



ANNUAL
REPORT

FISCAL
DEDUCTIONS

65%

2018

executive summary

65% FISCAL DEDUCTIONS

FOR ENERGY RENOVATION
OF EXISTING BUILDINGS

ITALIAN NATIONAL AGENCY
FOR ENERGY EFFICIENCY



ENEA

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ITALY'S
65% TAX DEDUCTION SCHEME - ECOBONUS
for energy renovation of existing building stock

ANNUAL REPORT 2018
2017 DATA

executive summary

The Report was prepared by ENEA's National Agency for Energy Efficiency based on the information and data available as at 1 June 2018.

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Fiscal deductions for energy savings in existing buildings – Ecobonus:

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ANNUAL REPORT 2018 – 65% Tax deduction scheme - Ecobonus

Executive summary

2018 ENEA – National Agency for new technologies, energy and sustainable economic development

Foreword

***An incentive is a bullet, a lever, a key:
an often tiny object with astonishing power to change a situation.***

Steven D. Levitt

One of the daunting challenges we face in achieving the objectives for the reduction of greenhouse gases emission over the next 10-15 years is stimulating the renovation of our existing building stock, promoting investments by households and businesses.

As a result, many governments, including Italy, took actions in recent years to support and implement incentive measures for households and corporate investments; besides reducing energy consumption the goal is also to foster economic recovery, especially in the construction sector, while stopping significant job losses.

Various researches worldwide analyzed the real impacts of incentives on the target of these policies, namely households and businesses which were affected heterogeneously in relation to the government stimulus package.

This new report shows an upward trend of the Ecobonus and the energy efficiency measures implemented in households, with significant economic and social repercussions.

Since 2007, besides the evaluation of the trends and the effectiveness of the measures adopted by the Italian government, from its very good observation field ENEA has also been able to assess the systemic impact of incentives on renovation actions, realizing they have so far and still continue to influence innovation, development, production and diffusion of technologies in the market for energy efficiency in the building sector.

It is noteworthy that incentives, together with the regulation and legislation, represent now an indispensable complement to the mandatory standards and labeling policies, which thus step up the introduction of more efficient energy saving products in the market compared to those required by existing standards, preparing the market for more severe mandatory requirements in the future.

Moreover, while supporting decision-makers at all territorial levels, ENEA also tested how incentives can be effectively addressed to different products in the supply chain management, depending on how a new technology evolves and how the market is penetrated.

Such analyses are a knowledge-based wealth made available to all, and they can be very useful in the design and implementation of new successful incentive schemes.

Before concluding, I would like to express my sincere acknowledgements to the entire work team who, year after year, elaborate this valuable piece of work, hoping its analyses and considerations could act as a compass for decision makers, in order to guide their policy and market choices.

Let's all keep the good work going!

Federico Testa

ITALIAN NATIONAL AGENCY
FOR ENERGY EFFICIENCY



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1. The national context

Compared to the target for the period 2011-2020 in the 2014 National Energy Efficiency Action Plan (NEEAP) and consistent with the 2013 National Energy Strategy (SEN), the energy savings achieved in 2017 were equal to slightly more than 8 Mtoe/year of final energy, equivalent to almost 52% of the final target (Table 1.1). Approximately 37% of these savings derive from the obligation of the White Certificates and for over a quarter from tax relief. The residential sector has in fact already reached its target for 2020; industry has covered half of its expected path.

Table 1.1 – Achieved annual energy saving by sector for 2011-2017 and expected in 2020 (final energy, Mtep/year) according to the 2014 NEEAP

Sector	White Certificates	Tax relief	Conto Termico	Other measures **	Energy Savings		Achieved target (%)
					Achieved in 2017	Expected in 2020	
Residential	0.71	2.08	-	0.85	3.64	3.67	99.2%
Tertiary	0.15	0.02	0.005	0.04	0.22	1.23	17.5%
Industry	2.10	0.03	-	0.37	2.50	5.1	49.0%
Transport	0.01	-	-	1.68	1.69	5.5	30.7%
Total	2.97	2.13	0.005	2.94	8.05	15.5	51.9%

* Data not consolidated for 2017; savings from tax relief for refurbishment of buildings (50% deduction) are also recorded.

** Legislative Decree 192/05 and 26/6/15 "minimum requirements" for new buildings; Impresa 4.0 National Plan; European Commission regulation and High-Speed railway in the transport sector; large scale appliance replacement in the residential sector.

Source: ENEA elaboration based on data from the Italian Ministry of Economic Development, ISTAT S.p.A., ENEA, ISTAT, FIAIP, GfK.

Concerning the cumulative minimum energy saving target of 25.5 Mtep of final energy, to be achieved in the years 2014-2020 in accordance with Article 7 of Directive 2012/27/EU (Energy Efficiency Directive - EED), Table 1.2 shows achieved savings in the years 2014-2016 and 2017 (estimated) through the notified measures¹. The results obtained are in line with the expected savings trend to achieve the target set.

¹ The values for 2017 are being verified for the following reasons: the White Certificates are usually calculated on the basis of primary energy savings and for a final evaluation of the final energy savings, the punctual analysis of each approved intervention is required; concerning the Ecobonus and Impresa 4.0 National Plan, until October 2018 the user is allowed to modify the data relating to the intervention performed; therefore the data can only be consolidated following the expiry of the deadline for the required tax obligations. The table 1.1 does not include the reduction of energy consumption deriving from other measures for the promotion of energy efficiency, in particular those implemented at regional level.

