



Technical Report on the ecosystem mapping and its analytic representation

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Executive Summary

Work Package 5 under the Energy Efficiency Mortgage Market Implementation Plan ('EeMMiP') aims to facilitate Energy Efficiency mortgage market development, by defining and developing market demonstrators that will provide the perfect environment to align the incentive chains among all market participating actors. These include, amongst others, the following: lending institutions, investors, regulators, energy assessors, utility companies, contractors, valuers and borrowers. This alignment requires mutual confidence (transparency and reliable performance data) and in-creasing awareness of the benefits of energy efficiency by consumer demand.

This report outlines the key pillars of the whole market chain as experienced by a consumer during their customer journey in implementing energy efficiency measures within their properties, and the key attributes that each of these pillars require for successful market development. Identification and establishment of the pillars was undertaken by reviewing the consumer and market research¹ conducted and compiled under the Energy Efficient Mortgages Initiative and described in another Report in this series, assessing various successful international energy efficiency programmes (which are also catalogued and described in separate Reports in this series²), as well as ongoing discussion with various actors within the market such as suppliers, financiers, and quantity surveyors. Learnings were also taken from other programmes (for instance the Green Deal in the UK) which enabled a map of the customer journey to be rationalized and identifying those key components common to all European jurisdictions that will allow a successful market framework to be developed. These are presented diagrammatically below (Figure 1).

Figure 1: Seven pillars of the market demonstrator



¹ To be published shortly at www.energyefficientmortgages.eu

² To be published shortly at www.energyefficientmortgages.eu



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These pillars lay the foundation for market demonstrators that are being explored and developed in Scotland and the Province of Trento, Italy that will provide the much-needed “best practice” examples of energy efficiency market development. The application of these pillars will be reported in Work Package 5.2 during March 2022

2. Introduction

The processes for planning and installing energy efficiency and renewable energy measures are new to many householders. The consumer journey from initial engagement to installation of a measure can be unfamiliar and involve a complex maze of new information on technologies, savings, regulations, eligibility criteria, processes and trusted bodies. This is especially true for technologies that have not reached market maturity, such as solid wall insulation or heat pumps.

The following diagram (Figure 2) provides an overview of the key components that are likely to be typically experienced and required by consumers in un-dertaking energy efficiency improvements of their properties – irrespective of their geographical location across Europe. We consider these components form a common set of “pillars” needed for ongoing development of the energy efficiency market and its financing.

Figure 2: Seven pillars of the market demonstrator.

