CONTRACT N°: IEE/13/886/SI2.674899
REFURBISHMENT OF THE PUBLIC BUILDING STOCK TOWARDS NZEB

ACRONYM OF THE PROJECT: REPUBLIC_ZEB

D5.4: MODEL CONTRACT BETWEEN BUILDERS AND PUBLIC BUILDING OWNERS FOR THE REFURBISHMENT INTO NZEB

D5.5: FINANCING SCHEMES BY THE THIRD PARTY FOR BUILDERS AND BUILDING OWNERS, BASED ON THE USE OF THE ENERGY EFFICIENCY MEASURES SUITABLE FOR REFURBISHMENT INTO NZEB

October 2016
RePublic_ZEB Project

Year of implementation: 01/03/2014 - 31/10/2016
Website: www.republiczeb.org

Project consortium

- BME WP3 Leader
- BRE WP6 Leader
- BSERC WP2 Leader
- CRES Partner
- CTI WP1-WP7 Leader, Coordination
- EIHP Partner
- URBAN-INCERC Partner
- IREC Partner
- LNEG WP5 Leader
- MACEF Partner
- POLITO WP 4 Leader, WP Leader – other participants
- ZRMK Partner
Project overview

The RePublic_ZEB project is focused on the energy and CO₂ emissions associated with existing public buildings and their refurbishment towards nZEB.

The core objective of the project is to:

- Define costs-benefit optimized “packages of measures” based on efficient and quality-guaranteed technologies for the refurbishment of the public building stock towards nZEB that are standardized and adopted by builders and building owners.

From this, three basic objectives stem:

(i) State-of-the-art assessment of the public building stock through a country-specific evaluation of the energy consumption and CO₂ emissions;

(ii) Reference buildings definition

(iii) Development of a common framework and a harmonized methodology for the definition of a nZEB concept for public buildings.

Acknowledgement

The authors and the whole project consortium gratefully acknowledge the financial and intellectual support of this work provided by the Intelligent Energy for Europe – Programme.

With the support of the EUROPEAN COMMISSION Executive Agency for Competitiveness and Innovation Intelligent Energy for Europe

Legal Notice

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union. Neither the EACI nor the European Commission is responsible for any use that may be made of the information contained therein.

All rights reserved; no part of this publication may be translated, reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the written permission of the publisher. Many of the designations used by manufacturers and sellers to distinguish their products are claimed as trademarks. The quotation of those designations in whatever way does not imply the conclusion that the use of those designations is legal without the consent of the owner of the trademark.
Authors of this report:

Laura Aelenei  
National Laboratory of Energy and Geology, I.P. (LNEG)

Ana Rute Ferreira  
National Laboratory of Energy and Geology, I.P. (LNEG)

Joana Ortiz  
Institut de Recerca en Energia de Catalunya (IREC)

With the contribution of the following partners:

Zoltan Magyar  
Budapest University of Technology and Economics (BME)

Gabor Nemeth  
Budapest University of Technology and Economics (BME)

Jeno Kontra  
Budapest University of Technology and Economics (BME)

Richard Hartless  
BRE

Lulin Radulov  
Black Sea Energy Research Centre (BSERC)

Elpida Polychroni  
Centre for Renewable Energy Sources and Saving (CRES)

Katerina Sfakianaki  
Centre for Renewable Energy Sources and Saving (CRES)

Maria Bololia  
Centre for Renewable Energy Sources and Saving (CRES)

Giovanni Riva  
Comitato Termotecnico Italiano (CTI)

Giovanni Murano  
Comitato Termotecnico Italiano (CTI)

Toni Borković  
Energetski institut Hrvoje Požar (EIHP)

Horia Petran  
URBAN-INCERC

Sashe Panevski  
Macedonian Center for Energy Efficiency (MACEF)

Vincenzo Corrado  
Politecnico di Torino (POLITO)

Simona Paduos  
Politecnico di Torino (POLITO)

Gasper Stegnar  
Gradbeni inštitut ZRMK (ZRMK)

Marjana Šijanec Zavrl  
Gradbeni inštitut ZRMK (ZRMK)
CONTENTS

1 EXECUTIVE SUMMARY .............................................................................................................. 9

2 MODELS FOR CONTRACTS ........................................................................................................ 10
  2.1 INTRODUCTION ..................................................................................................................... 10
  2.2 MODEL OF ANNEX FOR EPC CONTRACTS ......................................................................... 10

3 COUNTRIES CONTRIBUTION ..................................................................................................... 13
  3.1 BULGARIA ............................................................................................................................ 13
    3.1.1 Status quo ....................................................................................................................... 13
    3.1.2 RePublic_ZEB contribution at national level ............................................................... 15
  3.2 CROATIA ............................................................................................................................. 16
    3.2.1 Status Quo ..................................................................................................................... 16
    3.2.2 RePublic_ZEB contribution at national level ............................................................... 17
  3.3 MACEDONIA ......................................................................................................................... 17
    3.3.1 Status Quo ..................................................................................................................... 17
    3.3.2 RePublic_ZEB contribution at national level ............................................................... 18
  3.4 GREECE ................................................................................................................................ 18
    3.4.1 Status Quo ..................................................................................................................... 18
    3.4.2 RePublic_ZEB contribution at national level ............................................................... 22
  3.5 HUNGARY ........................................................................................................................... 22
    3.5.1 Status Quo ..................................................................................................................... 22
    3.5.2 RePublic_ZEB contribution at national level ............................................................... 22
  3.6 ITALY .................................................................................................................................... 25
    3.6.1 Status quo ...................................................................................................................... 25
    3.6.2 RePublic_ZEB contribution at national level ............................................................... 29
  3.7 PORTUGAL .......................................................................................................................... 29
    3.7.1 Status Quo ..................................................................................................................... 29
    3.7.2 RePublic_ZEB contribution at national level ............................................................... 31
  3.8 ROMANIA ............................................................................................................................. 31
    3.8.1 Status quo ...................................................................................................................... 31
    3.8.2 RePublic_ZEB contribution at national level ............................................................... 32
  3.9 SLOVENIA ............................................................................................................................ 33
    3.9.1 Status quo ...................................................................................................................... 33
    3.9.2 RePublic_ZEB contribution at national level ............................................................... 36
  3.10 SPAIN ................................................................................................................................... 37
    3.10.1 Status quo .................................................................................................................... 37
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.10.2</td>
<td>RePublic_ZEB contribution at national level</td>
<td>39</td>
</tr>
<tr>
<td>3.11</td>
<td>UK</td>
<td>40</td>
</tr>
<tr>
<td>3.11.1</td>
<td>Status quo</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>FINANCIAL SCHEMES</td>
<td>42</td>
</tr>
<tr>
<td>4.1</td>
<td>INTRODUCTION</td>
<td>42</td>
</tr>
<tr>
<td>4.2</td>
<td>BULGARIA</td>
<td>42</td>
</tr>
<tr>
<td>4.3</td>
<td>CROATIA</td>
<td>47</td>
</tr>
<tr>
<td>4.4</td>
<td>FORMER YUGOSLAV REPUBLIC OF MACEDONIA</td>
<td>52</td>
</tr>
<tr>
<td>4.5</td>
<td>GREECE</td>
<td>54</td>
</tr>
<tr>
<td>4.6</td>
<td>HUNGARY</td>
<td>56</td>
</tr>
<tr>
<td>4.7</td>
<td>ITALY</td>
<td>58</td>
</tr>
<tr>
<td>4.8</td>
<td>PORTUGAL</td>
<td>62</td>
</tr>
<tr>
<td>4.9</td>
<td>ROMANIA</td>
<td>65</td>
</tr>
<tr>
<td>4.10</td>
<td>SLOVENIA</td>
<td>68</td>
</tr>
<tr>
<td>4.11</td>
<td>SPAIN</td>
<td>70</td>
</tr>
<tr>
<td>4.12</td>
<td>UNITED KINGDOM</td>
<td>73</td>
</tr>
<tr>
<td>5</td>
<td>REFERENCES</td>
<td>78</td>
</tr>
<tr>
<td>5.1</td>
<td>ANNEX TO THE CONTRACT: BULGARIA</td>
<td>79</td>
</tr>
<tr>
<td>5.2</td>
<td>ANNEX TO THE CONTRACT: CROATIA</td>
<td>80</td>
</tr>
<tr>
<td>5.3</td>
<td>ANNEX TO THE CONTRACT: MACEDONIA</td>
<td>81</td>
</tr>
<tr>
<td>5.4</td>
<td>ANNEX TO THE CONTRACT: GREECE</td>
<td>82</td>
</tr>
<tr>
<td>5.5</td>
<td>ANNEX TO THE CONTRACT: HUNGARY</td>
<td>83</td>
</tr>
<tr>
<td>5.6</td>
<td>ANNEX TO THE CONTRACT: ITALY</td>
<td>85</td>
</tr>
<tr>
<td>5.7</td>
<td>ANNEX TO THE CONTRACT: PORTUGAL</td>
<td>88</td>
</tr>
<tr>
<td>5.8</td>
<td>ANNEX TO THE CONTRACT: ROMANIA</td>
<td>89</td>
</tr>
<tr>
<td>5.9</td>
<td>ANNEX TO THE CONTRACT: SLOVENIA</td>
<td>91</td>
</tr>
<tr>
<td>5.10</td>
<td>ANNEX TO THE CONTRACT: SPAIN</td>
<td>92</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

Figure 3.3.1 Responsible bodies for public procurement..............................................................18
Figure 3.6.1 Technical Standards that can be recalled in EPC contracts and their year of publication
..............................................................................................................................................27
Figure 3.7.1. Structure for the call procedure defined in the Decree-Law No. 29/2011 of 28 of
February ........................................................................................................................................29
Figure 3.7.2. Eco.Ap steps ..............................................................................................................30
Figure 3.9.1 Chart of energy renovation plan ...............................................................................35
Figure 3.9.2 Financing the energy renovation of public buildings in Slovenia............................36
Figure 3.11.1 Phases of the Model of Contract .............................................................................41

Figure 4.7.1. In Italy public administrations can access at national level to the grants provided by the
“Conto Termico 2” which include a specific measure for the transformation of public buildings to
nZEB. This measure was developed with the support of the Republic_ZEB project and can cover
around the 50-60% of the investment needed for the energy measures. If the public administration
needs more funds, is possible to integrate the state funds with regional ones. These funds can be
shifted to the ESCo selected through tenders. .............................................................................60
### LIST OF TABLES

Table 2.1. Reference public buildings studies by the project ................................................................. 11  
Table 2.2. Energy Performance levels ........................................................................................................ 12  
Table 3.1.1 Requirements to the different types of buildings to be classified as nZEB ............................. 15  
Table 3.1.2 Requirements to the different types of buildings to be classified as nZEB ............................. 15  
Table 3.5.1 Thermal resistance of building structure .................................................................................. 23  
Table 3.5.2 Total primary energy consumption ........................................................................................... 24  
Table 3.6.1 Part one: General information ................................................................................................. 26  
Table 3.6.2 Part two: Economic and technical aspects .................................................................................. 27  
Table 3.6.3 Part three – Responsibilities ...................................................................................................... 28  
Table 3.6.4 Part four - Guarantees and penalties ......................................................................................... 28  
Table 3.10.1 GS-ESCO proposal .............................................................................................................. 38  
Table 3.10.2 ESCO models proposal .......................................................................................................... 38  
Table 3.10.3 Projects carried out by the Catalan Government ...................................................................... 38
1 EXECUTIVE SUMMARY

This report includes the contents of deliverables D5.4 and D5.5 combined because the subject of energy performance contracts is closely related to the issue of financial schemes.

According to the European Commission Joint Research Centre, Institute for Energy and Transport (IET) an “Energy Performance Contracting (EPC) is a form of “creative financing” for capital improvement which allows funding energy upgrades from cost reductions. Under an EPC arrangement an external organization (ESCo) implements a project to deliver energy efficiency or a renewable energy project, and uses the stream of income from the cost savings or the renewable energy produced, to repay the costs of the project, including the costs of the investment. Essentially the ESCo will not receive its payment unless the project delivers energy savings as expected” [1].

The energy service market for the refurbishment of buildings is a key issue for public administrations without the capital for projects to transform existing buildings towards nZEB. In this context, the main aim of this document is to set out the state of the art for EPC contracts (which is not well developed yet) and for the financial instruments available in each country.

The first part of the document (Section 2; D5.4) presents an annex that can be included in the EPC contracts between builders (ESCos in this case) and public building owners to refurbish buildings. The template, based on RePublic_ZEB approaches and findings discussed in the previous deliverables (with special reference to those developed by WP4), is followed by the contributions of the participating countries.

In most countries, model contracts between public building owners and ESCOs / builders already exist and the project activity provides useful input to improve these models and/or provide information for their technical annexes.

The second part (Section 3; D5.5) features information gathered by the partners on national financing schemes and instruments to refurbish buildings and public buildings. Considering that there are very few funding schemes dedicated to nZEB, the topic is covered in a general way.
2 MODELS FOR CONTRACTS

2.1 INTRODUCTION

In almost all the participating countries, the EPC model contracts of different complexity are available (and presented here in the following): after a thorough discussion within the consortium, it was agreed that the project could propose a scheme of appendix, useful to recall the following aspects:

- Methodology for the selection of the reference buildings, useful for gathering the buildings' characteristics for energy calculations;
- Calculation of the energy performance of the buildings, in order to verify the basic requirement for nZEB, both in the national context (if a specific regulation exists) and in the case of adoption of the definition prepared by the project;
- General characteristics of the packages of measures defined by the project which, as seen in the other deliverables, do not change much, at least in terms of types of measures, for all the examples studied in the context of the WP4 activities.

The possible contents of the model are presented in the following.

2.2 MODEL OF ANNEX FOR EPC CONTRACTS

Introduction: the IEE RePublic_ZEB project

RePublic_ZEB, a European Commission funded project, has developed and promoted Near Zero Energy Building (nZEB) solutions and measures for refurbishment of public buildings, in accordance with Article 9 of the EU's Energy Performance of Building Directive.

Among the different activities, the project has been defined:

1. A methodology for defining the characteristics of the buildings
2. The basic steps for nZEB energy rating and a cost-benefit analysis of the "packages of measures" for the refurbishment towards nZEB
3. A set of measures and packages of measures useful for refurbishment to nZEB.

All the results are available on the website www.republiczeb.org and can be consulted for the preparation of this annex.

Methodology for the characterization of the buildings

In order to perform a co-ordinated analysis of the public building stock, the project has prepared a common methodology for the definition of building categories and characteristics.

This methodology is available in D2.1 and was applied for defining a set of reference buildings, shown in the following table: their characteristics are available in D2.2.

These buildings can be useful for comparing other similar existing public buildings in the different countries (performances and relevant comments are available in D4.3).
Table 2.1. Reference public buildings studies by the project

<table>
<thead>
<tr>
<th>Country</th>
<th>Residential</th>
<th>Offices</th>
<th>Education</th>
<th>Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Croatia</td>
<td>●</td>
<td></td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Macedonia</td>
<td>●</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Hungary</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Portugal</td>
<td>●</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td>●</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Slovenia</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Spain</td>
<td>●</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>UK</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Energy rating of nZEBs and economical evaluation

If detailed requirements exist and are regulated by the law of the specific country, it is compulsory to follow them.

If the regulations are flexible and/or not defined at analytical level, the methodological steps given by prEN 15603:2015 and the definition and methods focused by the project in D4.2 (details are available in D3.2 and in the deliverables prepared by WP4) can be adopted for nZEB rating and verification. In the following, the most important topics are underlined.

**Building energy needs calculation**

The following topics should be considered for the calculation of the building energy needs: thermal characteristic of the building envelope; transmission and ventilation properties; partition of building into different zones; climatic data; heat gains from internal heat sources, solar properties; comfort requirements. The procedure is detailed in the EN ISO 13790.

**Total primary energy use calculation**

The technical systems (plants for heating, cooling, DHW production, ventilation, lighting) can consume different energy carriers and the total energy consumptions should be expressed in primary energy and calculated according with the cited prEN 15603 and defining the primary energy factors. As specified in the EN 15217, the Energy Performance (EP) is the building primary energy demand per unit of conditioned area.

EP can either include only non-renewable energy (EP_{nren}), or include both non-renewable energy and renewable energy (EP_{tot}). According with EN 15603:

\[ EP_{tot} = EP_{nren} + EP_{ren} \]

\[ \text{RER (share of renewables)} = \frac{EP_{ren}}{EP_{tot}} \]
Compensation between different energy carriers (e.g.: natural gas and on-site PV production) and the effect of exported energy should not be considered in the calculations of the consumption of the single energy services (heating, cooling, etc.).

**nZEB rating**

nZEB could be rated and eventually verified from an economical point of view (D4.3) through the procedure prepared by the project (D4.2)

**Energy efficiency measures and the packages of measures**

Energy efficiency measures (EEMs) and the relevant packages have been defined in the project (D3.3, D4.2 and D4.3) by the elaboration of public building stock data and applying a cost-benefit analysis. In detail:

- Measures for the building envelope: wall thermal insulation (external wall and wall vs. unconditioned area); roof thermal insulation; floor thermal insulation; window thermal insulation; solar shading system.
- Technical systems: high efficiency chiller; high efficiency generator for space heating and appropriate emission system; high efficiency generator for DHW; high efficiency combined generator for space heating and DHW, and appropriate emission system; high efficiency heat pump for space heating, DHW and cooling, and appropriate emission system; heat recovery ventilation system; heating system control.
- Technical systems for production of renewable energy: thermal solar systems; PV systems.
- Lighting: high performance lamps; lighting control system (LCS).

The combination of the different energy measures generates the packages of measures. Examples of packages are presented in D4.3 and D5.2.

New packages can be defined applying the method and the common tool presented in D4.2 and D4.3.

---

**Table 2.2. Energy Performance levels**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EEM (BE, TS, LS, RES)</td>
<td>kWh/m²a</td>
<td>kWh/m²a</td>
<td>kWh/m²a</td>
<td>€/m²</td>
<td>years</td>
</tr>
</tbody>
</table>
3 COUNTRIES CONTRIBUTION BULGARIA

3.1.1 Status quo

The common requirements to contracts aimed at the achieving of the nZEB standards are defined in the National Plan for Nearly Zero Energy Buildings 2015-2020 (NP 2015) [3], developed pursuant to Art. 9, Para.1 of Directive 2010/31/EU regarding the energy performance of buildings.

The national nZEB definition sets two requirements (R7 2015):

- The energy consumption in the building, defined as primary energy, shall correspond to class “A” from the scale for energy consumption classes for the respective type of buildings;
- Not less than 55 percent of the energy consumed (delivered) for heating, cooling, ventilation, domestic hot water and lighting shall be from renewable sources, located at the building place or close to it.

The National Plan for nZEB takes into consideration the national goal for energy efficiency to be reached by December 31, 2020, as approved by the European Commission, and shows the contribution of the buildings which energy performance corresponds to the nZEB standards.

The indicative target adopted by the Bulgarian Government for energy savings by the year 2020 is 716 ktoe (8 325,65 GWh) energy savings at final energy consumption (FEC) and 1590 ktoe (18 488,52 GWh) at primary energy consumption (PEC), where 169 ktoe (1965,13 GWh = 11%) are in the processes for conversion, transmission and distribution in the energy sector (NAPEE 2014).

New Buildings

The process of constructing new buildings in Bulgaria is regulated by the Spatial Planning Act. The same act defines the participants in the construction and investment process, as well as their powers and responsibilities: client, designer, conformity assessment consultant, builder, construction supervision consultant, machinery and equipment supplier. The mode for practicing the activity for each group of participants with their given statutory functions is registration.

To erect a new building to the nZEB level, it would be necessary to pledge the requirement in the Technical Specification for design (SPA 2016). One of the designers (most often the architect) has special functions (as leading designer) for monitoring the compliance.

The contracts shall include the following stages (EEA 2015, SPA 2016):

1. Design

In case of a building with nZEB characteristics, the design solutions shall cumulatively fulfill both conditions of the national definition. The project shall include an obligation to use products and materials of high energy efficiency in conformity with the “New Approach” concept.

For new buildings, technical, environmental and economy comparisons must be made between the alternative solutions for high-efficiency installations: decentralized and central heating and cooling, heat pumps, CHP.

2. Evaluation of compliance

Investment projects, in the phases of technical and design work, shall be checked for compliance with the energy efficiency requirements. The check is carried out under a separate agreement between the contracting authority with the physical and legal persons, who meet the Energy Efficiency Act [1] requirements and are registered in the public register of the Sustainable Energy
Development Agency. (This requirement is set by Art. 142, para 11 of the SPA). Such specialists are called in Bulgaria Energy Efficiency Consultants and are specialized in providing energy audits and assessments.

3. Stage of works

The contract shall provide for the control of the construction, while evaluating the compliance of the investment projects and exercising construction supervision.

