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D4.1 – Report on Regulatory Framework and Incentive Systems in the Med Countries

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PUBLISHABLE EXECUTIVE SUMMARY

The project is aimed at stimulating the market uptake of deep retrofitting of buildings, with special regard to the Mediterranean area and to the residential built stock, by tackling major bottlenecks such as the fragmentation of the supply chain, the lack of transparency and of the perceived reliability of the interventions, of adequate financial support mechanisms, of integration among the relevant aspects connected to retrofitting, the low return on investments, or the lack of a retrofit approach clearly tailored for the Med environments. To this extent, the project will be acting on the following complementary themes: engagement and empowerment of target groups such as owners, inhabitants, building professionals; technological insight for the development of optimized one-stop shop packages of solutions for deep and beyond retrofitting; financial solutions for supporting the market uptake of deep retrofitting, and proposal of suitable changes in the regulatory frameworks.

In the above described Project framework, the analysis of the regulations and of the financial solutions employed to foster the energy efficiency improvements in the existing building stock play a crucial role. The present deliverable is related to the Work Package 4 entitled "Finance and Regulation", in particular to the Task T4.1. entitled "Individuation of reference financial solutions".

The aim of this Deliverable is to provide an in-depth analysis of the different national policies aimed at supporting and promoting energy efficiency in buildings. Firstly, the European regulatory framework regarding the energy efficiency policies in buildings is presented, by focusing on the EPBD Directive, on the EED Directive. Then, an overview of the main instruments to incentivize the energy efficiency in building renovation is provided, by distinguishing between the consolidated and innovative systems. Furtherly, the regulatory framework and the incentive systems for each MED Country, taking part to the present Project, is revised. In the final remarks, the importance of the analysis carried out in the present document is underlined and suggestions for improving energy efficiency and achieve the binding EU targets are provided.

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ACRONYMS AND ABBREVIATIONS

All acronyms and abbreviations (AAs) used in the report should be listed in alphabetical order in the table below (other than symbols for units of measurement) in the following way:

AAs	Acronyms and Abbreviations
EEAP	Energy Efficiency Action Plan
EECs	Energy Efficiency Certificates
EEFIG	Energy Efficiency Financial Institution Group
GSE	Gestore Servizi Energetici SpA
IACP	Independent social housing associations
HVAC	Heat Ventilation Air conditioning
ENEA	EX Ente per le nuove tecnologie, l'energia e l'ambiente Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile
M.D.	Ministerial Decree
MS	Member State
NES	National Energy Strategy

AAs must be defined the first time they are used in the text of the report, and AAs should not be introduced if they are not used again in the document.

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1 INTRODUCTION

The project is aimed at stimulating the market uptake of deep retrofitting of buildings, with special regard to the Mediterranean area and to the residential built stock, by tackling major bottlenecks such as the fragmentation of the supply chain, the lack of transparency and of the perceived reliability of the interventions, of adequate financial support mechanisms, of integration among the relevant aspects connected to retrofitting, the low return on investments, or the lack of a retrofit approach clearly tailored for the Med environments. To this extent, the project will be acting on the following complementary themes: engagement and empowerment of target groups such as owners, inhabitants, building professionals; technological insight for the development of optimized one-stop shop packages of solutions for deep and beyond retrofitting; financial solutions for supporting the market uptake of deep retrofitting, and proposal of suitable changes in the regulatory frameworks. On this basis, the project will act on the demand side by ensuring a comprehensive and integrated framework of conditions for enhancing the overall appeal, convenience and reliability of deep renovations market, through the proposal of a holistic MedZEB approach conceived for the retrofitting market uptake in Southern Europe. In particular, this result will be pursued thanks to: 1) an integrated ICT platform, aimed at facilitating the matching between demand and offer; 2) the construction of a system of guarantees aimed at building trust among the different segments of the retrofitting supply and value chain; 3) the activation of three main Pilots, as well as of smaller ones, for testing the project outputs directly on-the-field of deep and beyond retrofitting interventions: in the pilots, the residential stock will be the main target (private/public), but HAPPEN will also explore other typologies and functions, for the widest replication of the project outputs across the Med space.

In the above described Project framework, the analysis of the regulations and of the financial solutions employed to foster the energy efficiency improvements in the existing building stock play a crucial role. The present deliverable is related to the Work Package 4 entitled "Finance and Regulation", in particular to the Task T4.1. entitled "Individuation of reference financial solutions".
In this Task an in-depth analysis of the different national policies aimed at supporting and promoting energy efficiency in buildings and of the related tax incentive systems will be performed in the different MED countries, also in relation with the EU regulatory framework. The following paragraphs will contain a description of the energy efficiency policies in the different countries.
This Task shows some initial elements of a research effort still in progress, aimed at developing a methodology in order to direct the financial resources to the energy efficiency way (sources which are currently available and enormous), through public programs and, in a different form, through private initiatives – towards actions to improve urban quality. The research considers some operative ways to take action on urban places whose management straddles public and private partnerships – tending in certain ways to complicate the distinction between the two types of spaces – through an approach aimed at bridging the gap between public finance and private investors through new forms of collaboration.

The research studies how this goal might be achieved, through an appropriate use of the financing leverage for energy efficiency, which is in fact the main financial opportunity available today on a large scale for refurbishment in the urban fabric, at a national and European level.

1.1 Aims and objectives

Energy efficiency is commonly managed on a single building scale, essentially by focusing attention on reducing energy consumption; this eminent technical approach is limited for the built environment. As an alternative, the research takes into account some methodologies and instruments that – by relying on energy efficiency measures, at times in fact orient precisely towards obtaining benefits on the scale of the individual building – can consequently play an important role in regenerating urban areas. This kind of approach is presented as a genuine paradigm shift in the energy efficiency's definition, taking into consideration not only the buildings, but also the whole urban environment at a local scale, including impacts on the urban life's quality.

It is important to highlight some other aspects of the reasoning underlying the following considerations.

Firstly, the problem of identifying new supporting forms for urban renovation is becoming increasingly important in recent years. This condition is determined by the budgetary constraints at which many public administrations are subjected, and also by the diminishing, in the current economic circumstances, of setting up public-private partnerships; this has drastically reduced the options for intervention, particularly on public spaces.

Secondly, the true definition of "public space" in sharp opposition to "private space" appears increasingly blurring: public activities are carried out in private spaces and the other way around. While this lack of clarity creates uncertainties, it is at the same time a mode that cannot currently be neglected, and, in this specific case, may have beneficial implications.

Thirdly, the lines of reasoning that have been set out favor a small or medium-small operations scale, with an awareness which the contemporary city is marked by the fragmentation of ownership and of design aptitudes, in the attempt to intercept and redirect this parcelization of players and beyond large-scale operations, increasingly unlikely planning actions.

Lastly, and consequently, an initial approach is proposed to improve the financial mechanisms that facilitate the implementation of energy renovation interventions, in order to have an effect on public spaces as much as on private ones: in other words, on the city.

This paper will therefore argument financial issues, starting from the analysis of the building stock in Europe characterized by an increasingly complex articulation between public and private, and by a multitude of situations involving the allocation of funds for retrofitting. Then, considerations about ways of matching offer and demand to finance the energy renovation of the privately-owned building stock will be described. Interventions on the different scales (HVAC, building, open space) will be considered from a technical and financial point of view. Lastly, the consequences of the various possible interventions on the urban environment as a whole will be analyzed.

1.1.1 European Building Stock Overview

In Europe more than 60% of building stock was built after the Second World War and before the two oil crises of the 1970s, when building energy codes on reducing energy consumption began to be adopted. Therefore, to date, most of the buildings are not energy efficient, and from this standpoint their characteristics are marked by an increasingly clear and unsustainable inadequacy.

Built or open, urban spaces are one of the main sources of direct or indirect energy consumption; direct consumption deriving from heating and cooling needs of the activities carried out in the enclosed spaces (buildings); indirect consumption derives largely from urban heat islands caused by the open spaces where roads, buildings, and any built surface in general absorb and release solar radiation. A valid operating definition of energy efficiency is "using less energy to provide the same or a better service".

Typically, energy efficiency is a subject discussed from a merely technical standpoint, with an eye to reducing consumption (heating/cooling, lighting, transportation...). However, energy consumption may be figured out as one of the final steps in a long process that starts with applying the quantity of human work needed to acquire the energy itself; it is, in the final analysis, a matter of transforming human energy into mechanical or electrical energy. From this point of view, the subject of energy efficiency, even before dealing with the issues of reducing pollutants and safeguarding the environment, regards directly the issue of the quality of life of the individual – and of urban life, the aggregation of individuals, in a broader sense.

In 2007, the world population living in urban centers passed the 50% amount; by 2050, the urban population in Europe should attain a steady equilibrium, while developing countries are expected to see this percentage double by then, with an urban population climbing to 5 billion people. As things currently stand, cities cover about 2% of the earth's surface while consuming about 70% of global resources (United Nations, 2014).

In this context, the pursuit of environmental sustainability is a global priority, and energy efficiency and renovation are among the main tools taken into consideration to achieve this goal. In Western countries, energy consumed by the building stock represents about 45% of the total energy bill: this percentage is higher than the energy consumption by industry and transport. This figure refers first of all to components that may be directly involved in "traditional" energy efficiency processes, such as the building envelope and HVAC, but also indirectly, to the spaces surrounding the built environment.

Some institutions, such as the United Nations Environment Program Finance Initiative and the European Commission Directorate-General for Energy, have put together various programs aimed at carrying out environmental improvement interventions, and have consequently allocated large financial resources: for example, the European Fund for Strategic Investments allocated € 315 billion.

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1.2 Report Structure

The present report is divided into five main chapters. Starting form an overview of the EU regulatory framework for the sustainable building renovation (chapter 2), the financial solutions available in EU for supporting the market uptake of the deep retrofitting will be analyzed (chapter three). Then, for each MED country, taking part to the HAPPEN Project (see Table 1), the regulatory framework and the incentive systems will be revised (Chapter 4). In the final remarks, the importance of the analysis carried out in the present document is underlined and suggestions for improving energy efficiency and achieve the binding EU targets are provided.

Partners into the Project		
No.	**Participant**	**Role of Participant in T4.1**
1	CNR	Contributor for T4.1
2	CertiMaC(CER)	Contributor for T4.1
3	Harley& Dikkinson(H&D)	**Task leader** for T4.1
5	Etablissement Public d'Aménagement Euroméditerranée (EPA)	Contributor for T4.1
6	ENERGEIAKO GRAFEIO AIGAIOY (AEA)	Contributor for T4.1
7	Gradbeni inštitut ZRMK, d.o.o.(ZRM)	Contributor for T4.1
8	IRENA – Istrian Regional Energy Agency ltd (IRE)	Contributor for T4.1
9	Cyprus Energy Agency (CEA)	Contributor for T4.1
10	Universidad de Sevilla (USE)	Contributor for T4.1
11	Instituto Valenciano de la Edificacion (IVE)	Contributor for T4.1
12	Agence des Villes et Territoires Méditerranéens Durables (AVI)	Contributor for T4.1
13	Entidad de Infraestructuras de la Generalitat (EIG)	Contributor for T4.1

Table 1- HAPPEN Project Partners

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2 EU REGULATORY FRAMEWORK FOR THE ENERGY EFFICIENCY POLICIES

Starting from the late '70s, there was a succession of policies and technical standards, which have largely affected the design and the energy quality of buildings.
A general overview of the main policies is proposed in the next paragraphs and a timeline of the key-EU legislation affecting the energy use in building in Europe in the last twenty years is reported in Figure 1.

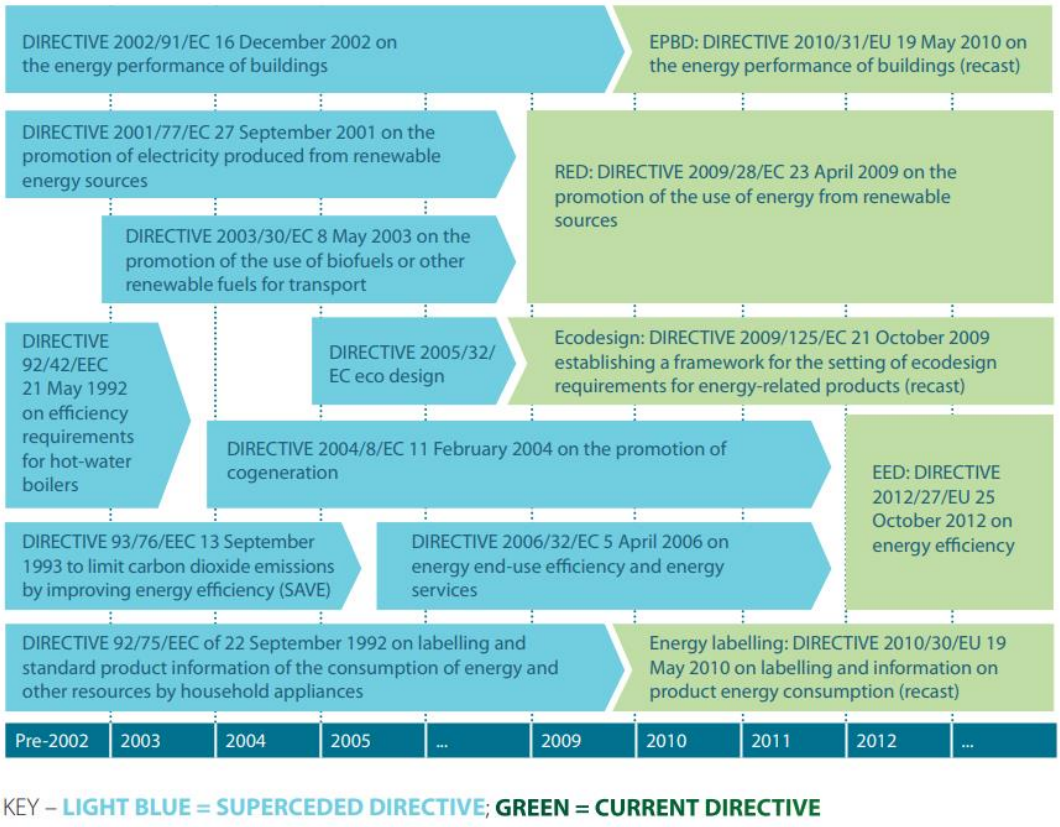

Figure 1 - Timeline of key EU legislation affecting energy use in buildings (Renovation Strategies of selected EU Countries, BPIE Report, 2014)

2.1 Energy Performance Building Directive EPBD 2002/91/EC

The Energy Performance of Buildings Directive (EPBD) is the European Union's main legislative instrument aiming to promote the improvement of the energy performance of buildings within the Community. It was inspired by the Kyoto Protocol which commits the EU and all its parties by setting binding emission reduction targets.
The Energy Union and the Energy and Climate Policy Framework for 2030 establish ambitious European Union (EU) commitments to further reduce greenhouse gas emissions (at least 40% by

2030), to increase the share of renewable energy consumed (at least 27%), and to save at least 27% energy with a review "having in mind an EU level of 30%" to increase Europe's energy security, competitiveness and sustainability.
The EU is already achieving energy efficiency progress. Although the decline in energy consumption could be partly attributed to the economic crisis and its aftermath of restrained production, EU energy efficiency policies have also played a significant role in decoupling economic activity from energy consumption.
The first version of the EPBD, directive 2002/91/EC, was approved on December the 16th 2002 and entered into force on January the 4th 2003. EU Member States (MS) had to comply with the Directive within three years of the inception date (January the 4th 2006), by bringing into force necessary laws, regulations and administrative provisions. In the case of lack of qualified and/or accredited experts, the directive allowed for a further extension in implementation by 4 January 2006.
The Directive required that the MS strengthen their building regulations and introduce energy performance certification of buildings. More specifically, it required member states to comply with Article 7 (Energy Performance Certificates), Article 8 (Inspection of boilers) and Article 9 (Inspection of air conditioning systems).

2.2 Renewable Energy Directive of 2009 (RED, 2009/28/EC)

Another important piece of energy policy for the building sector is the Renewable Energy Directive of 2009 (RED, 2009/28/EC) which replaces the Directive 2003/30/CE for the transport sector and the 2001/77/CE for the energy consumption deriving from RES in the electricity sector.
"This Directive sets the binding targets for RES to be implemented". It focusses on achieving, by 2020, a 20% share of RES in EU overall energy consumptions. This is in line with the targets set in the Climate and Energy Package for 2020, which represents the headline targets for Europe 2020 strategy for smart, sustainable and inclusive growth.
More in depth, the RES targets aim to reduce pollution and GHG emissions. This Directive sets rules to improve the market transparence in renewable energy sector and foresees National Action Plans for each Member State by the 2010.
It refers not only to the electric energy but also to thermal energy for both civil and industrial sector.
This EU Directive helps also to achieve the more ambitions targets to be achieved by 2030, set in the 2030 Climate and Energy Framework, which are:

- At least 40% cuts in GHG;
- At least 27% of RES implemented;
- At least 27% in Energy Efficient improvement;

The Framework was adopted by EU leaders in October 2014 and it builds the 2020 Climate and Energy Package. It is aligned with the long term perspective set out in the Roadmap for moving to a competitive low carbon economy in 2050, the Energy Roadmap and the Transport White Paper.

2.3 EPBD RECAST[1]2010/31/EU

Directive 2002/91/EC was later on replaced by the so-called "EPBD recast", which was approved on 19 May 2010 and entered into force on 18 June 2010.
The EPBD (2010/31/EU) was designed to lay out concrete actions in order to achieve energy savings in buildings and reduce the differences among Member States in this sector. The Directive foresees measures to improve the energy performance of buildings while taking into account climatic and local conditions, indoor-conditions and cost-effectiveness (EC 2010). The Directive put in place a number of important provisions to be implemented by each Member State including the setting of a minimum energy performance requirement for new buildings (Article 4), for major renovations (Article 7) and for the installation, replacement or retrofit of technical building systems (Article 8). It also established the requirement for all new buildings to be nearly zero energy by 2021 and public buildings by 2019 (Article 9) and established also the obligation of including energy performance certificates in all advertisements for the sale or rental of buildings (Article 12).

This version of the EPBD (Directive 2010/31/EU) broadened its focus on Nearly Zero-Energy Buildings, cost optimal levels of minimum energy performance requirements as well as improved policies. The four key points of the Directive are:

- a common methodology for calculating the integrated energy performance of buildings;
- minimum standards on the energy performance of new buildings and existing buildings that are subject to major renovation;
- systems for the construction of new buildings and buildings, prominent display of this certification and other relevant information. Certificates must be less than five years old;
- a regular inspection of boilers and central air-conditioning systems in buildings and in addition an assessment of heating installations in which the boilers are more than 15 years old.

The common calculation methodology should include all aspects that determine energy efficiency and not just the quality of the building's insulation. This integrated approach should take account of aspects such as heating and cooling installations, lighting installations, the position and orientation of the building, heat recovery, etc.
The minimum standards for buildings are calculated on the basis of the above methodology. The Member States are responsible for setting the minimum standards.
The Directive concerns the residential sector and the tertiary sector (offices, public buildings, etc.). The scope of the provisions on certification does not, however, include some buildings, such as historic buildings, industrial sites, etc. It covers all aspects of energy efficiency in buildings in an attempt to establish a truly integrated approach.
The Directive does not lay down measures on moveable equipment such as household appliances. Measures on labelling and mandatory minimum efficiency requirements have already been implemented or are envisaged in the Action Plan for Energy Efficiency.