Table 1.2 – Energy savings pursuant to article 7 of the Energy Efficiency Directive (final energy, Mtep), years 2014-2017

Policy measures	New Achieved savings				Achieved savings	
	2014	2015	2016	2017 *	2014-2017	Expected in 2020
Obligation scheme: White Certificates	0.872	0.859	1.101	1.341	4.174	12.51
Alternative measure 1: Conto Termico	0.003	0.008	0.019	0.045	0.075	0.43
Alternative measure 2: Tax relief	0.306	0.597	0.873	1.164	2.940	8.39
Alternative measure 3: Energy efficiency National Fund	0.000	0.000	0.000	0.000	0.000	0.18
Alternative measure 4: Impresa 4.0 National Plan	0.000	0.000	0.000	0.300	0.300	4.00
Total Savings	1.181	1.465	1.993	2.850	7.489	25.50

* Data not consolidated

Source: Ministry of Economic Development

2. Tax deduction for the energy renovation of the existing building stock

Budget Law 2018 (Law dated 27 December 2017 no. 205) confirmed the tax deduction scheme to incentivize energy renovation of the existing building stock, and introducing some new features concerning, for some specific cases, new rates of deduction, new eligible actions and/or new technical and/or performance requirements. Other important changes relate to sample checks on all interventions and significant updates on credit transfer rules.

The deduction rate has been reduced from 65% to 50% for the expenses incurred in 2018 for:

- Windows and shutters.
- Solar shading.
- Replacing heating systems with at least class A energy efficient condensation boilers.
- Biomass heating systems.

If heating systems are replaced with at least class A energy efficient condensation boilers, a deduction rate of 65% is obtained if an advanced thermoregulation system with efficiency classes V, VI or VIII as indicated in Commission Communication 2014/C 207/02 is installed also.

The eligible actions, the relative rates and deductions or the maximum expenses are summarized in Table 2.1.

Table 2.1 – Ecobonus: eligible energy efficiency actions pursuant to Law 27/12/2006 n. 296 and subsequent amendments and integrations

Code	Action	Maximum eligible deduction (€) (^)	Maximum eligible expense (€)	Deduction (%)
344	Reduction of heating energy demand of the whole building	100,000.00		65%
345	a) insulation of vertical walls, roof, slabs (*)	60,000.00		65%
	b) windows and shutters replacement (*)	60,000.00		50%
	c) installing solar shades (*)	60,000.00		50%
	d) actions on common parts, involving over 25% of the dissipating surface of the building envelope		40,000.00 (#)	70%
	e) same actions as in d) to achieve at least the average quality as per tables 3 and 4 of Annex 1, of the Italy's Ministerial Decree 26/06/2015 "Guidelines for the Energy Certification Decree"		40,000.00 (#)	75%
	f) actions as in d) and e) implemented in seismic zones 1,2 and 3, aimed to reduce seismic risks also, resulting in one lower class of the seismic risk classification		136,000.00 (#)	80%
	g) actions as in d) and e) implemented in seismic zones 1,2 and 3, aimed to reduce seismic risks also, resulting in two or more lower classes of the seismic risk classifications		136,000.00 (#)	85%
346	Installing solar panels to produce domestic hot water	60,000.00		65%
347	a) full or partial replacement of heating systems with systems equipped with (**)	i. condensing boilers that are at least class A efficient	30,000.00	50%
		ii. condensing boilers that are at least class A efficient and require the installation of advanced thermoregulation systems	30,000.00	65%
		iii. condensing hot air generators	30,000.00	65%
		iv. high efficiency heat pumps, with low enthalpy geothermal systems	30,000.00	65%
		v. hybrid appliances with heat pump integrated with a condensation boiler	30,000.00	65%
		vi. micro-CHP systems	100,000.00	65%
		vii. replacing conventional water heaters with heat pump boiler for domestic hot water	30,000.00	65%
	b) installation of biomass heating system	30,000.00		50%
	c) installation of Building Automation systems			65%

(^) Deduction for a single building unit.

(*) If the actions are on the same real estate unit, the maximum deduction is equal to 60,000 euro.

(**) If the action concerns the installation of several appliances, the maximum deduction is equal to 30,000 euros, or to 100,000 euros if a micro-co-generator is installed.

(#) Times the number of real estate units of the building.

Source: ENEA elaboration

Expenses occurred for the replacement of heating systems with hybrid systems or condensing hot air generators can be deducted at a 65% rate. Hybrid systems are composed by a heat pump integrated with a condensation boiler, assembled in a factory and designed by the manufacturer just to work together.

The new actions introduced by the 2018 budget law are: the micro-CHP systems replacing existing heating system, as long as the intervention saves primary energy by at least 20%; those able to reduce the seismic risk of one class (80% deduction), or two or more classes (85% deduction), implemented together with the interventions on common parts of the building envelope involving over 25% of the outer surface. Concerning the latter actions, the maximum eligible expenditure is equal to € 136,000, times the number of real estate units in the whole building.

Until December 31, 2017, the transfer of credit was possible for: all taxpayers, but only for actions on common parts, involving over 25% of the outer surface of the building envelope (code 345 d) and e), see Table 2.1); for taxpayers in the no-tax area, for all the eligible actions on common parts of the block of flats. The Budget Law 2018 has extended the possibility of credit transfer to all taxpayers and all eligible actions: credit can be transferred to suppliers who implemented works or to other private entities, with the possibility of a subsequent transfer. For taxpayers out of the no-tax area, credit cannot be transferred to credit institutions and financial intermediaries.

