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Energy Union Factsheet Italy

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COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE, THE COMMITTEE OF THE REGIONS AND THE EUROPEAN INVESTMENT BANK

Third Report on the State of the Energy Union

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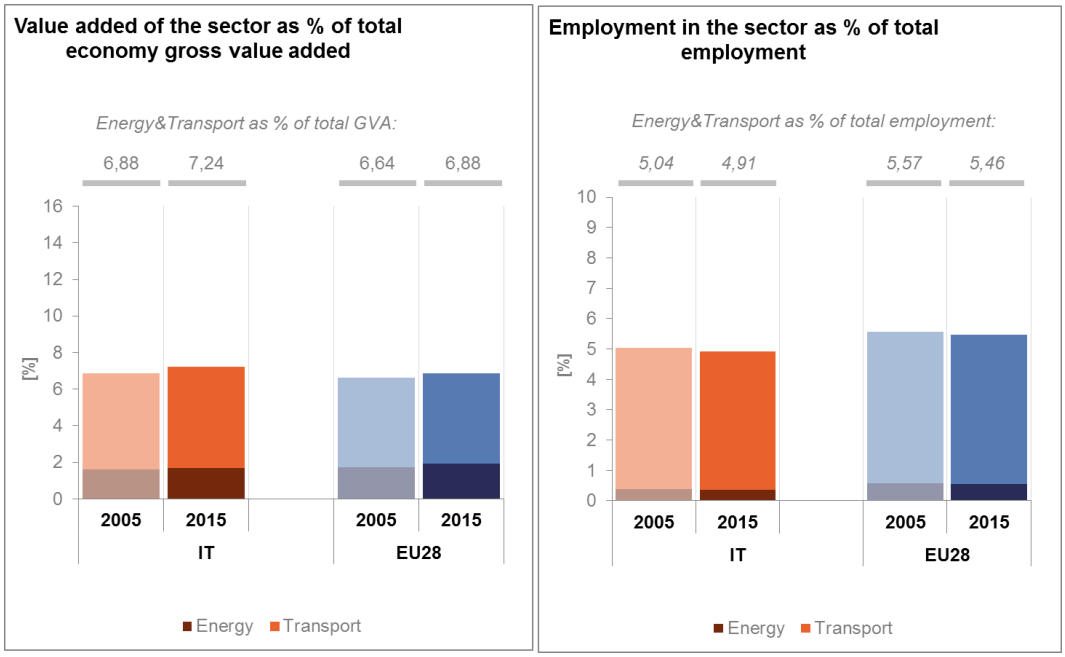
Italy

Energy Union factsheet[1]

1. Macro-economic implications of energy activities

Energy and transport are key sectors for the overall functioning of the economy as they provide an important input and service to the other sectors of the economy. Together the activity in these two sectors[2] accounted for 7.2 % of the total value added of Italy in 2015. Similarly, their share in total employment[3] was 5 % in 2015, of which 4.6 % in the transport sector and 0.4 % in the energy sector.



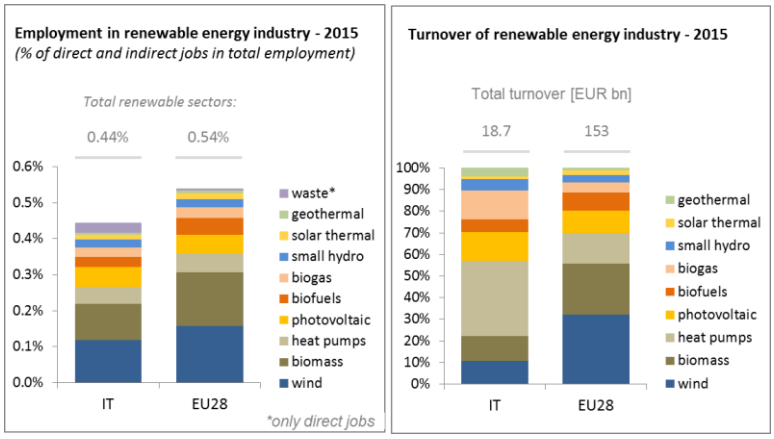
(source: Eurostat)

According to EurObserv'ER, in 2015, the share of direct and indirect renewable energy related employment in total employment of the economy in Italy was at about 0.44 %, below the EU average of 0.54 %. The turnover of the renewable energy industry in the same year was estimated at around EUR 18.7 billion, the biggest part being attributed to the biomass (EUR 2.3 billion) followed by wind (EUR 570 million), heat pumps (EUR 350 million) and biofuels (EUR 200 million) industries.

1 The indicators used in this country factsheet largely build on indicators developed for the Commission Staff Working Document "Monitoring progress towards the Energy Union objectives – key indicators" (SWD(2017) 32 final) https://ec.europa.eu/commission/sites/beta-political/files/swd-energy-union-key-indicators_en.pdf

2 Gross value added and employment in NACE sectors D-Electricity, gas, steam and air conditioning supply and H-Transportation and storage

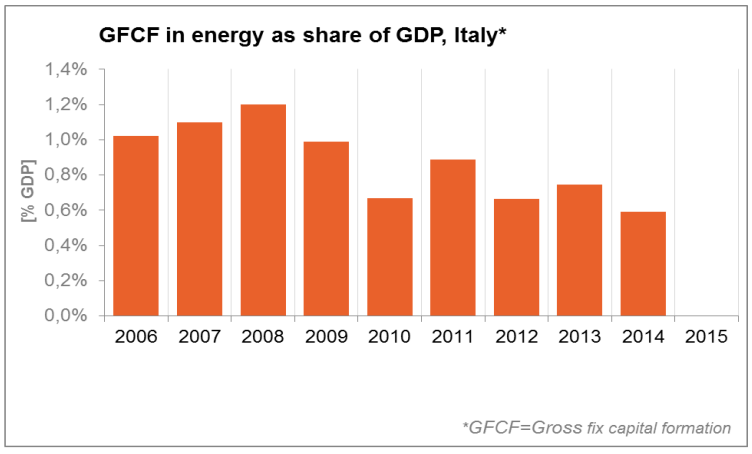
3 National Accounts, Eurostat



(source: EC based on Eurobserv'Er and Eurostat)

The decarbonisation of the energy and transport sectors will require significant investments and economic activity beyond the remit of these sectors themselves. The energy transition implies a structural shift in economic activity. Energy-related investment and jobs will in part migrate from traditional fossil fuel based activities towards construction, equipment manufacturing and other services related to the deployment of low carbon and clean energy technologies. At the moment, the efforts related to the low-carbon and clean energy transition in sectors beyond energy can only be partially quantified and are therefore not included.

An indication of the level of efforts and challenges encountered by Italy in the energy sector is given by the Gross fixed capital formation (GFCF)[4]. Investments in the electricity and gas sectors, which are taken as reference sectors, exhibited a fluctuating trend overt the period 2006-2014. After a pick of 1.2 % of the country's GDP in 2008, they almost halved in 2014.

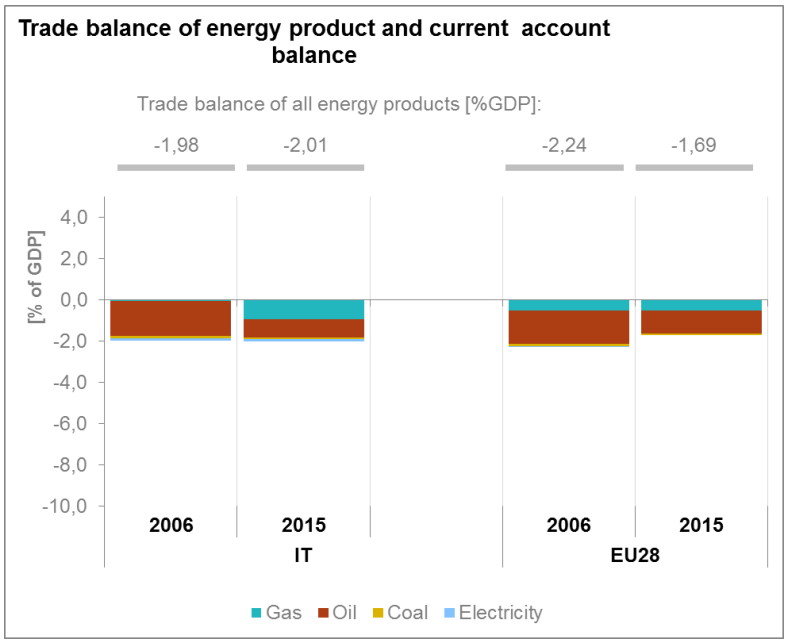


(source: Eurostat)

In terms of trade, Italy is a net importer of fossil fuels and electricity. The trade deficit in energy products overall did not show change in 2015 with respect to 2006 (2 % of GDP). There were,

[4] Gross fixed capital formation consists of resident producers´ acquisitions, less disposals, of fixed tangible or intangible assets. This covers, in particular, machinery and equipment, vehicles, dwellings and other buildings. It also includes foreign direct investment (FDI). Steam and air conditioning supply are also included in the figures mentioned above as Eurostat reports electricity, gas, steam and air conditioning supply together.

however, important variations in the composition of the import components. While coal and electricity did not show any relevant change, the import of gas increased significantly (0.9 % in 2015) and the one of oil almost halved (0.9 % in 2015).

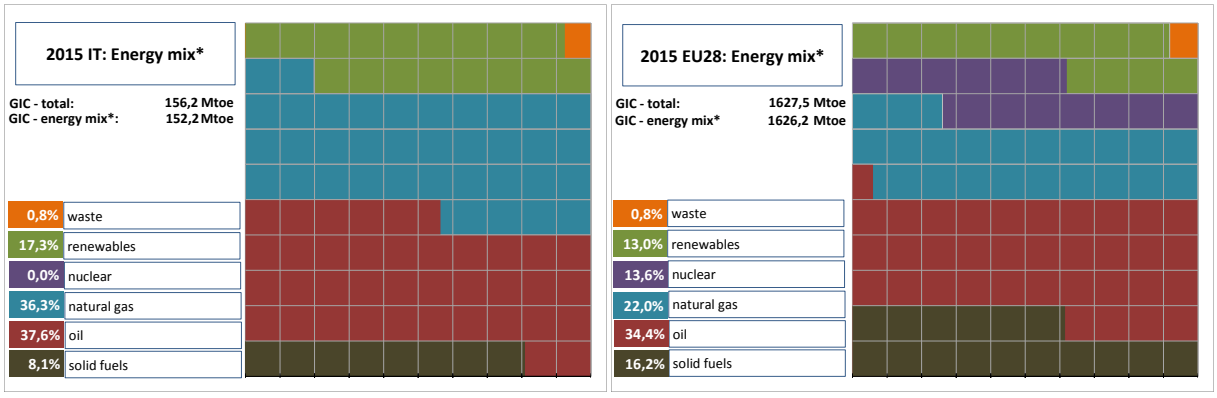


(source: Eurostat)

2. Energy security, solidarity and trust

2.1. Energy Mix

The energy mix of primary products in Italy differs from the EU-28 average mix mostly for a higher share of natural gas, a lower share of solid fuels (half the EU28 mix) and the absence of use of nuclear. Compared to 1995 data, the share of petroleum and oil products decreased (from 58 % to 37.6 % of gross inland energy consumption), while the share of renewable energy in gross inland energy consumption increased to 17.3 % in 2015. The share of natural gas increased considerably, to 36.3 % of the energy mix in 2015, and remains much higher than the EU-28 average (22 %).