[1] In the EU Jargon "Recast" means a full revision of the measure"

Energy performance certificates should be made available when buildings are constructed, sold or rented out.
The Directive specifically mentions rented buildings with the aim of ensuring that the owner, who does not normally pay the charges for energy expenditure, should take the necessary action.
Furthermore, the Directive states that occupants of buildings should be enabled to regulate their own consumption of heat and hot water, in so far as such measures are cost effective.
The Member States are responsible for drawing up the minimum standards. They will also ensure that the certification and inspection of buildings are carried out by qualified and independent personnel.
The Commission, with the assistance of a committee, is responsible for adapting the Annex to technical progress. The Annex contains the framework for the calculation of energy performances of buildings and the requirements for the inspection of boilers and of central air conditioning systems.
A crucial point in the EPBD recast was the introduction of the requirement according to which requirement all new construction have to be nearly zero-energy buildings from 2021 (2019 for buildings owned and occupied by public authorities). Then **nZEB Building** is defined as:" a building with very high energy performance where the nearly zero or very low amount of energy required should be extensively covered by renewable sources produced on-site or nearby" (BPIE (2015), Factsheet). To this extent, national plans have to be implemented in order to achieve the nZEB building standard. There is also the need for each country to define the nZEB taking into account the local conditions and by providing a value for the primary energy use. Information regarding the political and financial measures to achieve the target have to be provided.
Moreover, it is underlined that "when setting minimum energy performance requirements, the general indoor climate conditions shall be taken into account in order to "avoid possible negative effects"" (EPBD, Article 4, Renovation strategies of EU selected Countries).
An example of the nZEB application for the different EU countries is provided in Figure 2 and Figure 3.

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Table 1 – Cross-country overview of the main aspects related to national nZEB definitions in EU28 (and Norway) — nZEB definitions

Country	Status of the definition	Main reference(s)	Year of enforcement		nZEB definition for new buildings					nZEB definition for existing buildings		
			Public	Non-public	EPBD scope of nZEB definition [1]	Numerical indicator	Maximum primary energy [kWh/m²y]		Share of renewable energy	Other indicators	Status of the definition	Maximum primary energy [kWh/m²y]	
							Residential buildings	Non-residential buildings				Residential buildings	Non-residential buildings
Austria	✓	OIB Guidelines 6	1/01/2019	1/01/2021	✓ [7]	✓	160	170 (from 2021)	Minimum share proposed in the draft of OIB guidelines for all buildings	EP, CO_2	✓	200	250 (from 2021)
Belgium - Brussels	✓	Amended Decree of 21/12/2007	1/01/2015	1/01/2015	✓	✓	45	~90 [2]	✓ Qualitative	EP, OH	✓	54	~ 108 [2]
Belgium - Flanders	✓	Regulation of 29/11/2013	1/01/2019	1/01/2021	✓	✓	30% PE [5]	40% PE [5]	✓ Quantitative [4]	EP, OH	Under development		
Belgium - Wallonia	Under development	Consolidated report to EC	1/01/2019	1/01/2019	✓	Under develop-ment			Quantitative	EP	Under development		
Bulgaria	Still to be approved	National nZEB Plan, BPIE study	1/01/2019	1/01/2021	✓	Still to be approved	~30-50	~40-60	Quantitative	EP	As for new buildings	~30-50	~40-60
							Included in the calculation; building needs to comply with class A					Included in the calculation; building needs to comply with class A	
Croatia	✓	Regulation OG 97/14, National nZEB Plan	1/01/2019	1/01/2021	✓	✓	33-41[3]	Under de-velopment	Minimum share in current requirements for all buildings	EP	ND		
Cyprus	✓	Decree 366/2014, Law 210(I)/2012	1/01/2019	1/01/2021	✓	✓	100	125	✓ Quantitative	EP	✓ As for new buildings	100	125
Czech Republic	✓	Regulation 78/2013 Coll.	2016-2018 depending on size	2018-2020 depending on size	✓	✓	75-80% [2,5]	90% [5]	✓ Quantitative	EP, TS	✓ As for new buildings	75-80% [2,5]	90% [5]
Denmark	✓	Building Regulations 2010	1/01/2019	1/01/2021	✓	✓	20	25	✓ Qualitative	EP, OH, TS	✓ As for new buildings	20	25
Estonia	✓	Regulation 68:2012	1/01/2019	1/01/2021	✓ [7]	✓	50-100 [2]	90-270 [2]	✓ Qualitative		✗		
Finland	Under development	Consolidated report to EC	1/01/2018	1/01/2021	✓ [7]	ND			ND		ND		
France	Definition of Positive Energy Buildings under development [8]	Thermal Regulation 2012, National nZEB Plan	28/10/2011	1/01/2013	✓	✓	40-65 [2,3]	70-110 [2,3]	✓ Quantitative [4]	EP, OH, TS	✓	80 [3]	60% PE [2]
Germany	Under development	KfW Efficiency House, National nZEB plan	1/01/2019	1/01/2021	✓	Under develop-ment	40% PE [5]		Minimum share in current requirements for all buildings	EP	Under development	55% PE [5]	
Greece	Under development	Law 4122/2013	1/01/2019	1/01/2021	ND	ND			Minimum share in current requirements for all buildings		Under development		
Hungary	Under development	Amended decree 7/2006, study by University of Debrecen	1/01/2019	1/01/2021	✓	Under develop-ment	50-72 [2]	60-115 [2]	✓ Quantitative	EP	Under development		
Ireland	✓	Draft definition in National nZEB Plan	1/01/2019	1/01/2021	✓	✓	45	~60% PE [5]	✓ Quantitative [4]	CO_2	Under development	75-150	

Figure 2 - Cross-country overview of the main aspects related to national nZEB definitions in EU28 (BPIE (2015), Factsheet)

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Table 1 – Cross-country overview of the main aspects related to national nZEB definitions in EU28 (and Norway) — nZEB definitions

Country	Status of the definition	Main reference(s)	Year of enforcement		nZEB definition for new buildings					nZEB definition for existing buildings		
			Public	Non-public	EPBD scope of nZEB definition [1]	Numerical indicator	Maximum primary energy [kWh/m²y]		Share of renewable energy	Other indicators	Status of the definition	Maximum primary energy [kWh/m²y]	
							Residential buildings	Non-residential buildings				Residential buildings	Non-residential buildings
Italy	Still to be approved (under publication)	Draft of the new EPBD decree	1/01/2019	1/01/2021	✓	Still to be approved	Included in the upcoming updated version of the National nZEB Plan [2,3]		Quantitative	EP, TS	✓ As for new buildings	Included in the upcoming updated version of the National nZEB Plan [2,3]	
Latvia	✓	Regulation 383/2013	1/01/2019	1/01/2021	✓	✓	95	95	✓ Quantitative	EP	✓ As for new buildings	95	95
Lithuania	✓	Regulation STR 2.01.09 :2012	1/01/2019	1/01/2021	✓	✓	Included in the calculation; building needs to comply with class A++		✓ Quantitative	EP	✓ As for new buildings	Included in the calculation; building needs to comply with class A++	
Luxembourg	✓ Details to be fixed	National nZEB Plan	1/01/2019	1/01/2021	✗ [6]	✓	Included in the calculation; building needs to comply with class A-A-A		✓ Qualitative	EP, CO_2	ND		
Malta	Under development	National nZEB Plan	1/01/2019	1/01/2021	✓	Current values to be revised	40	60	Qualitative	EP	ND		
Netherlands	✓	National nZEB Plan	1/01/2019	1/01/2021	✓	✓	Included in the calculation; building needs to comply with energy performance coefficient = 0		✗	EP	ND		
Norway	Under development	Presentation by Research Centre on Zero Emission Buildings	1/01/2021	1/01/2021	✓	Under development			Minimum share in current requirements for all buildings	CO_2 (main indicator), EP, TS	ND		
Poland	Under development	Consolidated report to EC	1/01/2019	1/01/2021	✓	Under development	60-75 [2]	45-70 [2]	✗		ND		
Portugal	Under development	Law 118/2013	1/01/2019	1/01/2021	✓	In current requirements for buildings			✗		ND		
Romania	✓	National nZEB Plan	1/01/2019	1/01/2021	✓	✓	93-217 [2,3]	50-192 [2,3]	✓ Quantitative	CO_2	ND		
Slovakia	✓	Decree 364/2012	1/01/2019	1/01/2021	✗ [6]	✓	32-54 [2]	34-96 [2]	✓ Quantitative	EP	ND		
Slovenia	Still to be approved	Official Journal 17/14, National nZEB Plan	1/01/2019	1/01/2021	✓	Still to be approved	45-50 [2]	70	Under development	EP	Still to be approved	70-90 [2]	100
Spain	Under development	Decree 235/2013	1/01/2019	1/01/2021	✓	Under development	Included in the calculation; it is foreseen that buildings will need to comply with class A		Minimum share in current requirements for all buildings	CO_2 (main indicator)	Under development		
Sweden	Under development	National nZEB Plan	1/01/2019	1/01/2021	✓	Under development	30-75 [2,3]	30-105 [2,3]	✗		ND		
UK (England)	✓ Details to be fixed	National nZEB Plan, presentation by Zero Carbon Hub	1/01/2018 (from 2016 for residential buildings) [9]	1/01/2019 (from 2016 for residential buildings) [9]	✓	✓	~ 44 (2)	ND	✓ Qualitative	CO_2 (main indicator), EP, TS	ND		
							Included in the calculation; building will need to comply with carbon emissions ~ 0						

Figure 3 - Cross-country overview of the main aspects related to national nZEB definitions in EU28 (BPIE (2015), Factsheet)

The Directive forms part of the Community initiatives on climate change (commitments under the Kyoto Protocol) and security of supply (the Green Paper on security of supply). Firstly, the Community is increasingly dependent on external energy sources and, secondly, greenhouse gas emissions are increasing too. The Community can have little influence on energy supply but can influence energy demand. One possible solution to both the above problems is to reduce energy consumption by improving energy efficiency.

Energy consumption for buildings-related services accounts for approximately one third of total EU energy consumption. The Commission considers that, with the right initiatives in this area, significant energy savings can be achieved, thus helping to attain objectives on climate change and security of supply. Community-level measures must be framed in order to deal with such Community-level challenges.

This Directive is a follow-up to the measures on boilers (92/42/EEC), construction products (89/106/EEC) and SAVE programme provisions on buildings.

Though there is already a directive on the energy certification of buildings (Directive 93/76/EEC repealed by Directive 2006/23/32/EC), it was adopted in a different political context before the Kyoto agreement and the uncertainties with the security of energy supply in the Union.
It does not have the same objectives as Directive 2002/91/EC. The latter is an additional instrument, proposing concrete action to fill any existing gaps.

2.4 Energy Efficiency Directive - EED 2012/27/EU

The EED (2012/27/EU) was designed to achieve a 20% energy consumption reduction target across the EU. The Energy Efficiency Directive puts in place a number of important provisions to be implemented by Member States including the requirement to establish binding national energy efficiency targets (Article 3), national building energy efficiency strategies (Article 4), a requirement to renovate 3% of public sector buildings each year (Articles 5 and 6), the need to establish energy efficiency obligation schemes (Article 7), and provisions for auditing and metering (Articles 8-12). The most important Article of the Directive (Article 7) requires Member States to implement Energy Efficiency Obligations and/or alternative policy instruments in order to reach a reduction in final energy use of 1.5% per year (Rosenow et al. 2016). Article 7 is expected to deliver more than half of the required energy savings of the 20% reduction target and is therefore the most important component of the EED in terms of its contribution (EC 2011).

2.5 "Winter Package": strategy and vision document with targets for 2030 and 2050

On the 30th November 2016 the EU Commission published the "so-called "Winter Package" of eight proposals to facilitate the transition to a "clean energy economy" and to reform the design and operation of the European Union's Electricity Market" (Allen & Overy - Hancher and Winters, 2017).
The EPBD is the proposed legislative instrument in the Winter Package directly related to buildings. The "Winter package" however includes other instruments (e.g. the Communication Accelerating Clean Energy in Buildings), as well as other directives (EED, Renewable Energy Directive, IEM) that will have an impact on the performance of the EU building stock and the speed at which it will be renovated. This section will cover the main changes proposed in the EPBD.

As it can be red in (Allen & Overy - Hancher and Winters, 2017), the proposals may be divided into three categories:

- the first group of measures "is aimed to bringing about a new market design – also known as the market design initiative (MDI) and includes a new directive amending and repealing Directive 2009/72 (EDirective)[2], a new regulation on the internal electricity market, amending and repealing Regulation 714/2009 (E-Regulation) [3], as well as a new regulation repealing Regulation 713/2009 on the ACER (ACER Regulation) [4] , usually referred to as the third package of electricity market liberalisation measures" (Allen & Overy - Hancher and Winters, 2017);

- "The second category of measures aims to better align and integrate climate change goals into this new market design. This category includes a fully revised Renewables Directive 2009/28 (RED)[5] and a fully revised Energy Efficiency Directive 2012/27 (EED)[6], both to enter into force on 1 January 2021" (Allen & Overy - Hancher and Winters, 2017);
- "The proposal for a new regulation on risk-preparedness in the electricity sector (the Risk Regulation)[7] and a proposed regulation on Governance of the Energy Union (the Governance Regulation)[8] (both to enter into force on 1 January 2021) are entirely new measures" (Allen & Overy - Hancher and Winters, 2017).

In particular, as stated in the Working paper prepared by BPIE (Buildings Performance Institute Europe) in 2017, "the Winter Package proposes a 30% energy savings target by 2030, instead of the 27% initially discussed in the 2030 Energy Strategy (EC 2014). The target relates to a reduction of primary energy compared to a 2007 baseline. The Commission's analysis suggests that a 30% target represents a drop in final energy consumption of 17% by 2030 compared to 2005 (EC 2016b)."
Previous analysis has demonstrated that the cost-effective potential for energy efficiency exceeds 30% of primary energy compared to a 2007 baseline significantly (Braungardt et al. 2014) and this is one of the reasons the European Parliament has called for a 40% target by 2030 (EP 2016).
This means there is the possibility of a more ambitious target just for economic reasons. This is also illustrated by analysis in the Commission's impact assessment of the EED which shows substantial economic benefits from a more ambitious target (EC 2016c).
The other main change regarding the headline target is the nature of the target. Previously, the 20% target was non-binding and Member States were required to indicate their individual contributions to that target to the European Commission.
As outlined above, the EED previously required Member States to set targets for 2020. This potentially provided a disincentive to Member States regarding the promotion of technologies with long lifetimes and longer payback periods. The 1.5% target now extends to 2030 and for 10 years beyond unless it is stated that this is no longer necessary in order to meet the EU's energy targets. This change will provide to the investor certainty over 20 years' time horizon and is an improvement in the current version of Article 7.
However, by creating a new "starting point" in 2021, the EED provides a new opportunity for slippage in attainment. The revised Article 7 introduces a new savings period (2021-2030) in addition to the existing period (2014-2020). For each period, cumulative savings equivalent to 1.5% added each year (minus exemptions and exclusions) must be achieved by the end of the period. In a process that requires sustained, growing savings over time, claimed measures that are no longer delivering savings must be replaced either in situ, or with new measures. Under the EED today, savings by technologies installed before 2020 with lifetimes coming to an end before 2030 would need to be replaced in order to keep the same level of energy efficiency improvements. Using data from Forster et al. (2016), we estimate that by 2030 about 18% of all measures implemented before 2020 will no longer deliver savings in 2030 and beyond, and those currently do not need to be replaced. This is equivalent to 7% of the sum of the cumulative savings delivered over both periods. In other words, resolving the issue of short lifetimes and replenishing 'old' savings would lead to 7% more energy savings over the period

2014-2030. The cumulative savings in policy measures and required replacement compared to baseline [ktoe] are depicted in Figure 4.

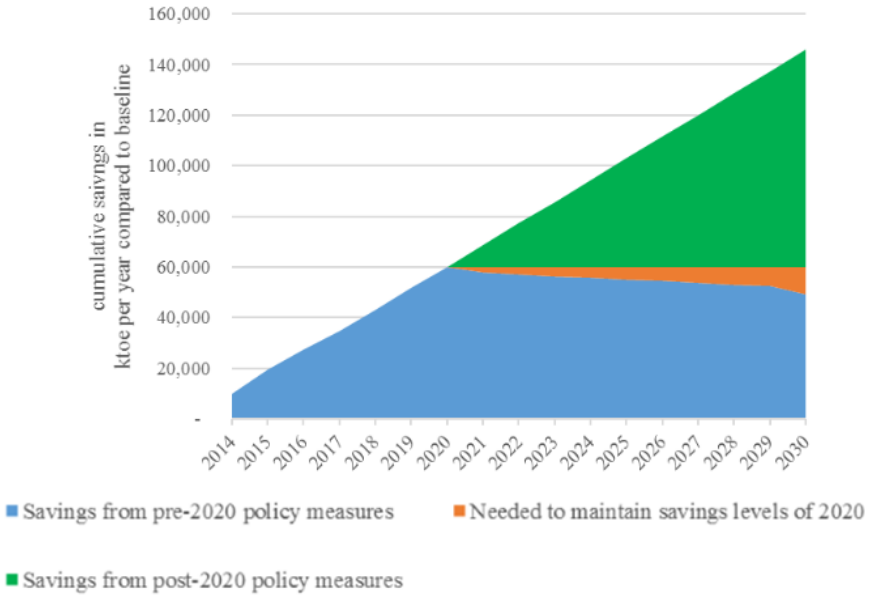

Figure 4 - Cumulative energy savings from policy measures and required replacement compared to baseline [ktoe] (Rosenow, J. et al (2017))

This matter becomes more severe over time and by 2040 only about ¼ of all savings resulting from measures implemented before 2020 are still 'alive'. The most straightforward answer to this problem is to require Member States to account for savings erosion from earlier measures as they leave the system and to compensate for them with additional savings in the relevant time period (2020 - 2030).
As described before, Article 7 requires Member States to implement measures that achieve 1.5% annual incremental savings of final energy sales in the period 2014-2020. The new period in which 1.5% savings have to be achieved is 2021-2030.
In a previous leaked version of the proposed EED the wording was not clear, this implies that Member States could potentially count against future years' incremental savings requirements (in the period 2021-2030), savings from measures that were delivered before 2020, provided their lifetimes extend beyond 2020. Based on data provided by Forster et all. (2016), we estimate that this effect could has reduced the level of ambition under the EED between 2020 and 2030 by 84%.
The Article 7 now clearly says that new savings from new measures are required. With the last proposal, it will continue to deliver new savings at the same rate as before 2020.
A number of exclusions and exemptions currently allow Member States to reduce the 1.5% target - this has resulted in planned savings of just ~0.75% per year (Rosenow et al. 2016). In the proposed EED the same exclusions from the baseline can be made (transport, non-energy use). The exemptions remain the same but they now include renewable energy produced and consumed in the same place. The inclusion of renewables within the exemptions has a little impact on the level of energy savings

required given that almost all Member States fully use the exemptions up to the 25% maximum already (Forsteret al. 2016).

