1st SINO-EU 2016 Bio-Natural Gas Summit

Beijing, P.R.China
3 - 5 November 2016

Italian biogas and bio-natural gas technology and cases sharing

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ETA-Florence Renewable Energies

First Sino-EU 2016 Bio-Natural Gas Summit

Sinopec Conference Center, Changping, Beijing

4 November 2016

ETA-Florence Renewable Energies

Expertise
Over 200 international projects completed since 1994, with a multidisciplinary expert's team providing consulting and engineering services to public and private organizations worldwide.

Knowledge base
As organizers of the annual European Biomass Conference & Exhibition and giving international support to the European Photovoltaic Solar Energy Conference and Exhibition we have a constant outlook on the latest global trends in market, technologies, research and policies.

Network
Our global network of contacts with the world's leading technology providers, industries, research organizations and institutions is a unique resource to develop solutions tailored to our customer's needs.

ETA-Florence Renewable Energies

Our activities

Project management
Business plans, due-diligence of projects, licensing and permits.

Strategic consultancy
Resource assessments and logistics, feasibility studies, market and policy analysis, sustainability assessment.

Business development
We help identify the best partners for their projects, from technology providers and research organizations, to industrial partners or financial institutions.

Communication and training
Knowledge transfer among research, industry, policy-makers through event organization, training and capacity-building activities, publications.

ETA-Florence Renewable Energies

ETA-Florence Renewable Energies professionally assists its customers in:

- Design, installation and monitoring of renewable energy plants in urban, industrial and rural contexts, isolated or connected to the grid;
- Applications to improve energy efficiency;
- Demand-side management;
- Sustainable Design;
- Complete energy analysis and planning;
- Economic-feasibility studies and finance management;
- Bioenergy strategies.

ETA-Florence Renewable Energies

The ETA-Florence Renewable Energies team, composed of qualified professionals and technicians with experience in the field, offers local authorities and entrepreneurs a consultancy service for all levels of requested technical performance:

- Feasibility studies for the realisation of biomass plants;
- Finding partners in the agricultural and industrial field for the creation of local supply chains;
- Preliminary design;
- Final design;
- Assistance in acquiring private financing.

ETA-Florence Renewable Energies offers its expertise to provide the most efficient solutions by developing action plans and suitable evaluations of economic, legal, financial and social components which characterize the feasibility of a project.

Excerpt of our activities

25th EUBCE in Stockholm, Sweden

The **European Biomass Conference and Exhibition (EUBCE)** is a world class annual event which, since 1980, is held at different venues throughout Europe.

The EUBCE covers the entire value chain of biomass to conduct business, network, and to present and discuss the latest developments and innovations, the vision is to educate the biomass community and to accelerate growth.

The EUBCE will host a dynamic international Exhibition for companies and research labs to showcase their latest products and bringing scientists, technologists and key players together with leading Biomass industries and organizations.

Excerpt of our activities

1st Asian Bioenergy Conference, IBSCE

The International Bioenergy (Shanghai) Exhibition and Asian Bioenergy Conference 2015 was the new leading conference and exhibition in Asia, an invaluable and influential international platform to discuss the role of bioenergy in the Asian context.

A knowledge exchange on the latest scientific and industry results, developments in policies, and deployment and business that will enable the move towards efficiency and sustainability in the bioenergy sector.

The main objective of the Conference was to promote synergy among markets, technologies and investments and create important business opportunities for the bioenergy sector.

Excerpt of our projects

BEST project
BioEthanol for Sustainable Transport

The main activities were:

- Introduction of 10 flexi-fuel vehicles in the municipal and provincial fleets;
- Setting up of 2 pumps for E85;
- Purchase of 3 buses running on E95;
- Setting up of 1 pumps for E95;
- Study and development of a supply and distribution system for bioethanol;
- Study and development of incentive schemes on both local and national level;
- Test and evaluation of the impact on the engine and emissions using E-diesel (10% bioethanol-90% diesel) in a small bus fleet;
- Information and awareness rising campaigns;
- Evaluation of the technical and environmental performances, of the use and of the public acceptance;
- Dissemination of the results.

Excerpt of our projects

GasHighWay project
Promoting the Uptake of Gaseous Vehicle Fuels, Biogas and Natural Gas, in Europe

The European Union has set the target of increasing the share of biofuels and so-called alternative fuels, including natural gas, in traffic to 10 and 20%, respectively, by 2020.

In order to overcome these barriers, a European project called GasHighWay has been established, aiming at promoting the uptake of gaseous vehicle fuels, namely biomethane and CNG, and especially the realisation of a comprehensive network of filling stations for these fuels spanning Europe from the north, Finland and Sweden, to the south, Italy - in other words: the GasHighWay.

