1. Introduction

After the first decree setting the basis for the national legislative EPBD framework enacted in 2005, a number of legal acts (legislative, ministerial and presidential decrees) have been issued to progressively define and specify all aspects of the national EPBD transposition.

In 2013, three new decrees were issued:

- Presidential Decrees 74/2013 and 75/2013 have completed the implementation of the EPBD in the sections related to inspections of the heating, ventilation and air-conditioning (HVAC) and domestic hot water (DHW) systems and qualification of energy assessors.
- Law 9/2014 partially modified the qualifications of the energy assessors included in Presidential Decree 75/2013.

Energy-related topics are a shared task between the state and the 21 regions and autonomous provinces. Consequently, regional authorities may implement autonomous transpositions of the EPBD, as long as they do not contradict the general principles and requirements provided by national and EU regulations. The national regulation stays in force for the regions that have not issued their own legislation.

At the end of 2014, 6 regions (Liguria, Emilia Romagna, Toscana, Val d’Aosta, Piemonte and Lombardia) and the 2 autonomous provinces (Trento and Bolzano) have fully transposed the EPBD. All other regions follow the national legislation, which, by itself, is a full transposition of the EPBD.

2. Current status of Implementation of the EPBD

I. ENERGY PERFORMANCE REQUIREMENTS

While transposing the EPBD (Directive 2010/31/EU), Law 63/2013 announced future acts, expected in the first part of 2015, that will provide:

- an updated energy performance calculation methodology according to Directive 2010/31/EU, Annex I;
- minimum energy performance requirements for new buildings and existing buildings subject to major renovations, on the basis of a cost-benefit analysis while taking into account the entire estimated lifespan of the building.

In case of new buildings and major renovations, calculations shall be based on a comparative methodology framework with reference buildings representative of their construction typology and outdoor climate conditions.

New minimum performance requirements will also include thermal performance and transmittance indexes, as well as overall energy performance indexes, expressed both in terms of total primary energy and non-renewable primary energy use.

Until new minimum requirements and calculation methodologies are introduced, existing requirements set by Legislative Decree 192/2005 will stay into force. Current calculation methodologies are based on national standards derived from CEN. The new methodologies shall be based on an updated set of technical standards (see Box 1).

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I.i. Progress and current status

Legislative Decree 192/2005 draws the general framework for the transposition of the EPBD, setting the minimum requirements for energy performance and the U-values for windows, walls, floors and roofs, in case of new buildings and major renovations. In 2009, Presidential Decree 59 extended the calculation methodologies and minimum requirements to the summer energy performance of cooling and lighting systems; it also updated the minimum requirements for the energy performance of buildings and of heating systems. A new ministerial decree setting the new requirements for new buildings (including NZEBs) and major renovations is near completion at the end of 2014 and will substitute DPR 59/2009.

With the Legislative Decree 28/2011 transposing the Renewable Energy Services (RES) Directive, the requirements regarding the share of renewable energy for new buildings and major renovations were increased, establishing a calendar with a progressively larger share of renewable quota for DHW and heating and cooling energy demand for all building permits:

- 20% renewable quota for permits requested between 31 May 2012 and 31 December 2013;
- 35% renewable quota for permits requested between 1 January 2014 and 31 December 2016;
- 50% renewable quota for permits requested from 1 January 2017 onwards.

A draft regulation is under development in order to introduce newly defined cost-optimal building performance requirements and the Nearly Zero-Energy Building (NZEB) concept, as well as the new standard values for cooling, ventilation and lighting, the last one only for non-residential buildings. The new rules are expected to come into force by the end of June 2015.

I.ii. Format of national transposition and implementation of existing regulations

Requirements for new buildings

Since January 2010, all new residential and non-residential buildings must comply with the minimum requirements for winter performance, set by Legislative Decree 192/2005. Energy performance values vary according to building type (energy performance for residential buildings is expressed in terms of kWh/m².year of primary energy, while energy performance for non-residential buildings is expressed in terms of kWh/m².year of primary energy), climatic zone, local degree days, and surface-area-to-volume ratio of the building, as depicted in Tables 1 and 2. Figure 1 shows a map of the distribution of climatic zones over the territory. The energy performance requirements for summer cooling as set by Presidential Decree 59/2009 are shown in Tables 3 and 4. Furthermore, in case of new buildings and major renovations, the designer is expected to:

- adopt compulsorily window shading and calculate their contribution to the winter and summer performance;
- either check that (i) the mass of the external walls is larger than 230 kg/m² (except northeast to northwest), or that (ii) their value for periodic thermal transmittance (a dynamic parameter introduced with the Standard UNI EN ISO 13786:2008) is lower than 0.12 W/m².K;
- check that the periodic thermal transmittance of roofs, floors and northeast to northwest external walls only is lower than 0.20 W/m².K.

Requirements for existing buildings

Minimum requirements are differentiated according to the degree of the planned renovation. The minimum energy performance requirements for new buildings apply fully in case of:
demolition/reconstruction or renovation of all building elements (for buildings with heated floor area >1,000 m²);
building enlargements over 20% of the original volume, only for the newly built section.

In case of any degree of refurbishment, a set of basic requirements applies to single building elements. Table 5 shows the minimum U-values for different building elements such as walls, roofs, floors, windows and window glass.

**Minimum requirements in specific regions**

When designing their local EPBD implementation, regional governments and autonomous provinces are allowed to set stricter minimum requirements. Table 6 shows the state of EPBD implementation among regions and autonomous provinces.