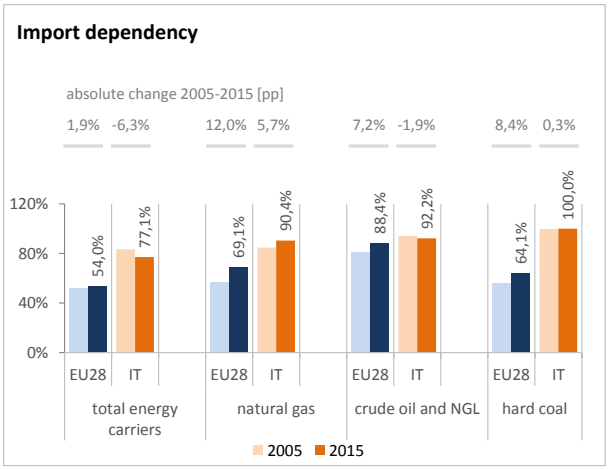


**energy mix as share share in GIC-excluding electricity and derived heat exchanges , GIC=gross inland consumption*

(source: Eurostat)

2.2 Import dependency and security of supply

Net import dependency in Italy decreased between 2005 and 2014, indicating an improvement in energy security. This was notably due to an increase in indigenous renewable energy production. Italy, however, maintains an import dependency above the EU28 for fossil fuels. Import dependency is particularly high for coal, petroleum products and gas. The Italian import dependency has increased significantly only for gas (5.7 % between 2005 and 2015) but, if compared to the evolution of overall EU import dependency on gas (12 % between 2005 and 2015), this increase remains moderate. A high share of gas imports comes from Russia[5], but otherwise, gas supply sources are relatively well diversified. As such, the country supplier concentration index is relatively low. Still, Italy experiences an energy trade deficit (expressed in percentage of GDP) above the EU average.



2015: Top non-EU suppliers for main energy carriers*

Natural gas		Crude oil and NGL		Hard coal	
IT	**EU28**	**IT**	**EU28**	**IT**	**EU28**
Russia 45,1%	Russia 37,3%	Iraq 18,6%	Russia 28,8%	South Africa 21,1%	Russia 29,1%
Algeria 12,5%	Norway 32,8%	Azerbaijan 17,9%	Norway 12,4%	Russia 20,7%	Colombia 24,3%
Libya 11,6%	Algeria 10,7%	Russia 12,9%	Nigeria 8,3%	Indonesia 17,3%	United States 16,0%

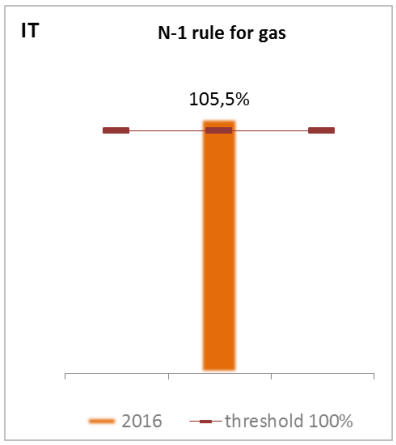
*share in total imports for the MS and in total non-EU imports for the EU28

(source: Eurostat)

The Regulation concerning measures to safeguard security of gas supply requires that, if the single largest gas infrastructure fails in one Member State, the capacity of the remaining infrastructure is able to satisfy total gas demand during a day of exceptionally high gas demand. Italy complies with this rule.

Italy plays an important role in the creation of a Mediterranean gas hub. The strategy for the diversification of gas supply is so far to be oriented towards the Southern Corridor. Within the Southern Gas Corridor, the construction of the Trans Adriatic Pipeline can play a role as long as a significant diversification of sources is guaranteed**.** Italy has also PCIs ensuring additional reverse flow capacity towards the north western markets by 2018.

[5] Top non-EU gas suppliers table is based on EUROSTAT data. The share of imports from non-EU countries is calculated as the ratio between volumes of imports from that specific non-EU supplier and total imports (from EU and non-EU countries).

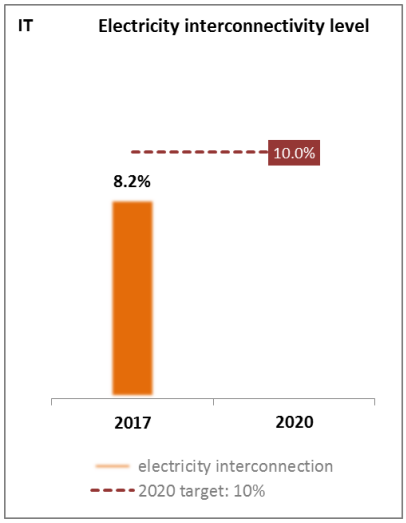


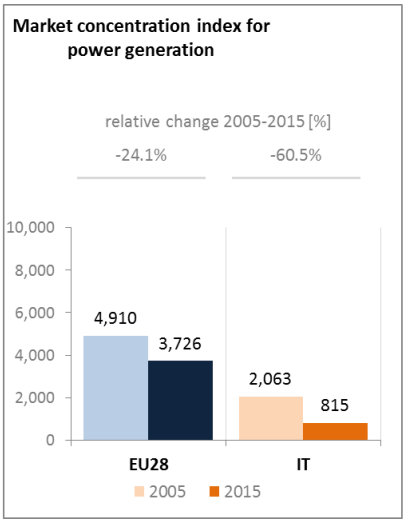
(source: gas coordination group)

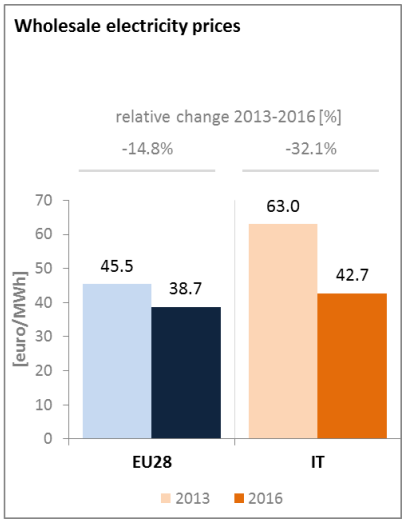
3. Internal market

3.1. Interconnections and wholesale market functioning

3.1.1. Electricity







(source: EC services based on ENTSOE source: EC services based on Eurostat source: EC services based on Platts and European power exchanges)

In 2017, the electricity interconnection level[6] for Italy was 8.2 %, below the 2020 target of 10 %. Nevertheless, the country is on the path to reach the 10% target by 2020 through the completion of PCIs currently under way. Italy remains insufficiently connected with the EU electricity market and the available interconnection capacity is not always fully exploited. In this regard, further capacity on the national network should be important to overcome internal bottlenecks and take into account the needs of security and flexibility of the system. The country still has to improve its electricity interconnection capacities with the neighbours as it relies on significant power imports with the risk of serious congestion problems.

[6] The interconnectivity level is calculated as a ratio between import interconnection and net generation capacities of the country (i.e. the 2017 value is the ratio between simultaneous import interconnection capacity [GW] and net generating capacity [GW] in the country at 11 January 2017, 19:00 pm as resulted from ENTSO-E Winter Outlook 2016/2017)

Overall, Italy has 15 Projects of Common Interest (PCIs), of which 7 are in the electricity, 1 in the smart grids and 6 in the gas sector and 1 in oil sector, with a focus mainly on interconnectors between Italy and France, Switzerland and Austria, and the necessary internal reinforcements. Altogether such investments will ease the grid constraints and reduce differences between price zones. The implementation of existing PCIs by 2020 is expected to improve Italy's interconnection capacities with neighbours to around 11 % when completed.

Italy is amongst the three Member States showing the biggest decrease between 2006 and 2014 of the cumulative market share power capacities of the main entities (-51 %) indicating that smaller companies (those with less than 5 % market share) have an increasing role in power generation.[7] This can be explained by the penetration of wind and photovoltaic generation that facilitated the entry of new market players and the decrease in market concentration in many Member States.

Furthermore, regarding the functioning of the electricity wholesale market in 2015, the market concentration index for power generation (815) indicates a significantly lower concentration than in the EU average (index of 3,726). Competition in the electricity market has been enhanced by the development of the electricity network and the excess of supply caused by demand reduction and growth in renewables. As a result, Italy registered a significant decrease in the wholesale electricity price between 2013 and 2015 (-17 %). Nevertheless, wholesale electricity prices in Italy for 2015 remain amongst the highest in Europe[8].

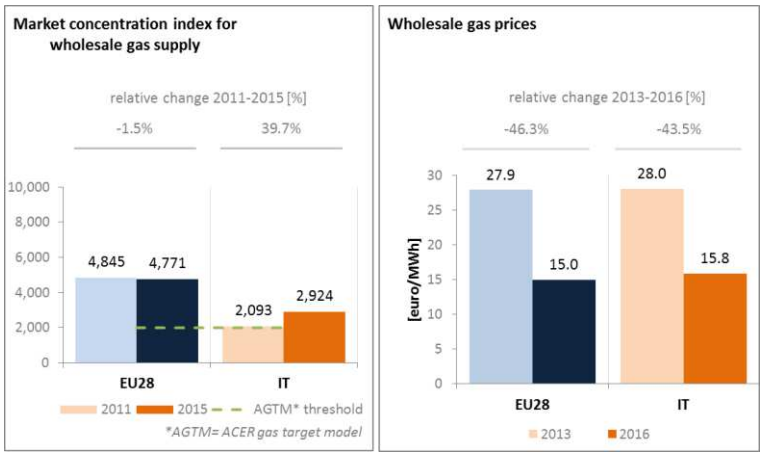
3.1.2. Gas

Italy fully unbundled the gas transmission system operators. Concentration on gas supply markets continues to improve although with ratios lower than EU average. If in 2015 the market concentration index for wholesale gas remained significantly lower than the EU average (2,924 against 4,771 for the EU), this level has increased since 2011 indicating a decrease in competition. Moreover, Italy is the Member State that has experienced the highest increase between 2010 and 2014 of the cumulative market share of main entities bringing gas in the country (+19, 5)[9]. Despite rather low market liquidity, the level of competitiveness on gas markets was somehow improved by the early introduction of congestion management rules at the Northern border.

[7] This indicator show the combined share from total generation capacity of the electricity generating companies having a share of more than 5 % of national electricity generation. https://ec.europa.eu/commission/sites/beta-political/files/swd-energy-union-key-indicators_en.pdf

[8] Wholesale electricity prices – annual average electricity price at the national power exchanges or the annual average of prices in bidding zones. In 2015 UK had the highest price, followed by four Mediterranean countries: Greece, Italy, Spain and Portugal.

[9] This indicator illustrates the combined market share of the gas importers with a market share of 5 % or more.



(source: ACER for the left graph and EC services based on Platts, gas hubs, Eurostat for the right graph)

3.2. Retail electricity and gas markets

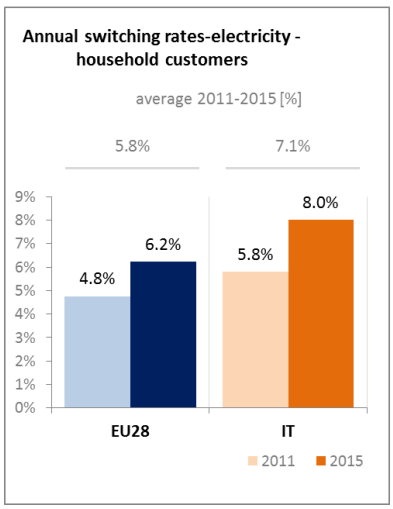
3.2.1. Electricity

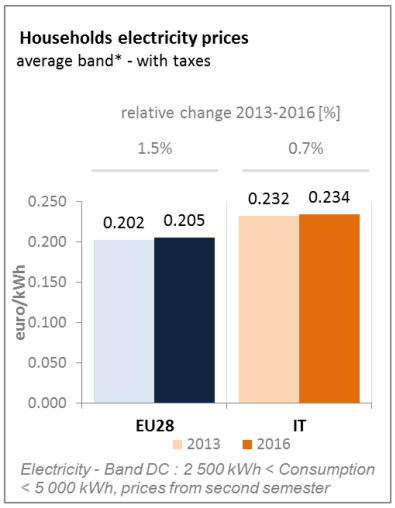
Italian retail electricity prices for industry and residential use remain among the highest in Europe. Between 2013 and 2015, average band retail electricity prices for households increased (+4 %) but in line with the EU average. This can be partially explained by an increase in taxes and levies. Domestic retail prices for electricity are in general above the EU average, with the exception of the smallest consumption classes (which are however representative for Italy: 74% of the Italian consumers are included in the first two bands). At retail level, electricity network costs, policy measures costs and taxes account, respectively, for 22 %, 22% and 14% of the final price paid by consumers. The share of taxes and levies in the Italian household electricity prices has increased about 10 % between 2013 and 2015. Italy has, nonetheless, recently adopted some measures (so-called "*Taglia bollette*") to reduce the burden of renewable energy support schemes on consumers and industry.