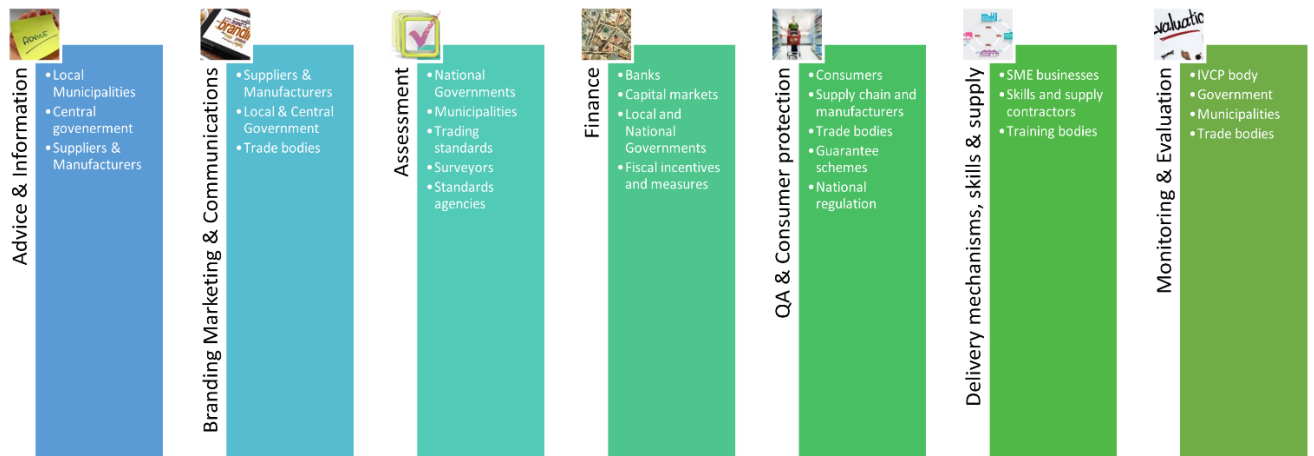


This report provides a description of each of these key pillars, what their main role is and how they might be developed such that they can support growth of a robust market framework that promotes and encourages the uptake of energy efficiency and heat decarbonisation measures throughout Europe. We believe that ensuring these components are in operation, and acting in unison, can underpin successful deployment of energy efficiency improvements at scale, and attract low cost supporting finance from financial institutions and markets. It is recognized that different jurisdictions will have different approaches and considerations for each of the pillars, but they form a minimum generalized structure for ongoing effective delivery of energy efficiency, and provide a robust framework for financial institutions to lend into this sector, minimizing their lending risk and so unlocking cost effective financing to the domestic consumer market.

3. Stakeholder mapping

The following diagram provide an overview of the key pillars outlined above together with key stakeholders likely to be involved with particular components. It is worth highlighting that some stakeholders such as local and / or central government can have a role across some and potentially all areas of the customer journey, and therefore the extent of stakeholder roles may vary, to a greater or lesser degree, depending on how different jurisdictions develop their energy efficiency markets.

Figure 3. Key stakeholders of the seven pillars.





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4. Overview of Pillars

The following sections consider each of the pillars in turn, providing an outline objective of the pillar an overview of what the areas cover, together with suggestions as to how these might be successfully considered and deployed. We have tried to include examples from across Europe as to how this has been done, and the follow-on report to this looks at the specific jurisdictions of Scotland and the Province of Trento and, where they are developing and growing these areas, identifying there are challenges and how these are being addressed.

5. Delivery mechanisms, Skills & Supply

Objective: to provide support and actively promote the opportunities of the market in energy efficiency in buildings for companies in European jurisdictions, as well as ensuring that the quality of the work carried out by the supply chain is of a high standard and that installers are suitably qualified.

Standards are at the heart of delivering a robust, quality service to the consumer in the energy efficiency and renewable energy sector. Individual standards for a range of retrofit improvement measures currently exist across the European Union and are used by designers, assessors, surveyors, and installers to ensure that the correct design, specification and procedures are followed when installing improvements in a property. Whilst the majority of installations are carried out in a professional manner and to high quality, the inappropriate and poor quality delivery of a proportion of retrofit improvements poses a significant risk and has been acknowledged for some time. Causes of this include: a lack of suitably available and agreed standards and guidance covering the impact of retrofits on overall building performance; a disconnect between multiple delivery teams; and omissions in standards around the quality levels for installation. Over the years, research undertaken by academia and others into some of these retrofit issues offers some potential solutions³. However, as of yet, the findings have not been integrated into new or existing standards. No comprehensive picture of existing standards is available or whether there are gaps in the availability of clear and suitable guidance. These present various challenges to overcome.

Standards ought to become better integrated, with a holistic or whole building approach⁴ incorporated into the process. This approach helps to prevent individual aspects of home retrofit being considered in isolation (e.g. solid wall insulation or boiler replacement) which ultimately can lead to un-intended consequences in overall building performance. A framework within which other relevant documents (e.g. standards and industry-agreed guidance) can function in conjunction with, and work seamlessly alongside others, can be of immense benefit. Where appropriate, existing standards only relevant to new build properties may be revised to incorporate retrofit elements. In other instances, new retrofit-specific standards may be needed. A standards framework can build on existing practices, and could include standards for assessment, design, installation, and operation, as well as give particular attention to commissioning and handover (i.e. the consumer interface).