### Table 1: Minimum energy performance requirements (primary energy) for heating in residential buildings (kWh/m²).

<table>
<thead>
<tr>
<th>Climatic zones (by degree days - °C)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 600 dd</td>
<td>&gt; 601 dd</td>
<td>≤ 900 dd</td>
<td>&gt; 901 dd</td>
<td>≤ 1,400 dd</td>
<td>&gt; 1,401 dd</td>
<td>≤ 2,100 dd</td>
</tr>
<tr>
<td>&lt; 0.2</td>
<td>8.5</td>
<td>8.5</td>
<td>2.8</td>
<td>12.8</td>
<td>21.3</td>
<td>21.3</td>
</tr>
<tr>
<td>≥ 0.9</td>
<td>36</td>
<td>36</td>
<td>48</td>
<td>48</td>
<td>68</td>
<td>68</td>
</tr>
</tbody>
</table>

### Table 2: Minimum energy performance requirements for heating (primary energy) in non-residential buildings (kWh/m²).

### Table 3: Minimum energy performance requirements for cooling (primary energy) in residential buildings (kWh/m²).

<table>
<thead>
<tr>
<th>Climatic zones (by degree days - °C)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 600 from 601 to 900</td>
<td>from 901 to 1,401</td>
<td>from 1,401 to 2,100</td>
<td>from 2,101 to 3,000</td>
<td>over 3,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>40</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

### Table 4: Minimum energy performance requirements for cooling (primary energy) in non-residential buildings (kWh/m²).

<table>
<thead>
<tr>
<th>Climatic zones (by degree days - °C)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 600 from 900 dd to 1,400</td>
<td>from 1,401 to 2,100</td>
<td>from 2,101 to 3,000</td>
<td>over 3,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

### Requirements for public buildings

Buildings used and owned by public authorities are expected to set an example and play a leading role. Therefore, energy performance and U-values are set 10% lower than those required for private buildings (Decree 59/2009).

### Calculation methodologies of the energy performance of buildings

The national standards UNI TS 11300 2014 (energy performance calculation methodologies), UNI EN 15193 2008 (calculations on artificial lighting) and CTI Recommendation 14 2013 (primary energy factors) are all applications of European standards. Calculation procedures include thermal comfort requirements, indoor air quality requirements, infiltrations, thermal bridges and shading devices.

Regional calculation methodologies refer almost entirely to the national standards, while only the Lombardia region and the autonomous province of Bolzano adopted standards derived directly from EN ISO 13790 2008 (Prestazione termica degli edifici - Calcolo del fabbisogno di energia per il riscaldamento).

CTI Recommendation n.14 released in February 2013 set conversion factors for the building energy performance calculation (for renewable and non-renewable primary energy) as listed in Table 7.
Compliance and Quality Assurance (QA)

Compliance checks of minimum requirements are performed systematically by municipal authorities. Local authorities may carry out on-site visits during or after the construction phase. A final report signed by an engineer confirming compliance with the town planning rules, the construction regulations and the energy performance requirements is compulsory.

Monitoring activities

The Ministries of Economic Development and of the Environment, as well as the regional governments, monitor the state of implementation of the EPBD and periodically provide a report to the Parliament.

I.iii. Cost-optimal procedure for setting energy performance requirements

On 2 August 2013, Italy issued its national study on cost-optimal procedures for setting energy performance requirements according to the guidelines provided by the European Commission. The report also outlined some reservations about the guidelines and hence on the results of the study.

The planned interventions were defined with a mix of 17 intervention combinations, taking into account outdoor climatic conditions, building typology (24 reference buildings overall, divided into single homes, small and large apartment buildings and office buildings) and the intended use of the building. A comparison of the requirements of the law with those arising from the application of the methodology is shown in Table 8.

Notwithstanding the reservations and the need for an in-depth review still ongoing at the end of 2014, the results confirm the prediction of the need for the adjustment of minimum performance levels. Those requirements, as defined by national standards in 2006, albeit with a progression towards greater efficiency in 2008 and 2010, could not take into account technological developments and new components and systems now currently available on the market.

For some results which have contradicting elements (e.g., a single-family building in zone B), a specific review will be enacted.

Law 63/2013 announced future acts to release updated minimum requirements for U-values of building components (current values are reported in Table 5).
I.iv. Action plan for progression to Nearly Zero-Energy Buildings

National application of the NZEB definition

The decree of transposition of the EPBD accepted the definition of NZEB as a building with very high energy performance. The performance requirements are to be developed in the subsequent implementation decrees in this regard. A national action plan to provide a proper definition for NZEBs and to promote their construction is foreseen to be completed by the first half of 2015. The document foresees that, starting 1 January 2019, all new buildings that are property of or utilised by public administrations will have to be classified as NZEBs. All the other new buildings shall be NZEBs from January 2021.

Figures and statistics on existing NZEBs

No statistical data or estimates are presently available on the number of NZEBs that already exist in Italy. This is in part due to the lack of an official definition. However, many ongoing pilot projects are in place and numerous solutions are available on the market. Figure 2 shows an example of such types of buildings.


Buildings renovation (Art. 4)

Legislative Decree 102/2014 transposing the Energy Efficiency Directive indicates that the National Agency for Energy and Environment (ENEA) will be responsible for the elaboration of the long-term strategy for the renovation of the building stock provided for in Article 4 of the EED. An assessment of the consistency of the building stock has been carried out in order to estimate the actions necessary for the upgrading of the energy efficiency. Based on the results obtained from the application of the comparative methodology, the potential national energy savings resulting from energy efficiency measures attributable to residential and non-residential sectors have been evaluated, taking into account both the regulatory tools and incentives currently in place as well as those planned, in view of achieving the national energy savings targets (see Table 9).

