

## Italy

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### THE WASTE RESOURCE IN ITALY

The most recent reported figures based on the certified data produced by ISPRA (the Italian Agency for the protection of the Environment) annually published in a *Waste Report* offer an overview of the whole (production and management) waste-system in Italy. The most recent ISPRA report is for 2010<sup>1</sup> for MSW, but only to 2009<sup>2</sup> for industrial wastes, not allowing a contextual analysis of all the waste produced and managed in Italy; therefore, the following discussion is mainly focused on MSW.

#### Production

Of the total waste production occurred in 2010, a 20% is due to municipal solid waste (**MSW**) (assuming industrial wastes production close to that assessed at 2009).<sup>3</sup> A total amount of about 32.5 Million ton of MSW was produced in Italy in 2010 (**fig. 1**) (+1.1% higher than in 2009 and + 12.2% compared to 2000), with the highest per inhabitant value occurring in central Italy (613 kg/cap/y) compared to a national average value of 536 kg/cap/y.

More than 11.4 Million ton of MSW were from *separate waste collection (RD)*, corresponding to an average share of about 35.3% of total MSW (%RD), on a national basis (**fig. 1**). This means that 63% of the total MSW produced in Italy was collected and managed in 2010 as mixed MSW. Data in **fig. 1** relating to the composition of the whole MSW collected at 2010 per macro-region show close incidence (48% and 49%, respectively) of the undifferentiated and differentiated (RD) waste in north Italy, while a quite different situation occurred in both the central and the southern regions. The average annual values of RD% per region showed in the same figure confirm this condition. As a result, the overall %RD value (35.3%) is still lower than the national target set for 31/12/2009 (at least 50%) and far from those (at least 60% by 31/12/2011 and at least 65% by 31/12/2012) required by Italian legislation.

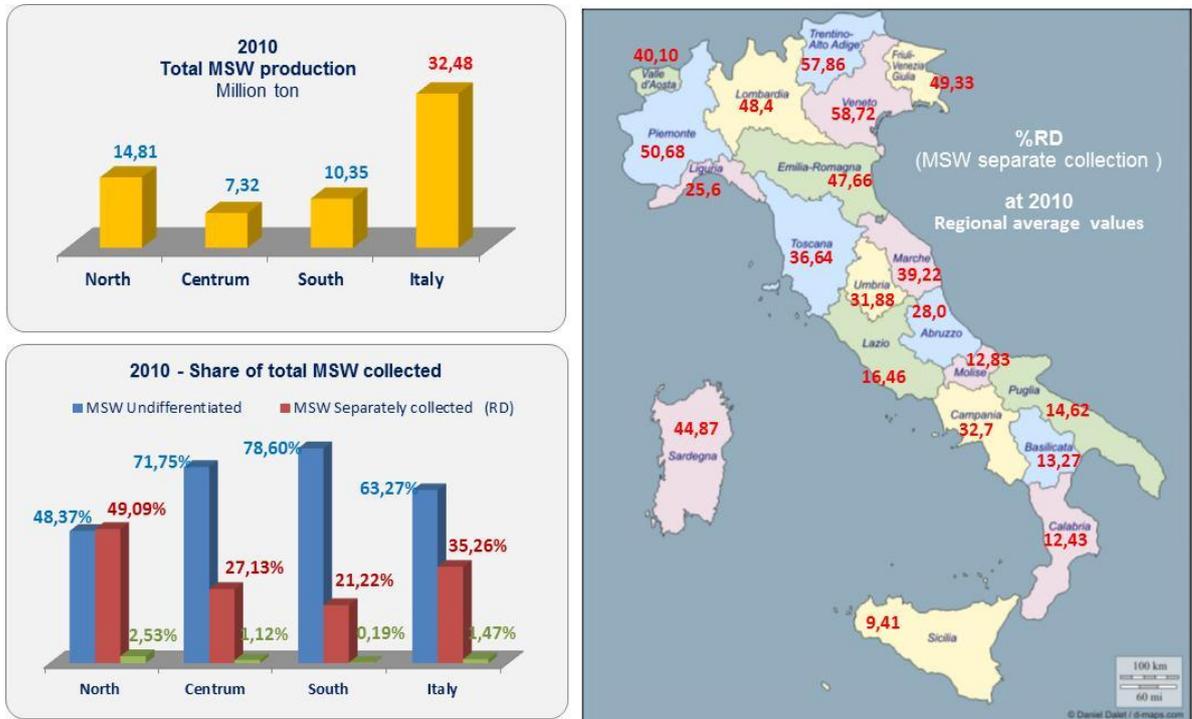
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<sup>1</sup> ISPRA, 2012. [Rapporto Rifiuti Urbani](#)

<sup>2</sup> ISPRA, 2011. [Rapporto Rifiuti Speciali](#)

<sup>3</sup> According to ISPRA in 2009 about 128.5 Million ton of industrial waste were produce, of which a 10% were hazardous wastes - from manufacturing industries mainly (52.9%), followed those from the commercial, transport and service (22.7%) and the waste treatment (16.4%) sectors - while non hazardous wastes were mainly (50%) from the construction & demolition sector, followed by the commercial, transport and service (25.8 %) and the waste treatment sectors (16.9%).

Figure 1 - MSW production in the year 2010: national and per macroregion (north, centrum and south Italy) total amount of MSW (million ton) generated (upper graph) and corresponding percentage shares of undifferentiated MSW, separately collected MSW and the bulky waste (lower graph) within it; average values of %RD (percentage share of MSW separate collection) achieved per region (map)[Data source: ISPRA, 2012]



Organic & gardening, paper & cardboard and glass are the main fractions of the municipal solid waste submitted to a separate collection in 2010, both at national level and within macro-regions (**fig. 2**). In Italy they accounted for a 36.6%, 26.7% and 15.5% of the total amount of 11.4 Million ton, respectively, followed by: plastic (5.7%), wood (6%), metal and bulky waste (2.8%), WEEE (2.2%), textiles (0.7%) and other fractions (1.0%).

**Figure 2 – MSW production in the year 2010: average incidence (% by mass) of the main fractions of MSW separately collected, on a national basis and per macroregion (north, centrum and south Italy) [Data source: ISPRA, 2012]**



## Management

According to the last MSW Waste Report published by ISPRA in 2012, landfilling remains the main waste management method for MSW in Italy (**fig. 3**) in 2010 (accounting for 37.94% of the total municipal solid waste yearly managed), although this percentage has decreased compared to 2009 (40.6%).