With the proposed revisions for the EPBD in the Winter Package, the Commission aims at streamlining existing provisions and ensuring consistency with other policies (i.e. EED) rather than introducing new requirements and substantial changes that would strengthen the Directive. The limited number of proposed revisions concern a focus on long term renovation strategies (previously Article 4 of the EED, now moved to the EPBD), a vision for a decarbonised building stock by 2050, the introduction of a smartness indicator for buildings, and the mobilisation of finance.
While there are some interesting new elements, such as the introduction of a smartness indicator (Article 8), the proposal fails to introduce new provisions to trigger a more efficient, healthier, more comfortable and affordable building stock. The role of buildings in the transition to a sustainable, decarbonised and secure energy system, which should also be supported across the Package, is hardly recognized. (Rosenhow et. al 2017).

The proposed directive confirms the continuation of national renovation strategies after 2020. The strategies should deliver a long-term roadmap with clear and specific milestones and measures for 2050 and 2030 (Article 2a). The proposal also states that the EU building stock should be decarbonised by 2050, but omits to provide a definition of decarbonised building stock or to require Member States to adopt a long-term renovation target in line with the ambition for all new buildings to be nearly zero energy.
While national building renovation strategies for Member States have been moved from the EED to the EPBD, in an attempt to increase consistency between all building related provisions, provisions obligating Member States to achieve 3% renovations for public buildings per year (Article 5 of EED), usually paired with Article 4, remains under the EED breaking the link between national renovation 10strategy and public buildings. Considering the general poor quality of the first renovation strategies (BPIE 2014), Member States would benefit from stringent guidelines, but specific requirements to follow existing guidelines on the content of national renovation strategies as well as a clear methodology on how to measure progress in implementing them are also missing.

Increasing the current EU renovation rate from about 1% per annum to 2-3% is necessary to meet both the EU targets and the commitment undertaken in Paris in December 2015. About 75% of the EU's 210 million buildings are not energy efficient, and 75% to 85% will still be in use in 2050. Ensuring that the rate and quality of energy renovations is of almost importance to achieve EU's 2030 and 2050 targets.
However, the long-term vision for 2050 established in Article 2a is not supported by provisions that could stimulate the realisation of deep renovation strategies across the EU, like the introduction of minimum energy performance levels for the renovation of specific building typologies such as commercial and public buildings, the extension of the requirement to renovate central government buildings (Article 5 EED) to cover all public buildings or the identification of "trigger points" in order

to accelerate energy renovation and capitalize on existing renovation plans (by reducing also the number of interventions and manage renovation costs at the same time).
Despite the proven economic and technical feasibility and the social and environmental benefits that building renovation could bring presented in the impact assessment (EC 2016d) (the EC estimates that 1.5 million to 8.3 million households would be taken out from fuel poverty if the most ambitious measures would be applied and more than 500 thousand additional jobs would be retained or created), the proposed amendments to the EPBD do not address market and regulatory failures. The Directive should be updated to create the right conditions for a direct action on the market and harmonising specific elements of the directive (e.g. targets for buildings in 2030, harmonisation of EPCs, inclusion of multiple benefits in the cost-optimal calculation framework).
The majority of expected activities would stem from decisions taken by national, regional and local authorities, with little guidance regarding the approach that would best to deliver results and the risk of delivering modest outcomes.

3 FINANCING BUILDING ENERGY RENOVATION IN EU COUNTRIES

Energy Efficiency has been represented in (COM (2011) 0109 final) as the EU's biggest energy resource "and one of the most cost effective ways to enhance the security of its energy supply and decrease the emissions of greenhouse gases and other pollutants" (EEFIG, Final Report, 2015).
Financing Energy efficiency in buildings represents a crucial challenge due to many barriers hampering the investments. Among these barriers, the most important are long pay back times, high transaction costs, risk exposure, scarce owners financial capability and the split incentives.
Therefore, as reported in (BPIE, 2010), "specific instruments have been successfully implemented both at European and national level to overcome financial barriers".
Ideally, a generic financial investment is expected to bring high returns quickly; this aspect tends to orient investors, for example, towards hedge funds, instruments that generally require a large capital in order to be significant. Conversely, funds managed directly by public institutions, are expressly conceived to get the public sector involved in agreements to share risks, by significantly leveraging the financing of private investments: "allocation of risk between the public and private partners consistent with their willingness and ability to mitigate risks, in order to encourage the private partner to mobilise financing" (IEA, 2011).
These financial instruments are conceived to incentivize the financial leverage effect: by catalysing additional financing from the public sector and resources from the private one, for example through co-investment and co-financing, they increase the total capital to implement energy efficiency measures.
Financial instruments help make it possible to implement national or regional supply chains for the energy renovation of building stock: the purpose is to permit long-term planning and economies of scale in supplies and services. Planning is essential, in order to be able to finance programs to renovate buildings on a large scale, involving national and local financial institutions called upon to contribute towards making assessments, towards providing technical consulting, and lastly towards delivering the financing.

In order to finance the renovation of the building stock, a variety of instruments have been developed over time, based on the principle of recovering the capital invested in energy efficiency and renovation measures through savings on energy bills. Some of these instruments have been on the financial market since the dual oil crises of the 1970s (1973 and 1979), and consist mainly of subsidies, loans, funds, and tax incentives. Also EU financial opportunities such as funding programs and structural funds are available. Some examples are the ELENA facility and the JESSICA mechanism.
Other more innovative instruments include energy performance contracts, third-party financing, and energy efficiency certificates (referred to as "white certificates"). All these instruments assume that the net cost of investing in energy renovation interventions on the building stock is negative, as it can produce a return for investors.
Each MS adopts its own regulations, in compliance with the EPBD Directive and with the EED, concerning the improvement of the energy efficiency in buildings. An analysis on the policies and instruments proposed in 2016 by Sahed (Sahed Y. 2016) showed that 43% of them are financial and fiscal measures (In particular of the 43%, 90% of them are grants) and "many instruments are designed to work together or to be a part of a policy package"(Economidou M., Bertoldi P., 2014) as shown in Figure 5 for the EU Countries.

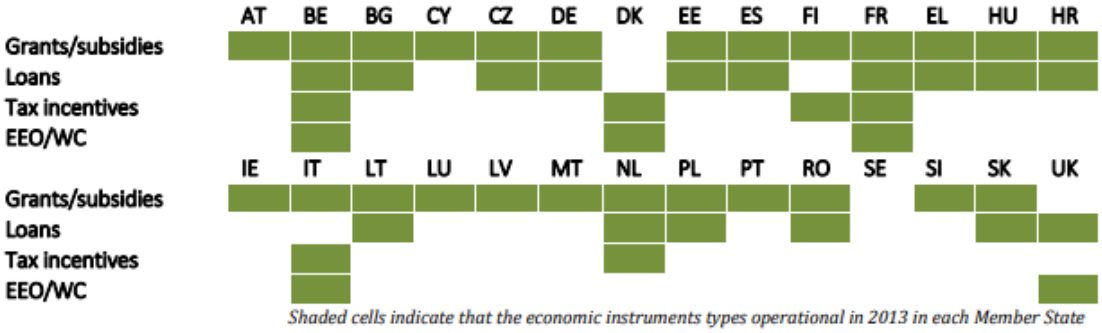

Figure 5 - Main EU 28 economic instruments for energy renovations [Economidou M., Bertoldi P, 2014.]

A comprehensive description of both the traditional and of the innovative financing systems for building renovation is reported in (Economidou M. –Bertoldi P., 2014, BPIE 2010, EEFIG, Report 2015). It is deemed important to show here the results reported in (EEFIG Final Report 2015). In fact, during the EEFIG work's (EEFIG, Final Report 2015), "participants identified 16 different financial instruments for energy efficiency investing in buildings of which 7 instruments are considered as "mature "and widely used to fund energy efficiency investments directly or indirectly and 9 other "emerging" instruments which are newer but have a varying potential to increase energy efficiency investing in EU buildings" (EEFIG, Final Report 2015).
EEFIG experts assessed the possible impact of the identified 16 financial instruments on energy efficiency investments in buildings and the results are depicted in (EEFIG Final Report, 2015] and herewith in Figure 6.
Each financial instrument was rated by the participants regarding its applicability to support the "energy efficiency investment flow in each buildings market segment using the following scores (EEFIG Final report 2015):

- Score 0 if instrument is "not applicable" (Mature) or has "zero potential" (Emerging);
- Score 1 if instrument is "marginally useful" (Mature) or has "some potential" (Emerging);
- Score 2 if instrument is "useful" (Mature) or has "potential" (Emerging);
- Score 3 if instrument is "very useful" (Mature) or has "strong potential" (Emerging).

Mature Financial Instruments	Commercial	Public	Public Rental	Private Rental	Owner Occupied
Dedicated Credit Lines	3	2	3	3	3
Energy Performance Contracting (Undertaken by Private Sector)	3	3	3	1	1
Risk-Sharing Facilities	2	1	2	2	2
Direct and Equity Investments in Real Estate and Infrastructure Funds	2	1	1	2	0
Subordinated Loan	1	1	1	1	1
Covered Bonds	1	1	1	0	0
Leasing	0	1	0	0	0

Emerging Financial Instruments	Commercial	Public	Public Rental	Private Rental	Owner Occupied
On-Bill Repayment	2	1	2	3	3
On-Tax Finance (PACE)	2	1	1	2	3
Energy Efficiency Investment Funds	3	2	2	1	1
Energy Services Agreement	3	3	2	1	1
Public ESCOS for Deep Renovation of Housing	0	0	3	2	2
Factoring Fund for Energy Performance Contracts	2	2	1	1	0
Public ESCOS for Deep Renovation of Public Buildings	0	3	3	0	0
Green Bonds	2	1	0	0	0
Citizens Financing	0	0	0	1	2

Figure 6 - Results of the EEFIG survey on Financial Instruments for energy efficiency investments in buildings [EEFIG Final Report, 2015]

In the following paragraphs a survey if the main incentives are carried out by distinguishing between the consolidated financial instruments and the innovative ones.

3.1 Consolidated financial instruments and incentives

To date, established financial instruments have shown limitations in supporting retrofitting measures; in particular, they have failed to offer solutions to the needs of institutional investors, and to the technical complexity and the fragmentation of the majority of interventions on residential buildings.
The scale and extent of these interventions require private finance greater involvement.
The financing of deep retrofits has shown to be particularly demanding for financial institutions, given the long (usually multi-decade) payback period, the specific technical skills for their assessment, and the high administrative costs due to the specific size and amount.
In this part of the document, only the consolidated instruments are analyzed.

3.1.1 Grants/Subsidies

These are economic incentives generally applied "when governments consider that the market will not provide the optimal level of energy efficient investments because of the access to the capital" [BPIE, 2010]

As reported in [Economidou, Bertoldi, 2014], over 70% of the grants/subsidies schemes are allocated for residential buildings and the target groups are households, housing associations, public authorities. By means of these instruments different measures are supported as building envelope improvements, retrofit measures and renewable energies for heat generation systems.
The main advantage of these incentives is that they have a direct impact on the market, by directly filling in an intermediate financial gap. In this way, a temporary shift in the market is enabled. On the other hand, the main disadvantages of this kind of incentives is that they are based on limited resources and therefore they show scarce flexibility; they seem to have a short lasting impact on the market, and therefore they cannot support massive market uptake. Moreover, subsidies often involve recipients, "who would have carried out the investments even without the incentive, the so called free-riders" (Economidou M, Bertoldi P., 2014). Therefore, in order to reduce the "free ridership" phenomenon, a proper design of the grant schemes has to be performed.
Different grant schemes are available in EU up to 2013 (Economidou M, Bertoldi P., 2014) and their intensity is mainly affected by different parameters as energy performance improvements, target group, innovativeness of technology.
The grant schemes are mainly implemented by the Governments and funded by national and regional budgets.
In order to evaluate **the effectiveness of the grant instruments**, a proper assessment should be carried out. However, there is not an ex-ante and/or an ex-post assessment regarding the implemented programs for the EU countries, as shown in (Economidou M, Bertoldi P., 2014) and therefore it is extremely difficult to evaluate their effectiveness.

3.1.2 Tax Incentives

Tax reduction/ exemption tax credit represent the most common type of instrument and represent a cheaper instrument to promote energy efficient use, when compared with subsidies or grants. In fact, the revenues deriving from taxation compensate for the tax loss due to the tax incentive scheme.
Generally, these incentives are aimed at stimulating investments in specific technologies and or measures in the field of building envelope improvements, building technical systems connection to the district heating and renewable heat and electricity generation systems (Economidou, Bertoldi, 2014)
Therefore, it may be understood that a positive impact on innovative technology characterizes these incentives, whose the target groups are usually households or commercial companies which "are typically allowed to declare tax benefits for one or more measures mostly based on their own choices or needs" (Economidou P., Bertoldi M., 2014).
These kind of measures act as relevant financial tools because "they specifically target the liquidity barrier, and aim at creating demand from the market. Offer significant flexibility (more room for market transformation and creativity is given)" (BPIE, 2010).
Governments and their agencies implement tax incentive schemes and it is not possible to comment if they are successful or not regarding the response capacity of the target groups, because "None of the tax incentive scheme are attached with a specific target" [Economidou M, Bertoldi P., 2014].

Tax incentives has shown a positive impact on the reduction of the incidence of the undeclared work in the construction sector. In fact, when participants are encouraged to deduct costs by the tax system, they are incentivised to "receive services from workers in the legal sphere." (Economidou M., Bertoldi P., 2014).
However, the main drawbacks of the tax incentives are that they are often characterized by "lack of transparency: often not understood by all actors in the market. Needs to last a long time to make sure the market has time to adjust and has created adequate, long lasting tools" [BPIE, 2010]. Moreover, a few data are available to **evaluate the cost efficiency** of the tax schemes. It seems that tax incentive schemes have a less cost-effectiveness when compared with white certificates or energy saving obligation schemes (Economidou M, Bertoldi P., 2014).

3.1.3 Dedicated Credit Lines

A highlight of this instrument is provided in (EEFIG Final Report, 2015) and it is here reported. "Dedicated credit lines (or soft loans) are a mechanism where public funding decreases the cost of energy efficiency building renovation loans and provides concessions on terms, such as repayment periods. The impact and relative success of dedicated credit lines can also be attributed to their retail distribution through networks of private banks" (Appendix 5.3 in (EEFIG Final Report, 2015))."Thanks to the long-term track-record and backing of several of the EU's public financial institutions, together with private sector distribution partners, dedicated energy efficiency credit lines are widely used (and tailored to local conditions). They tend to provide good leverage and mixing for public with private finance, can offer long maturities and low costs and can be used as an instrument from within ESIF 2014-2020 or as a compliment. Often the promoting financial institutions of dedicated credit lines have strongly defined the development of the sector they serve and continue to help develop comprehensive frameworks, simplifying procedures and aiming to reduce processing times and other transaction costs via a "one-stop" standardised approach, lists of eligible materials and equipment (LEME) and strengthened MRV (Measurement, Reporting and Verification)" (EEFIG Final Report, 2015). Moreover, always in the Appendix 5.3 of that document, an exhaustive analysis can be found. The main advantages and weaknesses of this instrument are underlined.
Among the advantages, for example, there are:

- "the leverage effect of public funds is usually between 4 and 10 which is higher than traditional grants";
- "Standardised supply offering at the same time flexibility according to individual preferences (repayment, interest rate fixation etc.)";
- "The use of Cohesion funds for soft loans in housing is facilitated with the "renovation loan" (off-the shelf instrument)";
- "Can be used for ambitious renovation/refurbishing project as well as for individual measures: large flexibility;
- "Usually offers longer duration than commercial loans;"

Among the weaknesses:

- "Capacity/ willingness of owners to take more debt (ie very country dependent)";

- "Risk aversion of banks (calling for guarantees from Governments)";
- Often complicated, time consuming and static application processes which act as a hurdle for projects;
- Loans often require the additional implementation of costly non-energy related measures which change project characteristics" (Appendix 5.3 in (EEFIG Final Report, 2015)).

3.1.4 Risk Sharing

Always taking into account what described in (Appendix 5.3 in (EEFIG Final Report, 2015)), "Risk-sharing facilities (Guarantee funds and First-loss Facilities) reduce the risks for banks and equity investors by covering part of the risk of payment default – either through a guarantee or first-loss absorption. They can be combined with dedicated credit lines and are a key instrument to grow the amount of bank lending to energy efficiency renovation". Among the advantages of this facilities (Appendix 5.3 in (EEFIG Final Report, 2015)):

- "Reduces the risks for banks and enables them to lend greater amounts";
- "Anecdotal evidence suggests that energy efficiency loans experience "market standard" or better credit performance therefore risk sharing facilities can be a transition phase until energy efficiency loans are mainstreamed";
- "Provides extra leverage for private sector funds".

Among the weaknesses (Appendix 5.3 in (EEFIG Final Report, 2015)):

- "Time to structure and negotiate";
- "Moral hazard if substantially all risk is removed from bank lending";
- "Know-how to implement at regional and local government levels".

3.1.5 Direct and Equity Investments in Real Estate and Infrastructure Funds

In (Appendix 5.3 in (EEFIG Final Report, 2015)), it can be red that: "Real Estate and Infrastructure funds already provide a large amount of 'invisible' energy efficiency investment in the building sector. This investment takes place during a fund's investment life cycle, new developments, renovation, planned and preventive maintenance and active building management. Real Estate investment funds are a key channel to scale up finance in energy efficiency in buildings, both through increased equity investments in the funds and through increased fund activity in energy efficiency, where it can be facilitated by strong regulatory and market frameworks". Among the advantages of this instrument (Appendix 5.3 in (EEFIG Final Report, 2015)):

- "Existing instruments well established existing instruments across the EU";
- "High leverage effect - Limits need for public funding";
- "Rewarding companies' efforts to reduce their assets' obsolescence risks by investing in best performers";
- "Sustainability and environmental criteria can be embedded as part of company's due diligence and valuation process";

- "Fund managers can influence companies' environmental policies in relation to energy efficiency".

Among the weaknesses of Real estate and Infrastructure Funds (Appendix 5.3 in (EEFIG Final Report, 2015)):

- "Difficult to estimate proportion of funds invested in energy efficiency";
- "Limited to cost effective investment within the investment timeframe of each fund";
- "Should deliver adequate return investment performance returns to investors, aligned with the investment risk, and (if possible) measurable and comparable to financial instruments that provide a similar level of returns";
- "In the absence of specific regulatory requirements, achievements will occur but could be limited to best practice within the industry, or to focus on the low-hanging fruit, e.g. just "quick wins"".

3.2 Innovative incentives and financial instruments

In this paragraph some financial instruments, for which there are expectations, given their capability to attract both investors and building owners, are presented.

3.2.1 Energy efficiency investment funds

Funds dedicated to energy efficiency are one of the models implemented through investment instruments. They offer medium- and long-term loans at low interest rates, as they are targeted to building renovation, and are granted mainly to third-party investors or to owners. They have proven attractive to socially responsible investors (SRI) that intend to combine their financial objectives with attention to the issues of environmental sustainability (sustainable finance), and to investors interested in the energy efficiency markets.
These funds ensure a financial critical mass, the absence of which hinders energy efficiency investments, particularly in residential and commercial buildings, because of their complexity and pervasiveness, and the small size of the individual projects.
Among the disadvantages of the Energy Efficiency Investment Funds (Appendix 5.3 in (EEFIG Final Report, 2015)):

- "High return and liquidity requirements may entail a focus on short and medium paybacks, not tapping higher energy savings potential".

