Gasification Survey Country: Italy

By: Antonio Molino, ENEA - Italian National agency for new technologies, Energy and sustainable economic development
Date: 06st December 2012

1. Policy

In the 2011 the National Electricity supplied was about of 335TWh, with the distribution that is possible to see in the figure 1:

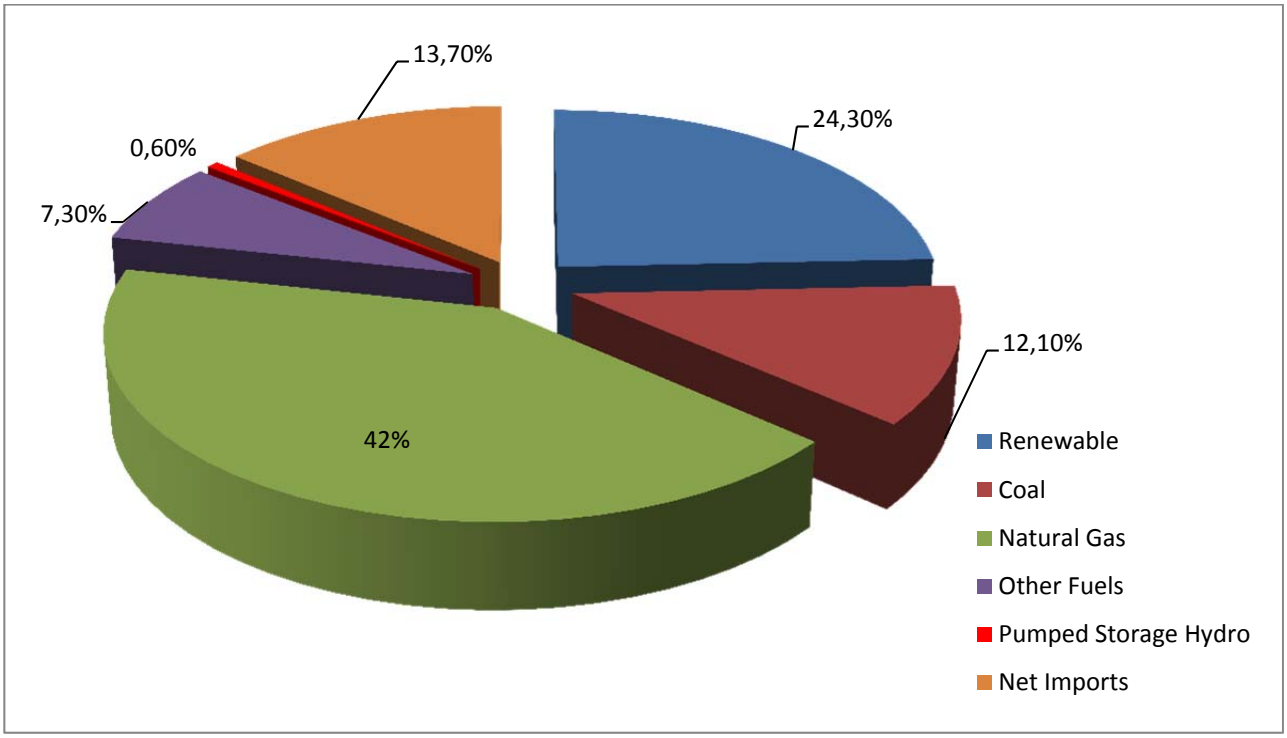


Figure 1: National Electricity supplied

Natural gas is still dominant, with a share of 42% in 2011, while the renewables are increasing their role, coal generation is quite steady in recent years, proving the 12% of the total.
The yearly growth of renewable energy power plant in Italy continues at very fast pace. In each of the past six years, their number doubled with respect to the previous year, reaching 335,151 in 2011. Installed capacity in 2011 was equal to 41,399MW, more than twice the one of 2000(18,335MW). Major contributors are new wind farms, bioenergy plants and, above all, photovoltaic plants, which had a boom in 2011.
The EU Directive on "renewables" requires Italy to increase renewable energy by up to 17% of gross energy consumption. The National Renewable Energy Action Plan(NREAO) of June 2010 shared the related burden among Electricity, Heating & Cooling and Transport sectors.
For the electricity sector, the target to be achieved by 2020 is 26.4% of electricity consumption from renewables. In 2011, Italy recorder 23.5%, surpassing by wide margins the 2011 intermediate target of 19.6%. Given this performance, the 26.4% target to be attained by 2020 will be revised upward(based on the preliminary version of the National Energy Strategy).
At the actually state the power generation from bioenergy(biomass, biogases and bioliquid) corresponds to 10.1TWh, the 3.1% of the electricity supplied, with the distribution that is possible to see in the picture below:

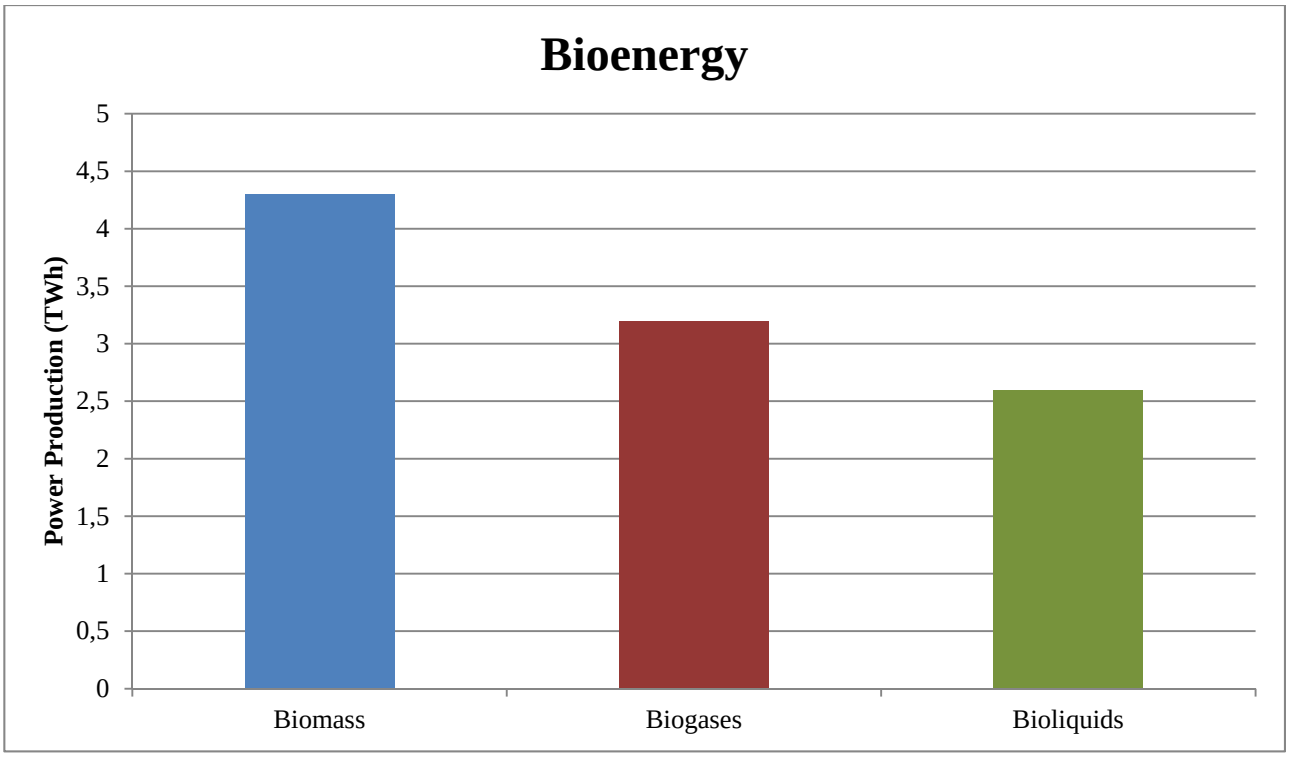


Figure 2: Power production from bioenergy

Bioenergy consists of biomass, biogases and bioliquids. Biomass covers a wide range of virgin or residual materials from agriculture and industry and the biodegradable fraction of industrial and municipal waste. Biomass and bioliquid plant designs depend on fuel type, technology and end product(electricity, CHP, heat). Currently, in Italy, the use of the biomass for power generation is very limited, in fact the power generation from biomass is equal to 7631GWh while the only solid biomass corresponding to 2828GWh. Combustion is by far the predominant energy conversion technology, almost all is based on the Rankine cycle coupling with the steam boiler grate. At the other hand, the total gasification plants fuelled with biomass are corresponding to 10MWe.

