ultrapanel external wall insulation system, some details around window openings were similar in principle to those adopted in curtain walling applications.

However, since this is not an established approach for domestic retrofit applications, Ultrapanel has been requested that the details are assessed by a specialist fire engineer (whereby the engineer would effectively apply their own **Professional Indemnity** by 'approving' the design approach).

There has also been a greater emphasis on hygrothermal performance of the construction in retrofit. Delays have been experienced, believed by Ultrapanel to be due to limited capacity on the side of the verifier in more specialist areas such as this. (It is observed by the authors that capacity on the side of the verifiers has been cited as an issue across numerous testing and approvals providers).

Further considerations for ensuring success

*"In addition to achieving product acceptance, we've had to provide additional training to installers to ensure **competency**."*

Although installers are generally TrustMark certified to PAS 2030, additional product-specific training is necessary, due to the unique features of the offsite-manufactured panelised product that differ from traditionally applied external wall insulation or roofing. There is however no formal scheme in place (other than general TrustMark certification) to verify the specific competency.

Going forward, Ultrapanel intend to also seek **Buildoffsite Property Assurance Scheme (BOPAS)** accreditation. They are aware of clients starting to ask for this for offsite manufactured systems during procurement and expect to see the instances of such requests increase going forward to the extent that it may well become a necessity to remaining competitive in the market. The estimated timeframe for BOPAS accreditation is nine months.

Photo right: as part of the Transform-ER project manufacturers Ultrapanel and Bow Tie Construction have created several models – including mock-ups of eaves details – to test common interfaces and develop our product interoperability methodology (photo credit: Ultrapanel).

Case studies

Mixergy

"To be competitive, we felt it was essential that the energy saving features were acknowledged in Energy Performance Certificates (EPCs) via the Government's Standard Assessment Procedure (SAP)."

The company

Mixergy develops sustainable technology solutions which provide the best interaction between homes and the grid to save carbon, save cost and maximise comfort.

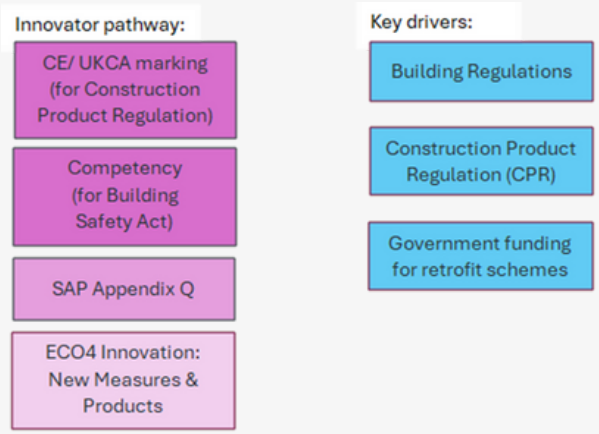
The product

Smart hot water tanks intended to reduce energy use and carbon emissions compared to traditional water tanks while providing flexibility to the grid.

The timeline

2.5 years for SAP Appendix Q route

The following approval routes and drivers for Mixergy relate directly to the certification pathway overview in Figure 1.



Mixergy's retrofit product

"We produce a range of smart hot water tanks intended to reduce energy use and carbon emissions compared to traditional water tanks while providing flexibility to the grid."

All Mixergy systems are future proofed for use with any heating source throughout their 25 year lifespan. The tanks adopt a top-down heating method that allows partial heating of a tank, linked with machine learning to deliver only what the home needs.

Optional modules allow integration of a PV diverter to store excess energy from solar PV generation, and a detachable heat pump head unit.

Mixergy systems can be used in both domestic and commercial new build and retrofit applications – there is no particular distinction in the use of the product for retrofit, except in relation to considerations for their potential deployment in Government-backed retrofit programmes, as discussed below.

Choosing the best certification route

"The product range could have followed only the approvals route of a traditional hot water tank, but that would not recognise the key energy benefits of our products, and they would not be cost-competitive in the market without these other benefits being considered."

As water tanks, the products require **CE or UKCA conformity** marking, but this does not necessitate independent conformity assessment by a Notified Body for this type of product, so it was a relatively straightforward process to make a self-certification of product conformity and obtain CE/ UKCA marking. The manufacturer can also self-declare that the system meets relevant requirements of the **Building Regulations** i.e. Part G 'Sanitation, hot water safety and water efficiency'.

A number of the Mixergy products are 'pressurised' systems, which means that they must incorporate/ be provided with certain temperature and pressure safety devices and controls. In addition, pressurised systems must be installed by competent installers who are 'G3 qualified' which demonstrates installer's **competency** with this part of the Building Regulations, and which allows such installers to self-certify that a pressurised domestic hot water system is installed and commissioned in line with Building Regulations. These certifications allowed the product to be placed on the market in the UK.

Applying for recognition under the SAP Appendix Q route

"To be competitive, we felt it was essential that the energy saving features were acknowledged in Energy Performance Certificates (EPCs) via the Government's Standard Assessment Procedure (SAP)."

Several features of the product could not be readily captured in a standard SAP calculation, since the traditional product categories recognised in SAP did not include them; particularly the novel approach to part-heating the tank based on learned demand patterns, the subsequent reduction in tank heat losses, and the impact of the PV diverter.

(Until the release of SAP version 10 in 2022, PV diverters were not a technology considered in the SAP calculation).

The **SAP Appendix Q** process looks to develop a way for the energy impacts of new product features to be incorporated into a SAP calculation, with a longer term intention that the features will most likely be integrated into future versions of SAP (or the Home Energy Model (HEM) going forward).