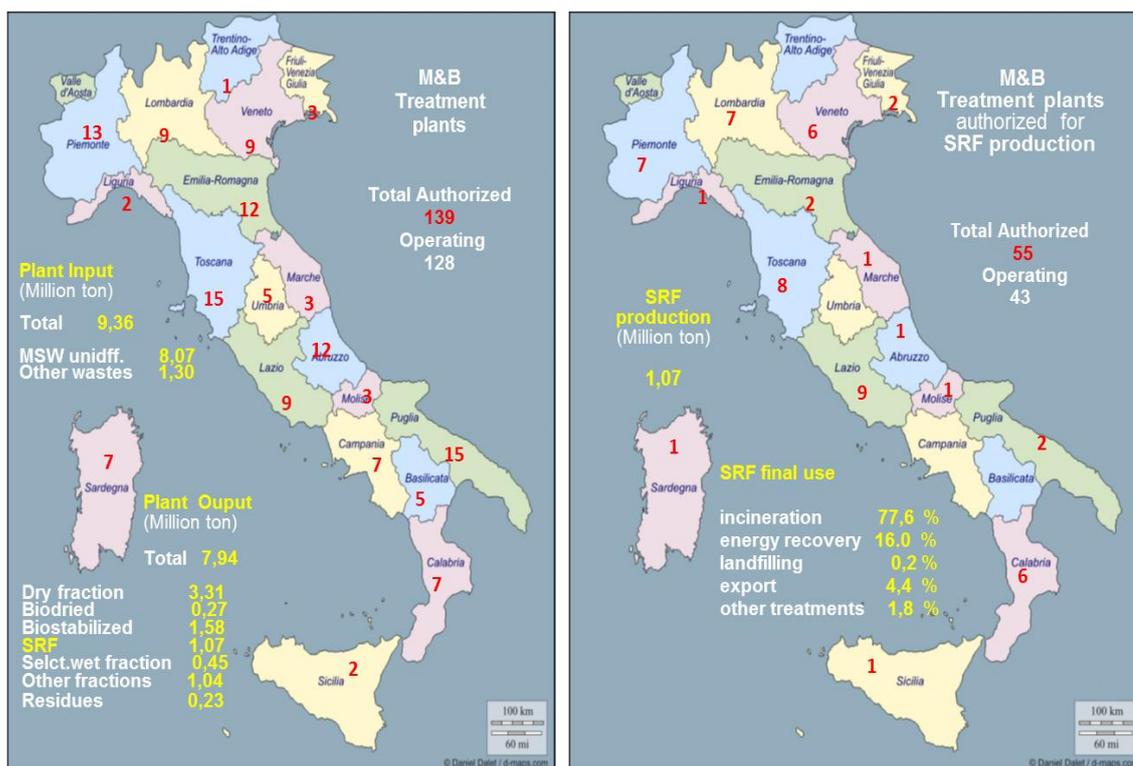
The amount going to anaerobic digestion (1.32%) and energy recovery (0.43%) are not far from that observed in 2009 as is the recovery of different materials (16.7%). Composting (8.45%), incineration (13.18%) and mechanical and biological treatment (22.41%) show a significant percentage, increasing (mainly M&B treatment) with respect to the previous year (7.7%, 12.1% and 20.1% of the total MSW managed at 2009, respectively).

**Figure 3 – MSW management in the year 2010: weight (% by mass) of the different modalities of management occurring in Italy [Data source: ISPRA, 2012]**



**Fig 4** shows that there were a total of 139 authorised **mechanical and biological waste treatment** and the **SRF production** plant in Italy, of which 128 were in operation in the reference year.

**Figure 4 – Mechanical and Biological treatment plants in Italy in the year 2010: (left) Whole M&B plants: plant number and regional distribution, total amounts of treated wastes and plant outputs (Million ton) on a national base; (right); M&B plant authorized for SRF production: plant number and regional distribution, total amount of SRF produced (Million ton) and finale use (% shares) [Data source: ISPRA, 2012]**



Of the whole output (7.9 Million ton) obtained from 9.4 Million ton of treated wastes (mixed MSW: 86%), **SRF** accounted for about 1.07 Million ton (produced by 43 of the 55 plants authorized in Italy to SRF production). The final use of SRF was mainly incineration (77.6% by mass of total SRF), followed by energy recovery (16.0%). Energy recovery largely means the use of SRF as alternative fuel in cement kilns. An analysis performed by Nomisma Energia on Italian cement kilns, showed that SRF covers about 48% of the total amount (0.31 Million tons) of wastes and residues cement kilns treated in 2010; wastes and residues including (percentage share, by mass): animal fat/flour (3.6%), plastic wastes and residues (3.3%), ELT(15.4%), sewage sludge (3.5%), waste oil (10.4%), waste solvent (4.9%) and an 1.3% of other wastes. Most of the SRF (0.10 Million ton) used at cement kilns was that classified in Italy as “normal quality CDR” according to the standard UNI 9903-1.

A large effort has recently been made in Italy to renew the reference national standard (really already arrived at the expiry date), requiring new definitions for both dispositions on SRF introduced by Dlgs 205/2100 (as before reported) and new European SRF technical specifications defined by CEN/TS 15359 and CEN/TS 15358. A general recommendation on classification and specification criteria for CSS (SRF) derived from mechanical treatment of non hazardous wastes (CTI Recommendation 8, 2012) and, later, a guideline<sup>4</sup> for the

<sup>4</sup> CTI Guideline 11, 2012

application of CEN TS 15359 and CEN TS 15358, have been published by CTI<sup>5</sup> with the aim to help SRF producers and users, pending the issuance of the new national UNI standard on this matter.