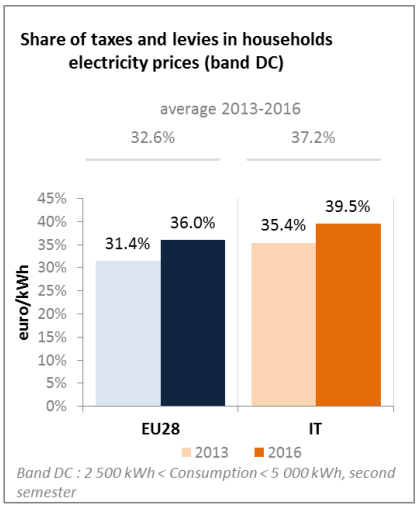
Annual switching rate among household consumers has risen for electricity (from 5.8 % in 2011 to 8 % in 2015) and is already well above the EU average (6 %). However, electricity and gas retail markets remain concentrated. Despite the numerous active electricity suppliers (about 140), the standard (monitored) offer market ("*mercato tutelato*", which is available to households only) is dominated by one company with an 85.4 % market share. The assessment of both retail electricity and gas markets in Italy is the 5th lowest in the EU and well below the EU average[10]. The planned phasing-out of the protected electric energy and gas market, even if delayed, is expected further to increase competition and consumer choice.

Smart metering deployment on ENEL's meters started already in 2001 and was completed in 2006. Italy is one of the EU top runners in deploying smart meters, together with Finland and the Netherlands.

[10] 10th Consumer Markets Scoreboard (June 2014), http://ec.europa.eu/consumers/consumer_evidence/consumer_scoreboards/10_edition/index_en.htm







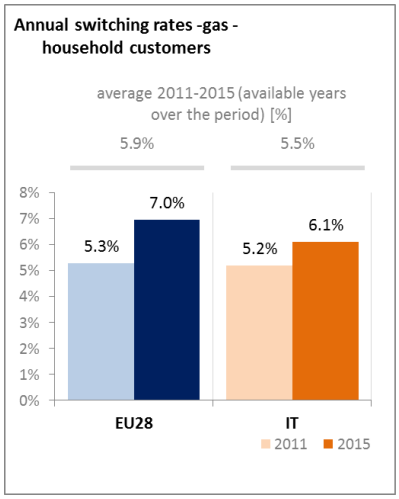
(source: ACER) *(source: Eurostat)* *(source: Eurostat)*

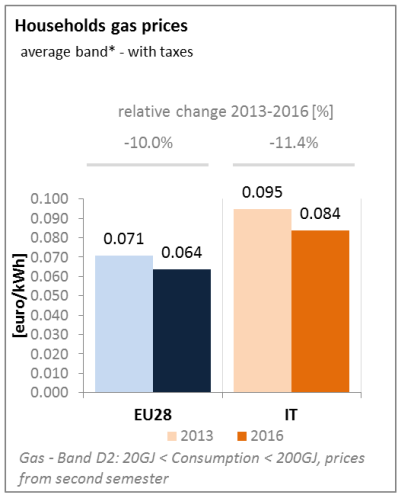
3.2.2. Gas

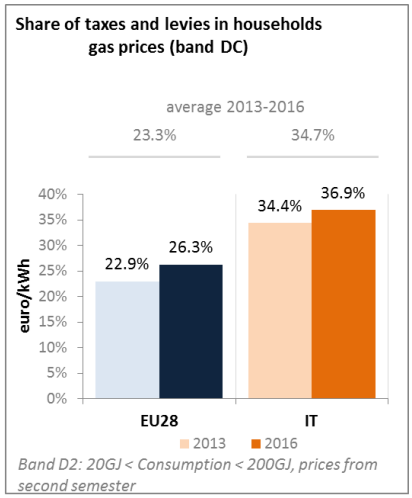
Domestic retail prices for gas are for all consumption bands amongst highest in Europe. However, between 2013 and 2016, average band retail gas prices for households decreased more than the EU average. Network costs and taxes account, respectively, for 18 % and 36 % of the final price paid by consumers. While remaining stable since 2013, the share of taxes and levies in the Italian household gas prices are 12 percentage points higher than in the average EU gas retail prices.

Annual switching rates among household consumers have risen also for gas (from 5.2 % in 2011 to 6.1 % in 2015) but at a lower rate than the average increase registered at European level. The planned phasing-out of the protected market is expected further to increase competition and consumer choice also for gas.

As regards smart meters for gas, the current target is at 60 % by 2018 for smaller gas customers.



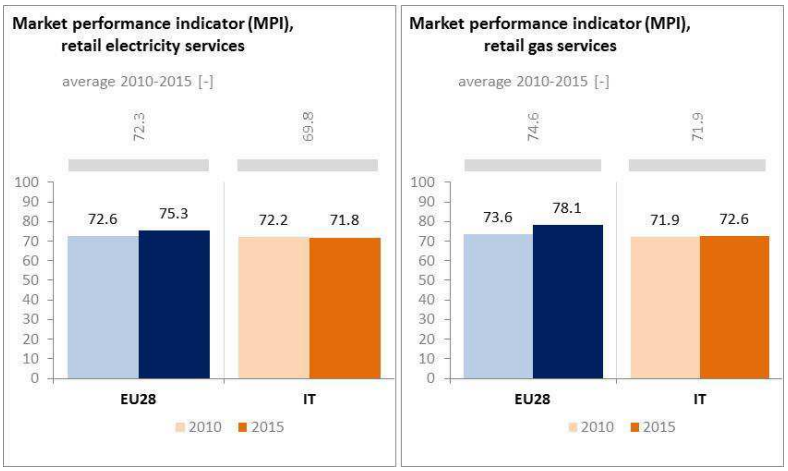




(source: ACER) *(source: Eurostat)* *(source: Eurostat)*

3.2.3. Market performance indicators

According to the periodical survey of DG JUST, the Italian consumers are less satisfied than the EU average about the services received on energy retail markets.

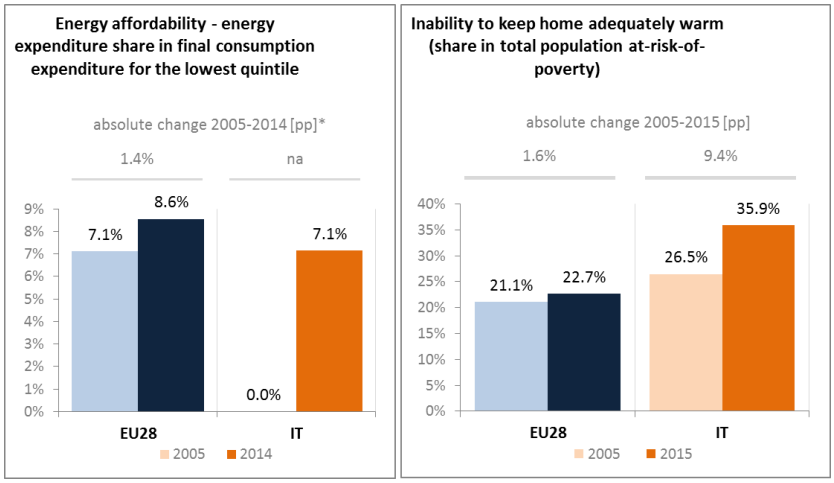


(source: DG JUST survey)

3.3. Energy affordability

2014 data on the share of energy in the total household expenditure showed that in this year the poorest households (Quintile 1) spent 7.1% of their expenditure on energy, 1.5 percentage points less than the EU-28 average.

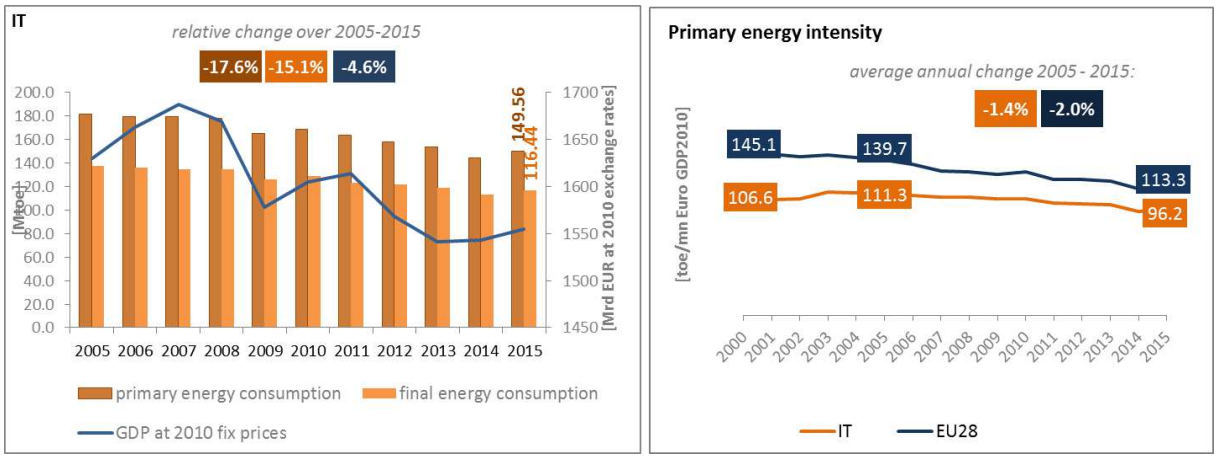
In the 2017 National Energy Strategy the Italian Government defined a comprehensive strategy to tackle energy poverty based on: 1) the adoption of an official definition and of national measures; 2) a thorough review of the existing policies; 3) the creation of an Italian Energy Poverty Observatory (IPOV) which will work in coordination with the European Energy Poverty Observatory (EPOV).



(source: ad-hoc data collection of DG ENER based on HBS with the support of Eurostat and national statistics)

4. Energy efficiency and moderation of demand

Italy's indicative 2020 energy efficiency target is at 158 Mtoe expressed in primary energy consumption (124 Mtoe expressed in final energy consumption). The target was set at a level that would allow energy consumption to grow in the coming years. Italy increased its primary energy consumption by 4 % from 143.84 Mtoe in 2014 to 149.56 Mtoe in 2015. Final energy consumption increased by 3% from 113.35 Mtoe in 2014 to 116.44 Mtoe in 2015. Even if Italy has already achieved and is below its indicative national 2020 targets, given the upward trend observed in the more recent years it would still need to make an effort to keep these levels in check until 2020.