"We therefore made an application for recognition of a number of products under the SAP Appendix Q route. While we believe the fundamental concept of the Appendix Q approach is sound, we found the process challenging and it took a considerable amount of time – 2.5 years for the first batch of assessed products."

This timeframe encompasses numerous process elements, from initial application review and feasibility assessment by BRE, establishing a programme to obtain the necessary evidence requirements by the applicant, and the final process approach to incorporate the required information into a SAP calculation by BRE.

The assessment required elements of laboratory testing, computer simulation modelling, as well as data from field trials. The multiple features of the Mixergy water tank meant it was complex to develop a calculation methodology to incorporate the full range of benefits into the SAP calculation. Mixergy are still working with BRE to better characterise the storage losses of the tanks for example.

Certification timelines are causing commercial risk

"The duration to achieve any necessary product approvals is a significant commercial risk. It applies to both startup and established companies, but we believe startups may struggle to stay afloat beyond approximately 6 months with an inability to sell their products at scale due to an awaited approval."

As noted in the main report, in the case of Appendix Q, the duration to achieve approval can be variable depending on the nature of the innovation under review and hence the type of evidence that needs to be obtained to demonstrate product performance. Since the Mixergy system involved a user behavioural-related aspect, data from field trials was required to demonstrate and quantify the behavioural-related benefits of the system.

Mixergy felt that they were fortunate because the smart data-driven nature of their products provided early in-use evidence to prospective customers.

This allowed them to promote the added value benefits, such as running costs savings on hot water generation that would help alleviate fuel poverty, particularly to social landlords/ Local Authority customers, which in turn allowed them to make sales prior to Appendix Q approval. These installations then provided the volume of in-use data needed to support the Appendix Q application.

In addition to these potentially time-consuming processes, Mixergy felt that the administrative processes and potential capacity limitations in the BRE Appendix Q delivery team further contributed to delays.

BRE has commented that applications for Appendix Q approvals have increased dramatically in recent years as the rate of product innovations ramps up, most likely in an attempt to meet net zero aspirations and/ or evolving regulatory requirements.

However, the contract requirements on BRE from Government to deliver the Appendix Q service have remained largely unchanged, resulting in some delivery challenges. Uncertainty relating to timeframes for approvals can introduce risk to product manufacturers as it can impact on strategic plans, funding/ investment strategies, product promotions, launch dates, etc.

Deploying products as part of Government home energy efficiency schemes

"We also explored how products could be deployed in Government home energy efficiency schemes, as these are an enticing potential market to help establish a product in the retrofit sector."

Many such schemes base funding levels on the efficiency improvement that measures achieve, as evidenced by the predicted EPC uplift (calculated by SAP). Improvements must be robustly demonstrated so they deliver on intended energy and carbon reduction targets of Government policies.

To better promote Mixergy products for use in Energy Company Obligation (ECO) schemes, Mixergy adapted the core smart hot water tank design to incorporate the ability to use the excess heating capacity of a part-heated tank to also provide space heating.

This allowed them to apply to Ofgem for acknowledgement as an **ECO4 Innovation measure**. The space heating aspect was necessary for this, as hot water systems are not otherwise eligible as innovation measures under the programme.

Meanwhile, **PAS 2030** (2023) does not explicitly cover the full scope of the Mixergy devices in the product annexes. As noted in the main report, if a product does not fit within one of the annex categories, it is not possible to state that installations comply with PAS 2030 (which is an eligibility criteria for some funding and/ or procurement mechanisms).

Although a Mixergy tank could be classed as a hot water system under PAS 2030 Annex C6, the standard does not include guidance on the required interactions between the PV diverter and heat pump elements. Mixergy suspect that this may have discouraged Retrofit Designers from specifying the Mixergy systems over fear of added complexity and/ or the potential for the system to be considered non-compliant under PAS 2030. It is anticipated that future updates to PAS 2030 and PAS 2035 will aim to remove such barriers to the use of innovative products that are not currently covered by specific product-type annexes.

Future UK regulation on Energy Smart Appliances (ESAs) is in development via the government's Smart Secure Electricity Systems (SSES) programme. Mixergy welcomed this prospect, as they believe that this will benefit their products (as Mixergy hot water tanks incorporate a demand response mechanism). Manufacturers with relevant products in this space will need to keep abreast of, and prepare for, developing standards and requirements brought about by future regulations.

Generally, clear and detailed Government policy commitments such as these signal to businesses what product standards (and therefore approvals) will need to be met and help support the case for investment in such activities. It follows that changes, delays or lack of detail given around future policy positions can lead to delays in investment and subsequent deployment of innovative products when new policies or regulations are implemented.

For example, it was noted that there is currently very little information around how the proposed Future Homes Standard 'wrapper' for the Home Energy Model (the successor of SAP) will deal with certain products, preventing manufacturers from proactively preparing for potential industry changes.

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TRANSFORM-ER

Tackling retrofit's big barriers to enable 1m home upgrades per year by 2030

Transform-ER (Transform.Engage.Retrofit) is a game-changing, consortium-led project funded by Innovate UK that's tackling the retrofit industry's biggest barriers to scale, from rising costs and underperformance issues to inadequate financing options and poor collaboration.

13 industry leaders are collaborating to create a cohesive, industrialised sector that uses a standardised end-to-end process to deliver high-performance, cost-effective home improvement solutions. The aim is to enable one million home upgrades every year by 2030, starting in social housing.

Find out more: bit.ly/transform-ER

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