IEA BIOENERGY TASK 40

COUNTRY PROFILE ITALY 2011

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1. Introduction

Italy is one of the biggest European Countries with a territory of is 294,020 sq km and a population of 59,5 million citizens in 2011. the density of population has reached nearly 200 people per square km, much higher than the European average of 113.

More than 75% of the Italian territory is occupied by mountains and hills. Thanks to this and to the relatively abundant rainfall in the northern regions, during the last 50 year hydropower became an important energy source for the country, whose energy balance is however still strictly relying on imports of fossil fuels and electricity. Besides fossil fuels, Italy is a major importer of natural gas and in the last 30 years has developed a wide and well distributed natural gas network, one of the most widespread in Europe, that now serves the majority of the population for residential and industrial uses. Agricultural land covers 17.800.000 hectares whereas forests cover 10.467.533 hectares.

Tab. 1 shows Italy's statistical profile in 2010 (source: OECD iLibrary) while table 2 shows the National energy balance for 2010.

	Unit	2010
Production and income		
Gross domestic product (GDP)	Bln USD curr. PPPs	1 908,6
GDP per capita	USD current PPPs	31 563
Gross national income (GNI) per capita	USD current PPPs	31 140
Household disposable income	Annual growth %	..
Economic growth		
Real GDP growth	Annual growth %	1,3
Net saving rate in household disposable income	%	..
Gross fixed capital formation	% of GDP	2,5
Economic structure		
Real value added: agriculture, forestry, fishing	Annual growth %	1,0
Real value added: industry	Annual growth %	4,8
Real value added: services	Annual growth %	-0,1
Trade		
Imports of goods and services	% of GDP	28,5
Exports of goods and services	% of GDP	26,8
Goods trade balance: exports minus imports of goods	Bln USD	-39,1
Imports of goods	Bln USD	486,6
Exports of goods	Bln USD	447,5
Service trade balance: exports minus imports of services	Bln USD	-11,8
Imports of services	Bln USD	110,1
Exports of services	Bln USD	98,3
Current account balance of payments	% of GDP	-3,2
Foreign direct investment (FDI)		
Outward FDI stocks	Mln USD	475 599
Inward FDI stocks	Mln USD	337 397
Inflows of foreign direct investment	Mln USD	21 011
Outflows of foreign direct investment	Mln USD	9 498

Tab . 1 - Italy's statistical profile Source OECD

Primary Energy Sources													
	Coal for coke	Coal for steam	Coal other uses	Lignite	By-products	Natural gas	Oil	semifinished	Hydropower	Geothermal	Wind + Photovoltaic	Wastes	Biomass
	ktons	ktons	ktons	ktons	ktons	Millions m3	ktons	ktons	GWh	GWh	GWh	ktons	ktons
Production		101			2.860	8406	5.080	2516	51.117	5.376	11.032	5.674	17.463
Import	5.066	16.863	177	6		75.354	78.620	7101					5.084
Export		3	2			141	369	1382					159
Changes in stocks	-79	530	-10			522	47	650					28
Gross domestic consumption	5.145	16.431	185	6	2.860	83.097	83.284	7585	51.117	5.376	11.032	5.674	22.360
Transformations	5.093	14.181			2.860	30.059	90.869		51.117	5.376	11.032	5.674	7.121
Consumptions and losses in the energy sector	52	-				1.767							
Final consumption		2.250	185	6		51.271							15.239
Agriculture						174							550
Industry		2.250	179	6		15.650							826
Tertiary						849							14.68
Residential uses			6			33.907							12.395
total		2.250	185	6		50.580							15.239
non energy uses						691							
Total energy consumption	52	2.250	185	6		53.038							
Total uses	5.145	16.431	185	6	2.860	83.097	90.869		51.117	5.376	11.032	5.674	22.360

Tab. 2 – Italian Energy Balance 2010 Source: Ministry of Economic Development

As shown by the energy balance, hydropower is the main source of renewable energy (51.000 GWh primary energy), followed by biomass (17.463 GWh) and wind+photovoltaic (11.000 GWh).
The national energy balance also makes a distinction among several biomass sources (firewood, biomass for electricity and biodiesel) as follows:

	firewood	biomass for electricity	biodiesel
	ktons	ktons	ktons
Production	9.594	7.070	799
Import	4.286		798
Export	58		101
Changes in stocks			28
Gross domestic consumption	13.822	7.070	1.468
Transformations	51	7.070	
Consumptions and losses in the energy sector			
Final consumption	13.771		1.468
Agriculture	550		
Industry	826		
Tertiary			
Residential uses	12.395		
total	13.771		1.468
non energy uses			
Total energy consumption			
Total uses	13.822	7.070	1.468

Tab. 3 – Biomass sources in the Italian energy balance 2010 Source: Ministry of Economic Development

As far as electric energy is concerned, the total installed power capacity in Italy increased from 101.447 MW in 2009 to 106.489 MW in 2010, whereas the total electricity consumption was 330 TWh, marking a + 3% compared to 2009.
About 75 TWh of the total electricity demand were produced from renewable sources, while the remaining 210,9 TWh were produced by conventional plants (using natural gas, oil and coal). The total energy consumption can be attributed to four economic sectors with the following respective percentages:

- Agriculture: 5,6 TWh (1,8%)
- Industry: 138,4 TWh (44,7%)
- Tertiary sector: 93,3 TWh (31,0%)
- Domestic sector: 69,6 TWh (22,5%)

The industrial sector is the largest consumer of electricity, fig. XX shows the electric energy balance in 2010.