4. Stage of commissioning of a new building

Before commissioning, each new building shall obtain a technical passport and an energy performance certificate, which are part of the building construction documents.

5. Stage of exploitation of a new building after the first commissioning

The energy performance of buildings in operation shall be assessed and certified through energy efficiency audit. Up to that moment, the design certificate for the project energy performance of the building shall be valid.

The certificate shall be updated when activities leading to changes in the energy performance of the building and described in the Act take place.

Existing Buildings

The process of renovation of existing buildings begins with a technical and energy audit aiming to identify the potential measures for improvement of their technical and energy performance. The stages are the same as for the new buildings.

Specific Requirements to the Contracts

There are not special requirements to the nZEB contracts. These shall comply with the same formal requirements as any contract for building renovation. The difference is in the efficiency performance for the energy use. A sample for such contracts are the ESCO contracts, as they are defined in the Energy Efficiency Act (EEA 2015) [1], a short overview of which is provided here below. Clients are the end users, while contractors are the energy efficient services providers. The contracts shall specify at least the following characteristics (NP 2015):

1. The normalized energy consumption, established by an energy efficiency audit;
2. A list of the energy efficiency measures to be implemented, including the steps for their implementation and - where appropriate - the related costs;
3. The guaranteed energy savings, the procedure and the terms for their assessment after the implementation of the measures under the contract, as well as procedures for measurement and verification of the energy savings achieved, the achieved guaranteed economies, quality checks and guarantees;
4. Obligation for full implementation of the measures and providing documents for all changes made during the time of the project;
5. Description of the financial implications of the project and the allocation of both sides shares in the financial savings achieved;
6. Means of financing;
7. Manner of payment of remuneration;
8. Other clauses, including provisions relating to changes in the framework conditions, considering the content and the outcome of the contract, inclusion of equivalent requirements for each subcontract with third parties, and detailed information on the obligations of each contracting party and sanctions for their violation.

The contractors shall ensure the achievement of the required class of energy consumption for the building under contract. The requirements for the different types of buildings to be classified nZEB according to the „specific total annual consumption of primary energy” are shown in the table below.

<table>
<thead>
<tr>
<th>Classes</th>
<th>Residential</th>
<th>Public Service Administration</th>
<th>Education</th>
<th>Schools</th>
<th>Universities</th>
<th>Kinder Garden</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>&lt; 48</td>
<td>&lt; 70</td>
<td>&lt; 25</td>
<td>&lt; 45</td>
<td>&lt; 33</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>48</td>
<td>95</td>
<td>70</td>
<td>140</td>
<td>50</td>
<td>90</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Classes</th>
<th>Public Service (Contd)</th>
<th>Healthcare</th>
<th>HOTELS</th>
<th>Commercial</th>
<th>Sport</th>
<th>Culture &amp; Arts</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>70</td>
<td>&lt; 85</td>
<td>&lt; 138</td>
<td>&lt; 88</td>
<td>&lt; 55</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>70</td>
<td>140</td>
<td>85</td>
<td>170</td>
<td>138</td>
<td>275</td>
</tr>
</tbody>
</table>

3.1.2 RePublic_ZEB contribution at national level

BSERC has prepared proposals for amending the Energy Efficiency Act [1] concerning the nZEB, as follows.

Primary energy calculation

Pursuant to the corresponding Bulgarian legislation (Regulation No.7 [4] from 2004 on the energy efficiency of buildings, title amended in ST, issue 85 from 2009, issue 27 from 2015, in force since 15.07.2015), the normative coefficient considering the losses connected with power generation and supply, is fixed to 3. This means that the primary energy generated and supplied to the consumer is three times higher.

This ratio reflected the structure of the Bulgarian power generation system – mainly coal TPPs and a NPP – before the introduction of the legislative framework supporting RES power generation. Hence, following the massive construction of RES installations, which annual generation reaches 15%, the structure of electricity production has changed during the last several years. During the implementation of the project, BSERC ascertained that the application to nZEB assessments of the No.7 coefficient, defined in Regulation, led to significant deviations in the results. That is why the Centre is preparing a proposal for introduction of changes in the Regulation concerning the calculating of the equivalent of primary energy to the supplied final electricity, in line with the new power generation structure.

Consumption of energy from renewable sources
The national nZEB definition fixes a minimum share of energy from renewable sources (not less than 55%) in the final consumption of energy for heating, ventilation, domestic hot water, cooling and lighting. A transitional period until 2018 is foreseen for registering the real obstacles to the achievement of the national requirements. Following the research carried out within the project, a proposal for introduction of more flexibility in applying the nZEB definition to the buildings connected to central district heating from cogeneration was made. If a new building has the possibility to utilize heat from highly efficient cogeneration, the share of the obligatory RES energy use should be decreased. In this way, in line with Directives 2010/31/EU and 2012/27/EU, including the proposals from 2016 for their renewal, priority was given to the the efficient use of energy and to the higher energy consumption from renewable sources.

More flexibility of the Energy Efficiency Act requirements

The project findings show that the requirements of the Bulgarian Energy Efficiency Act [1] for a minimum of 55% share of energy from RES in new buildings after 2018 and 2020 could not be or would be difficult to be met in the bigger cities, where the concentration of the largest buildings falling under this requirement is the highest. The deficiency of renewable resources in the densely populated areas would hamper the process of the implementation of EED. In order to overcome this shortage, BSERC is preparing a recommendation for the Bulgarian Ministry of Regional Development and Public Works and the Ministry of Energy to introduce in the Energy Efficiency Act [1] more flexible requirements, which could be applied by considering the specific conditions of the particular building when there is proven technical inability to meet the requirement for 55% RES. The proof could be provided by the consultants registered under the Energy Efficiency Act [1], who are entered in a special register.

3.2 CROATIA

3.2.1 Status Quo

Procurement of building renovation in Croatia is governed by Law on public procurement (OG 90/11, 83/13, 143/13, 13/14) transposing Directives 2004/17/EU; 2004/18/EU, 2005/75/EU, 2005/51/EU, 2007/66/EU and 2009/81/EU. Specifically, for public buildings, additional governmental Decree on contracting and implementation of energy services in public sector was adopted in 2015 (OG 11/2015) replacing previous Decree adopted in 2012. Decree additionally defines integral refurbishment of public buildings, requirements for assessment of energy and water savings, monetary value of energy and water savings and gives ways for contracting energy service, contents of energy service contracts, implementation of the contract and verification of the savings. Decree gives unique framework for energy contracting in public sector, standard energy performance contract which contents are:

- client of energy performance service
- provider of energy performance service
- reference energy consumption
- reference consumption, reference climatic data and reference internal conditions
- net conditioned floor area
- estimated energy and water consumption after renovation- guaranteed energy and water savings, per carrier
- procedures for determination of energy and water savings
- value of energy savings
- means of financing of energy savings measures
- payment for services
- means of calculation and indexing of energy services
- contract maturity
- building use schedule
- duties and rights of the client
- duties and rights of the service provider
- description of the service, or energy and water efficiency measure
- plan of application of measures
- measurement and verification plan in accordance to regulation on measurement and verification
- energy and water prices in force on the beginning day of public procurement
- payment plan for energy service
- savings plan
- final report on implementation of energy efficiency measures.

Key point of the contract is obligation of the provider to perform integral refurbishment of the building, and that the payment is based on verified savings.

### 3.2.2 RePublic_ZEB contribution at national level

The public building owners are obliged to follow the instructions of the national legislation concerning the public tender procurement, requirements of specific financing schemes and minimum requirements of the building regulations. Public procurement documents can include specific requirements set in results of RePublic_ZEB project regarding energy performance of the building or specific packages of measures given for administrative and education buildings. Annex to the contract can include additional verification models of energy savings in the buildings, including the project demo tool in appropriate situations.

### 3.3 MACEDONIA

#### 3.3.1 Status Quo

The ESCo market and energy performance contracts are non-existent in Macedonia. Due to this, no national contracting procedure exists and all work is done by the standard tendering procedure. The most used instrument is PPP – Public Private Partnership which is similar to ESCo but not the same, because the contracts between parties are not established on the basis of EPC (Energy Performance Contracting). Investment is on the side of the private partner and the savings of energy/financial means are shared in period fixed in advance. The procurement procedure is regulated by the Law on Public Procurement (2007) and 14 bylaws, together with Model tender documents and model contracts, together with guidelines, manuals and opinions. It is based on the EU procurement
directives. The procedures can be open, restricted, negotiated, simplified, competitive dialogue and design contest and the thresholds are simplified and nationally defined. The responsible bodies are shown on the following picture (Public procurement bureau)

Still, according with the legislation, new and refurbished buildings need to fulfil energy related requirements. For the building envelope and the technical systems, the requirements are defined in the Rulebook for Energy Performance of Buildings.

### 3.3.2 RePublic_ZEB contribution at national level

Since there is no model contract for energy and energy savings related contracting, the annex model suggested by the project RePublic_ZEB and other schemes presented here by other countries will be used as starting point. A national model contract is foreseen by several strategic documents, most notably in the National Strategy for development of the energy efficiency in Macedonia until 2020.

### 3.4 GREECE

#### 3.4.1 Status Quo

In Greece, the public tender typologies are regulated by PD60/2007 (GOG A’64/6-3-2007) which is the transposition law of Directive 2004/18/EC into national legislation. According with this Presidential Decree, the different types of public contracts are: a) Public works contracts b) Public supply contracts c) Public service contracts d) Public works concession e) Service concession f) Framework agreement. In the case of construction and major renovation of municipal buildings, the main type of public contract used is public works contract. Additionally, the public supply contracts and public service contracts are used. For awarding public contracts the followed procedures are open, restricted, negotiated procedures and competitive dialogue.

Public contracts are awarded in general according the following steps:

1. Publication of the notices (In the case of open procedures these notices include specifications, additional documents and information) and invitation for tender submission.
2. Receipt of requests to participate and receipt of tenders.
3. Candidate evaluation according to specific quality criteria such as: a) Verification of the suitability and choice of participants and award of contracts, b) Personal situation of the candidate or tenderer, c) Suitability to pursue the professional activity, d) Economic and financial standing, e) Suitability to pursue the professional activity, f) Technical and/or professional ability, g) Quality assurance standards, h) Environmental management standards, i) Additional documentation and information, j) Official lists of approved economic operators and certification.

4. Informing candidates and tenderers about their acceptance/rejection.

5. Contract awarding. Depending on the minimum fee, the contract award criteria are either a) the most economically advantageous tender from the point of view of the contracting authority. In this case various criteria linked to the subject-matter of the public contract are set in question, for example, quality, price, technical merit, aesthetic and functional characteristics, environmental characteristics, running costs, cost-effectiveness, after-sales service and technical assistance, delivery date and delivery period or period of completion, or b) the lowest price only.

‘Public works concession’ is a contract of the same type of a public works contract but the consideration for the works to be carried out consists either in the only right to exploit the work or in this right together with payment.

‘Service concession’ is a contract of the same type as a public service contract but the consideration for the provision of services consists either in the only right to exploit the service or in this right together with payment.

More specifically, in case of financing schemes by third party (ESCOs), there are two types of model contracts, one concerning the Guaranteed Performance and the other concerning the Shared Benefit.

The contents of the two model contracts are presented in detail below.

**Shared Benefit Model Contract**

Contents

1. Definitions
2. Subject of contract
3. Effective date and duration of contract
4. Preliminary and monitoring periods
5. Reporting period, basic energy consumption and energy cost
6. List of measures and conventional equipment
7. Financial benefit of ESCOs
8. Periodical Settlement
9. Implementation program
10. Measurement and verification program
11. Essential modifications
12. Obligations and rights of the parties
13. Proprietary rights
14. Operation and maintenance equipment
15. Force Majeure
16. Settlement of disputes
17. Denunciation of contract
18. Disclosures and communication
19. Amendments
20. Termination of contract

Annexes
A1. Description of conventional installation
A2. Feasibility Study
A3. Categories of technological measures
A4. Categories of organizational - management measures
A5. Preliminary and monitoring period
A6. Basic energy consumption in monitoring periods
A7. Energy prices in monitoring periods
A8. Economic benefit sharing
A9. List of measures and conventional equipment (Measures, New equipment, Upgraded and modern equipment)
A10. Implementation program
A11. Investment costs and funding of the project
A12. Integration report
A13. Program for supplementary works
A14. Measurement and verification program
A15. Monitoring report
A16. List of independent experts
A17. Bank accounts.

Guaranteed Performance Model Contract

Contents
1. Definitions
2. Subject of contract
3. Effective date and duration of contract
4. Monitoring periods
5. Reporting period, basic energy consumption and energy cost
6. Guaranteed energy saving and economic benefit
7. List of measures and conventional equipment
8. Financial benefit of ESCOs
9. Periodical Settlement
10. Implementation program
11. Measurement and verification program
12. Essential modifications
13. Obligations and rights of the parties
14. Proprietary rights
15. Force Majeure
16. Settlement of disputes
17. Denunciation of contract
18. Disclosures and communication
19. Amendments
20. Termination of contract

Annexes
A1. Description of conventional installation
A2. Feasibility Study
A3. Categories of technological measures
A4. Categories of organizational - management measures
A5. Monitoring period
A6. Basic energy consumption in monitoring periods
A7. Energy prices in monitoring periods
A8. List of measures and conventional equipment (Measures, New equipment, Upgraded and modern equipment)
A9. Implementation program
A10. Guaranteed benefits in monitoring periods
- Guaranteed energy saving in monitoring periods
- Guaranteed financial benefits in monitoring periods
A11. Integration report
A12. Program for supplementary works
A13. Measurement and verification program
A14. Monitoring report
A15. List of independent experts
A17. Bank accounts.

3.4.2 RePublic_ZEB contribution at national level

In Greece, the public building owners are obliged to follow the instructions of the national legislation concerning the public tender procurement. However, this tender document can be accompanied by a tender technical document, which contains all the technical specifications of building shell (thermal insulation, windows, etc.), of heating – cooling systems and RES systems which result to nZEB solution. The results of the RePublic_ZEB project should be an Annex containing the specific EEMs packages for the office and school building typology according with reference buildings studied in the project.

3.5 HUNGARY

3.5.1 Status Quo

The national law describes in details what a construction contract must and what can contain. The energy saving is not a compulsory content and it is not typical, but the parties can agree to involve it in the contract. The typical solution is to involve only the technical details. The ESCo contracts have different content. They are usually much more sophisticated in building energetics and energy costs. The ESCo contracts contain the calculated energy saving and the responsibility for the saving and the compensation if the measured energy consumption is below the calculated consumption. It is not necessary to involve all the technical details of the construction, only on conceptual level. The details of the refurbishment will be involved in the contract between the ESCo company and the contractor, the ESCo company has the responsibility for that.

3.5.2 RePublic_ZEB contribution at national level

The suggestion is to enclose the following model of appendix to the general construction contract, which contains the different levels of the refurbishment. In this way, the contractor has the responsibility to fulfil the fixed level for the requested energy savings, even if he wants some changes in the details.

Appendix - Requirements of refurbishment into nZEB

In Hungary, the 7/2006 TNM Decree contains the requirements for nearly zero-energy buildings. Thermal transmittance of building structures involved in energy-saving refurbishment, the specific heat loss factor and total primary energy consumption of the building, as well as minimum share of renewable energy are the requirements of Annex 6 of 7/2006. TNM Decree that must be met. The numerical requirements are shown below.

1. Building structures

Thermal transmittance of building structures involved in energy-saving refurbishment must meet the requirements below (Table 3.5.1).
2. Specific heat loss factor

2.1 In the case the specific heat storage mass of the building is light weight (m < 400 kg/m$^2$) – based on the calculations of 7/2006. TNM Regulation – the maximum permissible value ($q_m$) of specific heat loss factor can be calculated with the following equations considering the ratio of the cooling surface of the building (A) and the heated space air volume (V):

$$A/V \leq 0,3 \quad q_m = 0,12 \quad [W/m^3K]$$

$$0,3 < A/V < 1,0 \quad q_m = 0,05143 + 0,2296 \times (A/V) \quad [W/m^3K]$$

$$A/V \geq 1,0 \quad q_m = 0,28 \quad [W/m^3K]$$

2.2 In the case the specific heat storage mass of the building is heavy weight (m ≥ 400 kg/m$^2$) – based on the calculations of 7/2006. TNM Regulation – it is sufficient to meet the requirements of II. part of Annex 5 of 7/2006. TNM Decree:

$$A/V \leq 0,3 \quad q_m = 0,16 \quad [W/m^3K]$$
3. Total primary energy

3.1. Requirement of total primary energy consumption is presented in the Table 3.5.2.

<table>
<thead>
<tr>
<th>N.</th>
<th>Function</th>
<th>EP Requirement of total primary energy consumption (kWh/m²a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Residential and accommodation buildings (not including energy need of lighting)</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Office and commercial buildings including room up to 1000 m² useful area (including energy need of lighting)</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>Educational buildings and buildings typically including lecture hall, exhibition hall (including energy need of lighting)</td>
<td>85</td>
</tr>
</tbody>
</table>

*In the case the building has cooling system, further increasing of the requirement by 10 kWh/m²a is permitted, when the whole building served by the cooling system. If the cooling system serves only part of the building, increasing of the requirement is permitted considering the proportion of the air conditioned and not the air conditioned areas.

3.2 For buildings and building-parts other than those specified in the 3.1 section, the requirement of total primary energy consumption shall be calculated according with the Annex 6 of 7/2006. TNM Decree based on the reference building and building service system.

4. Minimum share of renewable energy

At least 25% of the total primary energy consumption of the building shall be provided from renewable energy source that is generated in the building, derived from the property, or produced nearby.

5. Typical nZEB packages of measures

- Thermal insulation of building envelope (typical 18-20 cm EPS)
- Replacing existing doors and windows to triple glazed doors and windows
- External, movable shading
- Heat pump for heating and cooling or condensing gas boiler for heating
- Photovoltaic system
- Lighting refurbishment to LED, lighting control.
3.6 ITALY

3.6.1 Status quo

In Italy, the feasibility of a project of deep renovation of a public building is strongly related to the availability of the necessary financial resources. This peculiar aspect is also discussed in the Italian section of D5.5.

From a general point of view, the public building owner (in other words: the body or public institution which owns the building and that generally is the responsible, directly or through other controlled bodies, for the relevant management) has no, or very little, resources for investments but has access to the resources needed for the regular maintenance and energy supply. This means that most of (if not all) the projects of renovation must be funded through EPC contracts in which:

- The public building owner can generally participate, on the basis of the yearly budget available for the management of the building (or a lower amount);
- The builder has to act as an ESCo or has to strictly cooperate with an ESCo that will provide the required renovation process and the management of the building for a certain period of time (generally 10-15 years).

The basic issue is more resolvable if the central or the local government makes available specific funds for renovation: this aspect appears to be a key factor in Italy in case of renovations to nZEBs (see 5.5 section). As a consequence, the contract between owners and builders has to be generally arranged as an EPC contract between an owner and an ESCo.

The EPC contract is defined, by the Directive 2012/27/EC, as the contractual arrangement between the beneficiary and the provider of an energy efficiency improvement measure, verified and monitored during the entire duration of the contract, where investments (works, supplies or services) are granted under an agreed level of energy efficiency improvement or under other agreed energy performance criteria, such as financial savings.

EPC contracts are generally complex and their content is highly technical. In fact, in addition to the legal content (i.e.: warranties, jurisdiction, safety standards, etc.) are flanked by economic (funding, calculation of benefits, etc.) and high engineering contents (i.e.: building energy audit, monitoring of the performance). In Italy, some of the characteristic elements of the EPC contract are included in “Energy plus” contracts. In particular, the technical annex for the custody of the integrated energy services for public administration, in accordance with the art. 26 of the Italian Law No. 488/1999 and subsequent amendments and with the art. 58 of the law No. 388/2000, states that the energy integrated service contract includes also the improvement of the energy efficiency of the building.

Annex XIII of Directive 2012/27/EC defines the minimum elements that should be provided within the energy performance contracts with the public sector or in the relevant tender documents, namely:

- A clear and transparent list of the efficiency measures to be implemented;
- Guaranteed savings to be achieved by applying the measures provided for the contract;
- The duration and the fundamental aspects of the contract;
- A clear and transparent list of the obligations of each party;
- The date or dates of reference for determining the savings achieved;
- A clear and transparent list of steps for implementing a measure or a package of measures and, where relevant, the related costs;
- The obligation to fully implement the measures provided;
- Clear and transparent rules for quantification and verification of the guaranteed savings achieved;
- Provisions clarifying the procedure to manage changes;
- Detailed information on the obligations of each of the contracting parties and the penalties for non-compliance.

To achieve the main objective of the Directive 2012/27 / EC, the scheme for a model contract here proposed postpones the supply and maintenance of the building to the effective implementation of the refurbishment of the building to nZEB.

The scheme envisaged for Italy is based on several items classified in four parts: general information; economic and technical aspects; responsibilities; guarantees and penalties.