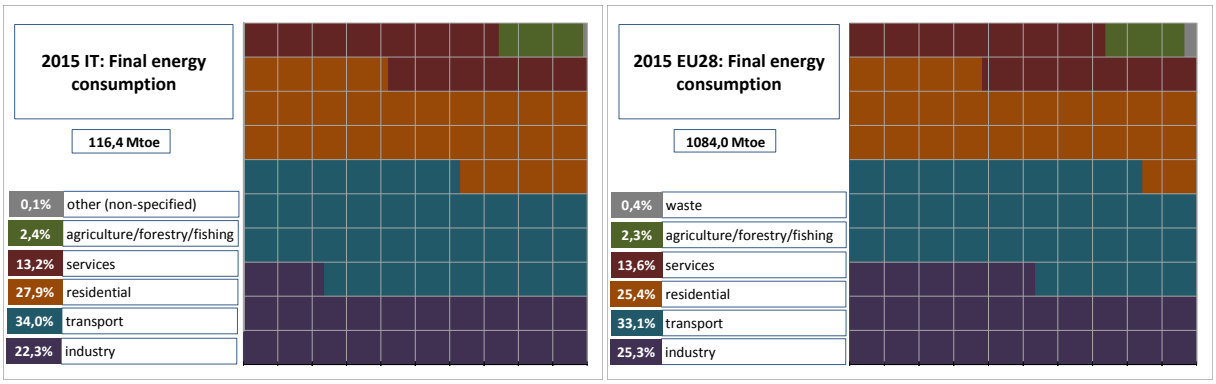


(source: Eurostat)

Although primary energy intensity decreased over 2005-2015 remaining well below the EU average, it decreased at a slower pace. In 2015, transport was the largest energy consuming sector representing a 34 % share in the total final energy consumption, which is above the EU average (i.e. 33.1 %). Also, the energy consumption of the residential sector is above the EU average, with a share in total final energy consumption of 27.9 %. To tackle this challenge, Italy provides a tax credit for energy efficiency improvement measures in residential buildings, which also covers an option of a comprehensive retrofit package. The total costs (public and private) of the Italian scheme were estimated to be 12 euro cents/kWh of saved energy year 2016. The total investment was 31.2 billion (2007-2016) with a tax expenditure of around EUR 18.2 billion[11] for the same period. According to the ex-post assessment, it led to energy savings of 1,08 Mtep/year.[12] The energy consumption of Italy's industrial sector in 2015 represented around 22.3 % of total final energy consumption, well below the EU average of 25.3 %. The energy consumption of the services sectors is aligned with the EU average, with a share in total final energy consumption of 13.2 % against the 13.6 % at EU level.

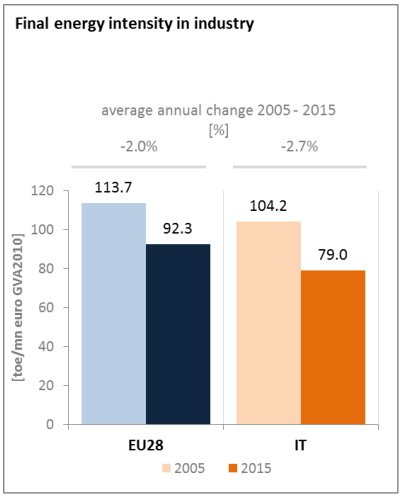
[11] Rapporto Annuale Detrazioni fiscali del 65% per la riqualificazione energetica del patrimonio edilizio esistente, 2017, ENEA - Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile

[12] Rapporto Annuale Efficienza Energetica 2017, ENEA - Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile.

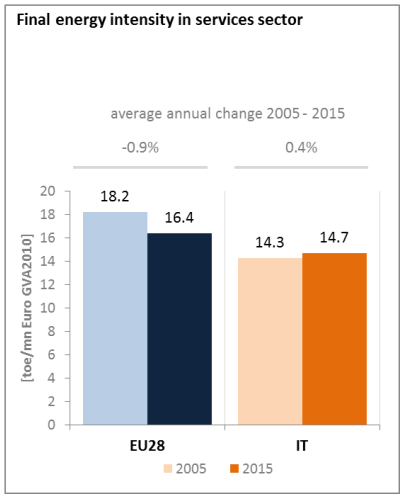


(source: Eurostat)

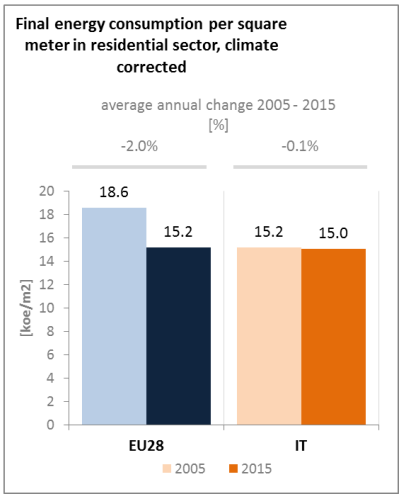
In terms of energy efficiency, progress can be observed in the final energy intensity in industry whilst in the services sector virtually no change has taken place in the period 2005-2015. In the final consumption per m2 for the residential sector, there has been a slight improvement.



(source: Eurostat)

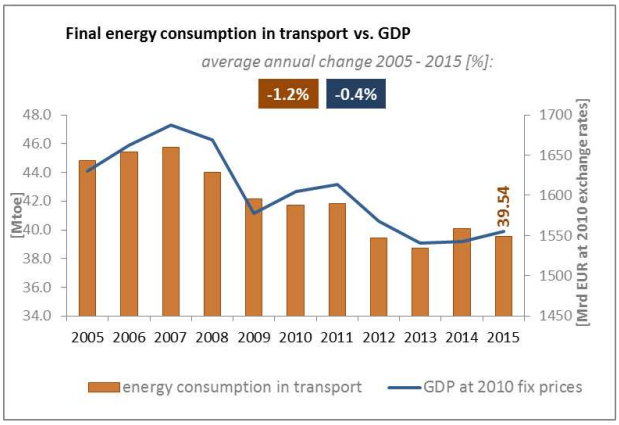


(source: Eurostat)

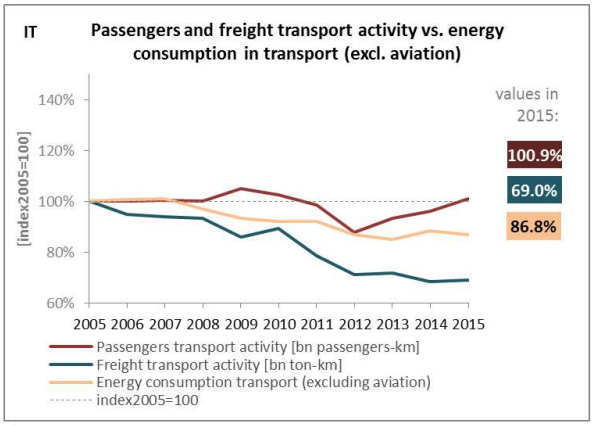


(source: Odyssee database)

Between 2005 and 2015 in Italy, the final energy consumption in transport recorded an average annual decrease of 1.2 %, which was bigger than the average annual decrease of the GDP in this period. The decrease of final energy consumption was mostly driven by a strong decline of freight transport activity affected by the economic context.



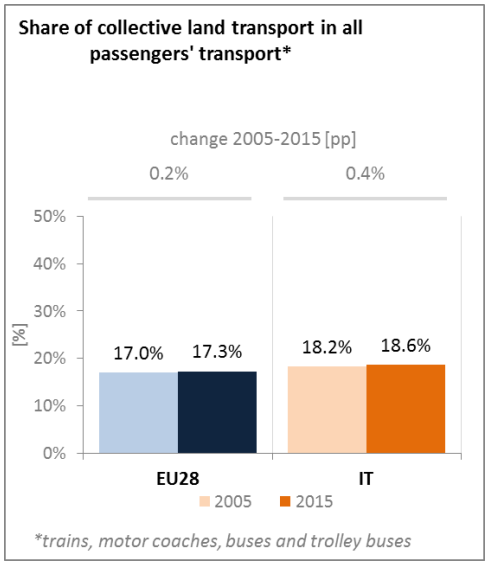
(source: Eurostat)



passengers transport activity=Private cars + bus + rail + tram & metro
freight transport activity=road+rail+inland waterways+pipeline

(source: Eurostat and DG MOVE pocketbook)

The share of collective passengers land transport into total passengers' transport slightly increased between 2005 and 2015 indicating a higher use of public transport in Italy compared to the EU level.



(source: Eurostat)

Italy took a progressive step for the transport planning, programming and investments with the 2016 Annex on infrastructure to the Economy and Finance Document ("Documento Economia e Finanza"), which introduced two new tools: a general plan for transport and logistics (Piano generale trasporti e logistica - PGTL) and a document of multiannual planning (Documento Pluriennale di Pianificazione - DPP).

A national strategic plan for ports and logistics to increase efficiency and rationalise the port sector was presented in 2015, and its full implementation is still ongoing. However, the Italian railway sector continues to face the challenge of a persistent gap between northern and southern regions, in terms of both infrastructure endowment and traffic management technology. The Italian authorities have announced a pro-market privatisation of the railway incumbent company (Ferrovie dello Stato), which nevertheless has been postponed several times. Local transport services still face a number of weaknesses in terms of quality and infrastructure and in-house awards are prevailing, although local public transport firms selected through competitive tenders show a higher level of productivity.

Italy is also active in promoting modal shift. In this respect, examples of good practices are the Ferrobonus scheme, aiming at encouraging the shift of freight transport from road to rail and the network of multimodal logistic platforms ("interporti", PPPs) based on ad-hoc existing legislation.

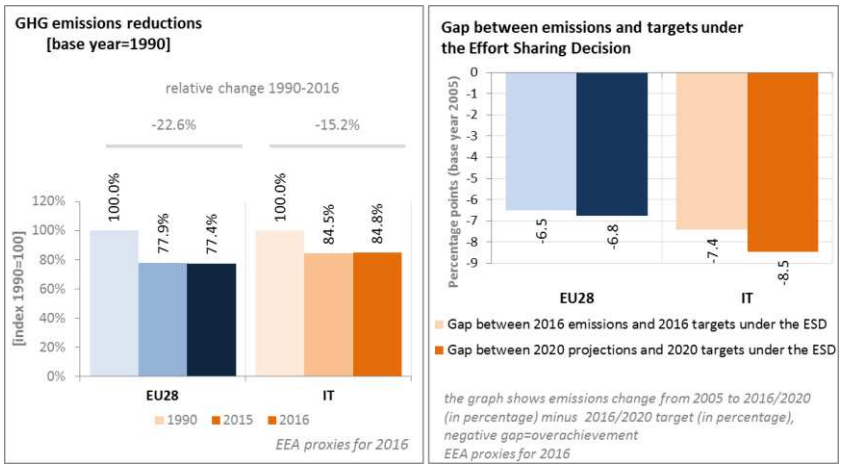
5. Decarbonisation of the economy

5.1. GHG emissions

Italy has a greenhouse gas emissions target of -13 % in non-ETS sectors in 2020 (compared with emissions in 2005). According to approximate data for 2016, emissions decreased by 17 % between 2005 and 2016.

According to the latest national projections submitted to the European Commission in 2017 and taking into account existing measures, emissions are projected to decrease by 21 % by 2020 as

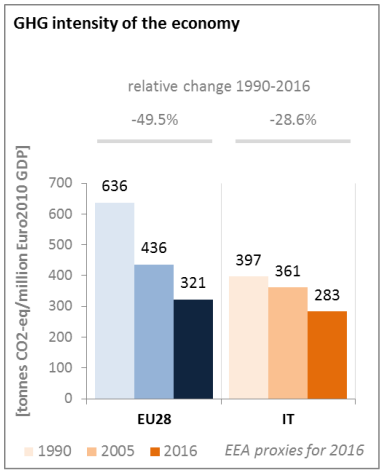
compared with 2005. Therefore, Italy is on track to reach its 2020 greenhouse gas emission reduction target, with an 8 percentage point margin.