3.2.2 Energy Performance Contracting

This is a contract by which a utility finances, develops, and distributes efficiency measures. It makes it possible to manage interventions as a service that the building owners pay for through energy savings, with no initial costs for the owners. It was developed as an alternative to using own financing or capital dedicated to energy renovation.

The energy services agreement is a slightly different contractual type, in which the utility takes over paying the building owner's bills, while the owner pays a yearly commission, generally an amount agreed upon on the basis of historic energy consumption.
Among the advantage of this instrument assessed in (Appendix 5.3 in (EEFIG Final Report, 2015)):

- "Turnkey contract: The Energy Performance Contract represents a one stop shop for the customer, with only one counterpart for the entire duration of the contract;
- Guaranteed savings: Energy Performance Contract provider manages the performance risks - Professionalism and expertise of Energy Performance Contract providers;
- Energy Performance Contract provider can bring financing or facilitate access to finance through savings guarantee".

3.2.3 On -Tax Finance-Property Assessed Clean Energy (PACE)

Property Assessed Clean Energy, or PACE, was initially introduced in the city of Berkeley to allow the municipal government to provide the financial resources for retrofitting measures. It offers the possibility for building owners to link financing, in whole or in part, to the property assessment. The financing that is delivered is recovered through an agreed-upon increase in the assessment of the property that is the object of the intervention, usually over a 20-year period. Among the advantages of this instrument, assessed in (Appendix 5.3 in (EEFIG Final Report, 2015)):

- "Can overcome the split incentive between user and owner as it is connected to property (or corporate asset) not user;
- "Overcomes the "split incentive over time" (i.e. short detention/occupancy time for buildings) as repayment obligation can be passed attached to the asset on to the next owner/user - Reduces the default risk (taxes are the most senior debt) - Can be used to finance deep renovation if that is the intention of the scheme - Can be run with public or private finance".

Among the weaknesses, as depicted in (Appendix 5.3 in (EEFIG Final Report, 2015)):

- "Impact on public debt if financed through public money";
- "Legal complications related to the lien priority can occur";
- "Some mortgage lenders can refuse to finance PACE mortgages because in case of default PACE loans are paid off before the main mortgage is paid to the lender".

3.2.4 On-Bill Repayment

Repayment through the energy bill corresponds to the amount owed to finance the interventions.
The improvement measures are usually financed by utility companies, by multi-utilities, or by a third-party institution, where the repayment is automatically charged to the energy bill. Among the advantages in (Appendix 5.3 in (EEFIG Final Report, 2015)):

- "Energy savings connected to energy bills";
- "Public sector actors and utilities are more trusted by decision makers";
- "Reduces transaction costs";

- "Can overcome the split incentive between user and owner as it is connected to property (or corporate asset) not user";
- "Overcomes the "split incentive over time" (ie short detention/occupancy time for buildings) as repayment obligation can be passed attached to the asset on to the next owner/user";
- "Overcomes the lack of finance capacity of homeowners and SMEs".

3.2.5 Public ESCos for deep retrofit

Financing the deep retrofit of buildings requires decades of payback, usually between 15 and 25 years. These periods are not easily handled by private financial institutions, mainly because of issues of liquidity, profitability, and risk. Consequently, public ESCos have been set up as an instrument to provide integrated consulting, design, and financing for owners. The advantages depicted in in (Appendix 5.3 in (EEFIG Final Report, 2015)) are:

- "Overcomes lack of capacity of public authorities and homeowner associations";
- "Creates a trusted entity which makes investing easier";
- "Debt could be securitised once it reaches the right scale";
- "Potential way to overcome the lack of willingness of private ESCOs to finance long-term investments through Energy Performance Contract";
- "A transitional instrument to demonstrate the feasibility and create a market for private ESCOs in the future";
- "Public sector actors are trusted by homeowners and public authorities";
- "Targets deep renovation"

Among the weaknesses in (Appendix 5.3 in (EEFIG Final Report, 2015)):

- "Impacts on public debt";
- "May crowd out private sector ESCOs";
- "Energy Performance Contract seems technically feasible on multifamily buildings, but the main obstacles remain the split incentives (in rental housing) and the long payback times".

3.2.6 Third-party financing

This financial mechanism, based on a stable cash flow, is done via the energy savings achieved, usually withdrawn directly from the bill by the energy provider (Energy Charter Secretariat, 2003).
There are two contractual arrangements of reference, depending on who is doing the financing and taking the risk – the property owner or the ESCo.
In the first arrangement, it is the owner that takes out the financing and is exposed to the risk of not achieving the expected energy savings. This is the emerging arrangement, and the one of reference in residential interventions. Since the residents' behaviour is an unknown that can impact the savings brought by efficiency interventions, the risk is borne by the owner, which can share it with any tenants, to offset the differences between certified performance and the savings actually achieved.

In the second contractual arrangement, the ESCo borrows the financial resources for the interventions and collects on the energy savings for the measures' amortization period. The ESCo or financial institution takes on the risk of not achieving the planned savings.

4 MED REGULATORY FRAMEWORK

4.1 Italian regulatory Framework

The current chapter briefly explains the main changes about the promotional measures of the energy efficiency at a national level in 2017. These measures are aimed to reach the binding goal of a reduction of the energy consumption by 25,5 Mtoe in the 2014 – 2020 period.

4.1.1 Overview of Measurements for Energy efficiency

4.1.1.1 *The National Energy Strategy*

The 2017 National Energy Strategy was adopted since November the 10th 2017 with the M.D. of the Economic Development Minister and the Environment Minister. The NES 2017 is a ten-year planning document that establishes the activities to develop in the energy field until 2030, according to the European roadmap until 2050. The main goal is to achieve the Country's competitiveness enhancement, the achieving of the environmental goals and the increase in the energy supply. The expected energy efficiency target for 2030 is an energy saving of 10 Mtoe, with a reduction on the final consumptions from 118 to 108 Mtoe. Moreover, the expected public and private investment for energy efficiency and renewable sources is approximately € 110 billion out of the € 175 billion needed. The interventions in the residential, industrial, transport and the services sectors, will contribute directly to the enhancement of the environmental sustainability of the energetic system.

4.1.1.2 *Tax deduction*

The 2017 Budget Law, has postponed the 65% tax deduction by one year, until December the 31th 2017 for refurbishment works that involve each single housing unit, and by five years, until December the 31th 2021 for redevelopment works involving common parts of the residential building (Civil Code, art 1117 and 1117-bis) or involving all the housing units of each single residential building. Moreover, for these renovation works and only for residential buildings, the beneficiaries can choose to transfer their tax credit to the company that has done the renovation works or transfer it to private subjects, with the opportunity to transfer it once again, according to the steps defined by the Measure taken by the Tax Revenue Agency Director on the 10th August 2017, (which replaces the previous Measure of June the 8th 2017). This Measure includes the possibility for those subjects that are in the "no tax area" to transfer the tax credit according to the deduction also to banks and financial institutions.

The Law n. 205/2017 (27th December 2017- Budget Law), confirms the tax deduction mechanism ("ECOBONUS") in order to give an incentive and promote the energy refurbishment interventions in

residential buildings, by introducing some new developments about deduction rates, interventions and, technical conditions.
The deduction rate was reduced from 65% to 50% for the expenses incurred in 2018 for the following interventions:

- Windows including windows frame;
- Solar shading;
- Replacing of heating/cooling systems with new systems equipped with an energy efficiency class A condensation boiler;
- Heat generators working with combustible biomass.

The new interventions introduced by the 2018 Budget Law, involve the microgeneration by replacing the current systems; it involves also interventions allowed to reduce the seismic risk made simultaneously to the interventions in the common parts of the residential buildings.

The shows details of more or less 422.000 interventions made in 2017, divided by type, giving a total of more than € 3,8 billions of investments activated, with a total energy saving of 0,1064Mtoe/year. The energy saving net of renewable sources is 0,1032 Mtoe/year.

TAX DEDUCTION FOR ENERGY REFURBISHMNET INTERVENTIONS IN EXIXTING RESIDENTIAL BUILDINGS.			
	Practices (n°)	Expenses (€)	Savings (Mtoe)
Comma 344 – Global Refurbishment	4.276	369,5	0,0086
Comma 345a – Building Envelop Interventions	21.862	771,3	0,0257
Comma 345b – Windows frame replacing	212.731	1.551,1	0,0451
Comma 345c – Solar shading	84.953	180,4	0,0021
Comma 346 – Solar Panels for warm water	8.236	52,3	0,0032
Comma 347 – Heating Systems	86.319	830,3	0,0224
Comma BA – Building Automation	3.614	50,3	0,0025
Total	421.991	3.805,1	0,1064

Table 2- TAX DEDUCTION FOR ENERGY REDEVELOPMENT INTERVENTIONS IN EXIXTING RESIDENTIAL BUILDINGS. Source: ENEA

In addition to the "ECOBONUS" described above, a further tax deduction of 50% is planned. This deduction can be applied for the expenses incurred on interventions for building renovation, according to the law n. 449 of December the 27th 1997. The main interventions involved in this deduction include condensation boilers, window replacing and heat pumps, incentivised also by the tax deductions regarding the energy refurbishment describe above and the "White Certificates". However, the number of interventions incentivised by these tax deductions is lower than what is actually registered in the sales dataset of the national market. This is due to the fact that many of the interventions are incentivised through tax deductions for the building renovation.

4.1.1.3 *National Fund for Energy Efficiency*

On 6th March 2018 the Implementing Decree of the MiSE for the National Fund for Energy Efficiency was published in the Official Gazzette n. 54, signed on December the 28th, 2017 by the Economic Development Minister, the Environment Minister and Economy Minister.

The rules, procedures and tools for submit an application are in a definition phase and will be available soon.

The fund will encourage, based on priorities and goals established period by period, the financing of the interventions that are necessary for the achievement of the energy efficiency national goals, promoting the involvement of financial institutions and private investors with an appropriate risk sharing.

The fund has a rotative nature and it is composed by two sections:

a) One section for the guarantees given on each single financing operation, that absorb the 30% of the sources that annually converge into the fund;
b) One section for the financing provision at a friendly rate that absorb the 70% of the sources that annually converge into the fund.

Moreover, the guarantees section counts with a 30% reserve for interventions regarding the district heating installations, while the 20% of the sources established for financing provisions is reserved to the Public Administration.

Finally, the 2018 Budget Law establish the integration of the instrument with an additional section aimed to encourage the financing of standard energy efficiency interventions on residential buildings.

4.1.2 Development of regulatory guidelines

The Italian Energy Efficiency Action Plan (EEAP) 2017, prepared on the basis of an ENEA proposal under the Article 17(1) of Legislative Decree N° 102/2014, contains a brief summary of the energy efficiency targets set by Italy for 2020. This is followed by a description of the results achieved until 2016, in addition to the main measures implemented and planned in order to achieve the energy efficiency targets by 2020.
The national energy efficiency target for 2020 (as stated in the EEAP 2014) includes an energy efficiency improvement programme that proposes to save 20 Mtoe/year of primary energy and 15.5 Mtoe/year of final energy.

The table shows the expected savings by 2020 and the intervention measures.

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement n. 785072

FINAL AND PRIMARY ENERGY EFFICIENCY TARGETS FOR 2020 (Mtoe/year)						
Sector	MEASURES PLANNED IN THE PERIOD 2011-2020				EXPECTED SAVING BY 2020	
	White certificates	Tax relief	Thermal energy account	Regulatory standards	Final energy	Primary energy
Residential	0.15	1.38	0.54	1.60	3.67	5.14

Table 3 - FINAL AND PRIMARY ENERGY EFFICIENCY TARGETS FOR 2020 (Mtoe/year), Source: EEAP 2014, Source: EEAP 2014

To achieve these objectives, the Legislative Decree No 102 of 4 July 2014 was enacted, implementing those provisions of Directive 2012/27/EU not already transposed into Italian law in accordance with the National Energy Strategy guidelines.

This is accompanied by the binding target laid down in Article 7 of Directive 2012/27/EU, which for the period 2014-2020 imposes a cumulative end-use energy saving target of 25.8 Mtoe through energy efficiency measures. Specifically, under EU legislation, the white certificates mechanism (national obligation scheme) must meet 60 % of the target, while the remaining 40 % will be achieved through alternative measures that meet the criteria under Directive 2012/27/EU.

In quantitative terms, through the white certificates mechanism, final energy savings are expected of around 5.5 Mtoe/year (4.3 Mtoe/year from 2014). To comply with the Article 7, two alternative measures are used: tax relief (1.38 Mtoe/year, of which 0.98 Mtoe/year from 2014) and the thermal energy account (1.47 Mtoe/year from 2014). The Figure 7 gives an overview of the energy saving targets in relation to each of the mechanisms proposed for the period 2014-2020.

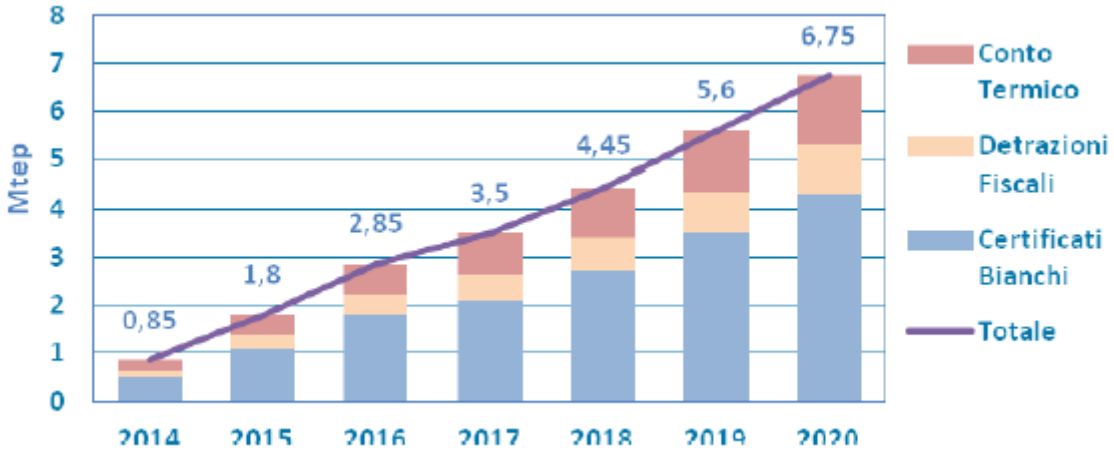

Figure 7 - Expected energy savings in the period 2014-2020 Mtoe/year of final energy Source: Ministry of Economic Development

ITALIAN	ENGLISH
Mtep	Mtoe
Conto Termico	Thermal energy account
Detrazioni Fiscali	Tax relief
Certificati Bianchi	White certificates
Totale	Total

Table 4 - TABLE CONTENTS TRANSLATION

4.1.2.1 *Aims of the Energy Efficiency Directive and results achieved*

As regards the minimum energy saving target of 25.8 Mtoe of cumulative final energy to be achieved between 2014 and 2020 in accordance with the Article 7 of the Energy Efficiency Directive, the results achieved are essentially in line with the savings trends provided for in order to meet the target for 2020.

POLICY MEASURES NOTIFIED	NEW SAVINGS ACHIEVED	NEW SAVINGS ACHIEVED	NEW SAVINGS ACHIEVED (ESTIMATED)	CUMULATIVE SAVINGS	CUMULATIVE SAVINGS ANTICIPATED BY 2020
	2014	**2015**	**2016**	**2014 - 2016**	
Obligation scheme White certificates	1.050	0.896	1.135	**3.081**	**16.00**
Alternative measure 1 Thermal energy account	0.000004	0.001	0.002	**0.003**	**5.88**
Alternative measure 2 Tax relief	0.248	0.502	0.731	**1.481**	**3.92**
Total savings	**1.298**	**1.399**	**1.868**	**4.564**	**25.80**

Table 5 - MANDATORY SAVINGS (MTOE) IN ACCORDANCE WITH ARTICLE 7 OF THE EED – 2014-2016
SOURCE: GSE AND ENEA DATA PROCESSED BY ENEA

4.1.2.2 *Policy measures implementing the Energy Efficiency Directive*

Energy Efficiency obligation schemes and alternative policy measures

To achieve the minimum cumulative final energy savings of 25.58 Mtoe targeted in the period 2014-2020, Italy mainly relies on the white certificates obligation scheme. This is accompanied by two other support instruments for energy efficiency improvement projects: tax relief on renovations to improve the energy efficiency of buildings, and the thermal energy account. All of these measures are already operational at national level.

White certificates

White certificates, also known as 'Energy Efficiency Certificates' (EECs), are negotiable securities that certify the achievement of energy savings in energy end-use through measures and projects to improve energy efficiency. The white certificates mechanism is based on the creation of an obligated market for these certificates. Each year, Gestore Servizi Energetici SpA (GSE) notifies each electricity and gas distributor of its mandatory quota.

With regard to white certificates, Legislative Decree No 102 of 4 July 2014, which transposed Directive 2012/27/EU in Italy, lays down that:

- the mechanism must ensure that at least 60% of the cumulative national energy savings target is achieved by 31 December 2020;
- eligibility for the mechanism is restricted to persons and companies certified according to UNI CEI 11339 and UNI CEI 11352 respectively as of July 2016.

The Decree of 11 January 2017 quantifies the national energy savings targets to be achieved in the period 2017-2020 and redefines the criteria and procedures for accessing the Energy Efficiency Certificates mechanism. In particular, the new Decree:

- determines the national quantitative energy savings targets to be achieved in the period 2017-2020 through the white certificates mechanism, in line with national energy efficiency targets and in conjunction with other instruments designed to support and promote energy efficiency;
- determines the annual requirements to increase energy end-use efficiency for electricity and gas distributors in the period 2017-2020;
- lays down new guidelines for the preparation, execution and evaluation of energy efficiency projects and the definition of criteria and procedures for issuing white certificates;
- defines the methodology for evaluating and certifying the savings achieved and the procedures for recognising white certificates;
- identifies the parties eligible for the white certificates mechanism and the procedures for accessing it;
- introduces measures to enhance the overall effectiveness of the white certificates mechanism, including by means of administrative simplification;
- introduces measures to facilitate compliance with the obligations set;
- updates the provisions on monitoring and verification of the technical and administrative implementation of projects accepted for the white certificates mechanism, and the related penalties.

In addition, the Decree quantifies the annual national energy savings targets to be achieved in the period 2017-2020 through the white certificates mechanism, as shown in Table 6.

QUANTITATIVE NATIONAL ENERGY SAVINGS TARGETS 2017-2020 (Mtoe)				
	2017	**2018**	**2019**	**2020**
Primary energy savings	7.14	8.32	9.71	11.19

Table 6 - QUANTITATIVE NATIONAL ENERGY SAVINGS TARGETS 2017-2020 (MTOE), SOURCE: MINISTRY OF ECONOMIC DEVELOPMENT

Tax relief on refurbishment and energy efficiency renovation of the existing building stock

Tax relief on projects designed to upgrade the energy efficiency of buildings was introduced in Italy by the 2007 Finance Act and still applies to date.