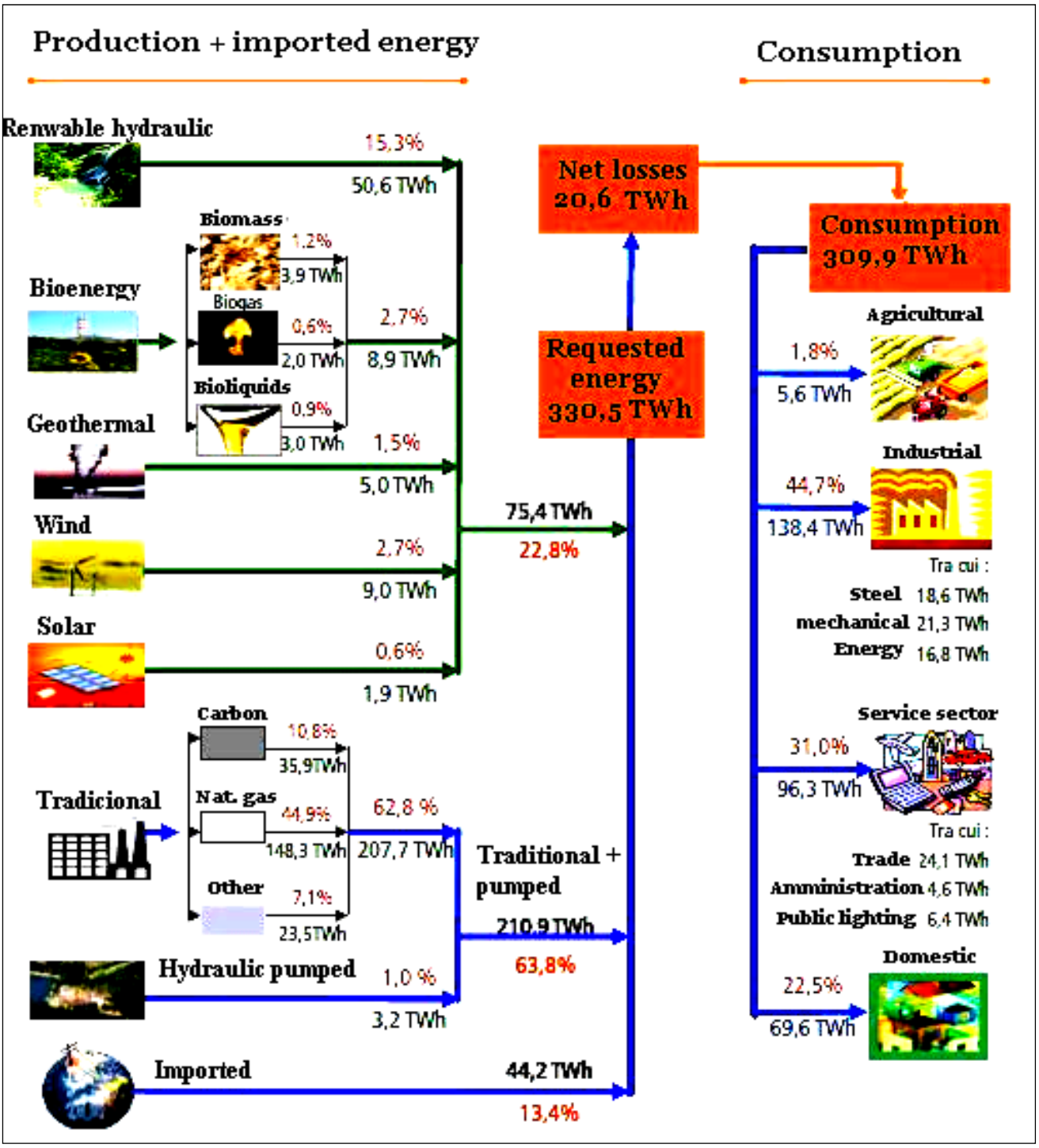

Figure 1. Electric energy balance in Italy. Energy sources and consumers. Source: GSE

2. National policy targets for renewables and bioenergy

The Italian target for renewable energy in the final energy consumption is 17% and 10.06% of alternative fuels in the transport sector by 2020, as stated in the National Renewable Energy Action Plan.
The NREAP acknowledges a predominant role for biomass especially in the heating sector, with an increase from 1,6 MTOE in 2010 to 5 MTOE in 2020.
As for most of the European members states the main policy updates and the major changes in the regulatory framework affecting the Italian biomass sector derived by the transposition and implementation of the EC Renewable Energy Directive 28/2009.
Figure XX shows the statistics of final energy consumption and RES energy consumption in 2008 and the forecasts for 2020 in electricity, heating and transports.

Figures from Italian NREAP

Total and sectorial RES consumption (Mtoe)

Statistics 2008 and forecasts to 2020

	2008			2020		
	RES consumption	Gross final consumption	RES / consumption	RES consumption	Gross final consumption	RES / consumption
	[Mtoe]	[Mtoe]	[%]	[Mtoe]	[Mtoe]	[%]
Electricity	5,026	30,399	16,53%	8,504	32,227	26,39%
Heating	3,238	58,534	5,53%	10,456	61,185	17,09%
Transports	0,723	42,619	1,70%	2,530	39,630	6,38%
From cooperation mechanism	-	-	-	1,127	-	-
Gross final consumption	8,987	131,553	6,83%	22,617	133,042	17,00%

Fig. 2 – RES consumption figures and 2020 forecasts in the Italian NREAP – Source GSE

In a recent ministerial implementing decree of 11 April 2012 (currently under final drafting for publication) the Italian government has increased the 2020 target for electricity from RES to 32%.
According to the Italian NREAP in 2020 solid biomass is expected to cover 50% of the RES share in the heating sector, increasing from 1.875 kTOE of 2008 up to over 5.600 kTOE in 2020.

Figures from Italian NREAP

Gross RES heat consumption in 2008 and forecasts to 2020

	2008		2020	
	Gross production RES-H	RES production share	Gross Production RES-H	RES production share
	[ktep]	[%]	[ktep]	[%]
Geothermic	213	7%	300	3%
Solar	67	2%	1.586	15%
Biomass:	1.875	58%	5.670	54%
solid	*1.854*	*57%*	*5.254*	*50%*
biogas	*16*	*1%*	*266*	*3%*
bioliquid	*4*	*0%*	*150*	*1%*
Heat pumps	1.083	33%	2.900	28%
Total	3.238	100%	10.456	100%

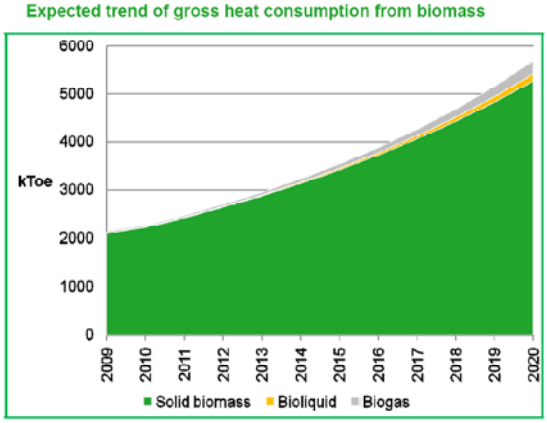

Figure 3: Gross RES heat consumption in 2008 and forecasts to 2010; expected trend of gross heat consumption from biomass Source: GSE

In order to achieve this ambitious target, a series of support measures will have to be put in place not only to mobilize additional biomass sources, but also to stimulate the demand for biomass energy in the heating sector and promote the installation of new biomass units (boilers, district heating network, pellets stoves etc.).
The NREAP also foresees an increasing use of biomass for the production of electricity, contributing to 19% of the production in 2020 compared to 12% in 2008. In absolute values, the majority of electricity should be produced with solid biomass, although a large relative increase in the use of bioliquids and biogas in particularly is expected (fig.4).

Figures from Italian NREAP

Gross RES electricity production in 2009 and forecasts to 2020

	2009				2020			
	Installed power RES-E	Gross production RES-E		RES production share	Installed power RES-E	Gross production RES-E		RES production share
	MW	GWh	[ktep]	[%]	MW	GWh	[ktep]	[%]
Hydro	16.458	42.155	3.625	67%	17.800	42.000	3.612	42%
Geothermic	737	5.342	459	9%	920	6.750	580	7%
Solar	1.142	676	58	1%	8.600	11.350	976	11%
Sea	-	-	-	0%	3	5	0	0%
Wind	4.898	6.830	587	11%	12.680	20.000	1.720	20%
Biomass	1.728	7.631	656	12%	3.820	18.780	1.615	19%
solid	*964*	*4.444*	*382*	*7%*	*1.640*	*7.900*	*679*	*8%*
biogas	*378*	*1.740*	*150*	*3%*	*1.200*	*6.020*	*518*	*6%*
bioliquid	*385*	*1.448*	*125*	*2%*	*980*	*4.860*	*418*	*5%*
Total	24.893	62.634	5.386	100,00%	43.823	99.885	8.504	100,00%

Expected trend of gross electricity production from biomass

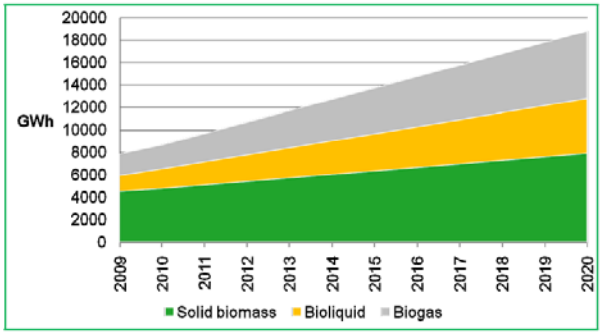

Fig. 4 – Gross RES electricity production and expected contribution of biomass for power generation in the NREAP. Source GSE

In the biofuels sector the NREAP targets a 65% share for biodiesel and 20% for bioethanol by 2020, however to date more than 90% of the biofuels distributed in Italy are represented by biodiesel.