Exemplary role of public buildings (Art. 5)

The decree transposing the EED provides that from 2014 to 2020, interventions will be made on the building stock of the central public administration, including peripheral real estate, capable of achieving energy requalification of at least 3% per year of the heated useful floor area or, alternatively, resulting in a cumulative final energy savings between 2014 and 2020 of at least 0.04 Mtoe[1] (465,200 MWh). As to the cumulative yearly savings in public administration buildings overall, the 2014 National Plan for Energy Efficiency foresees a savings of 0.57 Mtoe (6,629,100 MWh) of final energy consumption, equivalent to 0.8 Mtoe (9,304,000 MWh) of primary energy.

<table>
<thead>
<tr>
<th>Type of building</th>
<th>Hypothesis of intervention on the building stock</th>
<th>Type of renovation and estimated yearly energy savings</th>
<th>Energy saved until 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type of renovation</td>
<td>Refurbished surface/year</td>
<td>Roofs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>m²</td>
<td>GWh/year</td>
</tr>
<tr>
<td>Single-family unit</td>
<td>Partial interventions</td>
<td>39,407,808</td>
<td>221</td>
</tr>
<tr>
<td></td>
<td>Global interventions</td>
<td>26,551,030</td>
<td>2,230</td>
</tr>
<tr>
<td>Multi-unit</td>
<td>Partial interventions</td>
<td>79,141,300</td>
<td>253</td>
</tr>
<tr>
<td></td>
<td>Global interventions</td>
<td>25,142,222</td>
<td>2,414</td>
</tr>
</tbody>
</table>

Table 9: Consumption reduction potential in 2020 through residential buildings renovations enacted, starting in 2014.

Note: The terms 'partial interventions' and 'global interventions' are similar to those used in the tax deductions for the energy upgrading of existing buildings. ‘Partial interventions’ refers to actions on individual elements of the building structure or heating system, while ‘global interventions’ refers to restorations of multiple elements of the building and heating system.

[1] Mtoe – one million of tons of oil equivalent
Of the 0.57 Mtoe of final energy consumption savings, 0.1 Mtoe is based on EPBD standards, and 0.47 Mtoe on incentives schemes.

The Ministry of Economic Development, in collaboration with the relevant public administrations, shall prepare a program of interventions to be carried out annually. The criteria for the identification of the latter will be based on:

1. optimisation of investment recovery time;
2. buildings with the worst energy performance index;
3. shorter time for the initiation and completion of the intervention;
4. extent of any forms of co-financing, including third-party financing.

In order to monitor the performance, the companies supplying energy to consumers registered to a central public administration must communicate to the ENEA by 31 January of each year the annual consumption data per energy carrier for the previous year.

**I.vi. Other relevant plans**

The National Action Plan for Energy Efficiency (Piano d’Azione per l’Efficienza Energetica - PAEE) describes the energy efficiency targets set by Italy for 2020, the policy measures to enable their attainment and the savings already achieved by 2012. The latest version of the plan was adopted in July 2014.

In particular, the plan, in accordance with the guidelines of the European Commission and in agreement with the views expressed in the National Energy Strategy (Strategia Energetica Nazionale, SEN), contains national targets for the reduction of primary and final energy consumption, and specifies the savings in final energy use expected by 2020 for each economic sector and for the main instruments for promoting energy efficiency (Tables 10a and 10b).

**II. REQUIREMENTS FOR TECHNICAL BUILDING SYSTEMS (TBS)**

**II.i. Coverage of heating, domestic hot water, air-conditioning and large ventilation systems**

The Italian legislation envisages since 1993 minimum requirements for air and water heating systems, for the centralised production of DHW and for large controlled mechanical ventilation systems. More recently, minimum requirements specifically for heat pumps were also introduced.

It is important to remember that the requirements described in this section are related to the national legislation; regional regulations may provide slightly different requirements, which must always be more restrictive or compensate on other aspects of the building technical systems regarding a greater tolerance for a single requirement. In any case, the index of the global energy performance of the building, new or renovated, must either remain unchanged or be lower than the one set by national legislation.

**II.ii. Regulation of system performance, distinct from product or whole building performance**

**Heating and central production of DHW:**
seasonal efficiency should be higher than $(75 + 3 \log P_n) \%$, where $P_n$ is the nominal power output of the boiler. In addition, the heat generators of DHW must have a useful thermal efficiency (the ratio between the thermal power of the fuel and the power transmitted to the boiler) no less than the values prescribed by the law, and the hot air ones must

---

**Table 10a: Energy savings attained in 2005 – 2012 and expected in 2016, according to PAEE 2011 (final energy, Mtoe/year).**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Measure</th>
<th>Minimum requirements (according to Legislative Decree 192/05)</th>
<th>White Certificates</th>
<th>55% tax rebates</th>
<th>Mobility incentives and Regulation 443/2009/EU</th>
<th>Attained savings 2005 – 2012</th>
<th>Expected savings by 2016</th>
<th>Attained objective (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>2.10</td>
<td>1.31</td>
<td>0.71</td>
<td>-</td>
<td>3.79</td>
<td>5.16</td>
<td>73.5%</td>
<td></td>
</tr>
<tr>
<td>Tertiary</td>
<td>0.06</td>
<td>0.11</td>
<td>0.02</td>
<td>-</td>
<td>0.19</td>
<td>2.11</td>
<td>9.0%</td>
<td></td>
</tr>
<tr>
<td>Industry</td>
<td>0.15</td>
<td>1.57</td>
<td>0.04</td>
<td>-</td>
<td>1.76</td>
<td>1.73</td>
<td>101.8%</td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.62</td>
<td>0.62</td>
<td>1.87</td>
<td>32.6%</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>2.32</td>
<td>2.99</td>
<td>0.77</td>
<td>0.62</td>
<td>6.38</td>
<td>10.88</td>
<td>56.6%</td>
<td></td>
</tr>
</tbody>
</table>

