

BIOGAS³ FINAL CONFERENCE

SUSTAINABLE SMALL-SCALE BIOGAS PLANTS: GENERATING EMPLOYMENT AND GREEN ENERGY IN EUROPE



Opportunities and barriers in practice for a small-scale in an EU Country: the example of Italy

BIO-METHANE

TUESDAY, FEBRUARY 9TH 2016

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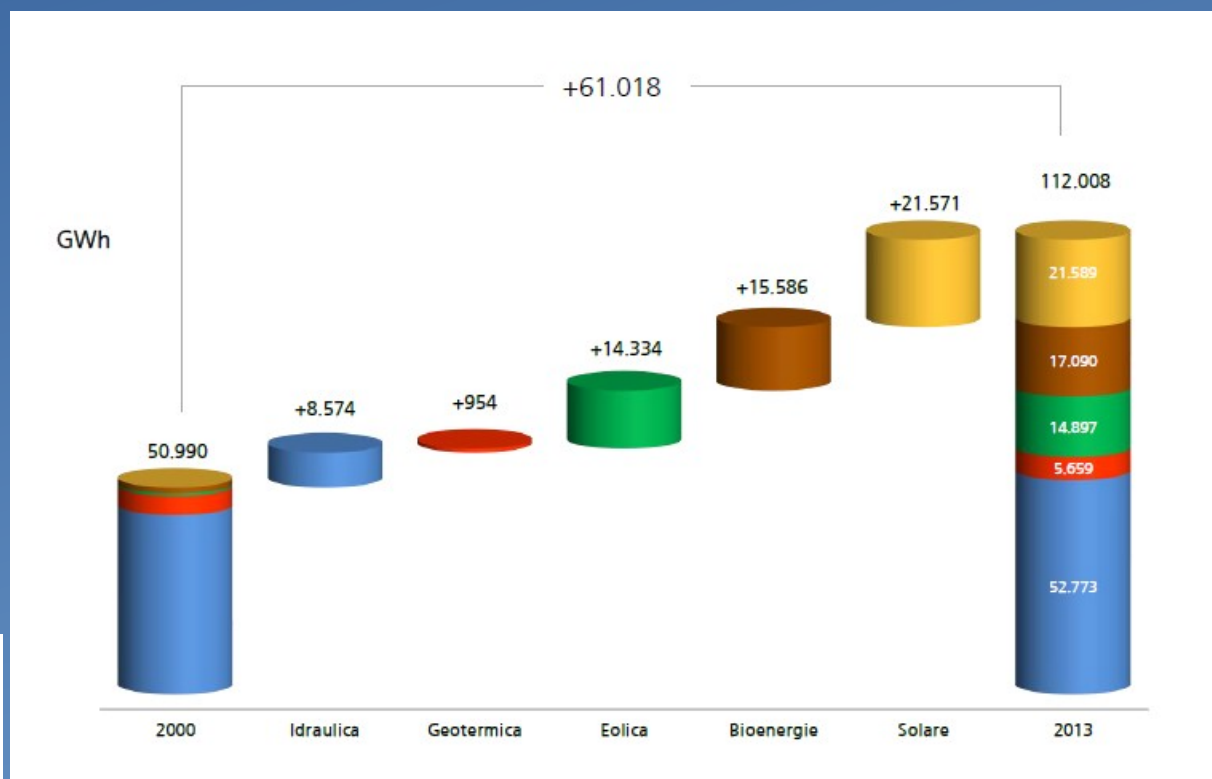


RENEWABLE ENERGY: TREND

Share of renewable energy in Italy: GSE - 2016

	2009	2010	2011	2012	2013	2014
EFR – Risc. e raffr. ² (%)	16,43%	15,64%	13,82%	16,98%	18,10%	18,89%
EFR-E ³ (%)	18,81%	20,09%	23,55%	27,42%	31,30%	33,42%
EFR-T ⁴ (%)	3,68%	4,57%	4,66%	5,68%	4,93%	4,48%
Quota complessiva di EFR ⁵ (%)	12,78%	13,02%	12,88%	15,44%	16,74%	17,07%