Highlights in Italy
- Multi-dispenser refuelling station
- Oil free zone in the green and tourist valley of Primeiro:

1.500 cattle units* give 500 kg biomethane/day, electrolyser capacity of 30kg hydrogen/day -> biomethane/hydrogen blends first application

Excerpt of our projects

ORION project

ORganic waste management by a small-scale Innovative automated system of anaerobic digestION

Restaurants, hotels, markets, fisheries and other small to medium size agro-food industries have to manage more than 250 million tonnes of organic waste in Europe per year. ORION aimed at allowing a vast majority of SMEs to manage their organic waste by themselves in order to decrease their treatment costs. Wastes are also valorised as biomass to produce energy and increase SME autonomy and profitability.

ORION main objectives consist of:

- Developing for the first time anaerobic digestion machine at the SME scale (1 m^3 to 50 m^3) that will combine effectiveness for a large range of organic wastes and reduced capital and operating costs
- Developing advanced control tools and sensors to reach an optimum reliability
- Increasing know-how on the impact of nanostructured surfaces on bacterial growth and increase waste throughput in the digester
- Contributing to the implementation of EU policies on waste management and renewable energies production.

A maximum autonomy, adaptability and reliability are targeted.

Italy description

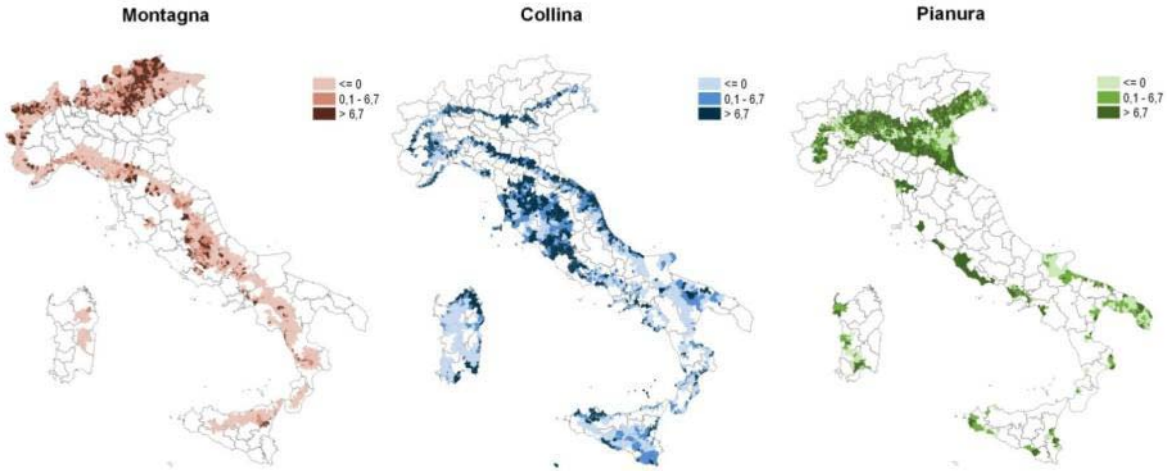
Surface: **302,073** km^2

Population: 60.795.612 (end of 2014)

Source: ISTAT Istituto nazionale di statistica

2014	Mountain	Hills	Plains
Surface	35%	42%	23%
Population	12%	39%	49%

Population living in mountain regions, hills and plains
Changes from 2001 to 2014