Concerning the issue of the subsequent transfer of credit to other private entities, the Revenue Agency recently clarified that:

- The credit transfer is limited to only one transfer subsequent to the initial one.
- Other private entities refer to parties other than suppliers, as long as they are linked to the works that implied the tax deduction.

The operating procedures for credit transfer, related to the actions which do not include common parts of the block of flats, as foreseen by the Budget Law 2018 from 01/01/2018, will be soon regulated by a new provision of the Revenue Agency.

Following the changes introduced by the Budget Law, ENEA has designed and launched the new website (<http://finanziaria2018.enea.it>) which requires compiling a single-sheet form to access the Ecobonus, with sections and fields describing the technical aspects and occurred expenses, for all the eligible actions. The procedure automatically calculates energy savings for the most common actions implemented individually and in a single housing unit, in order to help users when they are not obliged to apply to a technician (windows replacement, installation of solar panels to produce domestic hot water, replacement of conventional boilers with heat pump boilers, replacement of heat pumps with condensing hot air generators or with high efficiency heat pumps, and installing a biomass heating system).

3. Achieved Results

In 2014-2017 around one million and half actions were implemented (Table 3.1), of which over 420,000 in 2017. From 2011, over 2.3 million interventions were executed; over 3.3 million since the scheme started in 2007.

Table 3.1 – Ecobonus: number of implemented actions, years 2014-2017

Year	2014 - 2016		2017		Total	
Eligible action	n.	%	n.	%	n.	%
Overall renovation	10,906	1.1%	4,276	1.0%	15,182	1.1%
Envelope insulation	74,929	7.4%	21,862	5.2%	96,791	6.7%
Windows and shutters	570,238	56.0%	212,731	50.4%	782,969	54.3%
Solar shading	123,083	12.1%	84,953	20.1%	208,036	14.4%
Solar panels	35,788	3.5%	8,236	2.0%	44,024	3.1%
Space heating system	203,133	19.9%	86,319	20.5%	289,452	20.1%
Building automation	689	0.1%	3,614	0.9%	4,303	0.3%
Total	1,018,766	100%	421,991	100%	1,440,757	100%

Source: ENEA

Table 3.2 shows the details of over 3.7 billion euros investments activated in 2017 (8% more compared to 2016). For the 2017 actions, the maximum potential value of tax deductions that may be requested by beneficiaries over the next ten years is equal to 2.42 billion euros.

Table 3.2 – Ecobonus: investments (M€) by eligible action, years 2014-2017

Year	2014 - 2016		2017		Total	
Eligible action	M€	%	M€	%	M€	%
Overall renovation	891	9.1%	312	8.4%	1,203	8.9%
Envelope insulation	2,476	25.3%	769	20.7%	3,245	24.0%
Windows and shutters	4,124	42.2%	1,517	40.7%	5,642	41.8%
Solar shading	261	2.7%	184	4.9%	445	3.3%
Solar panels	229	2.3%	50	1.4%	279	2.1%
Space heating system	1,781	18.2%	871	23.4%	2,651	19.6%
Building automation	9.6	0.1%	20.3	0.5%	29.9	0.2%
Total	9,770	100%	3,724	100%	13,494	100%

Source: ENEA

The investments activated in the last four years amount to around € 13.5 billion: more than 40% of the resources have been allocated to windows and shutters; about 25% for the insulation of roofs and walls; around 9% to reduce energy demand for heating the whole building. Over 23.3 billion euro invested since 2011; around 35.5 billion since the tax deduction scheme started in 2007.

Table 3.3 shows achieved energy savings, according to the different eligible actions: the trend is increasing, with 0.112 Mtoe/year in 2017. Energy savings amount to just over 0.4 Mtoe/year in the considered period; starting from 2011, the achieved energy savings amount to 0.77 Mtoe/year; total savings are equal to 1.31 Mtoe/year since the scheme started.





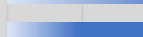

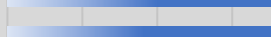
Table 3.3 – Ecobonus: energy savings (GWh/year) by eligible action, years 2014-2017

Year	2014 - 2016		2017		Total	
Eligible action	GWh/y	%	GWh/y	%	GWh/y	%
Overall renovation	257.0	7.6%	97.7	7.5%	354.7	7.6%
Envelope insulation	966.5	28.5%	329.1	25.3%	1,295.6	27.6%
Windows and shutters	1,372.3	40.5%	515.2	39.6%	1,887.5	40.3%
Solar shading	34.9	1.0%	25.6	2.0%	60.5	1.3%
Solar panels	164.0	4.8%	36.1	2.8%	200.0	4.3%
Space heating system	586.2	17.3%	287.3	22.1%	873.4	18.6%
Building automation	5.8	0.2%	10.5	0.8%	16.3	0.3%
Total	3,386.7	100%	1,301.4	100%	4,688.1	0%

Source: ENEA

The interventions activated in 2017 saved over 1,300 GWh/year, related in particular to the replacement of windows (about 40%) and the insulation of roofs and walls (over a quarter); these types of actions, including reducing energy demand for heating the whole building, are highly cost effective, with a cost incurred between 8 and 11 euro cent for each kWh of energy saved during the entire useful life of the intervention (Table 3.4).