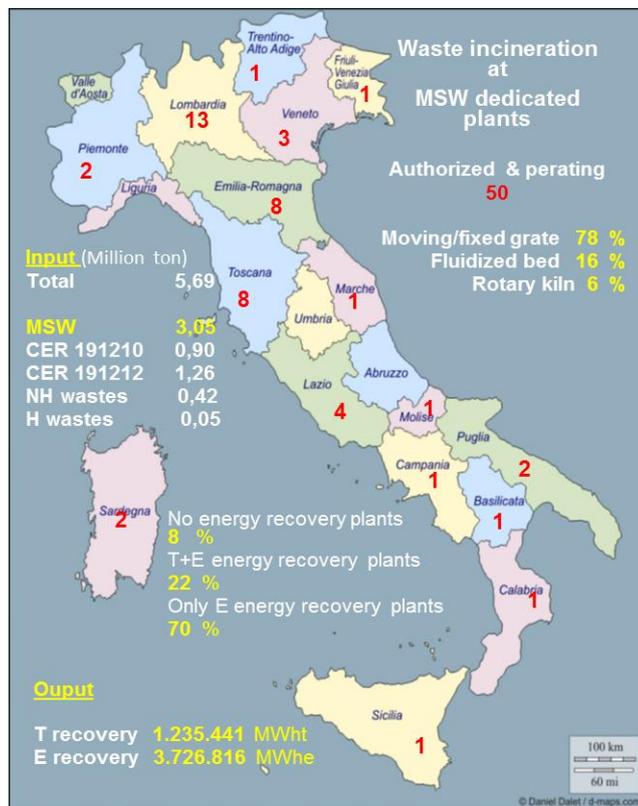
As highlighted for cement kilns, different industrial wastes (and residues too) are involved in energy recovery in Italy to satisfy (or to contribute to) on-site energy requirements for industrial processes. Certified data can be provided on this from the ISPRA national waste survey in 2009: industrial wastes coming from agriculture, from the food, textile, plastic, metal, chemical industries as packaging or C&D wastes represented quite low shares of the overall amount (about 2.1 Million ton) of industrial wastes sent to energy recovery in 2009. The use of wastes for energy in industry was dominated by wastes produced by paper & wood industries (45.3%) and wastes used for biogas production (31.2%). The highest amount of energy recovery from industrial wastes was used most in the energy sector (40.3% of all the recovered wastes), followed by paper and wood industries (24.5%), the waste treatment sector (13.1%), cement kilns (6.2%) and pottery industries (5.6%).

Data on **waste incineration** made available by the last ISPRA Report on waste shows a total of 5.69 Million ton of wastes disposed of by incineration at 50 MSW dedicated plants operating in Italy in 2010 (**fig. 6**). However, this gives only a partial view of waste incineration in Italy, because certified data for plants mainly treating industrial wastes are not available for the same reference year. As general information on this matter, a total of 102 plants “dedicated” to industrial wastes incineration were assessed in Italy in 2009 according to the ISPRA national survey. The total amount of industrial wastes disposed of by incineration (including those treated at the MSW dedicated plants mentioned above) approximately 0.9 Million tonnes (NH wastes: 57%; H wastes: 43%). Given the above, as **fig. 6** shows, the main waste (53.6%, by mass) treated at Italian dedicated MSW energy from waste plants was the mixed MSW, while SRF accounted for 15.6%. In general these plants are moving/fixed grate combustion technology, most of which (92%) included energy recovery, mainly as electricity (35 plants), but also as combined energy production (at 11 plants). Overall energy recovery from waste in Italy totaled approximately 3.7 Million MWh (electricity) of which approximately 1.2 Million MWh (heat) was at dedicated MSW plants in 2010.

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<sup>5</sup> CTI: Comitato Tecnico Italiano, member of UNI, the Italian committee for standardization

**Figure 6 – Waste incineration in Italy in the year 2010 (MSW dedicated plants): plant number and regional distribution, adopted combustion technologies (% on total plants); total amount of wastes treated (Million ton) and heat and electricity recovery (MWh), on a national base [Data source: ISPRA, 2012]**



## Policy and regulation

The Legislative Decree (DLgs).152/2006 and its amendments, the DLgs 4/ 2008 and the DLgs. 205/ 2010 (transposing the EU Directive 2008/98 on waste) define **policy and general regulations now in force in Italy on waste.**

A complete figure of regulations also needs to take into account other specific national acts in force in Italy, preceding and following those mentioned above. Examples are: the DLgs.151/2005 (WEEE); the Presidential Decree (DPR) 254/2003 (health care wastes); the DLgs. 188/2008 (batteries and accumulators and waste batteries and accumulators, transposing the EU Directive 2006/66); the DLgs. 117/2008 (wastes from extractive industries, transposing the EU Directive 2006/21), the DM September 27, 2010 (waste landfilling); the DLgs 133/2005 (waste incineration, transposing the EU Directive 2000/76); the DM May 5, 2010 (end-of-life vehicles); the DM April 11, 2011 (end-of-life tyres), the EU Regulations 1069/2009 and 142/2011 (animal by-products and derived products not intended for human consumption).

In general Italian policy and legislation is based on criteria of caution, prevention, responsibility and co-operation between all subjects *at national and local level (i.e.: private and public producers; private and public administrations involved in waste management and treatment) and with the aim of ensuring that waste management (reuse, recovery, recycling, discharge) can offer an adequate protection of people and environment and meet with criteria of effectiveness, efficiency, transparency other than economical.* This reflects EU

Directive 2008/98. The development of clean technologies, the use of commercial products with no or minimum impact on waste production, an improvement of technologies able to eliminate/reduce pollutants, a prevention of waste production and a stimulation (on a national and local level) of a more active role of public administrations towards promoting and support waste control, recycle and recovery (material but also energy recovery from waste), are assumed as priority criteria in Italy.

Knowledge, control and traceability along the whole waste-chain are considered important issues. All issues that planning, monitoring and reporting actions, local and national authorities have to adhere to are defined by the Italian legislation on wastes. Subjects (private or otherwise) relevant to the activities of collection, transport, recovery, discharge of waste as hazardous waste producers or public administration involved in the municipal waste management, are requested to qualify the waste they produce or anyway manage (CER code according to the European classification of wastes; registration; accompanying documentation,..) as to quantify, annually, the amount of waste produced/managed through the MUD (*Modello Unico di Dichiarazione ambientale*) reporting system. In the last few years, a new system (SISTRI) aimed to guarantee full traceability along the whole waste-chain was introduced in Italy (DM December 17, 2009 and following).

Based on the DLgs 152/2006 and following and the Law (Finance Act) 296/2006, specific targets for separate collection (%RD) have been set in Italy for MSW : at least 35% by 31/12/2006, 40% by 31/12/2007, 45% by 31/12/2008, 50% by 31/12/2009, 60% by 31/12/2011 and 65% by 31/12/2012. The subsequent DLgs 205/2010 asks for selective collection to be applied in Italy at least for paper, metal, plastic and glass (and where possible for wood, too) by 2015. It is also required that local authorities meet national targets for waste reuse, recycle and recovery, as follows: by 2020 to increase to at least 50% by weight of waste, treatment aimed at reuse and recycle of paper, metals and glass from domestic sources (and if possible from similar industrial sources); by 2020 to increase to at least 70% by weight of waste, treatments aimed at reuse, recycling and other material recovery of construction and demolition wastes.