The main focus of a framework of retrofit standards is likely to be on the technical characteristics of retrofit work and the processes used to plan and carry it out. The aim of this component area is to provide a suite of technical standards to inform the design and specification of retrofit work and to assist with the management and mitigation of technical risks. The compliance of work carried out on buildings can be certified for quality assurance against such standards. Other areas of the customer journey such as Quality and Standards and Consumer Protection (discussed later), highlight the step change in knowledge needed to drive growth in the energy efficiency and renewable energy industry.

³ See Retrofit for the Future by the Technology Strategy Board 2014. May N and Griffiths G (2015) Planning responsible retrofit of traditional buildings, Sustainable Traditional Buildings Alliance, London, and C King and C Weeks Designing out unintended consequences when applying solid wall insulation (HIS 2016).

⁴ The 'holistic property approach' (known by some as the 'whole house' approach) considers the house as an energy system with interdependent parts, each of which affects the performance of the entire system. It also considers the occupants, site, and local climate.



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Driving a step change presents a significant challenge, but one that industry is familiar with. For example, recent years have seen the embedding of health and safety knowledge and skills into all parts of the construction industry across Europe, with education and training increasing at a rapid pace. This has been driven in part, by increased legislation, the industry's desire to improve working practices, and by costs of and legal penalties for non-compliance. Industry can benefit from doing something similar for the other elements of retrofit installation. A key requirement is to ensure that knowledge and understanding of basic building physics, the holistic or whole property approach to assessing homes, and effective customer interactions are embedded in all relevant training and education, across all trades and professions in this sector, and at all stages of retrofit.

If successful, this will lead to a better skilled workforce, higher home energy performance and greater consumer confidence. Embedding new knowledge and understanding can be a straightforward process within the professions, thanks to the widely accepted and established system of Continuing Professional Development (CPD). To achieve the same integration across a very diverse range of trades, microbusinesses and SMEs in building services, renewable energy and building fabric will be more challenging. Often, this relies heavily on the availability of local, inexpensive and flexible learning which fits in with the normal operation of these companies. An increasing number of home energy improvements and installations will help drive the availability of such courses and greater innovation in training delivery. A robust and thriving retrofit market should lead to a similarly strong training market with its own supply chain also prepared to invest in the actions that are needed. This pillar recognizes that industry agrees and is aware of these needs and wants to see improved skills and knowledge within this market. It is worth noting initiatives can only be effective if individuals and the organisations they work for take the conscious decision to ensure such underpinning knowledge and understanding is embedded into everything they do.

A challenge is for industry to begin to embed core knowledge, including basic building physics, design stage and consumer interaction into all relevant vocational and professional pathways, including qualifications, training courses and apprenticeships. Apprenticeship bodies, training and education providers, employers, industry bodies and professional groups could benefit from working together to establish the best mechanism to translate the required core knowledge into mandatory requirements and learning outcomes for each job role. Training, qualifications and apprenticeships will need updating to include this core knowledge. Certification bodies and other schemes could benefit from monitoring and assess whether the required level of knowledge is maintained within companies. They could also agree to developing a consistent 'experienced worker' route, including links with colleges and training providers to allow formal recognition for workers' skills and knowledge that may not have been previously assessed or awarded credit. This will encourage the eventual move towards a fully qualified workforce. The continued development of career maps, timelines, online competency checking tools and training portals is needed to help businesses and individuals carry out their own assessment of their qualifications and skills against the agreed consolidated criteria for key roles. There ought to be clear communication and feedback loops between certification bodies, training and education providers, and the quality assurance and technical monitoring functions of any initiatives. This will facilitate improved signposting to training where necessary. Continued professional development ('CPD') could be stipulated for anyone who wishes to maintain a specialist qualification. Improved training and technical CPD also should be required for trainers themselves, especially college tutors and lecturers who may not have had recent direct experience as practitioners. It would also be helpful to establish a process for greater collaboration within the skills sector to



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ensure that the appropriate skills and knowledge are properly and consistently integrated across the sector and are available for all.