Table 3.4 – Ecobonus: cost effectiveness (€/kWh) by eligible action, average of years 2014-2017

Eligible action	Useful life	€/kWh	0	0.05	0.10	0.15	0.20
Overall renovation	30	0.11 €					
Envelope insulation	30	0.08 €					
Windows and shutters	30	0.10 €					
Solar shading	30	0.25 €					
Solar panels	15	0.09 €					
Space heating system	15	0.20 €					
Building automation	10	0.18 €					

Source: ENEA

Concerning specific actions implemented and installed technologies, the main share of resources allocated in the period 2014-2017, amounting to over 6 billion euro, involved the replacement of over 2.6 million windows (incentivized through actions addressed to the overall renovation or the insulation of the building envelope also); over 2.1 billion euros have been allocated to around 70,000 interventions on roofs and slabs. Concerning 2017, over 1.7 billion euros were allocated to over 720,000 replaced windows and shutters, over 410 million euros for more than 23,000 interventions on roofs and slabs walls, and over 380 million euros for approximately 17,000 actions on walls (Table 3.5).

Table 3.5 – Ecobonus: investments (M€) by technology, total 2014-2016 and year 2017

Year	2014-2016		2017		
Technology/action	M€	%	M€	%	
Walls	1,074	11.4%	384.6	10.3%	<p>INVESTMENTS 2014-2017 (M€)</p>
Slabs and roofs	1,734	18.3%	412.3	11.1%	
Windows and shutters	4,357	46.0%	1,736.4	46.6%	
Solar thermal	223	2.4%	50.3	1.4%	
Solar shading	249	2.6%	183.9	4.9%	
Condensing boilers	1,412	14.9%	633.5	17.0%	
Geothermal plants	11	0.1%	3.1	0.1%	
Heat pumps	297	3.1%	234.8	6.3%	
Building automation	9	0.1%	20.3	0.5%	
Other	97	0.4%	64.4	1.7%	
Total	9,463	100%	3,723.7	100%	

Source: ENEA

In terms of achieved energy savings (Table 3.6), the main contribution in the period 2014-2017 derives from the replacement of windows and shutters (over 46% overall), followed by actions on slabs and roofs (over 18%), walls (about 11%), and the installation of condensing boilers (over 14%). More specifically, the main contribution in 2017 derives from the replacement of windows and shutters (584 GWh/year on over 1,300), while over a quarter of savings was achieved thanks to interventions on walls, slabs and roofs (about 350 GWh/year).

Table 3.6 – Ecobonus: energy savings (GWh/year) by technology, total 2014-2016 and year 2017

Year	2014-2016		2017		
Technology/action	GWh/y	%	GWh/y	%	
Walls	351	10.7%	146.6	11.3%	<p>SAVINGS 2014-2017 (GWH/YEAR)</p>
Slabs and roofs	603	18.4%	193.6	14.9%	
Windows and shutters	1,531	46.6%	583.8	44.9%	
Solar thermal	160	4.9%	36.6	2.8%	
Solar shading	33	1.0%	25.6	2.0%	
Condensing boilers	428	13.0%	223.2	17.1%	
Geothermal plants	3	0.1%	0.5	0.0%	
Heat pumps	138	4.2%	61.3	4.7%	
Building automation	5	0.2%	10.1	0.8%	
Other	30	0.4%	20.0	1.5%	
Total	3,282	100%	1,301	100%	

Source: ENEA

Around 80% of investments activated in 2017 (€ 2.9 billion out of over 3.7 overall) were dedicated to buildings built before the '80s; in particular, about a quarter of total

resources (over 920 million euros) was allocated to buildings built in the '60s. Approximately 40% of investments (over 1.4 billion euros) concerned a detached or semi-detached house, while about 35% of the resources (about 1.3 billion euros) involved blocks of flats with more three floors (Table 3.7).

Table 3.7 – Ecobonus: investments (%) by age and type of building, year 2017

	Detached house	Block of flats with less than three floors	Block of flats with more than three floors	Other	Total (%)	Total (M€)
< 1919	3.0%	1.8%	2.3%	0.5%	7.6%	281.4
1919-1945	2.7%	1.4%	2.5%	0.3%	7.0%	261.6
1946-1960	7.1%	2.8%	8.0%	0.9%	18.8%	700.4
1961-1970	9.0%	3.2%	11.2%	1.4%	24.8%	924.5
1971-1980	8.0%	3.9%	6.0%	1.9%	19.8%	738.1
1981-1990	3.7%	2.5%	2.5%	1.8%	10.4%	387.9
1991-2000	2.2%	1.6%	0.9%	1.0%	5.7%	211.7
2001-2005	0.8%	0.6%	0.6%	0.4%	2.3%	85.1
> 2006	1.7%	1.0%	0.6%	0.3%	3.6%	133.1
Total (%)	38.1%	18.8%	34.6%	8.4%	100%	
Total (M€)	1,420.6	699.5	1,290.2	313.5		3,723.7

Source: ENEA

The distribution of achieved energy savings (Table 3.8) by age and type of building follows that of investments, with over 1,000 GWh/year from actions on buildings built before the '80s.