Figures from Italian NREAP

Gross RES transport consumption in 2008 and forecasts to 2020

	2008		2020	
	Gross consumption RE-T	RE Consumption share	Gross Consumption RE-T	RE Consumption share
	[kteo]	[%]	[kteo]	[%]
Bioethanol/bio-ETBE	58	6,6%	600	20,7%
2nd generation	*3*	*0,4%*	*100*	*3,5%*
imports	*-*	*0,0%*	*200*	*6,9%*
Biodiesel	665	75,8%	1.880	64,9%
2nd generation	*37*	*4,2%*	*250*	*8,6%*
imports	*-*	*0,0%*	*800*	*27,6%*
Hydrogen from RE	-	0,0%	-	0,0%
RE electricity	155	17,6%	369	12,7%
Others	-	0,0%	50	1,7%
2nd generation	*-*	*0,0%*	*50*	*1,7%*
Total	878	100%	2.899	100%

Expected trend of gross energy consumption for transport from biomass

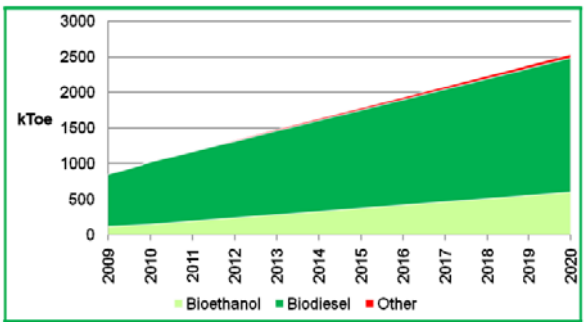

Fig. 5 – Gross RES consumption in transports and biomass contribution in the NREAP – Source GSE

3. Policy updates affecting the biomass heating sector

In March 2011 the Italian transposition law of the EU Renewable Energy Directive was adopted (Dlgs. 28 of 3 March 2011). This law introduced several major improvements in the regulatory context for biomass heating that will hopefully boost the adoption of biomass heating systems including pellet stoves and boilers.
Some of the main innovations introduced by the law are summarized below:

- Mandatory integration of RES systems in new buildings or old buildings subject to major renovations (art. 11);
- Simplification of the authorization procedures for new heating and RES systems;
- Introduction of mandatory “district heating and cooling plans” to be developed by municipalities with more than 50.000 citizens;
- Introduction of a loan guarantee fund for the installation of district heating networks;

- Introduction of incentives for RES heating and energy efficiency in small scale applications (to be further specified and regulated by ministerial decrees);
- Measures for the modernization of the system of energy efficiency certificates (so-called white certificates).

4. Policy updates affecting the biomass power, biogas and bioliquids sectors

The Italian budget law of 2008 introduced two distinct regimes for the production of electricity from biomass, biogas and bioliquids, which are valid until December 2012, whereas from 2013 on a new regime will be introduced as defined by Decree n. 28 of 3 March 2011 that is the transposition law of the renewable energy directive.

Under the current regime a distinction is made between plants with capacity up to 1 MWe and plants with capacity higher than 1 MWe. Plants up to 1 MWe are eligible for a fixed feed-in tariff of 28 €cents per kWh produced and sold to the grid, valid for 15 years, whereas plants bigger than 1 MWe are subject to the system of green certificates. In this case the electricity produced and sold to the gird is rewarded with a market price plus a green certificate (1 GC for 1 MWh of renewable electricity produced). In 2010 the actual market price of green certificates was 88 €/MWh.
For new plants in operation since 31/12/2007 the number of green certificates assigned to operators is calculated on the actual energy produced, multiplied by a coefficient varying between 0.8 and 1.8 depending on the renewable source utilized, as specified in the following table:

1	Organic wastes and biomass other than specified at point 2	1.30
2	Biomass and biogas from forestry, agricultural sources, livestock, obtained from framework contracts and supply agreements (as defined by Law 27/7/2005) or "short supply chains" (meaning sourced from a radius of maximum 70 km from the plant – Ministerial Decree 2 March 2010)	1.80
3	Landfill gas and gas deriving from treatment processes	0.80

Tab. 4 – multiplying coefficients applied to green certificates for renewable electricity valid until 31 December 2012

From 2013 onwards, a new support scheme for biomass energy will be introduced. The main principles defining the new scheme were introduced by decree 28/2011, however a series of further implementing decrees are required in order to define the operational details of such scheme, several of them are still under development and are expected in the first half of 2012.
The main principles introduced by the new regime valid from 2013 on will be as follows:

- A new mechanism of feed-in tariffs will be introduced for power plants (from biomass, biogas and bioliquids) up to 5 MWe. The value of feed-in tariffs will be modulated on the power range and the source of energy and feedstock used by the plant;
- for power plants with capacity higher than 5 MWe, the incentive will be assigned to operators by reverse auctions managed by GSE (www.gse.it);
- Plants with capacity between 50 kWe and 5 MWe will have to be included in a national register managed by GSE, which will set a maximum quota of energy that can be incentivized every year depending on the technology used;

- biomass biogas and bioliquids plants re-using waste heat will benefit of a premium for "high efficiency cogeneration" additional to the new feed-in tariffs.

At the time of writing of the present study (April 2012) the implementing decrees containing the operational details of the new schemes are still under development, although advanced drafts with new tariffs were published. According to those drafts a general and sensible reduction of tariffs is expected, though with longer validity periods than before (20 years instead of 15), coupled with a modulation of tariffs based on the source of feedstock, the technology and the reuse of waste heat.
An important innovation for the biomass sector contained in the renewable energy decree 28/2011 is the introduction of a support regime for small scale heat production and energy efficiency.
An incentive for small scale heating will be introduced and will be valid for a period up to 10 years. In this case also, the actual operational details of this scheme will be further defined by an implementing decree that is still under development and is expected by 2012.

5. Policy updates affecting the biofuels sector

The renewable energy decree of 2011 introduced important updates for the Italian biofuels sector, that can be summarized as follows:
a new definition of biofuels according to the European RES directive 28/2009 and the impact on raw materials that can be used for their production;
the introduction of new mechanisms for the verification of sustainability criteria;
the modification of mandatory quota for biofuels used in traditional transport fuels.

The transposition of the definition of biofuels according to the RED implies that only biofuels meeting the minimum 35% emission reductions by 2012 (increasing to 50% in 2017 and 60% in 2018) as well as the other sustainability criteria introduced by the RED shall be utilized for the achievement of the Italian national targets.
Considering that a sensible share of biofuels produced from feedstock that will not meet this criteria after 2012 (such as palm oil or soybean oil) is already utilized in by the Italian biofuels industry, it is clear that this new regulation will directly affect the future shaping and development of the Italian biofuels sector.