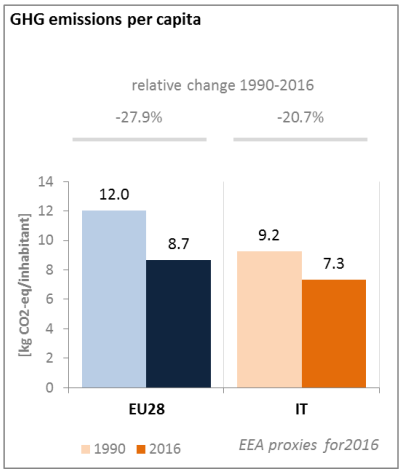


(source: EC and EEA)

According to 2016 EEA estimates, the GHG intensity of Italy's economy was below the EU average. In 2016, the GHG emissions per capita in Italy were below the EU average and they have decreased by around 21% since 1990.

In 2015 in Italy, the largest sectors in terms of GHG emissions were the energy and transport sector (both representing approximately 1/4 of the total GHG emissions) followed by industry (19.1 %), and residential and commercial sectors (17.1 %). In relative terms, the GHG emissions from the transport and residential and commercial sectors were well above the EU average (respectively 24.5 % vs an EU average of 21 % and 17.1 % vs an EU average of 12.8 %).



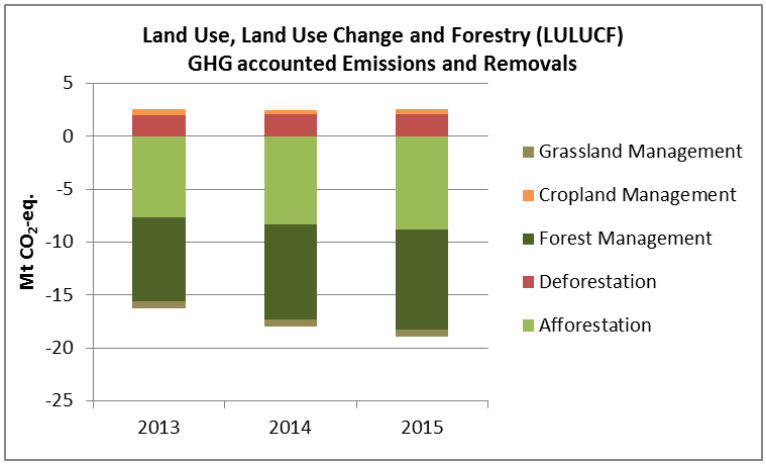


Largest Sectors of GHG Emissions in 2015	IT	EU28
Energy/power industry	26.2%	30.9%
Transport	24.5%	21.0%
Industry	19.1%	19.9%
Agriculture (incl. forestry & fishery)	8.7%	12.0%
Residential & Commercial	17.1%	12.8%
Waste	4.3%	3.2%
Other	0.1%	0.2%

(source: EC and EEA)

Preliminary accounts under the Kyoto Protocol for Italy show overall removals of -15.2 Mt CO_2-eq. as an annual average in the period 2013-2015. For comparison, the annual average of the EU-28 accounted for removals of -119.0 Mt CO_2-eq. It should be noted that in this preliminary simulated accounting exercise, removals from Forest Management did by far not exceed the accounting cap.

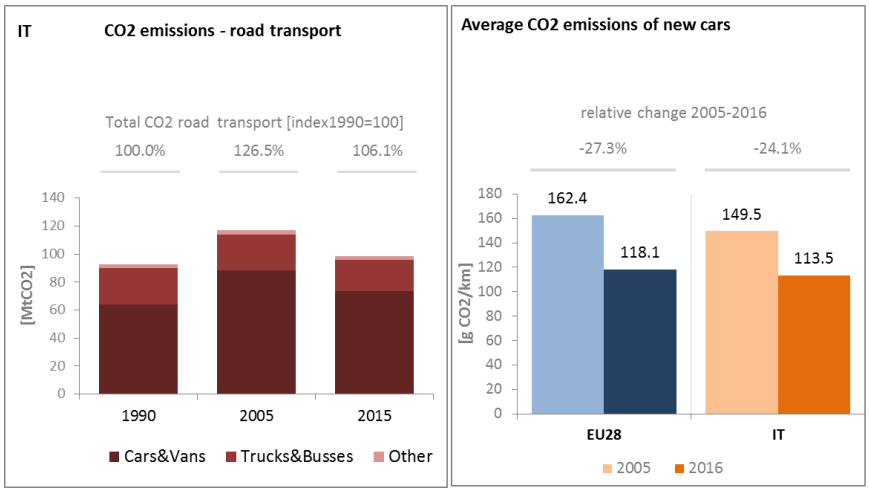
Removals by Afforestation are notably higher than emissions by Deforestation; however, removals by Forest Management gained relative importance over time and becoming the most important contributor in 2015. Removals by Grassland Management and emission by Cropland Management show very small shares. Overall, there is a clearly increasing trend in removals, mainly due to increasing removals by Forest Management and Afforestation. Deforestation shows no change in emissions over the course of the three-year period.



Note: Forest Management credits are capped and presented as yearly averages when the total Forest Management credits of the considered period exceed the simulated cap over the same period.
(source: EC and EEA)

CO_2 emissions in transport and alternative fuelled vehicles

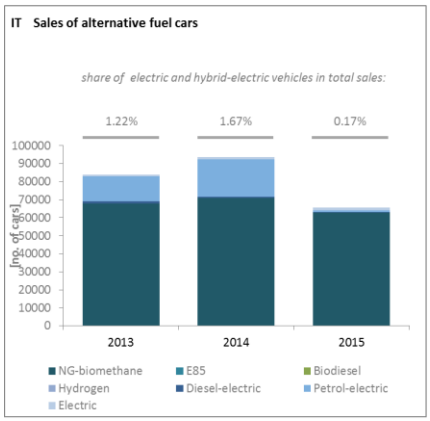
The average CO_2 emissions of new cars in Italy in 2016 were below the EU average and steadily decreased between 2005 and 2016.

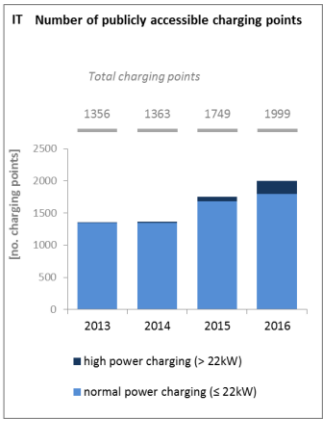


(source: European Environment Agency)

The shares of alternative power trains in the new cars sold during the last three years remain limited, in particular for electrically rechargeable vehicles. Italy is focusing on natural gas as a main option to support the objectives of sustainable mobility.

In the period from 2013 to 2016, the number of electric charging points in Italy has increased with more than 600 units, from 1 350 charging points in 2013 to 1 999 points in 2016.





(European Environment Agency) *(European Alternative Fuels Observatory)*

National Policy Frameworks under Directive 2014/94/EU on alternative fuels infrastructure have to establish targets, objective and measures for the development of the market of alternative fuels in the transport sector and the deployment of the relevant infrastructure. Italy has submitted its National Policy Framework as requested under article 3 of the Directive 2014/94/EU.

A detailed assessment of the Italian National Policy Framework in terms of its compliance with the requirements of Directive 2014/94/EU on alternative fuels infrastructure, its contribution to achievement of long-term energy and climate objectives of the Union and coherence of its targets and objectives in terms of cross-border continuity has been published as part of the Communication on Alternative Fuels Action Plans (COM(2017)652) and the related staff working document SWD(2017)365.

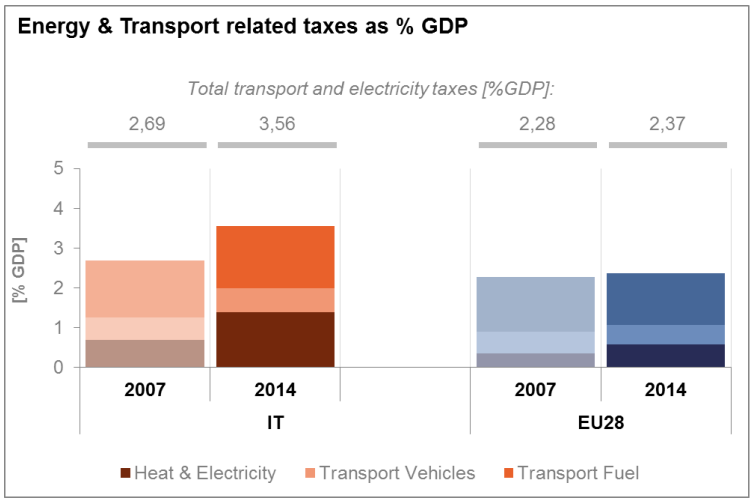
5.2. Adaptation to climate change

The Italian National Adaptation Strategy was adopted in 2015 with a Directional Decree of the Climate Change and Energy General Directors. A National Adaptation Plan (PNAC) and Sectoral Adaptation Plans are currently still under development. The main adaptation activities implemented to date concern the most vulnerable sectors such as agriculture, water use, forests, human health, flood risk, desertification and drought, coastal areas, biodiversity, tourism, and urban settlements. A monitoring system, aimed at evaluating progress in implementing the NAS, is not yet in place, neither at the national level nor at the regional level. The NAP will provide guidelines for monitoring the implementation of adaptation actions and their efficiency.

5.3. Taxes on energy and transport and fossil fuel subsidies

The overall tax burden on energy and transport in Italy amounts to 3.6% of GDP, i.e. considerably higher than the EU average (1.2 p.p. in 2014). While fuel and vehicles taxation are broadly in line with the EU-average and almost stable between the two considered years, the tax burden on heat and

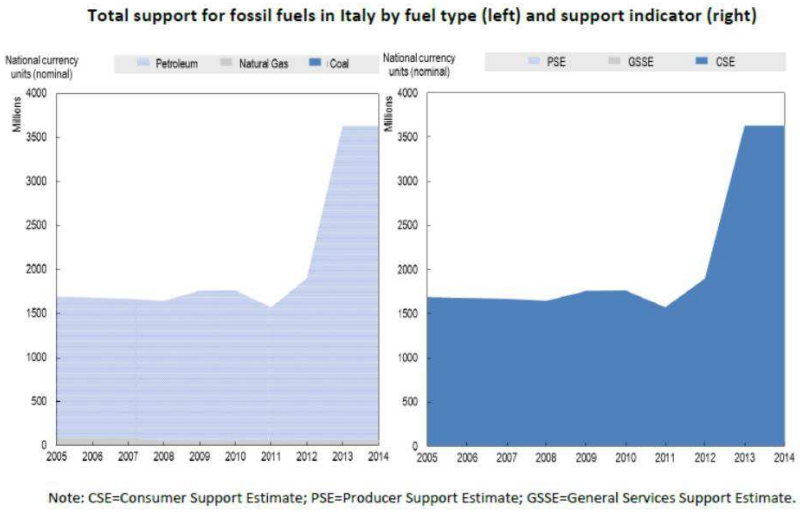
electricity is significantly higher (1.4% with respect to 0.6% EU average in 2014), and has nearly doubled during the period. There is no carbon component in the vehicle or the energy tax framework.



(source: Eurostat)

Hovering at a stable level for many years, the amount of support dedicated to fossil-fuel consumption in Italy has risen sharply since 2012. This development is mainly a result of the nominal increase in tax credits granted to trucking companies for the purchase of diesel.