**Table 10b: Yearly energy savings attained in 2011 – 2012 and expected in 2020 according to SEN (final energy, Mtoe/year).**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Measure</th>
<th>Minimum requirements (according to Legislative Decree 192/05)</th>
<th>White Certificates</th>
<th>55% tax rebates</th>
<th>Mobility incentives and Regulation 443/2009/EU</th>
<th>Attained savings 2011 – 2012</th>
<th>Expected savings by 2020</th>
<th>Attained objective (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>0.62</td>
<td>0.14</td>
<td>0.21</td>
<td>-</td>
<td>0.96</td>
<td>3.67</td>
<td>26.2%</td>
<td></td>
</tr>
<tr>
<td>Tertiary</td>
<td>0.02</td>
<td>0.03</td>
<td>0.01</td>
<td>-</td>
<td>0.05</td>
<td>1.23</td>
<td>4.1%</td>
<td></td>
</tr>
<tr>
<td>Industry</td>
<td>0.05</td>
<td>1.04</td>
<td>0.01</td>
<td>-</td>
<td>1.09</td>
<td>5.10</td>
<td>21.4%</td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.22</td>
<td>0.22</td>
<td>5.50</td>
<td>4.0%</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.68</td>
<td>1.20</td>
<td>0.23</td>
<td>0.22</td>
<td>2.33</td>
<td>15.50</td>
<td>15.0%</td>
<td></td>
</tr>
</tbody>
</table>
comply with minimum combustion efficiency values prescribed by the law as shown in Table 11.

**Heat pumps:** seasonal efficiency (combined heating and cooling) should be higher than \((75 + 3 \log P_n)\) (%), where \(P_n\) is the nominal power output of the heat pump.

**Large ventilation systems:** the use of heat recovery systems is required whenever the total flow of replacement air \((G)\) and the number of annual hours of operation \((M)\) of the ventilation systems are superior to the limit values prescribed by the law.

For public buildings:

> seasonal efficiency for heating systems should be higher than \((75 + 4 \log P_n)\) (%);
> only centralised heating systems are allowed.

These requirements apply to new installations, as well as in case of heating or cooling system renovations or boiler replacement.

In case of boiler replacement alone, as an alternative to compliance with the requirement of seasonal efficiency, it can comply with all the following conditions simultaneously:

> installation of a boiler with a combustion efficiency \(\geq (90 + 2 \log P_n)\) (%) or a heat pump that has a yield \(\geq (90 + 3 \log P_n)\) (%) (where the heat pump efficiency is the ratio between the energy delivered and the electric energy converted to primary energy, according to the national conversion rate; the efficiency will be higher than 1 whenever the Coefficient of Performance (COP) of the heat pump exceeds the conversion rate);
> installation of thermostatic valves or modulating devices in any room or area which can be favoured by solar free gains;
> installation of a programmable thermostat which allows the adjustment of the indoor temperature on two settings over 24 hours.

Any safety reasons (such as collective flue gas chimneys) preventing the installation of generators with the above foreseen yields, as well as any increases in power generators, will have to be justified by a technical report. For centralised systems, a check of the balancing of the system is required.

The following additional requirements also apply to all new technical systems and renovations:

**Installation:**

> If the total power exceeds 350 kW, at least two generators should be installed.
> In case of centralised systems serving several building units, the production of heat and DHW should be carried out with different generators.
> Pipework and vessels must be insulated, according to the foreseen minimum insulation requirements.

**Dimensioning:** the centralised systems producing DHW must be dimensioned according to UNI 9182.

In all existing buildings with more than 4 residential units or otherwise equipped with a centralised system of more than 100 kW, any intervention aimed at the transformation of the centralised heat generation in individual systems for single-dwelling units must be justified by a technical report.

**Regulation and control:** heating systems in the service of new buildings must be equipped with temperature control systems and metering of energy consumption for each apartment.

The recent transposition of the EED also foresees that, by the end of 2016, in multiple-apartment buildings and multi-purpose buildings supplied by centralised heating and district heating/cooling, it will be required to install individual meters for each housing unit. The installation must be carried out by the companies providing the service and is subject to a preliminary technical assessment.

---

### Table 11: Minimum efficiency values.

<table>
<thead>
<tr>
<th>Power range</th>
<th>Seasonal efficiency</th>
<th>Efficiency ratio at Nominal load</th>
<th>Efficiency ratio at Partial load</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boiler type</strong></td>
<td><strong>(kW)</strong></td>
<td><strong>Rate (%)</strong></td>
<td><strong>Avg. Water Temp (°C)</strong></td>
</tr>
<tr>
<td>Standard boiler</td>
<td>4 – 400</td>
<td>(\geq 75 + 3 \log P_n)</td>
<td>70(^a)</td>
</tr>
<tr>
<td>Low temp boiler</td>
<td></td>
<td></td>
<td>70(^a)</td>
</tr>
<tr>
<td>Condensing boiler</td>
<td></td>
<td></td>
<td>70(^a)</td>
</tr>
<tr>
<td>Heat pumps</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(P_n\) = ‘nominal power’ or ‘rated power’
II.iii. Encouragement of intelligent metering
The replacement of existing electricity meters with smart meters has been under implementation in Italy since 2006. The roll-out of smart meters has been almost completed: at the end of 2011, more than 95% (over 30 million) of the customers had smart meters installed on their premises.