**Table 3.6.1 Part one: General information**

<table>
<thead>
<tr>
<th>N.</th>
<th>Section</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Definitions</td>
<td>Based on EED definitions</td>
</tr>
<tr>
<td>2</td>
<td>Aim</td>
<td>The basic objective is the refurbishment of the building to nZEB</td>
</tr>
<tr>
<td>3</td>
<td>Scope</td>
<td>The process of refurbishment, management and maintenance of the building has to be clearly specified</td>
</tr>
<tr>
<td>4</td>
<td>Assignment</td>
<td>The sub-assignment to other companies of important parts of the refurbishment and management of the building is forbidden</td>
</tr>
<tr>
<td>5</td>
<td>Duration</td>
<td>To be defined.</td>
</tr>
<tr>
<td>6</td>
<td>Acceptance</td>
<td>The certificate of regular execution of the refurbishment should be issued within 6 months from the conclusion of the renovation process and approved by the customer</td>
</tr>
<tr>
<td>7</td>
<td>Termination</td>
<td>All causes that might invalidate the contract should be specified in detail</td>
</tr>
<tr>
<td>8</td>
<td>Contractor charges</td>
<td>All charges to be payed by the contractor should be specified in detail</td>
</tr>
<tr>
<td>9</td>
<td>Customer charges</td>
<td>All charges to be payed by the customer should be specified in detail</td>
</tr>
<tr>
<td>10</td>
<td>Safety during refurbishment</td>
<td>All Laws and requirements for the operators have to be specified</td>
</tr>
<tr>
<td></td>
<td>process</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Professional bodies</td>
<td>All activities that requires qualified registered personnel have to be identified</td>
</tr>
<tr>
<td>12</td>
<td>Names of the responsible</td>
<td>One responsible for the contractor and one responsible for the customer have to be clearly specified</td>
</tr>
<tr>
<td>13</td>
<td>Project manager</td>
<td>The name of the person that manages the refurbishment process has to be defined</td>
</tr>
<tr>
<td>14</td>
<td>Testing</td>
<td>The names of the persons charged to verify the performance and other aspects of the refurbishment have to be specified</td>
</tr>
<tr>
<td>15</td>
<td>Other aspects</td>
<td>Is necessary to clearly specify:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Legal address of the contractor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Applicable laws and standards</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Privacy restrictions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Safety standard to be in general applied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Modalities for communications</td>
</tr>
</tbody>
</table>
- Modalities to resolve disputes

![Diagram of Energy Standards and their Year of Publication]

**Figure 3.6.1 Technical Standards that can be recalled in EPC contracts and their year of publication**

<table>
<thead>
<tr>
<th>N.</th>
<th>Section</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Amount of the contract</td>
<td>The contractual amount should be defined as follows:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First phase: Energy Service</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- refurbishment fee (€/year)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- supply fee (€/year)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- maintenance fee (€/year)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Second phase: supply and maintenance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- supply fee (€/year)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- maintenance fee (€/year)</td>
</tr>
<tr>
<td>17</td>
<td>Payment method</td>
<td>Details to be specified</td>
</tr>
<tr>
<td>19</td>
<td>Variations</td>
<td>How to manage variations in construction costs and relevant methods of payment</td>
</tr>
<tr>
<td>20</td>
<td>Grants</td>
<td>How to manage public funds and energy efficiency certificates</td>
</tr>
<tr>
<td>21</td>
<td>Initial energy audit</td>
<td>The energy audit annexed to the tender issued by the customer is made available to the contractor. The energy audit model used in the tender must be used by the contractor as a model for all subsequent energy audits. This to identify all the measures to be applied for the refurbishment</td>
</tr>
<tr>
<td>22</td>
<td>Energy measures to be applied</td>
<td>All the measures (packages) have to be described in detail and their costs declared</td>
</tr>
</tbody>
</table>
The technical specifications have to be annexed to the contract. They include:
- management and logistical aspects
- service availability
- heating/cooling management and emergency services
- etc.

In order to ensure the safety and quality of the service, the contractor must carry out all the checks and measures provided by law and update the building documentation. The items to be periodically reviewed and the monitoring have to be specified as well as the methods of measurement and control of plants and equipment.

Other aspects to be specified:
- how to manage tax charges
- how to manage variations and contingencies
- how to manage critical measure instruments

<table>
<thead>
<tr>
<th>N.</th>
<th>Section</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>Responsibilities of the contractor</td>
<td>All details have to be defined</td>
</tr>
<tr>
<td>27</td>
<td>Responsibilities of the customer</td>
<td>All details have to be defined</td>
</tr>
<tr>
<td>28</td>
<td>Force majeure</td>
<td>How to manage the relevant damages</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N.</th>
<th>Section</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>Guarantees</td>
<td>The management of the building is given to the contractor and all the required guarantees and responsibilities have to be defined</td>
</tr>
<tr>
<td>30</td>
<td>Penalties</td>
<td>Details relevant to the “non-energy” aspects</td>
</tr>
</tbody>
</table>
| 31 | Penalties/Bonuses | All the details relevant to energy aspects like:
- building use standards that the user must follow in order not to distort the measurement of performance (efficient use of terminals; rooms use; behavioural details, etc.)
- the verification of the results
- how to manage failures in achieving the expected threshold of energy savings
- How determine and manage penalties
- How to manage better results
- Etc. |
| 33 | Monitoring by the customer | During the duration of the contract, the customer can carry out periodic monitoring and the methodology has to be agreed with the contractor |
3.6.2 RePublic_ZEB contribution at national level

Different models of EPC contracts have been deeply discussed in the meeting organised in the framework of the WP4 and 6 and during other restricted meetings. Between the different outputs an important Italian ESCO who participated in the national activity of Republic_ZEB project is preparing an EPC contract model specifically designed for the renovation of public buildings towards nZEB, considering the measures discussed in WP4 and the available Italian financial schemes in part promoted by the project and described in D.5.5.

This EPC model will be available by the end of November 2016 but it will remain confidential and used as corporate document of the cited ESCO.

3.7 PORTUGAL

3.7.1 Status Quo

In order to boost the implementation of energy efficiency measures in public buildings and equipment, the Decree-Law No. 29/2011 of 28 of February established the legal regime for the formation and execution of contracts of energy efficiency management (Figure 3.7.1), to be celebrated between the different departments and agencies from the government and the energy service companies (ESCOs), establishing this way the legal framework.

The Portuguese program Energy Efficiency Program in Public Administration “Eco.AP” [5] was launched by the Portuguese government in 2011 and aims to achieve the energy efficiency level of 30% in the agencies and departments of Public Administration by 2020, thus responding to the Decree-Law No. 29/2011 of 28 February.

Such level of efficiency, without increasing the public costs and while allowing the stimulation of the economy in the sector, is obtain through contracts with ESCOs. The publication of Decree No. 60/2013, of 5 of February establishes a group of specifications to be applied in the construction of a new energy savings performance contract (ESPC).

A basis model should have the following structure:
a) Energy and Savings;
b) ESCOs Payment;
c) ESCOs Obligations;
d) Additional Obligations;
e) Guarantees and Maintenance;
f) Service Requirements;
g) Steering committee;
h) Baseline definition;
i) Baseline change;
j) Measurement and verification;
k) Financial Basis Type;

In the Energy and Savings chapter, an ESPC should present the energy saving for a reference period for all existing vectors; the reference period must also be defined in the contract, which may be:

- The last year consumption, or;
- A representative period of the building normal use according to their characteristics and the values should be based on energy bills.

Through the application of the ESP contracts it is expected three levels of efficiency, presented in Figure 3.7.2.

![Figure 3.7.2. Eco.Ap steps](image)

The value paid during the reference period, divided by the kWh consumed during this period will lead to the "contract price expressed in €/kWh". The savings target is 30% and a mandatory minimum reduction of 15%.

In the contracts are also specified the ESCos compensations, the remuneration can be through the energy savings achieved by energy efficiency management contract or income from energy
rationalization plan proposed to the building. This should be fixed each year and revised annually, the review is done through updates on inflation in the contract price of kWh and is protected from energy price fluctuations or change in fees.

ESCos are obligated to guarantee the payments to the Institution, the assessment is done annually, with savings measurement and verification of the previous year. They are also obligated to coordinate the project, managing all changes and renovations that occur during the term of the contract, and all the subsequent maintenance, agreed in services conditions, and the mechanical and electrical installations of the systems included in the project, during the warranty period.

The ECO.AP program also created the Barometers Eco.AP, to characterize, compare and publicly disclose the energy performance of services. It will first characterizes the public sector energy consumption, which is an essential prerequisite for the planning of policies and measures to effectively promote energy efficiency and renewable energy in the public sector. It will also identify the best practices in terms of energy efficiency, to be communicated and disseminated by the rest of the Public Administration, functioning as inducing mechanism of practices and behaviors on energy efficiency.

3.7.2 RePublic_ZEB contribution at national level

As this Contract is only available for improving energy performance of public buildings, the results of the RePublic_ZEB project will be proposed as an Annex, especially with regard to the office building typology studied in the project.

3.8 ROMANIA

3.8.1 Status quo

Procurement of building renovation in Romania was governed until 2016 by Government Emergency Ordinance no. 34/2006 on the awarding of public procurement contracts, works concession contracts and services concession contracts, with subsequent amendments (“GEO no. 34/2006”). In addition to GEO no. 34/2006 which represents the general legal framework and provides the principal rules for organising and carrying out the award procedures, other primary and secondary legislation are equally important (e.g. G.D. no. 925/2006 – methodological norms for applying GEO. no. 34/2006; orders issued for applying the secondary legislation/operational instruments – standardized documentation). For various reasons (mainly systemic), the general procedure applied in practice in most of public procurements in construction sector (including building renovation) was the lowest price (usually without detailed specifications and detailed quality indicators or requirements.

A new legal framework was adopted in May 2016 as public procurement package consisting of four (4) laws, respectively:

(1) Law no. 98/2016 on public procurement;
(2) Law no. 99/2016 on sectorial procurement;
(3) Law no. 100/2016 on works and services concessions;
(4) Law no. 101/2016 on remedies and appeals concerning the award of public procurement contracts, sectorial contracts and of works concession contracts and service concession contracts, and for the organization and functioning of the National Council for Solving Complaints.
The new public procurement laws entered into force on 26 May 2016 and will apply to all public procurement proceedings initiated after their entry into force and to those public procurement contracts that are concluded after this date. The new Romanian public procurement laws mirror the newly reformed European regime by implementing the European Directives 2014/23/EU, 2014/24/EU and 2014/25/EU and are intended at reforming the Romanian public procurement system. The new public procurement laws bring significant improvements to the current legislation by promoting increased quality procurement projects, controlling the growth of the budget expenses, reducing bureaucracy and supporting innovation in the development of public projects.

In the context of building renovation, the public building owners are obliged to follow the instructions of the national legislation concerning the public tender procurement, requirements of particular financing schemes and minimum requirements of the building regulations. General or framework tendering specifications for renovation works are not yet adopted although they are under discussion for long time both at authority level and construction market representatives, i.e. construction sector stakeholders. In order to raise the ambitiousness level in the energy renovation of existing buildings (starting from the public buildings or publicly funded renovations and examples), specific quality levels and performance indicators have to be defined in the public procurement documents.

Regarding the energy performance requirements of buildings, a clear definition of thermal and energy indicators are under approval, with an increased level of performance required for both newly constructed buildings and for major renovations (http://mdrap.ro/ordin-pentru-modificarea-si-completarea-reglementarii-tehnice-metodologie-de-calcul-al-performantei-energetice-a-cladirilor.....). The values proposed for approval are correlated with the performance requirements defined within the guide for applicants developed for the call for projects on Regional Operational Programme 2014 - 2020, “Priority Axis 3: Supporting the transition to a low carbon economy”, and “Priority Investment 3.1 - Energy efficiency in public buildings, residential buildings and public lighting” (published as draft for consultations and expected to be launched at the end of 2016).

Moreover, there are municipalities who are taking the responsibility of establishing clear minimum energy requirements for the refurbishment of existing buildings and specific performance indicators in framework technical specifications for public procurement, Cluj-Napoca being the first to approve such a document.

Regarding the energy performance contracting, no major steps have been implemented to ensure the development of the relevant market framework to facilitate the nZEB renovation of public buildings with ESCO support/involvement. For time being, the preferred option is to define and implement state and/or local programmes based on grants/cofinancing (including the use of structural funds), while application of the EPC concept through ESCOs activities is somehow hindered by long payback periods and apparently low financial profitability of the investment in building renovation, especially if targeting the achievement of nZEB levels.

3.8.2 RePublic_ZEB contribution at national level

In Romania, the public building owners are obliged to follow the instructions of the national legal framework concerning the public tender procurement. However, the tendering documents can be accompanied by a technical specifications document, which contains all the technical requirements for the building envelope (thermal insulation of walls/floors/windows, shading etc.), for heating & cooling systems and RES systems which will result in a package for nZEB solution. Public procurement documents can include specific requirements set in results of RePublic_ZEB project regarding energy performance of the building or specific packages of measures given for office/administrative and education buildings (as annex to the existing procurement contract).
As general picture, the nZEB concept does not seem to be easily applicable yet in Romania, especially in the energy renovation of existing buildings. Previous research showed that required investments and optimal integration of the technologies suitable for the construction and/or renovation of buildings at nZEB levels are among the most important barriers. Moreover, gaining the confidence of building industry and building owners in the real energy performance nZEB and mitigation of actual risks associated with new technologies appear to be strategic issues whose solution could facilitate the uptaking of large investments required in the process of increasing energy efficiency of existing building stock.

The analyses carried out in the project IEE RePublic_ZEB showed that in the current conditions, the renovation of the public buildings to achieve the levels fixed for buildings with energy nearly zero energy use (nZEB) is feasible in terms of global cost during the service life of a building (30 years). In this context, fostering ambition to achieve these levels in the renovation of existing buildings should be a priority strategy for energy efficiency of public buildings, while supplementing implemented and monitored renovation projects with a strong awareness campaign on the effects achieved by renovation will lead to stimulating the mobilization of private funding sources, in such a manner that the objectives achieved through public funding would constitute an example for mobilizing private funding for other objectives to be renovated. This was the strong message which was sent to the authorities and stakeholders in the context of the ongoing process to review the current "Strategy for mobilizing investment in the renovation of existing national building stock". Exchanges with Romania Green Building Council in the context of the BUILD UPON project and with the Ministry of Regional Development and Public Administration regarding the definition of the energy efficiency calls of 2014-2020 Regional Operational Programme led to the formulation of relevant recommendations for the updating of Romania’s National Renovation Strategy as well as for a higher level of ambition in upgrading the energy efficiency of public buildings under cost effective conditions.

3.9 SLOVENIA

3.9.1 Status quo

Energy performance contracting (EPC) market in Slovenia is small (due to country and economy small size). After a promising start-up and several years of status-quo situation, it can still be marked as rather undeveloped. There are only few national EPC players present on the market (some 3-5 ESCOs – the first being Eltec Mulej, now Eltec Petrol - and few bigger energy utilities), which really perform EPC tasks only partially and randomly. The Slovenian EPC market is mainly oriented towards the public sector (e.g. street lighting in municipalities). There are many possibilities for improvements, especially in the public sector (institutional buildings, hospitals, schools). Most of the contracts are in the form of energy performance contracting (in case of ESCOs) and/or supply contracting (energy companies as energy efficiency services providers). Recent energy policy developments are in favour of further development of the EPC in Slovenia. These developments are reflected in the (proposed or already implemented) revision of the Energy Law too, introducing several energy efficiency - RES- and EPC-related provisions:

- energy book-keeping and annual energy efficiency targets are mandatory for the public sector;
- deployment of energy efficiency dividend in the public sector;
- local communities have to prefer RES heat supply and energy efficiency solutions in their acts;
- small commercial district heating networks with heat delivery lower than 1 MWh/h are eligible, beside district heating systems with concession;
- simplified procedures for operation of small independent highly efficient or RES power producers (< 50 kW).

As explained, in Slovenia only a few ESCOs exist, including some recently established companies of such an activity profile (like GGE, established by an appliances manufacturer (Gorenje) and two energy providers (Geoplin and Energetika Ljubljana)), which have announced their plans for ESCO activities and which already support various public entities in preparation of EPC or ESD projects. However, practical cases are mostly still to be waited for. At the moment, they are more active as subsidy providers, where they are joined by other energy companies (to achieve mandatory 1 % of annual energy savings on the side of end-consumers).

Legislative framework

In the programming period 2014 - 2020, Slovenia has committed itself to achieving several objectives in relation to Energy renovation of public buildings. Lowering energy consumption and promoting renewable energy are crucial for their achievement. The legislative basis is the Energy Act (EZ-1). In addition, the platform also defines the objectives in the context of international obligations to which Slovenia committed. For the current programming period of the financial perspective 2014 - 2020 is binding for Slovenia several commitments in the field of energy renovation of buildings, in particular:

- Directive EED 2012/27/EU,
- Directive EPBD 2010/31/EU,
- Directive 2009/28/ES
- Directive 2009/406/ES,
- Revision of the Gothenburg Protocol to Abate Acidification, Eutrophication and Ground ozone.

Funding the renovation with cohesion funds and with EPC

For the preparation and implementation of the projects, for energy renovations, are given guidance, particularly in the preparation phase project, which is key to finally correct implementation and achievement of objectives in relation to the overall energy renovation. Project preparation comprises several milestones: the preparation of a set of buildings key information from the perspective of a comprehensive energy renovation, construction expanded energy audit analysis of the key data of the building, a selection of buildings suitable for further detailed consideration and defining a set of investment and organizational measures of a comprehensive energy refurbishment of buildings and further economic and financial analysis of the defined measures and selection of the most eligible.
The holistic approach to integrated energy renovation of buildings, which applies to entities all from the public sector, derived from the documents “Selection criteria for operations under the Operational Programme for implementing the European cohesion policy for the period 2014 – 2020” requires:

- demonstration of options for financing with EPC: the suitability test for EPC: The applicant must carry out preliminary procedure under the Act on EPC, which tests whether the operation is suitable for the implementation of the process of public-private partnership, which allows the financing with EPC.

- allocation of support only to those buildings that demonstrate a certain level of delivered energy. The applicant must prepare an overview of the building (REP) and an energy performance certificate.

- allocation of support for only those parts of the operations which contribute to the efficient use and/or the use of renewable energy sources: the applicant must prepare the investment documentation and the calculation of the financial gap.
Figure 3.9.2 Financing the energy renovation of public buildings in Slovenia

The model contract in Slovenia by Public-Private Partnership Act should include the following parts:

- Form and purpose of the equity partnership,
- The type and level, and the form and method of its total assets and funds financed or invested private funds,
- Relationships in respect of assets invested by the public partner and the method of repayment or redemption of the invested public funds,
- Schedule of public spending,
- The method of control over the targeted use of resources,
- Timetable and method of implementation of any investments and fulfilling other obligations,
- Model of ownership of the facilities and devices, as resulting from Article 80 of this Law,
- Conditions for awarding business to subcontractors,
- Changes in the company equity partner, for which it must obtain the consent of the public partner,
- Contractual penalties and the reasons for the cancellation, annulment or rescission of the contract and the rights and obligations of the parties in such cases,
- The exclusion of the private partner or exit the public partner,
- The possibility of entering into an equity partner, and
- Regulation of legal relations.

3.9.2 RePublic_ZEB contribution at national level

As this Contract is only available for improving energy performance of public buildings, the results of the RePublic_ZEB project have been proposed as an Annex containing the specific EEMs packages for the office building typology according with reference buildings studied in the project.
3.10 SPAIN

3.10.1 Status quo

At national level, IDAE (National Energy Institute, “Instituto para la Diversificación y Ahorro de la Energía”) developed a proposal of model of contract for energy services and maintenance of public buildings (ES&M-ESCO) in 2007. Several years later, IDAE adapted the proposal for public lighting (PL-ESCO) contract. The structure of the ES&M-ESCO includes 5 main services:

- P1: Energy supply and energy management
- P2: Maintenance
- P3: Total warranty
- P4: Investments
- P5: Additional investments related to energy efficiency

At regional level, Catalonia approved the GenerCat program in 2007, with the objective to promote the energy efficiency in public buildings in Catalonia (the buildings of the regional government). ICAEN (regional energy agency, Institut Català d’Energia) is the responsible of the Genercat programme. The main activity of the Genercat was the development of a guaranteed savings contract of energy services adapted to the regional context of Catalonia (GS-ESCO) and was launched in 2014. The main difference between the GS-ESCO and ES&M-ESCO, is that the GS-ESCO does not include the energy supply in the contract. Consequently, the GS-ESCO is a service contract and the ES&M-ESCO is a supply and service contract (the contract includes also the energy supply).

The structure of the GS-ESCO is also different and includes two main sections:

- Energy efficiency services:
  - Implementation of energy efficiency measures to improve the performance of the installations (energy systems)
  - Energy management, monitoring and verification of the energy performance, following the IPMVP (International Performance Measurement and Verification Protocol).