No overall data are available on the fiscal costs of the subsidies supporting the production of fossil fuels in Italy. However, it has to be noted that Italy granted a State aid in favour of Carbosulcis S.p.A.to finance the irrevocable orderly winding down of activities of the Nuraxi Figus mine - the only operational coal mine in the country. The objective of the aid measure is to facilitate the closure of the mine by the end of 2018, to cover current production losses in the period 2011-2018 arising from the operation of the mine in accordance with the rules set out in the Council Decision 2010/787/EU. The measure is further intended to cover exceptional costs arising from the definitive closure of the mine. In this context, the Italian authorities have provided an environmental protection plan to mitigate the environmental impact of coal production which includes renewable energy installations, and coal desulphurisation[13].



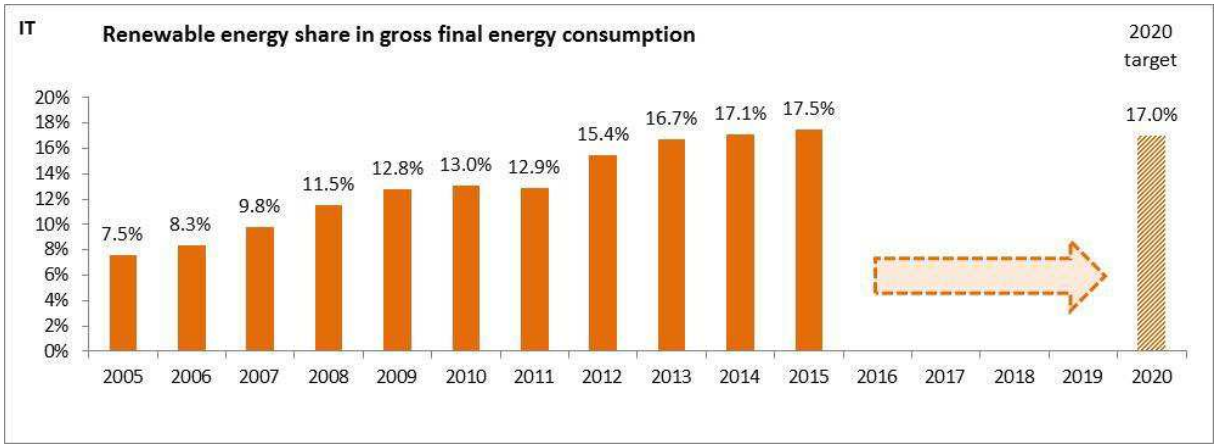
[13] Cf http://ec.europa.eu/competition/state_aid/cases/246720/246720_1726073_167_2.pdf

(source: OECD Inventory of Support Measures for Fossil Fuels 2015)

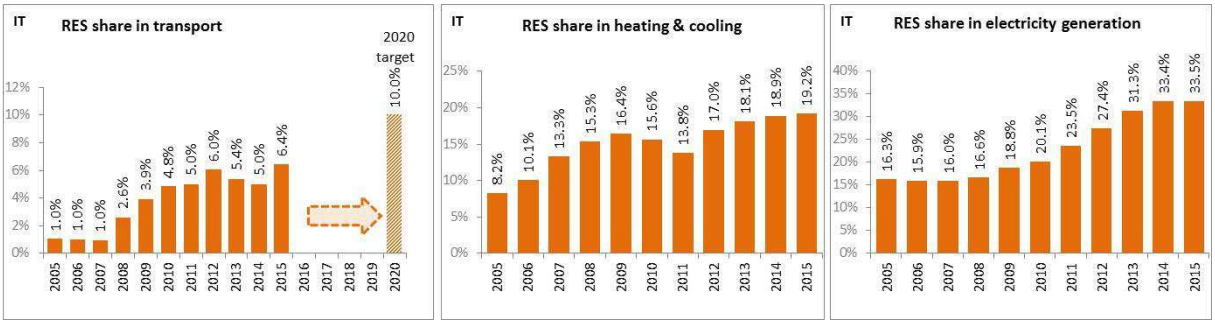
5.4. Renewable energy

With a renewable energy share of 17.1 % in 2015, Italy has already reached the 2020 target. The share of renewable electricity generation in final electricity consumption and in heating and cooling more than doubled between 2005 and 2015, increasing from 16.3 % to 33.5 % and from 8.2 % to 19.2 % respectively. Due to its large resource potential, Italy is also one of the three countries (with France and Hungary) that are leading the European geothermal production and with Sweden, France, Austria and Spain accounts for around 70 % of all hydropower in the EU-28. In 2015, 38 % of the solar-PV electricity in the EU-28 was produced in Germany, Italy and Spain. Italy is also the leading country in the deployment of heat pumps, primarily used for cooling. On the contrary, Italy is still far from reaching the 2020 renewable energy share in transport despite the fact that the country is one of the main consumers of biodiesel.

Past changes in support schemes for renewables (e.g. retroactive cuts in feed-in tariffs for existing projects), the uncertainty about the post-2016 regulatory framework for renewables, and persistent burdensome administrative procedures limited market growth during the last couple of years.

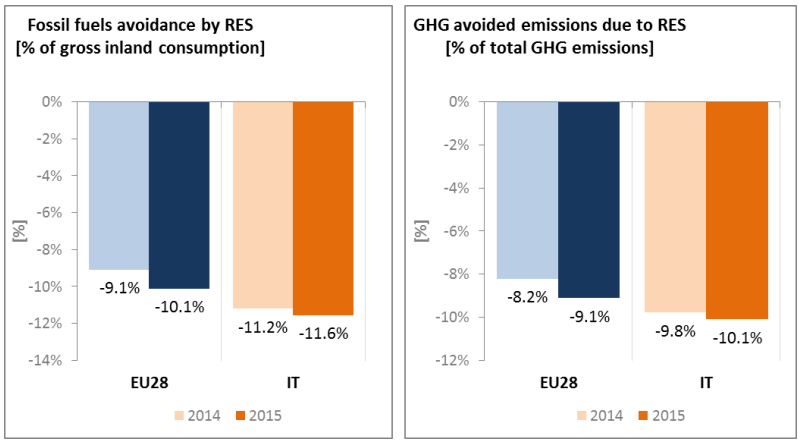


(source: Eurostat-SHARES)



(source: Eurostat-SHARES)

Due to a consistent deployment of renewables since 2005, it is estimated that Italy avoided in 2015 about 11.6 % of the fossil fuel in gross inland consumption and about 10.1 % of GHG emissions at national level[14].

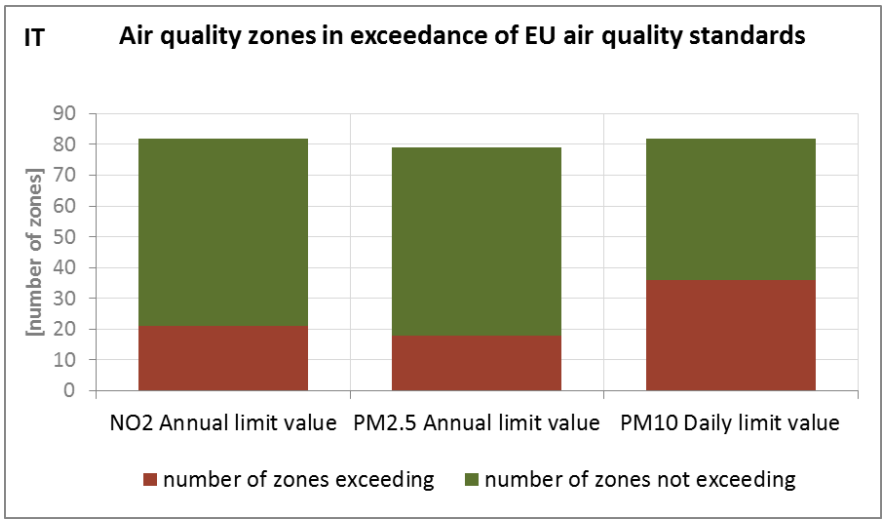


(source: EEA)

5.5. Contribution of the Energy Union to better air quality

Air quality in Italy continues to give cause for concern. For the year 2013, the European Environment Agency estimated that in Italy about 66,630 premature deaths were attributable to fine particulate matter ($PM_{2.5}$) concentrations and 21,040 to nitrogen dioxide (NO_2) concentrations[15].

For both pollutants Italy reported exceedances of the binding EU air quality standards[16]. For the year 2015, Italy reported exceedances of the limit value for PM_{10} in 36 out of the 82 air quality zones in Italy, while exceedances of the limit value for $PM_{2.5}$ were reported in 18 zones and of the limit value for NO_2 in 21 out of the 82 zones as shown in the figure below.



[14] Avoided GHG emissions mentioned here have a theoretical character as these contributions do not necessarily represent 'net GHG savings per se' nor are they based on life-cycle assessment or full carbon accounting.

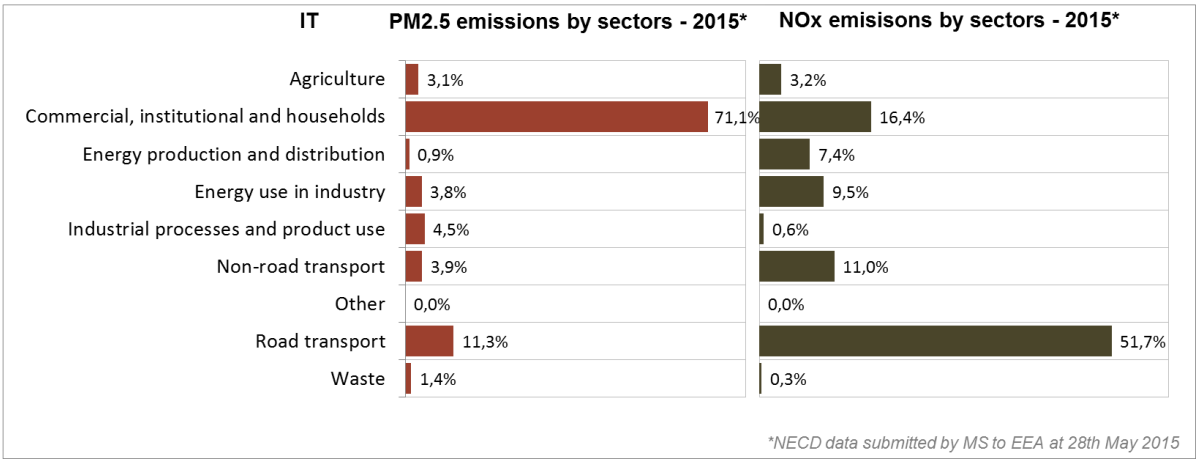
[15] European Environment Agency, 2016, Air Quality in Europe – 2016 Report, table 10.2. The report also includes details as regards the underpinning methodology for calculating premature deaths.

[16] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe, OJ L 152, 11.6.2008, p.1-44

(source: EEA)

The health-related external costs from air pollution have been estimated to be more than EUR 47 billion/year (income adjusted, 2010), which includes the intrinsic value of living a healthy life without premature death as well as the direct costs to the economy such as healthcare costs and lost working days due to sickness caused by air pollution[17].

The Energy Union can substantially contribute to addressing these air quality problems through measures reducing emissions of both GHG and air pollutants such as PM and nitrogen oxides (NO_x) from major contributing sectors such as (road) transport, energy production, industry and residential heating (e.g. stoves and boilers) as shown in the figure below[18].



(Source: EEA. This table reflects only sources of primary $PM_{2,5}$ emissions.)