In the natural gas sector, the regulatory authority AEEG in 2008 promoted the roll-out of gas smart meters, which by 2016 will be provided to 17.5 million users (Ruling ARG/gas 155/08). At present, the target of 60% replacement of smaller-sized meters (G6 category and smallest) is foreseen to be reached by the end of 2018.

Subject to the measures already adopted, the AEEG should prepare within 24 months the technical specifications for smart metering systems with which the distribution companies will be required to comply. The smart metering devices should provide to end users information on the real-time use of energy and of energy efficiency targets. It is also foreseen that, once the criteria for technical and economic feasibility have been established, the replacement of existing meters will be extended to the fields of district heating, district cooling and DHW supply. At present, smart metering has no link to the EPBD, as it does not affect the energy indicator or inspections.

II.iv. Encouragement of active energy-saving control (automation, control and monitoring)
The transposition decree for Directive 2010/31/EU provides that the design, installation and maintenance specifications of active control systems, such as automation, control and monitoring, aimed at energy savings, will be identified by the new decrees expected within the first half of 2015.

Some regions, as part of their legislative autonomy in the transposition of the EPBD, have already issued regulations to this regard. The region of Emilia-Romagna, for example, has enacted minimum levels of active energy savings (the so-called Building Automation Control System - BACS) for new buildings since 2008. All the buildings are actually divided into four classes on the basis of performance of control and automation systems (home automation for energy efficiency).

III. ENERGY PERFORMANCE CERTIFICATES (EPCs) REQUIREMENTS

III.i. Progress and current status on sale or rental of buildings
Overview and administration system
The Italian Energy Performance Certificate (EPC) administration system is presently based on regional systems with distinct registries and databases. Ten regional EPC databases were operating by the end of 2013, while three more will be implemented in the near future, as shown in Figure 3. The other regions will adopt a foreseen national database as soon as it is released before the end of 2015.

How flats are certified in apartment buildings
The EPC may refer to one or more housing units that are part of the same building. The certification of the energy performance related to multiple units can be issued only if they have the same intended use typology and the same characteristics influencing performance (orientation, geometry, etc.) and are served by the same thermal systems for winter and summer climatisation.

Format and content of the EPC
The format and content of the national EPC will be updated through the new National Guidelines for Energy Certification of Buildings, expected within the first half of 2015. Pending the update of the format, the current multipage format of the national EPC is shown in Figure 4.
The building energy performance is expressed in terms of primary energy in kWh/m².year for residential buildings and in kWh/m³.year for non-residential buildings. EPC classes range from A⁺ to G. The building performance is expressed for the whole energy used in the building and for the single-end uses: heating, DHW, and cooling. The global energy performance (EPgl) is the sum of partial energy performance indicators.

Figure 5 shows the standard graphic layout of a dashboard. The energy performance for heating is calculated in terms of primary energy. In case of summer cooling, the energy performance refers to the load only because the system performance is not considered. The summer energy performance is calculated as prescribed by Standard UNI/TS 11300 and expressed in terms of primary energy in kWh/m².year for dwellings and in kWh/m³.year for all other uses. In the foreseeable update, lighting will be included for non-residential buildings only.

The regions of Emilia-Romagna, Liguria, Lombardia, Piemonte, Toscana, Valle d’Aosta and the autonomous provinces of Trento and Bolzano have developed different regional EPC formats, as shown in Figure 6. The cost of an EPC is not subject to predefined tariffs. The average EPC cost for a flat ranges from less than 100 up to 300 € according to the location and the taxes/costs imposed by the respective regional scheme.
If a technician is not qualified to properly evaluate the building design and all its technical systems, he should work in collaboration with other qualified technicians so that the constituted group covers all required areas of professional expertise.

Those who, on the basis of educational qualifications, do require a training course must undergo a final examination which, if successful, will give them the right to issue EPCs (a flowchart is shown in Figure 7).

When issuing an EPC, the qualified experts must declare that they have no direct or indirect involvement in the design or construction process of the building to be assessed, nor with material and component suppliers, nor with any sort of benefit possibly obtained by the owner. In case of new buildings, the person in charge of the energy certification process must be nominated before the building works begin.

In some of the regions which have autonomously implemented the EPBD, different requirements are still presently in force, in particular regarding the obligation for all assessors to attend a training course and register in the regional registers. Tables 12 and 13 illustrate the various situations of regional registers.

**Compliance levels by sector**

Statistical data about the overall compliance levels recorded during the control phase of the EPC is currently not available.

**Enforcement with building owners and real estate actors**

In case of sale, lease or even property transfer without charge, the owner is required to provide the building/flat with an EPC. Failure to provide the document carries a penalty of between 3,000 and 18,000 € in case of a sale, and between 300 and 1,800 € in case of lease, enforced by the Guardia di Finanza (Financial Police).

In case of lease, the requirement to attach the EPC to the contract only applies to contracts for entire buildings. The payment of the administrative penalty, however, does not exempt persons from the obligation to subsequently submit a copy of the EPC.

The possession of the EPC is also a necessary condition in order to obtain access to the tax deductions schemes in force for energy improvements on existing buildings.

No statistical data is available on the number and amounts of penalties issued.
Quality Assurance (QA) of EPCs

The decree for the transposition of the Directive 2010/31/EU entrusts the control on the quality of issued EPCs to regions and autonomous provinces. At the moment, only a few institutions have started the task of controls, often still on an experimental basis. The methods of control are determined by the institution and may include formal checks and/or audits with substantial testing in situ.

The data available on the EPCs issued and the number of controls carried out in 2013 are reported in Table 14, totalling 28,025 controls.

Reliable data on controls results is available only for some regions. As an example, Tables 15 and 16 list the results of controls performed in the Piemonte and Liguria regions in 2013 respectively.

