

Cost-effective transformation of Italian building stock

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**ENERGY
EFFICIENCY
IN BUILDINGS**



ARTICLE

COST-EFFECTIVE TRANSFORMATION OF ITALIAN BUILDING STOCK

The energy efficiency of buildings is currently one of the most important topics of debate at international level. The European Union has promoted programmes, projects and directives to develop harmonised instruments, criteria and solutions to increase the energy efficiency of both new and existing buildings. The main reference legislation in this field includes *Directive 2010/31/EU* on building energy performance and *Directive 2012/27/EU* on energy efficiency, along with their subsequent amendments.

Building energy efficiency is a priority objective for Italy. Relevant regulations and incentive measures include:

- Legislative Decree 192/2005, updated by Law 90/2013, transposing Directive 2010/31/EU;
- Inter-ministerial Decree 26 June 2015, enforcing Legislative Decree 192/2005, and subsequent amendments, providing minimum energy performance requirements for buildings and guidelines for building energy performance certification;
- Legislative Decree 102/2014 and subsequent amendments, transposing Directive 2012/27/EU.

According to the *Italian Energy Efficiency Action Plan (PAEE 2017)*¹, the overall final energy saving achieved in 2016 by the civil sector was about 38.2 TWh/year², equal to 67 % of the target expected in 2020. The residential sector has already reached 84 % of the final target, while the tertiary sector, at 15 %, still has far to go. The *Italian National Energy Strategy of 2017 (SEN 2017)*³ recently established a programme to meet the European goals by 2030, aiming for industrial leadership to capture the great international growth of efficient technologies. For the residential and tertiary sectors, SEN 2017 set a target to reduce the final energy consumption by 58.2 TWh/year² by 2030 compared with 2015.

According to the last national census of 2011, Italian building stock comprises 14.5 million buildings, of which 84 % are residential. More than 60 % of residential buildings were built before 1976, i.e. before the introduction of the first law on energy saving. The annual final energy use of the civil sector covers about 43 % of national overall energy use. On average, the *annual thermal energy consumption*⁴ is 125÷142 kWh/m² for residential buildings, 170 kWh/m² for office buildings, and 130 kWh/m² for schools.

¹ *Italian Energy Efficiency Action Plan (PAEE)*, Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), Rome, 2017.

² 1 Mtoe = 11.63 TWh

³ *National Energy Strategy (SEN)*, Italian Ministry of the Economic Development and Ministry of the Environment, Rome, 2017.

⁴ *Italian Strategy for the Energy Refurbishment of the National Building Stock (STREPIN)*, Italian Ministry of Economic Development and Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), Rome, 2015.