6. Research, innovation and competitiveness

6.1. Research and innovation policy

The Italian National Energy Strategy adopted in 2013 aimed at paving the way for wider and more effective participation of industry and Italy's public and private research centres in R&I programmes. The Strategy proposed a series of new measures which were effectively incorporated into R&I-related policy frameworks (e.g. the Fund for System Research in the Electricity Sector and the Fund for Sustainable Growth). The new Energy Strategy released for public consultation in 2017 identified several technology areas as prospective priority sectors for R&I efforts at the national level, such as solar energy, geothermal, wave energy, technologies enhancing the security and resilience of the electricity system, storage systems, electric mobility, biorefineries, advanced materials, and energy efficiency in buildings and industry[19].

[17] See also the EU Environmental Implementation Review Country Report for Italy, SWD(2017)47 final of 3.2.2017

[18] National emission data as reported by the Member States to the EEA (available on the EEA's Eionet/Central Data Repository), http://cdr.eionet.europa.eu/it/eu/nec_revised

[19] At the time of this writing the National Energy Strategy is being revised to incorporate comments received from stakeholders during the public consultation phase. The official release of the Strategy is expected before the end of 2017.

In addition, the Italian Central Government has undergone a substantial revision of the governance of the public research system through a National Research Plan (PNR) for the period 2015-2020 that includes all R&I activities related to energy and clean technologies. This revision aims to reduce fragmentation in the R&I landscape. The PNR's budgetary allocation was EUR 2.5 billion.

Italy's technological innovation activities are closely co-ordinated with the European Union Strategic Energy Technology (SET) Plan, where Italy is also a very active contributor. It participates in all the temporary working groups for the implementation of the integrated SET Plan, co-leading those dedicated to energy systems, deep geothermal and renewable fuels and bioenergy.

Regarding the Horizon 2020 programme, Italy has so far received 10% of the EU contribution devoted to the 'secure, clean and efficient energy' part of the programme. As of September 2017, 480 participations from Italian organisations have been awarded EUR 182 million in Horizon 2020 energy projects. This includes a grant of EUR 9.6 million to SOLIDpower for its participation in project PACE (residential fuel cell combined heat and power installations), and three grants totalling over EUR 3.5 million to Italian beneficiaries participating in project ORC-PLUS (innovative thermal energy storage for CSP plants).

Italy is a founding member of Mission Innovation (MI)[20]. As a result, it has committed to doubling MI-related public funding of clean energy RD&D21 from EUR 222.6 million in 2013 to EUR 445.3 million in 2021. These additional investments will focus on low carbon technologies, including energy efficiency in industry and buildings, renewable energy, electricity grid (including smart cities), energy storage as well as basic energy research. Investments will be implemented through a number of mechanisms including cost-shared projects with the private sector, research and development activities at the R&D National Agencies, grants to universities, and Cohesion Funds at regional level.

6.2. Investments and patents in the Energy Union R&I priorities

In 2014, public (national) investments in the Energy Union R&I priorities reached EUR 542 million, having increased by 6 % compared to 2013. This was the highest annual public investment reported in the period 2007-2014. The largest share of investments (54%) was attracted by the Smart System R&I priority of the Energy Union, followed by the Nuclear Safety and the Renewables priorities (14% each). In 2014, the most recent year for which data for most Member States are available, public investment per GDP in Italy was similar to the EU average.

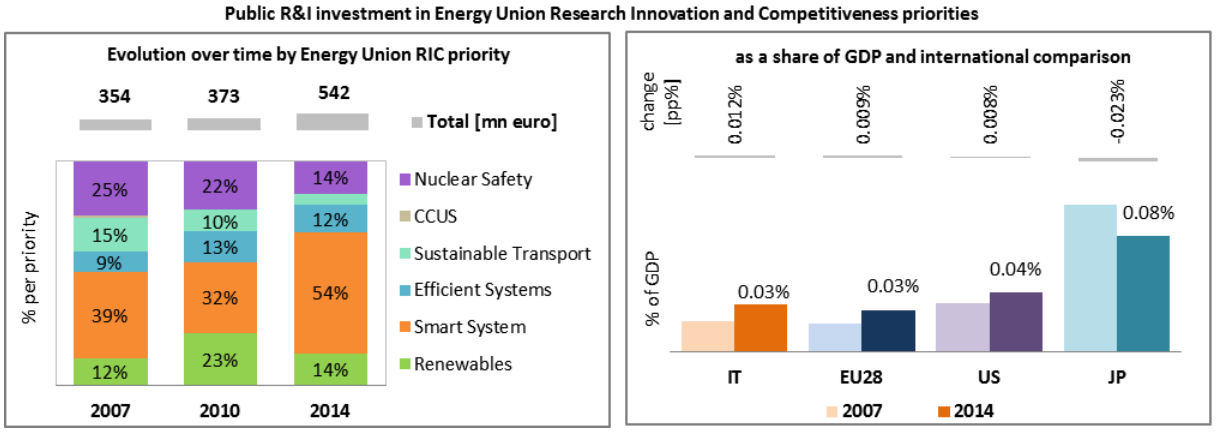
Private investment in the Energy Union R&I priorities in 2013 was estimated at EUR 717 million (4% of the private R&I investment in Energy Union R&I priorities in the EU). The focus was on Renewables, which received 32% of these investments, followed by Efficient Systems (24%) and Smart System priority (21%).

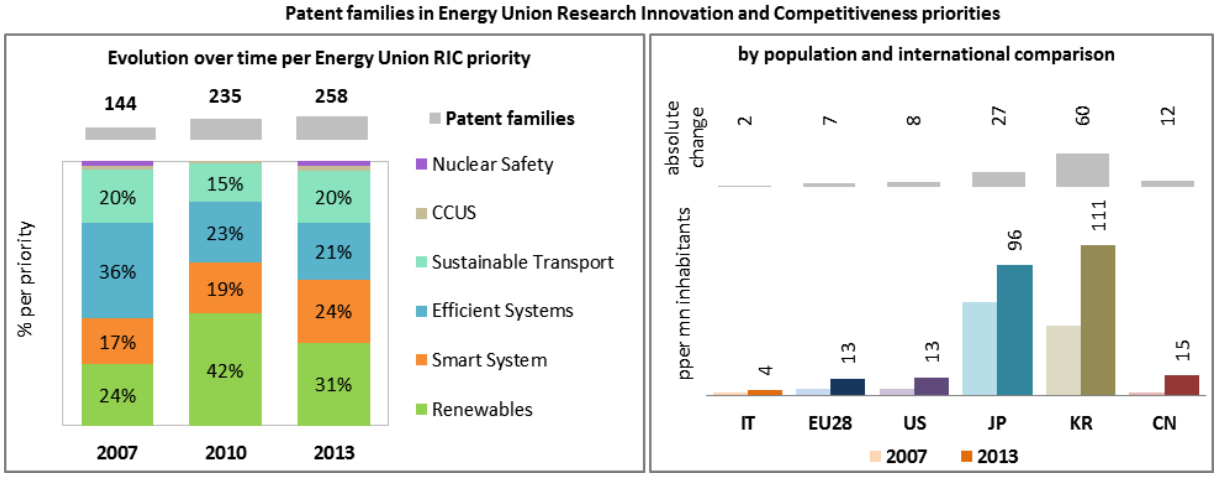
[20] http://mission-innovation.net/

[21] The baseline for doubling under the MI pledge is composed of clean energy RD&D spending in focus areas for Mission Innovation, so it does not necessarily include all areas of RD&D research in clean energy in a specific country (e.g., nuclear).

In 2013, the most recent year for which complete patent[22] statistics are available, 227 companies and research organisations based in Italy filed 258 patents in low-carbon energy technologies (4% of the EU total). The focus was on Renewables (31%), followed by the Smart System (24%) and Efficient systems priority (21%).

In 2013, private R&I investments and patents in Energy Union R&I priorities were lower than the EU average when normalised by GDP and by population respectively. In the period 2007-2013, both private R&I investments and the number of patents in Energy Union R&I priorities increased on average by 1% and 10% per year, displaying lower average rates of increase than the indicators at EU level (6% and 15% respectively).





(Data sources: Public investment as available in the International Energy Agency RD&D Statistics database[23] for codes relevant to Energy Union RIC priorities. Patent data based on the European Patent Office PATSTAT database[24]. Private investment as estimated by JRC SETIS. Detailed methodology available from the JRC[25].)

[22] In the context of this document, the term 'patent' refers to patent families, rather than applications, as a measure of innovative activity. Patent families include all documents relevant to a distinct invention (e.g. applications to multiple authorities), thus preventing multiple counting. A fraction of the family is allocated to each applicant and relevant technology.

[23] http://www.iea.org/statistics/RDDonlinedataservice/

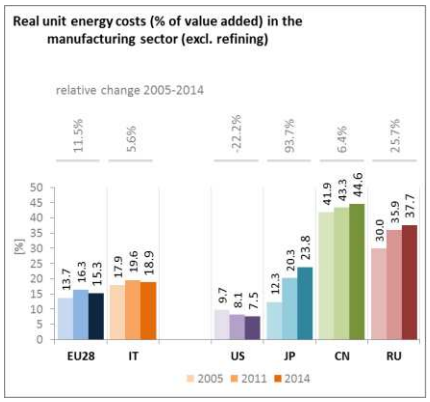
[24] https://www.epo.org/searching-for-patents/business/patstat.html#tab1

[25] https://setis.ec.europa.eu/related-jrc-activities/jrc-setis-reports/monitoring-ri-low-carbon-energy-technologies

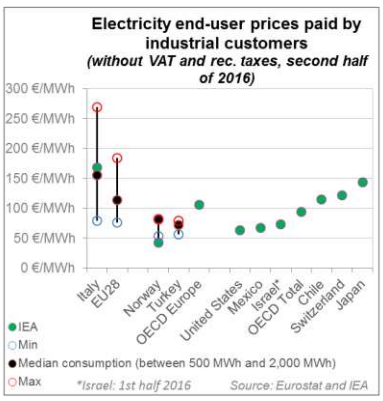
6.3. Competitiveness

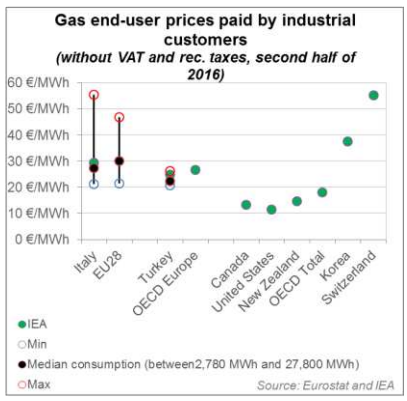
The real unit energy costs (RUEC)[26] in Italy (18.9) were above those at the EU average (15.3), almost three times more than those in the US but below those in Japan and China. The energy intensity[27] of Italy's manufacturing sector is slightly lower than the EU's and much lower than of the US, while real energy prices are higher vis-à-vis both. In recent years, manufacturing firms' profit margins have recovered somewhat thanks to the moderation in nominal unit labour costs and lower energy costs.

Regarding electricity prices paid by industrial customers, Italy experiences one of the highest prices in the EU, and higher than most non-EU trade partners too. Conversely, gas prices for industrial consumers are aligned with the EU and OECD averages. There is, however, both for electricity and gas, a large discrepancy between minimum and maximum prices paid industry, based on the level of consumption.