The Ministerial Decree of 23 January 2012 has finally introduced the Italian regulation for the certification of mandatory sustainability criteria for biofuels, whose main principles are summarized here below:

- a National accreditation organism, named "*Accredia*" is introduced, and is the sole organism responsible for the accreditation or certification bodies;
- the National system for the certification of sustainability criteria is composed by the accreditation body (Accredia); the accredited certification bodies; the certification schemes used by certification bodies; the economic operators subject to audits from the certification bodies;
- the minimum verification activities due by certification bodies on economic operators are: an initial audit and an annual audit of the operators or one every six months;
- The certification bodies assign a "Certificate of Conformity" to operators, that is valid for 5 years and which can be revoked in case of lack of compliance;
- Operators in a given supply chain, delivering their product to the next operator of the supply chain, must release a "Declaration of Conformity" for each lot of the delivered product (or in certain cases a Certificate of Sustainability);
- Operators can also choose to certify their products based on voluntary schemes approved by the Commission, provided that they are audited by accredited certification bodies.

As regards mandatory quotas for biofuels, the financial Law of 2007 fixed a minimum share of 2% biofuels in the final transport fuels consumption in 2008, 3% in 2009 and 5,75% in 2010, but at the end of 2009 this target was reduced to 3,5% in 2010, 4% in 2011 and 4,5% in 2012.
The renewable energy decree of 28/2011 has further postponed the minimum share of 5% biofuels to 2014 instead of 2013.

6. Biomass resources

The latest survey on the theoretical biomass potential in Italy was carried out by ENEA in 2009. This work has led to the development of an online GIS based atlas of biomass resources (available at http://atlantebiomasse.trisaia.enea.it/).

Table 5 summarizes the regional distribution of the theoretical exploitable biomass potential according to this atlas (source ENEA).

Region	Straw (ktons)	Prunings (ktons)	Olive and Grape Residues (kton)	Forest wood (kton)	Biogas organic fraction of MSW, animal wastes and slaughterhouse residues (millions m3)
Piemonte	2,478	110	48.47	256.57	337.87
Valle d'Aosta	0.20	1.70	0.30	1.09	12.16
Lombardia	3,616	40	16.98	242.13	723.31
Veneto	1,744	367	74.73	90.99	272.61
Trentino-Alto Adige	1.52	64.63	12.95	34.99	67.66
Friuli Venezia Giulia	592	56.40	11.15	65.13	48.80
Liguria	4.23	19.36	5.38	96.47	43.91
Emilia Romagna	1,556	398.46	62.62	236.54	318.05
Toscana	724	237.67	63.76	365.07	127.68
Marche	539	57.86	16.96	32.32	56.47
Lazio	436	247.85	56.70	112.33	229.43
Umbria	430	101.89	13.73	67.15	43.78
Abruzzo	229	290.35	54.99	60.13	55.05
Molise	163	31.48	29.04	43.75	18.83
Campania	316	286.58	65.85	119.83	260.19
Basilicata	452	49,96	11.58	65.28	35.95
Puglia	1,219	813.88	369.64	46.43	136.87
Calabria	212	1,012	189.92	153.80	85.23
Sicilia	731	597.92	186.35	25.58	210.50
Sardegna	260	120.90	28.78	65.01	122.43
TOTAL	15,710	4,906	1,319.90	2,180.58	3,206.77

Tab. 5 - regional distribution of the theoretical exploitable biomass. Source ENEA

7. Current and expected future energy use of biomass

Bioenergy power plants

Table 6 reports the number and cumulative capacity of bioenergy power plants in Italy in 2009 and 2010 (biomass, biogas and bioliquids). In terms of units biogas plants are the most abundant (66%) followed by biomass plants 20% and bioliquids (14%). In terms of installed power capacity, 53% is represented biomass, followed by bioliquids (26%) and biogas (22%). Biomass plants have an average capacity of 9 MWe whereas biogas plants only 1 MWe.
The reason of this significant increase in small size plants up to 1 MWe lies in the support scheme valid until December 2012, that introduced a feed in tariff of 28 €cents/kWh for 15 years for plants up to this capacity.

In 2010 the capacity of bioenergy plants represented a share of 8% of the total capacity of renewables in Italy (Source: GSE).

	2009		2010		% variation	
	n.	kW	n.	kW	n.	kW
Biomass	122	1,255,406	138	1,242,659	+13.1	-1.0
From organic fraction of MSW	69	781,964	71	797,929	+2.9	+2.0
Other biomass	53	473,442	67	444,730	+26.4	-6.1
Biogas	273	378,181	451	507,704	+65.2	+34.2
from waste	194	299,254	228	341,338	+17.5	+14.1
From sludge	20	9,922	47	14,569	+135	+46.8
From animal waste	28	17,170	95	41,371	+239	+140.9
From agriculture	31	51,835	81	110,426	+161	+113.0
Bioliquids	42	384,967	97	591,182	+131	+56.2
Pure vegetal oil	35	302,543	86	510,016	+145	+68.6
Other bioliquids	7	82,424	11	91,166	+57.1	+10.6
Total	419	2,018,554	669	2,351,545	+59.7	+16.5

Tab. 6 - Number and cumulative capacity of power plants in Italy – source GSE

Most plants are located in the Northern regions of Italy (64% in 2009 and 71% in 2010), as well as .
the installed power capacity (55%) especially in the regions of Lombardy and Emilia Romagna.

Between 2000 and 2010 electricity from bioenergy marked a +30% increase per year, moving from 1.505 GWh to 9.440 GWh.
In 2010 67 biomass power plants were active in Italy, compared to 53 in 2009; despite the increasing number of plants the overall installed capacity decreased to 444 MWe in 2010 from 473 MWe in 2009.
Altogether these plants generate an annual demand of nearly 4 million tons of solid biomass, mainly represented by woodchips and round-wood sourced from the management of domestic forests. An amount in the range of some hundred thousand tons of biomass (palm kernels and shells, olive cake and woodchips) were also imported at least until 2010. However the current policy framework and support schemes are in favor of the use of locally sourced biomass therefore the import of solid biomass for power generation will not probably increase in the future.