Table 3.8 – Ecobonus: energy savings (%) by age and type of building, year 2017

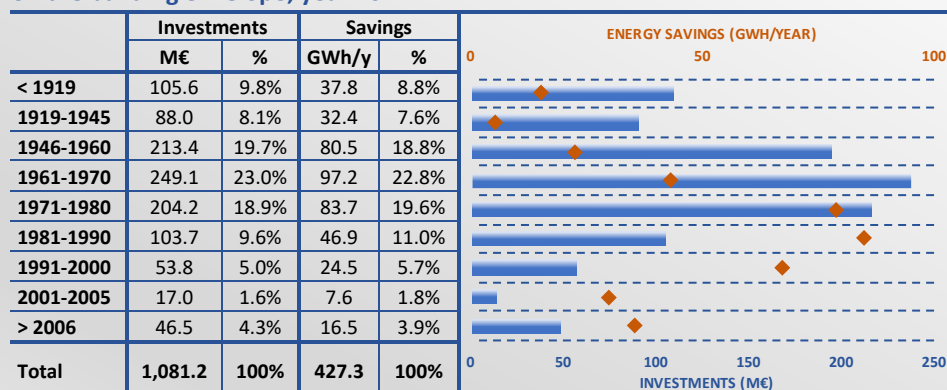
	Detached house	Block of flats with less than three floors	Block of flats with more than three floors	Other	Total (%)	Total (GWh/y)
< 1919	2.9%	1.7%	2.1%	0.5%	7.2%	94.3
1919-1945	2.7%	1.4%	2.3%	0.3%	6.8%	88.5
1946-1960	7.2%	2.8%	7.9%	1.1%	18.9%	246.1
1961-1970	9.1%	3.3%	11.1%	1.8%	25.4%	330.3
1971-1980	7.9%	3.9%	5.9%	2.7%	20.4%	265.9
1981-1990	3.6%	2.3%	2.3%	2.4%	10.6%	137.9
1991-2000	2.1%	1.4%	0.8%	1.4%	5.6%	72.9
2001-2005	0.7%	0.4%	0.5%	0.5%	2.1%	27.8
> 2006	1.5%	0.7%	0.4%	0.3%	2.9%	37.8
Total (%)	37.7%	17.8%	33.4%	11.1%	100%	
Total (GWh/y)	490.4	231.6	434.5	144.8		1,301.4

Source: ENEA

Renovating the whole building and insulating the envelope activated around a third of investments (1.08 billion euros), leading to one third of total savings in 2017 (427 GWh/year). In particular, about 80% of these resources were allocated to actions on

buildings built before the '80s, of which over 40% are concentrated on a housing unit from the '60s and '70s (Table 3.9).

Table 3.9 – Ecobonus: investments (M€) and energy savings (GWh/year) from actions on the building envelope, year 2017



Source: ENEA

Table 3.10 shows the distribution of investments for replaced windows: over half of the frames of incentivized windows in 2017 is in PVC (about 55%); concerning the glazing, low-emission glazing cover 70% of the activated resources. In particular, PVC windows with low-emission glazing cover around 40% of total investments (about 680 million euros).

Table 3.10 – Ecobonus: distribution of investments on windows by frame and glazing typology (%), year 2017

	Wood	Metal, thermal cut	PVC	Mixed	Total (%)	Total (M€)
Double	3.7%	3.8%	11.8%	1.8%	21.1%	365.4
Triple	1.4%	0.8%	3.4%	1.5%	7.2%	124.7
Low-emission	11.0%	12.8%	39.2%	7.0%	70.0%	1,213.3
Other	0.3%	0.3%	0.4%	0.7%	1.7%	30.2
Total (%)	16.4%	17.8%	54.8%	11.1%	100%	
Total (M€)	283.7	308.3	950.0	191.6		1,733.7

Source: ENEA

4. The Italy's national market of incentivized technologies

Given the last 2018 Budget Law, which provides for 50% tax deductions for at least Class A condensing boilers and a 65% rate if advanced thermoregulation systems are concurrently installed, it is expected that both supply and demand will opt more and more for these actions, which represent the best gas-fueled heating systems. This expectation is

confirmed by the fact that in 2017 a total of 664,000 condensing boilers were sold, with an increase in sales of around 15% compared to 2016 (Table 4.1).

Table 4.1 – Boilers sold on the national market, years 2011-2017

	Traditional boilers	Condensing boilers	Total	
2011	650,000	302,000	952,000	
2012	601,500	269,000	870,500	
2013	513,000	301,000	814,000	
2014	466,500	277,800	744,300	
2015	446,000	340,000	786,000	
2016	77,600	577,000	654,600	
2017	84,500	664,000	748,500	
Total	2,839,100	2,730,800	5,569,900	

Source: Assotermica

Comparing the first four months of 2018 with the corresponding period of 2017, the condensing boilers show an increase in sales of about 11% for wall-hung boilers and 12.5% for class A wall boilers up to 35 kW. In the same period, the non-condensing boilers market reported a drop in sales of about 9% for wall-hung boilers, around 19% for floor-standing boilers; as expected this market will tend to run out, as non-condensing boilers will continue to be produced for a niche market, in cases where there is a technical impediment to installing a condensing boiler.

High-efficiency heat pump markets used as primary heating systems registered about 188,000 appliances in 2017, of which 135,000 split and multisplit (Table 4.2), about 33,000 chillers and about 20,000 Variable Refrigerant Flow (VRF) systems. Compared to the 147,000 split and multisplits sold in 2016 there was a slight decline, but note that sales in 2016 recorded a unique figure. On the other hand, sales of air-cooled chillers up to 17 KW are on the rise (+25% compared to 2016); these devices can be found, for example, in semi-detached houses. The VRF systems are also on the rise (about +6%), and are increasingly popular in the residential sector.