General rules about structure and requirements of local systems aimed at separate collection of wastes (MSW) have been defined (DM April 8, 2008). In addition, due to a lack of implementing decrees for some aspects, separate collection is currently mainly managed in Italy according to rules and criteria set out on a local basis (eg: region, city), so resulting in quite a varied performance as data reported above shows. It should be noted that effort is underway in Italy to promote a separate collection of specific residual materials occurring in a waste (from domestic and commercial/industrial activities) and for whole wastes (eg. WEEE; ELT household appliances,..), because of their high potential for reusing/recycling/recovering (material and energy). Different consortia are working towards this in Italy, e.g.: COREPLA (plastic packaging and wastes); RILEGNO (wood packaging and wastes), COMIECO (cellulosic – paper & cardboard- packaging and wastes), CIAL (aluminum packaging and wastes), CONSORZIO ACCIAIO (steel packaging and wastes), ECOPNEUS (end-of-life tyre), ECODOM (household appliance), ECOLIGHT(WEEE).

According to DLgs 205/2010, the Italian legislation on wastes also:

- ✓ takes in the *end-of-waste* and the *by-product* concepts, defining them on the whole although the task of defining technical specification and criteria for their practical application is left to subsequent implementing decrees,

- ✓ introduces a change regarding *solid recovered fuels*: all solid fuels derived from waste meeting the technical requirements of CEN/TS 15359 and following upgrade, are now defined in Italy as CSS (Combustibile Solido Secondario) and classified as a “special waste”. As a result, the previous “Italian category” of solid recovery fuels labeled CDR (*combustibile derivato da rifiuto*) is now abolished.
- ✓ Introduces a change on the matter of what wastes are or are not submitted in Italy according to Italian regulations: so that now animal by-products and derived products not intended for human consumption fall within the scope of the waste legislation when disposed of by incineration and landfilling or composted and transformed into biogas, contrary to provisions of the previous DLgs 152/2006.

All these items are relevant in the framework and for the application of financial supports to RES-E, based on national policy and regulations on renewable energies now in force in Italy as then discussed.

## RENEWABLE ENERGY AND WASTE IN ITALY

The most recent reported figures for Renewable Energy Source electricity (**RES-E**) **generation in Italy** in 2010, and those from the **bioenergy sector** (including waste), are based only on certified data GSE<sup>6</sup> which publishes annual Statistical Reports on RES plants<sup>7</sup> in Italy and also provides up-to-date data to the year 2011.<sup>8</sup>

### Whole RES-E production

The amount of RES-E in the total (effective) yearly gross production of electricity in Italy has changed over time (**fig.7**) from about 18.4% (2000) to 25.5% (2010) and 27.4% (2011). RES-E gross production increased by about 50% in ten years from 51 TWh/y (2000) to 77 TWh/y (2010) and a further +7.8% has been observed in 2011 with respect to 2010.

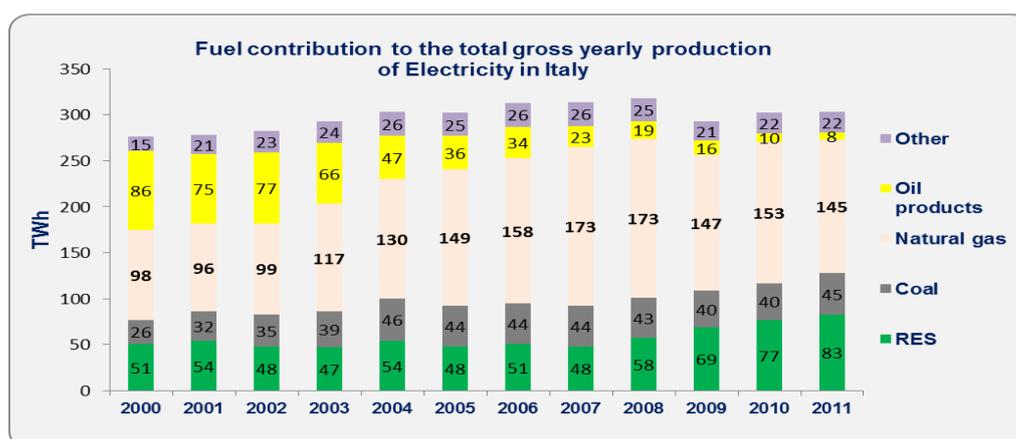


Figure 7 – Total (effective) gross production of Electricity in Italy (TWh): annual trend and contribution of individual fuels [Data source: GSE, 2011 and 2012]

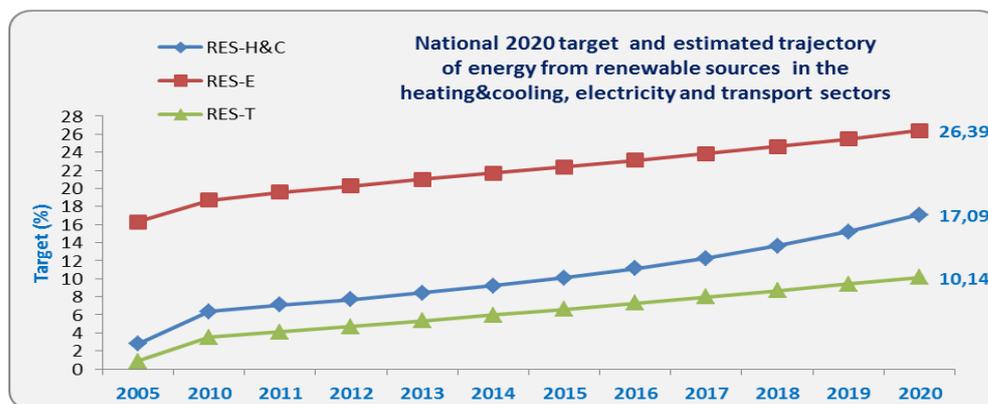
<sup>6</sup> GSE is the publicly-owned company whose mission is to promote renewable energy in Italy by granting incentives and offering services to renewable power producers, other than to monitor and supply statistical data on RES plants in Italy

<sup>7</sup> GSE, 2011. Statistical Report 2010. Renewable energy power plants

<sup>8</sup> GSE, 2012. Statistical Report 2011. Renewable energy power plants

According to the RES Directive 2009/28, energy from renewable sources must provide a share of 17% of whole Italian gross energy in the year 2020. To achieve such a national target, the 2010 Italian PAN<sup>9</sup> called for specific contributions to the RES-H&C, RES-E and RES-T sectors, based on the estimated trajectory 2010-2020 in **fig. 8**, starting from the national situation in 2005 (the reference year adopted by the EU Directive).

**Figure 8 – Annual targets for the share of energy from renewable sources in the heating&cooling, electricity and transport sector to be reached according to the Italian National Action Plan on Renewables, 2010 [from: PAN, 2010]**



The electricity sector, in particular, is required for to achieve a 2020 target of 26.4% expressed as RES-E/CIL index (RES-E normalised production on the gross national electricity consumption). This means that a normalised RES-E production of about 99 TWh have to be achieved in the year 2020 in Italy.