Risc e raff: Heat and Cooling + E: Electricity + T: Transportation



RENEWABLE ENERGY POLICIES IN ITALY

- **1992**: First support framework: CIP6 – No effect on biogas production (FIT)
- **1999**: Introduction of the “Green Certificates”. Hydropower and Biogas from landfills. No effect on farm plants (low prices of energy, 8 years contracts)
- **2008**: Introduction of the Feed In Tarif for all renewable technology. Biogas: 0,28 €/kWh. Strong impact.
- **2012**: tarif degression. Biogas: 0,236 €/kWh up to 300 kW, 0,206 €/kWh up to 600 kW,.. Slowdown of implementation.

a) prodotti di origine biologica	1<P≤300	20	180
	300<P≤600	20	160
	600<P≤1000	20	140
	1000<P≤5000	20	104
	P>5000	20	91
b) sottoprodotti di origine biologica di cui alla Tabella 1 –A; d) rifiuti non provenienti da raccolta differenziata diversi da quelli di cui alla lettera c)	1<P≤300	20	236
	300<P≤600	20	206
	600<P≤1000	20	178
	1000<P≤5000	20	125
	P>5000	20	101
c) rifiuti per i quali la frazione biodegradabile è determinata forfettariamente con le modalità di cui all’Allegato 2	1<P≤600	20	216
	600<P≤1000	20	216
	1000<P≤5000	20	109
	P>5000	20	85

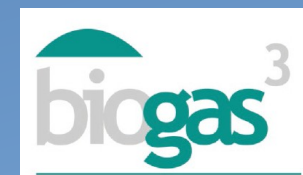


THE STATE OF BIOGAS IN ITALY

	Installed MW	2009	2010	2011	2012	2013	2014
Hydropower	Energia idroelettrica:	21.371	21.520	21.737	21.880	22.009	22.098
	<i>senza pompaggio</i>	13.827	13.976	14.193	14.325	14.454	14.506
	<i><1MW</i>	451	509	548	569	621	654
	<i>1MW-10 MW</i>	2.137	2.155	2.271	2.335	2.413	2.432
	<i>>10MW</i>	11.239	11.312	11.374	11.421	11.420	11.420
	<i>con pompaggio</i>	3.957	3.957	3.957	3.957	3.957	3.982
	<i>mista</i> ¹¹	3.587	3.587	3.587	3.598	3.598	3.610
Geothermal	Geotermica	695	728	728	728	729	768
	Solare:	1.142	3.470	12.773	16.420	18.420	18.609
Solar	<i>fotovoltaico</i>	1.142	3.470	12.773	16.420	18.420	18.609
	<i>energia solare a concentrazione</i>	0	0	0	0	0	0
Sea, tides, ..	Da maree, moto ondoso e correnti marine	0	0	0	0	0	0
	Energia eolica:	4.879	5.794	6.918	8.102	8.542	8.683
Biomass	<i>onshore</i>	4.879	5.794	6.918	8.102	8.542	8.683
	<i>offshore</i>	0	0	0	0	0	0
	Biomassa:	1.871	2.183	2.631	3.555	3.762	3.772
	<i>biomassa solida</i>	438	406	421	538	606	620
	<i>biogas</i>	359	480	732	1.274	1.317	1.336
	<i>bioliquidi</i>	371	581	736	989	1.003	990
	<i>rifiuti urbani</i>	703	716	742	754	836	826
Biogas	TOTALE	29.958	33.695	44.787	50.685	53.462	53.930
	<i>di cui in cogenerazione</i>	718	858	1.084	1.642	1.807	1.870