The 2016 Stability Law expanded the incentive to include the costs of buying, installing and implementing 'multimedia systems for remote control of residential heating, hot water and air conditioning systems'. Another major change involves the work carried out in common areas of multi-apartment buildings, the tax relief can be transferred to the companies doing the work in return for a discount. This allows tenants to benefit from the tax relief, even if they would otherwise be unable to take advantage of it. Finally, independent social housing associations (IACP) are also now eligible for tax relief on expenditure incurred from 1 January to 31 December 2016, for work carried out on public housing they own.

The Law of 11 December 2016 extended the tax relief of 65 % for projects designed to upgrade the energy efficiency of buildings to include expenditure incurred before 31 December 2017, confirming the possibility of access to the mechanism for IACP. For energy efficiency improvements on common areas of multi-apartment buildings, the rate is increased to 70 % for improvements carried out on at least 25 % of the building envelope, and to 75 % for projects designed to boost winter and summer energy performance that ensure 'average quality' for the building envelope, subject to a ceiling of EUR 40 000 for each building unit. In this case, the incentives will be valid for expenditure incurred from 1 January 2017 to 31 December 2021.

All taxpayers, individuals, professionals, companies and businesses that incur costs for energy efficient renovations are eligible for tax relief on existing buildings or parts thereof or existing building units in any cadastral category (including rural buildings) that they own or hold, provided they are heated.

Conversely, tax relief on building 'refurbishment' projects was introduced by Article 1(5) and (6) of Law No 449 of 27 December 1997. Refurbishment projects include condensing boilers and doors and windows, with the incentive of tax relief for energy efficiency improvements.

The total cost of energy efficient renovation projects until 2016 was more than EUR 29 billion.

Table 7 contains data on applications submitted to the Revenue Agency for tax relief (50 % as at 26 June 2012, compared with 36 % previously, except for a few years when it was 41 %) on building refurbishment. It is estimated that around 1.4 million applications were submitted in 2016, for a total cost of more than EUR 25.7 billion in subsidised projects.

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement n. 785072

	Building refurbishment				Energy efficiency renovation			
	Applications submitted	Expenditure (€m)	Amounts deductible (€m)	Tax relief applied	Applications submitted	Expenditure (€m)	Amounts deductible (€m)	Tax relief applied
1998	240 413	3 385	1 388	41 %				
1999	254 989	3 590	1 472	41 %				
2000	273 909	4 392	1 581	36 %				
2001	319 249	5 119	1 843	36 %				
2002	358 647	5 750	2 070	36 %				
2003	313 537	5 666	2 040	36 %				
2004	349 272	4 888	1 760	36 %				
2005	342 396	6 848	2 465	36 %				
2006	371 084	6 313	2 588	41 %				
2007	402 811	7 938	2 858	36 %	106 000	1 453	799	55 %
2008	391 688	7 365	2 651	36 %	247 800	3 500	1 925	55 %
2009	447 728	8 070	2 905	36 %	236 700	2 563	1 410	55 %
2010	494 006	8 705	3 134	36 %	405 600	4 608	2 534	55 %
2011	779 400	14 400	5 184	36 %	280 700	3 099	1 704	55 %
2012	883 600	16 325	7 279	36 % / 50 %	245 234	2 891	1 590	55 %
2013	1 317 627	24 345	12 172	50 %	355 961	3 849	2 260	55 % / 65 %
2014	1 366 416	25 246	12 623	50 %	299 795	3 056	1 987	65 %
2015	1 195 438	22 087	11 043	50 %	335 960	2 839	1 845	65 %
2016*	1 392 705	25 732	12 866	50 %	408 032	3 355	2 181	65 %
Total	11 494 914	205 272	89 928		2 921 782	31 213	18 235	

Table 7 - COMPARISON OF TAX RELIEF FOR BUILDING REFURBISHMENT AND ENERGY EFFICIENCY RENOVATION, 1998-2016, SOURCE: CRESME FOR BUILDING REFURBISHMENT; ENEA FOR ENERGY EFFICIENCY RENOVATION

Thermal energy account

The Ministerial Decree of 28 December 2012 introduced a new incentive system for actions to improve energy efficiency and generate thermal energy from renewable sources. This incentive mechanism, dubbed the Thermal Energy Account, is the first nationwide direct incentive scheme for the generation of renewable thermal energy, as well as being the first scheme encouraging public administrations to implement energy efficiency improvement actions in buildings and technical installations. The Thermal Energy Account became operational in July 2013.

The Ministerial Decree of 16 February 2016 (Thermal Energy Account 2.0) amended the earlier Decree from 2012, increasing access to funding for businesses, households and public authorities, and transposing the legislative provisions adopted in recent years, which have an impact on the types of investment eligible for incentives. It also significantly enhanced the incentive through the addition of new eligible measures. For some of these (such as the transformation of public buildings into NZEB), the eligible expenditure includes costs incurred for seismic improvements, which contribute to thermal insulation. The maximum size of the projects eligible for incentives has been increased. At the same time, the range of eligible beneficiaries has been extended, allowing social cooperatives and 100 % publicly owned companies (which are responsible for managing local services and networks in the public interest) to qualify for incentives for projects reserved for public authorities. Lastly, the payment procedures have been revised: under the new rules, the grant will be disbursed in one, two or

five annual instalments, depending on the size and type of the project. For applications submitted by individuals, lump-sum payments have been introduced for amounts up to EUR 5000, while for public authorities, lump-sum payments may be made for amounts above this threshold.

4.2 Spanish Regulatory Framework

4.2.1 Development of the regulatory guidelines

The national document that is in force according to Directive 2012/27/EU of the European Parliament on the energy performance of buildings is the Technical Building Code (CTE), in particular, the document DB HE of Energy Saving, which was last updated by Ministerial Order 1635/2013. This document contains all the information necessary to meet the minimum requirements for energy efficiency in new buildings, as well as energy rehabilitation of existing buildings.

In Spain, the definition of Nearly Zero-Energy Building (NZEB) has not yet been properly established, Royal Decree 56/2016, of 12 February, does not establish the minimum requirements that NZEBs must meet, but rather literally copies the definition of the Directive 2010/31 / EU. The fourth additional provision of RD 56/2016 establishes that the minimum requirements of the NZEB will be defined in the Technical Building Code.

This document is being revisited and it will include an update of the regulatory requirements that the buildings must comply with to be considered as nearly zero energy buildings. It is foreseen to be published within 2018 (as of today, it has not been published 19th June, 2018).

The procedure for energy certification of buildings is defined in RD 235/2013 and establishes that for existing buildings a document of recommendations for the improvement of optimum or profitable levels of energy efficiency must be generated. The recommendations included in the energy efficiency certificate will be technically feasible and may include an estimation of the recovery periods of the investment, or the profitability during its life cycle.

In addition, it will contain useful information to the owner or lessee on where to obtain more detailed information, including information on the cost-effectiveness of the recommendations made in the certificate. This evaluation will be carried out on the basis of a series of standard criteria, such as the evaluation of energy savings, the underlying energy prices and a preliminary forecast of the costs. Moreover, the owner or lessee may be provided with information on other related topics, such as energy audits or financial or other incentives and the possibility of financing. To this end, the corresponding criteria of the Delegated Regulation (EU) No. 244/2012 of the Commission, of January 16, 2012, can be applied to calculate the optimum levels of profitability of the minimum energy efficiency requirements of buildings and its elements.

The Table 8 shows the percentage of new and existing buildings that have been certified in Spain.

	Nº of EPCs for new buildings	% of EPCs for new buildings	Nº of EPCs for existing buildings	% of EPCs for existing buildings
ANDALUCIA	609	4.31%	88,308	13.68%
ARAGÓN	-	0.00%	32	0.00%
ASTURIAS	17	0.12%	3,993	0.62%
BALEARES	188	1.33%	18,017	2.79%
CANARIAS	181	1.28%	32,172	4.99%
CATALUÑA	5,530	39.11%	195,089	30.23%
C LEON	72	0.51%	27,700	4.29%
C MANCHA	17	0.12%	10,507	1.63%
EXTREMADURA	3,015	21.32%	1,072	0.17%
GALICIA	65	0.46%	399	0.06%
MURCIA	154	1.09%	16,233	2.52%
NAVARRA	747	5.28%	5,926	0.92%
PAIS VASCO	125	0.88%	17,085	2.65%
RIOJA	283	2.00%	5,388	0.83%
VALENCIA	2,951	20.87%	128,888	19.97%
MADRID	176	1.24%	91,368	14.16%
CANTABRIA	10	0.07%	3,182	0.49%
TOTAL	*14,140*	*100%*	*645,359*	*100%*

Table 8 - PERCENTAGE OF NEW AND EXISTING BUILDINGS THAT HAVE BEEN CERTIFIED IN SPAIN

More information can be found at https://www.epbd-ca.eu/

4.2.1.1 *Uptake of renewable energy sources for building renovations*

The uptake of renewable energy sources in Spain is fostered through different future programs at national level. Among them:

Programa de fomento de la regeneración y renovación urbana y rural del Plan Estatal de Vivienda 2018-2021 (Program for the promotion of urban and rural regeneration and renewal of the State Housing Plan 2018-2021)

The objective of the program, whose beneficiary are the City Councils, is to finance the joint execution of rehabilitation works in buildings and houses, urbanization or redevelopment of public spaces and, where appropriate, the construction of buildings or houses to replace demolished buildings or dwellings, within areas of action denominated area of regeneration and urban or rural renewal previously delimited. The implementation of renewable energies and centralized or district air conditioning systems, and, in general, all those aimed at increasing the use of renewable energies, is eligible. As previously said, it is a financial aid in which the maximum amount of aid cannot exceed 40% of the investment of the action.

Programa de fomento de la mejora de la eficiencia energética y sostenibilidad enviviendas del Plan Estatal de Vivienda 2018-2021 (Program to promote the improvement of energy efficiency and sustainability in households of the State Housing Plan 2018-2021)
The purpose of this program, whose beneficiaries are dwelling/building owners, construction company, ESCOS, is to finance works to improve energy efficiency and sustainability.
The installation of generation equipment or that allow the use of renewable energies such as solar energy, biomass or geothermal energy that reduce the consumption of conventional thermal or electrical energy of the house will be eligible. It will include the installation of any technology, system, or renewable energy equipment, such as solar thermal panels, in order to contribute to the production of sanitary hot water demanded by the dwelling, or the production of hot water for the air conditioning installations.
Programa de ayudas para la rehabilitación energética de edificios existentes PAREER-II (Program of aid for the energy rehabilitation of existing buildings PAREER-II)
It deals with aid for the Energy Rehabilitation of existing buildings in the Residential sector, to promote comprehensive actions that favor the improvement of energy efficiency and the use of renewable energy in the park of existing buildings. The beneficiaries of this program are dwelling/building owners, ESCOS and it is conceived as base aid: from 20% to 30% of the cost; additional help for energy efficiency criteria: up to 15%; refundable loans of up to 70% of the cost; additional help by social criteria (housing): from 5% to 10%.
FEDER-POCS 2014-2020 para Proyectos de inversión que favorezcan el paso a una economía baja en carbono (ERDF-POCS for Investment projects that favor the transition to a low carbon economy)
Direct grant to local entities of less than 20,000 inhabitants for investment projects in the field of low carbon economy.
FEDER-POCS 2014-2020 para renovación energética de edificios e infraestructuras existentes de la Administracion general del estado (ERDF-POCS 2014-2020 for the energy renewal of existing buildings and infrastructures of the general state administration)
The objective of the call is to promote and promote actions that reduce carbon dioxide emissions through the implementation of energy saving and efficiency projects and renewable energy in existing buildings or infrastructures of the General State Administration, favouring compliance of the objectives foreseen in the ERDF Operational Program of Sustainable Growth 2014-2020. The performances in the buildings may be total or partial performances, also adding performances in the exterior lighting.

At regional level for the Valencian Community we can find the following programs:
Instalaciones de autoconsumo de energía eléctrica programa del IVACE (installations of self-consumption of electric energy IVACE program) deals with financing of projects of self-consumption installations of electric energy from renewable energies or residual energies. The reimbursable aid will consist of the granting of a subsidized loan at its interest rate on the eligible costs of the associated projects. The beneficiaries of this program are companies and town halls, as well as any entity or legal entity, of a public or private nature, with headquarters in the Valencian Community, with the exception of communities of homeowners.

Moreover, ongoing programs of awareness raising are available at national and regional level.
Fiscal deductions in the IRPF for self-consumption and renewable energies (*deducciones fiscales en el IRPF para autoconsumo y energías renovables*) deals with fiscal reductions of personal income taxes for owners that have installed in their permanent residence a self-consumption installation or use of renewable energy according to a specified criterion. Taxpayers may deduct up to 20% of the amounts invested in facilities made in the habitual residence and in collective facilities of the building. The deduction has a maximum of 8,000€.
Awareness raising (national level): Website to promote self-consumption of energy (http://www.autoconsumoaldetalle.es/) The Association of Spanish Agencies for Energy Management, EnerAgen, is currently the main instrument for the cooperation and coordination between agencies and public organisms in the field of energy that operate at different territorial levels in Spain. One of the conditions that EnerAgen considers fundamental to promote and extend the use of facilities for the production of electricity under the modality of self-consumption is the diffusion of its advantages and benefits. This is the objective of the website. The beneficiaries of this program are citizens and installers.
Awareness campaign (regional level) (https://www.eseficiencia.es/2017/10/03/ivace-energia- lanza-campana-dar- conocer-plan- autoconsume-comunidad- valenciana) Ivace-Energía has launched an information and publicity campaign with the aim of publicizing the advantages of self-consumption in the Valencian
Community, as well as the aid that, through the Autoconsum + Plan, the Ivace puts at the service of citizens, companies and entities. The beneficiaries are citizens, companies and entities.
At regional level, there is also another Program, the so called, Plan AutoconsumE+ (http://www.ivace.es/index.php?option=com_content&view=article&id=6350:el-ivace-lanza-una- campana- de-promocion- para-dar- a-conocer- el-plan- autoconsume-a- la-sociedad-valenciana&catid=47&lang=es&Itemid=100585)
The regional agency of energy lunches this plan for the promotion of the self-consumption and its beneficiaries are citizens, companies and entities. This Plan is based on 20% tax deductions in the autonomic section.
Moreover, it also foresees a specific line of financing for companies and private and public entities of subsidized loans, at 0% interest and to return in up to 10 years in semi-annual installments, with an amount of the loan that may reach 300,000 euros. Moreover, for the Andalusian region, there is an operative program, from 2017 to 2020, and it is a part of the European Strategy 2020. It is the so called "Programme for the sustainable energy development of Andalusia" in which many incentives for several actuations in energy efficiency are present, such as those for the installation, integration and improvement of systems based on RES like PV, solar energy and works aiming to reduce the energy needs of building.
At regional level for the Andalusia Community we can find the following program:
Programa de incentivos para el desarrollo energético sostenible de Andalucía 2020. Program of Incentives for the Sustainable Energy Development of Andalusia 2020.

Aid for sustainable construction supports investments in savings, efficiency, use of renewable sources, reform and adaptation of urban infrastructures for public and private use, including residential, with 38 categories of incentive projects.
Works of adaptation for the reduction of the energy demand and energy efficient installations in the buildings and infrastructures of the cities (solutions for insulation, windows, solar protection, bioclimatic solutions, generation of energy for self-consumption through renewable energies, air conditioning, lighting...).
Processes or smart solutions for the evaluation and energy management of buildings and cities (accounting and monitoring of energy consumption, energy improvement through ICTs ...).
Actions for the energy improvement in buildings and installations linked to energy services.

4.3 French regulatory framework

At national level, the Law on Energy Transition for Green Growth was enacted in 2015 and aims at efficiently contributing to the fight against climate change. The objectives target:

- 500.000 major renovations of housing / year;
- All new buildings labelled "Low Consumption Building" by 2050;
- Creation of 75.000 jobs.

Among the key actions that are embedded in the Law, the following financial incentives aim at encouraging individuals to engage in energy renewal of their housing:

- Tax Credit for Energy Transition
- Ecocredit at zero rate
- Living better program
- Reduced VAT
- Exemption from real estate tax

As such, it provides a global framework that also encompasses the other policies and aids at national level that are described in the table.
The **Low Carbon National Strategy** is part of the implementation of the Law on Energy Transition for Green Growth. It was elaborated in 2015 and defines a roadmap to reduce GHG emissions towards a low-carbon and sustainable economy. It facilitates the management by public decision makers of GHG emissions policies. It is articulated around the main objectives:

- Implementation of RT 2012 and future RT 2018 based on environmental impacts analysis during new buildings lifecycle.
- Building Park completely renewed by 2050.
- Speed up control/ management of energy use.

Some policies described in the below table allow for achieving these objectives:

- Guarantee Fund for Energy Renewal
- Positive Energy Building and High Environment Performance Building
- Third-party financing companies

The "Grenelle 1" Law, enacted in 2009, established the **2012 thermal regulatory framework**. This framework aims at limiting primary energy use in new buildings up to 50 kWhEP/ (m^2. year) while encouraging:

- A significant technology and industrial evolution of all buildings and equipment sectors;
- A high level of building energy quality;
- A technical and economic balance between energy used for heating and domestic hot water, with low GHG emissions.

The **Industry Plan** comprises a component dedicated to energy renewal in building. The objective is to structure this field at technical and organisational levels, in order to propose a global offer for building energy renewal at affordable costs for housing to engage in. It targets the objectives falling under the Law on Energy Transition for Green Growth that are below mentioned.

The **Housing Energy Renewal Plan** provides incentives for households to engage in energy renewal works. Local authorities are also encouraged to support local initiatives of energy renewal. The Plan aims at:

- Facilitating the decision-making process in providing advice and support to individuals;
- Financing the renewal works through incentives, tools and solutions;
- Mobilizing the professionals to guarantee renewal quality.

Launched in 2009, the **Sustainable Building Plan** gathers a broad range of stakeholders from building and real estate sectors. The objective is to reach the energy efficiency objectives that are set within the Law on Energy Transition for Green Growth, above described, by implementing and managing energy performance buildings plan.

At regional and local level, the «Grenelle II» Law enacted in 2010 established 2 regional schemes that are complementary, in order to facilitate renewable energy sources development:

- The **Regional Scheme on Climate-Air-Energy** sets regional objectives by 2020 – 2050 regarding GHG emissions reduction, renewable energy sources development and climate change adaptation. It includes the Regional Scheme for wind power. Within this framework, the Territorial Climate-Air-Energy Plan described in the table implements these public policies. The Positive Energy Territory for Green Growth Label is also part of this strategy.
- The **Regional Scheme for connecting to Renewable Energy Electric Network**, which is described in the table.

4.3.1 Development of regulatory guidelines

In order to achieve the quantitative national energy savings targets 2017-2020, shown in, the following policies are employed.
These policies are classified according to the type of instrument. They include: regulatory, financial, and technical.

Regulatory policies:

QUANTITATIVE NATIONAL ENERGY SAVINGS TARGETS 2017-2020 (Mtoe)				
	2017	**2018**	**2019**	**2020**
Primary energy savings	7.14	8.32	9.71	11.19

Table 9 - QUANTITATIVE NATIONAL ENERGY SAVINGS TARGETS 2017-2020

The regulatory policies in France are shown in Table 10.