- Maintenance service:
  - To guarantee a correct operation of the energy systems.
  - The maintenance service is adapted according with the situation of each building: integral maintenance, HVAC maintenance...

Following the GS-ESCO proposal, two types of projects have been implemented in the regional public buildings, as shown in the following tables. In conclusion, in Catalonia there are three types of ESCo model proposals that can be implemented in public buildings depending on the objective of the project and ownership of the building (regional or local government).
Table 3.10.1 GS-ESCO proposal

<table>
<thead>
<tr>
<th></th>
<th>ESCo for equipment replacement</th>
<th>ESCo for energy management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy savings</td>
<td>Around 25%</td>
<td>Around 10-15%</td>
</tr>
<tr>
<td>Contract period</td>
<td>Around 8-10 years</td>
<td>4 years</td>
</tr>
<tr>
<td>Saving agreement</td>
<td>Guaranteed Savings Contract</td>
<td>Shared Savings Performance Contracts (from 10% to 40%)</td>
</tr>
<tr>
<td>Level of investment</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Maintenance service</td>
<td>It must be included in the contract</td>
<td>It depends on the situation of each building</td>
</tr>
</tbody>
</table>

Table 3.10.2 ESCO models proposal

<table>
<thead>
<tr>
<th>ES&amp;M-ESCO</th>
<th>PL-ESCO</th>
<th>GS-ESCO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply and service contract</td>
<td>Public lighting service</td>
<td>Service contract</td>
</tr>
<tr>
<td>Local buildings</td>
<td>Local buildings</td>
<td>Regional and local buildings</td>
</tr>
</tbody>
</table>

In the following table are shown the projects that have been carried out until now by the Catalan Government.

Table 3.10.3 Projects carried out by the Catalan Government

<table>
<thead>
<tr>
<th>Building</th>
<th>Energy savings Electricity (kWh/yr)</th>
<th>Energy savings Natural gas (kWh/yr)</th>
<th>CO₂ savings (Tn/yr)</th>
<th>Investment (M€)</th>
<th>Contract period (years)</th>
<th>Guaranteed savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAR, Sant Cugat</td>
<td>349 193</td>
<td>3 063 368</td>
<td>1 037</td>
<td>1.3</td>
<td>10</td>
<td>39% energy 5% water</td>
</tr>
<tr>
<td>Hospital Joan XXIII, Tarragona</td>
<td>9 000 000</td>
<td>-</td>
<td>2 160</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Institut Català d’Oncologia</td>
<td>3 150 338</td>
<td>1 773 229</td>
<td>1 459</td>
<td>0.7</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Laboratori Agroalimentari de Cabrils</td>
<td>116 876</td>
<td>-</td>
<td>47</td>
<td>0.04</td>
<td>5</td>
<td>15% energy 5% water</td>
</tr>
<tr>
<td>CAR II, Sant Cugat</td>
<td>58 590</td>
<td>117 179</td>
<td>40</td>
<td>0.2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Centre de Recerca Biomèdica</td>
<td>-</td>
<td>1 267 297</td>
<td>255</td>
<td>0.5</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: ICAEN

A brief description of the GS-ESCO procedure is the following:

1. Diagnosis of the existing building
2. Technical information definition
a. Definition of the installations/systems to be included in the service contract
b. Estimation of energy savings
c. Preparation of the tender documentation following the GS-ESCO proposal

3. Multiannual Government Agreement:
   a. Agreement of the energy efficiency budget
   b. Agreement of the maintenance budget

4. Public procurement tender:
   a. Coordination between ICAEN, auditor and procurement department to launch the tender

5. Selection of the Energy Service Company according the criteria established in the tender.
   a. Definition of an annual economic quota for the energy efficiency services and the maintenance services.

6. Definition of the IPMVP methodology by the ESCO:
   a. An external consultant evaluates and approves the IPMVP methodology and planning

7. IPMVP annual report to demonstrate the energy savings established in the contract
   a. The external consultant evaluates the IPMVP report to guarantee the well implementation of the protocol.
   b. The economic savings are calculated using an energy reference cost. If the economic savings (energy) are lower than the agreed annual quota of the energy efficiency services, the annual quotas will be adjusted in order to achieve the guaranteed savings by the ESCo.

3.10.2 RePublic_ZEB contribution at national level

Starting from the results of the project, one of the main hurdles of the contract model proposed by the national and regional governments is the tendency to consider only efficient plants and renewable energy systems. This doesn’t meet the nZEB general requirements that aim to improve the building performance through more general efficiency measures (e.g.: adopting also wall insulation). nZEB solutions are also considered expensive. In fact, they deal with pay-back periods greater than 10 years, difficult to manage with EPC contracts. The experience gathered with the project will be useful for finding solutions to this issue.
3.11 UK

3.11.1 Status quo

The UK government provides guidance and an example contract which organisations can use to help create their own EPC. The basis of the contract is an agreement between the buying organisations (the Authority) and the Energy Services Company (the Service Provider, also commonly referred to as an ESCO).

The Energy Efficiency (Encouragement, Assessment and Information) Regulations 2014 gives the meaning of “energy performance contract” as a contract under which energy efficiency measures are:

a) provided;

b) verified and monitored during the whole term of the contract; and

c) paid for by reference to a contractually agreed level of energy efficiency improvement or other agreed criterion such as financial savings.

EPC has become an approach for organisations to retrofit existing buildings with energy saving and energy generation measures. These measures improve the energy performance of their buildings, thereby reducing carbon emissions and achieving substantial annual cost savings – these savings are guaranteed by the Service Provider under the Model Contract.

To ensure that the buying organisation isn’t tied into the proposals before they, and their impact, are fully detailed, the Model Contract uses a two stage process:

- Call-Off Phase 1: this is expected to be signed on selection following tender. This covers the production of the Investment Grade Proposal.

- Call-Off Phase 2: this is expected to be signed once the Authority is happy with the approach, measures, plan and other details contained in the Investment Grade Proposal.

A core element of the contract is the savings guarantee that places the obligation on the Service Provider to ensure performance levels are achieved and provides the buyer with certain rights should that performance not be achieved. Ongoing measurement and verification of the performance throughout a defined period (normally to the point where the savings produced by the energy conservation measures equals the cost of those measures), underpins the validity of performance after the effects of variable factors (such as external temperature), have been taken into account.

Compliance to public procurement regulations is required for all public sector organisations and interest in EPC opportunities often comes from organisations outside the UK. Most EPC requirements are likely to be above the relevant OJEU threshold.

The example model contract provided by UK government was developed from the highly successful and award-winning Greater London Authority RE:FIT EPC programme. The supporting guidance provides information and notes on specific areas of the example contract. There is also a best practice guide covers the project brief in detail and covers areas such as:

2 https://www.london.gov.uk/what-we-do/environment/energy/energy-buildings/refit
- Technical requirements: e.g. specific problem areas to be addressed and details on service continuity needs and minimum performance levels (such as energy and/or CO2 reduction).

- Strategic requirements: e.g. wider goals to be achieved and/or to be reported on such as environmental impacts or economic benefits.

- Financing requirements / approach: e.g. maximum payback periods, internal funding limits, whether external finance is required and what the basis of that financing may be (Authority arrangement, supplier finance etc…).

- General requirements and information: e.g. site policies and processes that need adherence to.

![Figure 3.11. Phases of the Model of Contract](image)
4 FINANCIAL SCHEMES

4.1 INTRODUCTION

In Europe 40% of the annual energy consumption is due to buildings. By 2020 this consumption must be reduced by 20% together with a yearly reduction in CO$_2$ emissions of around 782 million tons and thus save € 100 billion in costs incurred for the purchase of fossil fuel annually.

According to the new Energy Efficiency Plan 2011 [1], due to Europe’s failures in obtaining a proper engagement from all State Members in comprehensive policy frameworks and suitable enforcement of those, Europe will not be able to fully accomplish the goals established in 2020, being needed an extra effort to reach it. In addition, some economic issues (like the decrease of the cost of fossil fuels and the capital needed for the refurbishments) is triggering a decrease of interest in the improvement of energy efficiency, although some measures may be, over the lifetime of the buildings, cost-effective. In fact, the required investments in low-energy buildings are generally high, the available incentives are generally low and in most of the countries there is a lack of information. As a correctional measure, the European Commission believes that the increase of financial support schemes is essential to overcome the issues.

In this part of the report the situation in each participating country, in terms of availability of financial schemes, is described and commented. Very often, these schemes are open both to public and private subjects, in other cases can be reserved only to public subjects. In the following, also schemes that consider specific technologies (like PV) or specific measures (like wall insulation) are cited. In fact, all incentives available for renewable sources and energy efficiency measures are useful to reach the economic feasibility of the projects of refurbishment of public buildings to nZEB.

4.2 BULGARIA

The “National nZEB Plan till 2020” identifies the following possibilities for financing of nZEB projects in Bulgaria:

- Energy performance contracting;
- Energy saving certificates;
- Energy Efficiency and Renewable Energy Fund or other financial mediators;
- Financing under other national or European supporting schemes and mechanisms.

There are several main sources of financing of EE measures implementation that could be applied to the public building stock:

- EU Structural funds
- EERSF
- National Trust “Ecofund”
- Energy performance contracting
EU Structural funds. Operational Programme “Regions in growth” (2014 - 2020)

OPRG 2014-2020 is an integrated operational programme focused on regional development especially targeted at achieving the objectives of the urban policy of Bulgaria, applying a special focus on EE in supporting centres in peripheral areas in accordance with the national model of polycentric development, formulated in the National Spatial Development Concept 2013 – 2025 and contributing to the territorial dimension of the sectoral policies included in the Partnership agreement.

The basic principle of the programme is the application of a balanced and integrated territorial approach. The need for this approach results from the regional disparities between the Bulgarian and the average EU regions and from the advanced monocentric development of Sofia and the 6 big cities, which in the long term will lead to serious imbalances between different parts of the country, unused potential of the territory and increased migration towards the biggest centre and externally to other EU MSs.

The resources by the European structural and investment funds are regulated by the “Management of the European Structural and Investment Funds Act” and the corresponding secondary legislation.

- Procedure BG16RFOP001-1.001-039 Integrated plans for urban regeneration and development, Priority axis 1 “Sustainable and integrated urban development”.

Within this scheme, the eligible Bulgarian municipalities (39 middle and big cities) have the possibility to develop EE refurbishment projects for public buildings to reach nZEB levels.

These projects do not contradict to the requirements of the procedure, as the aim to improve energy efficiency and to reach at least energy consumption class “C” in residential sector, students housing and state and municipal administrative buildings allows for achieving higher than the minimum “C” EE levels. The municipal nZEB projects should be developed according to cost-benefit analyses, normally for a period of 20-30 years, taking into account the admissible energy saving measures and their economic lifetime set forth in the Ordinance No.E-RD-04-3/04.05.2016.

The proportion of the total Union support (ERDF) foreseen for this priority axis is 54,46%, or EUR 714,381 mln.

- Procedure BG16RFOP001-2.001 Energy Efficiency in peripheral areas, Priority axis 2 “Support for EE in support centers in peripheral areas”.

Beneficiaries of this support scheme are 28 smaller municipalities and the specific aims are to improve EE 1. in the residential sector and 2. in public buildings. The interventions aim to contribute to the achievement of the national EE target.

The proportion of the total Union support (ERDF) foreseen for this priority axis is 6,85%, or EUR 89,848 mln.

Energy Efficiency and Renewable Energy Fund

The Fund was established through the Energy Efficiency Act [1] adopted in 2004. Its initial capitalization was entirely with grant funds by GEF (through WB), the Government of Austria, the Bulgarian Government and several private Bulgarian companies. It operates according with the provisions of the Energy Efficiency Act [1], the Energy from Renewable Sources Act [2] and the agreements with the Donors and is not part of the consolidated state budget.

The Fund has the combined capacity of a lending institution, a credit guarantee facility and a consulting company. The Fund offers credits below market interest rates, partial credit guarantees and portfolio guarantees. It provides technical assistance to state bodies and local administrations,
enterprises, institutions (including education and health), NGOs and private individuals in developing energy efficiency investment projects and assists their financing, co-financing or plays the role of guarantor before other financing institutions.

The underlying principle of the Fund’s operations is the public-private partnership. The Fund pursues an agenda that is fully supported by the Bulgarian Government, but it is structured as an independent legal entity, separate from any governmental, municipal and private agency or institution.

A necessary condition for a successful application with the EERSF is the presence of a detailed energy audit allowing for an energy analysis and choice of energy saving measures.

The projects approved and supported by the Fund should

- involve the application of well-proven technology;
- cost in the range between BGN 30 000 and BGN 3 mln.
- the equity contribution of the project developer should be at least 10%;
- the repayment period is up to 7 years.

**National Trust Ecofund**

The Fund was established in 1995 by a swapping agreement “Debt for environment” between the Government of Switzerland and the Bulgarian Government.

The current programme supported by the Fund is the Investment programme for the climate, which uses financial sources from the earlier trades of the European emissions trading scheme. It finances projects for improving of EE of state and municipal buildings. Applications are continuous and could be made at any time. The programme provides up to 85% of the investment cost, which includes construction activities and monitoring and investment control. The remaining 15% should come from the beneficiary’s own budget.

The measures include thermal wall, roof and floor insulation, change of windows, modernization of heating and lighting installations, installation of solar and PV systems. The buildings renovated under the programme include administrative buildings, schools, kindergartens, cultural centres, sports halls, high education buildings etc.

**Energy Performance Contracting**

EPC (ESCO) contracting is regulated in Art. 72 of the EEA.

The ESCO contracts have as a subject the implementation of EE improvement measures in buildings, enterprises, industrial systems and outdoor lighting systems: the investments made are recouped and the remuneration due to the contractor is paid by the energy saving released. Final customers may be clients and EES providers may be contractors.

EPCs could be concluded after an energy efficiency audit and a certificate for energy performance, which certifies the current state of energy consumption in the building.

These contracts shall contain at least:

- The normalized energy consumption established by an EE audit;
- A list of EE measures that will be implemented, including the steps to be performed and the associated costs;
The guaranteed energy savings, the procedure and time limits for establishing the savings after implementing the measures and the provisions on M&V of the energy savings achieved, quality checks and guarantees;

- Obligation to fully implement the measures in the contracts and documentation for all changes made during the project;
- Display of financial implications of the project and distribution of the share of both parties in the monetary savings achieved;
- Method of financing;
- Method of payment of the remuneration;
- Other clauses, including provisions to changing framework conditions that affect the content and the outcome of the contract, inclusion of equivalent requirements in any subcontracting with third parties, as well as detailed information on the obligations of each contracting party and the penalties for their breach.

The contractor ensures that the implementation of the service is on their own financial resources or undertakes to procure the financing from a third party. They take the financial, technical and commercial risks associated with the implementation of the EE improvement activities and measures and for achieving the guaranteed by the contract result.

For the State and municipal-owned buildings financial sources which, for the period of implementation of the contract, correspond to the normalized energy consumption of these buildings, shall be planned and allocated on the budget of the State bodies and municipalities.

The Ministry of Energy has issued guidelines for the application of his financial mechanism.

A deep look in the financial programmes created by Bulgaria national government to support the energy efficiency measures for buildings shows that they exist primarily to increase the renovation of the existing building stock. Between 2006 and 2020 the national programme for housing renovation in Bulgaria, which includes a national strategy for financing building insulation, provides financial needs of 5295.842 million levs for all measures of which 234.795 million levs is only for buildings insulation improvement (2490 million levs for residential buildings (498 million levs grant - 20 %) and 744.795 million levs for public buildings).

Some of the ongoing and programmes are described in the following tables.

<table>
<thead>
<tr>
<th>Programme name</th>
<th>Building Tax Exemption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2005 – ongoing</td>
</tr>
<tr>
<td>Type of support</td>
<td>Tax reduction</td>
</tr>
<tr>
<td>Budget</td>
<td>N/A</td>
</tr>
<tr>
<td>Measures covered</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• ENVELOPE (including insulation, windows &amp; glazing, exterior wall, doors, ceiling, etc.).</td>
</tr>
<tr>
<td></td>
<td>• EQUIPMENT (including efficient heating, efficient lighting systems, ventilation, cooling, control systems, etc.).</td>
</tr>
<tr>
<td></td>
<td>• Renewable energy sources.</td>
</tr>
</tbody>
</table>
### Impacts

N/A

<table>
<thead>
<tr>
<th>Programme name</th>
<th>National Program for Energy Efficiency in Multifamily Renovation of Residential Buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2006 to 2020</td>
</tr>
<tr>
<td>Type of support</td>
<td>Grant</td>
</tr>
<tr>
<td>Budget</td>
<td>1 billion Bulgarian levs</td>
</tr>
<tr>
<td>Measures covered</td>
<td>Energy efficiency measures for multi-families residential buildings</td>
</tr>
<tr>
<td>Impacts</td>
<td>Foresees within the 2006 – 2020 period 684 683 dwellings to be renovated, of which 362 792 are Panel, 152 686 are ferro-concrete and 169 205 are massive.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Programme name</th>
<th>National Strategy for financing the building insulation for energy efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2006 to 2020</td>
</tr>
<tr>
<td>Type of support</td>
<td>Grant</td>
</tr>
<tr>
<td>Budget</td>
<td>81.3 million euro</td>
</tr>
<tr>
<td>Measures covered</td>
<td>Insulation for existing buildings</td>
</tr>
<tr>
<td>Impacts</td>
<td>Saved energy for heating, reduced CO2 emissions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Programme name</th>
<th>Residential Energy Efficiency Credit Facility REECL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2005 – ongoing</td>
</tr>
<tr>
<td>Type of support</td>
<td>Preferential loan; Grant</td>
</tr>
<tr>
<td>Budget</td>
<td>50 million euro credit fund, 10 million euro grants fund (time period unknown)</td>
</tr>
<tr>
<td>Measures covered</td>
<td>Support energy efficiency and renewable energy measures</td>
</tr>
<tr>
<td>Impacts</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Programme name</th>
<th>Bulgarian Energy Efficiency and Renewable Energy Credit Line BEERECL</th>
</tr>
</thead>
</table>
**4.3 CROATIA**

HBOR (Croatian bank for reconstruction and development) is a development and export oriented bank established with the mission of lending to reconstruction and development of Croatian economy. Special financial facilities were developed for financial support and incentives for investment in environment protection projects, energy efficiency projects and renewable energy sources projects. Credits are offered directly or in cooperation with commercial banks cooperating with HBOR.

Short description of the present lending facility is given in the tables below

<table>
<thead>
<tr>
<th>Program name</th>
<th>Lending program for environment protection projects, energy efficiency projects and renewable energy sources projects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td>Institutional investment, Construction plots, Buildings, Technical equipment Permanent working assets – up to 30% of the loan</td>
</tr>
<tr>
<td><strong>Program beneficiaries</strong></td>
<td>Local and regional administration units Utility companies Commercial companies, craftsmen and other legal entities</td>
</tr>
<tr>
<td><strong>Funding type</strong></td>
<td>Loan – lending to final users by means of commercial banks and direct loans to final users</td>
</tr>
<tr>
<td><strong>Total budget and single contract amounts</strong></td>
<td>Top cap depends on HBOR capacity, particular investment program, credit status of the applicant, amount and quality of collateral HBOR lends up to 75% of investment excluding VAT; investments below 100,000 HRK are not considered</td>
</tr>
<tr>
<td><strong>Lending conditions</strong></td>
<td>Loan rate: 4% with possibility of reduction for environment protection projects and energy efficiency projects.</td>
</tr>
<tr>
<td>Program name</td>
<td>Lending program for energy refurbishment of buildings[^3]</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>- Reconstruction of buildings</td>
</tr>
<tr>
<td></td>
<td>- Building technical equipment</td>
</tr>
<tr>
<td><strong>Program beneficiaries</strong></td>
<td>- Energy services providers (commercial companies and tradesmen offering improvement of energy efficiency in public buildings selected through the public procurement)</td>
</tr>
<tr>
<td></td>
<td>- Energy service users (central government, local and regional administration, public institutions, agencies, schools and hospitals in their ownership)</td>
</tr>
<tr>
<td></td>
<td>- Commercial companies and tradesmen investing in energy efficiency improvement</td>
</tr>
<tr>
<td><strong>Funding type</strong></td>
<td>Loan – lending to final users by means of commercial banks and direct loans to final users</td>
</tr>
<tr>
<td><strong>Total budget and single contract amounts</strong></td>
<td>- Top cap depends on HBOR capacity, particular investment program, credit status of the applicant, acceptability of the project based on Certificate of technical and financial viability of the project issued by APN i.e. professional commission, amount and quality of collaterals</td>
</tr>
<tr>
<td></td>
<td>- HBOR lends up to 50% of investment excluding VAT</td>
</tr>
<tr>
<td><strong>Lending conditions</strong></td>
<td>Loan rate: 4% with possibility of reduction for environment protection projects and energy efficiency projects.</td>
</tr>
<tr>
<td></td>
<td>Loan maturity: up to 14 years including grace period</td>
</tr>
<tr>
<td></td>
<td>Collateral:</td>
</tr>
<tr>
<td></td>
<td>- Bills of exchange and promissory notes of end beneficiary and owner (founder) of the end beneficiary</td>
</tr>
</tbody>
</table>

[^3]: U sklopu Programa za energetsku obnovu zgrada javnog sektora kojeg provodi Agencija za pravni promet i posredovanje nekretninama
EBRD

EBRD is the youngest international financial institution with the mission to finance projects which help transition to market economy and democratic society in private sector, unable to find financing in open market.

