



EuroPACE

Methodology to define Eligible investments to EuroPACE

D 3.3 Eligibility List

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1. Introduction

This note relates to the methodology to define the investments in residential buildings eligible for EuroPACE financing. The note focus on energy-related investments, and to a limited extend other type of building renovations, such as accessibility or safety. It concerns existing buildings, as EuroPACE will not finance new buildings.

Financial instruments, such as EuroPACE, provide two types of value added to homeowners: access to competitive financing and finance adapted to the life of the assets, as well as technical value added. The definition of eligible investment, as well as the selection of contractors and energy experts contributes significantly to technical value added. These activities gives indications to homeowners about the most energy performing investments and who can carry out the works or provide good energy advice. The definition of eligible investments is part of a process aiming at helping homeowners identifying the most suitable investments to renovating their home.

The methodology proposed here is general. It can be applied to any city that wants to develop an EuroPACE facility and not just to the Olot pilot. The task related to the definition of eligible investments is connected to other EuroPACE tasks, notable the Contractor Training & Verification Programme, the identification of target groups and the procedures and processes for set up an EuroPACE. In addition, the methodology to define eligible investments should facilitate the measurement of the project impacts (energy saved, renewable production and CO2 emissions reduction).

Section 2 of the report gives a short presentation of the energy consumption in buildings and a brief analysis of key factors that influence the penetration of energy efficient technologies into the residential market.

Section 3 lays down the EU energy policies on energy performance of buildings which are relevant to the definition of eligible investment. This concerns mainly product design and labelling, buildings regulations and policies to promote the improvement of the energy performance of buildings and the proposal of a taxonomy to classify sustainable investments.

Section 4 reviews examples of how different financial instruments supporting the improvement of the energy performance of private residential buildings have define eligible investments. Three of these examples are in Europe (Germany, UK and Lithuania) and the other is a PACE in California.

Section 5 proposes a methodology to define eligible investments, taking into account the findings of the previous sections.

Section 6 lays down a definition of eligible energy investments for Spain based on the methodology proposed in the previous section.

Finally, section 7 gives the approach adopted in Olot to define eligible investments

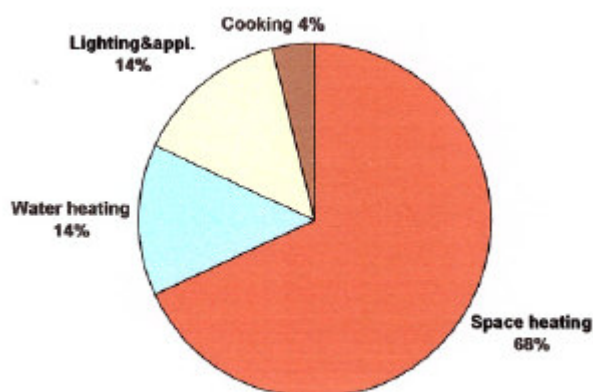
2. Energy consumption of the residential sector and key barriers to the penetration of more efficient technologies

2.1. Energy consumption in buildings

Buildings accounts for about 40%¹ of the final energy consumption of the EU, ahead of transport and industry. 65% of the energy consumption of buildings corresponds to residential buildings and the rest to service buildings (commercial, offices and public buildings).

According to ADEME² for EU 15 (see figure 1), space heating accounts for about 68% of the energy consumption of residential buildings³, followed by water heating (14%) and lighting (14%).

Figure 1: Breakdown of energy consumption in the residential sector by end-use for EU 15 (2006)



Source: ADEME

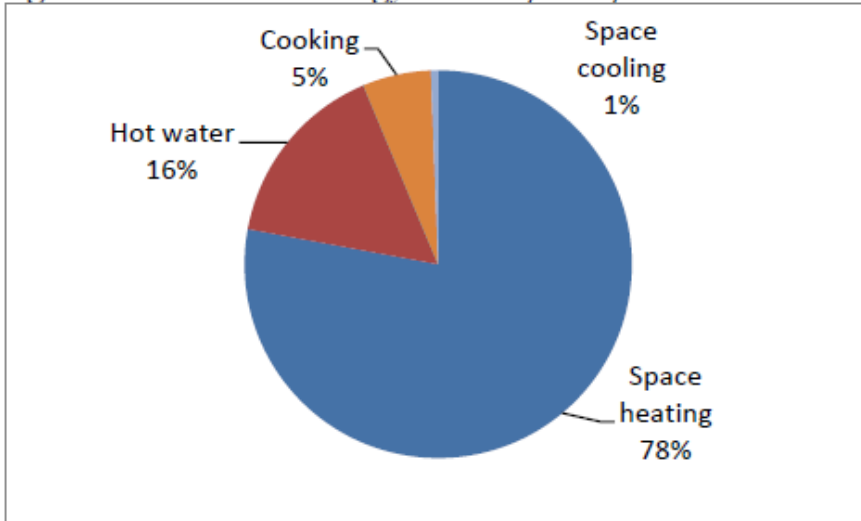
Therefore, most of the energy consumption of the residential sector is for thermal uses. Space heating and hot water production account for 94% of the total thermal energy consumption according to a recent study for 2012 (see figure 2).

¹ Eurostat, [Energy balance sheets 2016](#). August 2018

² Estimation for EU15, from ADEME, Evaluation of energy efficiency in the EU15 : indicators and policies. 2007

³ This is similar to more recent studies (2012) on the final energy consumption for heating and cooling of residential buildings (From EU heating and cooling working document 1, p, 10)

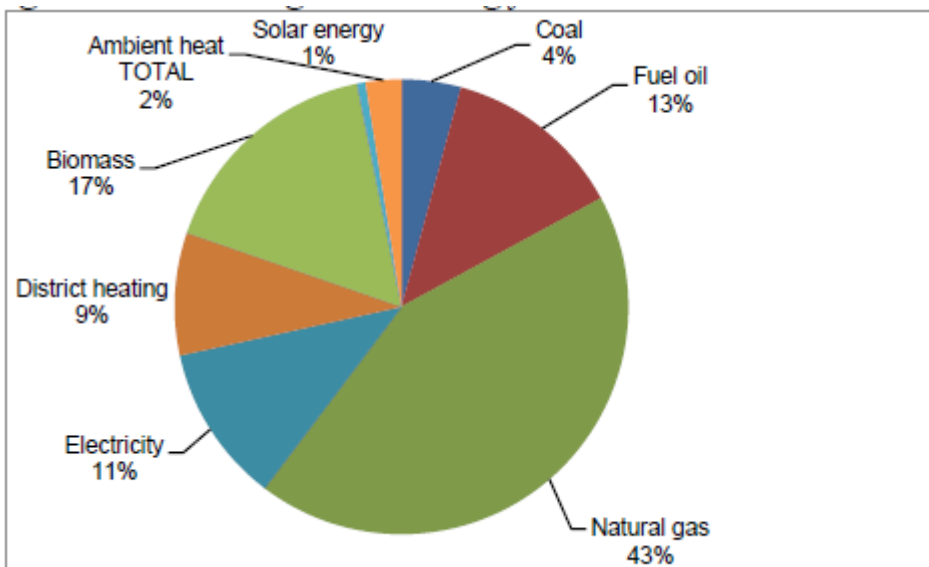
Figure 2-4: Thermal energy consumption per use in the residential sector (2012)



Source: From EU heating and cooling working document 1, p, 10.

Natural gas covers most of the demand for heating and cooling (see figure 3) in the residential sector (43%), followed by biomass (17%), gas-oil (13%) and heat from district heating networks (9%).

Figure 3: Heating and cooling fuel mix in the residential sector 2012



Source: Heating and cooling working paper 1 p30

There are substantial differences of the amount of energy used by the residential sector in the EU countries. For instance, the energy consumption per capita of the residential sector in Finland is about three times higher than in Spain. These differences are mainly related to climatologic conditions.