Name of the policy	**Area that it covers (Local, regional, national)**	**Actions that are promoted**	**For which sector is it meant** [e.g.: public sector]	**Type of support (subsidy, ...)** [25 % eligible costs]
Regional Scheme for wind power	Regional	Support to wind power development	Public sector	Identify areas of the local territory that are favourable to wind power development, with regards to wind potential, natural areas and heritage protection, landscapes and technical constraints.
Regional Scheme for connecting to Renewable Energy Electric Network	Regional	Creation of 747 MW new capacity	Public sector	Grid networks development and management accounting for 69,77 M€, including 35,71 M€ at the expense of producers and 34,06 M€ at the expense of grid networks managers.
Territorial Climate-Air-Energy Plan	Local (Union of Municipalities accounting for +20.000 inhabitants)	• Reduce GHG emissions • Energy use • Energy distribution network • Renewable energy on the covered area	Public sector	• Diagnosis • Territorial strategy • Action plan • Monitoring and evaluation
Exemption from the Local Urban Plans rules	National	Installation of solar radiation protection, thermal insulation or roof elevation	Private sector	The possible exemption from the Local Urban Plans rules (floor space, height, settlement, facade)

				facilitates the installation of energy efficiency equipment.
Third-party financing companies	National	Energy renewal works	Private sector	Creation of a framework for third party financing from public companies that advance cash to individuals willing to engage in energy renewal works.

Table 10 - FRENCH REGULATORY POLICIES

Financial instruments

The financial instruments available in France are listed in Table 11.

Name of the policy	**Area that it covers (Local, regional, national)**	**Actions that are promoted**	**For which sector is it meant** [e.g.: public sector]	**Type of support (subsidy, ...)** [25 % eligible costs]
Tax Credit for Energy Transition	National	• Heating and domestic hot water installation; • Thermal isolation of opaque and glazed surfaces; • Hydropower and biomass equipment; • Energy performance diagnosis	Private sector	Reimbursement of 30% up to 8000 Euros for a single person and 16000 Euros for a couple.
Ecocredit at zero rate	National	• Supply, products and equipment installation cost; • Equipment removal and landfilling cost; • Project management and related studies fees; • Contracting authority insurance fees; • Cost linked to energy saving works.	Private sector	Credit at zero rate up to 30.000 Euros energy renewal works
Living better program	National	Renewal energy works improving energy performance by at least 25%	Private sector	Subsidies up to 20.000 Euros
Reduced VAT	National	Works cost related to equipment installation (including removal and landfilling) and supply	Private sector	5,5% VAT

		eligible under the Tax Credit for Energy Transition		
Exemption from real estate tax	Local	Eligible equipment under the Tax Credit for Energy Transition	Private sector	Exemption from 50% or 100% over 5 years.
Guarantee Fund for Energy Renewal	National	Energy renewal of buildings (housing)	Private sector	Guarantees credits of low-income housing engaged in energy renewal building
Heat Fund	National	Support to heat production from renewable energy	Private and public sector	Call for proposals and funding of selected projects
Photovoltaic Call for proposals	National	Support to solar power infrastructure building	Private sector	Funding of selected projects
Methanation development	National	Support to the methanation development field	Private and public sector	Price of electricity produced by existing methanation installations (less than 500 kW) is revaluated and guaranteed over a 20-year period.
Compensation costs	National	Cost efficiency of renewable sources of electricity	Private sector	Bonus paid to a renewable energy producer in addition to the sale on the electricity market in order to cover the installation costs while ensuring projects cost efficiency.
Call for proposals "Self-use of electricity production"	National	Renewable energy installations (from 100kW to 500kW)	Private sector	The beneficiaries will be allocated a 50MW volume. They will benefit from a financial valuation for the self-use of their electricity production.
Smartgrid/flexgrid	Regional	Large-scale smart grid roll-out call for projects	Public sector	Priority access to the 50 million Euros dedicated fund and the 40 million Euros investment fund led by grid networks (RTE and ERDF).
Participation to Local Energy Cooperatives and companies funding	Local	Creation of renewable energy local companies	Private and public sector	Citizens, municipalities, and union of municipalities are encouraged to buy stakes of renewable energy local companies.
Positive Energy Territory for Green Growth Label	Local	• Energy use reduction • Renewable energy development • Awareness-raising on environment	Public sector	Call for proposals: Up to 500.000 Euros for a local authority to engage in energy use reduction

Table 11 - FINANCIAL INSTRUMENTS

Technical instruments

Name of the policy	**Area that it covers (Local, regional, national)**	**Actions that are promoted**	**For which sector is it meant** [e.g.: public sector]	**Type of support (subsidy, ...)** [25 % eligible costs]
Low Carbon Building Label	National	Measure a building carbon footprint during its: • Construction • Exploitation • Carbon storage • Circular economy	Public and private sector	Labelling process and communication support on the low carbon building
Environmental High Quality Certification	National	• Life quality • Environmental friendly • Economic performance • Responsible management	Public and private sector	Labelling process and communication support on the environmental friendly building
Positive Energy Building and High Environment Performance Building	National	Newly constructed buildings should demonstrate energy and environmental exemplary	Private and public sector	Constructability bonus for these new buildings in order to improve the economic balance of such operations and absorb additional cost linked to the exemplary effort.
Environmental Performance of New Buildings Label	National	Consider both energy and carbon use during the building lifecycle. GHG emissions must be lower than a given threshold	Public sector	Labelling process and constructability bonus (max 30%)
Industry Plan	National	Buildings Thermal Renewal through capacities reinforcement of energy renewal professionals and communication campaigns	Private sector	Training programs and tools
Insulation works in case of major building renovation works	National	Increase thermal insulation of housing, offices, schools, commercial buildings and hotels	Private and public sector	Facilitation of walls insulation to encourage restoration of the front facade and roof.
Co-ownership – Simple majority vote for energy renewal works	National	Increase co-owned buildings energy efficiency through major works in common portions	Private sector	Simplification of decision-making through a simple majority vote to engage in major energy renewal works (front façade and roof restoration, etc.).
Territorial Platforms for Energy Renewal	National and local	Energy renewal works	Public and private sector	Provide technical advice and financial support to individuals willing to engage in energy renewal works. 450 local support

				offices are widespread throughout the country.
Participation to Local Energy Cooperatives and companies funding	Local	Creation of renewable energy local companies	Private and public sector	Citizens, municipalities, and union of municipalities are encouraged to buy stakes of renewable energy local companies.

Table 12 - TECHNICAL INSTRUMENTS

4.4 Greek Regulatory Framework

4.4.1 Background

Greece is currently drafting its National Energy and Climate Plan to be submitted to the European Commission by the end of 2018, covering the period from 2021 to 2030. In its NECP Greece will have to put together in a coordinated manner all the obligations deriving from different pieces of EU legislation across energy, climate and other Energy Union related policy areas all while ensuring the expected contribution to the Union's 2030 climate and energy targets (GHG, RES, EE and electricity interconnection) is met.

4.4.2 Energy Efficiency

Law 4342/2015 aligned the national legal framework with the Energy Efficiency Directive (EED) 2012/27/EU. The Law provided definitions for energy efficiency, energy savings, energy services and energy performance contracts, while in accordance with the provisions enshrined in Government Gazette B 2337/10-07-2017 provisions for Energy Efficiency Inspectors, Qualification & Certification Systems, Registry & Audits were introduced, solidifying the market for energy efficiency.
Below, in Table 13, there are the national energy savings targets arising from Law 4342/2015:

QUANTITATIVE NATIONAL ENERGY SAVINGS TARGETS 2020 (Mtoe)	
Gross Domestic Energy Consumption (Mte)	25,4
Primary Energy Consumption	24,7
Total final energy consumption	18,4

Table 13 - Quantitative national energy savings targets 2020 (Mtoe)

4.4.3 Energy Efficiency in Buildings

4.4.3.1 *State of art*

Law 4122/2013 transposed the Energy Performance for Buildings Directive (Directive 2010/31/EU) in the national legal framework, specifying that after 1 January 2019 every new public building should be NZEB. This obligation is also applied to all new buildings constructed after 1 January 2021. In this

respect, the 4th National Energy Efficiency Action Plan (November 2017) foresees that new buildings should cover their entire primary energy consumption with energy supply systems based on renewable energy sources (RES). Law 4122/2013 also introduced the provisions for Energy Performance Certificate and Energy Efficiency Inspection of Heating and Air Conditioning Systems.
Following the enactment of Law **4122/2013,** the revised Buildings Energy Performance Regulation was established in 2017 (KENAK 2017). This significant delay hindered the activation of incentive programmes (e.g. "Saving at home"), while KENAK 2017 will have to be amended soon, following the recent decision on the revised EPBD (May 2018). KENAK 2017 defines a number of issues including: the methodology for calculating buildings energy performance; energy consumption for heating, cooling, lighting and hot water production; minimum requirements for energy efficiency; categories for the energy classification of buildings; parameters for energy-efficient design; thermo-physical characteristics of envelope's structural elements; specifications of building's technical systems. Last but not least, KENAK defines procedure for energy inspections of buildings as well as the inspection process of heating and air-conditioning systems.
Overall, KENAK 2017 includes many modifications and additions compared to the previous version, but without changing the overall minimum requirements and specifications of materials and installations. Only the requirements concerning buildings thermal insulation are amended substantially. While KENAK 2017 constitutes an important step towards integrated energy - efficient design of buildings, Greece falls behind the specifications set by EC.
An important drawback that should be referenced here, is the fact that KENAK 2017 fails to include a national standard for conducting sufficient and verified calculations of the amount of energy actually consumed in buildings. Namely, KENAK 2017 adopts a calculation method based on the building materials (asset method) and not the operation of the building (operational method), which makes it not fit for calculating real consumption. In that respect, the International Performance Measurement and Verification Protocol, issued in 2000, offers useful insights in that is seeks to establish a common methodology for calculating and verifying energy savings.

4.4.3.2 *NZEB standard*

The phrase "Nearly-Zero Energy Building" (NZEB) was first introduced to the national legislation in June 2010 and was also included in Law 4122/2013. However, no standard on NZEB exists at the moment. The roadmap for NZEB in Greece will be defined from 2019 onwards (no precise timeframe yet) following the latest decision on a revised EPBD, creating a clear path towards a low and zero-emission building stock by 2050 at national level.

4.4.3.3 *Incentive systems*

The 2nd "Report on long-term strategy for mobilising investment in the renovation of the national stock of residential and commercial buildings, both public and private" was issued in April 2018. The report sets a clear target for the transition to a sustainable building stock so that by 2030, 7% of Greece's building stock has been upgraded.

The report states that in the period 2014-2020 65% of the total energy efficiency target (2156 ktoe) will be met, pointing to the need to cover a funding gap of the remaining 35% (1176 ktoe) reaching up to 800 million €.The most suitable policy measures to be used in order to maximize the financial efficiency and minimization of implementation risk is the energy upgrading of residential buildings, energy upgrading of tertiary sector buildings (SMEs) and support measures, the energy managers and actions plans for public buildings.

A number of incentives and programmes that have been put forward or are currently under consideration, which will help boost the energy efficiency of Greece's building stock, are outlined below:

Measure	**Sector**	**Short description**	**Implementation period**
Energy Efficiency Obligation Schemes (2)	Private	Energy distributors and/or energy retailers designated as obligated parties operating in the Greek Territory achieve a cumulative energy saving target in the end-use by 31 December 2020 (33 ktoe of diesel).	Started in 2017 and 2018
Energy managers in public buildings and public sector	Public	A registry will be created where experts (natural persons) will sign up as energy managers and will be tasked with the design, issuing and monitoring of action plans per area for the energy upgrading of public buildings, belonging to the central and local/regional governments.	Starts in 2018
European Investment Bank Plan	Public	The European Investment Bank has agreed on investing 2 billion EUR in the energy upgrading of public buildings. The set-up of the Energy Managers registry is in line with the effective realization of the investment plan.	Starts in 2018
Establishment of "Infrastructure Fund" – Energy upgrading of public buildings	Public	The "Infrastructure Fund" will fund the realization of small-scale infrastructure projects carried out by public and private entities focusing on energy (upgrading of public buildings, RES production and distribution systems).	Starts in 2018
Implementation of energy management system according to ISO 50001 in the public sector	Public	Monitoring of the energy performance of public buildings in order to improve energy efficiency and reduce energy costs.	2017 - 2020

Table 14 - Policy and regulatory measures

Measure	Sector	Short description	Implementation period
Building ratio increase	Private	Law 4067/2012 provides urban planning incentives when building energy efficient buildings. In case a building is classified as A + according to KENAK, the building factor can be increased by 5%, while a special increase of 10% is possible for a building with an annual primary energy consumption in heating, air conditioning, lighting, ventilation and hot water under 10 kWh / m2 / year.	In progress (started in 2012)
Energy upgrading of residential buildings	Private - Residential	Applying interventions for the improvement of the energy performance of residences.	In progress (started in 2018)
Saving at home II	Private - Residential	A programme for supporting the energy upgrading of households, with a double budget compared to the previous ESIF programming period, reaching up to 1 billion EUR.	In progress (started in 2018)
Energy upgrading of public buildings	Public	Upgrading energy-intensive public buildings, exploiting the potential for energy savings and improving energy performance in public buildings.	In progress (started in 2018)
Replacement of oil-fired boilers with natural gas fired boilers	Private - Residential	Subsidizing the replacement of existing oil heating systems with natural gas fired systems.	Starts in 2018
Energy upgrading of SMEs	Private - SMEs	Supporting SMEs in improving their energy performance.	Starts in 2018
Energy upgrading of pumping stations	Public	Increasing the energy efficiency of energy – intensive pumping stations.	Starts in 2018
Energy upgrading of commercial buildings	Private – Commercial buildings	Upgrading of energy performance in tertiary building sector, provided by Energy Service Companies (ESCO)	Starts in 2019
Tax relief	Private	The Greek government plans to restore an income tax relief, in force until 2013, calculated as % of the costs borne by the property owner following an energy efficiency inspection / auditing.	Planned
Fine relief	Private	Law 4495/2017 gives financial incentive (fine relief) for retrofitting arbitrary buildings that are part of a legalization process. According to the law, up to 50% of the fine can be offset by improvements in the energy performance of the property.	In progress (started in 2017)
Installation of central solar thermal systems for hot water production	Public & Private - Residential	KENAK 2017 requires that solar collectors should cover at least 60% of the yearly thermal loads due to domestic hot water consumption.	In progress (started in 2011)

Table 15 - Financial Instruments

Measure	Sector	Short description	Implementation period
Appliances energy labelling & minimum energy efficiency requirements	Public & Private	The objective is to inform consumers about the electricity consumption and energy efficiency of the appliances they use. The minimum energy efficiency requirements will ensure that consumers reduce their energy and environmental cost.	In progress (started in 2008)
Pilot telemetering and demand management system for electricity providers, residential and small-scale consumers and smart meters installation	Public & Private	Study, supply and installation by the Hellenic Electricity Distribution Network Operator of 170,000 smart meters as well as the execution of all the necessary tests and adjustments.	Starts in 2019
Build Up Skills UPSWING	Private	Technical training program and qualification scheme (in accordance with National Qualification Roadmap) to improve knowledge and skills in energy efficiency of insulation technicians, aluminum and metal constructions craftsmen, installers-mainteners of burners.	Ended in 2017

Table 16 - Technical Instruments

Further, the upcoming regulation about nZEB that the Greek government will issue (approx. 2020), is expected to include the integration in buildings of automation and systems and EV charging stations (e.g. mandatory charging points/stations for electric cars per 10 parking spaces in new buildings).

4.4.3.4 *Renewable Energy Resources uptake*

Greece has set national targets for 2020 presented below. For 2030 Greece has not yet set targets, yet the Ministry for Environment and Energy is putting forward an ambitious plan to cover 50% of final energy production by RES.

2020	RES share				Primary Energy Consumption	GHG emissions outside the ETS
Target	Gross Final Consumption	Transportation	Heating & Cooling	Electricity generation		
2020	20%	10%	20%	40%	24.7 Mtoe	61.24Mt CO2 eq

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement n. 785072

4.4.4 Development of regulatory guidelines

4.4.4.1 *Incentives*

Greece has recently moved from feed-in-tariff to feed-in-premium model. According to **Law 4414/2016**, since 1st January 2016 for PV installations up to 500 kilowatts (kWp), the mechanism of feed-in tariffs can be applied, whereas for projects whose power counts more than 500 kWp, the feed-in premium mechanism applies in the context of a competitive process.

With regards to licensing, no generation license is required for PVs with power up to 1 MW and no environmental license is required for PV systems that are installed in buildings. Also, the installation of PV systems requires no building permission, but an approval for small-scale construction works by the competent Department of Urban Planning.

A number of incentives have been put forward in the last years to promote the uptake of RES and specifically in islands, where the electrification of demand is further needed, in light of the absence of alternative fuels to diesel (gas, biogas etc.).

These are outlined below in Table 17-Table 19.

Measure	**Short description**	**Implementation period**
Simplified licensing	According to Law 3851 / 2010, PVs of installed capacity up to 1MW, wind farms of installed capacity up to 100kW, biomass / biofuels stations of installed capacity up to 1MW, and small hydro-electric stations of installed capacity up to 50kW don't require electricity generation, installation and operation licenses.	In progress (started in 2010)
Energy net metering or virtual energy net metering **and** Local Energy Communities (LECs)	Self-producers are allowed to install PV stations in order to meet their needs while applying net energy metering. In case of self-producers that are public or private legal entities pursuing public or other public interest purposes of general or local scope as well as for persons registered in the Register of Farmers and Agricultural Holdings of Law 874/2010 (A 151), they are allowed to install PV stations for their own needs while implementing virtual net energy metering. Specifically under the new scheme of LECs, one installation can balance the demands of many buildings by applying virtual net metering, which is particularly relevant for islands, where there is limited space.	In progress (started in 2017) In progress (started in 2018)
Islands: frontrunners in energy transition	The "Clean Energy for EU Islands Initiative" is a new policy framework at EU level foreseeing an Islands' Secretariat and a Facility, both tasked with helping build islands' technical capacity to create a pipeline of bankable projects for deep decarbonisation (RES, energy efficiency, transport, waste etc.)	In progress (started in 2018)
Smart Islands	2-3 pilot projects with RES and battery storage will be tendered in 2018 by the Regulatory Authority for Energy in order to demonstrate RES penetration levels up to 60-70%. Law 4495/2017 has set the legislative framework to enable the deployment and operation of the pilot project.	Starts in 2018

Table 17 - Policy and regulatory measurements

Measure	Short description	Implementation period
Use of solar collectors	The wide use of solar collectors is due to tax incentives set by the Greek Government in the past. According to the KENAK 2017, solar collectors should cover at minimum 60% of the yearly thermal loads due to domestic hot water consumption. This percentage depends on the climate zone and the possibility of installation of a solar collector on the roof of the building.	In progress (started in 2010)
"PV on roofs"	"PV on roofs" is a programme that subsidizes the energy generation from PVs. The measurement is supported further by a simplified licensing procedure that requires a single permission of works by the Ministry of Environment, Physical Planning and Public Works for PV installation up to 10 kWp.	In progress (started in 2009 – for non-interconnected islands in 2011)

Table 18 - Financial instruments

Measure	Short description	Implementation period
Cyclades Interconnection	Of the two thematic pilots in Greece, this measure applies to the one in Paros, which belongs to the Cyclades complex of islands. The interconnection is a 10-year project that will run in 4 phases, representing an important endeavour for the Greek economy, since it will provide reliable and sufficient power supply to the islands with high voltage electricity, boosting tourism and the economic activity as a whole. Over the next twenty years, the project, including its ensuing stages, promises to offer financial benefits worth 2.7 billion euros.	In progress (started in 2018)
Electro-mobility	The roll-out of EVs charging stations throughout Greece is foreseen, with the first 100-150 to be deployed on islands. This is foreseen to increase the penetration of RES in the local energy mix of islands, using EVs as storage to also address the intermittence of RES.	Planned in 2018

Table 19 - Technical instruments

4.5 Slovenian Regulatory Framework

As regards the Slovenian framework, targets for deep renovation of existing buildings are given in NEEAP 2020 – Slovenian National energy efficiency action plan for 2014–2020, and more detailed in Long-term strategy for mobilising investment in the renovation of national buildings stock (2015) and in Slovenian nZEB action plan (gives also with targets on nZEB renovation) (2015).