(source: ECFIN)





(source: Eurostat and IEA)

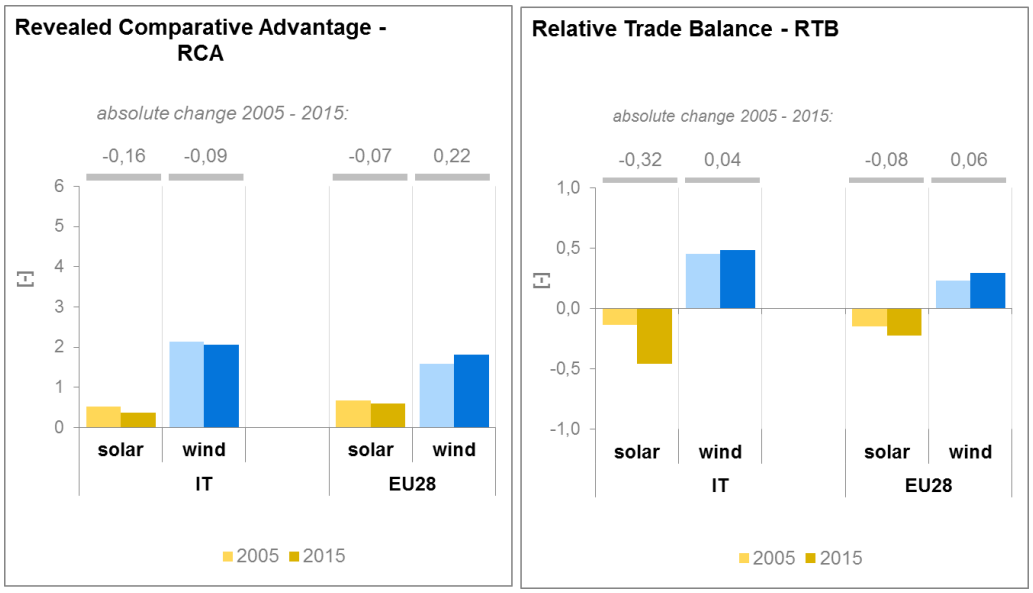
Italy enjoys a considerable specialisation in wind technologies, notably wind turbines generating sets and gearboxes, as indicated by a revealed comparative advantage indicator[28] well above 1. The situation is different for solar PV, where the country shows an indicator of revealed comparative advantage below 1. This difference is confirmed by the relative trade balance[29], showing that Italy is a net exporter of wind components and a net importer of solar PV technology.

[26] This indicator measures the amount of money spent on energy sources needed to obtain one unit of value added.

[27] The energy intensity presented here is derived from Use Tables of WIOD, see "Energy Economic Developments in Europe SWD(2014)19".

[28] The RCA index for product "i" is defined as follows: $\mathrm{RCA_i} = \frac{\frac{X_{j,i}}{\sum_i X_{j,i}}}{\frac{X_{w,i}}{\sum_i X_{w,i}}}$ where X is the value of exports, and j is the country and w is the reference group, the World economy. 2005 refers in the text to the indicator average over the 2000-2009 period, while 2015 represents the average over the 2010-2016 period. The same applies for the RTB indicator - see below.

[29] The RTB indicator for product "i" is defined as follows: $RTB_i = \frac{X_i - M_i}{X_i + M_i}$ where X_i is the value of product's "i" exports and M_i imports.



(source: UN comtrade)

7. Regional and local cooperation

Regional cooperation on infrastructure development is necessary to optimise the identification of regional infrastructure priorities and to coordinate cross-border investments. Italy is a member of 5 energy infrastructure priority corridors which have been established under the TEN-E Regulation: North South Electricity Interconnections in Eastern Europe, North South Electricity Interconnections in Western Europe, North South Gas Interconnections in Western Europe, North South Gas Interconnections in Eastern Europe and the Southern Gas Corridor.

Italy is also member of the Central and South-Eastern Europe Gas Connectivity (CESEC) High-Level Group. The aim of the group is to coordinate efforts to facilitate cross-border and trans-European projects that diversify gas supplies to the region, as well as to implement harmonised rules.

In the context of regional cooperation with neighbouring countries, Italy is active in the context of the EuroMed platforms which provide for cooperation of regulators and transmission system operators around the Mediterranean with the objective to develop a plan for an integrated regional network including identification of projects of Euromed common interest.

The EU macro-regional strategies for the Alpine Region and the Adriatic and Ionian Region in which Italy takes part can be used as a basis for regional cooperation on energy. The Autonomous Province of Bolzano - South Tyrol is leader of the action 'To make the territory a model region for energy efficiency and renewable energy' in the strategy for the Alpine Region and Italy is a co-coordinator of the pillar 'Connect the Region', which among other topics also focuses on energy networks in the strategy for the Adriatic and Ionian Region. European Territorial Cooperation – 'Interreg' – under EU cohesion policy also provides further opportunities for cross-border, transnational and interregional cooperation, including in the Energy Union areas.

Cities and urban areas have a key role in the energy and climate challenge. The Urban Agenda for the EU, established by the Pact of Amsterdam in May 2016, better involves cities in the design and implementation of policies, including those related to the Energy Union. It is implemented through Partnerships, in which the Commission, Member States, cities and stakeholders work together on a number of important areas, including on Energy Transition, Urban Mobility, Air Quality, Climate Adaptation and Housing. Italy is participating in the partnerships on Climate Adaptation, with the city of Genova as coordinator and the city of Potenza as member, Energy Transition, with the city of Udine as member, Urban Mobility, with the city of Bari as member, and Air Quality, with the city of Milano as member.

By 2016 on Covenant of Mayors, the sustainable energy action plans delivered by 2953 Italian municipalities had been assessed. Overall, these municipalities cover about 37 million inhabitants. All together, these municipalities committed to reduce by 2020 the GHG emissions by 23.5% (as compared to 1990 baseline).

	No. of SEAPs submitted	Population covered by SEAPs [million]	Average GHG emissions [t CO2-eq/capita*year]		Relative GHG savings by 2020
Italy	2953	36.98	Baseline emissions 4.63	by 2020 3.54	GHG -23.5%
European Union	5332	160.06	Baseline emissions 5.50	by 2020 4.00	GHG -27.2%

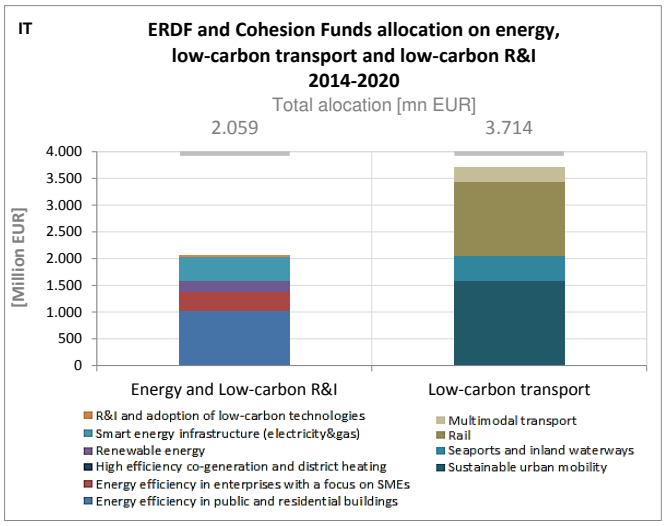
(source: JRC 2016. Notes: SEAP=sustainable energy action plan, GHG=greenhouse gas emissions)

In Italy, by September 2016, 117 cities (covering 3.9 million inhabitants) have committed to conduct vulnerability and risk assessment and develop and implement adaptation plans in the framework of the Covenant of Mayors for Climate and Energy.

8. Cohesion policy and EU-supported clean energy investments

EU cohesion policy makes a key contribution to delivering the Energy Union objectives on the ground, including important investment possibilities to implement energy policy objectives in Italy which will are complemented by national public and private co-financing, aiming at optimal leverage. It also ensures integrated territorial solutions to energy and climate challenges, supports capacity building and provides technical assistance.

Over 2014-2020, cohesion policy is investing some EUR 2,026 million in energy efficiency improvements in public and, to a lesser extent, residential buildings and in enterprises, as well as in high-efficiency cogeneration and district heating, renewable energy and smart electricity distribution grids in Italy. Cohesion policy is also investing significantly in R&I and in SME competitiveness in Italy, based on the national and regional strategies for smart specialisation. For Italy, the national strategy identifies five macro-areas of specialisation, including one on smart and sustainable industry, energy and environment. Many regional strategies further develop their areas of specialisation targeting smart and sustainable energy, sustainable mobility, blue growth and green chemistry. At this stage, at least EUR 33 million is foreseen for investments in R&I and adoption of low-carbon technologies in Italy, but this might increase further in line with the evolving content of the smart specialisation strategies. A further estimated EUR 3,714 million is invested in supporting the move towards an energy-efficient, decarbonised transport sector.



(source: DG REGIO)

These investments are expected to contribute to around 1,000 households with improved energy consumption classification, a decrease of around 344,883,000 kWh per year of primary energy consumption of public buildings, around 304,000 additional users connected to smart grids and 400 MW of additional capacity of renewable energy production, as well as to around 440 km of reconstructed or upgraded railway lines and 250 km of new or improved tram and metro lines. Overall, the EU cohesion policy investments in Italy over 2014-2020 are expected to contribute to an estimated annual decrease of GHG emissions of around 5,159,000 tonnes of CO2eq.

For example, the project on solar energy in the University of Sannio concerns the installation of two thermic solar plants with solar cooling system in two historical buildings hosting the University of Sannio in Campania. The new system provides around 96% of the total energy needed for the summer cooling system and 51 % of the total energy needed for the winter heating system. The project also had a positive impact on the overall activity of the University: a new Degree course in Energy Engineering has been introduced, (the only existing course in Southern Italy, together with Palermo University). The total cost of the project was EUR 389,640, with a contribution from the European Regional Development Fund (ERDF) of EUR 292,000 from the Interregional Programme on Energy Efficiency and Renewable energies for 2007-2013.

As another example, the project on hydrogen technology in Alto Adige concerns the construction of a pilot plant for the production of hydrogen from renewable sources, and for its distribution to supply private cars as well as for public transport (buses). The plant was built in the city of Bolzano and is considered to be one of the largest and most innovative in the world. The hydrogen which is stored in the plant can supply up to a daily 15 buses (running every day for 200-250 km) and a daily 700 cars (running every day for 50 km). This pilot plant was developed by the Institute for Technological Innovation and costs EUR 6,397,500, with contribution from the European Regional Development Fund (ERDF) of EUR 2,110,989 from the Regional Operational Programme for Bolzano 2007-2013.

Through its support to sustainable transport systems, the Connecting Europe Facility (CEF) also contributes to the goals of the Energy Union. Following Italian participation in the CEF – Transport programme 2014-2015, the Italian action portfolio comprises 41 signed grant agreements, allocating EUR 1,309.7 million of actual CEF Transport Funding to Italian beneficiaries (state-of-play February 2017)[30]. The transport mode which receives the highest share of funding is rail (87.8 % of actual funding). These actions are related to the Brenner Base Tunnel, the Rhine-Alpine Corridor, the Mediterranean Corridor, the Baltic Adriatic Corridor, and to the deployment of the European Rail Traffic Management System (ERTMS).

[30] Note that European Economic Interest Groups and International Organisations are excluded from the analysis.

The Italian action portfolio also includes a large share of maritime actions, which in overall are divided into two groups. The first group of actions includes studies aiming at the deployment of Sea Traffic Management in order to tackle communication challenges and overcome information sharing difficulties in the supply chain where maritime transport is involved. Moreover, these studies also aim at enhancing safety, as well as validating and deploying alternative fuel strategies, with a particular focus on LNG. The second group focus on improving accessibility to ports and their hinterland connexions to the Core Network and on implementing LNG bunkering stations. The Italian inland waterways (IWW) actions funded under the CEF programme are aiming to improve the Inland Waterway System in North Italy and increasing the number of vessels using IWW. The Italian road actions are mainly focusing on the implementation of intelligent transport services (ITS), and the deployment of alternative fuels to speed up the transition from diesel to LNG and to encourage the use of electric vehicle along four Core Network Corridors by installing and developing a refuelling and charging stations network.[31]

[31] Source: INEA