According to the EU reference scenarios for 2050⁴, final energy demand for heating in the residential sector will gradually decrease, cooling demand will increase substantially, but from a low level (1%), water heating demand will remain more or less constant, demand for lighting will decrease and demand for electrical appliances will increase⁵. The potential for increasing the demand for cooling is substantial, in particular in warm climates⁶. In the referenced scenario, the energy mix in the residential sector will change substantially. Coal consumption is expected to practically disappear by 2050, oil consumption declines substantially, gas maintains its market share, whereas the share of electricity and renewable energy increases. The implementation of the new policies to fight climate change proposed by the EU Commission should result in a faster decline of the total energy consumption of the residential sector and a faster expansion of renewables than the reference scenario. Electricity consumption based on renewable energy should also increase; while fossil fuel consumption (coal, oil and gas) should decline faster than foreseen in the EU reference scenario.

2.2 Key barriers to the penetration of more energy efficient technologies

There is a substantial academic literature on the barriers to the penetration of more energy efficient technologies.

As noted by B.Broadman⁷ “the market rarely delivers energy efficiency improvements spontaneously, as there is no market push. Consumers are not providing a pull towards energy efficiency, usually because they are ignorant of (or indifferent to) the range on the market or the implications of their purchase”.

F.Knobloch and all⁸ have carried out an in-depth review of the literature on household behaviour when deciding investing in new heating systems. This analysis is relevant to other energy consuming or producing equipment in a house. The investment cost is the main criterion when a household decides to buy a new heating system, operational costs plays a minor role in the decision. This implies that households use a high implicit discount rate, and this rate depends on the income level (see figure 4). The high discount rate is a substantial barrier to the penetration of more efficient technologies, which usually have a higher investment cost than the less efficient ones.

⁴ EU Commission, EU reference scenario 2016. Energy, transport and GHG emissions . Trends to 2050. July 2016.

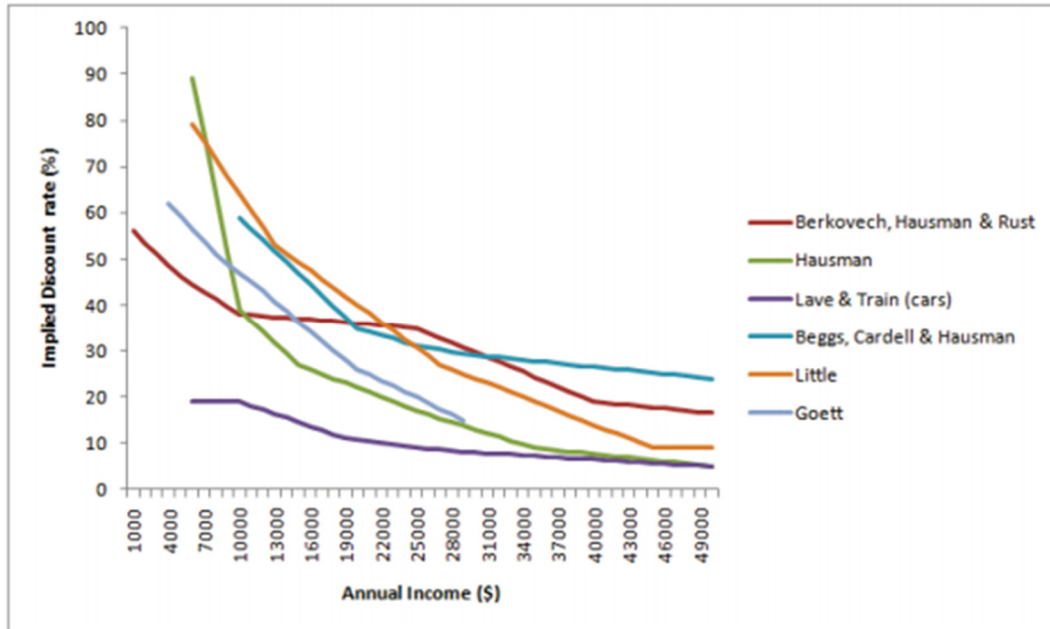
⁵ This is mainly related to the development of the information society.

⁶ According to several studies, potential demand of cooling in the residential sector over the long term (1% of total thermal demand currently) could be between 6 and 25 times current demand (see EU heating and cooling wp p.1)

⁷ Brenda Boardman, New directions for household energy efficiency: evidence from the UK. Energy Policy (32) 2004 (p.1)

⁸ Florian Knobloch, Hector Pollitt, Unnada Chewpreecha, Vassilis Daioglou, Jean-Francois Mercure, Simulating the deep decarbonisation of residential heating for limiting global warming to 1.5°C

Figure 4: Empirical estimates of the relationship between discount rates for energy efficiency investments and income



Source: (Train ,1985 cited by Green deal impact assessment 2012)

Other important barriers to the penetration of more efficient technologies in the residential sector is related to hidden cost, imperfect information and split incentives in the case of rental⁹. Hidden costs are mainly related to the costs of identifying the type of investment and the professionals that can carry it out. In addition, the information available to households when taking the decision is often imperfect.

Energy consuming equipment is generally replaced when it reaches the end of its life. There is a significant quantity of very old equipment that is not replaced, because households tend to use the equipment as long as possible. Replacing energy equipment prematurely because the new equipment has a lower operating cost than the existing one is rare, even if it was profitable to do so.

The diffusion of new technologies in the residential sector is slow. It typically follows an S-shaped trajectory. First, early adopters, followed by mass penetration and finally laggards. The process is further amplified by learning by doing and scale effects that tend to decrease the cost of the new technologies, as their market share increases. The penetration of new technologies can take decades, if policy do not favour its penetration.

In addition, the introduction of new technologies in a region or country is difficult for several reasons. There are few local supplier of the equipment or professionals with experience in this new equipment. Cost of the equipment might be higher than in more mature markets. Households might be reluctant to take the risk involved in a new equipment.

EuroPACE should contribute to lower these barriers.

⁹ Article on EE of EIB papers on energy.

3 EU policies related to energy efficiency and renewable energy in buildings

3.1. Design and labelling of energy equipment

The EU introduced a compulsory labelling for household appliances¹⁰, rating them on a scale of A (most efficient) to G (least efficient) in 1995. This was followed by the Eco-design directive in 2005 and its revision in 2009, which sets out minimum performance standards, thus removing the least efficient appliances from the market. The US (Energy starts) and other non EU countries have also introduced similar label systems and mandatory requirements. In 2010, the EU introduced a revised rating system. EU decided to rescale the labels meaning that from as early as the end 2019, a product labelled A+++ could become B. Energy labelling requirements for space and water heaters came into application in 2015. The sale of inefficient boilers is now banned, such as non-condensing gas boilers.

The initial focus of the Ecodesign Directive was to improve the energy efficiency of the products. The new directive extended its objectives¹¹ to the integration of environmental aspects into product design, with the aim of improving the environmental performance of the product throughout its whole life cycle. This Directive has to be seen in combination with the Energy Labelling Regulation, which in July 2017 replaced the 2010 Directive on energy labelling. It also aims at providing consumers with information that allows them to choose more efficient products.

There are two types of mandatory product requirement: a) specific requirements setting limit values for products, such as maximum energy consumption or water consumption during use; and b) generic requirements that do not set specific limit values, but for instance concern mandatory information for consumers about how to use a product in an energy efficient way.

3.2 EU Heating & cooling strategy

The main objective of the EU strategy for heating & cooling is first to promote the use of renewable energy sources (solar, biomass or heat pumps) and secondly energy efficient solutions (see figure 5).