Table 4.2 – Heat pumps for the central heating system sold on the national market, (number of units), year 2017

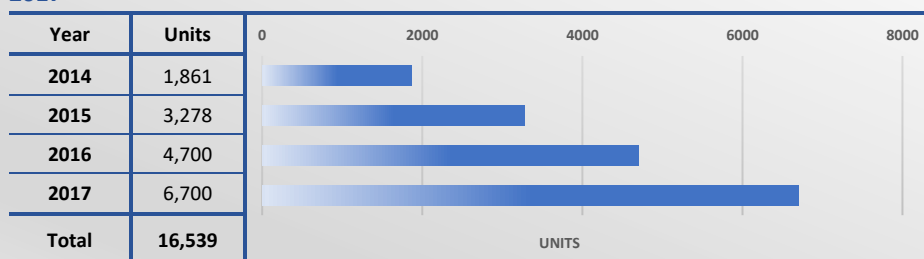
Year	Total	
2011	108,783	
2012	102,569	
2013	99,844	
2014	82,524	
2015	96,145	
2016	147,466	
2017	135,003	
Total	772,334	

Source: ENEA elaboration based on data from the Italian Ministry of Economic Development and Assoclima

Concerning the costs, the average wholesaler cost of a mono-split system below 7kW can be around € 450; monosplits above 7 kW, around 1,700 euros; around 800 euros for multisplits. The cost of a VRF system below 16 kW can be around 2,000 euros; with higher power around 4,900 euros. Finally, for chillers up to 17 kW wholesaler cost may be around 3,000 euros; from 17 kW to 50 Kw the cost is around 5,800 euros (source: Assoclima).

The Budget Law 2018 covers 65% of the expenses for the replacement of heating systems with assembled hybrid systems, consisting of a heat pump integrated with condensing boiler, assembled in the factory and designed to operate together. Sales of this type of equipment have gradually increased recently: 6,700 in 2017, compared to about 4,700 pieces sold in 2016; in the last four years, about 16,600 pieces were sold on the national market (Table 4.3).

Table 4.3 – Preassembled hybrid systems sold on the national market, years 2014-2017

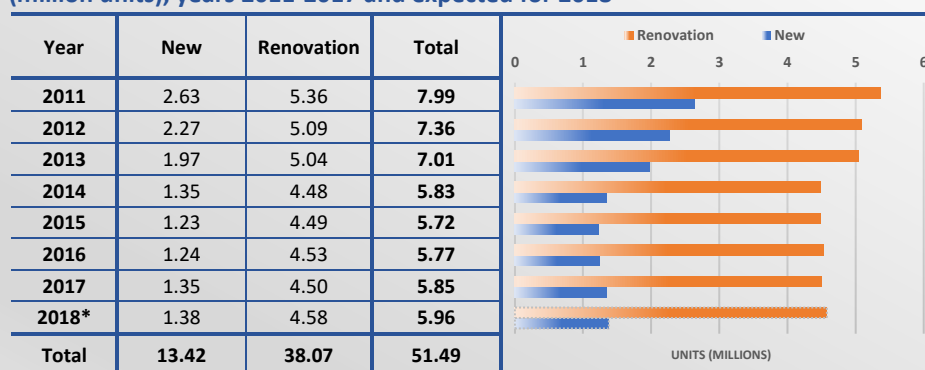


Source: Assoclima

The supply on the hybrid system market is expanding rapidly, also due to the considerable bill cuts thanks to this technology: a sort of energy manager manages the two generators inside, powered by two energy carriers, usually one fossil fuel and electricity, giving priority to the one or to the other depending on what is the most advantageous source according to the set operating conditions (cost of energy carriers, electricity drawn from the grid and used fuel, self-generation of electricity, thermal power required by the building), thus ensuring up to 40% savings on the building's heating costs.

Following the fall in turnover in the years 2012-2015 in the Italian windows and shutters market, which affected both the residential and non-residential sectors, from 2016 onwards a recovery in demand was registered and in 2017 the sales reached a value of about 4.5 billion euros, of which 2.8 in the residential sector and almost 1.7 in the non-residential sector. This trend has led to an overall demand for windows and shutters of around 4.65 billion euros for 2018 (source: UNICMI on ISTAT data). 2017 registered another increase, compared to the previous year, of the number of windows sold, which is around 4.5 million windows sold in renovated buildings and about 1.35 million in new buildings, with expected sales for 2018 of about 4.58 million windows in renovated buildings, and about 1.38 million new buildings (Table 4.4).

Table 4.4 – Windows sold in the residential sector for new and renovated buildings (million units), years 2011-2017 and expected for 2018



* Estimate

Source: UNICMI elaboration based on data from ISTAT

2017 saw an increase in the sale of PVC window frames, with a 37.6% share of windows sold and 28.5% of turnover, followed by aluminum window frames (32.6% units sold and 36% of the total market value), and those in wood (29.7% units sold and 35.5% market value).

5. The renovation of blocks of flats and the role of the administrators

One of the key factors for long-term planning in the renovation of old building units, in particular block of flats, is related to specific and necessary steps to change the behaviour of residents and arouse their interest on safety, health and energy performance of buildings.