2. Implementation

PLANT	POWER (kWe)	MANUFACTURER OF THE SYSTEM	CHARACTERISTICS OF THE PLANT
Belluno(BL)	1000	Caema/Rivoira GAS-1000	The plant is fed with 8500t/a of wood
Parma(PA)	1000	Caema/Rivoira GAS - 1000	The plant produces 7.5GWhe and 15GWht and it is powered with 9000 t/a of kenaf
Gadesco Pieve(CR)	960	Agroenergia	The pyrogasifier is fed with chopped or chipped vegetable biomass
Alessandria(AL)	640	nd	The system is experimental and the process has been developed by poliTO; the plant is fed with 4100 t/a of biomass from forest

Vigevano(PV)	500	Modello GAS-500	The plant produces 3.75GWhe and 7.5 GWht and it is powered with 4100 t/a of wood chips
Caluso(TO)	400	Autogas Nord	The plant is fed with residues of agricultural production, forest biomass, leaves, waste of food industry
Oltrepo Pavese(PV)	300	Bio&Watt	The plant uses an endothermic motor
Castel San Pietro(BO)	250	Bio&Watt	The pyrogasificator is fed with waste prunings, corn stalks, wood chips of poplar
Orzinuovi(BS)	250	Bio&Watt	The pyrogasificator is powered by biomass from forests
Verbania(VB)	250	CoVer Energy	The plant is classified as experimental
Rossano(CS)	4200	Guascor	Commercial plant
Castel D'Aiano(BO)	35	Stirling	Commercial plant
Pomarico(MT)	300	Bio&Watt	Commercial plant
Quingentole(MN)	70	Caema	Commercial plant
Torre S.Susanna	500	ICQ/SIAG/ERBA	Experimental plant

During the last year requests for qualification that have come to the GSE concern another 20 plants under construction with a total power over 20MWe.

3. Analysis of the residual biomass

The analysis of the residual biomass is an important basic operation for the energy planning; in fact it's important to understand which are the potential energy of an area and if they can significantly affect the energy balance of an area with economically, sustainable and renewable way during the time. The proposed methodology is based on the use of map data and inventory to produce a geographically detailed on provincial scale that we can use for estimate the size of the power plant with a WEB Geographic Information System. In particular, the residual forest biomass, under these limitation: Forests up 1500m, Slope roads greater than 40%, Accessibility Road, Protected natural areas, considering only the routine maintenance of forests is equal to 2180ktonn, that corresponds to 1MTOE:

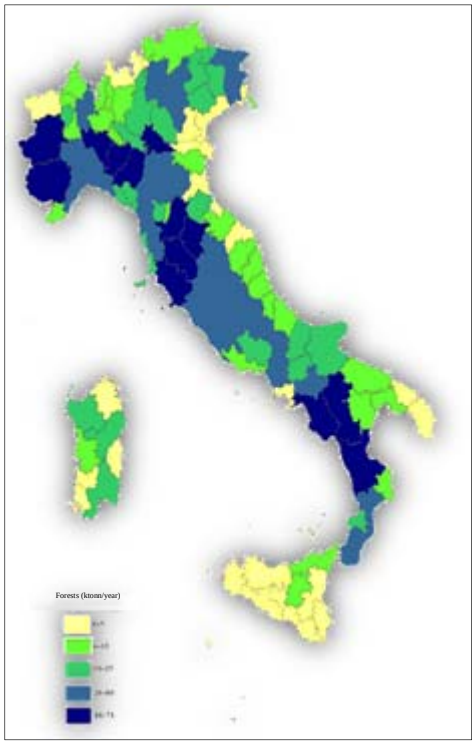
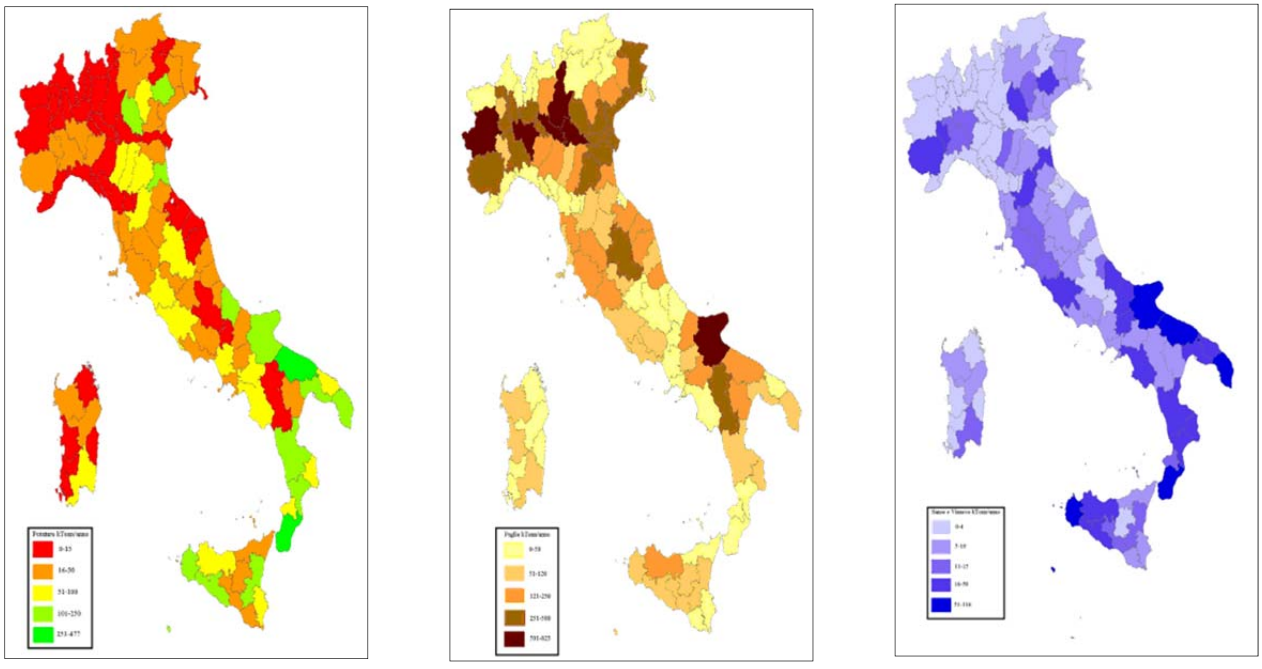


Figure 3: Resudual Biomass_Forests

Similar to the previous figure, the agro-industrial residual biomass, pruning, straws, pomace & marc, with the distribution of different type of agro-industrial biomass:



POMACES & MARC
1,320ktonn - 1MTOE

PRUNING
4,900ktonn - 2MTOE

STRAWS
15.700ktonn - 6MTOE

Figure 4: Agro industrial biomass

As you can see, the sum of the agro-industrial biomass is equal to 9MTOE. At the end, the total of the residual biomass, forestal and agro-industrials is equal to 53TWh that represent the 15% of the national electrical consumption.

4. Incentives to the RES

Green Certificates(GCs) are issued to RES producer in respect of generation by plants which have been commissioned in the period of 1 April 1999 to 31 December 2012 and which have obtained an appropriate qualification. These tradable certificates give proof of RES generation. GCs may be sold to parties having the obligation to inject a quota of RES-E into the power grid; unsold GCs are bought back by GSE. The underling electricity represent an additional source of revenue, as it may be sold in the market. The support period is 15 years if the plant has been commissioned after 31 Dec 2007.

The GSE buy-back price for 2011 was **85.12 €/MWh**.

All-inclusive feed-in tariff support scheme for small RES plan; the tariff includes both the incentive and the value of electricity fed into the power grid. The tariff is granted, upon request, to plants which have been commissioned after 31 Dec. 2007 and with capacity not exceeding 1MWe. The support period is 15 years.

The GSE buy-back price for 2011for the biomass was **280 €/MWh**.

CIP6 scheme is another form of support that GSE manages and that is no longer applicable to new project.