Statistical data published by GSE show that an RES-E/CIL value of 20.1% (normalised RES-E production: 68.9 TWh) and of 23.5% (normalised RES-E production: 81.6 TWh) have been obtained in 2010 and 2011, respectively [it was 16.3% (normalised RES-E production: 56.4 TWh) in the reference year 2005]. Both the 2010 and 2011 RES-E/CIL values are above the expected annual target according to the estimated trajectory defined by the Italian Renewable Energy Action Plan.

This may be due to a decline in gross consumption but it is also due to an increase of electricity from renewable sources in Italy. As **fig. 9** shows, solar energy was the first to show this increase (overcoming the installed power expected in year 2020 by 2010).<sup>10</sup> However, an increasing contribution can also be observed in Italy for the wind and the bioenergy sectors, both showing a more gradual change in time, finally resulting in the following gross production: 9126 Gwh (wind) and 9440 Gwh (bioenergy sector), in 2010; 9856 Gwh (wind) and 10832 Gwh in 2011 (bioenergy sector). With respect to 2011, their incidence in the total annual RES-E generation was close to that of the solar source (wind: 11.9%; bioenergy: 13.1%).

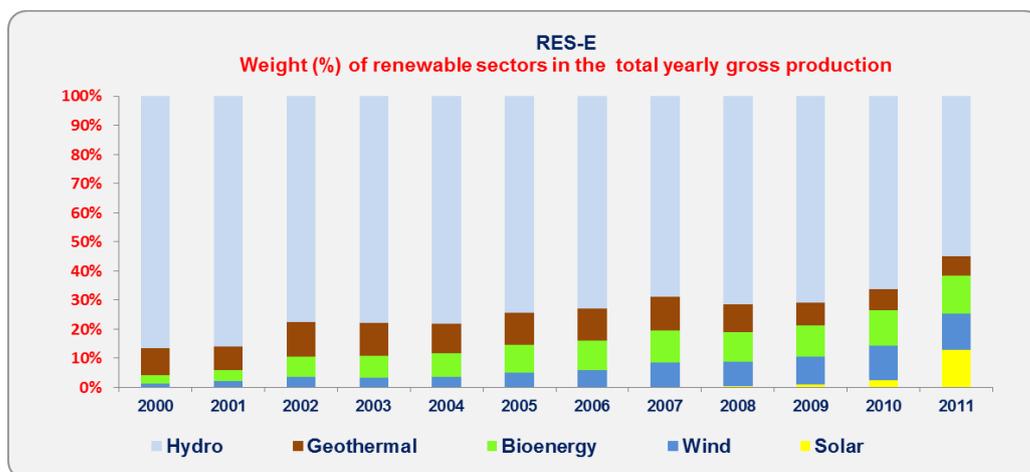
Statistics for the **bioenergy sector** in **fig. 9** refer to electricity achievable from all the sub-sectors it includes: biogas (from wastes, sludges, animal manure, agro-forestry and agro-industrial residues), bioliquids (raw vegetable oils; other bioliquids), the biodegradable fraction of waste and other (solid) biomass (the last two, on the whole considered in the GSE

<sup>9</sup> PAN, 2010. Italian National Action Plan on Renewables

<sup>10</sup> After 10 years with a very low increase in annual gross production of electricity from renewables (generally <1%), a RES-E from solar sources of about 10796 GWh was obtained in 2011 (+467% with respect to 2010), so covering a 13.0% of the total annual RES-E against a 2.5% only in 2010.

Report as Biomass sub-sector). For the **waste sub-sector** annual data published by GSE refer to electricity produced from the biodegradable fraction of MSW, only.

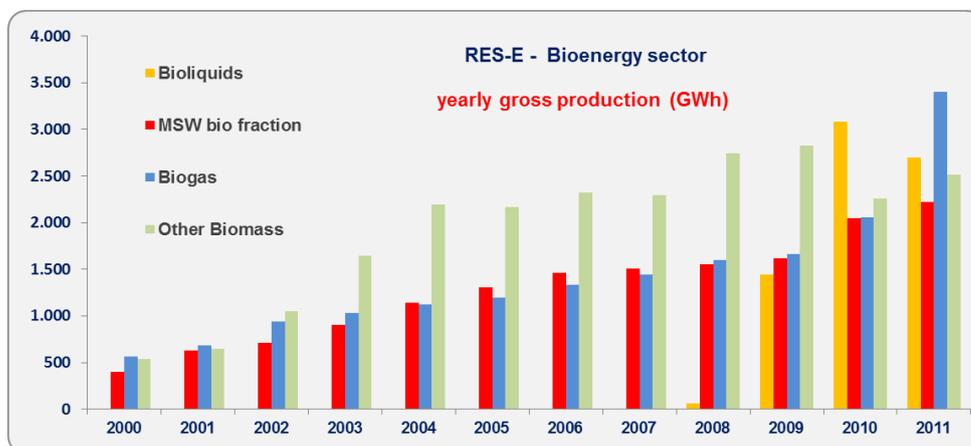
**Figure 9 – RES-E: percentage contribution of each RES sector to the total annual gross production of electricity from renewable sources in Italy [Data source: GSE, 2011 and 2012]**



Details on the annual trend of RES-E gross generation from each sub-sector within bioenergy are reported in **fig. 10**. These figures highlight the increasing role of biogas in Italy whose RES-E production in 2011 was of about 3405 GWh (31.45% of the total amount of 10832 GWh produced by the whole bioenergy sector), showing the highest annual performance within bioenergy: +65.8% with respect to 2054 GWh reported for the year 2010. Bioliquids gave a contribution of about 2698 GWh in 2011 by (24.9% of total RES-E Bioenergy), although a negative trend (2011 vs 2010) can be observed (3078 GWh in 2010: -12.4%). About a 23.2% (2512 GWh) of the whole RES-E Bioenergy was derived from the other biomasses sub-sector, reaching a +11.2% with respect to 2010 (2260 GWh).

For **biodegradable MSW sub-sector**, in 2011, gross RES-E production was of about 2218 GWh, accounting for a 20.5% of the whole RES-E Bioenergy and reaching an increase of +8.3% with respect to the year 2010 (2048 GWh).