The recent update about Ecobonus eligible actions provide block of flats with a wide range of incentives, growing in terms of complexity, breadth and efficiency of the proposed actions. The opportunities offered must be fully understood and correctly assessed to be incisive; thus the support of the block of flats administrator is fundamental.

A pilot project focused on how administrators are reacting to the stimuli and queries from both owners and tenants, as regards the actions to be implemented, the relative costs, the regulatory changes, and companies introducing innovative solutions not only in technical but also financial terms. More specifically, thanks to a sample of administrators, the initiative analyzed the main legislative, behavioral and economic barriers that impede investments for the energy renovation of (big) blocks of flats: Table 5.1 summarizes the questions asked and relevant results.

Table 5.1 – Barriers to energy-efficient renovation of blocks of flats

Barrier type and interview questions	Agreement	Neutral	Disagreement
<i>Economic or socio-economic barriers</i>			
Despite the possibility of credit transfer, 20%/30% of expenses to be covered is in any case too burdensome for a block of flats, regardless of the benefits from energy-efficient renovation.	31%	41%	28%
The different economic situation of residents makes the decision difficult.	72%	21%	7%
<i>Technical and administrative barriers</i>			
Difficulty in efficiently managing the procedures (time management, cost of operations in terms of work done).	48%	42%	10%
<i>Information barriers</i>			
Residents struggle to understand the benefits of investments per energy efficiency.	79%	10%	11%
Residents are not informed about incentives.	48%	42%	10%
<i>Conflicts of interest and social barriers</i>			
Owners and tenants have too many different and conflicting interests.	79%	-	21%
The various age brackets make it difficult to identify a common interest with respect to contingent energy-efficient interventions.	73%	17%	10%
Bad relations among residents, differences between households, the negative spirit and unfavorable residents' atmosphere make the decision impossible.	39%	45%	24%
So-called experts, who suggest solutions contrary to the majority, represent an obstacle to energy-efficient solutions.	31%	34%	35%

Source: ISINNOVA-ENEA

Besides the expected economic issue, the feasibility of interventions on common parts is also influenced by other aspects related to the residents, their needs, their culture and relationships. Social factors can represent barriers, but can also be seen as enabling factors, when they are positive and trigger virtuous mechanisms.

The participation and support of administrators is essential for the large-scale dissemination of efficient measures in blocks of flats, even if a higher workload and more responsibilities, together with the dealing with more and more demanding residents, may raise the concern that efficient actions may prove to be a further burden of their working condition and cause more difficulties.

The quality of relationships between residents and administrators and, above all, the authoritativeness of the latter plays a significant role on the decisions related to the action, without which the trust required to start the intervention procedure would not be established. An important issue in this context is represented by the communication methods used in the relationship with the residents, besides the quantity and above all the quality of the information provided.

The interviewed sample also mentions as a barrier the fact that the decision to adopt efficient measures is mainly related to social factors, deeply rooted in the history of people and the specific context. The presence of very different and conflicting interests among the residents, not only between owners and tenants but also between different generations, makes it difficult to identify a common interest on the possible energy efficiency measures to be implemented in the building.

The sample expressed its opinion on the usefulness of a series of information to improve the awareness of the opportunities and the ability to correctly transfer information to residents (Table 5.2).

Table 5.2 Information tools for administrators of blocks of flats

Type of information tool	Agreement	Neutral	Disagreement
Transparent description of the legal measures and type of works that can be incentivized	79%	14%	7%
Support in spreading information to residents	76%	7%	17%
Notions on how to evaluate the economic benefits of investments	76%	10%	14%
Tips on how to present an investment proposal at a meeting	72%	7%	21%
Support to handle meetings on these issues	62%	17%	21%
Defining the no-tax area and documents required to prove it	62%	14%	24%
Information on how to collaborate with energy service companies	59%	17%	24%
Interventions aggregator (es. Community-led interventions for renovation)	45%	21%	34%

Source: ISINNOVA-ENEA

The answers of the sample highlight the need for administrators to be able to count on substantial regulatory, procedural and technical information, possibly based on good practices related to all stages of the process (reference legislation, cost/benefit analysis, financial solutions, etc.).

6. The socio-economic implications of the Ecobonus

Recent estimates indicate that, overall, the investments activated by building renovations and energy renovation provided jobs to an average of about 250,000 employed in the period 2011-2017, over 370,000, also taking into account the allied industries. This figure is significant also in light of the fact that in the last ten years the construction sector recorded a loss of about 530,000 employees (source: CRESME).

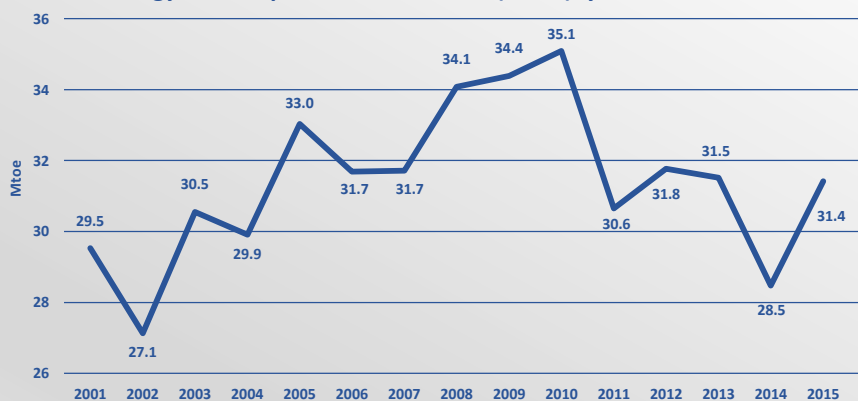
According to these estimates, on average, an investment of 200,000 euros can absorb two direct employees and one in the allied industries. Since the Ecobonus started in 2007, over 3 billion euros investments have been activated each year, on average over 31,000 have been directly employed and around 16,000 in the allied industries (Table 6.1).