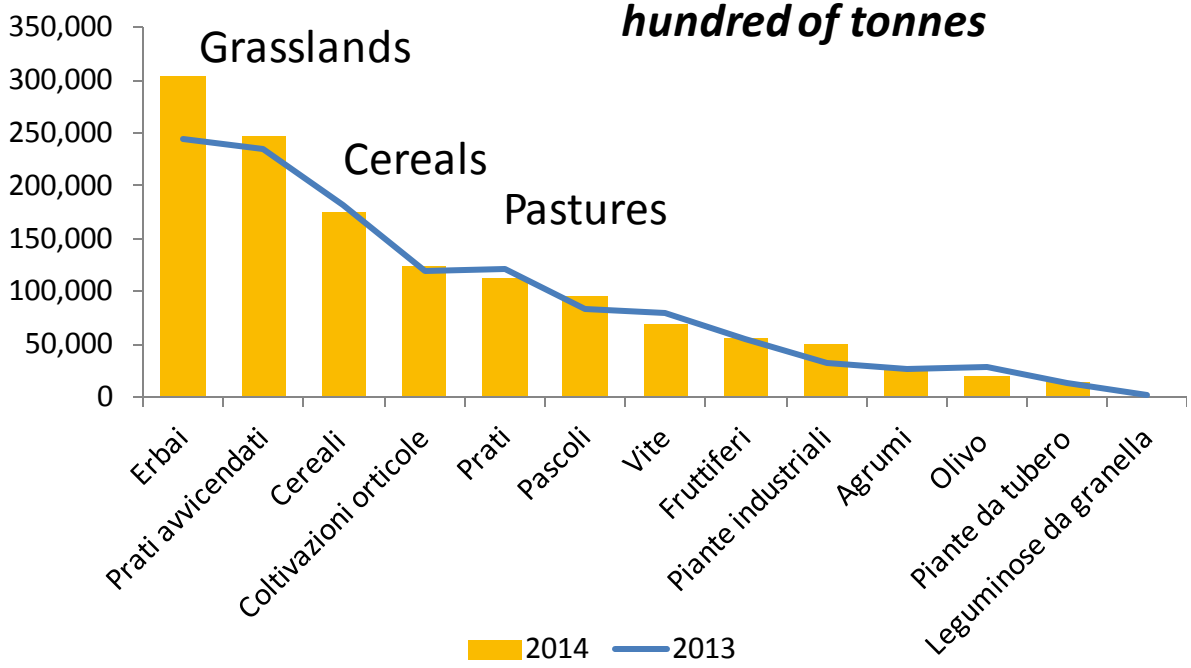


Italian farms

Farms: 1.471.000

Used surface in agriculture:
12.426.000 ha
(end of 2013)

Harvested cultivation, hundred of tonnes



Farms with animals: 189.531

Animals slaughtered (2014):

- Cows: 2.590.000
- Pigs: 10.931.000
- Sheepes & goats: 2.650.000

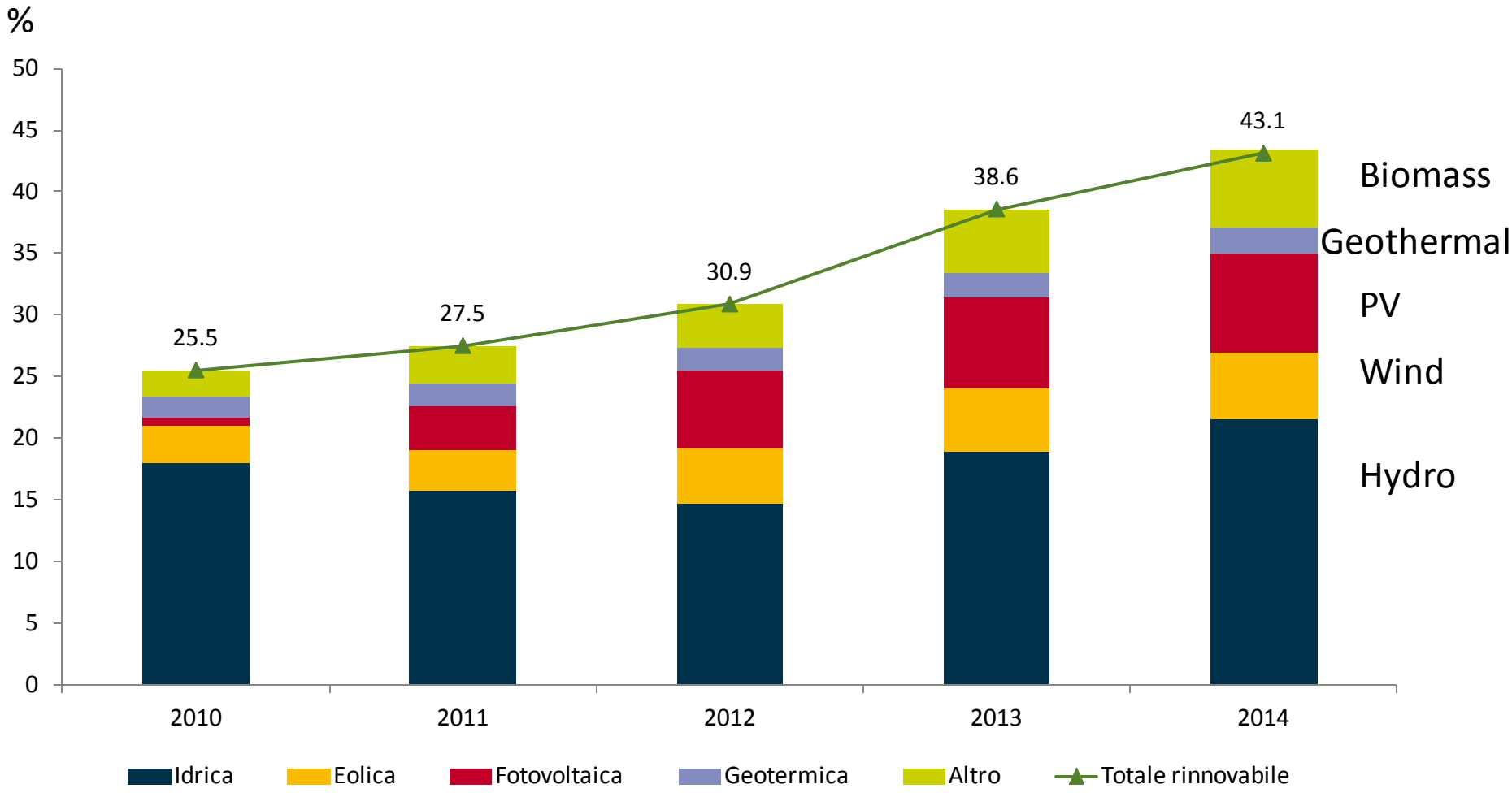
Source: ISTAT Istituto nazionale di statistica