EBRD has options for direct financing in Croatia as well as financing through commercial banks. As a rule, only large projects are directly financed (above 3 mil. €), while other projects are financed through commercial banks. For large projects, the financial status of the client and the project profitability are considered, after which a financial model is used to define loan and financing options. Within the facility, grants for final beneficiaries are offered reducing loan principal based on certain conditions (e.g. CO2 reduction, reduction of energy consumption).

At the moment, loans are available in Croatia for energy efficiency projects and renewable energy sources projects through WeBSEFF II. Funds are distributed through commercial banks independently setting the commercial conditions:

- Privredna Bank Zagreb (20 mil €)
- Zagrebačka Bank (20 mil €)
- Erste & Steiermärkische Bank (10 mil €)

### Program name

<table>
<thead>
<tr>
<th>Western Balkans Sustainable Energy Financing Facility (WEBSEFF II)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td>Energy efficiency (energy refurbishment of the buildings, energy efficiency improvement) resulting in at least 30% savings in building energy consumption</td>
</tr>
<tr>
<td>State of the art technologies resulting in 20% CO2 emissions reduction</td>
</tr>
<tr>
<td>Renewable energy sources</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Program beneficiaries</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Public sector</td>
</tr>
<tr>
<td>Private sector (SME, ESCO)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Funding type</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans</td>
</tr>
</tbody>
</table>
Grants
Free technical assistance

| **Total budget and single contract amounts** | Total budget for Croatia is 50 mil €, limited to 2,5 mil € per project for public sector and 2 mil € for private sector. Fulfiling the energy consumption / CO₂ reduction requirements can give access to grant in form of principal reduction (10 – 15% of the loan for private sector, 5 – 10% for public sector) |
| **Lending conditions** | Lending conditions are set by commercial bank for each financing facility user separately |

**European investment bank (EIB)**

European investment bank is EU development bank with role to contribute to integration and well-balanced development, as well as economic and social cohesion of member states, performing similar roles outside of EU boundaries. EIB in Croatia participates in financing public and private sector projects, through direct financing or commercial partner banks. EIB finances directly projects larger than 25 mil. €, and smaller scale projects are financed through commercial banks.

| **Program name** | Erste & Steiermärkische Bank |
| **Purpose** | Energy efficiency |
| **Program beneficiaries** | Small and medium enterprise  
Large enterprise  
Public sector and other commercial subjects |
| **Funding type** | Loans and grants |
| **Total budget and single contract amounts** | Grants up to 15% of the loan principal  
Lower threshold value of the contract 40.000 €, upper value 2,5 mil. € for energy efficiency in production, and 250.000 € for energy efficiency in buildings |
| **Lending conditions** | Better conditions (rates) than commercial, case dependent |

| **Program name** | Raiffeisen Bank |
| **Purpose** | Expansion and modernization of existing production facilities, infrastructure, knowledge economy, education, energy, environment and healthcare. |
| **Program beneficiaries** | Small and medium enterprises, and medium capitalized enterprises (up to 3000 employees) |
| **Funding type** | loans |
### Total budget and single contract amounts

Upper value of the loan limited to 25 mil €

For SME and medium capitalized companies upper limit is 25 mil €. up to 100% of the project value

For local (regional) authorities and other subjects loans up to 50% of total value of the project (12.5 mil € for infrastructure for public services which are candidates for EU funding up to 2.5 mil €)

### Lending conditions

Financial conditions are set by commercial bank in agreement with EIB, rate is lower than market rate

---

**Green for Growth fund**

Funding form Green for Growth (GGF) Fund available. GGF was established as public/private partnership in December 2009 by German KfW and EIB, with the support from EC, German federal ministry for economic cooperation and development and EBRD. Until now, two commercial banks, Privredna Bank Zagreb (25 mil. €) and Zagrebačka Bank (20 mil. €) signed financing contracts with GGF.

<table>
<thead>
<tr>
<th>Program name</th>
<th>Green for Growth (GGF)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td>Energy efficiency and renewable energy sources</td>
</tr>
</tbody>
</table>
| **Program beneficiaries** | Large corporate clients  
Small and medium enterprise  
Households  
Industry  
Public sector |
| **Funding type** | loans |
| **Total budget and single contract amounts** | Small projects to 500.000 € resulting in at least 15% CO2 reduction or energy savings  
Large projects over 500.000 € resulting in 20% or more CO2 savings or energy savings. |
| **Lending conditions** | Terms of financing set by commercial bank |
Environmental protection and energy efficiency fund (FZOEU)

Environmental protection and energy efficiency fund was founded as extra budgetary fund with goal of financing national energy programs, considering energy efficiency and renewable energy sources goals, as well as environment protection.

The Fund is involved in energy efficiency in public buildings in two ways: through public calls for financing of non-residential buildings and through financing of the Program of the energy refurbishment of public buildings operated by APN.

Funds are awarded based on public calls and tenders published in Official Gazette, Funds web pages and public newsletters. Management board of the Fund adopts annual Operative program and Financial plan separately reporting programs and projects with provided funding.

4.4 FORMER YUGOSLAV REPUBLIC OF MACEDONIA

Public institutions have several budget lines to finance energy efficiency and RES measures and activities. It is important to highlight that is necessary to make efforts to find additional funds, for faster implementation of the measures envisaged. They need to explore the possibilities as offered grants from technical offices of some of embassies in Macedonia, funds through the EU, the opportunities offered by GEF projects financed by the World Bank and the soft "green" loans offered by commercial banks.

The public institutions can use the following sources of funding:

- Own budget;
- Donations;
- Government assets;
- Loans from financial institutions;
- Funds for special purpose.

<table>
<thead>
<tr>
<th>Programme name</th>
<th>Macedonian Bank for Development Promotion – Loans for public bodies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2010 – ongoing</td>
</tr>
<tr>
<td>Type of support</td>
<td>Loans</td>
</tr>
<tr>
<td>Budget</td>
<td>300 000 USD for EE projects and 4m USD for RES projects</td>
</tr>
<tr>
<td>Measures covered</td>
<td>Support in implementation of energy efficiency and renewables projects for public bodies</td>
</tr>
<tr>
<td>Impacts</td>
<td>N/A</td>
</tr>
<tr>
<td>Programme name</td>
<td>IPA cross border cooperation</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Dates</td>
<td>2015 – ongoing</td>
</tr>
<tr>
<td>Type of support</td>
<td>Grant</td>
</tr>
<tr>
<td>Budget</td>
<td>300 000 EUR per project</td>
</tr>
<tr>
<td>Measures covered</td>
<td>Support in implementation of energy efficiency and renewables projects for public bodies</td>
</tr>
<tr>
<td>Impacts</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Programme name</th>
<th>Small GEF projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>1992 – ongoing</td>
</tr>
<tr>
<td>Type of support</td>
<td>Grant</td>
</tr>
<tr>
<td>Budget</td>
<td>50 000 USD per project</td>
</tr>
<tr>
<td>Measures covered</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>Impacts</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Programme name</th>
<th>Project for improvement of municipal services financed by the World Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2007 – ongoing</td>
</tr>
<tr>
<td>Type of support</td>
<td>Long term loan</td>
</tr>
<tr>
<td>Budget</td>
<td>102.4 m USD</td>
</tr>
<tr>
<td>Measures covered</td>
<td>/</td>
</tr>
<tr>
<td>Impacts</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Programme name</th>
<th>WEBSEF II financed by the EBRD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2015 – ongoing</td>
</tr>
<tr>
<td>Type of support</td>
<td>Loan ESCorted with grant</td>
</tr>
<tr>
<td>Budget</td>
<td>75m EUR for loan + 11.5 for incentives</td>
</tr>
<tr>
<td>Measures covered</td>
<td>EE and RES</td>
</tr>
<tr>
<td>Impacts</td>
<td>N/A</td>
</tr>
</tbody>
</table>
4.5 GREECE

The financial support in Greece can be provided by different types: own financial resources, Public-Private partnerships or external financial resources such as the ones described in the following tables.

<table>
<thead>
<tr>
<th>Name</th>
<th>Vendor finance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of support</strong></td>
<td>“point of sale” financing for equipment</td>
</tr>
<tr>
<td><strong>Budget</strong></td>
<td>-</td>
</tr>
<tr>
<td><strong>Measures covered</strong></td>
<td>Typically involves major equipment suppliers (e.g. Philips, Siemens, Johnson Controls) using financial resources that permit them to offer “point of sale” financing for their equipment. Vendor financing is particularly suitable for standard equipment that can be used for EE in the residential and small commercial/industrial sectors.</td>
</tr>
<tr>
<td><strong>Impacts</strong></td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>ESCO financing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of support</strong></td>
<td>Various types – most common: commercial debt supported by an energy savings guarantee agreement from the ESCO</td>
</tr>
<tr>
<td><strong>Budget</strong></td>
<td>-</td>
</tr>
<tr>
<td><strong>Measures covered</strong></td>
<td>Some of the most effective EE schemes are where the ESCO (often through third-parties) has combined separate EE schemes and established a portfolio of buildings undergoing EE.</td>
</tr>
<tr>
<td><strong>Impacts</strong></td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Regional or national contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of support</strong></td>
<td>Various types</td>
</tr>
<tr>
<td><strong>Budget</strong></td>
<td>-</td>
</tr>
<tr>
<td><strong>Measures covered</strong></td>
<td>These are opportunity-based contributions making part of a larger national or regional strategy.</td>
</tr>
<tr>
<td><strong>Impacts</strong></td>
<td>-</td>
</tr>
</tbody>
</table>
### EU Structural Funds (e.g. ERDF, ESF, Cohesion Fund)

<table>
<thead>
<tr>
<th>Name</th>
<th>EU Structural Funds (e.g. ERDF, ESF, Cohesion Fund)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2014 - 2020</td>
</tr>
<tr>
<td>Type of support</td>
<td>Various types</td>
</tr>
<tr>
<td>Budget</td>
<td>Minimum of €23bn to sustainable energy (SE)</td>
</tr>
<tr>
<td>Measures covered</td>
<td>The European Structural and Investment Funds (ESI Funds), and specifically Cohesion Policy Funds1, will play a major role in relation to the refurbishment and construction of buildings. Under the European Regional Development Fund (ERDF), a minimum percentage of funding will be directed to the shift towards a low-carbon economy in all sectors (Thematic Objective 4), including energy efficiency (EE), renewable energies (RE), smart distribution systems and sustainable urban mobility: 20% in the case of more developed regions, 15% for transition regions and 12% for less developed regions, which receive more funding overall.</td>
</tr>
<tr>
<td>Impacts</td>
<td>A greater amount of funding will be available for the energy renovation of buildings.</td>
</tr>
</tbody>
</table>

### EU Funding Programmes (e.g. LIFE, territorial Cooperation, Horizon 2020, etc.)

<table>
<thead>
<tr>
<th>Name</th>
<th>EU Funding Programmes (e.g. LIFE, territorial Cooperation, Horizon 2020, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>N/A</td>
</tr>
<tr>
<td>Type of support</td>
<td>Various types</td>
</tr>
<tr>
<td>Budget</td>
<td>-</td>
</tr>
</tbody>
</table>
| Measures covered | there are several funding opportunities which can be explored for this purpose, for example:  
  - Horizon 2020;  
  - EE5 – Increasing energy performance of existing buildings through process and organization innovations and creating a market for deep renovation;  
  - EE7 – Enhancing the capacity of public authorities to plan and implement sustainable energy policies and measures. |
| Impacts | N/A                                                                           |

There are several available calls for refurbishment of public buildings in Hungary. KEHOP calls are for refurbishment of governmental institutions and TOP calls are for municipal buildings. These are non-refundable financial supports for energy refurbishments, focusing on improving building energy efficiency and installing systems using renewable energy sources. The support intensity is 100% for public buildings. The sources of financial supports are the Cohesion Fund and Hungary’s budget.

<table>
<thead>
<tr>
<th>Programme name</th>
<th>KEHOP-5.2.10 Governmental institutions’ building energy refurbishments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>08-01-2016 – ongoing (Deadline for submission: 07-31-2018)</td>
</tr>
<tr>
<td>Type of support</td>
<td>Non-refundable</td>
</tr>
<tr>
<td>Budget</td>
<td>The financial source is HUF 10 billion, the minimum aid amount is HUF 50 million and the maximum aid amount: HUF 250 million. Aid intensity: 100%</td>
</tr>
<tr>
<td>Measures covered</td>
<td>Stimulate implementation of energy efficiency improvements and promotes the spread of decentralized, environmentally friendly renewable energy systems. Improves the energy efficiency of buildings and increases investment in renewable energy implementation. Supports activities: implementation of thermal insulation, changing of windows and doors, installation of photovoltaic and/or solar thermal collector systems.</td>
</tr>
<tr>
<td>Impacts</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Programme name</th>
<th>KEHOP-5.2.11 Installing photovoltaic systems in governmental institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>17-10-2016 – ongoing (Deadline for submission: 16-10-2018)</td>
</tr>
<tr>
<td>Type of support</td>
<td>Non-refundable</td>
</tr>
<tr>
<td>Budget</td>
<td>The financial source is HUF 10 billion, the minimum aid amount is HUF 100 million and the maximum aid amount: HUF 250 million. Aid intensity: 100%</td>
</tr>
<tr>
<td>Measures covered</td>
<td>Encourage the spread of decentralized photovoltaic systems, and support full or partial replacement of existing fossil-based electricity use for renewable energy sources in central government institutions.</td>
</tr>
<tr>
<td>Impacts</td>
<td>N/A</td>
</tr>
<tr>
<td>Programme name</td>
<td>KEHOP-5.2.5 - Building of nearly zero-energy buildings as pilot projects</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Dates</strong></td>
<td>19-09-2016 – ongoing (Deadline for submission: 14-10-2018)</td>
</tr>
<tr>
<td><strong>Type of support</strong></td>
<td>Non-refundable</td>
</tr>
<tr>
<td><strong>Budget</strong></td>
<td>The financial source is HUF 5.65 billion, the minimum aid amount is HUF 1 and the maximum aid amount: HUF 565 million. Aid intensity: 100%</td>
</tr>
<tr>
<td><strong>Measures covered</strong></td>
<td>Supports new buildings, nearly zero-energy public buildings according to Directive 2010/31/EU, as pilot projects.</td>
</tr>
<tr>
<td><strong>Impacts</strong></td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Programme name</th>
<th>TOP-3.2.1 -15 – Energy refurbishment of municipal buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dates</strong></td>
<td>22-04-2016 – ongoing (Deadline for submission: 30-09-2016)</td>
</tr>
<tr>
<td><strong>Type of support</strong></td>
<td>Non-refundable</td>
</tr>
<tr>
<td><strong>Budget</strong></td>
<td>The financial source is HUF 63.59 billion, the minimum aid amount is HUF 10 million and the maximum aid amount: HUF 500 million. Aid intensity: 100%</td>
</tr>
<tr>
<td><strong>Measures covered</strong></td>
<td>Improves energy efficiency of municipal building stock and spreads of renewable energy sources. Supports implementation of thermal insulation, changing of windows and doors, installation of photovoltaic and/or solar thermal collector systems, modernization of fossil-based thermal energy producers, installation of solar thermal collectors, PV systems, heat-pump systems, designing SECAP.</td>
</tr>
<tr>
<td><strong>Impacts</strong></td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Programme name</th>
<th>TOP-3.2.2-15 - Implementing renewable energy source based local energy supply systems controlled by local governments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dates</strong></td>
<td>22-04-2016 – ongoing (Deadline for submission: 30-09-2016)</td>
</tr>
<tr>
<td><strong>Type of support</strong></td>
<td>Non-refundable</td>
</tr>
<tr>
<td><strong>Budget</strong></td>
<td>The financial source is HUF 29.26 billion, the minimum aid amount is HUF 15 million and the maximum aid amount: HUF 1200 million. Aid intensity: 100%</td>
</tr>
</tbody>
</table>
Measures covered

<table>
<thead>
<tr>
<th>Measures covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>The aim of this call is to support implementing local RES based energy supply</td>
</tr>
<tr>
<td>systems. Supported activities: 1) biomass renewable energy-based energy supply</td>
</tr>
<tr>
<td>systems to meet their own (public) heating, cooling and electricity demand. 2)</td>
</tr>
<tr>
<td>geothermal renewable energy-based energy supply systems to meet their own (public)</td>
</tr>
<tr>
<td>heating, cooling and electricity demand. 3) Solar energy-based power plants to</td>
</tr>
<tr>
<td>meet their (public) electricity demand.</td>
</tr>
</tbody>
</table>

Impacts

| Impacts | N/A |

4.7 ITALY

In Italy, the analytical requirements for the refurbishment of an existing building are made available by the law (DM) 16.5.2015 on “Minimum energy requirements for buildings” that is connected to other several laws, as the national adoption of the Directive on renewable energy sources (RED).

These requirements are synthetically described in D5.1 (Italian section) and are considered by technicians and investors quite severe, then expensive from an economic point of view. This sentiment is mainly justified by:

- the required level of insulation of the envelope (the same for all types of buildings);
- the required share of renewables (55% for public buildings) that restrict the choice of possible technologies for the heating and cooling services;
- Italian ESCOs can generally afford projects with business plans not longer than 12-15 years and find financial resources at an interest rate of 4-5%. This is significantly different from the directions given by the EC for the definition of the “optimal” case (30 years and 3%). An additional important issue is the debt capacity of these companies, which is rapidly saturated by this type of projects. In fact, the work done by the Republic_ZEB project at Italian level shows how a typical project of renovation of a public building into a nZEB requires 1,5-2,5 M€.

As a consequence, the practical launch of projects of renovation of existing public buildings to nZEB is not an easy task and many exercises, developed in the framework of the RePublic project, show that an EPC contract could be triggered if a funding of around the 70-80% of the needed investments is assured by a third part (typically the State and/or the local government).

In this context, the financial problem and relevant schemes are mainly related to:

- availability of funds and possibility to add funds from different origin (i.e.: state and european grants);
- real applicability of the procedures that make the funds available under an EPC contract.

The awareness of these issues has been focussed during the national meetings and the “one to one” meetings and has directed the national activities of the RePublic project (mainly during 2015) to give a substantial contribution to put into force the following national rules (main aspects):

- grant line reserved to the refurbishment of public buildings into nZEB (new section of the “Conto Termico 2”; availability: 200 M€ till 2020). The grant could cover the 65% of the
maximum eligible investments for the refurbishment (400-500 €/m² in relation to the climatic zone);

- possibility to apply to a “pre-call” for grants in order to assure the availability of funds before opening the procedure for a tender;

- possibility to transfer the grant to the ESCO winner of the tender (for the EPC contract which includes the refurbishment);

- possibility to apply both to national and European funds, like the European structural and investment funds (ESIFs).

The resulting, mostly procedural, scheme is displayed in the following figure. The cited “national funds” are the funds provided by the “Conto Termico 2”.

The financial details are strictly related to the administrative rules for the financial reporting.

Other financial schemes are available at national level for public administrations (PA) for the refurbishment of public buildings and presented in the following. The possible regional and local schemes available throughout Italy are not included. The more important schemes are the “White certificates” and the “Guarantee funds and the Third-part financing”. Other schemes are available for the buildings of the central administrations.

It should be underlined that funds available or useful to the PAs are different and less in number from the schemes available for the private subjects (one of the more popular measures available just for private subjects is, for example, the tax reduction reserved for technologies based on renewable sources and on energy saving).

White certificates

This system is also known as “Energy Efficiency Securities” (EES), are tradable securities certifying the achievement of energy saving in the final uses of energy, through energy efficiency measures and projects. The system was introduced into Italian legislation by the Ministerial Decrees of 20 July 2004 - in advance of the “compulsory regimes” introduced by EU Directive 2012/27. It sets specific quantitative primary energy saving targets, expressed in tonnes of oil equivalent to be achieved by electricity and natural gas distributors each year. One certificate is equal to the saving of one tonne of oil equivalent (toe).

Electricity and gas distributors can meet their obligation by implementing energy efficiency projects entitling them to the issue of white certificates, or by purchasing EES from other entities on the Energy efficiency securities market. In the last year (2015/16) the value of one EES (as said, equivalent to an energy saving of 1 Toe) has fluctuated between 90 and 120 Euros, depending their availability on the market. In the 2015, the white certificate scheme generated savings of more 5 Mtoe, 32% of which in the civil sector (thermal and electrical uses).