**Figure 10 – RES-E from the bioenergy sector: total annual gross production (GWh) of electricity obtained by the sub-sectors bioliquids, biogas, other (solid) biomass and from the biodegradable fraction of MSW [Data source: GSE, 2011 and 2012]**



In terms of regional distribution of RES-E generation from bioenergy, a different situation seems to occur in Italy depending on the sub-sector. RES-E generation from the other biomass sub-sector appears to be evenly distributed in Italy, although a different annual total gross production per region can be observed (fig. 11). Most of the contribution from bioliquids comes from southern regions of Italy (fig. 12) and, conversely, northern regions show the highest RES-E generation from both the biogas sub-sector (fig. 13) and from the biodegradable fraction of wastes (fig. 14).

Figure 11 – RES-E from Bioenergy at a regional level in Italy: gross production (GWh) from the other biomasses sub-sector in 2010 and 2011 [Data source: GSE, 2011 and 2012]

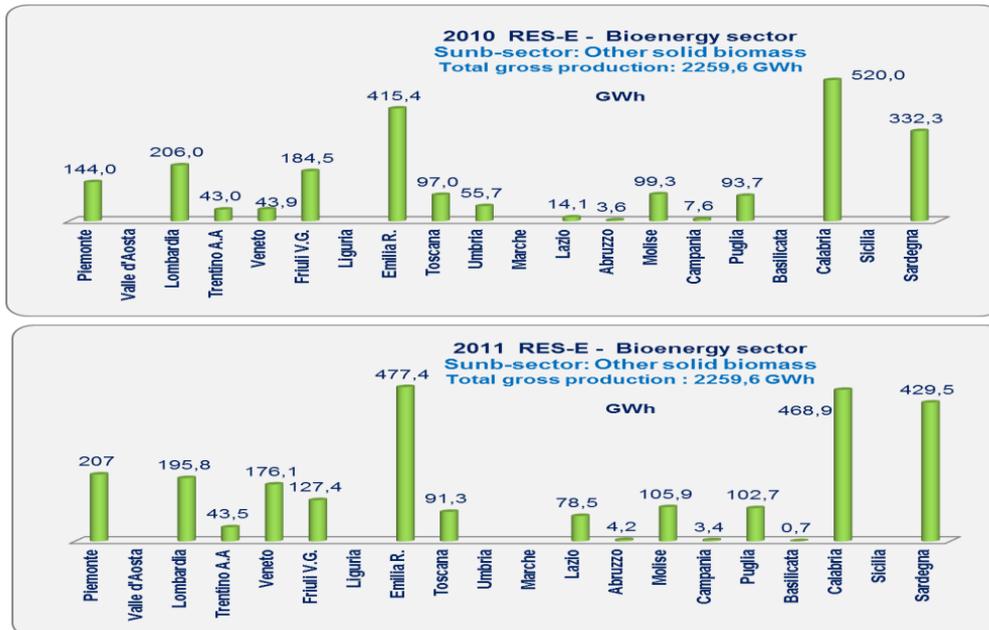


Figure 12 – RES-E from Bioenergy at a regional level in Italy: gross production (GWh) from the bioliquids sub-sector in 2010 and 2011 [Data source: GSE, 2011 and 2012]

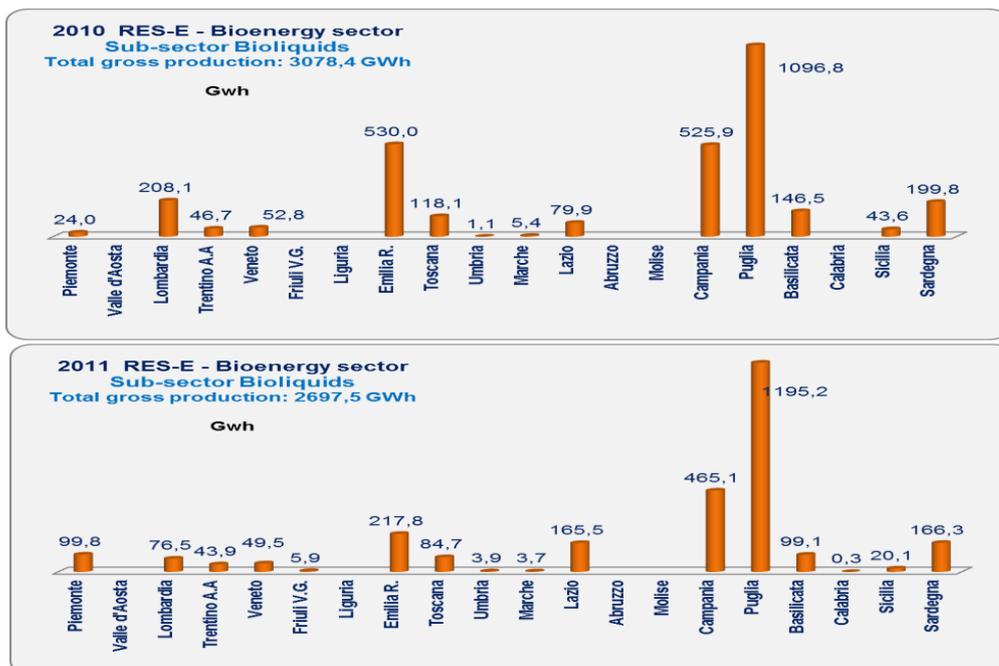


Figure 13 – RES-E from Bioenergy at a regional level in Italy: gross production (GWh) from the biogas sub-sector in 2010 and 2011 [Data source: GSE, 2011 and 2012]