6. Branding, marketing & Communications

Objective: To build communications that motivate owners and occupiers to access the advice and support on offer, based on a strong brand for the Programme that inspires trust and raises awareness, as well as targeted messages for each sector that make the case for improving energy efficiency.

The ‘climate change’ agenda is widely discussed within the media. However, greenhouse gas emission reduction spans various areas from transport and buildings, through to industry and the natural environment. It would be helpful to have domestic focused approaches for engaging consumers with energy efficiency and renewable energy (e.g. by using trigger points and promoting the wider benefits of measures which are valued by households), and deliver awareness-raising programmes at national and local levels. This could involve developing new materials and programmes to engage householders at trigger points for action on installing energy efficiency and renewable energy measures. These are the times when householders are most likely to consider installing these measures:

- when consumers are planning or undertaking other (non-energy related) work in their homes, such as renovations;
- potentially at the point of changing energy supplier to reduce not just costs, but also consumption.
- the period immediately after moving into a new home;
- wider life stage trigger points, such as having a baby or retiring; and
- when they wish to tackle cold in their home.

Development of new messaging that focuses on the benefits of different energy efficiency and renewable energy measures for the individual consumer. Sophisticated approach to promoting different measures to different types of consumers, recognising that simple financial messages around energy bill savings are not always the right solution. A primary way in which householders engage with energy efficiency and renewable energy is through communications directly from designers, assessors, installers, manufacturers and retailers. However, often householders may encounter a trust gap as they try to balance the different claims of different companies. They are also likely to be particularly suspicious of new products and technologies or waiting for new ones to arrive e.g., hydrogen. There is a need for a set of impartial information to underpin these communications. This could encompass everything from statistics on the impact of measures, through to case studies, infographics, videos and interactive online tools.

7. Advice & Information

Objective: To provide all households with access to good quality, independent advice and information on improving the energy efficiency of their property and reducing their fuel bills.

Improving energy efficiency and adding renewable energy measures to homes are rarely explicit priorities for householders; however, in recent years, industry, working with academia and government, has gained an increasingly sophisticated understanding of how consumer choice can be influenced in this area. Nevertheless, the question remains as to how industry and governments (municipal or central) can collaborate to encourage householders to choose energy efficiency and renewable energy measures, whilst maximising the effectiveness of individual companies' marketing of their products and services. Advice and Guidance relates to the consumer journey, from a householder's first awareness of the opportunity for energy efficiency or renewable energy measures to be installed in their home, up to the point where they contact an installer or assessor for a quote or detailed property assessment. We identify the activities that can initiate and drive the consumer journey forward, and also how to integrate these into the Framework. There are a number of journeys a consumer may take. Different households, including vulnerable consumers, will have different advice and informational needs. Most importantly, the measures needed will be diverse – ranging from buying and fitting an energy-saving lightbulb to installing a renewable energy heating system. Experience shows that householders planning more complex and less well-known solutions have more detailed needs for information, advice and guidance. In addition, for a very high proportion of households, there is no single "consumer" for most energy-saving measures. A considerable number of homes will be privately rented across a variety of land-lord types e.g. socially provided housing. Landlords make the investment decisions, but tenants can play a role in encouraging their landlord to take action and in consenting for works to proceed. In leasehold properties, especially flats, decision-making processes can be complicated with freeholders and multiple leaseholders needing to agree prior to the improvements proceeding. Accurate impartial information can inform the dialogue between landlord and tenant, and between freeholder and leaseholder.