The EES system results useful for refurbishment of public buildings especially for the following measures: wall insulation, efficient lighting and controls (BACs). It may be of interest underline that the public administrations are not the direct beneficiaries, but can be the ESCOs operating for them under EPC contracts.
INTEGRATION OF THE FUNDS AVAILABLE AT NATIONAL AND REGIONAL LEVEL (ONLY FOR PUBLIC ADMINISTRATIONS)

**Preparatory phase** (to be developed by the Public Administration - PA)
- Transfer to a third party or to an own service of an assignment for the choice of the building/s and of the measures on the basis of a pre-diagnosis.
- Eventual tender for the above task (Tender A).
- Energy audit of the building/s and preparation of a report for:
  - a) identification of the building/s to be refurbished
  - b) identification of the measures to be implemented
  - c) first estimation of the needed investment
- Administrative act certifying the commitment to perform the refurbishment presented in the above cited report.
- Presentation of a request for grants at state (preliminary) and regional level.

**National grant**
- Evaluation of the preliminary request (here a positive outcome is assumed).
- Verification of reporting at the end of the renovation (if required):
  - a) description of the adopted measures
  - b) needed certifications (eg.: compliance with the requirements for nZEB)
  - c) detailed description of the investments made
- Payment

**Regional grant**
- Regional call for projects with the following features:
  - a) eligibility of the regional grant with national incentives
  - b) similar documentation and procedure required at national level
  - c) possibility to allocate funds to the winner of tenders
  - d) eventual criteria for the establishment of rankings for the access to incentives

**Executive phase**
- The following cases are possible:
  - a) the building is run by the public administration (PA)
  - b) the building is managed by a third part classified as PA
  - c) the building is managed by a private organization under contract
  - In the case (a) and (b) it is possible to launch a tender procedure for the selection of the organization that will refurbish and manage the building for the agreed time (e.g.: an ESCo).
  - In the case (c):
    - c1) is necessary to wait for the current contract expiration
    - c2) if admitted by the current contract, a new tender is launched
    - c3) in the other cases it is not possible to operate

**Tender for the renovation of the building/s (Tender B)**
- The participating subjects on the basis of the report prepared under Tender A prepare an offer for an EPC contract.
- Selection the best offer and launch of the refurbishment
- Implementation of the refurbishment and acceptance procedure
- Reporting

**Management of the refurbished building/s**
- Management for the agreed time

Figure 4.7.1. In Italy public administrations can access at national level to the grants provided by the “Conto Termico 2” which include a specific measure for the transformation of public buildings to nZEB. This measure was developed with the support of the Republic_ZEB project and can cover around the 50-60% of the investment needed for the energy measures. If the public administration needs more funds, is possible to integrate the state funds with regional ones. These funds can be shifted to the ESCo selected through tenders.

**Guarantee funds**
These funds and the promotion of TPF (Third-Party Financing) models (Article 5 of the national Decree Law No 63 of 2013, as converted by Law No 90 of 2013) support energy efficiency improvement projects in public buildings, especially schools and hospitals. The fund, established by the national Legislative Decree No 28 of 2011, provide a public financial guarantee backing bank to lower the cost of debt and to improve the bankability of projects. The fund itself is financed with a
share of the proceeds from the sale of methane gas of EUR 0.05/m³ charged to end users and with part of the proceeds from the auctioning of CO₂ emission allowances for energy-environmental projects, referred to the Article 19 of Legislative Decree No 30 of 2013. The Fund’s current budget is about EUR 50 million; the estimated annual inflows from the quota on methane gas sales is approximately EUR 39 million. The estimated proceeds from auctioning of CO₂ emission allowances to be appropriated for energy-environmental projects are about EUR 210 million over the period 2013-2020. It is estimated that up to EUR 30 million per year of that revenue are available for the fund.

Resources available for the buildings of the central administrations

The Legislative Decree no. 102/2014 (national adoption of the EED) has allocated 355 million euro in the period 2014-2020 for the renovation of the buildings of the central public administrations and a recent national decree (September 2016, signed by the Ministers of Economic Development, Infrastructure and Economy) has activated the fund aimed to renovate annually at least the 3% of the usable area of the central buildings of the state, in accordance with the provisions of European Directive 2012/27 on energy efficiency. Presently, projects for a total value of 70 million euro have been presented.

In conclusion, the more useful funds available for all the public administrations (local and central) interested to the transformation of buildings to NZEB are the “white certificates” and the “Conto termico 2”. These schemes are synthetized in the following tables.

<table>
<thead>
<tr>
<th>Programme name</th>
<th>White Certificate System (EES)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dates</strong></td>
<td>On going (extensions expected until 2020)</td>
</tr>
<tr>
<td><strong>Type of support</strong></td>
<td>Energy saving projects can “sell” for 5 years the certificates (EES) that are bought by gas and electricity distributors. 1 EES = 1 toe of energy savings = around 100 € (the value increase or decrease according to the demand)</td>
</tr>
<tr>
<td><strong>Budget</strong></td>
<td>More than 500 M€ in 2015</td>
</tr>
<tr>
<td><strong>Measures covered</strong></td>
<td>Envelope, technical equipment</td>
</tr>
<tr>
<td><strong>Impacts</strong></td>
<td>Energy consumption reduction in the 2015: 5 Mtep</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Programme name</th>
<th>ContoTermico 2 (2nd Thermal account)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dates</strong></td>
<td>On going (2016 – 2020)</td>
</tr>
<tr>
<td><strong>Type of support</strong></td>
<td>Incentive</td>
</tr>
<tr>
<td><strong>Budget</strong></td>
<td>900 million of euro reserved for the public administrations of which at least 200 M€ for the refurbishment of public buildings to NZEB</td>
</tr>
<tr>
<td><strong>Measures covered</strong></td>
<td>Among the measures of interest of the public administration: renovation to ZEB; insulation of walls; solar screens; efficient lighting; BACs</td>
</tr>
</tbody>
</table>
4.8 PORTUGAL

This macroeconomic context, characterized by budgetary constraints and limitations in the use of funding, requires new solutions in the structuring of projects. Consequently, the PNAEE 2016 fits the financial incentive mechanisms to the instruments available, in a logic of strict necessity of meeting the targets. This will be mainly implemented through regulatory measures (e.g. penalties imposed on inefficient equipment, minimum energy performance class, mandatory energy labeling, mandatory energy audits), tax differentiation mechanisms (e.g. positive discrimination in the seat of IUC, and ISP ISV) and financial support from funds that provide funding for energy efficiency programs, presented in the following tables.

<table>
<thead>
<tr>
<th>Programme name</th>
<th>Energy Efficiency Fund (Fundo de Eficiência Energética (FEE))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2010 – ongoing</td>
</tr>
<tr>
<td>Type of support</td>
<td>Grant</td>
</tr>
<tr>
<td>Budget</td>
<td>N/A</td>
</tr>
<tr>
<td>Measures covered</td>
<td>Support to projects in the areas of transport, residential and services, industry and public services that contribute to the reduction of final energy consumption, energy-efficient and optimized.</td>
</tr>
<tr>
<td>Impacts</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Programme name</th>
<th>European Local ENergy Assistance (ELENA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2012 – ongoing</td>
</tr>
<tr>
<td>Type of support</td>
<td>Grant</td>
</tr>
<tr>
<td>Budget</td>
<td>N/A</td>
</tr>
<tr>
<td>Measures covered</td>
<td>Aims to provide support (up to 90% of costs) in implementation preparation and financing of energy efficiency projects. In Portugal, two initiatives have been developed, focused on public facilities, one being developed by the municipality of Vila Nova de Gaia and a second by ADENE. ADENE’s initiative aims to support the development of energy efficiency management contracts in Lisbon region, being focused both on promoting energy efficiency in public buildings, such as public lighting systems, and traffic signal systems.</td>
</tr>
</tbody>
</table>

Impacts

Expectation of energy consumption reduction in the period 2016-2020: 2,5 Mtep
In addition and under the Intelligent Energy Europe, the Community Intermunicipal Minho-Lima and Alto Minho AREA presently are embarking on a similar initiative called MLEI GLEE AM.

<table>
<thead>
<tr>
<th>Programme name</th>
<th>Rehabilitation and Conservation Patrimonial Fund (Fundo de Reabilitação e Conservação Patrimonial (FRCP))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2009 – ongoing</td>
</tr>
<tr>
<td>Type of support</td>
<td>Grant</td>
</tr>
<tr>
<td>Budget</td>
<td>N/A</td>
</tr>
<tr>
<td>Measures covered</td>
<td>The Rehabilitation and Patrimonial Conservation Fund (FRCP) has the object and purpose of financing recovery operations, reconstruction, rehabilitation and conservation of buildings owned by the State under conditions to be set by order of the Government member responsible for the finances, which also approves the respective management regulations.</td>
</tr>
<tr>
<td>Impacts</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Programme name</th>
<th>Efficiency Promotion Plan on Energy Consumption (Plano de Promoção da Eficiência no Consumo de Energia Eléctrica - PPEC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2005 – ongoing</td>
</tr>
<tr>
<td>Type of support</td>
<td>Grant</td>
</tr>
<tr>
<td>Budget</td>
<td>N/A</td>
</tr>
<tr>
<td>Measures covered</td>
<td>• Adoption of more efficient behavior;</td>
</tr>
<tr>
<td></td>
<td>• Purchase of more efficient equipment than the market standard;</td>
</tr>
<tr>
<td></td>
<td>• Reduction in the electricity bill of consumers;</td>
</tr>
<tr>
<td></td>
<td>• Reducing the emission of greenhouse gas effects;</td>
</tr>
<tr>
<td></td>
<td>• Reduction of the electricity sector costs;</td>
</tr>
<tr>
<td></td>
<td>• Reduction of investments in networks and production infrastructure.</td>
</tr>
<tr>
<td>Impacts</td>
<td>N/A</td>
</tr>
</tbody>
</table>
**Programme name** | Portuguese Carbon Fund (Fundo Português de Carbono (FPC))
---|---
**Dates** | 2006 – ongoing
**Type of support** | Grant
**Budget** | N/A
**Measures covered** | Support the transition to a resilient, competitive and low-carbon economy by financing or co-financing of measures to contribute to the fulfilment of the Portuguese State's commitments under the Kyoto Protocol (KP) and other international commitments and community in the context of climate change.
**Impacts** | N/A

**Programme name** | Portugal 2020
---|---
**Dates** | 2014 – ongoing
**Type of support** | Grant
**Budget** | N/A
**Measures covered** | The Domain of Sustainability and Efficient Use of Resources concentrates, for the period of 2014-2020, the most of support for the promotion of energy efficiency. They are mobilized by the respective Thematic Operational Programme and the various Regional Operational Programmes including public building refurbishment.
**Impacts** | N/A

Other proposes to incentive refurbishment and energy efficiency measures are:

- Creation of a new taxation regime for vehicles and industrial fuels;
- Creation of an accelerated depreciation regime for investments in energy-efficient equipment and vehicles in the industry and service sectors;
- Providing fiscal incentives for micro-production and progressively aligning the tax system with that of the energy certificates for buildings (for example fiscal benefits for class A/A+ level houses).
4.9 ROMANIA

In Romania several programmes were defined and implemented, the major goal of them is to rehabilitate residential buildings with the intent to increase the energy performance of buildings constructed between 1951 and 1990 and other buildings with poor thermal efficiency and high consumptions levels. Furthermore, several programs were launched or announced for financing energy efficiency measures in public buildings. The past, ongoing and new programmes are described in the following tables.

<table>
<thead>
<tr>
<th>Programme name</th>
<th>Multiannual National Programme for increasing the energy performance of the block of flats (GEO 18/2009 and GEO 63/2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2002 – ongoing</td>
</tr>
<tr>
<td>Type of support</td>
<td>Grant</td>
</tr>
<tr>
<td>Budget</td>
<td>204 million euro cumulative budget between 2008-2011.</td>
</tr>
<tr>
<td>Measures covered</td>
<td>• Envelope: exterior walls, roof, double glaze of windows and exterior doors, construction works and painting of the external walls and other structural and non-structural parts of the building shell.</td>
</tr>
<tr>
<td></td>
<td>• Other energy-efficiency related measures: works for reducing the thermal losses of the heating network from the basement of the building (common systems).</td>
</tr>
<tr>
<td>Impacts</td>
<td>By 31 December 2014, thermal rehabilitation works have been finalised for 1,533 housing units (block-of-flats), accounting for 59,219 apartments, and under the local programmes for almost 210 housing units, and accounting for 9,626 apartments. The total investment was 223 MEUR, with an indicative average of 3770 EUR/apart.</td>
</tr>
<tr>
<td></td>
<td>The energy saving output following the implementation of thermal rehabilitation measures for residential buildings under these programmes was about 35% - 40% of the final energy consumption (approximately 82 Mtoe) before the rehabilitation work was carried out.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Programme name</th>
<th>Direct reduction of energy consumption through community based retrofits and market development - Component 3 of the LGGE Improving Energy Efficiency in Low-Income Households and Regions of Romania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2011 – 2015</td>
</tr>
<tr>
<td>Type of support</td>
<td>Grant</td>
</tr>
<tr>
<td>Budget</td>
<td>Volume of investments in EE buildings leveraged (cumulative USD by EOP): baseline = 0, targets end of project = USD 10 741 000</td>
</tr>
</tbody>
</table>
| Measures covered | • Envelope: Energy efficient buildings reconstructed (and potentially new buildings constructed) with reduced fuel costs or using improved sustainable energy technologies in low income communities;  
| | • Sustainable heating systems in buildings. |

| Impacts | Ex-ante: Tonnes CO2eq per year reduced (direct reductions) by end-of-project (EOP): baseline=849, targets end of project=22227; Tonnes CO2eq reduced over the lifetime of the EE measures introduced (direct reductions): baseline = 25456, targets end of project = 666800. MWh in heat energy per year saved as a direct result of this project by end of project: baseline = 2197, Targets End of Project = 43374. No. of people living in EE buildings by the end of project: baseline = 4500, targets end of project = 110616. |

| Programme name | Thermal rehabilitation of housing stock financed by bank loans with Government guarantee (GEO 69/2010) |
| Dates | 2010 – ongoing |
| Type of support | Loan |
| Budget | Available budget, for 2011 alone: RON 143,1 million (≈EUR 33,7 million) |
| Measures covered | • Envelope: exterior walls, roof;  
| | • Technical equipment (HVAC, RES, etc.): installation, if appropriate, of alternative systems for partially/totally providing energy for heating water, lighting and/or heating. |
| Impacts | N/A |

| Programme name | Program Casa Verde for individuals |
| Dates | 2010 – ongoing |
| Type of support | Grant |
| Budget | For 2011 alone: RON 100 million (≈EUR 23,6 million) |
| Measures covered | Technical equipment (heating, ventilation systems, RES in buildings, etc.): installing of heating systems that use renewable energy. The scope is that of replacing the traditional methods (such as burning wood and fossil fuels) used to produce thermal energy for domestic use. |
| Impacts | N/A |
### Programme name: Program Casa Verde for public bodies

**Dates**
2010 – ongoing

**Type of support**
Grant

**Budget**
For 2011 alone: RON 100 million (≈EUR 23.6 million)

**Measures covered**
Technical equipment (heating, ventilation systems, RES in buildings, etc.): installing of heating systems that use renewable energy. The scope is that of replacing the traditional methods (such as burning wood and fossil fuels) used to produce thermal energy for domestic use.

**Impacts**
N/A

### Programme name: European funding mechanism provided by the Structural and Cohesion Funds for programmes implementing the thermal rehabilitation of apartment buildings (2007-2013)

**Dates**
2013 – 2016

**Type of support**
Grant

**Budget**
182.4 million EUR

**Measures covered**
- Envelope: exterior walls, roof;
- Technical equipment (HVAC, RES etc.): installation, if appropriate, of alternative systems for partially/totally providing energy for heating water, lighting and/or heating.

**Impacts**
By 31 December 2014, about 108 ongoing contracts aimed at achieving a better energy performance for 680 housing units representing 31,427 apartments

### Programme name: Regional Operational Programme 2014 - 2020, “Priority Axis 3: Supporting the transition to a low carbon economy”, and “Priority Investment 3.1. - Energy efficiency in public buildings, residential buildings and public lighting”.

**Dates**
2016 – ongoing

**Type of support**
Grant

**Budget**
Residential buildings (Call June 2016): 447.75 million EUR
Residential buildings in Danube Delta region (Call announced for End 2016): 40.5 million EUR
Public buildings (Call announced for End 2016): 325.21 million EUR

Measures covered

- Envelope: exterior walls, roof;
- Technical equipment (HVAC, RES etc.): installation, if appropriate, of alternative systems for partially/totally providing energy for heating water, lighting and/or heating.

Impacts

N/A

All these programs are taken into account in the National Energy Efficiency Action Plan (NEEAP) 2014 - 2017 which was developed to achieve Romania's assumed target of 19% energy consumption reduction in the building sector (both residential and non-residential buildings) by 2020, in compliance with the requirements of Directive 2012/27/EU.

Other energy renovation programs are approved and implemented only at local level (in some municipalities and districts of Bucharest) using public funds based on EIB (European Investment Bank) loans.

To implement measures for improving energy efficiency and for using Renewable Energy Sources (RES) in buildings owned by or under the management of public administration, as well as for setting an example in reducing energy consumption, a mechanism for developing and co-financing energy efficiency projects with the participation of Energy Service Companies (ESCOs) is taken into consideration, being currently under discussion. However, all projects promoting the ESCO/EPC concept in Romania recognise that there is still long way to go before the ESCO market matures, the complete regulatory framework is in place, public institutions have adapted their accounting systems to accommodate EPC contracts, a number of issues such as taxation rules, measurement and verification etc. are clearly defined and, most important, procurement officers are trained and feel ready to tender and manage EPC contracts.

4.10 SLOVENIA

The new and ongoing programmes are described in the following tables.

<table>
<thead>
<tr>
<th>Programme name</th>
<th>Financial stimulation for energy efficiency renovation and sustainable building of new buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2008 – 2016</td>
</tr>
<tr>
<td>Type of support</td>
<td>Grant; preferential loan</td>
</tr>
<tr>
<td>Budget</td>
<td>N/A</td>
</tr>
<tr>
<td>Measures covered</td>
<td>• Energy sanitation (thermal insulation of shells and lofts, replacement of windows);</td>
</tr>
<tr>
<td></td>
<td>• Building of new low energy buildings;</td>
</tr>
<tr>
<td></td>
<td>• Building of new passive solar buildings.</td>
</tr>
</tbody>
</table>
## Programme name

**Financial stimulation for energy efficiency heating systems**

### Dates
2008 – 2016

### Type of support
Grant; preferential loan

### Budget
N/A

### Measures covered
- Replacement of boilers with unsuitable capacity with high energy efficient devices (condense boilers, modular boilers);
- Installation of special biomass boilers with very high efficiency;
- Optimization of heating system operation: thermostatic valve, control and hydraulic balance of heating system;
- Use of thermal solar system and heat pump for space heating and hot sanitary water;
- Use of heat pump for space heating and hot sanitary water (use of air heat, heat of underground water, geothermal or under land heat).

### Impacts
N/A

## Programme name

**Financial stimulation for efficient use of electricity**

### Dates
2008 – 2016

### Type of support
Grant; preferential loan

### Budget
N/A

### Measures covered
- Stimulation for purchasing of most energy efficient household appliances: refrigerators, freezers, washing machines, dishwashers;
- Stimulation of energy efficient lighting: purchasing of efficient florescence lamps;
- Penetration of intelligent energy meters in households: internet monitoring, remote control, quick measure and advice at consumers.

### Impacts
N/A
### Programme name: Scheme of efficient use of energy for households with low income

<table>
<thead>
<tr>
<th>Dates</th>
<th>2008 – 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of support</td>
<td>Grant</td>
</tr>
<tr>
<td>Budget</td>
<td>N/A</td>
</tr>
</tbody>
</table>
| Measures covered | • Sanitation of buildings to achieve minimum of energy efficiency standard: thermal insulation of lofts, draught proofing and thermal insulation of critical parts;  
• Energy efficient lighting and other measures. |
| Impacts | N/A |

### Programme name: Programme of energy audits of companies and buildings

<table>
<thead>
<tr>
<th>Dates</th>
<th>2008 – 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of support</td>
<td>Grant</td>
</tr>
<tr>
<td>Budget</td>
<td>N/A</td>
</tr>
<tr>
<td>Measures covered</td>
<td>Stimulate energy audits and prepare energy efficiency measures for companies or institutions.</td>
</tr>
<tr>
<td>Impacts</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### 4.11 SPAIN

A number of financial and fiscal programmes have been developed by Spain to support the energy efficiency of buildings, especially for the renovation of the existing ones. The new and ongoing programmes are described in the following tables.