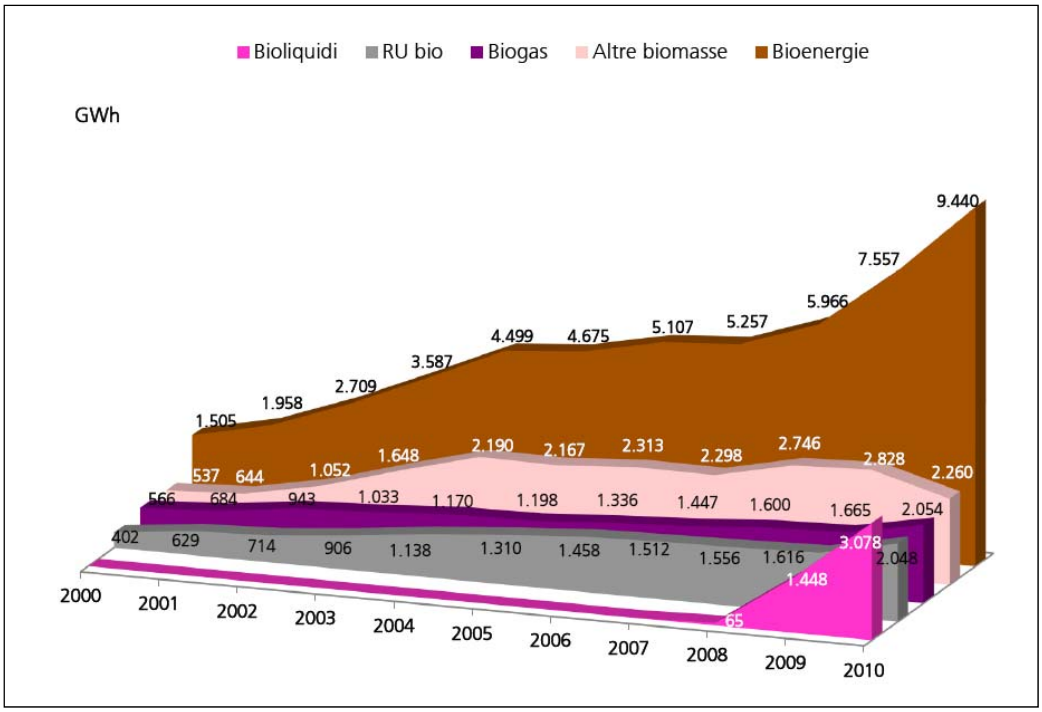

Fig. 5 – Electricity from bioenergy 2000 – 2010 source GSE

District heating biomass plants

At the end of 2010 about 250 district heating biomass plants were present in Italy, with an overall installed capacity of 430 MWt, and generated 2,5 TWh of heat, enough to cover the demand of 170.000 families. In the same year 20 new plants were installed. The majority of district heating plants are located in the alpine regions (90%). Nevertheless a significant number of micro scale and small scale DH plants are also located in Tuscany, in central Italy, thanks to regional grants available for public bodies, that led to the installation of 30 plants and additional 13 projects in the pipeline.

Table 7 shows the average capacity of DH plants in different regions of Italy, while table 8 lists the major district heating plants:

Region	Average capacity (MWt)
Lombardia	6.4
Valle d'Aosta	5.3
Piemonte	3.7
Trentino Alto Adige	3.0
Friuli Venezia Giulia	0.3
Average	2.8

Tab. 7 – Average capacity of district heating plants per region – Source Biomass Energy Report 2011 Politecnico di Milano

Location	Capacity MWt	N. boilers	n. users served
Tirano (SO)	20	3	691
Sellero Novelle (BS)	12.9	1	415
Collio (BS)	12.9	1	320
Sedrina (BG)	12.9	1	200
S. Caterina Val Furva (SO)	12.9	2	54
Sondalo (SO)	12	2	361
Piancogno (BS)	5.5	2	200
Abbiategrasso (MI)	1.5	1	10
Marchirolo (VA)	1	1	8
Ospitaletto (BS)	0.9	1	2

Tab. 8 – Major district heating plants in Italy – source Biomass Energy Report Politecnico di Milano

Bioliquids plants

During the last three years a sensible increase in the number of power plants using bioliquids (namely pure vegetable oil) was observed, thanks to the relatively low investment costs required for this technology and a very good profitability of these investments in presence of a relatively low cost of feedstock.
In 2010, the cumulative capacity of bioliquids plants was around 600 MWe, generating 3.078 GWh of electricity from around 100 plants.
During the last 2 years, since the price of feedstock has increased sensibly, the cumulative number of operating hours of these plants has reduced drastically.
Southern regions such as Puglia and Campania followed by Sardinia, hold the most of the generating capacity (200 MWe only in Puglia), whereas the highest number of plants, (though with much smaller capacity) is located in the Northern regions of Lombardia (28 plants), Veneto (21) and Trentino Alto Adige (18).
Most power plants with capacity higher than 10 MWe are located in coastal areas and in close proximity of ports, due to the fact that the majority of vegetal oil is imported.

In 2010 the demand for pure vegetal oil generated by these plants amounted to 1 million tons. It is estimated that only 56.000 tons are produced from domestic agriculture; therefore 95% of the oil is imported, mostly from East European countries or Germany and overseas from U.S., Brazil, Argentina, Malaysia and Indonesia.

Since the highest feed-in tariffs can be obtained only by using traced oil from European origin, the price of this feedstock has been 15-20% higher than oil from other origins in the last few years. The high prices and most of all the price fluctuations on the PVO markets greatly affect the profitability of these plants. In addition, since 2012 only certified sustainable bioliquids can be used.

Biomass heating and wood pellets

Italy is a big consumer of biomass for heating, according to estimates from AIEL among different solid biofuels firewood still holds the highest market share (83%) and is frequently used in old stoves and fireplaces that are still common in many households and country homes particularly in the rural areas (15 million units estimated). As a matter of fact Italy is one of the largest importers of firewood in the world.

Besides firewood, Italy is also a major consumer of wood pellets, whose demand is almost exclusively generated by the consumer market for space heating in residential buildings. The main driver for this market is therefore represented by the market of pellet stoves and boilers that has been growing steadily since 2003. In 2010 over 1.200.000 heating units were estimated, most of them being pellet stoves with an average installed capacity of 7-10 kWth and a much smaller share being pellet boilers of slightly higher power capacity (14.000-15.000) units. Forecasts for 2011 foresee that the number of installed units may reach 1.400.000 units.

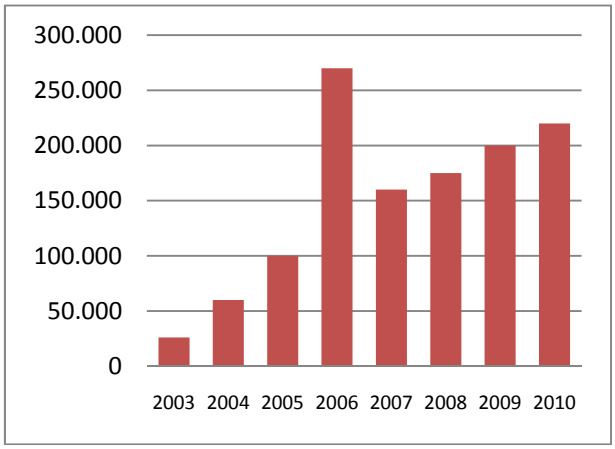

Fig. 6: Sales of pellet stoves in Italy – source: Politecnico di Milano

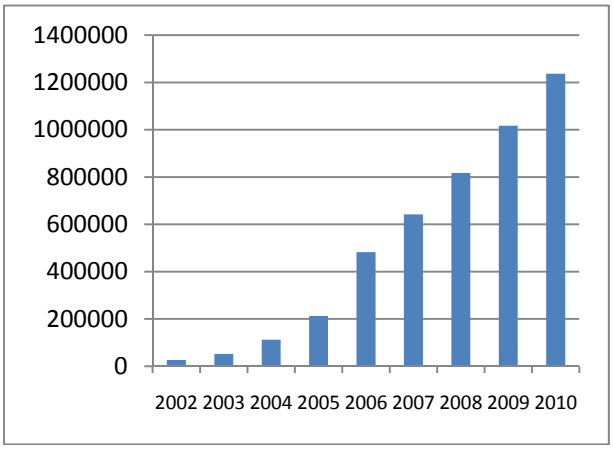

Fig. 7:Cumulative sales of pellet stoves in Italy – Source: Politecnico di Milano

According to a report published in 2011 by the Energy Strategy Group of the Politecnico di Milano, the market of pellet stoves has experienced a steady growth of 10% per year since 2008. Over 220.000 new pellet appliances were installed in 2010 (+ 20% compared to 2009).