Figure 5: Efficiency rating of new space heating appliances¹²

¹⁰ From FT, Sarah Shearman, Less is more, September 25, 2018

¹¹ From European Parliament, The Ecodesign Directive (2009/125/EC), European Implementation Assessment. November 2017

¹² Packages of space or combination heaters, temperature control and solar device ranked A+++ include a heat pump or a heater using fossil fuel or biomass, temperature controls and a solar device

| | Best Available Technology (BAT) class for space heaters (including packages) |
|-------------|---|
| A+++ | Packages using renewables |
| A++ | Heat pumps (renewable) Best biomass boiler (renewable) |
| A+ | Gas cogeneration |
| A | Condensing gas boilers |
| B | |
| C | Non-condensing gas boilers |
| D | Electric resistance |

Source: EU heating & Cooling strategy

Demand side management is also a priority of the strategy. Smart building connected to a smart grid allows a remote control of heating, cooling, water heaters and appliances, in order to adapt building demand to the situation of the electricity market. Smart buildings can use excess RE for heating/cooling and for heat storage or reduce demand when there is too little RE production. The strategy promotes also the use of district heating based on renewable energy or high efficient cogeneration.

3.3 Energy performance of buildings directive of 2018

This is the key piece of legislation on energy performance of buildings in the EU. The first EU legislation on energy performance of buildings was adopted in 2001. It established a common methodology to calculate the energy consumption of buildings and proposed increasing the energy performance standards for buildings in the EU. It set up the obligation to produce an Energy certificate for each buildings (when buying it, selling or renting) and inspections for energy consuming equipment. The different revisions of the Directive has kept the same basic objectives. The energy performance standards for new and existing buildings have been gradually tighter. In particular, the recast of 2010 mandated that all new buildings should be nearly zero energy buildings from 31 December 2018 for public buildings and from 31 December 2022 for all buildings.

The Energy performance of buildings Directive of May 2018, published on mid-June 2018, amends the previous two directives of 2010 and 2012. The main novelty of this directive is the proposal to accelerate the renovation of the existing building stock. MS have until March 2020 to transpose the directive into the national legislation. In this section we will focus on the issues of this directive relevant for the definition of eligible investments for EuroPACE.

Concerning existing buildings the objective of the Directive is the transformation of the existing building stock into nearly zero energy buildings, in particular by increasing deep renovations. To implement this objective, MS have to prepare national plans of building renovation. These plans should “encourage high-efficiency alternative systems, if technically, functionally and economically feasible”.

These national strategies will have to promote an increase of the renovation rate of the existing building stock. According to the Directive, this rate will need to increase to about 3% per year to achieve the EU long term objectives. This is very challenging, as there are not precedents of such level of renovation rate. Historically, it has been around 1% in the EU.

The main instrument foreseen by the Directive to measure the level of energy efficient of a building is the energy performance certificate, which plays an important role to achieve the objectives of the Directive. In addition, in the previous versions of the Directive it was mentioned the need to improve the quality of the certificates through independent controls and verifications, as this quality is poor in some countries.

In addition to promoting energy efficiency and renewable energy in buildings, the Directive also mentions other investment necessary to fully decarbonise the buildings sector over the long term. It is indicated that buildings should contribute to the development of electric vehicles, by developing electrical infrastructure for smart charging electric vehicles and electric bikes, notably in parkings.

Smart buildings or smart-ready buildings are also promoted by the Directive, in order to facilitate demand side management¹³. It is indicated that devices for the separate regulation of the temperature in each room or, where justified, in a designated areas should be implemented, where technically and economically feasible.

Financial support and dedicated financial instruments to support the development of high energy performance buildings are also encourage, in order to facilitate the financing of the substantial investment required to implement the Directive. More specifically, “to ensure that financial measures related to energy efficiency are applied in the best way in building renovation, they should be linked to the quality of the renovation works, in light of the targeted or achieved energy savings”.

3.4 The EU Taxonomy

The EU Commission set up a Technical Expert Group on Sustainable Finance in July 2018 with the objective of developing an EU classification system for environmentally sustainable economic activities (hereafter ‘Taxonomy’). The conclusions of this group have been published in June 2019¹⁴. This report is part of the implementation of the EU Action Plan on Sustainable Finance. The taxonomy identifies the economic activities that make a substantial contribution to climate change mitigation or adaptation. The EU Commission will develop the taxonomy in a specific legislation, taking into account the report of this expert group and further feedback from stakeholders. Therefore, the taxonomy is very relevant to defining EuroPACE eligible investments, as it identifies under which conditions or criteria an investment or financial product will contribute to the EU’s sustainability objectives; and thus can be considered a sustainable investment. The Action Plan on sustainable Finance will aim at reorient finance towards sustainable investment.

Several sections of the report are relevant to defining EuroPACE eligible investments. The most relevant ones concern the “Renovation of existing buildings” and “Individual renovation measures, installation of renewables on-site and professional, scientific and technical activities” in existing buildings. Renovations complying with the

¹³ Australia has taken direct action to manage peak electrical demand in summer by mandating the inclusion of a demand response enabling device (DRED) in all household air-conditioners sold since 2011/2012 (EU Heating and cooling working paper 2, p 122)

¹⁴ EU Technical Expert Group on Sustainable Finance, Taxonomy Technical report June 2019 (https://ec.europa.eu/info/publications/sustainable-finance-teg-taxonomy_en).

requirements of major renovations of the EPBD, as developed in each member state, are eligible. In addition, renovations not meeting these requirements, would still be eligible if they deliver at least 30% of primary energy savings. In the case of individual building renovation measures, the eligibility rely on requirements set in the national regulation and building codes transposing the EPBD by each Member State.

In addition, other sections of the report are also relevant to EuroPACE, in particular the section on “Biomass, biogas and biofuels, on district heating networks and electric heat pumps. Concerning the first, it is considered eligible the types of biomass listed in the Annex IX of the Directive 2018/2001 of 11/12/2018 on the promotion of the use of energy from renewable energy sources. On District heating networks, the report establish detailed criteria, depending on the source of heat. It also defines detailed technical specifications for electric heat pumps. To be noted that there is certain lack of clarity in relation to the eligibility of heat pumps in buildings. Ground-source heat pumps are clearly eligible, but other type of heat pumps can also be eligible in the context of the installation and updating of HVAC and domestic hot water systems. This will clarify in the following sections of this report.

The criteria of the Taxonomy will be taken into account when defining the eligibility criteria of EuroPACE investments. These criteria will need to be reviewed, once the EU Commission has published the legislation related to the taxonomy, which is expected by end 2019.

4 Approach to define eligible investments in some EU countries and in the US Pace

In this section we will briefly explain the approaches to define eligible investments in financial instruments similar to EuroPACE: KfW in Germany, the Green Deal in the UK, the Jessica fund in Lithuania and California First in the US.

4.1. KfW facility in Germany¹⁵

For many years, KfW, the German public bank, has a facility that combines financing with grants to support high energy efficiency standards in residential buildings in Germany. This facility has been very successful to develop the energy efficiency investment in buildings. The investment mobilised in 2016 was about 50 bn EUR for both new and existing buildings.

The KfW facility can finance new residential buildings achieving EE standards higher than the existing standard for new buildings in Germany. For existing residential buildings, KfW finance individual measures and packages of measures to improve the energy efficiency of the building. To obtain kfw financing or grants, the investment has to be verified and approved by a certified energy expert. Table 1 list the package of measures that can be financed by the KfW facility. KfW can finance the investment cost, including the cost of architects’ fees and of the energy advice.