Municipal solid waste

Material	Tonnes collected in Italy, 2014
Organic waste	5.720.793
Glass	1.711.312
Plastics	991.197
Paper	3.154.015
Other	18.077.934
Total	29.655.251
kg/person	**487,8**

Source: ISTAT Istituto nazionale di statistica

Electricity produced from renewable sources



Source: ISTAT Istituto nazionale di statistica

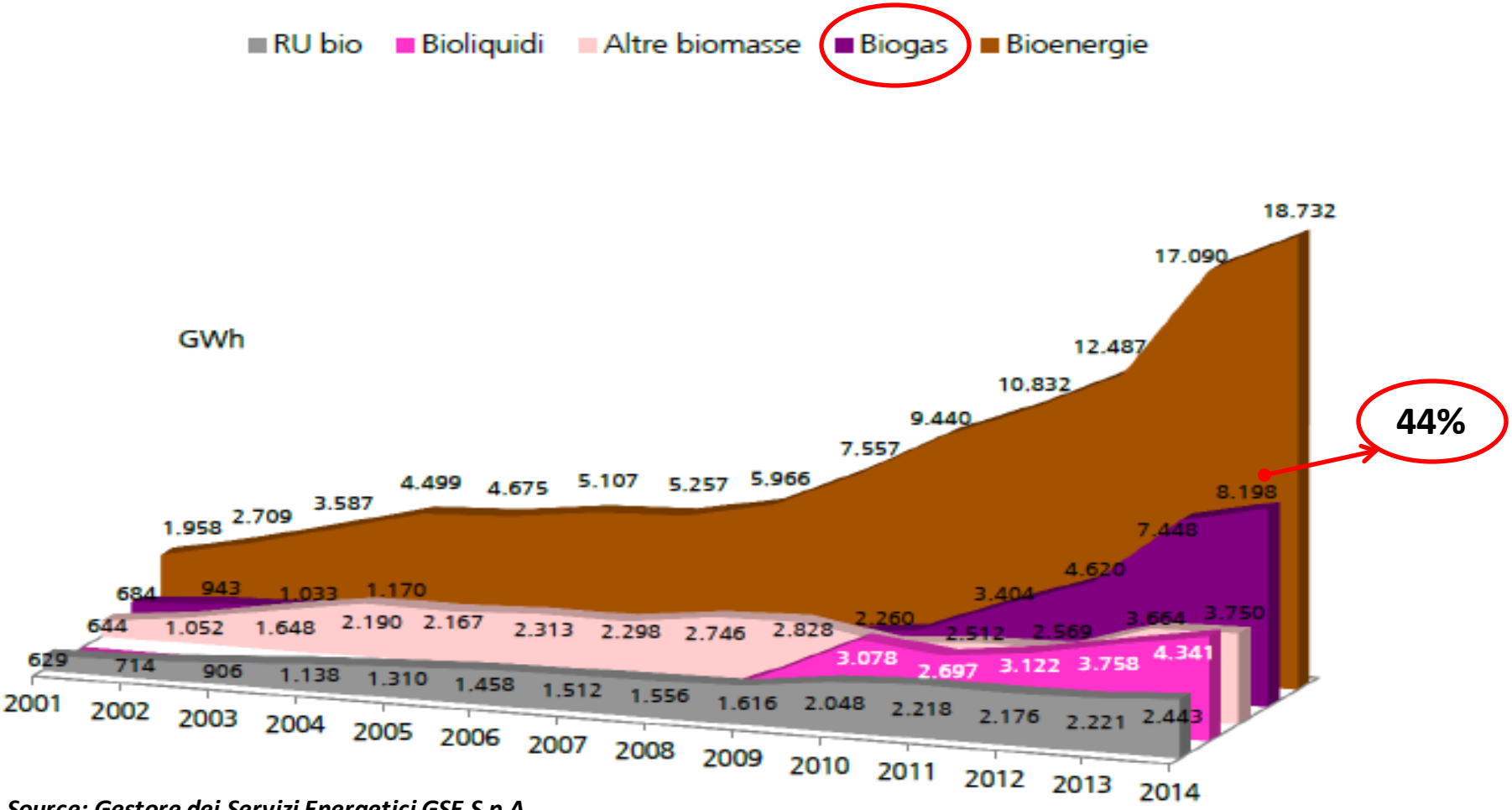
Biogas plants in Italy

	2013		2014		%
Source	**n°**	**MW**	**n°**	**MW**	**n°**
Municipal & industrial organic waste	346	401,8	360	401,4	4,0
Sewage sludges	68	40,8	74	43,9	8,8
Manure	379	192,5	421	203,3	11,1
Agriculture	920	753,2	941	757,5	2,3
Total	**1.713**	**1.388,4**	**1.796**	**1.406,1**	**4,8**

Source: Gestore dei Servizi Energetici GSE S.p.A

Range of installed power plants:
50 kW – 10 MW
(95% between 100 kw and 1,5 MW – 44% of 1 MW)