By 2030, 26 mio $m^4$of useful floor area of existing buildings (over ¼ of the stock) is planned to be renovated, i.e. 1,3 – 1,7 mio m^2 per year (up to 2% per year in average, 1.75% in single family houses and 2.5% per year in multifamily buildings). Moreover, 1/3 of these buildings has to be renovated in nZEB standard (that involves the obligation on 50% RES share after renovation). Additionally, the national target by 2030 is that at least 2/3 of energy use in buildings must come from RES (60% by 2020).

By 2030, 12.8 million m2 of single-family buildings, 4.1 million m2 of apartment buildings, 3.1 million m2 of public buildings (including governmental buildings) and 4.9 million m2 of buildings in the tertiary sector will be renovated. In Slovenia all new buildings must reach 25% of RES in delivered

energy, the rule is valid also for major renovation on existing buildings, however in case of step-by-step renovation the shift towards the increase of RES share is a result of a number of policies and measures, such as: information and awareness raising activities, EP certification, energy advisory programme for buildings and households, training of (apartment) buildings managers for deep and sNES renovation, fuel poverty programme for low income flat owners, financial incentives – subsidies and soft loans - from Eco fund, EU sources (EIB loan distributed via SID bank) and commercial banks. ESCO market is still underdeveloped, and not used in apartment buildings. New financial instruments for apartment buildings (i.e. factoring, leasing) offered by private sector are slowly penetrating the multifamily buildings market. The Eco fund will further provide grants and soft loans for the renovation of existing residential buildings, while also new financial products are available as soft loans from commercial banks for the renovation of residential buildings.

Financial resources for mitigation of fuel poverty in households and residential cooperatives are planned in the Operational Programme for the implementation of the European cohesion policy in the period 2014-2020 (OP ECP). A strong focus is placed on the mobilisation of private resources. Therefore, a budget line in the operational programme is also planned to support the development of energy performance contracting.

In the coming years the cohesion funding (OP ECP) is planned for demonstration projects on renovation of private and public multifamily buildings financed by ESCOs, and on NZEB renovation of a multifamily building. Cohesion funding is planned also for energy renovation in the framework of Integrated Territorial Investments in selected urban areas.

The update of national Long-term strategy (passed public consultation in 2017) identified three critical fields in energy renovation of existing buildings: quality management, development of financial instruments and the problem of moderately developed energy contracting market. The update suggested the following new policies by the 2020 among them there is the monitoring of RES measures in buildings energy renovation projects with "RES on-site" indicator.

In the latest Slovenian national RES action plan (NRESAP draft) there is a number of policies and measures planned to support the increase of RES in buildings and households. The Slovenian national 2020 target based on Climate and energy package is 25% of RES (23,5% in 2016), where the leading sector in use of RES is »heating and cooling sector« (with 34% RES share). The updated target (recent draft NRESAP 2017-2020) for RES in 2017-2020 period is to prepare financial support for at least 373 GWh of electricity from RES from decentralized production, and to financially support at least 33 ktoe of heating and cooling energy from RES in households.

Ongoing financial support schemes for RES in buildings and households are available at Eco Fund (www.ekosklad.si). Incentives facilitating RES uptake in residential buildings and households are described in the following:

Heat pumps for central heating of residential building – loans and subsidies (Subsidy is part of Non-refundable financial incentives for citizens for new investments in the use of renewable energy sources and increased energy efficiency of residential buildings)

Wood biomass boilers for space heating – loans and subsidies (Installation of wood biomass boilers - on pollen, pellets or chips).

Solar collectors heating system – loan and subsidies (Subsidy is part of Non-refundable financial incentives for citizens for new investments in the use of renewable energy sources and increased energy efficiency of residential buildings)
Micro solar power plant (PV) – subsidy (Investments in self-supply installations with a maximum rated power of 11 kVA, which produce electricity using solar power)
Micro CHP – loan (Installation of micro-combined heat and power plants with high efficiency and nominal power up to 50 kW.)
Support for RES based electricity producers (incl. installations on buildings) includes also (see, www.borzen.si):
Producers of decentralized RES based electricity (RES/CHP) can receive support in form of guaranteed purchase (feed in tariff, preferably for small producers, like PV power plant on buildings) or in form of operating support (i.e. the Centre for Support does not accept or pay electricity, but only pays operating support on the basis of the net electricity generated).
The development of a similar support scheme for RES based heat is planned soon.
(Subsidies are usually between 20% and 30% of the eligible costs in RES or EE investment per dwelling.)
Until recently, grants for RES installations were available also from cohesion funding (EAFRD) - for rural areas.

4.5.1 Development of regulatory guidelines

Slovenian Building Codes (PURES 2010) with the more severe minimum requirements in force since January 2015 are valid for all types of new buildings, i.e. residential and non-residential, while for public buildings (public investments) 10% more severe minimum requirements are imposed. However, new public buildings are front-runners in energy efficiency also due to financial incentives available for early NZEB and due to Decree on green public procurement that included low primary energy among selection criteria for tenders.
Compliance with PURES 2010 must be demonstrated for minimum requirements for the maximum allowed specific transmission heat losses (Ht'), maximum annual heat demand for space heating (Qnh,). Residential buildings must further comply with, maximum energy needs for cooling (Qnc), and maximum primary energy for the energy systems operation (HVAC and lighting). Maximum U-values of the envelope elements are prescribed for all buildings. The use of 25% of RES is mandatory in all new buildings from 2008, alternatively solutions giving a similar impact on primary energy are possible. An alternative solution for the required overall share of RES used on site is expressed by the adequate share of the RES in total final energy used for the operation of HVAC building's energy systems, i.e. consideration of exported RES is subject of integration of new CEN EPBD standard in the revised rules (by mid-2018).
The minimum requirements for existing buildings are set in Building Codes PURES 2010. In case of major renovation where a building permit is needed these do not differ from the requirements for new buildings, If the works are classified as maintenance works then only the minimum requirements for the particular elements are applied.

PURES 2010 transposed the EPBD related to major renovation. Thus the minimum requirements apply also to major renovations, i.e., if at least 25% of the area of the building envelope is subject to renovation. In case of maintenance works on the building envelope, if a renovation (when a building permit is needed) is less than 25% of the thermal envelope area, and for buildings with a floor area smaller than 50 m2, only the minimum requirements for the U-values of the envelope must be considered. For major renovations of the heating system, and in case of maintenance and replacement works, minimum requirements for the systems, subsystems and elements are of the same level as those required for new buildings.

In the Figure 8 the development of the Slovenian regulation on energy efficiency of buildings is presented.

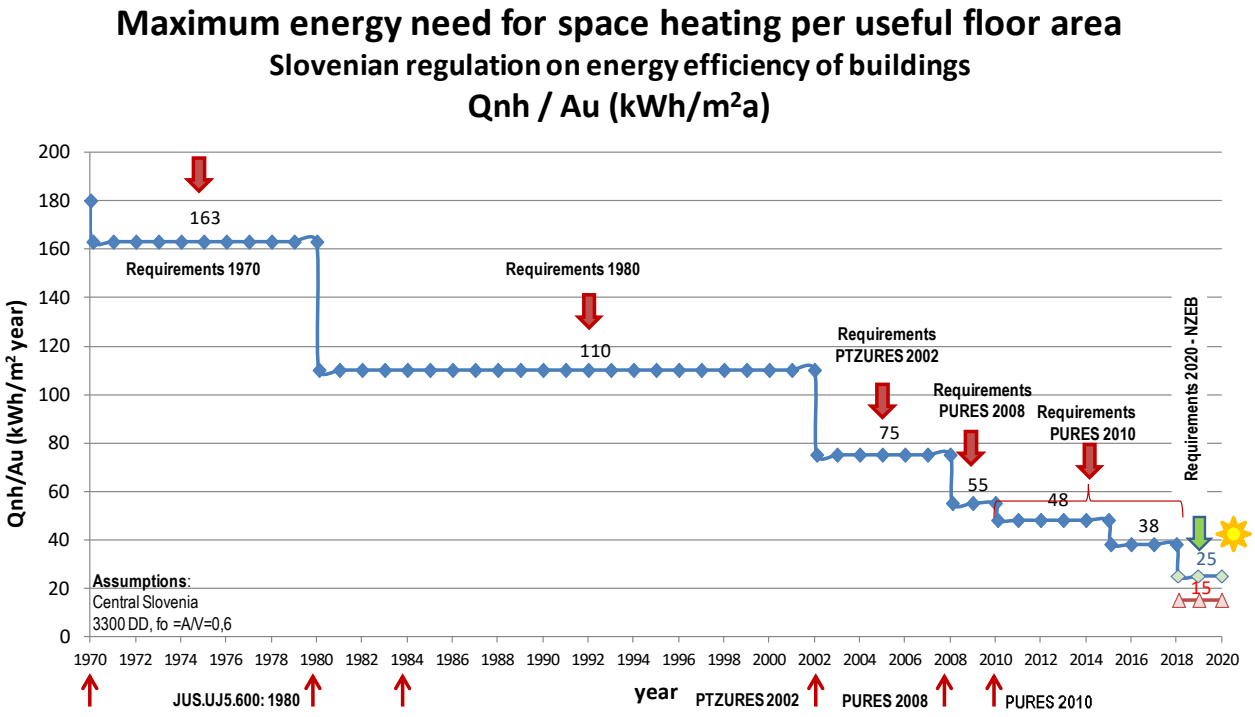

Figure 8 - Development of the Slovenian regulation on energy efficiency of buildings

The study on PURES revision (2015/2016) recommended to complement the minimum efficiency requirements of Technical Building Systems (TBS) with specific values for: space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, as well as water heaters, hot water storage tanks and packages of water heater and solar device based on the requirements of Eco design directive and delegated regulation No 811/2013 and No 812/2013.

Based on cost-optimal study more stringent minimum requirements were proposed for building components Table 20. However, the designers should optimize the U-values of the envelope elements in order to meet the design specific maximum heat transmission coefficient (H_T'), as presented in

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement n. 785072

Figure 9 and to comply with energy performance based minimum requirements. Linear thermal bridges should be kept bellow Ψ_e = 0,2 W/(mK).

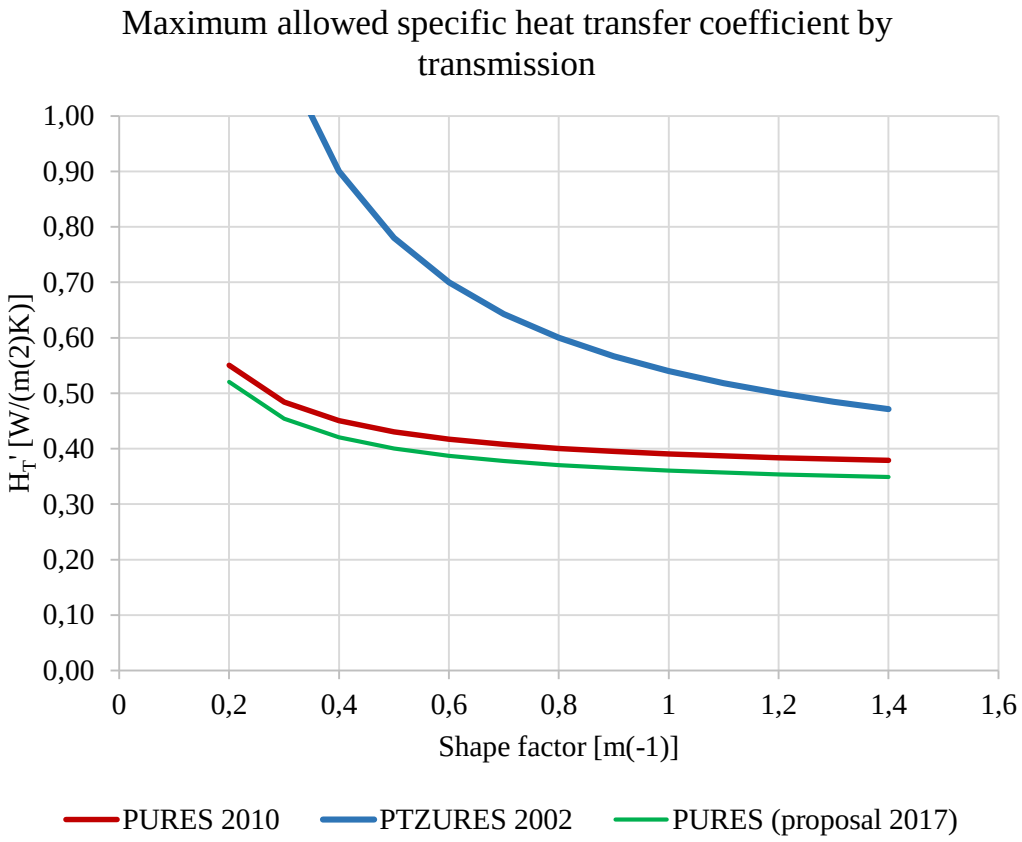

Figure 9 - Maximum allowed specific heat transfer coefficient by transmission

walls	0.28 W/m².K	0.20 W/m².K
floors between flats	0.90 W/m².K	0.90 W/m².K
flat roofs	0.20 W/m².K	0.18 W/m².K
windows	1.3 W/m².K	1.0 W/m².K

Table 20 - Minimum requirements for the elements of the building envelope, current status (2017) and proposal for revised regulation expected in 2018

4.6 Croatian Regulatory Framework

From 2014. Croatia is one of the member states of the European Union that has fulfilled its obligation to define NZEB standard under Technical regulation on the rational use of energy and thermal protection in buildings (OG 97/14). Regulation sets minimum requirements for energy performance for all existing buildings. It was valid till January 2016. After it with some minor changes made were made in Regulation (OG 128/15).

By 2020 all new buildings should be NZEB. After December 2018 all new buildings used by owners of public authorities must be NZEB.

Requirements for NZEB buildings is set according the building purpose and reference climate zone (continental and coastal), as specified in following table (Table 21).

	Continental kWh/m2	Coastal kWh/m2
single family houses	80	50
multiapartment buildings	45	35
office	35	25
building for education	55	55
health care	250	250
hotels and restaurants	90	70
sports halls	210	150
building for retail	170	150

Table 21 - Requirements for NZEB buildings

Except OG 128/15 other national framework that regulates renovation measures and NZEB are as follows:

- Law on Energy Efficiency (OG 127/14),
- Law on Construction (OG 153/13) and
- Regulation on energy audit and certification of buildings (OG 88/17).

Incentive system in the form of integral building renovation to the NZEB standard is targeting buildings constructed prior to 1987 and their renovation aimed at achieving a low-energy standard and energy class B, A or A+. The said building stock was chosen owing to its greatest savings potential and a significant share in the total area of all buildings, it shows the highest annual thermal energy requirements for heating and annual final energy requirements for heating, cooling, domestic hot water (DHW) generation and lighting.
Prerequisite for the implementation of integral building renovation or NZEB standard is a completed energy audit of the building, including an elaboration of recommended measures, some incentive instruments also prescribe establishment of the building energy management system.

At the local government level models of incentives for energy-efficient construction are established based on the reduction of municipal contribution for buildings planned to achieve a lower level of required heating energy in relation to the legal minimum. So far, such models are conducted in cities Koprivnica, Samobor, Jastrebarsko, Požega, Križevci and the municipality of Križ. Communal fee reduction in those cities and municipality is between 20% to 100% of the amount of communal fee. Specific models developed for NZEB buildings do not exist.[2]

When considering the Croatian case, it can be said that there are currently no specific incentives/programmes related to solar energy, there are only ones that consider RES as whole. Up to 2015 when decision making related to incentives and use of EU funds was still on regional/local level, some municipalities/cities had specific RES type measures and incentives related to exclusively solar energy (thermal energy production) were common. Electric energy production related to use of solar energy was also promoted by national energy HROTE via fixed annual installation quotas and feed-in tariffs. That system was also abandoned in 2015 and market is liberalized – there are no annual quotas and national electric energy distributor, HEP, has the obligation to connect any new installation to grid. Electric energy produced is mainly used by the owner and excess production is transferred to the grid for around 25% of market price of kWh.

Most common financial instruments available are:

- Istrian County budget;
- Environmental Protection and Energy Efficiency Fund (cro. Fond za zaštitu okoliša i energetsku učinkovitost – FZOEU). The Fund grants financial resources to legal and natural persons for the purpose of financing the programmes, projects and other activities, set out in the Act on the Environmental Protection and Energy Efficiency Fund through: loans, subsidies, financial assistance and donations. Financial resources are granted on the basis of a completed public contest. Appropriations of the Fund are used primarily to finance the programmes, projects and similar activities set out in accordance with the National Environmental Strategy and the National Environmental Action Plan, the Energy Development Strategy and the Implementation Programme for the Energy Development Strategy and national energy programmes[3];
- The Croatian Bank for Reconstruction and Development (cro. Hrvatska banka za obnovu i razvitak - HBOR) has special lines for lending projects for environmental protection, energy efficiency and renewable energy sources. Currently are active "ESIF Loans for Energy Efficiency in Public Sector Buildings";
- Various commercial banks have available green lending lines. One of the most significant is the credit line of the European Bank for Reconstruction and Development, which, by 2013, offers green loans to various companies and units of local government through various commercial banks. These loans will make it easier to invest in energy efficiency and renewable energy projects. This credit line is the result of the EBRD project implemented in co-operation with the European Union under the name of the Western Balkans Sustainable Energy Financing

[2] Plan za povećanje broja zgrada gotovo nulte energije do 2020. godine, prosinac 2014.
[3] http://www.fzoeu.hr

Facility II (WeBSEFF II). It is open to the public and private sector if they want to improve the efficiency of energy use and / or invest in renewable energy production facilities;

- EU funds - approximately three billion euros are available to the Republic of Croatia within the Operational Program for Competitiveness and Cohesion 2014-2020, through five competitiveness priorities: research and innovation, ICT, small and medium-sized enterprises, low carbon economy and education;
- Public Private Partnership - The basic foundation of a public-private partnership is the use of expertise in the private sector and their resources, in order to contribute to the infrastructure and to the provision of public sector service activities. In this way, the public sector triggers private sector activity, taking into account public interest and quality control;
- The ESCO (Energy Service Company) model includes development, implementation and financing of projects to improve energy efficiency and reduce operating and maintenance costs. The goal of each project is to reduce energy costs and maintenance by installing more efficient equipment and by optimizing energy systems. Therefore, ensuring the repayment of investments through realized savings over a period of several years, depending on the client and the project;
- Transnational Cooperation Programs as:
    - Interreg Mediterranean,
    - Interreg Danube,
    - Interreg Adriatic - Ionian,
    - Interreg Central Europe and
    - Interreg Italy – Croatia.