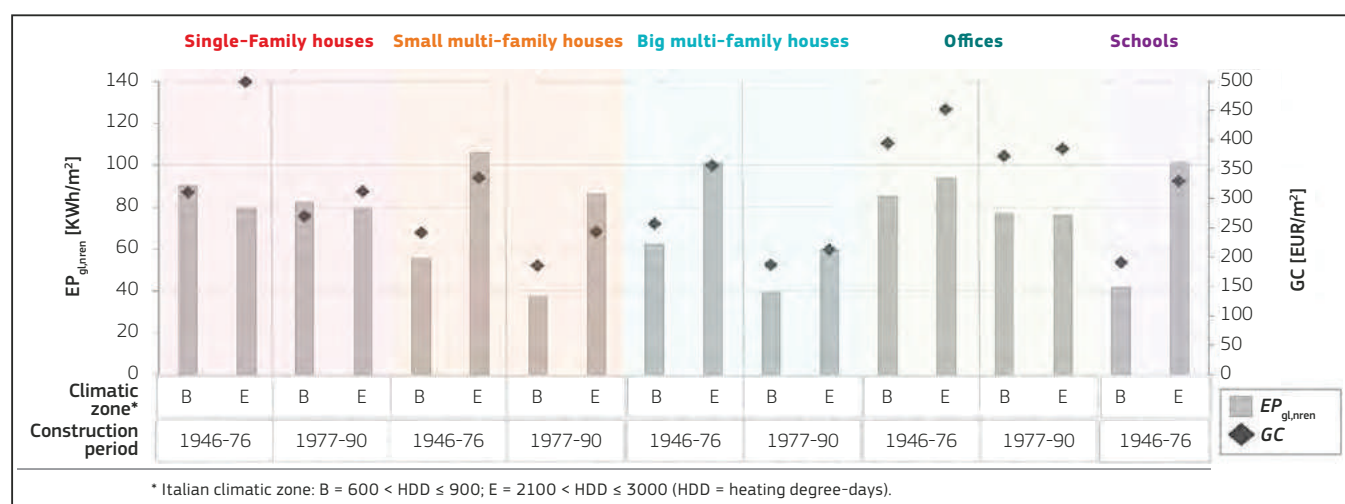


Figure 1 – Global cost and energy performance of cost-optimal energy efficiency measures implemented in Italian reference buildings. Source: MiSE⁵.

Building typology	Refurbished building floor area [10 ⁶ m ² /year]	Energy saving by 2020 [TWh/year] ²	Investment cost [10 ⁹ EUR/year]
Residential	170	48.9	24.1
Non-residential	16	17.3	17.5
Total	186	66.2	41.6

Table 1 – Energy refurbishment scenario of Italian building stock – period 2014-2020. Source: STREPIN⁴.

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Vincenzo Corrado is a civil engineer and Full Professor of Building physics and building energy systems at Politecnico di Torino, where he is vice-coordinator of the academic board of Building Engineering and coordinates a unit of TEBE (Technology Energy Building Environment) Research Group, focused on building thermo-physics, building energy modelling, procedures for energy audit and certification, indoor environmental comfort, legislation and technical standards. He is a former President of IBPSA-Italy (Italian chapter of the International Building Performance Simulation Association), Italian delegate of CEN/TC 89 (Thermal performance of buildings and building components) and of ISO/TC 163 (Thermal performance and energy use in the built environment).



The energy-saving potential of Italian building stock is therefore significant, and mostly achievable through energy refurbishment measures with low payback periods. The national application of the comparative methodology framework, in compliance with *Directive 2010/31/EU* - Art. 5, allowed the identification of cost-optimal energy efficiency measures for major renovation of buildings. The resulting global cost (GC) in 30 years building lifecycle and the related overall non-renewable energy performance (EP_{glnren}) for the analysed reference buildings are shown in Figure 1.

*The Italian Strategy for the Energy Refurbishment of the National Building Stock (STREPIN 2015)*³ provides an energy refurbishment scenario which takes into account current minimum energy performance requirements for the building envelope and technical building systems, technical feasibility and a favourable cost-benefit ratio. The resulting energy-saving potential in the period 2014-2020 amounts to 66.17 TWh/year², whereas the overall investment costs are equal to EUR 41.6 billion/year, as shown in detail in Table 1.

Although the energy-saving potential is high, several barriers hinder its full achievement. Instruments and actions to overcome these barriers were identified in SEN 2017, such as, for the civil sector, the reinforcement of minimum requirements and regulations, the extension of incentives (e.g. tax deductions), and the introduction of direct financial incentives for retrofit actions in public buildings.

⁵ Updating of the application of the calculation methodology to derive cost-optimal energy performance requirements (2010/31/EU Directive, Art. 5), Italian Ministry of Economic Development (MiSE), Rome (in Italian).

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SETIS Magazine

SETIS launches a new magazine quarterly, each issue is dedicated to a different low-carbon energy technology or relevant aspects of the sector. It covers the latest developments in the subject in question. Relevant personalities are invited to write articles outlining the main challenges and priorities facing their sectors, and interviews are conducted with key representatives from the related topic.

The magazines also include a SET Plan news section detailing the last developments to achieve the Integrated SET Plan objectives, and European Commission services and/or relevant organizations/institutions are invited to provide a foreword that highlights the main policy developments on the subject.

Energy efficiency in buildings

This edition of SETIS Magazine takes a closer look at the current status of the EU building stock and its future evolution. It discusses the energy transformation of Europe's buildings, along with the challenges and policy actions ahead. We bring together experts from the research and policy communities to discuss the most relevant and pressing issues on energy efficiency in buildings today. Their input sheds light on the question: What is the potential contribution of buildings in the transition to climate neutrality in 2050?

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