There are several drivers behind the expansion of this market such as:

- The economic competitiveness of wood pellet versus other fuels such as LPG and heating oil that are still the main fuels used in several decentralized rural areas not served by the natural gas grid network;
- The availability of tax incentives;
- The presence of a mature and dynamic sector of stove manufacturers providing a wide range of solutions from entry level to high design products.

The relative cost competitiveness of pellet heating is therefore the main driver behind market expansion. As a matter of fact, despite the increasing trend of pellet prices, the annual costs of a pellet stove are still as competitive as a traditional natural gas boiler.

In 2008 and 2009 the cumulative pellet production of Italian manufacturers was estimated around 800.000 tons, in increase since 2007 when it was around 650.000-700.000 tons.

In 2010 70 to 80 producers were operating, most of them declaring a small production capacity in the range of 15.000-20.000 tons per year. Over 70% of the production is located in the northern regions, due to the relatively higher abundance of raw material and a more developed wood industry in these areas. Several manufacturers are companies involved in the wood industry as primary activity, (sawmills, furniture manufacturers), that produce large quantities of sawdust and therefore produce pellet as secondary activity.

Raw material used in pellet production are mainly constituted by residues of the wood industry with 65% of sawdust, 19 % of shavings, 5% of rough discards, whereas chips and other residues represent 11%. In the last 2-3 years several manufacturers experienced difficulties in sourcing feedstock at competitive prices, due to the rising competition of other manufacturing activities such as that of fiberboards and furniture, but also to the increasing competition of a growing number of biomass plants, that in some cases have led to a concentrated demand of feedstock in some local areas.

Despite the steady growth of pellet demand, the sector is currently affected by strong market dynamics that have led some large producers to close their plants in 2009-2010 due to the economic crisis and to strong difficulties in ensuring a competitive supply of feedstock. At the same time some large players entered into the market, i.e. Italiana Pellets, that started its activity in May 2010 and has a production capacity of 60,000 tons per year.
As a consequence of this, during the last 2 years an increasing number of operators shifted their main activity from the production to the distribution of imported pellets.

Company	Location – Region	Capacity (tons/y)
Italiana Pellets	Corana – Lombardia	60.000
Energy Pellets	Treviso – Veneto	100.000
Fiul - Pellet	Captiva – Friuli Venezia Giulia	40.000
IT-Fire	Sassocorvaro - Marche	40.000
Sitta	San Giovanni Natisone – Fiuli Venezia Giulia	30.000
Rossikol	Sambuceto - Abruzzo	30.000
Elle - BI	Cerreto Guidi – Friuli Venezia Giulia	30.000
Pe.Pe	Azzana Decimo – Friuli Venezia Giulia	30.000
Italtrucciolo	Bologna – Emilia Romagna	30.000
Segatifriuli	San michele de Piave di Cimaldolmo - Veneto	25.000
Del Curto	Verderio Inferiore - Lombardia	25.000
Produttori Sementi Verona	Caldiero – Veneto	25.000
Braga	Casalmaggiore - Lombardia	23.000
Biocalor	Romans D'Isonzo – Friuli Venezia Giulia	20.000
Ecologic Fire	Pletrabbondante - Molise	15.000
Priant	Vazzola - Veneto	25.000
Bordignon Giuseppe	Selva del Montello - Veneto	15.000
Geminati	Brescia - Lombardia	15.000
Imola Legno	Imola – Emilia Romagna	15.000
Melinka Italia	Verona - Veneto	15.000
Mallarini	Savona - Liguria	10.000

Tab. 9 : Major Italian Pellet Producers. Source: Politecnico di Milano and AIEL 2011

The demand for wood pellet has increased steadily since 2003, led by the growth of the pellet stoves sector. A sensible increase in the pellet market was observed in 2007, when the volume of pellets distributed reached over 1.000.000 tons, from around 650.000 tons in 2006.
In 2009 the consumption of pellet reached over 1.200.000 tons, and in 2010 it was estimated well above 1.400.000 tons, thus confirming Italy as one of world's biggest and dynamic markets for high quality pellets.

Official estimates for 2011 are not available yet at the time of writing this report, however some sources recently indicated the market may have already reached an amount 2.000.000 tons of pellet sold.

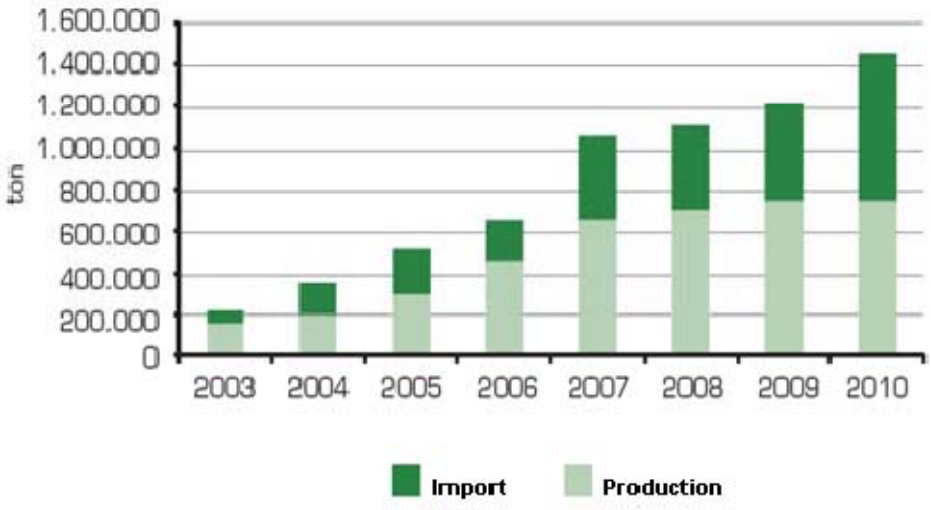

Fig. 8 . Evolution of the Italian pellet market - Source: Biomass Energy Report Politecnico di Milano

The increasing pellet demand cannot be satisfied by domestic production and a large share of the market is currently covered by imports.
The estimated amount of imported pellets in 2010 varies between 680.000 tons (source: Politecnico di Milano) and 1.054.000 tons (source: Eurostat 2011). This represents a market share between 48% and 72% respectively.
According to Eurostat in 2010 Austria remained the largest exporting country to Italy with nearly 400.000 tons delivered. Other important partners were, Germany (147.000 tons), France (85.000 tons), Romania (76.000 tons), Slovenia (66.000 tons) and Lithuania (52.000 tons).
For the first time in 2010, small volumes of imports were also recorded from overseas countries such as U.S. (3.500 tons) and Canada (12.000 tons). This is an evidence that Italy is being increasingly targeted as an export market by countries that had so far looked almost exclusively towards Northern EU markets for industrial pellet.

Wood pellets are distributed to final consumers through 3 main channels: direct sale from producers, sale through stove and boiler providers and sale through wholesalers and retailers. Over 70% of pellets are distributed through wholesalers and retailers. The large majority of pellets are sold in bags of 15-20 kg.
In some regions of Northern Italy, pellets are also delivered in bulk with tank trucks mainly to owners of biomass boilers.