Table 6.1 – Ecobonus: direct and indirect employees induced by incentivized actions

Year	Investments (M€)	Directly employed (n)	Allied industries (n)	Total employees (n)
2007	1,453	14,460	7,230	21,690
2008	3,500	34,832	17,416	52,248
2009	2,563	25,507	12,753	38,260
2010	4,608	45,859	22,929	68,788
2011	3,309	32,931	16,466	49,397
2012	2,883	28,692	14,346	43,037
2013	3,612	35,947	17,973	53,920
2014	3,066	30,513	15,256	45,769
2015	3,088	30,732	15,366	46,098
2016	3,309	32,931	16,466	49,397
2017	3,724	32,931	18,531	51,462
Average	3,192	31,394	15,885	47,279

Source: ENEA elaboration based on data from CRESME

Concerning demand, even if the expenditures allocated to energy consumption may be only partially reduced, the recent decrease in energy consumption in the residential sector is related to a more general need of Italian households to save money in the post-crisis period. In particular, between 2001 and 2015, household energy consumption (net of consumption for transport) increased from 29.5 to 31.4 Mtoe, +6.4% over the entire period (Figure 6.1).

Figure 6.1 – Energy consumption in households (Mtoe), years 2001-2015

(a) Source: Elaboration on ISTAT data – Environmental accounting. Consumption for heating/cooling, hot water, kitchen use, household appliances is included.

However, energy consumption in the residential sector showed an increasing trend (in the years 2001-2010), which culminates with a peak of over 35 Mtoe, and a second decreasing trend, albeit discontinuous, with a variation -10.5% compared to 2010.

In monetary terms, the period in which energy costs weighed more heavily on households budgets is in fact between 2009 and 2013² (with spending ranging from a minimum of 4.8% and a maximum of 5.4%), partly as a result of a decreasing trend in overall household average spending (decreased by over 5% between 2008 and 2013). In 2016³, Italian households spent 4.4% of average annual expenses for energy consumption in homes, slightly lower than that recorded in the two previous years (4.4% for both).

Gas and electricity, which amounted to an expenditure of respectively, 16.5 and 15.3 billion euro (equal to 93% total energy consumption: 48% for gas and 45% for electricity) determined the total energy consumption in homes in 2016. Methane gas is widely distributed through networks, and mostly used to heat rooms, for domestic hot water and kitchen use, while the high expenses for electricity derives from lighting and appliances, including room coolers and, only to a limited extent, heating and kitchen uses.

On average, spending on energy consumption in the residential sector amounted, in 2016, to € 1,329 per year per household: € 640 for gas and € 595 for electricity (Table 6.2).

Table 6.2 – Energy consumption in households, gas and other fuels for domestic use (a) by sector, years 2014-2016

Expenses	Annual total expense (thousands of euros)			Annual average expense (€)		
	2014	2015	2016	2014	2015	2016
Electricity	14,171,494	14,813,875	15,348,827	550.0	574.4	595.0
Gas (b)	18,750,015	18,206,681	16,492,740	727.7	706.0	639.3
Diesel	559,255	501,592	479,539	21.7	19.5	18.6
Solid fuels (c)	1,836,482	1,834,770	1,753,603	71.3	71.1	68.0
Thermal energy	259,960	188,301	213,796	10.1	7.3	8.3
Total	35,577,207	35,545,220	34,288,505	1,380.7	1,378.3	1,329.2

(a) Including expenses for Electricity, Gas, diesel, Solid fuel, Thermal energy (excluding expenses for heating/central air conditioning). (b) Including methane and liquid hydrocarbons. (c) Including wood, pellets, wood chips, chipboard, coal and other solid fuels.

Source: ENEA elaboration on ISTAT data – Household spending survey.

Average savings on the annual bill of households also derive from energy efficiency actions incentivized with the 2014-2017 Ecobonus: also due to the different price levels, savings vary from 250 euros in 2014, to 150 euros in 2017 (Table 6.3).

² ISTAT elaboration on household consumptions.

³ ISTAT elaboration on household expenditures, which replaced the previous Istat elaboration on consumptions from 2014.

Table 6.3 – Ecobonus: average savings on the energy efficiency bill of households due to incentivized actions, years 2014-2017

	2014	2015	2016	2017
Overall Ecobonus savings (Mtoe/year)	0.093	0.094	0.096	0.112
Natural gas saved (Mm³)	107.73	109.19	111.25	130.14
Average cost of natural gas (€/m³, current values)	0.82	0.79	0.72	0.73
Financial savings (M€)	88.6	86.7	80.4	95.2
Real estate units incentivized with Ecobonus actions (n)	353,732	415., 28	465,751	625,646
Saving per household (€/year)	250.52	208.56	172.53	152.17

Source: ENEA elaboration on ARERA data

In fact, energy efficiency actions can account for average savings of 15% on total annual household spending on energy products. Assuming that this saving is entirely on gas, thanks to energy efficiency the annual expenditure for this fuel would be reduced by around 30% on average.

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