In case of a negative outcome of the control, the penalties range from 500 to 2,000 € to be paid by the assessor who issued the EPC.

III.ii. Progress and current status on public and large buildings visited by the public

Overview

In Italy, public buildings (i.e., used by public administrations and open to the public) with a total useful floor area greater than 500 m$^2$ (250 m$^2$ since 7 September 2015) had to issue an EPC by 2 December 2013 and display it in a prominent place clearly visible to the public. There are no sanctions for non-compliant administrations. The format and content of the EPCs related to public buildings are the same as for private buildings.

All contracts, new or renewed, related to the management of heating systems or air-conditioning (AC) systems in public buildings, or in which the client is listed as a public entity, require the issuing of an EPC of the building or building unit concerned.

Where the EPC is available, it is required to post the certificate in a prominent place clearly visible to the public. In some regions (Abruzzo, Lombardia, Puglia, Valle d’Aosta) and in the autonomous province of Trento, it is mandatory that public buildings display a plaque with the energy efficiency rating outdoors.

In the framework of the collaboration between the Ministry of Economic Development and the State property Office, starting in the early months of 2013, Italy initiated the preparation of an inventory of property ownership and use of the central state public administration buildings. The inventory, still in the validation phase, produced to-date figures shown in Table 17. No data about the number of EPCs in public buildings actually produced and/or exposed is presently available.
The maximum validity of the EPCs related to public buildings is 10 years (the same as for other buildings). The EPCs must be updated after any renovation or alteration modifying the energy class of the building or building unit is carried out.

No data about the cost of EPCs in public buildings is presently available. Public buildings or buildings open to the public can be certified by experts with the same characteristics as for other buildings. If the technician is an employee of a public body or a body governed by public law operating in the energy and construction sectors, and he is acting on their behalf, the QE is automatically deemed to have no conflict of interest.

The EPC related to public buildings is subject to the same control system as provided for all other EPCs by the regions and autonomous provinces. Presently, there is no specific data regarding the non-compliance of EPCs of public buildings.

### III.iii. Implementation of mandatory advertising requirement

The legislation in force provides that, in case of an offer for sale or lease, the corresponding announcements by all means of communication report the energy performance indexes of the overall building, or of the single unit and the corresponding energy class since 29 March 2011. The law specifies that sanctions could be issued after 6 June 2013. The management of sanctions is entrusted to the regions and there is no information available regarding any sanctions ever having been issued.

A fine between 500 and 3,000 € issuable to the party responsible for the announcement applies in the event of non-compliance. The same law (Presidential Decree 75/2013) provided that the update of national guidelines for the energy certification scheme shall include a model of notice of sale or lease for display in the real estate agencies, in order to make information on the buildings’ energy quality supplied to citizens uniform.

<table>
<thead>
<tr>
<th>Building area class</th>
<th>Number of buildings</th>
<th>Gross area (m²)</th>
<th>Thermal consumption (GWh)</th>
<th>Electric consumption (GWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A &gt; 500 m²</td>
<td>2,904</td>
<td>13,763,975</td>
<td>1,398.2</td>
<td>695.6</td>
</tr>
<tr>
<td>250 m² &lt; A &lt; 500 m²</td>
<td>1,176</td>
<td>437,227</td>
<td>44.4</td>
<td>22.1</td>
</tr>
</tbody>
</table>

Above figures do not include: army buildings, church buildings, buildings protected by historical or architectural restrictions.

Presently, no data is available for local administrations building property.

Source: ENEA extrapolations of State property Office data

### III.iv. Information campaigns

The legislative decree transposing the EPBD entrusts to the Ministry of Economic Development the task of creating communication campaigns targeting the general public and construction and real estate markets on the topics of energy savings. The decree also gives to the regions and autonomous provinces the power to carry out information campaigns for raising awareness of the citizens concerning the issues of upgrading the energy efficiency of existing buildings. Communication campaigns can be in collaboration with the electricity and gas distribution companies involved in pursuing their own obligations (arising from the mechanism of white certificates).

Presently, the ministry, in collaboration with the ENEA, is preparing two information campaigns on energy certification: one for citizens tentatively titled 'Program of National Circulation EPC' and one addressed to the estate agencies tentatively titled 'Campaign Diffusion at EPC Network Estate Agents'.

Among the most recent regional information campaigns on issues of energy and energy certification, Figure 8 reproduces a poster of the region of Umbria (www.umbriapiu.it).

Tax deductions schemes dedicated to the energy renovation of existing buildings have recently been the subject of a communication campaign of the Italian government that included television commercials, radio and website info campaigns (www.casa.governo.it). The TV spot is visible at the following link: www.casa.governo.it/tematiche/Spot.html

The main campaign on energy efficiency currently in progress was made by the state broadcaster company, RAI, which produced the TV spot 'Energy Efficiency: An Italian success (thanks to Europe)'. The spot underlines in particular the role Europe played in supporting the country in achieving relevant results over the past decade. The campaign started in April 2014 and the spot is visible online.[2]

A national communication plan is under preparation, in order to foster the best use of the funds foreseen by Decree 102/14 for energy efficiency information campaigns.

[2] www.rai.tv/dl/RaiTV/programmi/media/ContentItem-024e265fa24a49b4-b0d2-b5aa5a02e05.html#p
III.v. Coverage of the national building stock

A preliminary estimate of the coverage can be outlined on the basis of the official data of the last census ISTAT 2011; civil housing units in Italy total more than 29 million, while the certificates issued until 31 October 2014, taking into account only the regions that provided data, totalled 3,637,166, of which more than 90% were in northern Italy and 40% were in the Lombardia region alone. The number of issued EPCs is not presently available for all regions (see Table 6).