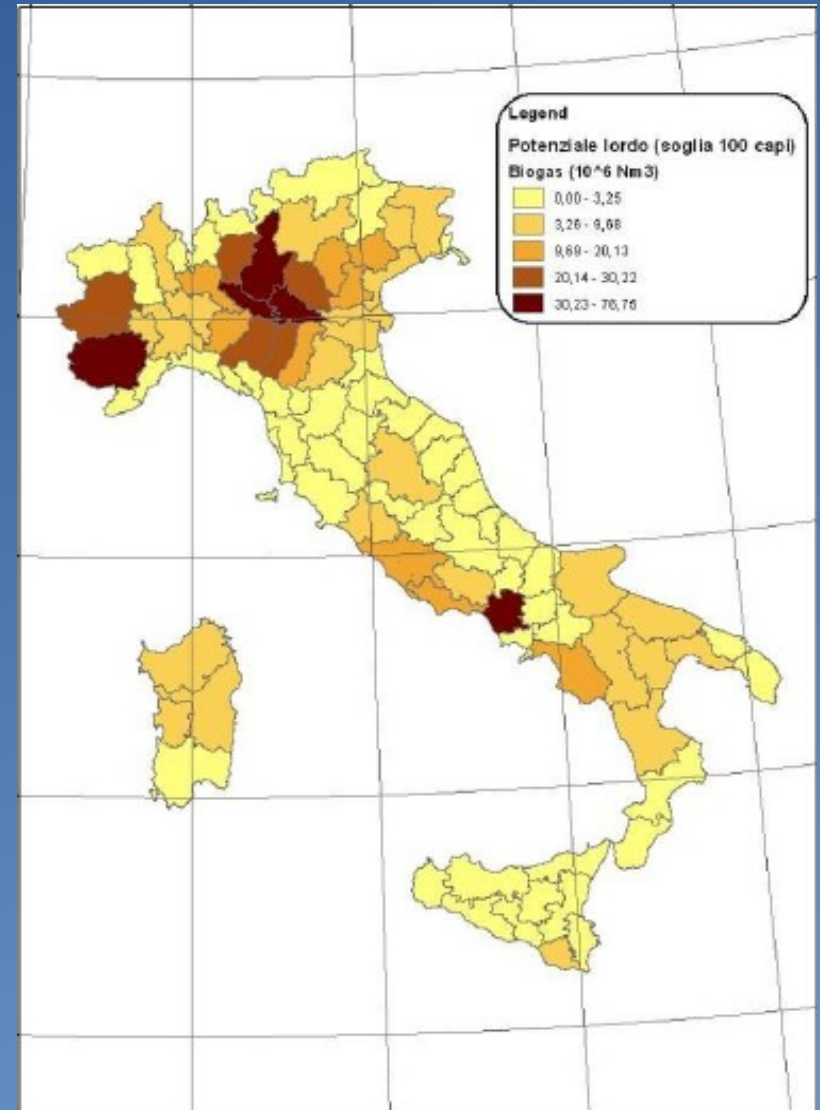


Share of renewable energy in Italy: GSE - 2016



BIOGAS

- Very high biogas potential for small scale biogas plants
- Italian cost of production is higher than in other EU countries due to strict rules (safety, environment...)
- Average cost of energy in Italy is 0,19 €/kWh (higher in small plants)
- Actual low tariff discourages new investments (0,232 €/kWh)
- Feed In Tariff valid to 2016 (a new decree is supposed to be approved)



100 kW BIOGAS PLANT - ITALY

Small scale biogas plant - ITALY					
Manure	5475 t/y		1000 Beef		
Liquid slurry	9125 t/y		350 Dairy cattle		
Power	100	100	100	100	kW
Own consumption	11,00%	11,00%	11,00%	11,00%	
Net power	89	89	89	89	kW
hours per year	8500	8500	8500	8500	h
Energy for sale	756500	756500	756500	756500	kWh
Feed in Tariff	0,232	0,232	0,232	0,232	€/kWh
Income	€ 175.508,00	€ 175.508,00	€ 175.508,00	€ 175.508,00	€/y
Cost for feed	€ 0,00	€ 10.000,00	€ 20.000,00	€ 30.000,00	€/y
EBITDA	€ 86.978,00	€ 76.978,00	€ 66.978,00	€ 56.978,00	€/y
Profit	€ 56.978,00	€ 46.978,00	€ 36.978,00	€ 26.978,00	€/y
Costs	€ 118.530,00	€ 128.530,00	€ 138.530,00	€ 148.530,00	€/y
Parity tariff	€ 0,16	€ 0,17	€ 0,18	€ 0,20	€/kWh
Investment	€ 750.000,00	€ 750.001,00	€ 750.002,00	€ 750.003,00	€/y
Payback Time	8,6	9,7	11,2	13,2	y