¹⁵ From <https://www.kfw.de/migration/Weiterleitung-zur-Startseite/Homepage/KfW-Group/Research/PDF-Files/Energy-efficient-building-and-rehabilitation.pdf> (consulted on 12/10/2018) and Petra Bühner, KfW Promotional programs for energy efficiency. Paris April 26th 2017

Table 1: Package of measures supported by the KfW EE in residential buildings facility

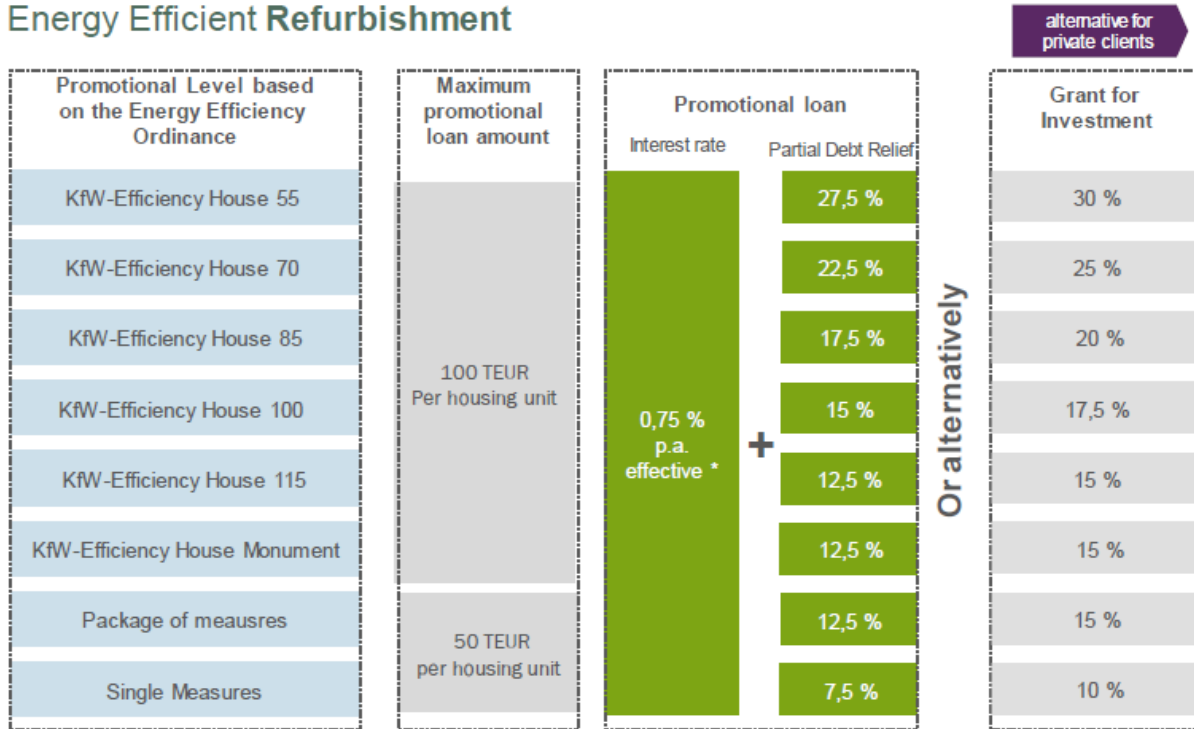
| Package | Measures |
|---------|--|
| 0 | <ul style="list-style-type: none"> • Retrofitted insulation on exterior walls • Retrofitted insulation on the roof • Retrofitted insulation of the basement ceiling or outside walls of heated rooms in contact with the ground • Replacement of existing windows |
| 1 | <ul style="list-style-type: none"> • Replacement of central-heating boiler • Retrofitted insulation of the roof • Retrofitted insulation on exterior walls |
| 2 | <ul style="list-style-type: none"> • Replacement of central-heating boiler • Retrofitted insulation of the roof • Retrofitted insulation of the basement ceiling or outside walls of heated rooms in contact with the ground • Replacement of existing windows |
| 3 | <ul style="list-style-type: none"> • Replacement of central-heating boiler • Change of heating energy carrier • Replacement of existing windows |
| 4 | <ul style="list-style-type: none"> • A combination of measures from package 0 to 3 • Proof of a 40kg reduction of CO2 emissions per m2 floor area and year through calculations by an accredited energy advisor |
| 5 | <ul style="list-style-type: none"> • Replacement of a) decentralised furnaces fired by gas, oil or black coal, or b) night storage heaters, or c) black coal-fired central heating boilers with a heating system complying with EnEV <p>Or</p> <ul style="list-style-type: none"> • Replacement of standard oil- or gas-fired central heating systems installed before 01.06.1982 with oil- or gas-fired condensing boilers combined with solar thermal or other renewable energy sources (i.e. biomass) |

Source: <https://www.kfw.de/migration/Weiterleitung-zur-Startseite/Homepage/KfW-Group/Research/PDF-Files/Energy-efficient-building-and-rehabilitation.pdf> (consulted on 12/10/2018)

The grant level provided by the KfW facility depends on the level of EE achieved in the building. For new buildings, the EE improvement has to be higher than the standards set out in the German Energy Conservation Ordinance (EnEV). A building achieving an energy consumption (heating and hot water) of 55% (KfW Effizienzhaus-55) of the Ordinance will get a grant of 5% of the investment cost. This grant increases to 10 or 15% if the primary energy consumption of the buildings is 40% of the German standard.

Figure 6 lays down the amount of financing and the percentage of grants in relation to investment for the refurbishment of existing residential buildings. These amounts depend on the type of measure (single or package) and on the level of energy efficiency achieved. The approach adopted favours renovations that improve substantially the energy efficiency, in relation to single measures.

Promotional programs for residential buildings – Set-up Energy Efficient Refurbishment



* As per 16.11.2016 , applicable to all maturities

Source: Petra Bühner, KfW Promotional programs for energy efficiency. Paris April 26th 2017

4.2 The Green deal in the UK

The Green deal is similar to EuroPACE. The main difference is that payments of energy efficiency measures in the Green Deal are integrated in the electricity bill (on-bill) rather than in a property tax, as EuroPACE. This initiative was launched in 2013 and was cancelled in July 2015, due to its low uptake. The Green deal provided unsecured loans to home owners to improve the energy efficiency and to install renewable energy in their homes, provided that, the so-called “Golden rule”, is fulfilled. This rule is that energy savings should allow recovering the investments during their expected life, for a maximum life of 25 years¹⁶.

The initiative integrated a network of accredited enterprises, including advisers, contractor and financiers. Taking into account its initially low uptake, the initiative was complemented by some limited grants and subsidies (tax

¹⁶ Largely From R.D.Marchand, S.C.Lenny Koh I J.C. Morris, Delivering energy efficiency and carbon reduction schemes in England: lessons from Green Deal Pioneer Places. Energy Policy 84 (2015) and H.Pettifor, C.Wilson, C.Chrysochoidis, The appeal of the green deal: Empirical evidence for the influence of energy efficiency policy on renovating homeowners Energy Policy 79 (2015)

subsidies, grants, including grants to part finance the initial energy diagnosis). Grants to finance energy diagnosis had a very positive impact in the uptake of the initiative.

Green deal defines a “measure” as an improvement made to a property, for example, loft or cavity wall insulation. “Product category” means the type of measure such as mineral wool insulation, and “Product” means the branded materials.

The measures financed should be assessed by an energy expert. Product installed in the property must meet health, safety and performance standards given in a Green Deal Code of Practice. The developers of the Green deal had doubts about the quality of the Energy Performance Certificates (EPC) and thus decided that the Green Deal assessment should be based on a strengthened and improved version of the EPC. The Green deal worked with stakeholders to investigate which new products could be on the horizon and what processes and innovations are driving up the performance of measures and driving down costs. Green Deal supported and promoted the installation of packages of measures as far as possible, rather than individual measures. Where packages are not the right solution for the customer, the appropriate sequencing of installations over time was encouraged. The list of recommended measures may include measures that do not fulfil the Golden Rule. However, measures that do not fulfil such rule could not be financed by the Green deal.

