IEA Bioenergy

Biomass Gasification for Energy Purposes

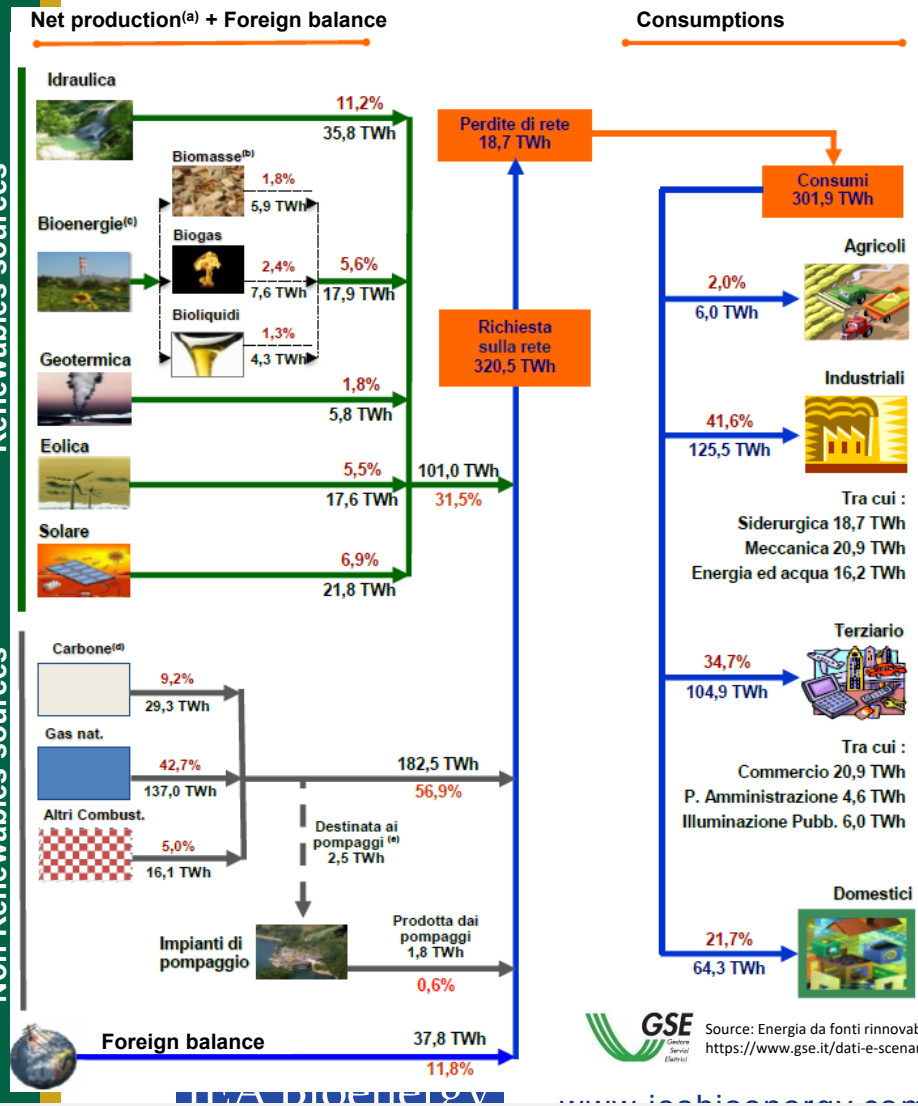
Country Report – Italy

Karlsruhe – 5 June 2019

Donatella Barisano

ENEA -ITALY

National Electricity Balance in 2017 vs 2016

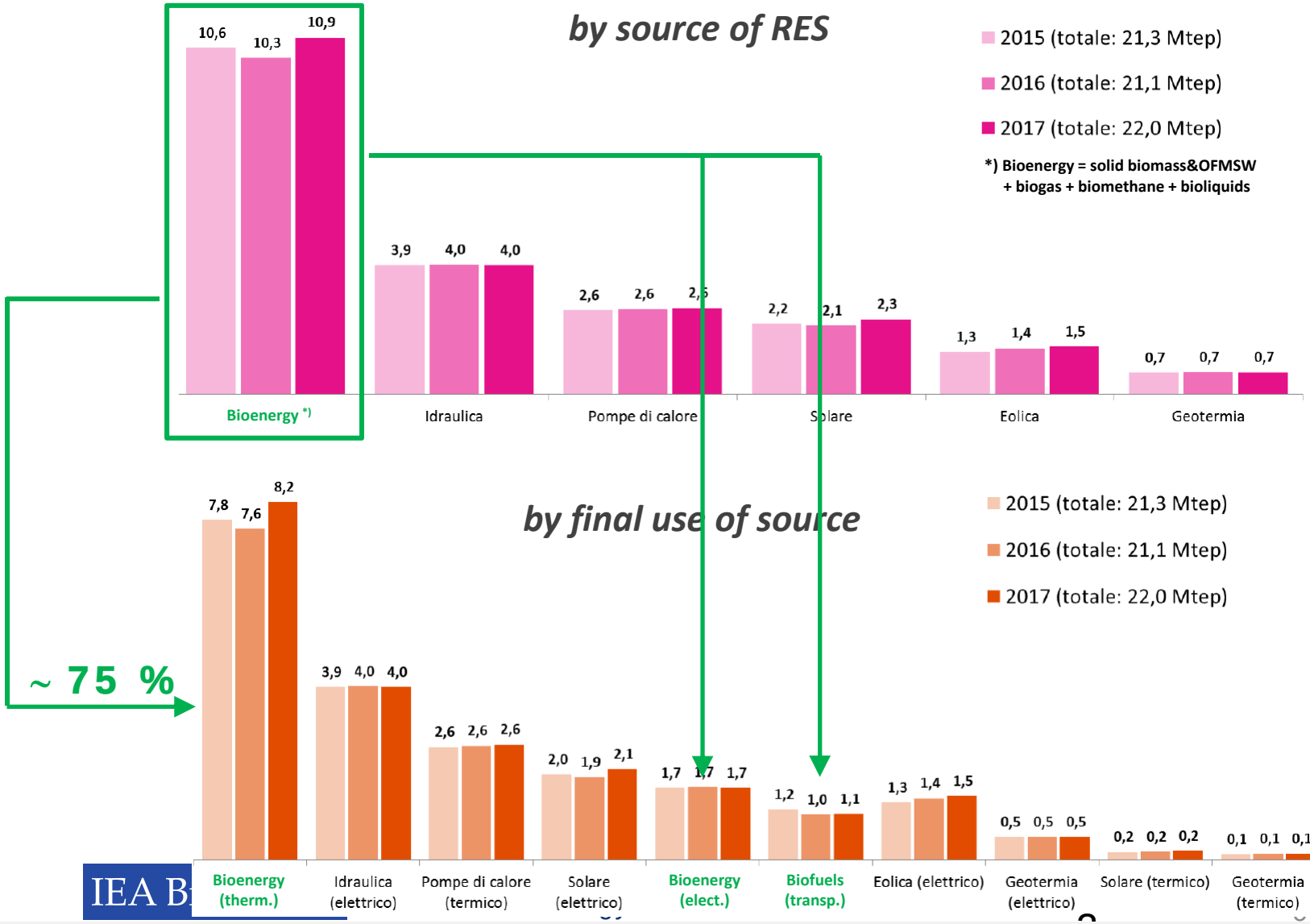


2017	2016
Total grid requirement 320.5 TWh	Total grid requirement 314.3 TWh
Share of Total RES 101.0 TWh, 31.5%	Share of Total RES 105.1 TWh, 33.4%
Share of Bioenergy 17,9 TWh, 5.6%	Share of Bioenergy 17,9 TWh, 5.7%
Share of Biomass 5.9 TWh, 1.8% (4.3 TWh Bioliq.)	Share of Biomass 5.8 TWh, 1.8% (4.7 TWh Bioliq.)

Source: Energia da fonti rinnovabili in Italia - Rapporto Statistico 2016, available at: https://www.gse.it/dati-e-scenari/statistiche; published on December 2018.

(A) Net production: gross production net of auxiliary services; (B) Includes the biodegradable part of MSW; (C) Net of the non-biodegradable fraction of MSW accounted in other fuels; (D) Coal + Lignite; (E) The energy used for pumping is conventionally subtracted from the non-renewable thermal production.