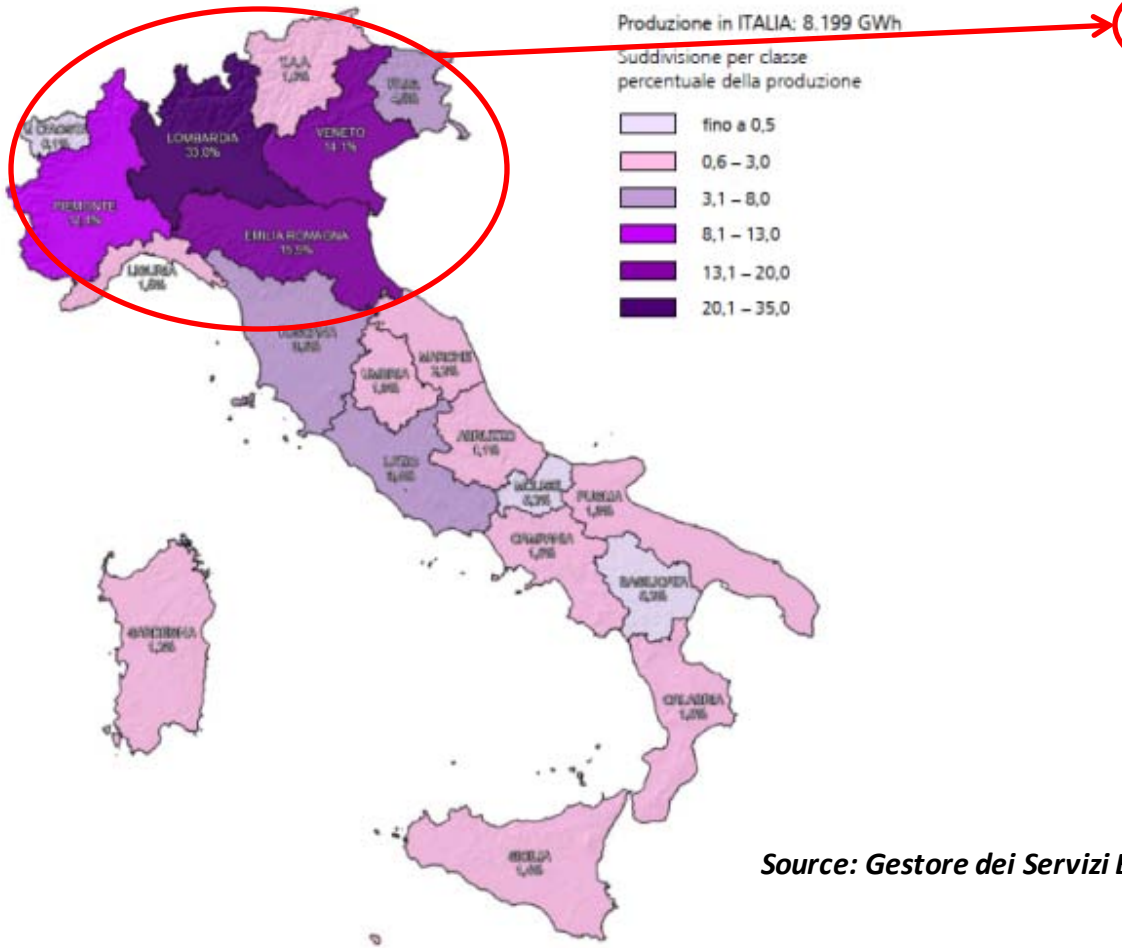
Energy from biogas plants in Italy



Source: Gestore dei Servizi Energetici GSE S.p.A

Regional distribution of production

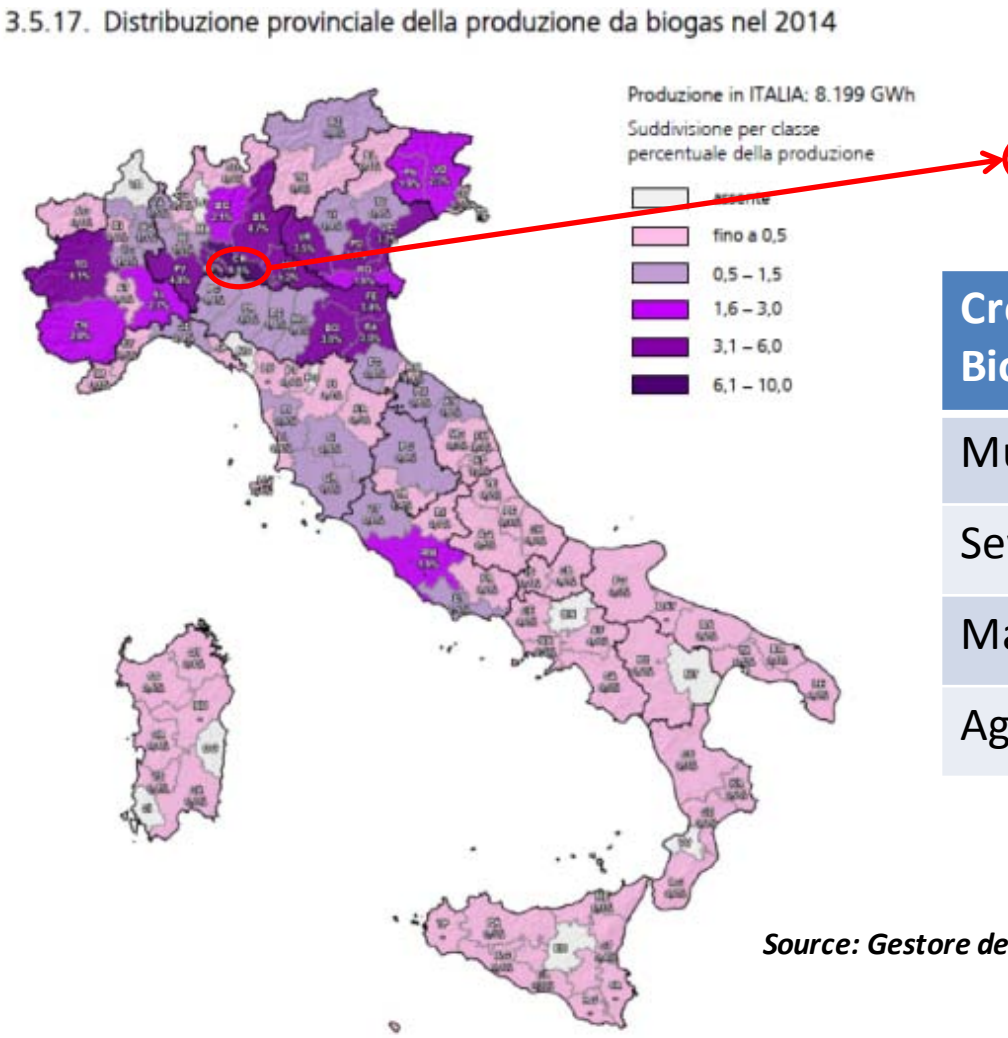
3.5.16. Distribuzione regionale della produzione da biogas nel 2014



82%

Source: Gestore dei Servizi Energetici GSE S.p.A

Provincial distribution of production



10%,
Province of Cremona

Cremona is in a plain region Biogas production is from:
Municipal & industrial organic waste
Sewage sludges
Manure
Agriculture

Source: Gestore dei Servizi Energetici GSE S.p.A

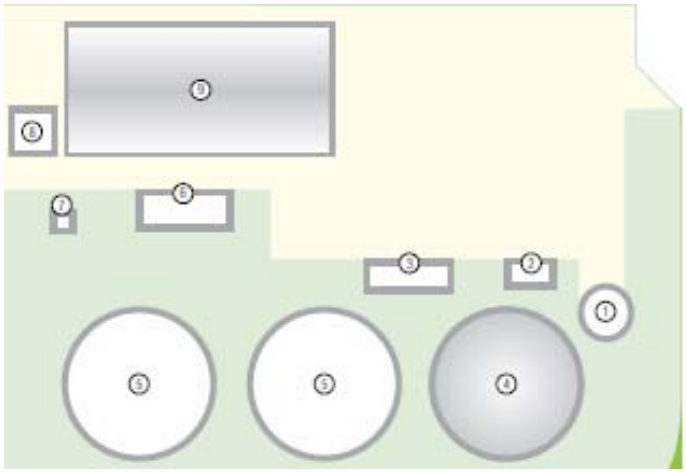
Biogas from Municipal & industrial organic waste - case

Anno di costruzione:	2008 - 2009
Proprietario:	Biofor Energia S.r.l.
Alimentazione:	100.000 t/a FORSU - Rifiuti agroalimentari - Biomasse agricole e zootecniche
Digestori:	4 x 2.000 m^3 in cls
Cogeneratore:	2 x 835 Kw_{el}
Utilizzo En. Elettrica:	Immissione nella rete
Utilizzo En. Termica:	Teleriscaldamento

Year	2009
Source (organic waste, manure and agriculture)	100.000 t/y
Digesters	4 x 2.000 m^3, concrete
CHP (Power)	2 x 835 kWel
Produced electricity	National grid
Produced heat	District heating

Source: Biotec Sistemi srl

Biogas from Manure - case



1) PREVASCA MISCELAZIONE
2) CARRO MISCELATORE
3) SALA POMPE / QUADRI
4) FERMENTATORE
5) VASCA STOCCAGGIO SCOPERTA
6) TRATTAMENTO BIOGAS - COGENERATORE
7) TORCIA
8) VASCA DI SCARICO
9) FABBRICATO ESISTENTE