Table 2: Green deal measures categories

| Item | Descriptor | Domestic | Non-domestic |
|------|---|----------|--------------|
| (a) | air source heat pumps | √ | √ |
| (b) | biomass boilers | √ | √ |
| (c) | biomass room heaters (with radiators) | √ | |
| (d) | cavity wall insulation | √ | √ |
| (e) | chillers | | √ |
| (ea) | circulator pumps | √ | |
| (f) | cylinder thermostats | √ | |
| (g) | draught proofing | √ | √ |
| (h) | duct insulation* | | |
| (i) | gas-fired condensing boilers | √ | √ |
| (j) | ground source heat pumps | √ | √ |
| (k) | hot water showers* | | |
| (l) | hot water systems | √ | √ |
| (m) | hot water taps* | | |
| (n) | external wall insulation systems | √ | √ |
| (o) | fan-assisted storage heaters | √ | |
| (p) | flue gas heat recovery devices | √ | √ |
| (q) | heating controls for wet central heating systems or warm air systems | √ | √ |
| (r) | heating ventilation and air-conditioning controls (including zoning controls) | | √ |
| (s) | high performance external doors | √ | √ |
| (t) | hot water controls (including timers and temperature controls) | | √ |
| (u) | hot water cylinder insulation | √ | √ |
| (v) | internal wall insulation systems (for external walls) | √ | √ |
| (w) | lighting systems, fittings and controls (including roof-lights, lamps and luminaires) | | √ |

Source: UK DECC, Green Deal and ECO Measures Update 2014, 7/12/2014

4.3 The Jessica fund in Lithuania

The Jessica Lithuania¹⁷ is a debt fund financed by EU Cohesion or Structural funding¹⁸. It focus on the energy efficiency renovation of existing private multi-apartment buildings in Lithuania. These type of buildings are common in many Eastern European countries. Just in Lithuania, there are about 24.000 buildings of this kind that need to be renovated (66% of the population lives in this type of buildings). Financing from the fund is combined with grants and technical assistance. The level of grants varies depending on the improvement of the energy efficiency (from 15% p to 35% grants). It is important to underline the important role that the public agency HUDA plays in this fund. This agency is in charge of raising awareness of the programme among the homeowner associations, helping homeowners to implement EE renovations, provide quality control during the whole project development, from identification to completion, and it is in charge of the administration of grants.

The typical renovation¹⁹ consists in improving the energy rating of the buildings from E to C, with an average energy saving of 63%.

Eligible investment includes²⁰: EE investment (insulation, window replacement, RE, replacement of energy related equipment), replacement of lifts and electrical network in common areas, replacement of water supply and draining pipes.

The process starts with a preliminary proposal discussed with the home owner association, production of an energy certificate before starting of the refurbishment, definition of an investment plan, work supervision, and finally production of a certificate after the works have been completed.

4.4 US PACE

This section will be based on the best practice standards for residential PACE drafted by the DOE²¹ and of the California First²² Pace programme.

Different approaches to develop PACE has been adopted by different states or local governments in the US, reflecting policy choices and characteristics of the specific jurisdictions.

The approach to define eligible investments, builds up on legislation, regulations, standards and resources at federal or State level. For instance, at Federal level, the DOE has developed residential energy efficiency analytical tools and resources, such as the DOE Home Energy Score, Home Performance with ENERGY STAR, the Standard Work Specifications, and systematic program guidance available through the Better Buildings Residential Program Solution Center. In addition, Pace also built up on the State legislation and regulation, such as in the case of California, the Title 24 Building Energy Efficiency Standard. This approach is similar to the EU, as the financial

¹⁷ From Frank Lee, FI experiences in energy efficiency. Fi-compass EIB January 2015

¹⁸ Three Jessica funds for residential buildings in Lithuania have been developed (Jessica I and II and a leverage fund

¹⁹ VIPA, Vaida Lauruseviciene, Lithuanian experience on financing instruments for energy efficiency, 27 4 2017

²⁰ JESSICA IN LITHUANIA: An Effort to Renovate Apartment Blocks

(http://ec.europa.eu/regional_policy/archive/funds/2007/jjj/doc/pdf/jessica/31032011_7jessica_nwp_310311_lt_apartment_blocks.pdf)

²¹ DOE, Best Practice Guidelines for Residential PACE Financing Programs November 2016

²² California first (<https://renewfinancial.com/product/californiafirst>)

instruments develop to finance residential building renovation also built up on EU and national regulations and resources.

Products and works finance by PACE have to meet the federal and state standards.

First, as mentioned by the DOE guidelines, the criteria for defining eligible improvements in the residential sector has to be consistent with the “public purpose” of the specific PACE, which generally includes environmental, health, energy independence, and economic development benefits. A PACE should have a clear process in place for defining the types of equipment and installations that are eligible for finance under the programme, such as an eligible products list (EPL). Programs should also have a process for reviewing contractors’ scopes of work to assure that all measures installed are not only PACE-eligible, but also meet or exceed the specifications detailed in the PACE program’s guidelines. Depending on the process taken, programs should also consider establishing a schedule and approach for updating eligible products as new measures meet eligibility criteria, and for approving custom efficiency measures.

PACE programs should provide information to help homeowners choose among eligible projects, including tools and resources to help homeowners evaluate the cost and savings of energy efficiency, renewable energy, water conservation, and other improvements.

DOE encourages energy assessments to identify comprehensive, cost-effective energy efficiency improvements relevant to an individual home. Only a qualified energy assessor should perform these assessments.

As a best practice, PACE programs should provide current homeowners, prospective purchasers, and future buyers with information on energy efficiency, water efficiency, renewable energy, and other improvements conducted through PACE financing.

The *California First Eligible Products List (EPL)* is an example of eligible products of a US PACE²³. The eligibility list is very detailed. It specifies the product category and type, the main characteristics of the product, whether or not a permit is required and the product’s life. For several products, the list makes reference to the title 24 of California legislation and other regulations or certifications. Although a homeowner can directly apply to the programme, in the majority of cases, it will need to be assisted by an energy expert. The normal approach foreseen in this PACE is that the homeowner selects a Participating Contractor who will help the homeowner identify the appropriate products for his home²⁴. All Eligible Products must be installed by a Participating Contractor. The programme recommends to carry out an energy and/or water diagnosis, before deciding the investments to be done.

5 Methodology to define eligible investments in EuroPACE

As indicated in the introduction, the definition of eligible investments is a key step in the process of identifying the renovation investments that can be carried out in a residential building. It is part of the investment cycle of the renovation, which includes the assessment of possible investments and of the expected results, identification

²³ <https://renewfinancial.com/product/californiafirst>

²⁴ California First: Residential Property Owner Handbook, October 2018

of the contractors that can carry out the works and project implementation. Based on the findings of the previous sections, we propose in this section an approach to define eligible investments.

5.1 General type of investments

Eligible investments should be consistent with the general objectives of the specific local authority developing a EuroPACE. They can just be limited to energy measures or include other type of investments, such as accessibility, health, safety or water savings. However, considering that EuroPACE main objective is improving the energy performance of buildings, energy related investments should be a substantial element of the investment financed by EuroPACE in a building. Eligible investment concern only existing buildings, as new buildings will not be financed by EuroPACE.

Investments promoted should improve substantially the energy performance of the building

In line with the objectives of the EU policy, EuroPACE should contribute to the development of deep renovations of buildings. It should promote high energy efficiency standards and the use of renewable energy in buildings, when technically and economically feasible. EuroPACE will help homeowners identifying cost effective measures to improve the energy performance of buildings. In case that the owner cannot or does not want to carry out a comprehensive renovation of buildings, EuroPACE should propose to the homeowner a sequence of works aiming at achieving the maximum possible improvement of the building energy performance. The investment list will include smart buildings or smart ready buildings, in order to facilitate demand side management and the integration of renewable energy sources through smart networks. It can include the connection of electrical vehicles to the grid. A similar approach that the one for energy-related investments will be applied the other type of investments that could be financed by EuroPACE.