- Limit for profitable plants: 100 kW ?
- Feed must be on site: no transport cost acceptable
- High investment
- Long pay back time
- Strict environmental constrains
- Complex operating fulfillments

EBITDA: Earnings Before Interest, Taxes, Depreciation and Amortization



SO.. SMALL SCALE CHP BIOGAS PLANTS IN ITALY MEAN:

- Good income integration for farmers in case of on site feed availability
- Help farms to be profitable, hence enforcing food production
- Lower air emissions due to methane. Green energy (GHG reduction)
- Odour reduction, good quality fertilizer from digestate
- Multiplier effect of Feed In Tariff due to a large amount of technology, services, feeds providers
- High cost of investment due to environmental and safety rules
- Quite long pay back time
- Uncertain Feed In Tariff for medium term investments (reliable tariffs only up to the end of 2016)
- Complex operating rules and fulfillments
- Profitable only with very low (or zero) costs for feeding. (manure and slurry on site)
- Unprofitable with energy crops (payed normally more than 40 €/t)



WHAT ABOUT BIOMETHANE IN ITALY ?

- The Feed In Tariff for Biomethane was decided with Legislative Decree 28/2011 and approved with Decree 5/12/2013
- Still many regulation are missing (ex. EU regulation for Gas infrastructure, gas quality, natural gas and biomethane for transport and national grid injection CEN/PC 408)
- Base Feed In Tariff: 0,54 €/m³
- + 10% for small plants (< 500 m³/h)
- + 50% if only by products or wastes are used in the plant
- Maximum Feed In Tariff is about 0,72 €/m³
- For transportation use a support based on CIC (Renewable Energy Certificates) will be carried out
- For fully converted or dual electricity and biomethane plants the feed in tariff will be decreased to 40%
- Only one destination for biomethane is admitted (grid, transport, industry). Mixed system non admitted



OPPORTUNITIES OF THE ITALIAN BIOMETHANE INDUSTRY

- Better energy exploitation. Biogas plants usually waste heat..
- Lower air pollution due to gas engines emissions
- Methane is a strategic asset for the country and for Europe
- Bio-methane is a farm product: the italian farm biomethane potential is assumed to be about 7 billion m³, which are 10% of the national need in 2015.
- The average yield could be in the Po valley of about 6-8.000 m³/ha using energy crops
- Bio-methane can contribute to the EU biofuel targets
- Italy has one of the most extended natural gas grid in the world



WEAKNESS OF THE ITALIAN BIOMETHANE SUPPORT FRAMEWORK

- Complex regulations, lack of technical rules (EU rules as well...)
- Feed In Tariff can be suitable for big investments in the waste management industry (big biogas upgrading plants)
- Feed In Tariff is NOT profitable for farmers, especially for small scale plants (maximum FIT = 0,72 €/m³, average cost = 0,80 €/m³)
- Very difficult to manage project in agriculture using only by products. Big scale plants need huge amounts of manure, slurry, ... Energy crops have higher energy concentration!
- With a reduction to 40% of the FIT for biogas to biomethane conversion NO CHP plant will upgrade to biomethane
- Very high cost of bio methane upgrading



WHAT IF POLICY MAKERS WANTS TO SUPPORT...

...SMALL SCALE BIOGAS (CHP)

- Feed in Tariff scaled to plant capacity (the smaller capacity the higher tariff). In Italy the tariff should decrease from 0,30 €/kWh for 50 kW to 0,23 €/kWh for 500 kW
- Allow the use of energy crops as part of the feedstock adopting more sustainable growing technologies
- Support the use of manure by giving advantage to digestate within the Nitrate Directive (higher nitrogen application compared to manure, extended period..)

....BIOMETHANE

- Feed in Tariff scaled to plant capacity (the smaller capacity the higher tariff)
- Clear and effective regulation
- Possibility to use raw biogas for thermal applications
- Possibility to have different use for biomethane (ex Grid + Transportation)



Thank you !



Biogas plant – 1 MW – 35 t/d Corn + 30 t/d manure