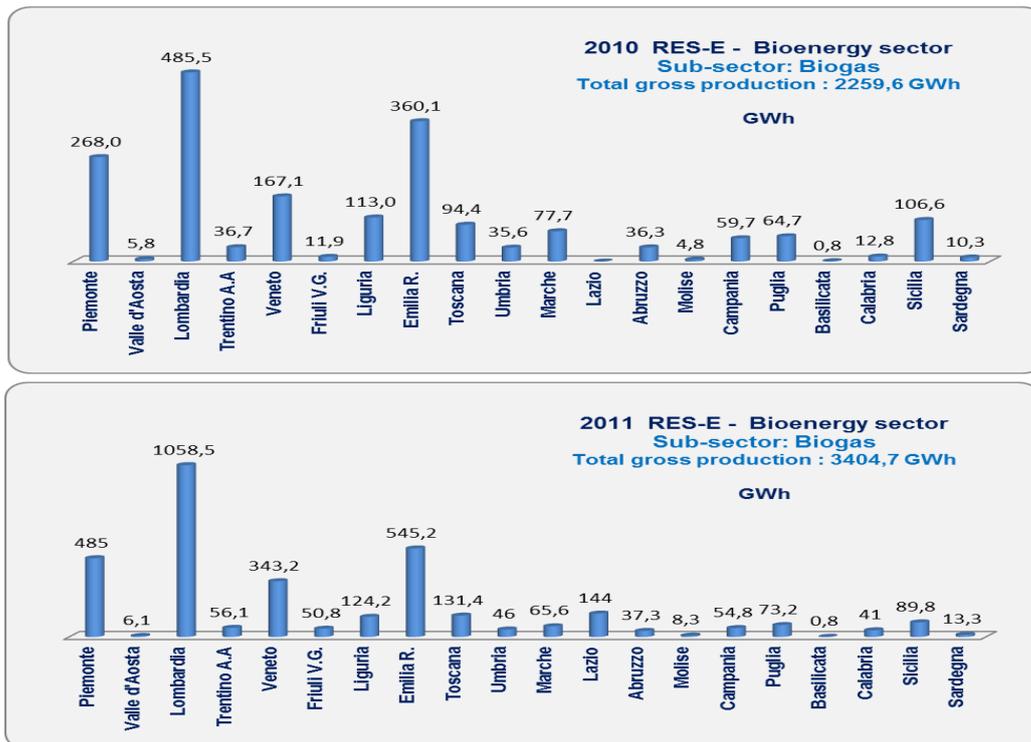
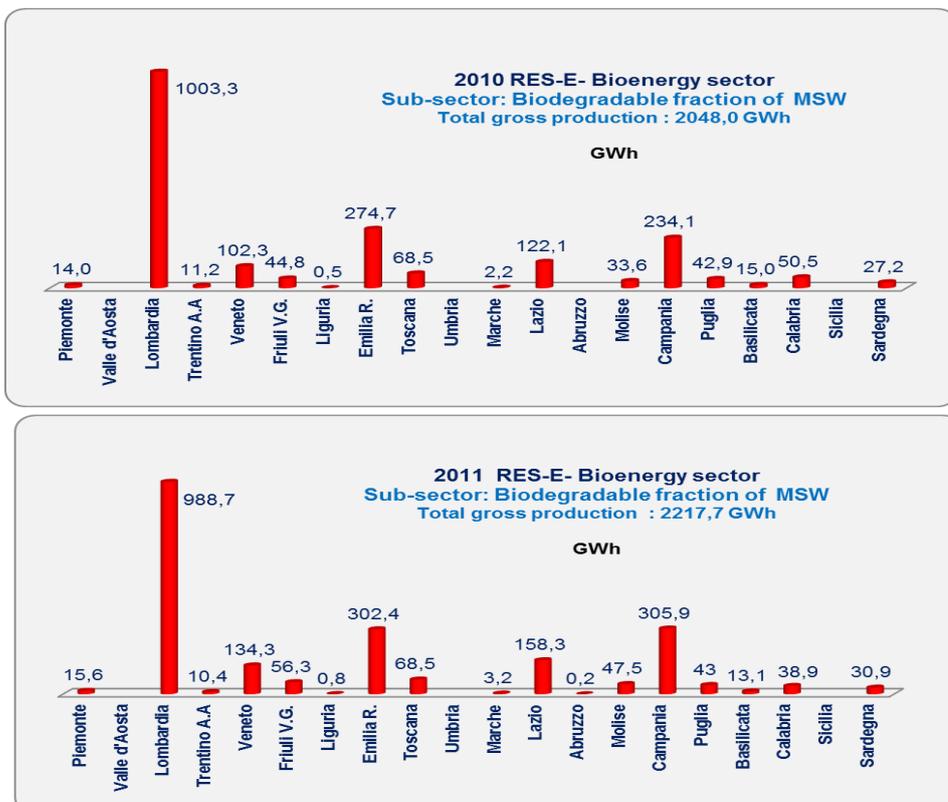


Figure 14 – RES-E from Bioenergy at a regional level in Italy: gross production (GWwh) from the biodegradable fraction of MSW sub-sector in 2010 and 2011 [Data source: GSE, 2011 and 2012]



## Policy, regulations and financial supports

Historically the so-called CIP-6 Resolution adopted at 1992 was the first national attempt to support energy (electricity) from renewable sources. In this feed-in tariff scheme, GSE purchases electricity produced by plants fed with different renewable sources (solar, wind, hydro, geothermal, waves & tides, biomass) at an assured rate and trades it into the energy market.

The CIP 6 scheme is still in force in Italy, but only for plants admitted to it in the past and just for the residual years of validity.

Based on statistical Reports published by GSE, the whole RES-E supported under CIP6 was of about 6047 GWh in 2010 (of which 4770 GWh were from bioenergy). It decreased in 2011 to 4921 GWh, with almost all attributable to the bioenergy sector (4445 GWh) and, within it, energy produced by waste incinerators accounted for about 2.572 GWh (of which 1241 GWh only are really renewable: i.e. due to the biodegradable fraction of the treated waste). As a result of the European Directive 96/92/CE, producers and importers of non-renewable electricity are now required in Italy (DLgs 79/1999) to enter (from 2001) the national energy network. There is now a minimum share of renewable energy, which can either be own production or purchase of the corresponding amount by buying financial mechanisms aimed promoting such a requirement through green obligations from other qualified producers of renewable energy.

Apart from the CIP6 mechanism, different financial schemes, essentially aimed at promoting and supporting the development of the RES-E sector in Italy, were made available to owners of RES plants, including hybrid plants, as detailed by regulations<sup>11</sup>: the feed in premium tariff (*conto energia*: the main support scheme for solar power generation in Italy); tradable certificates (GCs, *Certificati Verdi*); the all-inclusive feed-in tariff (*tariffa omnicomprensiva*); an indirect sale of electricity through GSE (*ritiro dedicato*); a net metering (*scambio sul posto*).

The range of renewable sources admitted to support schemes was expanded so that not only non-fossil sources, as wind, solar, geothermal, waves & tidal, hydro, biomass, landfill gas, biogas and gas from waste water treatment have been admitted, but also the biodegradable fraction of products, wastes and residues from agricultural activities, forestry management, industrial activities and that from municipal and industrial wastes.

RES-E generation in 2010 and in 2011 was still submitted and supported according to the above cited policy, regulations and mechanisms.

With respect to RES-E from the bioenergy sub-sector, statistical data published by GSE show that the amount of energy supported under the GCs system was of about 4,230,958 MWh in 2010 and 4,632,845 MWh, in 2011, corresponding to a 13.0% and to a 14.2% of all supported renewable energy, respectively. That financially supported under the all-inclusive feed in tariff mechanism was of about 807,194 MWh in 2010 increasing to 1,873,650 MWh in 2011 and corresponding to a 61.9% and to a 73.7% of all supported renewable energy, respectively. The amount supported within the net metering system was quite low, accounting for about the 8.8% (958,991 MWh) RES-E from bioenergy in 2010 and (1,197,100 MWh) in 2011, which was 6.1% of the whole electricity covered by this mechanism in Italy.