### Programme name: Programa PAREER-CRECE (FEDER)

<table>
<thead>
<tr>
<th>Dates</th>
<th>2014 - 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of support</td>
<td>Grant, preferential loan</td>
</tr>
<tr>
<td>Budget</td>
<td>200M€</td>
</tr>
</tbody>
</table>
| Measures covered | Energy efficiency improvement of:  
- Thermal envelope.  
- Heating and lighting systems |
<table>
<thead>
<tr>
<th>Programme name</th>
<th>JESSICA F.I.D.A.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2015 – 2016</td>
</tr>
<tr>
<td>Type of support</td>
<td>Preferential loan</td>
</tr>
<tr>
<td>Budget</td>
<td>123M€</td>
</tr>
<tr>
<td>Measures covered</td>
<td>Energy efficiency projects and energy management. Projects THERMAL, PHOTOVOLTAIC AND BIOMASS ISOLATED. Projects related to clean transport which contributes to improve energy efficiency and use of renewable energy.</td>
</tr>
<tr>
<td>Impacts</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Programme name</th>
<th>ERDIBA - ELENA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2012 – 2016</td>
</tr>
<tr>
<td>Type of support</td>
<td>Grant</td>
</tr>
<tr>
<td>Budget</td>
<td>98 M€</td>
</tr>
<tr>
<td>Impacts</td>
<td>52.3 GWh of energy savings 21.593,8 t of CO₂ savings 9.8 GWh of renewable energy production</td>
</tr>
</tbody>
</table>
**Programme name**  
Be energi – Sustainable energy for Girona Province

**Dates**  
2015 – on going

**Type of support**  
Technical and financial assistance to promote energy efficiency, renewable energies and promoting forest biomass.

**Budget**  
-

**Measures covered**  
Promote different financing mechanisms for:

- Public Lighting
- Improve energy efficiency of Public Buildings
- Boilers and heat networks
- Joint Purchase

**Type of contracts:**

- Energy Supply contract
- Comprehensive energy management services with guaranteed savings (EPC)
- Joint purchase

**Impacts**

Participating cities: 64  
Reduced emissions: 350 tn CO₂  
Energy Savings: 0.187GWh/yr  
Investment allocated: 1.37 M€

**Type of support**  
Tax reduction

**Description**  
Local level: There are some municipalities (as Barcelona and Sant Cugat del Valles) that are proposing tax discounts to promote the energy efficiency in buildings and the use of renewable energies. Some examples are:

- Property tax ("IBI") reduction for deep renovation of buildings.
- Property tax ("IBI") reduction for voluntary installation of solar thermal and photovoltaic systems.
- Reduction of Tax on Buildings, Installations and Eorks ("ICIO") for implementation of energy efficiency and renewable energy in buildings.
- Reduction of Tax on Business Activities ("IAE") to use renewable energies.
4.12 UNITED KINGDOM

In the UK numerous programmes for energy efficiency have been created with the intention to improve energy efficiency and thermal comfort and reduce fuel poverty. The most important currently is the Energy Company Obligation (ECO). It is the government’s domestic energy efficiency programme which replaced CERT and CESP to provide additional support for energy efficiency and heating measures. Within ECO there are specific targets for support to low income and vulnerable households and households in low income areas. Below are summarised the three ECO targets currently in legislation for the period to 31 March 2015:

- **Carbon Emission Reduction Obligation (CERO)** (20.9 million savings in lifetime tonnes of CO2). Focusing on hard to treat homes, other measures are also eligible if they are promoted as part of a package that includes solid wall insulation or hard to treat cavity wall insulation.

- **Carbon Saving Communities Obligation (CSCO)** (6.8 million savings in lifetime tonnes of CO2). Focusing on the provision of insulation measures and connections to district heating systems to domestic energy users that live within an area of low income. At least 15% of each supplier’s CSCO must be achieved by promoting measures to low income and vulnerable households living in rural areas.

- **Affordable Warmth obligation** (£4.2bn reduction in lifetime notional space and water heating costs). Requiring energy suppliers to provide measures which improve the ability of low income and vulnerable households (the affordable warmth group) to affordably heat their homes. A heating qualifying action is the installation of a measure that will result in a heating saving; including the replacement or repair of a qualifying boiler.

In July 2014, the Government published its response to its consultation on the future of the ECO. The proposed changes to the targets currently in legislation include, for CERO, a 33% reduction to the original target level (from 20.9MtCO2 to 14MtCO2 lifetime) and increasing the range of eligible measures to include easy to treat measures. In addition, the eligibility criteria for CSCO target will be widened. There will be no changes to the AW target for the period to March 2015. The changes for the period to 31 March 2015 are intended to come into force by the end of 2014 (subject to parliamentary approval).

The government also confirmed its intention to introduce ECO targets for an additional two year period to the end of March 2017, with the following target levels:

- **CERO**: 12.4 MtCO2 lifetime savings;
- **CSCO**: 6.0 MtCO2 lifetime savings;
- **Affordable Warmth**: £3.7 bn reduction in lifetime notional space and water heating costs.

For Affordable Warmth, certain changes will be introduced for this new target period. These changes are designed to achieve a more balanced profile of delivery between insulation and heating measures, as well as between on- and off-grid households. Further, to increase consumer protection, warranties will be required to accompany the delivery of replacement boilers.

---

4 [www.ofgem.gov.uk/Sustainability/Environment/ECO/Pages/index.aspx](http://www.ofgem.gov.uk/Sustainability/Environment/ECO/Pages/index.aspx)
The final Impact Assessment supporting the government’s response to the ECO consultation6 shows the government’s estimates of the uptake of insulation and heating measures. The Affordable Warmth obligation target has enabled the delivery of over 160,000 boilers to low income and vulnerable households in the first year of its operation7. It is estimated that around 500,000 heating measures will be taken up under ECO for the 4.25 year target period to the end of March 2017.

Other programmes are described in the following tables.

<table>
<thead>
<tr>
<th>Name</th>
<th>Stamp Duty Relief for Zero Carbon Homes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2007 – ongoing</td>
</tr>
<tr>
<td>Type of support</td>
<td>Tax break</td>
</tr>
<tr>
<td>Budget</td>
<td>N/A</td>
</tr>
<tr>
<td>Measures covered</td>
<td>All new homes meeting the zero carbon standard costing up to GBP 500,000 would pay no stamp duty, and that zero carbon homes costing in excess of GBP 500,000 would receive a reduction in their stamp duty bill of GBP 15,000.</td>
</tr>
<tr>
<td>Impacts</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Feed-In-Tariffs (FiTs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2010 – ongoing</td>
</tr>
<tr>
<td>Type of support</td>
<td>Payments according to production</td>
</tr>
<tr>
<td>Budget</td>
<td>N/A</td>
</tr>
<tr>
<td>Measures covered</td>
<td>Programme designed to promote the uptake of small-scale renewable and low-carbon electricity generation technologies. Owners of technologies (e.g. PVs) are paid for the electricity they generate</td>
</tr>
<tr>
<td>Impacts</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Renewable Heat Incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2014 – ongoing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Type of support</th>
<th>Measures covered</th>
<th>Budget</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landlords’ Energy Saving Allowance</td>
<td>Quarterly payments for seven years for the amount of clean, green renewable heat it’s estimated their system produces</td>
<td>Government financial incentive to promote the use of renewable heat. Switching to heating systems that use eligible energy sources helps to reduce the carbon emissions and meet lower renewable energy targets. Owners are paid for the heat they generate from heat pumps, solar thermal, etc.</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Scotland – Public Sector Central Energy Efficiency Fund (CEEF)</td>
<td>Tax reduction</td>
<td>Incentive for private landlords to improve the energy efficiency of the residential properties that they let.</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Climate Change Levy</td>
<td>Tax reduction; preferential loan</td>
<td>The revenue collected is recycled back to business through a 0.3% reduction in National Insurance Contributions and also a system of</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
enhanced capital allowances and interest free loans for investments in energy saving technologies. Electricity produced from qualifying renewable sources and energy used and generated in approved combined heat and power schemes are exempt from the levy. There is also a reduced (20%) rate for energy-intensive businesses that enter into voluntary agreements to reduce their energy use and/or emissions.

**Northern Ireland Warm Homes Scheme**
- **Dates**: 2001 – ongoing
- **Type of support**: Grant
- **Budget**: €20m per year in 2007 and 2008
- **Measures covered**: Tackles fuel poverty in private sector housing, targeting tenants and owner-occupiers. Installation of insulation measures (including boiler jackets and window and door draught insulation) and energy advice.
- **Impacts**: N/A

**Scottish Energy Assistance Package**
- **Dates**: 2009 – ongoing
- **Type of support**: Grant
- **Budget**: N/A
- **Measures covered**: Tackles fuel poverty. Gives advice and support to help maximise income, cut fuel bills and make homes warmer and more comfortable. It combines and replaces the Central Heating and Warm Deal programmes in Scotland.
- **Impacts**: N/A

**Scotland – Community and Householder Renewables Initiative**
- **Dates**: 2001 – ongoing
- **Type of support**: Grant
- **Budget**: N/A
Measures covered

- Support the development of community scale renewable projects;
- Support the installation of household renewables;
- Raise awareness of renewable technologies and their benefits to Scotland;
- Provide support to the renewables industry.

<table>
<thead>
<tr>
<th>Name</th>
<th>Reduced sales tax for energy saving materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>2000 – ongoing</td>
</tr>
<tr>
<td>Type of support</td>
<td>Tax break</td>
</tr>
<tr>
<td>Budget</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Measures covered**
The reduced rate covers:

- All insulation, draught stripping, hot water and central heating controls;
- Installations of solar panels, wind and water turbines;
- Ground-source and air-source heat pumps and micro-CHP;
- Wood/straw/similar vegetal matter-fueled boilers.

| Impacts | N/A |

---

**Name** | Wales Home Energy Efficiency Scheme
---|---
**Dates** | 2000 – ongoing
**Type of support** | Grant
**Budget** | N/A
**Measures covered** | Heating and insulation improvements not only for owner-occupiers, but also to tenants.
**Impacts** | N/A
5 REFERENCES


ANNEX I

5.1 ANNEX TO THE CONTRACT: BULGARIA

The IEE RePublic_ZEB project as a reference for the identification of the packages of measures needed for the transformation of the existing building into nZEB

RePublic_ZEB, a European Commission funded project, has developed and promoted Near Zero Energy Building (nZEB) solutions and measures for refurbishment of public buildings, in accordance with Article 9 of the EU's Energy Performance of Building Directive.

Among the different activities, the project defined:

1. A methodology for defining the characteristics of the buildings
2. The basic steps for nZEB energy rating and a cost-benefit analysis of the “packages of measures” for the refurbishment towards nZEB
3. A set of measures and packages of measures useful for refurbishment to nZEB.

All the results are available on the website www.republiczeb.org and can be consulted for defining all the aspects to be considered for the transformation of the building.

Methodology for the characterization of the buildings

| Model for reporting the data needed for the energy characterization of the building | Page 19 of D2.2 |

Energy rating of nZEBs

The national nZEB definition sets two requirements (R7 2015):

- The energy consumption in the building, defined as primary energy, shall correspond to class “A” from the scale for energy consumption classes for the respective type of buildings;
- Not less than 55 percent of the energy consumed (delivered) for heating, cooling, ventilation, domestic hot water and lighting shall be from renewable sources, located at the building place or close to it.

Energy efficiency measures and the packages of measures

| Examples of energy efficiency measures (EEMs) and the relevant packages that can be applied | D3.3, D4.2 and D4.3 |
5.2 ANNEX TO THE CONTRACT: CROATIA

The IEE RePublic_ZEB project as a reference for the identification of the packages of measures needed for the transformation of the existing building into nZEB

RePublic_ZEB, a European Commission funded project, has developed and promoted Near Zero Energy Building (nZEB) solutions and measures for refurbishment of public buildings, in accordance with Article 9 of the EU's Energy Performance of Building Directive.

Among the different activities, the project defined:

1. A methodology for defining the characteristics of the buildings
2. The basic steps for nZEB energy rating and a cost-benefit analysis of the “packages of measures” for the refurbishment towards nZEB
3. A set of measures and packages of measures useful for refurbishment to nZEB.

All the results are available on the website www.republiczeb.org and can be consulted for defining all the aspects to be considered for the transformation of the building.

Methodology for the characterization of the buildings

<table>
<thead>
<tr>
<th>Model for reporting the data needed for the energy characterization of the building</th>
<th>Page 19 of D2.2</th>
</tr>
</thead>
</table>

Energy rating of nZEBs

Croatian definition of nZEB is based solely on primary energy demand of the building and mandatory renewable energy ratio, while other requirements are similar for all the buildings, new or refurbishments. Cost optimal level of primary energy demand is implemented in the regulation, based on the non-renewable primary energy factors. Requirements for new buildings on delivered energy and useful heating and cooling energy differ from requirements for refurbishments (which are slightly more relaxes), but requirements for primary energy are same. Due to refinements in methodology, and new development of current certification scheme, it is expected that next iteration of cost optimal definition of requirements is to include varied requirements for nZEB refurbishments opposed to new construction.

Energy efficiency measures and the packages of measures

| Examples of energy efficiency measures (EEMs) and the relevant packages that can be applied | D3.3, D4.2 and D4.3 |
5.3 ANNEX TO THE CONTRACT: MACEDONIA

The IEE RePublic_ZEB project as a reference for the identification of the packages of measures needed for the transformation of the existing building into nZEB

RePublic_ZEB, a European Commission funded project, has developed and promoted Near Zero Energy Building (nZEB) solutions and measures for refurbishment of public buildings, in accordance with Article 9 of the EU’s Energy Performance of Building Directive.

Among the different activities, the project defined:

1. A methodology for defining the characteristics of the buildings
2. The basic steps for nZEB energy rating and a cost-benefit analysis of the “packages of measures” for the refurbishment towards nZEB
3. A set of measures and packages of measures useful for refurbishment to nZEB.

All the results are available on the website www.republiczeb.org and can be consulted for defining all the aspects to be considered for the transformation of the building.

Methodology for the characterization of the buildings

<table>
<thead>
<tr>
<th>Model for reporting the data needed for the energy characterization of the building</th>
<th>Page 19 of D2.2</th>
</tr>
</thead>
</table>

Energy rating of nZEBs

The country has not an official detailed definition of nZEB. Consequently, the methodological steps given by prEN 15603:2015 and the definition and methods focused by the project in D4.2 (details are available in D3.2 and in the deliverables prepared by WP4) can be adopted for nZEB rating and verification. In the following, the most important topics are underlined.

Building energy needs calculation: the following topics should be considered for the calculation of the building energy needs: thermal characteristic of the building envelope; transmission and ventilation properties; partition of building into different zones; climatic data; heat gains from internal heat sources, solar properties; comfort requirements. The procedure is detailed in the EN ISO 13790.

Total primary energy use calculation: the technical systems (plants for heating, cooling, DHW production, ventilation, lighting) can consume different energy carriers and the total energy consumptions should be expressed in primary energy and calculated according with the cited prEN 15603 and defining the primary energy factors. As specified in the EN 15217, the Energy Performance (EP) is the building primary energy demand per unit of conditioned area.

EP can either include only non-renewable energy (EP_{nren}), or include both non-renewable energy and renewable energy (EP_{tot}). According with EN 15603:

\[ EP_{tot} = EP_{nren} + EP_{ren} \]

\[ \text{RER (share of renewables)} = \frac{EP_{ren}}{EP_{tot}} \]

Compensation between different energy carriers (e.g.: natural gas and on-site PV production) and the effect of exported energy should not be considered in the calculations of the consumption of the single energy services (heating, cooling, etc.).
nZEB rating: the building could be rated and eventually verified from an economical point of view (D4.3) through the procedure prepared by the project (D4.2)

**Energy efficiency measures and the packages of measures**

| Examples of energy efficiency measures (EEMs) and the relevant packages that can be applied | D3.3, D4.2 and D4.3. |

### 5.4 ANNEX TO THE CONTRACT: GREECE

The IEE RePublic_ZEB project as a reference for the identification of the packages of measures needed for the transformation of the existing building into nZEB

RePublic_ZEB, a European Commission funded project, has developed and promoted Near Zero Energy Building (nZEB) solutions and measures for refurbishment of public buildings, in accordance with Article 9 of the EU’s Energy Performance of Building Directive.

Among the different activities, the project defined:

1. A methodology for defining the characteristics of the buildings
2. The basic steps for nZEB energy rating and a cost-benefit analysis of the “packages of measures” for the refurbishment towards nZEB
3. A set of measures and packages of measures useful for refurbishment to nZEB.

All the results are available on the website [www.republiczeb.org](http://www.republiczeb.org) and can be consulted for defining all the aspects to be considered for the transformation of the building.

**Methodology for the characterization of the buildings**

| Model for reporting the data needed for the energy characterization of the building | Page 19 of D2.2 |

**Energy rating of nZEBs**

The country has not an official detailed definition of nZEB. Consequently, the methodological steps given by prEN 15603:2015 and the definition and methods focused by the project in D4.2 (details are available in D3.2 and in the deliverables prepared by WP4) can be adopted for nZEB rating and verification. In the following, the most important topics are underlined.

*Building energy needs calculation:* the following topics should be considered for the calculation of the building energy needs: thermal characteristic of the building envelope; transmission and ventilation properties; partition of building into different zones; climatic data; heat gains from internal heat sources, solar properties; comfort requirements. The procedure is detailed in the EN ISO 13790.

*Total primary energy use calculation:* the technical systems (plants for heating, cooling, DHW production, ventilation, lighting) can consume different energy carriers and the total energy consumptions should be expressed in primary energy and calculated according with the cited prEN
15603 and defining the primary energy factors. As specified in the EN 15217, the Energy Performance (EP) is the building primary energy demand per unit of conditioned area.

EP can either include only non-renewable energy (EP\textsubscript{ren}), or include both non-renewable energy and renewable energy (EP\textsubscript{tot}). According with EN 15603:

\[
EP\textsubscript{tot} = EP\textsubscript{ren} + EP\textsubscript{ren}
\]

\[
\text{RER (share of renewables)} = \frac{EP\textsubscript{ren}}{EP\textsubscript{tot}}
\]

Compensation between different energy carriers (e.g.: natural gas and on-site PV production) and the effect of exported energy should not be considered in the calculations of the consumption of the single energy services (heating, cooling, etc.).

nZEB rating: the building could be rated and eventually verified from an economical point of view (D4.3) through the procedure prepared by the project (D4.2)

### Energy efficiency measures and the packages of measures

| Examples of energy efficiency measures (EEMs) and the relevant packages that can be applied | D3.3, D4.2 and D4.3.. page.. |

#### 5.5 ANNEX TO THE CONTRACT: HUNGARY

The IEE RePublic_ZEB project as a reference for the identification of the packages of measures needed for the transformation of the existing building into nZEB

RePublic_ZEB, a European Commission funded project, has developed and promoted Near Zero Energy Building (nZEB) solutions and measures for refurbishment of public buildings, in accordance with Article 9 of the EU’s Energy Performance of Building Directive.

Among the different activities, the project defined:

1. A methodology for defining the characteristics of the buildings
2. The basic steps for nZEB energy rating and a cost-benefit analysis of the “packages of measures” for the refurbishment towards nZEB
3. A set of measures and packages of measures useful for refurbishment to nZEB.

All the results are available on the website [www.republiczeb.org](http://www.republiczeb.org) and can be consulted for defining all the aspects to be considered for the transformation of the building.

**Methodology for the characterization of the buildings**

In Hungary, the 7/2006 TNM Decree contains the requirements for nearly zero-energy buildings. Thermal transmittance of building structures involved in energy-saving refurbishment, the specific heat loss factor and total primary energy consumption of the building, as well as minimum share of renewable energy are the requirements of Annex 6 of 7/2006. TNM Decree that must be met. The numerical requirements are shown below.