Share of individual RES to gross final consumption: 2017 vs 2016 & 2015



Source: Energia da fonti rinnovabili in Italia - settori termico, elettrico e trasporti. Rapporto statistico 2017, available at: https://www.gse.it/documenti

Current status about incentives to RES for Power & for Biofuels

(in connection to gasification)

Feed-in tariff I (tariffa omnicomprensiva)

Updated: 22.02.2017

Author: Dr. Moïra Jimeno

All plants except for PV plants with an installed capacity between 1 kW and 0.5 MW are entitled to choose this feed-in tariff in alternative to the premium tariff I (Art.3, c.1 and c.4 & 7, c.4 and c.6 DM 23/06/16). Depending on their size, plants may access this scheme directly or after undergoing a listing in a registry with capacity limits set per year.

Eligible technologies SHOW

Amount HIDE

The Tarifa omnicomprensiva (To) is determined by the following formula:

To = Tb + Pr

- Tb: the tariffs indicated by source in Annex 1 DM 23/06/16 (Annex 1 in conjunction with Art. 7, c. 4 DM 23/06/16).
- Pr: bonuses that may be granted to the plant.

- The larger the plant the lower the incentive
- The incentives have to be gradually reduced over time.

VITA UTILE CONVENZIONALE, TARIFFE INCENTIVANTI E INCENTIVI PER I NUOVI IMPIANTI

Fonte rinnovabile	Tipologia	Potenza	VITA UTILE degli IMPIANTI	23-June-2016 Tb	6-July-2012 Tb
		kW	anni	€/MWh	
Biomasse	a) prodotti di origine biologica di cui alla Tabella 1-B	1<P≤300	20	210	229
		300<P≤1000	20	150	180
		1000<P≤5000	20	115	133
		P>5000	-	-	122
	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	246	257
		300<P≤1000	20	185	209
		1000<P≤5000	20	140	161
		P>5000	-	-	145
	c) rifiuti per i quali la frazione biodegradabile è determinata forfettariamente con le modalità di cui all'Allegato 2 del decreto 6 luglio 2012	1<P≤5000	-	-	174
		P>5000	20	119	125

GAZZETTA UFFICIALE DELLA REPUBBLICA ITALIANA http://www.gazzettaufficiale.it/eli/id/2016/06/29/16A04832/sg

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M.D. 23 June 2016 vs M.D. RES 2018 - 2020

Fonte rinnovabile	Tipologia	Potenza	VITA UTILE degli IMPIANTI	TARIFFA
		kW	anni	€/MWh
Eolica	On-shore	1<P≤20	20	250
		20<P≤60	20	190
		60<P≤200	20	160
		200<P≤1000	20	140
		1000<P≤5000	20	130
		P>5000	20	110
	Off-shore (1)	1<P≤5000	-	-
		P>5000	25	165
Idraulica	ad acqua fluente	1<P≤250	20	210
		250<P≤500	20	195
		500<P≤1000	20	150
		1000<P≤5000	25	125
		P>5000	30	90
	a bacino o a serbatoio	1<P≤5000	25	101
		P>5000	30	90
Oceanica (comprese maree e moto ondoso)		1<P≤5000	15	300
		P>5000	-	-
Geotermica		1<P≤1000	20	134
		1000<P≤5000	25	98
		P>5000	25	84
Gas di discarica		1<P≤1000	20	99
		1000<P≤5000	20	94
		P>5000	-	-
Gas residuati dai processi di depurazione		1<P≤1000	20	111
		1000<P≤5000	20	88
		P>5000	-	-
Biogas	a) prodotti di origine biologica di cui alla Tabella 1-B	1<P≤300	20	170
		300<P≤600	20	140
		600<P≤1000	20	120
		1000<P≤5000	20	97
		P>5000	20	85
	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	233
		300<P≤600	20	180
		600<P≤1000	20	160
		1000<P≤5000	20	112
		P>5000	-	-
Biomasse	a) prodotti di origine biologica di cui alla Tabella 1-B	1<P≤300	20	210
		300<P≤1000	20	150
		1000<P≤5000	20	115
		P>5000	-	-
	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	246
		300<P≤1000	20	185
		1000<P≤5000	20	140
		P>5000	-	-
	c) rifiuti per i quali la frazione biodegradabile è determinata forfettariamente con le modalità di cui all'Allegato 2 del decreto 6 luglio 2012	1<P≤5000	-	-
		P>5000	20	119
Bioliquidi sostenibili		1<P≤5000	20	60
		P>5000	-	-
Solare termodinamico		1<P≤250	25	324
		250<P≤5000	25	296
		P>5000	25	291

GAZZETTA UFFICIALE DELLA REPUBBLICA ITALIANA http://www.gazzettaufficiale.it/eli/id/2016/06/29/16A04832/sg

M.D. «FER I»

To promote the most mature sources close to competitiveness, i.e. wind on-shore, hydropower, landfill gas, PV.