The need for impartial advice

Home owners and occupiers often do not choose or agree to energy efficiency or renewable energy measures because of a lack of engagement, awareness and trust. This is due to a number of factors including:

- difficulty consumers face in finding out about and buying new technologies where there are few companies in the market, where neighbours and friends have little experience of the products, and there is limited information available on the internet from consumers who have had these measures installed;
- consumers' lack of trust in claims or lack of understanding of how a particular measure will work in their home;
- homes are complex energy systems, with consumers struggling to understand how different measures relate to each other and which action to take first; and



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- for government-supported funding schemes, consumers need a trusted route to find out about support on offer, and to verify the claims of companies involved in delivering or promoting these schemes

In this context, impartial advice bridges the trust gap through provision of clear and accessible information about different energy-saving measures. It ensures that the energy efficiency and renewable energy market can develop as rapidly as needed to support the achievement of the Government's ambitions for reducing carbon emissions and for alleviating fuel poverty. Impartial advice and engagement play a central role in overcoming the barriers to a well-functioning market for energy efficiency and renewable energy measures: it drives the uptake of measures at a faster rate than will be achieved by the market alone. Two key elements that can support provision an impartial set of information, have been explored under the EU funded Energy Efficient Data Protocol & Portal (EeDaPP) initiative, part of the broader EEMI, and discussed below. The use / development of an Information Hub which provides quality assured, consistent, impartial information, statistics, resources and tools to the wider industry on energy efficiency and renewable energy measures and their installation. This information can be drawn from the wider industry or generated independently, but it should be quality-assured and verified under a suitable framework. Information might include potential savings figures, case studies, data and analysis. A Data Warehouse which consists of property level energy-related information, drawn from key data sources across the industry. The Data Warehouse will amalgamate key data sources regarding the home and make these available to consumer advice services and information tools that can be accessed by householders and those working on their behalf. The Data Warehouse can have several other benefits including: underpinning the design, installation and quality assurance aspects of the proposed Framework; enhancing the value of EPCs as an advice tool; reducing the cost of delivering energy supplier obligations; and providing a basis for powerful macroeconomic data and analysis.

Case Study: Advice and Guidance Bristol City Council (UK)

Bristol City Council (BCC) has worked with the Sustainable Traditional Buildings Alliance (STBA) to develop consumer-facing guidance for traditional building retrofit. 'A Bristolian's Guide to Solid Wall Insulation' helps householders to understand how they use their home⁵, how and when to consider insulating their walls, and the beneficial impacts of following a holistic or whole house approach. The guidance is supported by an online tool, providing a simple entry point to understanding a holistic approach to retrofitting their home. To support the quality of installation, BCC has also worked with STBA to develop a series of training courses, which promote the skills and understanding required for designers and installers to undertake high quality retrofit on specific property types. This training will be linked to the Council's own future procurement process providing a Quality Assurance (Kitemark) scheme to increase confidence of householders and to ensure on-going skills improvement. This work has been developed by BCC with its Warm Up Bristol scheme which was supported by a Green Deal Communities (GDC) grant. Warm Up Bristol is a five-year city-wide scheme with an initial focus on external insulation supported by GDC funding. BEIS support has enabled BCC to focus on developing

⁵ Bristol City Council, *A bristolian's guide to solid wall insulation*:
https://issuu.com/bristolcitycouncil/docs/a_bristolian_s_guide_to_solid_wall_?workerAddress=ec2-184-72-82-39.compute-1.amazonaws.com



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a longer term self-sustaining financial mechanism that will allow it to provide affordable solid wall insulation solutions for householders.

8. Assessment

Objective: An Action Plan' that records both the improvement targets and the measures that will be undertaken to meet them.

High quality advice and information is critical for guiding householders' decisions to improve the energy performance of their home. Energy Performance Certificates (EPCs) are a useful source of basic comparable information. However, the Climate Change Committee in the UK, amongst many others have acknowledged that there are extensive issues with using them as a basis upon which to set standards. These are mainly poor quality or low robustness; modelled data rather than actual energy performance; they do not incentivise or show benefits of decarbonising heat or include the savings possible from smart tariffs.