Source: IES BIOGAS

POTENZA ELETTRICA INSTALLATA: 100 kWe

PROCESSO MESOFILO A DOPPIO STADIO

Prevasca:	n.1	Ø 05m	h=3m
Fermentatore:	n.1	Ø 15m	h=6m
Vasca stoccaggio scoperta:	n.2	Ø 15m	h=6m
Alimentatore biomassa:	n.1	carro miscelatore 20 mc	

PIANO DI ALIMENTAZIONE GIORNALIERO

Liquame bovino:	1,7 ton
Letame bovino:	10,9 ton
Insilato di mais:	0,5 ton

RESA ENERGETICA

Produzione annua di energia elettrica:	820.000 kWh
Produzione annua di biogas:	410.000 mc
Concentrazione metano (CH_4) nel biogas:	52-54%

GRUPPO DI COGENERAZIONE

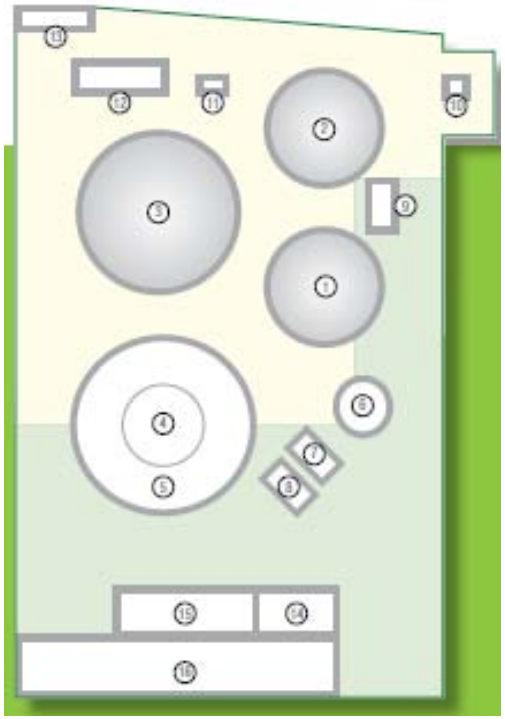
Costruttore:	AB Energy
Modello:	Ecomax 1 Bio

MOTORE

Costruttore:	MAN
Modello:	E 0836 LE 202

CHP (Power)	100 kWel
Source (Manure)	12,5 t/day
Source (Vegetables)	0,5 t/day
Digesters	1
Produced electricity	National grid
Produced heat	District heating

Biogas from Manure - case



1) FERMENTATORE 1
2) FERMENTATORE 2
3) VASCA DI STOCCAGGIO COPERTA
4) VASCA NITRO-DENITRO
5) VASCA STOCCAGGIO SCOPERTA
6) PREVASCA MISCELAZIONE
7) GALA POMPE / QUADRI
8) SERBATOIO ANTINCENDIO
9) CARRO MISCELATORE
10) TORCIA
11) TRATTAMENTO BIOGAS
12) COGENERATORE
13) CABINA DI CONSEGNA
14) STOCCAGGIO LETAME
15) STOCCAGGIO SOLIDO
16) SILO BIOMASSE

POTENZA ELETTRICA INSTALLATA: 330 kWe

PROCESSO MESOFILO A DOPPIO STADIO

Fermentatori:	n.2	Ø 18	h=6m
Post-fermentatore:	n.1	Ø 24	h=6m
Alimentatore biomassa:	n.1 carro miscelatore 40 mc		

PIANO DI ALIMENTAZIONE GIORNALIERO

Liquame bovino:	7,8 ton
Letame bovino:	14,3 ton
Insilato di mais:	6,4 ton
Insilato di triticale:	4,1 ton

RESA ENERGETICA

Produzione annua di energia elettrica:	2.600.000 kWh
Produzione annua di biogas:	1.300.000 mc
Concentrazione metano (CH_4) nel biogas:	52-54%

GRUPPO DI COGENERAZIONE

Costruttore:	AB Energy
Modello:	Ecomax 3 Bio

MOTORE

Costruttore:	GE Jenbacher
Modello:	J 208 GS–C25

Source: IES BIOGAS

CHP (Power)	330 kWel
Source (Manure)	22,0 t/day
Source (Vegetables)	10,5 t/day
Digesters	2
Produced electricity	National grid
Produced heat	District heating

Biogas from Agriculture - case

SCHEDA TECNICA

POTENZA ELETTRICA INSTALLATA 999 kW

PROCESSO MESOFILO A DOPPIO STADIO
Fermentatori: n.2 Ø=25 m h=6 m
Post fermentatore: n.1 Ø=25 m h=6 m
Vasca di stoccaggio: n.1 Ø=28 m h=6 m
Vasca di stoccaggio coperta
non a recupero biogas: n.1 Ø=28 m h=6 m
Carico biomassa: n.1 tramoggia 88 mc