In force since 23 January 2019

M.D. «FER II»

Dedicated to promoting the more innovative and expensive sources, i.e. biomass and biomethane, geothermal, wind off-shore, thermodynamic solar.

In preparation

MD RES 2018 – 2020 (FER I)

Draft Ministerial Decree «FER I»

(made known in March 2018)

Fonte rinnovabile	Tipologia	Potenza	VITA UTILE degli IMPIANTI	TARIFFA
		kW	anni	€/MWh
Eolica	On-shore	1<P≤100	20	140
		100<P<1000	20	90
		P>1000	20	70
Idraulica	ad acqua fluente (compresi gli impianti in acquedotto)	1<P≤400	20	140
		400<P<1000	25	110
		P>1000	30	80
	a bacino o a serbatoio	1<P<1000	25	90
Geotermia	Impianti con caratteristiche diverse da quelle di cui all'articolo 1, comma 3-bis, del decreto legislativo 22/2010	1<P≤100	20	120
		100<P<1000	25	120
		P>1000	25	80
Gas di discarica				
Gas residuati dai processi di depurazione				
Solare fotovoltaico				

DETERMINAZIONE DEGLI INCENTIVI PER IM

1. Impianti che richiedono la tariffa onnicompre

Per impianti di potenza fino a 100 kW che scelgono
sensi dell'articolo 7, comma 4, il GSE provvede a ricc
rete, la tariffa incentivante onnicomprensiva To determi

To = Tb + Pr (1)

dove:

- Tb è la tariffa incentivante base ricavata per c
  tabella 1.1;
- Pr è l'ammontare totale degli eventuali premi a c

IEA Bioenergy

MD «FER II»

Final Ministerial Decree «FER I»

(Published in January 2019)

Fonte rinnovabile	Tipologia	Potenza	VITA UTILE degli IMPIANTI	TARIFFA
		kW	anni	€/MWh
Eolica	On-shore	1<P≤100	20	150
		100<P≤1000	20	90
		P>1000	20	70
Idraulica	ad acqua fluente (compresi gli impianti in acquedotto)	1<P≤400	20	155
		400<P≤1000	25	110
		P>1000	30	80
	a bacino o a serbatoio	1<P≤1000	25	90
		P>1000	30	80
Gas residuati dai processi di depurazione		1<P≤100	20	110
		100<P≤1000	20	100
		P>1000	20	80
Solare fotovoltaico		20<P≤100	20	105
		100<P≤1000	20	90
		P>1000	20	70

To ≡ Tb (no «+ Pr»)

Incentives in the transport sector

http://www.res-legal.eu/search-by-country/italy/tools-list/c/italy/s/res-t/t/promotion/sum/152/lpid/151/

Promotion in Italy

Updated: 07.02.2019

Author: Jasmin Schwarz

Means of support

- Biofuel quota (Obbligo di immissione)
- Premium tariff (decreto biometano)

Summary of support schemes

The current goal foresees 8% of biofuels, of which 0,8% advanced biofuels in 2019. The competent authority is the GSE and the obligated parties are all those who feed gasoline or diesel in the system. To monitor the compliance with the biofuelquota certificates are released. One certificate corresponds to 10 Gcal of biofuel or 5 Gcal of advanced biofuel. Producers of advanced biomethane or advanced biofuels other than biomethane are entitled to receive a premium of € 375 for every CIC that they would be entitled receive if the biofuel is released for consumption in the transport sector. Producers of advanced biomethane destined to transport can sell the produced biomethane to GSE ("ritiro") through a simplified procedure.

Technologies HIDE

Biodiesel, biomethane, bioethanol and biohydrogen are eligible.