5. R&D Institutes

ENEA: Italian National agency for new technologies, Energy and sustainable economic development

CNR: National Research Council

6. Industries

Caema Engineering now Terruzzi Fercalx Energy S.r.l.
Viale Lombardia 7
24050 Spirano (Bergamo) Italy
Phone: (+39) 035.48.79.811
Fax: (+39) 035.48.79.800
Phone: (+39) 0372.800.559 (sede Cremona)
Fax: (+39) 0372.800.560 (sede Cremona)
E-mail: info.tfenergy@terruzzifercalxgroup.com
E-mail: info@caemaenergia.com
Web-site: www.caemaenergia.com

SOCOGES s.r.l.
Zona Industriale
70043 - Monopoli (Bari) Puglia - ITALY
Phone: (+39) 080.937.40.39
Phone: (+39) 080.937.30.00
Fax: (+39) 080.937.19.72
Email: info@socoges.it
Web-site: http://www.socoges.it

EXA
Corso Silvio Trentin, n°24
30027 - San Donà di Piave(VE)
Phone: (+39) 0421.336.999
Fax: (+39) 0421.560.164

E-mail: info@exaenergie.com
Web-site: http://www.exaenergie.com

Guascor Italia Spa
Via Orvieto, 12 - Pomezia (RM)
Phone: (+39) 06.91.62.780
Fax: (+39) 06.91.25.10.42
E-mail: commerciale@guascor.it
Web-site: http://www.guascor.it

Flenco SPA
Corso Torino, 2
10051 Avigliana(TO)
Phone: (+39) 011.93.30.611
Fax: (+39) 011.93.67.717
E-mail: info.flenco@flenco.com
Web-site: http://www.flenco.com

SERI Società Energie Rinnovabili
Zona PIP sn
75026 Rotondella (MT)
Phone/Fax: (+39) 0835.848242
E-mail: email info@serisrl.eu
Web-site: www.serisrl.eu

ECOENG ENVIRONMENT SRL
Viale Corassori, 54
41126 Modena
Phone: (+39) 059.344643
Fax: (+39) 059.344637
E-mail: ecoeng@ecoeng.eu
Web-site: http://www.ecoeng.eu

Planitec srl
Via E. Fermi
37047 San Bonifacio(VR)
Phone: (+39) 045.6104032
Fax: (+39) 045.610290
E-mail: info@planetec.it
Web-site: http://www.planitec.it

SOLENIA SRL
Vai 42 Martiri, 165
28924 - Verbania (VB)
Phone: (+39) 0323585211
Web-site: http://www.solenia.com/

ENERGY LIFE SRL
Via Maria Adelaide, 12
00196 Roma

Phone: (+39) 06.3200454
Fax: (+39) 06.32507527
E-mail: segreteriaroma@energylifegroup.it
Web-site: http://www.energylifegroup.it

Di Gas Italia s.r.l.
Corso Francia, 238
10146 Torino
Phone: (+39) 011 7727265
Fax: (+39) 011 7727265
E-mail: digas@digasitalia.it
Web-site: http://digasitalia.it

Syngen S.r.l.
Via Morselli, 20
29100 Piacenza (PC)
Phone: (+39) 0523 401666 / 498745
Fax: (+39) 0523 480821
E-mail: info@syngen.it
Web-site: http://www.syngen.it

7. Projects

Commercial Plant

During the last year requests for qualification that have come to the GSE concern another 20 plants under construction with a total power greater than 20MWe.

Research Project

ENERPARK Project
The project was funded by Basilicata Region with the EU Structural Funds PO FERS 2007-2013 through which the EU aims to streng then economic and social cohesion of its territory by correcting imbalances between the regions .
The project provides the construction of a gasification plant coupling with a methanation plant for increase the biomethane content in the syngas.
The biomass used for the process derive from the routine maintenance of the Gallipoli Cognato's foresty. A second step of the project provides the use of biomethane for the service cars for the workers in the park

HY-Tractor project
HY-Tractor project is funded by the Ministry of Economic Development
4.51M€ funded
The initiative runs from 1st October 2010 to September 2014.
The project involves the construction of an innovative and ecological sub-surface seeder provided with electrical rather than pneumatic or hydraulic actuators. Electric actuators guarantee for higher level of control, which enable the development of advanced planting techniques, i.e. techniques including the use of GPS.