There are numerous requirements on householders to have assessments done; however, these are not always appropriate or useful. Often assessments do not necessarily consider fully the suitability of a particular measure for an individual property when making recommendations, or take into account the interaction of the proposed measure with the building or existing measures. Assessments remain an important tool, but more is needed to ensure they are done in a consistent and accurate way, at appropriate times, and take into account the whole building. The original policy driver for the current system on EPCs was the European Union's (EU) Energy Performance in Buildings Directive 2002 (EPBD) with its objective to promote the improvement of the energy performance of buildings across EU member states. On 15 December 2021, the European Commission adopted a major revision (recast) of the EPBD, as part of the 'Fit for 55' package. The latter consists of several legislative proposals to meet the new EU objective of a minimum 55 % reduction in greenhouse gas (GHG) emissions by 2030 compared to 1990. It aims to accelerate building renovation rates, reduce GHG emissions and energy consumption, and promote the uptake of renewable energy in buildings. It would introduce a new EU definition of a 'zero emissions building', applicable to all new buildings from 2027 and to all renovated buildings from 2030.

Energy Performance Certificates (EPCs) provide information on how energy efficient your building is, and how it could be improved. Buildings are rated on a scale from A-G, with A being the most efficient. Information is also provided on measures which could be made to improve energy efficiency and an indication of the cost for each improvement. An EPC must be produced when a new building has been constructed; and when a building is to be sold or rented to a new tenant. EPCs are valid for 10 years. They are based on information collected onsite by Domestic Energy Assessors, such as the size and layout of a building, how it has been constructed and the way it is insulated, heated, ventilated, and lighted. Since people use buildings in different ways, the calculation is based on standardised assumptions of occupancy and use.

Figure 4. Energy Performance Certificates (EPCs): Standard energy cost & carbon emission ratings



Domestic EPCs display an Energy Efficiency Rating (EER) and an Environmental Impact Rating (EIR). The EER is rated in terms of energy costs, while the EIR is rated in terms of carbon emissions. Domestic EPCs also have numerical ratings, with a higher number suggesting greater energy efficiency. The numbered arrows show the current rating based on the existing energy performance of the property and the potential rating if the suggested improvements are implemented. An EPC also shows the Primary Energy Indicator which indicates the amount of energy used to produce one kilowatt of power for a household.

The EPC assessment records specific information such as the dwelling type, floor area, construction type, insulation, heating, ventilation and lighting. It also provides a primary energy indicator which is the amount of energy used to produce one kilowatt of power for the household. The calculation is based on standard assumptions of occupancy and use, and does not take into consideration variations in behaviour of occupants, or the state of repair of the property, and uses a jurisdiction specific calculation methodology, managed and implemented by the national Government with input from the devolved administrations. The EPC assessment process generates a set of suggested improvements and indicates what EPC score might be achieved if these improvements were cumulatively undertaken. This list of recommendations is advisory only and are generated as part of the calculation methodology and software tools used by the EPC assessor. As more and more energy efficiency installations are deployed and the impacts on building performance are more deeply understood, hopefully this can lead to ongoing refinements and updates to EPC assessment methodologies across Europe.

9. Finance

Objective: *To catalyse financing mechanisms, for example, grant and loan funding, fiscal advantages, across different tenure and sectors to support improvements to the local building stock.*

The transition to a net-zero economy is heavily reliant on the decarbonisation of our built environment – currently responsible for approximately [36% of total EU emissions⁶ – and an estimated investment in excess of €260 billion p.a. until 2030⁷ is needed to meet the EU’s climate and energy savings targets, three quarters of which is accounted for by energy efficiency in buildings⁸, with further investment required to scale up the supply chain and innovate new technologies. The financial system will play a critical role in deploying this investment; to play this role, financiers will require robust and reliable data on the energy performance of buildings. A key question is how can lenders, investors and the data community help to mobilise capital towards low carbon homes? A major objective of the EEMI is seeking to respond to this question from the perspective of energy efficient mortgages, and how a market framework can be established to enable this to occur both efficiently and effectively. Across the three main housing tenures – owner occupied, private rented and social rented – there are distinct decision makers with specific barriers to investing in energy efficiency improvements. For example, homeowners are typically responsible for investment decisions in the owner-occupier sector, and yet their financial position varies from highly leveraged first-time buyers to outright owners with significant savings. Meanwhile, in the private and social-rented sectors the decision-making power often lies with the landlord. While many barriers are common across the entire market – such as limited consumer awareness and education on energy efficiency, the hassle and complexity of retrofit projects, and a shortage of reliable and accessible data – there are specific challenges that impact different sectors, as outlined below:

- Owner occupiers can be deterred by lengthy and uncertain payback periods on energy efficiency investments, in addition to a limited selection of attractive finance options
- Private renters and landlords experience a split incentive (i.e. landlords have minimal motive to retrofit their properties, as energy savings often accrue to the tenants) and awareness of Minimum Energy Efficiency Standards can be limited among smaller landlords
- Social housing providers and registered social landlords, who typically undertake large-scale retrofit projects, can be impacted by the underdeveloped supply chain and access to affordable funding.

The breadth of unique and distinct barriers highlights an important consideration: to deploy investment into decarbonising buildings at the pace and scale required, the solutions must be granular, bespoke and local. This indicates that there will be a mix of financing and funding solutions that are

⁶ European Commission, *In focus: Energy efficiency in buildings*: https://ec.europa.eu/info/news/focus-energy-efficiency-buildings-2020-feb-17_en

⁷ European Commission, *Financing the green transition: The European Green Deal Investment Plan and Just Transition Mechanism*: https://ec.europa.eu/commission/presscorner/detail/en/ip_20_17

⁸ European Commission, *Smart Finance for Smart Buildings Investment Facility*: https://ec.europa.eu/clima/system/files/2018-11/initiative_7_smart_en.pdf



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likely to be deployed across Europe. In the journey towards a mature market for financing net-zero and resilient-homes, the design and development of new financial mechanisms that unlock the investment barriers, appeal to consumers, deliver commercial returns to financial institutions, and can be scaled to form part of the long-term finance landscape is critical. To catalyse and scale up the degree of financial innovation, an enabling environment is required: industry-wide standards and principles, robust data infrastructure, and tools that support homeowners on their retrofit journey, and these are embodied in the pillars described within this report. A way in which this can be achieved, is for different European jurisdictions to develop, pilot, scale and mainstream demonstrator projects. This not only provides financing routes that are most suitable to a particular area, but allows these approaches to be shared through collaborative efforts, such as the Energy Efficiency Mortgage Initiative, and permit potential wider scaling of successful initiatives elsewhere.

10. Finance

Objective: To ensure robust consumer protection, focussed on high standards of quality, customer care, competence, skills and training, and health and safety.

Consumers play a fundamental role in the renovation of Europe's housing stock through installation of energy efficiency and renewable energy measures. By installing these measures, consumers can lower their bills and make their homes more comfortable. However, if the measure is inappropriate or the quality of work falls short, the consumer will not reap the full benefits expected and, in the worst case, end up with damage to their home and/or health. Consumer trust is vital. Without demand for improvements from householders, the energy efficiency and renewable energy industries will face an uncertain future and society will miss a great opportunity to save energy at low cost. Ensuring robust consumer protection frameworks as well as support mechanism are in place is essential to achieving this trust. In recent years, shortcomings in consumer protection and in the quality of installation in the renewable energy and energy efficiency sector have emerged. Several organisations with consumers' interests at heart have highlighted this as an area of growing concern. Numerous codes, charters and certification schemes currently cover various aspects of the retrofit market. While many are fit-for-purpose, others are not; and they simply do not exist for some technologies. The absence of a unifying approach leads to confusion, thereby increasing consumer detriment and reducing market confidence. However, a consistent consumer protection regime will only generate sufficient trust and confidence if it is easily recognisable by consumers as a genuine design of a reliable organisation, and is required for relevant government schemes. The problems addressed by this Consumer Protection workstream are in some cases severe. They can be split into three broad areas, reflecting key stages of the consumer journey:

Sales, marketing and contracts

The complexity of energy efficiency and renewable energy measures, and their lengthy and often uncertain payback periods, increases the risk of deliberate and unintentional mis-selling. In some cases, this has been compounded by the intricacy of government schemes, which have often added to the complexity for consumers. In the absence of clear and consistent branding, it is challenging for consumers to find appropriate impartial information to aid them in making informed choices and to identify legitimate organisations to undertake the assessment and installation;

Standard of work

When the quality of work falls short, there can be serious consequences for the consumer. Problems can occur in the assessment, design and installation phases. There is likely to be no single body with overall responsibility for checking the quality of work. Existing standards and the associated monitoring and sanctions regimes can be fragmented, and might not be effective in driving out low-quality work from all parts of the sector; and

Help if something goes wrong

Levels of redress can vary significantly between different organisations and compliance schemes. Redress processes, where they exist, can be unclear, slow and difficult for consumers to navigate. Ultimately, they may not resolve satisfactorily the consumer's complaint. Robust consumer protection



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envisions a future where consumers are well-advised and engaged, they can trust that any work in their homes will be finished to a high standard, and where something goes wrong, they can access a simple, fair and consumer focused redress process.

11. Monitoring & Evaluation

***Objective:** Monitoring and evaluation of evolutions to ensure that aims and objectives are met. This monitoring and evaluation should allow for adaptation and flexibility where necessary.*

Evaluation, measurement, and verification (EM&V) is the collection of methods and processes used to assess the performance of energy efficiency activities so planned results can be achieved with greater certainty and future activities can be more effective. The main objectives of an EM&V process are to assess the performance of an energy efficiency pro-gram or project, to measure the energy or demand savings, and to determine if the program is gener-ating the expected level of savings. EM&V data can inform recommendations for improvements in program performance. Having a clear understanding and description of how the program is expected to deliver results is critical to an effective EM&V process. Key aspects of the monitoring and evaluation process included the following:

- Monitoring of market compliance and progress towards targets (e.g., product testing according to the prescribed protocols, proper reporting, properly carry out accreditation of suppli-ers, and sampling and testing of products on energy consumption)
- Evaluating progress (e.g., market trends and consumer preferences, consumer and manufacturer costs, and energy and CO2 savings)
- Program evaluation, including administration costs and effectiveness
- Reviewing program results and, when necessary, revising program elements

The International Performance Measurement and Verification Protocol (IPMVP) outlines four approaches that are most commonly used in energy efficiency programs. The IPMVP was created through a collaborative effort of energy efficiency experts from around the world and was first used by the United States Department of Energy in 1994. The methodology describes 4 main areas;

- Use computer-based energy simulation programs to model the projected energy performance of the entire facility
- Measure energy usage on the whole before and after upgrades are installed.
- Conduct field measurements or estimates of energy use by individual upgrades.
- Conduct field measurements or estimates of energy use of individual upgrades and systems affected by the upgrades.

Regulators, public and private energy efficiency portfolio administrators, program implementers and evaluators can use the following resources to help with:

- Guidance on planning evaluation efforts
- Approaches for determining and documenting program impacts
- Improving the efficacy of energy efficiency portfolios



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- Comparing demand- and supply-side resources.

These are key elements that need to be considered by European countries in ensuring that as the transition to net zero in the built environment progresses and new technologies are developed, appropriate monitoring and evaluation processes will allow the most effective technologies deployed and the benefits to consumers to be maximized.



12. Conclusion

The previous sections identify that there are a key set of integrated pillars that if implemented effectively within European jurisdictions can create a robust framework and low risk market for stimulating investment in the decarbonisation of Europe's building stock. As noted, different approaches for developing these pillars are likely to be jurisdiction specific, and example demonstrator projects are being progressed in both Scotland and the Province of Trento, Italy which will be reported on at a later date.