Statutory provisions HIDE

- DM 02.032018 (Decreto 2 marzo 2018, Promozione dell'uso del biometano e degli altri biocarburanti avanzati nel settore dei trasporti. Decree 2 March 2018: Promotion of the use of biomnethane and other advanced biofuels in the transport sector)
- DM 10.10.2014 (Decreto 10 ottobre 2014: Aggiornamento delle condizioni, dei criteri e delle modalita' di attuazione dell'obbligo di immissione in consumo di biocarburanti compresi quelli avanzati. Decree 10 October 2014. Update of the conditions, criteria and implementation modalities of the obligation to release biofuels, including advanced ones, for consumption.)

Italy

Electricity

Heating & Cooling

Transport

Further information

Agenzia delle Entrate – Tax Agency

+39 06 96668933

Tax Agency website

Gestore Servizi Energetici - GSE

+39 0692928540

GSE website

gsespa(at)pec.gse.it

➢ Gasification is an eligible technology, but not yet in operation.

National programmes for R&D including gasification in the period 2017-2019

DECREE by MIUR 13 July 2017 - NOTICE
For the presentation of industrial research projects and experimental development in the **12 specialization areas** identified by the 2015-2020 National Research Program

(12 specialization areas: Aerospace; Agrifood; Blue Growth; Cultural Heritage; Design, Creativity and Made in Italy; **Energy**; **Green Chemistry**; Health; Smart Communities; Smart, Secure and Inclusive Communities; Smart Factory; Sustainable Mobility, Technologies for Living Environments)

NOTICE «POR FESR 2014-2020» (Programma Operativo Regionale - Fondo europeo di sviluppo regionale).
For instance, in Basilicata:

- Call for «Exhibition of interest aimed at the integration and adjustment of the three-year plan of **research infrastructures** of the Basilicata region», published on 13 November 2018;
- Call for «Complex **Research and Development** Projects in Basilicata on **Energy** and **BioEconomy**», published on 15 April 2019

TRIENNIAL PLAN 2019-2021 of the National Electricity System Research (by MISE), submitted to public consultation until 10 April 2019, (gasification included in «Theme 1.2 - Storage systems, including electrochemical and **power to gas**, and related interfaces with the networks»)

Italian projects on Gasification funded by National Programmes: Updates

Italian Region	Name	Funding	Aim	Reactor design	Present Status	Note
Basilicata & Calabria	WW-GREEN FUEL	MISE	Development of gasification process (dry and SCWG) for the exploitation of large-scale biomass and production of liquefied **SNG**.	Pyro-gasifier	Next start	**ENEA**, CNR, UNICAL, UNIBA, POLITO, SOTACARBO, CALABRA Maceri, et al.
Basilicata, Campania, Apulia, Sardinia, Lazio	COMETA	MISE	Use of residual biomass for **CHP** and **biofuels** production.	Downdraft & BFB	In progress	**Novamont**, ENEA, CREA, Uni Sassari, CIHEAM-Bari, BIOAGRITEST S.r.l, et al.
Basilicata	PIBE	Regional	**Infrastructure** and R&D activities aimed at producing biofuels, innovative biolubricants, biomethane and **syngas** for frontier energy applications.	Different types	Next Start	**ENEA**, CNR, UNIBAS
Basilicata	RETENERGY	Regional	Network of Lucanian's energy technology **infrastructures**.	Different types	Next start	**ENEA**, CNR, UNIBAS
Basilicata & Sicily	SPRING G2E	MISE	Realizing a preindustrial gasification plant based on the ICBFB reactor with in-situ gas filtration for power production (200 kWe, ICE)	(IC)Bubbling Fluidized Bed	From 20 March 2018 To Feb. 2021	ENEA, ASCOT Industrial S.r.l
Abruzzo & Lazio	HBF 2.0	MISE	Realizing a small scale **CHP** system (25 kWe, 55 kWth)	Bubbling Fluidized Bed	From Dec. 2016 To Nov. 2018	**Walter Tosto SpA** (Large Enterp.), UnivAQ, Enertecna S.r.l., UniTuscia, Nuova Ma-Tec 2001 s.r.l.
Sardinia	Sotacarbo	MISE/Regional	Cogasification to efficient **power** production with CCS	Updraft Fixed Bed	In progress	http://www.sotacarbo.it/en/