In the case of individual investments, EuroPACE will promote the use of the most energy performing technologies, when it is technically and economically feasible. In line with this, the use technologies with a high energy performance rating (RE for heating and cooling, heat pumps, etc.) will be a key criterion to define eligible investments. Choosing the best available technologies to replace an equipment that has reached the end of its life, limits the risk that the equipment becomes prematurely obsolete, if climate policies become very strict in the long run.

The general approach is that eligible investments should comply with the requirements of the national standards for new buildings. When the new Energy Performance in Buildings Directive will be transpose into national legislation, these standards will be in line with the specification of Nearly Zero Energy buildings (NZEB), as all new buildings should be NZEB from 31 December 2022, according to the Directive. This implies that once the building is fully renovation in application of this approach, it will be similar to a NZEB²⁵.

EuroPACE can only finance non-energy related investments, if they are part of a package of investments in a building that includes energy related investments. The minimum percentage of energy related investment in the total will be defined for each EuroPACE initiative, depending on the local circumstances and specific objectives of the initiative.

²⁵ Ideally, the renovation should follow a certain order, in order to achieve an optimal solution, starting by the insulation of the building envelope. However, this approach is not always possible in practice.

5.2 Process of identification of eligible investments in a building

It is proposed that certified experts prepare the energy certificates of buildings, with the aim of helping homeowners identifying major renovations or packages of measures in a building. Similar initiatives than EuroPACE developed in the EU (such as Jessica Lithuania) also involve certified energy experts to help homeowner on this tasks, as mentioned in the previous section. The certified energy expert will carry out an ex-ante energy diagnosis that will propose possible investments and will assess the expected results in terms of improving the energy performance of the building and thus its energy rating. This diagnosis will include a brief analysis of the profitability of the different investments, using tools available or developed specifically for EuroPACE. The capacity of the certified energy expert to perform high quality assessments is a key element in the success of the initiative. In addition, renovations non related to energy will also be reviewed by an expert. Contractors will need to be certified to be able to participate in the EuroPACE programme.

For individual investments, it is proposed that the participation of an energy expert will not be mandatory and the homeowner can contact directly possible contractors. However, even for individual investments, it will be recommended that homeowner contact an energy expert. This experts or the contractor should recommend a sequence of investments to be carry out in the building. To ensure that major investments in the building are the appropriate ones, it is proposed that individual investments above certain amount (for instance 15.000 EUR) will be reviewed by an energy expert. We think that this approach minimize the risk that the solution offered by a contractor is not the optimal one.

In line with the Energy Performance of Buildings, Ecodesign and labelling directives, Energy performance certificates and product labels should play a key role in deciding the investments integrated in the eligibility list.

In addition, it is propose to produce an energy certificate of the building before and after the works for comprehensive renovations or large packages of measures.

The process described above is a combination of the approaches adopted in the EU, where the certified energy expert plays a key role in the process, with the approach of US PACE, where it is the certified contractors that plays this role. This approach aims at facilitating uptake, while ensuring that the investment financed by EuroPACE are optimal from an energy performance point of view.

For non-energy related investments, a similar approach is proposed. Therefore, it will be necessary that a renovation expert advice the homeowner in the case of major renovations, as indicated before.

5.3 Criteria to select eligible individual investments

These criteria vary depending on the type of investment.

Concerning comprehensive renovations, it is proposed that the investment should improves the Energy Certificate of the building by at least one notch. The building rating considered here is the one related to the energy performance of the building. Buildings with low ratings can improve significantly their energy performance with limited investment. Contrary, achieving a high rating (A/B) can imply substantial investments. An energy diagnosis will assess the possible level of improvement in the building. EuroPACE will recommend to the builder owners to implement all the profitable energy measures identified in the diagnosis, taking into account grants available. The energy diagnosis and certificate has to be carry out by a certificated energy expert.

For individual investments, the approach proposed varies depending whether it relates to the buildings envelop and energy consuming equipment or renewable energy production.

For investments related to the building envelop and energy consuming equipment, eligible investments will have to apply the minimum requirements of energy performance as defined by the relevant national legislation for new buildings. These standards concern, for instance, the minimum insulation of the building envelop, or of the roofs or of windows, or minimum energy label for energy consuming equipment. However, the authority in charge of implementing EuroPACE may decide to apply higher standards than the minimum established in the legislation. This decision will depend on the cost and benefits of going to higher standards and on the grants available.

Finally, for equipment producing renewable energy, such as PV, solar water heaters or biomass boilers, specific requirements in terms of type of technology, guarantees and estimated production, will be defined for each technology. The main objective of the eligibility requirements is to ensure that the eligible equipment is technically sound and that it produce the expected production of renewable energy.

5.4 Other criteria to select eligible investments

The eligible investments should apply the regulations and standards related to improving energy efficiency or promoting the use of renewable energy, as well as the general ones, such as the ones related to health and safety. Guarantees for the equipment and works should be in line with best practice standards. These requirements and guarantees will allow to gradually develop a Code of practice for the main type of investments financed.

In all cases, investments should use proven technologies.

5.5 Eligibility investment list

A local or regional entity that wants to develop an EuroPACE initiative will need to prepare an eligibility investment list. This list will identify concrete measures that can be financed by EuroPace and the eligibility criteria that these measures need to fulfil to be eligible to EuroPACE financing. It will not identify specific categories of products, neither specific brands. Table 3 is an example of eligibility list, inspired in the examples analyzed in the previous section. This table compiles possible measures, the eligibility criteria and the expected technical life of the investment. The technical life will be the basis to establish the loan duration.

The approach proposed to prepare the list of eligible measures is easy to put in place, as the identification of specific products or brands will be carried out by homeowners, with the assistance of energy experts and contractors. This list has to be regularly updated, to incorporate new measures or technologies. Section 6 lay down the detailed approach to define eligible energy measures and its main technical characteristics for Spain. This section is intended mainly for energy experts.

Table 3: First list of eligible investments to EuroPACE

| Measure | Eligibility criteria | Life (years) |
|---------------------------------|---|---|
| Comprehensive rehabilitation | <ul style="list-style-type: none"> -Full rehabilitation, including main recommendations of the rehabilitation expert (energy and non-energy) -Mandatory energy diagnosis -Renovations complying with the requirements of major renovations of the EPBD, as developed in each member state, are eligible -Other renovations not complying with the requirement of major renovations, improvements of the energy certificate rating should be defined in each EuroPACE initiative. According to the taxonomy, this renovations would be eligible if they deliver at least 30% of primary energy savings. -Individual investments should fulfil criteria listed below | <p>Weighted average of the different investments</p> <p>Max. 25</p> |
| Packages | <ul style="list-style-type: none"> -Package should include at least 2 of the energy related investments listed below -Mandatory energy diagnosis | <p>Weighted average of the different investments</p> <p>Max. 25</p> |
| Roof insulation | <ul style="list-style-type: none"> -Comply with the minimum requirements of the relevant national standards for new buildings -Mandatory review by an energy expert for investments above 15.000 EUR | 25 |
| External wall insulation system | <ul style="list-style-type: none"> -Comply with the minimum requirements of the relevant national standards for new buildings -Mandatory review by an energy expert for investments above 15.000 EUR | 25 |
| Basement insulation | <ul style="list-style-type: none"> Comply with the minimum requirements of the relevant national standards for new buildings -Mandatory review by an energy expert for investments above 15.000 EUR | 25 |