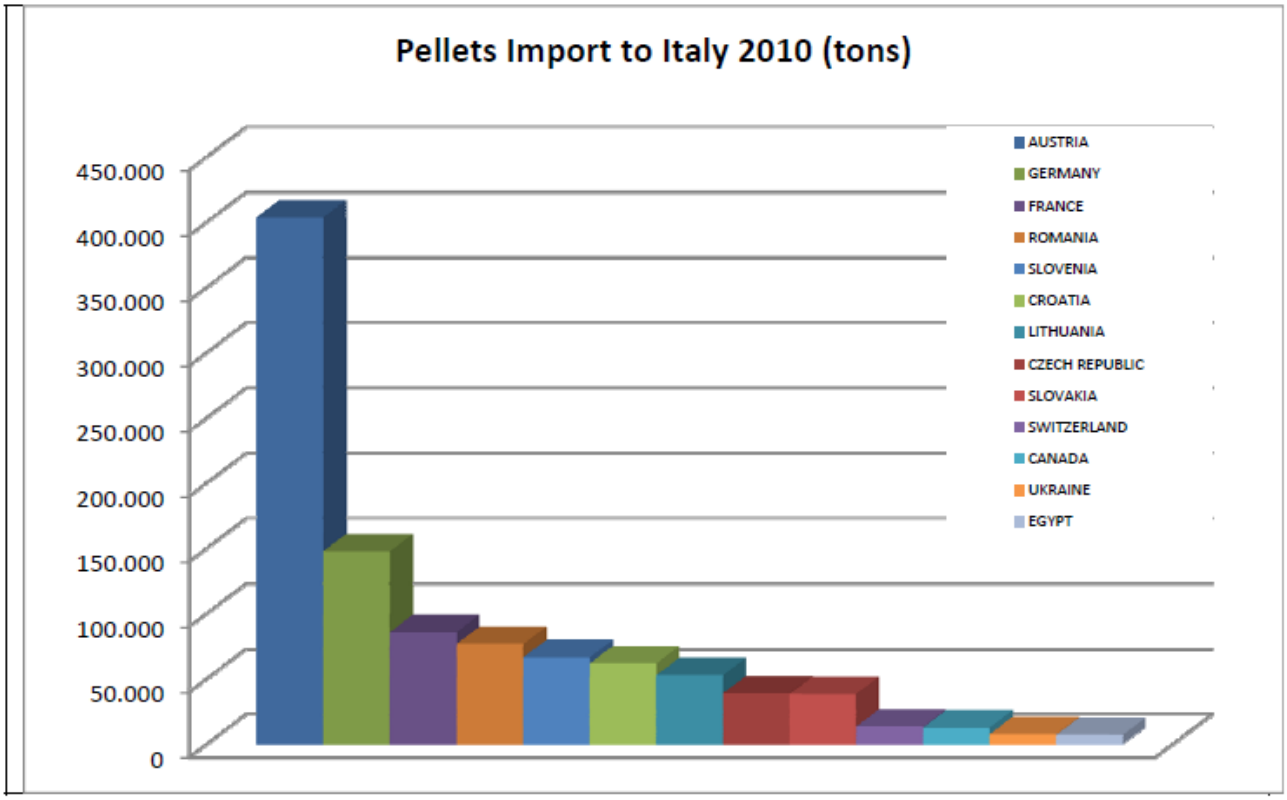

Fig. 9 - wood pellet imports to Italy in 2010 - Source: Eurostat

Biofuels for transports

The large majority of the Italian biofuels market is represented by biodiesel (95%), while the use of bioethanol is still marginal.

Figures 10 and 11 shows the amount of biodiesel and bioethanol produced and distributed in Italy from 2008 to 2010.

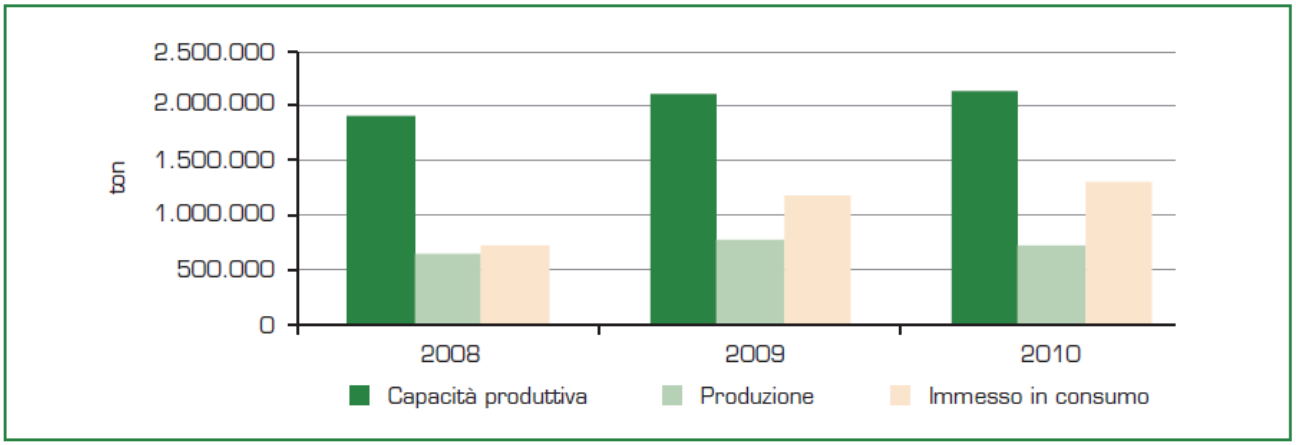

Fig. 10 – Biodiesel capacity, production and consumption in Italy – Source: Biomass Energy Report Politecnico di Milano

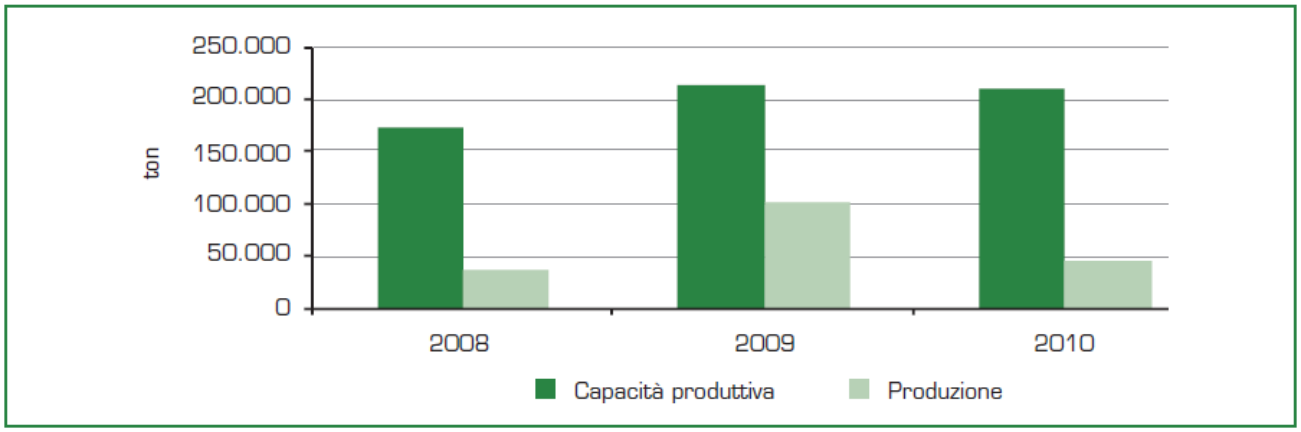

Fig. 11 – Bioethanol capacity, production and consumption in Italy – Source: Biomass Energy Report Politecnico di Milano

The production capacity of the biodiesel industry was 2,4 million tons in 2010 while the production was 800.000 tons, with a very low utilization rate of only 33% for biodiesel plants, however the amount of biodiesel distributed increased from 0,74 million tons in 2008 to 1,46 million tons in 2010. This means that a growing share of the market is covered by imported biodiesel (798.000 tons in 2010), while only 101.000 tons were exported, mainly to other EU countries.