As previously mentioned, all measures and installations are now under general RES rules that in Istrian region have to be aligned with these documents:

1. County Development Strategy for Istrian County 2011. - 2013. (cro. Županijska razvojna strategija za Istarsku županiju 2011. - 2013.), Note that this is currently active strategy http://www.ida.hr/fileadmin/sadrzaji/datoteke/ZRS/ZRS_Istarske_zupanije_2011_-2013.pdf
2. Istrian County Energy Efficiency Action Plan for the Period 2017 - 2020 (cro. Akcijski plan energetske učinkovitosti Istarske županije za razdoblje od 2017. do 2019. godine), December 2016 https://www.istra-istria.hr/fileadmin/dokumenti/novosti/sjednice_skupstine_2013/38/38-25-En_ucinkovitost_IZ_2017_2019.pdf
3. Istrian County Annual Energy Efficiency Plan for 2017 (cro. Godišnji plan energetske učinkovitosti Istarske županije za 2017. godinu), December 2016, https://www.istra-istria.hr/index.php?id=4454
4. Istrian County Spatial Plan (cro. Prostorni plan Istarske Županije), SNIŽ 14/16, http://www.zpuiz.hr/fileadmin/dokumenti/prostorni_plan/Ostali/PPIZ_2016/broj14-od-29-07-2016.pdf

RES use measures have to be aligned with these priorities of regional operational programme, where the numbers of the list are those of the regional operational programme,

Strategic goal: I Competitive Economy,

Priority 1.2 Encouraging and support the development of small and medium entrepreneurship,

Measure 1.2.1. Creating a favorable financial environment for small and medium entrepreneurship;

Measure 1.2.2. Entrepreneurship education with the aim of raising competitiveness
Measure 1.2.3. Development of entrepreneurial incubators with the aim of encouraging the creation of new jobs
Priority 1.10. Energy Efficiency and Renewable Energy Sources
Measure 1.10.1. Increasing the efficiency of using primary energy sources
Measure 1.10.2. Establish supports to promote energy efficiency projects
Measure 1.10.3. Using Renewable Energy Sources
Measure 1.10.4. Information and education of the population
Most of the investments are being financed by structural funds through operational programme competitiveness and cohesion 2014-2020. Since energy topics are addressed by several investment priorities, there are multiple bodies responsible for management of these funds.
Energy related topics can be found under these investment priorities:
1. 4b - Promoting energy efficiency and renewable energy use in enterprises
Responsible bodies: Ministry of Economy, Entrepreneurship and Crafts (first intermediary level), The Environmental Protection and Energy Efficiency Fund (second intermediary level)
2. 4c - Supporting energy efficiency, smart energy management and renewable energy use in public infrastructure, including in public buildings, and in the housing sector
Responsible bodies: Ministry of Construction and Physical Planning (first intermediary level), The Environmental Protection and Energy Efficiency Fund (second intermediary level)
3. 4d - Developing and implementing smart distribution systems that operate at low and medium voltage levels
Responsible bodies: Ministry of Economy, Entrepreneurship and Crafts (first and second intermediary level)
4. 6c - Conserving, protecting, promoting and developing natural and cultural heritage
Responsible bodies: Ministry of Regional Development and European Union Funds (first intermediary level), SAFU (second intermediary level)
5. 6i - Investing in the waste sector to meet the requirements of the Union's environmental acquis and to address needs, identified by the Member States, for investment that goes beyond those requirements
Responsible bodies: Ministry of Environment and Energy (first intermediary level), The Environmental Protection and Energy Efficiency Fund (second intermediary level)
6. 7ii - Developing and improving environmentally-friendly (including low-noise) and low-carbon transport systems, including inland waterways and maritime transport, ports, multimodal links and airport infrastructure, in order to promote sustainable regional and local mobility

Responsible bodies: Ministry of Maritime Affairs, Transport and Infrastructure (first and second intermediary level).

4.6.1 Development of regulatory guidelines

The regulatory framework and programs concerning the uptake of the renewable energy sources in Croatia are as follows:

- National Energy Efficiency Programme for 2008–20165;
- 2nd National Energy Efficiency Action Plan for 2011–20136;
- 3rd National Energy Efficiency Action Plan for 2014-2017;
- Programme of energy renovation of residential buildings for the period between 2013 and 2027;
- Programme of energy renovation of commercial buildings for the period between 2013 and 2020 with a detailed plan of energy renovation of commercial buildings for 2013–20168;
- Programme of energy renovation of public buildings.

4.7 Cypriot regulatory framework

4.7.1 Regulatory Framework concerning the building renovation strategy

In Cyprus there is a strategy for mobilising investments in the field of building renovation in accordance with Article 4 of Directive 2012/27/EU on energy efficiency. In this publication, quantitative and qualitative indicators are used to stress the problems caused by the energy status of the building stock to date, as well as the opportunities offered by increased mobilisation in investment in major renovation. The aim is to ensure the energy upgrading of the building stock in cost-optimal ways for the owner, while at the same time maximising economic, environmental and social benefits for Cyprus.

Overall, the policies and measures to stimulate the mobilisation of investment in the renovation of existing buildings can be broken into legislative measures, incentives, training measures and information measures.

Concerning the legislative measures which can be considered as the basis, those are:

- Related to the provisions of the Regulation on the Energy Performance of Buildings Laws of 2006 - 2017. As of the 1st of January 2017, all buildings undergoing major renovation must be classified under energy efficiency class B. If the energy upgrading to that minimum level is not technically and/or financially feasible, a study should be prepared to explain why.
- Mandatory EPCs when sell or rent buildings and building units, and on commercial advertisements when a building is offered for renting or sale.
- Mandatory periodic inspection of air conditioning when those have a rated output of more than 12 kW or aggregate output of more than 50 kW, and heating systems with a boiler of more than 20 kW rated output.

Regarding the incentives, those are analysed below, whereas training and information measures can be indicatively mentioned. The offered training regards all professionals involved in the energy performance of buildings. Those are professionals who either are engaging primarily in the design of buildings and of technical building systems, including RES systems, either those who are responsible

for the installation of building elements that affect energy performance. Through this training, the follow credentials are obtained: Qualified experts, Energy auditors, European Energy Managers, Qualified RES installers etc. Regarding the information measures, those are horizontal, and include campaigns, workshops, social media updates etc.

In regards of the renovation of buildings owned and used by central government authorities, as of 1st January 2014 in the context of applying Article 5 of Directive 2012/27/EU – *Exemplary role of the public sector*, Cyprus selected the alternative approach for implementing other cost-effective saving measures in selected privately-owned public buildings (including deep renovations and measures intended to improve user behaviour) to achieve, by 2020, an amount of energy savings that is at least equivalent with the requirement for 3% of the total floor area of the buildings owned and occupied by the central government renovated each year. This option allows for more flexibility in implementing cost-optimal energy savings measures as appropriate. In specific, financing of 16 million euros has been secured from the European and Structural Funds for the period 2014-2020 with a view to implementing energy upgrading projects in buildings owned and used by the central public administration.

NZEB Standard:

The NZEB Standard is in force in Cyprus since 2014, and the requirements and technical characteristics that must be met by a nearly-zero energy building as laid down in RAA 366/2014 are as follows in Table 22 :

	Requirements	
1	Energy efficiency class in the energy performance certificate of a building.	A
2	Maximum primary energy consumption in residential buildings, as determined in accordance with the methodology used to calculate the energy performance of buildings.	100 kWh per m^2 per year
3	Maximum primary energy consumption in non-residential buildings, as determined in accordance with the methodology used to calculate the energy performance of buildings.	125 kWh per m^2 per year
4	Maximum energy demand for heating for residential buildings.	15 kWh per m^2 per year
5	At least 25 % of total primary energy consumption, as determined in accordance with the methodology used to calculate the energy performance of buildings, comes from renewable energy sources.	
6	Maximum mean U-value for walls and load-carrying elements (pillars, beams and load-carrying walls) which are part of the building envelope.	0.4 W/m^2K
7	Maximum mean U-value for horizontal building elements (floors in a piloti, floors in a cantilever, terraces, roofs) and ceilings which are part of the building envelope.	0.4 W/m^2K
8	Maximum mean U-value for (door and window) frames which are part of the building envelope. Shop displays are exempted.	2.25 W/m^2K
9	Maximum mean installed lighting power for office buildings.	10 W/m^2

Table 22 - nearly-zero energy building as laid down in RAA 366/201

There is also a national plan for increasing the number of Nearly-Zero Energy Buildings in accordance with the Article 5A of the regulation of the Energy Performance of Buildings Laws of 2006-2017.
In addition, the 'Technical Guide for Nearly Zero Energy Buildings" was prepared in order to assist buildings professionals in designing new buildings and renovating existing buildings to Nearly Zero Energy Buildings.
There are also plans to revise the "Guide on the thermal Insulation of Buildings", which sets out the method used to calculate U-Values and the specific heat capacity, also referring to thermal insulation techniques. The revision will include clear-cut references to NZEBs.
Other measure was the issuance of technical guides on energy performance requirements, and the adjustment and control of the technical building systems which are installed or upgraded in existing buildings (Partially compliance with Article 8 of Directive 2010/31/EU).
Training seminars in specific for NZEBs were also provided to professional groups involved in the construction industry and the real estate market (i.e. 'SouthZEB' research programme & the MENS project).
The revision of minimum energy performance requirements for news buildings between 2017-2019 (RAA 119/2016), set the route for NZEBs as well, as the requirements are close to the ones for a NZEB.
Cyprus must ensure that the share of RES in final energy consumption is at least 13% by 2020 in compliance with the Directive 2009/28/EC. Cyprus up to 2016, was at 9.27% (or 71.8% of the target).
In specific, the targets for electricity production in 2020, in terms of systems capacity, are 175 MW, 288 MW and 15 MW for wind, photovoltaics and biomass technology respectively. Up to May 2018, those were 157.5 MW, 117 MW and 12.8 MW (National Plan for RES).
Is noted that RES in transportation (also 2020's target - 10% form RES), is addressed separately.

Moreover, a national energy efficiency fund was established in 2003 with the "Special Fund for Renewable Energy Sources (RES) and Energy Savings (ES)", under the Fostering and Promoting the Use of Renewable Energy Sources and Energy Savings Law of 2003. The Fund aims to encourage the use of RES and promote energy savings.
Is worth noting that solar thermal panels for hot water production in residential buildings are obligatory (they actually were a common practise). In specific, currently, in Cyprus, about 92% of buildings have installed Solar thermal panels to cover their needs for DHW.
In addition, according to the minimum energy performance requirements in force since 1st of January 2017 (RAA 119/2016), for new buildings at least 25% of total primary energy consumption must originate from RES in detached houses, for residential building units the proportion should be at least 3%, whereas for non-residential buildings this should be at least 7%. In the case of an NZEB (RAA 366/2014), at least 25% of total primary energy consumption must originate form RES in all buildings.
The penetration of RES systems is also part of the upgrading of existing buildings. To promote the use of Renewable Energy, a certification system has been established for installers of small-scale RES systems carrying out the installation and/or maintenance of small-scale biomass boilers and heaters and/or photovoltaic and solar thermal systems and/or shallow geothermal systems and heat pumps.

4.7.2 Development of regulatory guidelines

Incentive systems available and planned for the future for Cyprus:

Order No 1 of 2014 [On-Going]:

This was issued by the Minister for Interior on the basis of the Town and Country Planning Law - *Use of renewable energy sources, in accordance with Article 6*. It states that in the case of new buildings and buildings undergoing renovation, it is possible to increase the build rate by 5% for energy class A building, which cover at least 25% of their total energy needs from renewable energy sources.

"Plan for the production of electricity from renewable energy sources for self-consumption" [On-Going]:

The firsts steps initiated in 2013 from the "Solar Energy for all" programme, aiming to promote photovoltaic installations for meeting own electricity needs. Up to 2018 it is possible to install a photovoltaic system with a maximum permissible capacity of 5.2 kW_p (is expected to be increased soon to 10 kW_p for all types of buildings). Where these systems are installed, the electricity consumed by the building is offset against that generated by the photovoltaic system (net-metering method). Up until 2017, more than 11,000 PV systems have been installed in buildings using the net-metering method, and the aim was to have another 70 MW installed by 2020, which corresponds to approximately 8,000 buildings.

Categories in the framework of the programme "Plan for the production of electricity from renewable energy sources for self-consumption" which was launched in June 2017:

a. Category A - Total Capacity 23 MW: PV systems connected with the network using the net-metering.
   It is noted that Category A has 3 sub-categories: 1. Low income households (net metering with grand 900 €/kW with maximum the 2700 €, up to 5.2 kW), 2. Residential buildings (net-metering up to 5.2 kW), 3. commercial and public buildings (net metering up to 5.2 kW).

b. Category B - Total Capacity 80 MW: Photovoltaic systems [40 MW] and biomass/ biogas systems [40 MW], intended for self-production for consumers having commercial or industrial tariffs (commercial and industrial facilities, public buildings, agriculture and stock farming holdings, fisheries facilities etc.), from 10 kW_p - 10 MW_p capacity.

c. Category C - Unlimited Capacity: Autonomous photovoltaic systems not connected to the grid (off-grid).

Lower VAT rate for the renovation and repair of private dwellings [On-Going]:

This measure, as planned by the Ministry of Finance, has been in force since late 2015 and relates to applying lower VAT rate (5%) instead of 19% for renovation and repair works carried out in existing private dwellings. The lower rate is used, among others, for works consisting in applying thermal insulation on the buildings' envelope and replacing window frames.

Thermal Insulation of dwellings through low-interest loans [On-Going]:
The 1st uptake in Cyprus was developed by the Cyprus Cooperative Central Bank in cooperation with the Employers and Industrialists Federation and with support from the Energy Service.

"Save & Upgrade" programme [Recently Closed]:
There were 2 calls for supporting schemes for the energy renovation of existing houses and existing buildings (those are the buildings that had requested building permits before the 21st of December 2007, meaning, before the entry into force of the minimum energy performance requirements), owned or used by small and medium enterprises utilizing European and Structural Funds. The support scheme provided direct grants for large-scale renovation in buildings, which will upgrade their energy class on the building's energy performance certificate to at least B or achieve energy savings at least 40% or upgrade the building to the nearly zero energy level. The 1st call closed on 2016 (opened in 2015), whereas the 2nd call opened from April 2018 and closed on June 2018. The 2nd call excluded the SMEs and included multi-residential buildings. In addition, instead of 40% energy savings, it demanded 50%. In both calls the largest grant amount was granted to buildings undergoing renovation to become NZEBs. In the following months is expected to open a call for enterprises.

Scheme for solar thermal systems for hot water demand in residential buildings [Recently Closed]:
It was launched in September 2017, closed in January 2018. Its purpose was to promote the efficiency of installed solar thermal systems by replacing existing systems with new more efficient.
The total budget was 600,000 €

- Grant 350 € per dwelling for solar panels and hot water tank
- Grant 175 € per dwelling for solar panels only.

Expected to be announced in the following months/period:

PV systems - Net Billing method:
The Net-Billing method is expected to replace the existing Net-Metering method approximately 80-100 MW available).

Energy Audits Scheme:
Available budget 500,000.00 euros

Re-launched of the scheme for enterprises "Save & Upgrade"
Re-launched of the scheme for solar thermal systems
New Scheme for thermal insulation of the roofs
New scheme for installation of PV systems in all public schools (4 – 5 MW)

These schemes, regard mainly the residential and municipal buildings as those will be promoted with HAPPEN. It is also possible to exploit some of the schemes for the pilot projects in Cyprus and present them as good practices or funding opportunities.

5 CONCLUSIONS AND RECOMMENDATIONS

Promoting and encouraging the energy efficiency is not a new issue for European politics, but above all it currently plays strong motivations, both at an economic and geopolitical level; in addition to the "environmental issue" according to the Kyoto Protocol's international commitments.
The other important economic-political element is the security or, even better, the energy independence of developed countries. These motivations represent the core of the last European measures about renewable energy that aim (according to a climate change – energy juncture integrated approach) at reducing the energy demand and at diversifying the energy supply.
The analysis developed in this paper gives us a deep study about the European strategic framework aimed at fighting against the global warming, at reducing the greenhouse gas emission and promoting energy efficiency. It shows also how the regulatory system around the Mediterranean countries (involved in the HAPPEN project) moves in the right direction in order to achieve the European binding goals.
The EU established in autonomy some goals regarding climate and energy issues for 2020, 2030 and 2050.
2020 goals:

- To reduce the greenhouse gas emission by at least 20% with respect to the 1990 level.
- To obtain the 20% of energy coming from renewable sources
- To improve the energy efficiency by 20%

2030 goals:

- To reduce the greenhouse gas emission by at least 40%.
- To obtain at least the 27% of energy coming from renewable sources
- To improve the energy efficiency by 27-30%
- To increase the interconnection level to the 15% (in other words, the 15% of the electric energy produced in Europe can be exported to other EU countries)

2050 goals:

- To reduce the greenhouse emission by 80-90% with respect to the 1990 level.

To this extent, the international cooperation is crucial in order to face the global energy challenge.
New national measures must ensure major energy savings for consumers and industry alike. For example:

- energy distributors or retail energy sales companies have to achieve 1.5% energy savings per year through the implementation of energy efficiency measures;
- EU countries can opt to achieve the same level of savings through other means, such as improving the efficiency of heating systems, installing double glazed windows or insulating roofs;
- the public sector in EU countries should purchase energy efficient buildings, products and services;

- every year, governments in EU countries must carry out energy efficient renovations on at least 3% (by floor area) of the buildings they own and occupy;
- energy consumers should be empowered to better manage consumption. This includes easy and free access to data on consumption through individual metering;
- national incentives for SMEs to undergo energy audits;
- large companies will make audits of their energy consumption to help them identify ways to reduce it;
- monitoring efficiency levels in new energy generation capacities.

To reach the EU's 20% energy efficiency target by 2020, individual EU countries have to set their own indicative national energy efficiency targets. Depending on country preferences, these targets can be based on primary or final energy consumption, primary or final energy savings, or energy intensity.

The building industry is an important sector for EU politics about energy efficiency, since it offers the second major potential energy saving that can be reached but not exploited yet, with also a good cost/effectiveness relationship, after the energy industry itself.

The building energy efficiency improvement entails some important collateral advantages, for example, the employment generation, fuel savings, a greater health conditions, as well as the reinforcement of the energy security and the industrial competitiveness.

If the European Union wants to achieve the energy efficiency goal by 2020 and also reach additional savings by 2050, it is important to consolidate the financial help for the energy efficiency in buildings. In order to make it happen, it is necessary to ensure the right implementation of the regulatory framework, to make available a greater number of financing sources and to look for the elimination of the main barriers.

Therefore, the state-of-the-art analysis carried out in the present deliverable is fundamental to introduce innovative market guarantee systems aimed at encouraging and supporting all the stakeholders in the business chain of retrofit actions for the renewal of the real estate market, to be applied to different combinations of buildings typologies, retrofit solutions and incentives systems.

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