For all these schemes no statistical data related to support applied to the waste renewable source are extractable from GSE reports.

The change in policy and regulations on renewable energies recently introduced in Italy by the DLgs 208/2011 (implementing the EU Directive 2009/28), has been now detailed by the

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<sup>11</sup> DLgs 387/2003; DM of October 24, 2005; Law (Finance Act) 244/2007; DM of December 18, 2008

implementing Ministerial Decrees of July 5, 2012 (the *conto energia* for solar power generation) as of July 6, 2012 (consistently amending the way to support in Italy not solar renewable energies including the RES-E from wastes). The effects of this legislation will be visible in future years.

According to the Ministerial Decrees July 6, 2012, plants commencing operation from the beginning of 2013 cannot be supported under the tradable certificates (GCs) scheme. A smooth transition from old to new mechanisms will be made by 2016 for plants already supported under the GCs scheme.

Renewable energy will be now financed through two different mechanisms, depending on the plant type and its installed power, as well as the nature of the renewable source they use. An all-inclusive feed-in tariff (TO) will be available for plants with an installed power < 1MW: this will be calculated as the sum of a basic (reference) tariff (whose value depends on the renewable source) and other incentives plants can ask for (e.g.: for high-efficiency cogeneration plants; reduction of greenhouse gas emissions etc.). Plants with an installed power > 1MW (or <1 MW if not asking for a TO) will be supported through an incentive calculated as the difference between the same basic tariff (plus any other incentives plants can ask for, as above cited) and the zonal hourly price of electricity (the price occurring where energy produced by the plants is fed into the grid). Both an indirect sale of electricity through GSE (*ritiro dedicato*) and a net metering (*scambio sul posto*) will remain really available, as alternative.

RES plants up to certain installed power thresholds (e.g. up to 200KW for plants fed with biomass; and to 100 kW for plants fed with biogas) could be directly eligible for incentives; but they will need to be entered in National Registers and to fall within the annual quota of power eligible for incentives if exceeding such power thresholds but not those (10 MW, hydro plants; 20 MW geothermal plants; 5 MW other RES plants), above which incentives will be awarded only through a competitive bidding.

As a general reference, the following ranges of basic tariffs will occur for plants fed with biomass and biogas according to the Ministerial Decrees of July 6, 2012 :

- Plants fed with Biogas:
  - (a) biological products: range from 91 €/MW if electrical capacity >5000 MW to 180 €/MW if electrical capacity ≤300
  - (b) biological by-products and wastes not c): range from 101 €/MW if electrical capacity >5000 MW to 236 €/MW if electrical capacity ≤300
  - (c) wastes: range from 85 €/MW if electrical capacity >5000 MW to 216 €/MW if electrical capacity ≤1000;
- Plants fed with biomasses:
  - (a) biological products: range from 122 €/MW if electrical capacity >5000 MW to 229 €/MW if electrical capacity ≤300
  - (b) biological by-products and wastes not c): range from 145 €/MW if electrical capacity >5000 MW to 257 €/MW if electrical capacity ≤300
  - (c) wastes: range from 125 €/MW if electrical capacity >5000 MW to 174 €/MW if electrical capacity ≤5000).

Biological by-products (b) are those detailed by the same Ministerial Decree and include: animal by-products and derived products not intended for human consumption of Cat. 1, 2 and 3 as defined by the EC Regulation 1069/2009, some of which can really be defined as waste according to the DLgs 205/2010 as previously pointed out; agricultural and agro-industrial by-products; forestry by-products and wood industry by-products.

The wastes not c) are completely or partially biodegradable wastes not separately collected, differing from wastes at point (c) to which a flat (default) share of biogenic energy is recognized by law. On this matter, RES plants have already been placed in conditions to avoid (optional choice) a measure of the biogenic content of the fuel when fed with the hybrid wastes MSW and SRF (if from MSW only). According to the Ministerial Decree of

December 18, 2008, a 51% of the total net energy produced from these wastes have been legally recognized in Italy as renewable energy (based on results of different studies on MSW composition). This fixed share allows calculation of the net renewable energy generated and the corresponding amount of incentives RES requested from GSE, in a very easy way.

The Ministerial Decrees of July 6, 2012 now:

- a) confirm as eligible for incentives the previous fixed share of 51% of the total net energy fed into the grid produced from MSW (excluding CER 200202 and CER 200203) and from SRF derived from municipal solid wastes, respecting technical specifications defined by the UNI EN 15359 and with a Lower Calorific Value not higher than 20 MJ/kg, expressed as daf value;
- b) apply as eligible for incentives the same fixed share of 51% to the total net energy fed into the grid produced from a list of industrial non-hazardous wastes or that produced from SRFs derived from such industrial wastes. But only if they cover less than a 30% by weight of the whole waste (including MSW), treated on an annual basis in the hybrid plant; the flat share will so apply to WtE plants dedicated to MSW combustion;
- c) recognize as eligible for incentives a fixed share of 40% of the total net energy fed into the grid produced from CER 180103 and CER 180202 (health care hazardous waste with high risk for human and environment);
- d) recognize as eligible for incentives a fixed share of 35% of the total net energy fed into the grid produced from CER 160103 (ELT, not hazardous waste).

To obtain financial support (e.g.: the old tradable certificates and the all-inclusive feed-in tariff) a pre-requirement occurs in Italy: all plants (including hybrid plants) need to be firstly qualified (by GSE) as IAFR plant (plant fed with renewable sources), according to a specific procedure as defined by GSE and transposed into the Italian legislation by the Ministerial Decree of December 21, 2007. That procedure also defines how to qualify and, in particular, to quantify the renewable share of the total (net) energy fed into the grid, so that the financial incentive can be applied. Methodologies already supported by standard specifications have been accepted by the IAFR procedure as reference methods for both fuel sampling and for the assessment of its biogenic content (e.g. EN 15440). These methodologies cover physico-chemical properties (e.g.: calorific value, water content) and determination of the share of renewable energy. The corresponding amount of incentive (e.g. for GCs) according to the method is adopted by the same procedure. A review of the IAFR procedure is now in progress in Italy; it will take into account technical guidelines for fuel (waste) characterization as recently published by CTI,<sup>12</sup> which introduces new analytical methodologies for the assessment of the biogenic content of wastes, such as the post-combustion <sup>14</sup>C method applied at plant emission, now supported in Italy by a national technical specification (UNI 11461:20129).

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<sup>12</sup> CTI Guideline 10, 2012