| | | |
|---|---|----|
| Cavity wall insulation | <ul style="list-style-type: none"> -Comply with the minimum requirements of the relevant national standards for new buildings -Mandatory review by an energy expert for investments above 15.000 EUR | 25 |
| Windows and exterior doors | <ul style="list-style-type: none"> Comply with the minimum requirements of the relevant national standards for new buildings -Mandatory review by an energy expert for investments above 15.000 EUR | |
| HVAC-Energy recovery ventilation system | <ul style="list-style-type: none"> -Comply with the minimum requirements of the relevant national standards for new buildings -Mandatory review by an energy expert for investments above 15.000 EUR -including air distribution system transportation, if necessary | |
| HVAC-Gas-fired condensing boilers | <ul style="list-style-type: none"> Minimum energy label required by the relevant national standards for new buildings. including replacement of the heat transportation (and insulation) and radiators, if necessary -Mandatory review by an energy expert for investments above 15.000 EUR | 20 |
| HVAC-Oil-fired condensing boilers | <ul style="list-style-type: none"> Minimum energy label required by the relevant national standards for new buildings . including replacement of the heat transportation (and insulation) and radiators, if necessary -Mandatory review by an energy expert for investments above 15.000 EUR | 20 |
| HVAC-Heat pumps Air-air Air-water | <ul style="list-style-type: none"> Minimum energy label required by the relevant national standards for new buildings. It includes replacement of the heat transportation (and insulation) and radiators, if necessary -Mandatory review by an energy expert for investments above 15.000 EUR | 15 |

| | | |
|--------------------------------------|---|-----------------------------|
| HVAC-Geothermal heat pump | <p>Minimum energy label required by the relevant national standards for new buildings including replacement of the heat transportation (and insulation) and radiators, if necessary</p> <p>-Mandatory review by an energy expert for investments above 15.000 EUR</p> | 20 |
| HVAC-Biomass boiler | <p>Minimum energy label required by the relevant national standards for new buildings Minimum including replacement of the heat transportation (and insulation) and radiators, if necessary</p> <p>Use of sustainable biomass</p> <p>Fulfilling local requirements on atmospheric pollution</p> <p>-Mandatory review by an energy expert for investments above 15.000 EUR</p> | 20 |
| HVAC-Central air conditioner | <p>Minimum energy label required by the relevant national standards for new buildings</p> <p>including replacement of the heat transportation (and insulation) and radiators, if necessary</p> <p>-Mandatory review by an energy expert for investments above 15.000 EUR</p> | 15 |
| Water heating- Electric | <p>Minimum energy label required by the relevant national standards for new buildings including replacement of the heat transportation (and insulation), if necessary</p> <p>-Mandatory review by an energy expert for investments above 15.000 EUR</p> | 10 with Tank 20 Tankless |
| Water heating- Gas | <p>Minimum energy label required by the relevant national standards for new buildings including replacement of the heat transportation (and insulation), if necessary</p> <p>-Mandatory review by an energy expert for investments above 15.000 EUR</p> | 10 with Tank 20 Tankless |
| Indoor lighting and lighting control | LED | 15 |
| Solar photovoltaic | Profitability analysis, based on site specific solar irradiation | 20 |

| | | |
|---|---|----|
| Solar water heaters | Profitability analysis, based on site specific solar irradiation | 15 |
| Connexion to a district heating network | The district heating should be based on high efficient cogeneration or renewable energy Including the cost of the heat exchanger and replacement of heat distribution and radiators if necessary | 20 |
| Micro-cogeneration | In line with the EU directive on cogeneration | 20 |
| Electrical infrastructure for smart charging electric vehicles and electric bikes | Requirements to be defined taking into account national regulations | |
| Smart buildings or smart-ready buildings | in order to facilitate the integration of renewable energy through smart grids Devices for the separate regulation of the temperature in each room or, where justified, in a designated areas | |
| Accessibility | Adaptation of access to the building Lifts | |
| Non-energy related refurbishment of facade and roofs | They should integrated measures to improve the energy efficiency, if economically and technically feasible | 25 |
| Rehabilitation of electricity network | For safety reasons or obsolete | 25 |
| Rehabilitation of water and water draining network | For safety or healthy reasons or obsolete | 25 |
| Water savings and water quality | Installation of low-flow kitchen and sanitary water fittings Other water saving investments Requirements on water quality, taking into account national regulations | 15 |
| Batteries | Requirements need to be specified and should be in line with national regulations | |

Source: Own elaboration

6 Definition of eligible energy investments for Spain

6.1 Approach

The eligibility criteria for the energy measures shown in the table in Section 6.2, are based mainly on compliance with the minimum requirements under current legislation for new buildings in Spain at the time of applying to join the programme. These requirements are currently set out in the Technical Building Code (TBC) 2013 and Regulations on Thermal Installations in Buildings (RITE) 2013. These regulations apply to interventions on the thermal envelope of the building, the lighting system etc., and the thermal installations of buildings. We have also included a fourth table, OTHER INDIVIDUAL ENERGY-RELATED MEASURES. The eligibility criteria for these measures are not set out either in the energy saving document (HE) of the Technical Building Code or the Regulation on Thermal Installations in Buildings (RITE), and we therefore consider it helpful to include them. These minimum requirements are briefly outlined below.

Specifically, for interventions on existing buildings the sections of the TBC 213 related to energy saving only require compliance with:

The limits of enclosures to be acted on (walls, floors, roofs, openings) to reduce the energy demand of the building, as shown in Table 2.3 of the HE1 (enclosed). As for the limit on consumption, there is no specific requirement, except in the case of extension to existing buildings.

Table 2.3 Maximum thermal transmittance and air permeability of elements of the thermal envelope

| Parameter | Winter climate zone | | | | | |
|--|---------------------|------|------|------|------|------|
| | a | A | B | C | D | E |
| <i>Thermal transmittance of walls and elements in contact with the ground¹ [Allm²·K]</i> | 1.35 | 1.25 | 1.00 | 0.75 | 0.60 | 0.55 |
| <i>Thermal transmittance of roofs and floors in contact with the air pAam²·K]</i> | 1.20 | 0.80 | 0.65 | 0.50 | 0.40 | 0.35 |
| <i>Thermal transmittance of openings² [W/m²·K]</i> | 5.70 | 5.70 | 4.20 | 3.10 | 2.70 | 2.50 |
| <i>Air permeability of openings³ [m³1h·m²]</i> | < 50 | < 50 | < 50 | < 27 | < 27 | < 27 |

(1) For elements in contact with the ground, the value indicated is required only in the first metre of buried wall, or the first metre of the ground perimeter supported on the ground to a depth of 0.50 m.

(2) The joint performance of glass and framework is taken into consideration. Includes skylights.

(3) The permeability of the carpentries indicated is that measured with an overpressure of 100 Pa.

It should also be noted that for new work, the requirement of the Technical Building Code 2013 is currently under review and will probably be modified during 2019.

The draft for the TBC 2019 was submitted for public inspection in 2018. The chapter on interventions in existing buildings and mandatory compliance therewith, in the item on limitation of energy consumption HE0, establishes the same requirement in its area of application for new work as for interventions on existing buildings. Among others, these include:

-Where the thermal generating installations and more than 25% of the total surface area of the final thermal envelope of the building are being renovated.