Assuming that the EPCs were produced in the great majority of cases for individual homes, and considering the low incidence of issuance in absolute numbers for non-residential buildings (less than 150,000 units), it is thus possible to roughly estimate that, by the end of 2013, only approximately 13% of existing buildings had been energy certified. The EPCs issued in 2013 totalled 419,650. The situation is summarised in Figure 9.

IV. INSPECTION REQUIREMENTS – HEATING AND AIR-CONDITIONING (AC) SYSTEMS

IV.i. Progress and current status on heating systems

Overview, technical method and administration system

Boiler inspections were launched in Italy back in 1993, as required by Law 10/1991. Recently, Decree 74/2013 set the basis for a new framework introducing new operating methods and frequencies of mandatory maintenance activities, standardised control procedures related to thermal systems and AC systems, a new common log book template for thermal and AC systems, and indicating regions and autonomous provinces as the competent authorities for controls (which was previously assigned to provinces and cities).

The law requires all heating systems with thermal output equal or greater than 10 kW[^3] to undertake maintenance and inspection. Inspections include an energy efficiency assessment of the boiler, a power-sizing check and advice on possible measures to improve system efficiency.

Maintenance staff produce an inspection report and deliver it to the owner and also to the competent authority which is in charge of setting a regional inventory and of running periodic controls. Controls consist of documental checks on the reports and of on-site verifications. After on-site verification, a report is to be released and one copy attached to the log book. The following control intervals are foreseen:

- systems with liquid- or solid-fuelled generators with thermal output over 100 kW: every two years;
- systems with liquid- or solid-fuelled generators with thermal output between 20 and 100 kW: every four years;
- systems with gas generators with thermal output over 100 kW: every four years;
- systems with gas generators with thermal output less than 100 kW: controlled through a check of inspection reports.

Competent authorities are in charge of running compliance controls. Control procedures can be assigned to external controllers or qualified bodies meeting the independence, competence and training requirements set by Decree 74/2013. Regions and autonomous provinces have the task of setting a proper accreditation scheme and ensuring qualification and retraining. To do this, they can be assisted by the collaboration of the ENEA. On the other hand, maintenance operators are also trained through professional associations.

[^3]: For boilers fed by solid or liquid fuels between 10 kW and 20 kW, the law does not specify a % of compulsory control frequency, leaving this decision to the regional authorities in charge.
Local administrations have generally experienced difficulties in providing regular on-site controls. However, there are positive examples, where up to 5% of the total systems were checked every few years as required by the former legislation. Studies performed by some local administrations (e.g., the city of Florence) estimate that the potential energy savings are as high as 6% of the overall heating consumption.

There is however no data available concerning the cost-benefit from inspections at a national level. According to the consumer association ‘Altroconsumo’, the maintenance and inspection cost for small autonomous heating plants (below 35 kW) is on average above 100 €. Frequency and costs of maintenance depend on the power and fuel of the heating system.

**Promotional activities**

Competent authorities have the duty to promote information and public awareness campaigns. Figures 10 and 11 show two ongoing campaigns carried out by the municipality of Roma and the province of Milano, respectively.

**Enforcement and penalties**

The person in charge of the installation (owner or tenant of the property, or the administrator of the building) failing to follow the maintenance schedule laid down in the decree for the maintenance and control of the thermal efficiency of the heating system can be levied a penalty of between 500 and 3,000 €. Similarly, any company not performing the assigned maintenance and inspection services will be levied a fine of between 1,000 and 6,000 €. The regional government is due to report the violation to the chamber of commerce for appropriate disciplinary measures.

Presently, there is no statistical or aggregate data available on a national scale about the penalties imposed. However, Decree 75/2013 foresees that by 31 December 2014, competent authorities will transmit to the Ministry of Economic Development and to the Ministry of the Environment a report with particular reference to the results of inspections carried out in the last two years. The report will be updated every two years.

**Quality control of inspection reports**

It is up to the competent authorities to start annual compliance check programs of the inspection reports. In case the inspection report bears indication of safety issues, the regional authority shall immediately inform the competent municipality and relevant health and safety body.

There is no aggregated quantitative data available on a national scale.

**Inspection activity figures**

There is no aggregated quantitative data available on a national scale for inspection activity. Only the province of Milano has published updated information on the last inspection campaigns. The report published by the province of Milano relates to the former procedural framework. Table 18 provides inspection figures, while Table 19 classifies inspection reports according to the type of action required.

**IV.ii. Progress and current status on AC systems**

**Overview, technical method and administration system**

Decree 74/2013 extended the mandatory operations of maintenance, inspection and control set for heating systems to AC systems. The inspection and control framework follow the same patterns and procedures provided for heating systems.
The law requires all AC systems with thermal power equal or greater than 12 kW to undertake compulsory maintenance and inspection. Inspections include an energy efficiency assessment of the generator, a check for proper power sizing and advice on possible measures to improve the system efficiency (based on a cost-benefit analysis).

Maintenance staff shall produce an inspection report and deliver it to the competent authority which is in charge of setting an inventory and running compliance controls similar to those set for heating systems. Inspections should cover 100% of the installed AC systems with thermal power higher than 100 kW every four years. Checks on inspection reports may fully substitute on-site visits for gas systems with power lower than 100 kW.

The procedure requires that the maintenance professional in charge of the system, during its energy efficiency inspections at mandatory minimum intervals (similar to those provided for heating systems), should intervene whenever energy efficiency parameters are lower by more than 15% compared to nominal data. The machines will have to be returned to the original parameters with a tolerance of 5%.