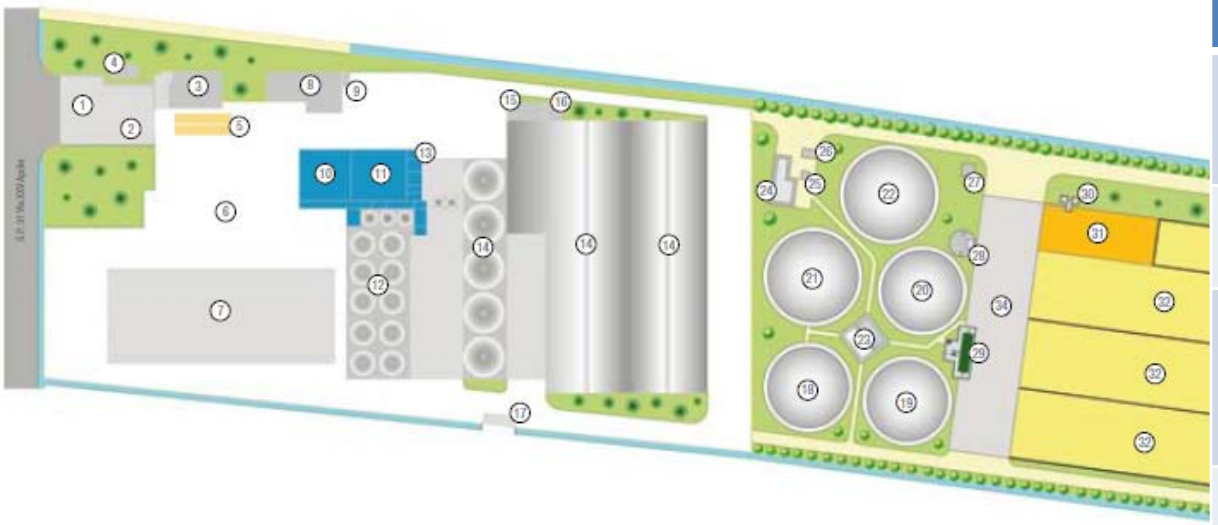
ETTARI COLTIVATI 300 ha

PIANO DI ALIMENTAZIONE GIORNALIERO
Insilato di mais: 38,0 ton
Insilato di triticale: 6,0 ton

RESA ENERGETICA
Produzione annua di energia el.: 8.500.000 kWh
Produzione annua di biogas: 4.250.000 mc
Concentrazione metano (CH_4) nel biogas: 52-54%

GRUPPO DI COGENERAZIONE
Costruttore: AB Energy
Modello: Ecomax 10 BIO

MOTORE
Costruttore: GE Jenbacher
Modello: J 320 GS-C25



1) INGRESSO
2) PARCHEGGIO
3) UFFICI
4) CABINA METANO
5) PESA
6) PIAZZALE
7) MAGAZZINO
8) DEPOSITO FITOFARMACI
9) BLOCCO SERVIZI
10) TETTOIA DI RICEVIMENTO PULITORI
11) ESSICCATOIO
12) SILOS CEREALI
13) OFFICINA
14) MAGAZZINO CEREALI
15) DEPOSITO
16) RICOVERO ATTREZZI
17) CABINA ENEL
18) POST FERMENTATORE
19) FERMENTATORE 1
20) FERMENTATORE 2
21) VASCA DI STOCCAGGIO COPERTA
22) VASCA DI STOCCAGGIO COPERTA NON A RECUPERO BIOGAS
23) SALA POMPE
24) COGENERATORE
25) DEPOSITO OLIO
26) TRATTAMENTO BIOGAS
27) TORCIA
28) PREVASCA MISCELAZIONE
29) SISTEMA DI CARICAMENTO
30) SEPARATORE
31) DEPOSITO COPERTO SEPARATO PALABILE
32) SILOS INSILATO
33) BACINO DI LAMINAZIONE
34) PIAZZALE PAVIMENTATO

CHP (Power)	999 kWel
Source (Vegetables)	44,0 t/day
Digesters	2
Produced electricity	National grid
Produced heat	District heating

Source: IES BIOGAS

Biomethane in Italy

4-5 billion of cubic metres of biomethane per year by 2030 (estimation).

Actual natural gas import in Italy: 70 billion of cubic metres per year.

7 biomethane plants in Italy:

- **ACEA Pinerolese Industriale S.p.A, Turin**:

Upgrading of biogas to biomethane.
Biogas produced from:

- Municipal organic waste of Turin;
- Landfill;
- Wasterwater treatment.

Biomethane in Italy

- **Ozegna (Turin)**:

Power installed: 625 kWe
Biogas production from 2011
Biogas produced from:

- Manure;
- Agriculture.

Digestate is used as fertilizer for cultivated land of the feedstock for feeding the plant.

- **Bosmina (Curtatone, Mantova)**:

Manure and agriculture.

- **Pieve Fissiraga (Lodi)**:

Manure and agriculture (production of hydrogen and methane).

- **Montello (Bergamo)**:

369.000 ton/year of municipal organic waste.

- **San Giovanni in Persiceto (Bologna)**:

Agriculture and agro-industry waste.

- **Rome**

Thank you for your kind attention!

Stefano Capaccioli
Bioenergy Division

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