Table 3.1.a –HE0

Primary non-renewable energy consumption

Total

primary energy consumption (renewable and non renewable)

Table 3.1.a - HE0
Limit value $P_{ec,nren,lim}$ [kW·h/m²·year] for private residential use

| | Winter climate zone | | | | | |
|---|---------------------|----|----|----|----|----|
| | α | A | B | C | D | E |
| New buildings and extensions | 20 | 25 | 28 | 32 | 38 | 43 |
| Changes in use to private residential and alterations | 40 | 50 | 55 | 65 | 70 | 80 |

For non-mainland territory the values in the table are multiplied by 1.25

Table 3.2.a - HE0
Limit value $P_{ec,tot,lim}$ [kW·h/m²·year] for private residential use

| | Winter climate zone | | | | | |
|---|---------------------|----|----|----|-----|-----|
| | α | A | B | C | D | E |
| New buildings and extensions | 40 | 50 | 56 | 64 | 76 | 86 |
| Changes in use to private residential and alterations | 55 | 75 | 80 | 90 | 105 | 115 |

For non-mainland territory the values in the table are multiplied by 1.15

The commentary in this regard is that, although this is the type of intervention least often performed, the proposed requirement is high enough and we consider it to be difficult to meet, especially as the percentage of renovation of the envelope approaches 25%. This is because there are parameters that cannot be changed, for example, the compactness, volume and orientation, as well as the fact that there is little envelope surface on which to act.

-As for partial interventions on existing buildings, and the requirement on the limits of the closures to be intervened (walls, floors, roofs, openings) to reduce the energy demand of the building, we note that the level of requirement remains the same (at least in the draft) since Table 3.1.1.a- HE1 is practically identical to that published 6 years ago (TBC 2013)

Table 3.1.1.a- HE1 TBC 2019

Table 2.3 of HE1 TBC 2013

Table 3.1.1.a - HE1 thermal transmittance limit values, U_{lim} [W/m²K]

| Element | Winter climate zone | | | | | |
|---|---------------------|------|------|------|------|------|
| | a | A | B | C | D | E |
| Walls and floors in contact with external air (US, UM) Walls, floors and roofs in contact with non-habitable spaces (UNH) or with the ground (UT) Party walls (UMD) | 1.35 | 1.25 | 1.00 | 0.75 | 0.60 | 0.55 |
| Roofs in contact with external air (UC) | 1.20 | 0.80 | 0.65 | 0.50 | 0.40 | 0.35 |
| Openings (framework and glass) (UH) | 4.00 | 4.00 | 3.20 | 2.70 | 2.30 | 1.80 |

Table 2.3 Maximum thermal transmittance and air permeability of elements of the thermal envelope

| Parameter | Winter climate zone | | | | | |
|--|---------------------|------|------|------|------|------|
| | a | A | B | C | D | E |
| Thermal transmittance of walls and elements in contact with the ground ¹ [Allm ² ·K] | 1.35 | 1.25 | 1.00 | 0.75 | 0.60 | 0.55 |
| Thermal transmittance of roofs and floors in contact with the air pAam ² ·K] | 1.20 | 0.80 | 0.65 | 0.50 | 0.40 | 0.35 |
| Thermal transmittance of openings ² [W/m ² ·K] | 5.70 | 5.70 | 4.20 | 3.10 | 2.70 | 2.50 |
| Air permeability of openings ³ [m ³ h·m ²] | < 50 | < 50 | < 50 | < 27 | < 27 | < 27 |

(1) For elements in contact with the ground, the value indicated is required only in the first metre of buried wall, or the first metre of the ground perimeter supported on the ground to a depth of 0.50 m.

(2) The joint performance of glass and framework is taken into consideration. Includes skylights.

(3) The permeability of the carpentries indicated is that measured with an overpressure of 100 Pa.

We can see that the regulations are becoming increasingly demanding and are updated on a regular basis. However, there is an absence of bodies to oversee the requirements, at least with regard to the energy saving document, such as the limit on demand for heating and cooling and the minimum solar contribution. In conclusion:

-In energy rehabilitation it is more important to offer advice and ensure compliance with the regulations than to have a high requirement level.

-All information documentation, such as the energy efficiency certificate and the energy diagnoses, appear to be indispensable instruments in interventions on existing buildings, both for the beneficiary—because of the information they provide—and for any energy efficiency overseeing body that is qualified to monitor the results achieved.

6.2 Proposal for eligibility criteria of energy measures in Spain

In accordance with the general proposal set out in Section 5, the table below sets out the eligibility criteria for Spain, based on the previous approach

Table 2.3 Maximum thermal transmittance and air permeability of elements of the thermal envelope

| Parameter | Winter climate zone | | | | | |
|---|---------------------|------|------|------|------|------|
| | a | A | B | C | D | E |
| <i>Thermal transmittance of walls and elements in contact with the ground¹ [Alm²·K]</i> | 1.35 | 1.25 | 1.00 | 0.75 | 0.60 | 0.55 |
| <i>Thermal transmittance of roofs and floors in contact with the air pA_{air}²·K]</i> | 1.20 | 0.80 | 0.65 | 0.50 | 0.40 | 0.35 |
| <i>Thermal transmittance of openings² [W/m²·K]</i> | 5.70 | 5.70 | 4.20 | 3.10 | 2.70 | 2.50 |
| <i>Air permeability of openings³ [m³1h·m²]</i> | < 50 | < 50 | < 50 | < 27 | < 27 | < 27 |

- (1) For elements in contact with the ground, the value indicated is required only in the first metre of buried wall, or the first metre of the ground perimeter supported on the ground to a depth of 0.50 m.
- (2) The joint performance of glass and framework is taken into consideration. Includes skylights.
- (3) The permeability of the carpentries indicated is that measured with an overpressure of 100 Pa.

Table 3.1.a - HE0

Limit value $P_{ec,nren,lim}$ [kw·h/m²·year] for private residential use

| | Winter climate zone | | | | | |
|--|---------------------|-----------|-----------|-----------|-----------|-----------|
| | α | A | B | C | D | E |
| New buildings and extensions | 20 | 25 | 28 | 32 | 38 | 43 |
| Changes in use to private residential and alterations | 40 | 50 | 55 | 65 | 70 | 80 |
| For non-mainland territory the values in the table are multiplied by 1.25 | | | | | | |

Table 3.2.a - HE0

Limit value $P_{ec,tot,lim}$ [kw·h/m²·year] for private residential use

| | Winter climate zone | | | | | |
|--|---------------------|-----------|-----------|-----------|------------|------------|
| | α | A | B | C | D | E |
| New buildings and extensions | 40 | 50 | 56 | 64 | 76 | 86 |
| Changes in use to private residential and alterations | 55 | 75 | 80 | 90 | 105 | 115 |
| For non-mainland territory the values in the table are multiplied by 1.15 | | | | | | |

Table 3.1.1.a - HE1 thermal transmittance limit values, U_{lim} [W/m²K]

| Element | Winter climate zone | | | | | |
|--|---------------------|------|------|------|------|------|
| | α | A | B | C | D | E |
| Walls and floors in contact with external air (U_s , U_M) | | | | | | |
| Walls, floors and roofs in contact with non-habitable spaces (U_{NH}) or with the ground (U_T) | 1.35 | 1.25 | 1.00 | 0.75 | 0.60 | 0.55 |
| Party walls (U_{MD}) | | | | | | |
| Roofs in contact with external air (U_c) | 1.20 | 0.80 | 0.65 | 0.50 | 0.40 | 0.35 |
| Openings (framework and glass) (U_H) | 4.00 | 4.00 | 3.20 | 2.70 | 2.30 | 1.80 |

7 The definition of eligible investments for Olot

In the initial phase, Olot will focus on comprehensive rehabilitations of a building and packages of measures. The involvement of an energy expert will be mandatory. This expert will identify the most appropriate energy related measures to be implemented, in agreement with the owner of the building.

The technical solution adopted should improve the energy certificate to a “D” and, in case the dwelling already had an energy qualification of “D” or above, the project should improve the qualification of at least 1 notched. Major renovations, as defined in the specific national legislation (transposing the EPBD) should comply with the requirements of this national legislation.

All measures integrated in the project must meet the specification stated in Table 3 (First list of eligible investments of EuroPACE).

Finally non-energy investments, such as lifts, kitchens and bathrooms can be included if at least 30% of the investment cost corresponds to energy-related investments.