Competent authorities in each region are in charge of running compliance controls. Similar to the inspections for heating systems, control procedures can be assigned to external controllers or qualified bodies meeting the independence, competence and training requirements set by Decree 74/2013. An accreditation scheme for controllers and controlling bodies is not yet operational in most regions. It must be set in place by each regional authority, with qualifications and retraining ensured.

No data is yet available concerning cost-benefit from inspections at any level. Local administrations have generally experienced difficulties in providing regular on-site controls.

**Promotional activities**

The promotion is entrusted to the local authorities. Figure 12 reports the local information campaign carried out by the province of Savona, Liguria.

**Enforcement and penalties**

The enforcement and penalties for AC systems inspections are the same as those set for heating systems.

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**Table 18:**

<table>
<thead>
<tr>
<th>Inspection reports received</th>
<th>Number</th>
<th>Var. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campaign 2009/2011</td>
<td>173,251</td>
<td></td>
</tr>
<tr>
<td>Campaign 2011/2013</td>
<td>203,986</td>
<td>17.7 %</td>
</tr>
</tbody>
</table>

**Table 19:**

<table>
<thead>
<tr>
<th>Anomalies classification</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety issues (need for immediate action)</td>
<td>4,258</td>
<td>2</td>
</tr>
<tr>
<td>Combustion efficiency below the legal minimum</td>
<td>2,044</td>
<td>1</td>
</tr>
<tr>
<td>High priority</td>
<td>21,314</td>
<td>11</td>
</tr>
<tr>
<td>Medium priority</td>
<td>9,504</td>
<td>5</td>
</tr>
<tr>
<td>Low priority</td>
<td>149,371</td>
<td>81</td>
</tr>
</tbody>
</table>

**Figure 12:** Province of Savona, local information campaign on control of AC systems www.tecnocivis.it

Presently, there is no statistical or aggregate data on levied penalties available on a national scale. It is up to the competent authorities to start annual compliance check programs of the inspection reports. At the end of 2014, only very few regions have started test-phase inspection and control campaigns on AC systems. There is no aggregated quantitative data available on a national scale.
3. A success story in EPBD implementation

In Italy, the tax deductions available in 2014 have been in effect since 1 January 2007 without interruption, and they are designed solely for the energy refurbishment of existing buildings. The deductions are available for homeowners and tenants, and for businesses (deductions limited to buildings used for their activities).

The encouraged interventions concern the replacement of winter heating systems with condensing boilers or efficient heat pumps, replacement of lighting fixtures, the installation of solar thermal systems and insulation interventions of roofs, walls and floors. The so-called ‘comprehensive renovation’ (also covered) is expected to apply to an entire building, with no constraints on the technologies used, but with the need to certify (at the end of the works) that the overall energy performance is within the limits set by the state.

To be eligible for tax deductions, any intervention is bound to comply with certain performance requirements, which vary according to the type of operation and are set to be more demanding than the minimum requirements prescribed by law and pursuant to the decree of the adoption of the EPBD. In order to qualify, it is necessary to provide an EPC after the intervention.

The rate of the deduction, originally fixed at 55% of the expenditure, was further increased to 65%, in effect from 6 June 2013. Part of the cost incurred by the Italian government for granting the deduction is recovered from the generated stimulus to economic growth and from the potential tax evasion avoided in work commissioned to engineering and construction companies.

To take advantage of the deduction, it is necessary to communicate via the web a number of technical and economic data to the ENEA, which periodically issues a report on the costs and results of the deduction. The following data is from the report published in 2014, containing the overall data until the year 2012.

Main achievements for the year 2012:
- 265,400 total applications;
- total investment of more than 2.8 M€;
- total value of the deducted amounts over 1.58 M€;
- overall energy savings in primary energy exceeding 1,260 GWh/year;
- avoided CO₂ emissions into the atmosphere of about 270,000 tons/year.

Main overall results (2007 - 2012):
- about 1.5 million applications;
- energy savings produced more than 9,000 GWh/year;
- environmental benefit in terms of avoided CO₂ emissions into the atmosphere more than 1,900,000 ton/year;
- approximately 6.2% of Italian estate property involved in a cycle of energy improvement (partial or total), which has been able to take advantage of tax deductions of 55% or 65%.

The highest number of interventions over the years has been the replacement of lighting fixtures, while the greatest contribution to energy savings achieved can be attributed to the interventions carried out on winter heating systems. The overall results are summarised in Figures 13 to 17.
Figure 14: Energy savings per type of renovation (MWh/year): 2007 – 2012 trend.

Figure 15: Buildings renovated in 2012 per year of construction.

Figure 16: Buildings renovated in 2012 per use.

Figure 17: Average cost of saved kWh per type of renovation (€/kWh).
4. Conclusions, future plans

The new implementation decrees, which should be issued in 2015, will define the new methodologies for the calculation of the energy performance in buildings, the criteria to be met by NZEBs, and the new minimum requirements to be applied to new buildings and renovations, according to cost-optimal criteria.

The first estimates performed by the ENEA have verified that the cost-optimal requirements should make minimum overall performance significantly more stringent for new buildings. This result, combined with the increasing contribution of RES progressively required by the decree transposing the RES directive already in place (the next step of 1 January 2017 foresees that 50% of the needs for heating, cooling and hot water has to be provided through RES), will contribute to the gradual approach towards a desired NZEB-era, and to the establishment of a credible action plan for further construction of these buildings.

All the latest decrees issued by the government to transpose the EPBD foresee a gradual legislative convergence of regions and autonomous provinces to the national legislation. This work on legislation, along with the creation of national databases for EPCs and heating systems inspections reports, will also reduce fragmentation of data and facilitate the monitoring of the implementation of the EPBD.