**Building structures**

Thermal transmittance of building structures involved in energy-saving refurbishment must meet the requirements below (Table 3.5.1).
**Thermal resistance of building structure**

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Building structures</th>
<th>Requirement of thermal transmittance [W/m²K]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Façade wall</td>
<td>0,24</td>
</tr>
<tr>
<td>2</td>
<td>Roof</td>
<td>0,17</td>
</tr>
<tr>
<td>3</td>
<td>Envelope structures of heated attic</td>
<td>0,17</td>
</tr>
<tr>
<td>4</td>
<td>Slab under attic</td>
<td>0,17</td>
</tr>
<tr>
<td>5</td>
<td>Slab above arcade and passage</td>
<td>0,17</td>
</tr>
<tr>
<td>6</td>
<td>Bottom slab above unheated spaces</td>
<td>0,26</td>
</tr>
<tr>
<td>7</td>
<td>Glazing</td>
<td>1,0</td>
</tr>
<tr>
<td>8</td>
<td>Special glazing*</td>
<td>1,2</td>
</tr>
<tr>
<td>9</td>
<td>Glazed doors and windows on facade with wood or PVC frame (&gt;0,5 m²)</td>
<td>1,15</td>
</tr>
<tr>
<td>10</td>
<td>Glazed doors and windows on facade with metal frame</td>
<td>1,4</td>
</tr>
<tr>
<td>11</td>
<td>Glass wall on façade curtain wall</td>
<td>1,4</td>
</tr>
<tr>
<td>12</td>
<td>Glass roof</td>
<td>1,45</td>
</tr>
<tr>
<td>13</td>
<td>Skylight roof, smoke extraction dome</td>
<td>1,7</td>
</tr>
<tr>
<td>14</td>
<td>Roof windows</td>
<td>1,25</td>
</tr>
<tr>
<td>15</td>
<td>Industrial and fire doors and gates (boundary of heated space)</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>Door on façade or between heated and unheated area</td>
<td>1,45</td>
</tr>
<tr>
<td>17</td>
<td>Gate on façade or between heated and unheated area</td>
<td>1,8</td>
</tr>
<tr>
<td>18</td>
<td>Wall between heated and unheated area</td>
<td>0,26</td>
</tr>
<tr>
<td>19</td>
<td>Wall between heated buildings and heated building-parts</td>
<td>1,5</td>
</tr>
<tr>
<td>20</td>
<td>Foundation wall</td>
<td>0,3</td>
</tr>
<tr>
<td>21</td>
<td>Conventional energy collector walls (e.g. mass wall, Trombe wall)</td>
<td>1</td>
</tr>
</tbody>
</table>

*Requirement if there is high acoustic or safety requirements of glazing

**Specific heat loss factor**

In the case the specific heat storage mass of the building is light weight (m <400 kg/m²) – based on the calculations of 7/2006. TNM Regulation – the maximum permissible value (q_m) of specific heat loss factor can be calculated with the following equations considering the ratio of the cooling surface of the building (A) and the heated space air volume (V):

\[
A/V \leq 0,3 \quad q_m = 0,12 \quad [W/m^3K]
\]

\[
0,3 < A/V < 1,0 \quad q_m = 0,05143 + 0,2296 \times (A/V) \quad [W/m^3K]
\]

\[
A/V \geq 1,0 \quad q_m = 0,28 \quad [W/m^3K]
\]

In the case the specific heat storage mass of the building is heavy weight (m≥400 kg/m²) – based on the calculations of 7/2006. TNM Regulation – it is sufficient to meet the requirements of II. part of Annex 5 of 7/2006. TNM Decree:
A/V ≤ 0,3 \quad q_m = 0,16 \quad [W/m^3K] \\
0,3 < A/V < 1,0 \quad q_m = 0,079 + 0,27 \times (A/V) \quad [W/m^3K] \\
A/V ≥ 1,0 \quad q_m = 0,43 \quad [W/m^3K]

**Energy rating of nZEBs**

**Total primary energy**

Requirement of total primary energy consumption is presented in the following Table.

<table>
<thead>
<tr>
<th>N.</th>
<th>Function details</th>
<th>$E_P$ Requirement of total primary energy consumption (kWh/m²a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Residential and accommodation buildings (not including energy need of lighting)</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Office and commercial buildings including room up to 1000 m² useful area (including energy need of lighting)</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>Educational buildings and buildings typically including lecture hall, exhibition hall (including energy need of lighting)</td>
<td>85</td>
</tr>
</tbody>
</table>

In the case the building has cooling system, further increasing of the requirement by 10 kWh/m²a is permitted, when the whole building served by the cooling system. If the cooling system serves only part of the building, increasing of the requirement is permitted considering the proportion of the air conditioned and not the air conditioned areas.

For buildings and building-parts other than those specified, the requirement of total primary energy consumption shall be calculated according with the Annex 6 of 7/2006. TNM Decree based on the reference building and building service system.

**Minimum share of renewable energy**

At least 25% of the total primary energy consumption of the building shall be provided from renewable energy source that is generated in the building, derived from the property, or produced nearby.

**Energy efficiency measures and the packages of measures**

Typical measures and packages are based on the following technologies:

- Thermal insulation of building envelope (typical 18-20 cm EPS)
- Replacing existing doors and windows to triple glazed doors and windows
- External, movable shading
- Heat pump for heating and cooling or condensing gas boiler for heating
- Photovoltaic system
- Lighting refurbishment to LED, lighting control.

5.6 **ANNEX TO THE CONTRACT: ITALY**

The IEE RePublic_ZEB project as a reference for the identification of the packages of measures needed for the transformation of the existing building into nZEB
RePublic_ZEB, a European Commission funded project, has developed and promoted Near Zero Energy Building (nZEB) solutions and measures for refurbishment of public buildings, in accordance with Article 9 of the EU's Energy Performance of Building Directive.

Among the different activities, the project defined:

1. A methodology for defining the characteristics of the buildings
2. The basic steps for nZEB energy rating and a cost-benefit analysis of the “packages of measures” for the refurbishment towards nZEB
3. A set of measures and packages of measures useful for refurbishment to nZEB.

All the results are available on the website www.republiczeb.org and can be consulted for defining all the aspects to be considered for the transformation of the building.

Methodology for the characterization of the buildings

| Model for reporting the data needed for the energy characterization of the building | Page 19 of D2.2 |

Energy rating of nZEBs

The definition of nZEB has gone in force with the decree 26.6.2015 (competent body: Ministry for the Economic Development – MiSE). All the requirements foreseen by the national law for nZEB are synthesized in the following tables. The most important are the following:

- a reference building is defined (same shape as the real building and characteristic of envelope and technical systems stated by law for the year 2019 - public buildings and 2021 - all buildings). In other words: all new and fully renovated public buildings shall be nZEB since 2019 and the other buildings since 2021. The total energy performance (including renewable and non-renewable sources) for the reference building is calculated (considered services: heating, cooling, sanitary water and ventilation for residential buildings; lighting and internal transports – lifts, escalators and travelators – have to be added);
- the real building (nZEB) should be characterised by a better of equal total energy performance in comparison of the performance of the reference building (cited above);
- a renewable energy ratio (according to the national law that has adopted the directive 28/09 on renewable energies – RED) of 50% (private) or 55% (public buildings) is required. These requirements do not apply to the buildings served by a district heating networks;
- In any case, a PV plant is required (or other on-site electric generator from RES). Minimum size in kW shall be equal to 1/50 of the footprint of the building in m² (10% more for public buildings).

Requirements for the new buildings are the same as the requirements for the fully renovated buildings.

As stated above, according to the law, all buildings (new and fully renovated) should comply with nZEB requirements by 2019 (public) and by 2021 (all buildings).

Italian requirements for nZEB qualification (Italian Ministerial Decree DM 26.6.2015, published by the Italian Official Gazette on 15.7.2015)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Definition</th>
<th>Requirements</th>
<th>Units</th>
</tr>
</thead>
</table>

RePublicZEB© 2014  
Page 86 of 93  
October 2016
### ENVELOPE

<table>
<thead>
<tr>
<th>$H^{\prime}T$</th>
<th>Average thermal transmittance of the envelope (weighted)</th>
<th>$H^{\prime}T &lt; H^{\prime}\text{Ref}$</th>
<th>[W/ m²K]</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A_{\text{sol.est}}/A_{\text{us.surf.}}$</td>
<td>Solar effective collecting area of the glazed walls ($A_{\text{sol.est}}$) referred to the useful surface ($A_{\text{us.surf.}}$).</td>
<td>$A_{\text{sol.est}}/A_{\text{us.surf.}} \leq (A_{\text{sol.est}}/A_{\text{us.surf.}})_{\text{ref}}$</td>
<td>[-]</td>
</tr>
</tbody>
</table>

#### AVERAGE SEASONAL EFFICIENCIES OF PLANTS

| $\eta_H$ | Heating | $\eta_H > \eta_{H, \lim}$ (1) | [-] |
| $\eta_W$ | Generation of hot sanitary water | $\eta_W > \eta_{W, \lim}$ (1) | [-] |
| $\eta_C$ | Cooling (with eventual humidity control) | $\eta_C > \eta_{C, \lim}$ (1) | [-] |

#### ENERGY PERFORMANCE

| $E_{P,H,\text{nd}}$ | Energy performance – Energy need for heating | $E_{P,H,\text{nd}} < E_{P,H, \text{nd, lim (2019,2021)}}$ (2) | [kWh/m²] |
| $E_{P,C,\text{nd}}$ | Energy performance – Energy need for cooling | $E_{P,C,\text{nd}} < E_{P,C, \text{nd, lim (2019,2021)}}$ (2) | [kWh/m²] |
| $E_{P,\text{gl,tot}}$ | Overall Energy Performance | $E_{P,\text{gl,tot}} < E_{P,\text{gl,tot, lim (2019,2021)}}$ (2) | [kWh/m²] |

**Notes:**

1. Limit values are defined by the decree with reference to the generator type.
2. Limit values are defined through the reference building. For the nZEB shall be considered the values foreseen by the law since 2019 (for public buildings) and since 2021 (for other buildings).
3. $E_{P,L}$ (Lighting) and $E_{P,T}$ (transport: lifts, escalators and travelators) are not considered for residential buildings.

**Legend (all values in primary total energy, non-renewable and renewable):**

- H Heating
- W Cooling
- V Ventilation
- C Cooling
- L Lighting
- T Transport of persons and goods (lifts, escalators and travelators)
Italian requirements for renewable energy share

<table>
<thead>
<tr>
<th>Minimum coverage of the total energy delivered yearly for heating, cooling and sanitary water production</th>
<th>Minimum coverage of the total energy delivered yearly for sanitary water production</th>
<th>Electric power of RES plants to be installed on site [kW]²</th>
</tr>
</thead>
<tbody>
<tr>
<td>50%¹</td>
<td>50%¹</td>
<td>Building Footprint (m²)/50</td>
</tr>
</tbody>
</table>

Notes:
1) These requirements are not applied if the building is served by a district heating network
2) For public buildings the minimum requirements are increased by 10%

Energy efficiency measures and the packages of measures

Examples of energy efficiency measures (EEMs) and the relevant packages that can be applied

D3.3, D4.2 and D4.3.. page..

5.7 ANNEX TO THE CONTRACT: PORTUGAL

The IEE RePublic_ZEB project as a reference for the identification of the packages of measures needed for the transformation of the existing building into nZEB

RePublic_ZEB, a European Commission funded project, has developed and promoted Near Zero Energy Building (nZEB) solutions and measures for refurbishment of public buildings, in accordance with Article 9 of the EU's Energy Performance of Building Directive.

Among the different activities, the project defined:

1. A methodology for defining the characteristics of the buildings
2. The basic steps for nZEB energy rating and a cost-benefit analysis of the "packages of measures" for the refurbishment towards nZEB
3. A set of measures and packages of measures useful for refurbishment to nZEB.

All the results are available on the website www.republiczeb.org and can be consulted for defining all the aspects to be considered for the transformation of the building.

Methodology for the characterization of the buildings

Model for reporting the data needed for the energy characterization of the building

Page 19 of D2.2
Energy rating of nZEBs

The country has not an official detailed definition of nZEB. Consequently, the methodological steps given by prEN 15603:2015 and the definition and methods focused by the project in D4.2 (details are available in D3.2 and in the deliverables prepared by WP4) can be adopted for nZEB rating and verification. In the following, the most important topics are underlined.

Building energy needs calculation: the following topics should be considered for the calculation of the building energy needs: thermal characteristic of the building envelope; transmission and ventilation properties; partition of building into different zones; climatic data; heat gains from internal heat sources, solar properties; comfort requirements. The procedure is detailed in the EN ISO 13790.

Total primary energy use calculation: the technical systems (plants for heating, cooling, DHW production, ventilation, lighting) can consume different energy carriers and the total energy consumptions should be expressed in primary energy and calculated according with the cited prEN 15603 and defining the primary energy factors. As specified in the EN 15217, the Energy Performance (EP) is the building primary energy demand per unit of conditioned area.

EP can either include only non-renewable energy (EP\textsubscript{ren}), or include both non-renewable energy and renewable energy (EP\textsubscript{tot}). According with EN 15603:

\[ EP\textsubscript{tot} = EP\textsubscript{ren} + EP\textsubscript{ren} \]

\[ \text{RER (share of renewables)} = \frac{EP\textsubscript{ren}}{EP\textsubscript{tot}} \]

Compensation between different energy carriers (e.g.: natural gas and on-site PV production) and the effect of exported energy should not be considered in the calculations of the consumption of the single energy services (heating, cooling, etc.).

nZEB rating: the building could be rated and eventually verified from an economical point of view (D4.3) through the procedure prepared by the project (D4.2)

Energy efficiency measures and the packages of measures

| Examples of energy efficiency measures (EEMs) and the relevant packages that can be applied | D3.3, D4.2 and D4.3.. page.. |

5.8 ANNEX TO THE CONTRACT: ROMANIA

The IEE RePublic_ZEB project as a reference for the identification of the packages of measures needed for the transformation of the existing building into nZEB

RePublic_ZEB, a European Commission funded project, has developed and promoted Near Zero Energy Building (nZEB) solutions and measures for refurbishment of public buildings, in accordance with Article 9 of the EU's Energy Performance of Building Directive.

Among the different activities, the project defined:

1. A methodology for defining the characteristics of the buildings
2. The basic steps for nZEB energy rating and a cost-benefit analysis of the “packages of measures” for the refurbishment towards nZEB
3. A set of measures and packages of measures useful for refurbishment to nZEB.
All the results are available on the website www.republiczeb.org and can be consulted for defining all the aspects to be considered for the transformation of the building.

**Methodology for the characterization of the buildings**

<table>
<thead>
<tr>
<th>Model for reporting the data needed for the energy characterization of the building</th>
<th>Page 19 of D2.2</th>
</tr>
</thead>
</table>

**Energy rating of nZEBs**

The nZEB general definition is included in the Law 372/2005 on Energy Performance of Buildings, as amended in 2013 and was detailed in the “National Plan for Increasing the Number of Nearly Zero Energy Buildings” (NPINN ZEB) in July 2014. The definition comprises numerical targets for primary energy use (kWh/m²/y), for specific CO₂ emission (kgCO₂/m²/y) and takes into consideration the share of renewables in a qualitative way. The set levels were formalised in March 2016 by approval of the minister of regional development and public administration (Ministry order no. 386/28 March 2016).

Maximum allowable levels of primary energy from conventional sources (fossil fuels) and CO₂ emissions of buildings are fixed as targets by building types and winter climates zones, while the total calculated primary energy consumption of an nZEB must be covered by 10% from renewable energy (non-fossil) sources for all building categories and climatic zones. Renewable energy systems shall be used according to their technical, economic and environmental feasibility and installed on the building or on the corresponding land having the same ownership as the building. Currently the meaning of “on-site or nearby” is not clearly detailed, however it is generally accepted that it refers to the considered building and corresponding land which is linked with it in terms of property.

In existing buildings undergoing major renovations, the maximum admissible primary energy from conventional sources shall be respected to the extent that these investments are technical and economical feasible, based on the return of investment analysis during the normal service lifetime of the building. RePublic_ZEB analyses showed that the nZEB levels set for new buildings can be fully achieved for educational buildings and with up to 25% deviation for office buildings in economic feasibility conditions. while more ambitious shares of renewables could be required.

In order to effectively implement the nZEB concept and levels, more detailed requirements should be defined, e.g. energy need for space heating, limitation of overheating in summer, maximum U-values for building components and overall envelope, air tightness of building envelope, provision of mechanical ventilation with heat recovery (MVHR), maximum efficiencies for building systems etc.

**Energy efficiency measures and the packages of measures**

<table>
<thead>
<tr>
<th>Examples of energy efficiency measures (EEMs) and the relevant packages that can be applied</th>
<th>D3.3, D4.2 and D4.3.. page..</th>
</tr>
</thead>
</table>
5.9 ANNEX TO THE CONTRACT: SLOVENIA

The IEE RePublic_ZEB project as a reference for the identification of the packages of measures needed for the transformation of the existing building into nZEB

RePublic_ZEB, a European Commission funded project, has developed and promoted Near Zero Energy Building (nZEB) solutions and measures for refurbishment of public buildings, in accordance with Article 9 of the EU’s Energy Performance of Building Directive.

Among the different activities, the project defined:

1. A methodology for defining the characteristics of the buildings
2. The basic steps for nZEB energy rating and a cost-benefit analysis of the “packages of measures” for the refurbishment towards nZEB
3. A set of measures and packages of measures useful for refurbishment to nZEB.

All the results are available on the website www.republiczeb.org and can be consulted for defining all the aspects to be considered for the transformation of the building.

Methodology for the characterization of the buildings

| Model for reporting the data needed for the energy characterization of the building | Page 19 of D2.2 |

Energy rating of nZEBs

In Slovenia, the detailed definition of nZEB has gone in force with the National Plan for Increasing the Number of Nearly Zero Energy Buildings on 22.4.2015 (competent body: Ministry for the Infrastructure – MZI). The most important requirements foreseen by the nZEB Action Plan are the following:

- The definition concerns three building types: single-family house, multi-family house and an office building.
- All new and fully renovated public buildings shall be nZEB since 2019 and the other buildings since 2021. The total energy performance (including renewable and non-renewable sources) for the reference building is calculated (considered services: heating, cooling, domestic hot water, ventilation and lighting).
- A renewable energy ratio (according to the national law that has adopted the directive 28/09 on renewable energies – RED) of 50% is required.

Requirements for the new buildings are not the same as the requirements for the fully renovated buildings. As stated above, according to the law, all buildings (new and fully renovated) should comply with nZEB requirements by 2019 (public) and by 2021 (all buildings).

The further decree that is going to define nZEB is Regulation on energy efficiency in buildings (PURBS), which will be further updated in the early 2017. The Regulation will define nZEB requirements for all building types according to EPBD Recast 2010 (Annex I). The competent authority has been addressed and presented the work of RePublic_ZEB project and its solutions how to define cost optimal and nZEB levels for five public building types, results that derive from WP4.
Energy efficiency measures and the packages of measures

| Examples of energy efficiency measures (EEMs) and the relevant packages that can be applied | D3.3, D4.2 and D4.3.. page.. |

5.10 ANNEX TO THE CONTRACT: SPAIN

The IEE RePublic_ZEB project as a reference for the identification of the packages of measures needed for the transformation of the existing building into nZEB

RePublic_ZEB, a European Commission funded project, has developed and promoted Near Zero Energy Building (nZEB) solutions and measures for refurbishment of public buildings, in accordance with Article 9 of the EU’s Energy Performance of Building Directive.

Among the different activities, the project defined:

1. A methodology for defining the characteristics of the buildings
2. The basic steps for nZEB energy rating and a cost-benefit analysis of the “packages of measures” for the refurbishment towards nZEB
3. A set of measures and packages of measures useful for refurbishment to nZEB.

All the results are available on the website www.republiczeb.org and can be consulted for defining all the aspects to be considered for the transformation of the building.

Methodology for the characterization of the buildings

| Model for reporting the data needed for the energy characterization of the building | Page 19 of D2.2 |

Energy rating of nZEBs

The country has not an official detailed definition of nZEB. Consequently, the methodological steps given by prEN 15603:2015 and the definition and methods focused by the project in D4.2 (details are available in D3.2 and in the deliverables prepared by WP4) can be adopted for nZEB rating and verification. In the following, the most important topics are underlined.

Building energy needs calculation: the following topics should be considered for the calculation of the building energy needs: thermal characteristic of the building envelope; transmission and ventilation properties; partition of building into different zones; climatic data; heat gains from internal heat sources, solar properties; comfort requirements. The procedure is detailed in the EN ISO 13790.

Total primary energy use calculation: the technical systems (plants for heating, cooling, DHW production, ventilation, lighting) can consume different energy carriers and the total energy consumptions should be expressed in primary energy and calculated according with the cited prEN 15603 and defining the primary energy factors. As specified in the EN 15217, the Energy Performance (EP) is the building primary energy demand per unit of conditioned area.
EP can either include only non-renewable energy (EP\textsubscript{ren}), or include both non-renewable energy and renewable energy (EP\textsubscript{tot}). According with EN 15603:

\[ EP\textsubscript{tot} = EP\textsubscript{ren} + EP\textsubscript{ren} \]

\[ \text{RER (share of renewables)} = \frac{EP\textsubscript{ren}}{EP\textsubscript{tot}} \]

Compensation between different energy carriers (e.g.: natural gas and on-site PV production) and the effect of exported energy should not be considered in the calculations of the consumption of the single energy services (heating, cooling, etc.).

\textit{nZEB rating:} the building could be rated and eventually verified from an economical point of view (D4.3) through the procedure prepared by the project (D4.2)

**Energy efficiency measures and the packages of measures**

| Examples of energy efficiency measures (EEMs) and the relevant packages that can be applied | D3.3, D4.2 and D4.3. |