Production Capacity - tons	Production - tons	Imports - tons	Exports - tons	Consumed in Italy
2.395.000	799.000	798.000	101.000	1.468.000

Tab. 10 . Production, imports and exports of biodiesel Source. Assocostieri

Table 11 lists the 16 producers of biodiesel currently active in Italy.

Company	Capacity tons
Alchemia Italia	15.000
Bio-Ve-Oil Olimpo srl	100.000 under construction
Cereal Docks	150.000
COMLUBE srl	120.000
DP Lubrificanti srl	155.520
ECOIL	200.000 under construction
F.A.R.	100.000
ECO FOX srl	199.416
ITAL BI OL	190.000
ITAL GREEN OIL	365.000
GDR Biocarburanti	50.000
Mythen	200.000
Novaol Livorno	250.000
Novaol Ravenna	200.000
Oil.B	200.000
Oxem	200.000
Total	2.395.240

Tab. 11 . Italian biodiesel producers. source: Assocostieri

As far as bioethanol is concerned, the production capacity also remained stable in the last 4 years around 200.000 tons/y, but the actual production decreased from 100.000 tons in 2009 to less than 50.000 tons in 2010. The reason of this downtrend is related to the reduction of incentives and tax exemptions for biofuels. The utilization rate of bioethanol plants was less than 25% in 2010.
In Italy bioethanol is not blended directly with gasoline, it is instead transformed into ETBE and then added to gasoline as an additive.

Table 12 lists the only two bioethanol producers currently active in Italy

Company	Production capacity tons
Caviro	43.000
I.M.A	172.000

Tab. 12 – Italian bioethanol producers – source Assocostieri

The main feedstock used by these two companies is represented by the distillation of wine and wine by-products.

Despite the current weak production of bioethanol and the reduced level of investments occurred in this sector, Italy will soon host the world's largest second generation ethanol demo plant, which is currently under construction by Mossi & Ghisolfi Group in the region of Piemonte ad should be completed in the second half of 2012.
Mossi & Ghisolfi is a multinational leading company in the production of PET for the food market.
The Italian Bio Products plant (IBP) will have a capacity of 40.000 tons per year and will use only no-food ligno-cellulosic feedstock sourced from the local area. The main feedstock used will be cereal straw and biomass from plantations of giant reeds (*Arundo donax*).
The plant will be based on the PRO.E.SA technology developed by Chemtex Italy, an engineering company fully owned by M&G Group, with the support of ENEA, Politecnico of Torino, the Region of Piedmont, Novazymes and with the contribution of the FP7 Biolyfe project (www.biolyfe.eu).
In the current configuration the plant will also use the lignin recovered from the hydrolysis of the ligno-cellulosic biomass as feedstock to feed a 13MW power plant.

8. Barriers and opportunities for bioenergy trade

As described in the chapters above the trade of solid and liquid biofuels or feedstock already sensibly affects almost all bioenergy sectors in Italy. The future opportunities and barriers for biomass trade mostly depend on the evolution of the policies and support measures, as well as the relative dynamics of feedstock costs and market prices in each sector.

The sector of wood pellets will likely see a continuous growth of the market and an increasing importance of trade and imports. This is determined on one hand by the indirect policies supporting energy efficiency and the installation of pellet stoves in households, plus the relative competitiveness of pellet heating compared with fossil fuels. On the other hand, the increasing price of feedstock limits the expansion of domestic production, therefore generating increasing margins for imports.

The bioliquids sector for power generation is already almost exclusively covered by imports of oils or seeds and will likely remain highly related to imports. However, the increasing prices of oil-based feedstock have strongly reduced the competitiveness and profitability of bioliquid plants in Italy. The new support scheme valid from 2013 on will introduce much lower feed-in tariffs than the current ones for bioelectricity from bioliquids and will require the exclusive use of certified sustainable oils, thus probably reducing the appeal of this kind of plants in the future.
The biomass for electricity sector is already the least affected by imports in Italy and will likely be even less affected in the future. Indeed the new support scheme is in favor of small to medium size (up to 5 MWe) biomass plants working in cogeneration and will probably introduce higher tariffs for electricity produced from wastes and local resources. In addition the forest and agricultural sectors in Italy are constantly increasing their production capacity of round-wood and woodchips from forest management and ligno-cellulosic energy crops such a short rotation coppice.

As far a biofuels for transports are concerned and biodiesel in particular, in absence of major policy updates, this sector will likely continue to be strongly dependent from imports either of biofuels or feedstock (oil and/or seeds).
At the same time, the share of bioethanol distributed in Italy will likely remain marginal, though the start-up of the large 2nd generation ethanol plant plant by Mossi & Ghisolfi Group in 2012 (Italian Bio Products) may sensibly contribute to the development of this sector in Italy, by producing ethanol from locally sourced and no-food feedstock, while generating opportunities for replication and exporting of the PRO.E.SA technology itself.

Sector	Type of biofuel or feedstock	Market prices	Quantity and trade aspects	Main trade partners	Barriers/Opportunities for trade
Residential Biomass heating	Wood pellets	180-250 €/t	More than 1 million tons imported	Austria, Germany, Eastern EU, Canada and South U.S. growing	Margin for increase of pellet imports
District heating	Woodchips	40-70 €/t at 40% moisture depending on location	Mostly locally sourced	n.a.	Likely to remain local market, though imports of feedstock from bordering countries of the Alpine region may occur
Biomass power generation	Woodchips, PKS, olive oil cake	35-50 €/t	Woodchips mostly sourced locally, PKS, olive cake traded (in the range of few hundred thousand tons)	Mediterranean countries for olive cake, S.E: Asia for PKS	Role of trade likely to remain limited due to policies supporting the use of local feedstock and small-mid size plants
Bioliquids	Rapeseed and Rapeseed oil, palm oil Soybean and Soybean oil		Demand 1 million tons of PVO, 95% imported	Palm oil from S.E. Asia, rapeseed oil from Germany and France. Soybean from Argentina and U.S.	Lower feed-in tariffs from 2013 on, requirements on use of waste-heat and mandatory sustainability certification, high PVO price may reduce investor's attractiveness of this sector
Biodiesel	Rapeseed and Rapeseed oil, palm oil Soybean and Soybean oil		798.000 tons imports; Exports 101.000 tons to EU countries	Biodiesel imported from Germany, France other EU countries, Palm oil from S.E. Asia, rapeseed oil from Germany and France. Soybean from Argentina and U.S.	Biodiesel sector still strongly dependent on imports of biodiesel, PVO and oil seeds.

Tab. 13 – summary of trade issues related to different solid and liquid biofuels used in Italy

9. References and further reading

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