EU projects on Gasification involving Italy: Updates

Name	Funding	Aim	Reactor design	Present Status	Partners	link
BLAZE	H2020	Developing an advanced zero-emission **CHP** technology in the capacity range from small (25-100 kWe) to medium (0.1-5 MWe) by using low-cost and short-chain biomass feedstocks.	Bubbling fluidized bed	From 2019-03-01 to 2022-02-28, ongoing	**USGM**, UNIVAQ, ENEA, EPFL, Walter Tosto, SOLIDpower, HyGear, VERTECH GROUP, EUBIA	Under preparation
WASTE2GRIDS	H2020	Identify the most promising industrial pathways of waste gasification and solid-oxide cell (SOC) integrated **power**-balancing plants (W2G plants in short).	All types of reactors	From 2019-01-01 to 2020-06-30, ongoing	**EPFL**, ENEA, DTU, SOLIDpower SA	https://www.waste2grids-project.net/
CLARA	H2020	Chemical Looping gAsification foR sustainAble production of **biofuels.**	Two fluidized bed reactors	From 2018-11-01 to 2022-10-31, ongoing	**EST**, REPOTEC, CHALMERS, UNIVAQ et al.; 13 partners	https://clara-h2020.eu/
Heat-To-Fuel	H2020	Biorefinery combining HTL and FT to convert wet and solid organic, industrial wastes into **2nd gen. biofuels** with highest efficiency	Dual circulating fluidized bed	From 2017-09-01 to 2021-08-31, ongoing	**GUSSING Energy Technologies**, RE-CORD, TUV, BIOENERGY 2020+, PoliTO, CRF et al.; 14 partners	http://www.heattofuel.eu/
BECOOL	H2020	Brazil-EU Cooperation for Development of **Advanced Lignocellulosic Biofuels** (twinned with the Brazilian BioVALUE project)	Indirect Circulating Fluidized Bed	From 2017-06-01 to 2021-05-31, ongoing	**UniBO**, BIOCHEMTEX SPA, CREA, RE-CORD, BTG, ECN et al.; 13 partners	https://www.becoolproject.eu/
COMSYN	H2020	Developing a new **BTL production** concept that will reduce biofuel production cost up to 35 % compared to alternative routes.	Dual fluidized bed gasifier	From 2017-05-01 to 2021-04-30, ongoing	**VTT Oy**, AMEC FW ITALIANA SRL, GKN, DLR, UniCRE, ÅF-Consult, INERATEC.	https://www.comsynproject.eu/
BRISK II	H2020	**Biofuels Research Infrastructure** for Sharing Knowledge II	Fluidized and Fixed Beds	From 2017-05-01 to 2022-04-30, ongoing	**KTH,** BIOENERGY 2020+ GMBH, ECN, KIT, ENEA et al.; 15 partners	https://www.brisk2.eu/
AMBITION	H2020	**Advanced biofuel** production with energy system integration	Fluidized and Fixed Beds	From 2016-12-01 to 2019-11-30, ongoing	**SINTEF**, ECN, DTU, ENEA, KIT et al. 8 partners	http://www.ambition-research.eu/
FLEDGED	H2020	FLExible **Dimethyl ether** (DME) production from biomass Gasification with sorption-enhanced processes	Dual circulating fluidized bed	From 2016-11-01 to 2020-10-31, ongoing	**PoliMI**, ECN, CSIC, LUT et al. 9 partners	http://www.fledged.eu/
3EMOTION	7 FP	**Hydrogen** production by parallel operation of electrolysers and biomass gasifier	Bubbling Fluidized Bed	From 2015-01-01 to 2019-12-31, ongoing	**VAN HOOL N.V.**, UniLaSapienza, UnivAQ, ENEA et al.; 22 partners	http://www.3emotion.eu/

NB: This table is based on data available from the EU CORDIS database and project websites.

Synergies in Energy Research
EERA JPs FCH & BioEnergy

EERA European Energy Research Alliance

ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA
DIPARTIMENTO DI CHIMICA INDUSTRIALE "TOSO MONTANARI"

***Sinergies* in Energy research**
EERA Joint Programmes FCH and Bioenergy

Research and development opportunities in Fuel cells, Hydrogen and Bioenergy

Joint Workshop: May 9, 2019, 13:45-18:00 (Univ of Bologna, V.le Risorgimento aula 1, 4 Bologna, Italy)

Final Agenda

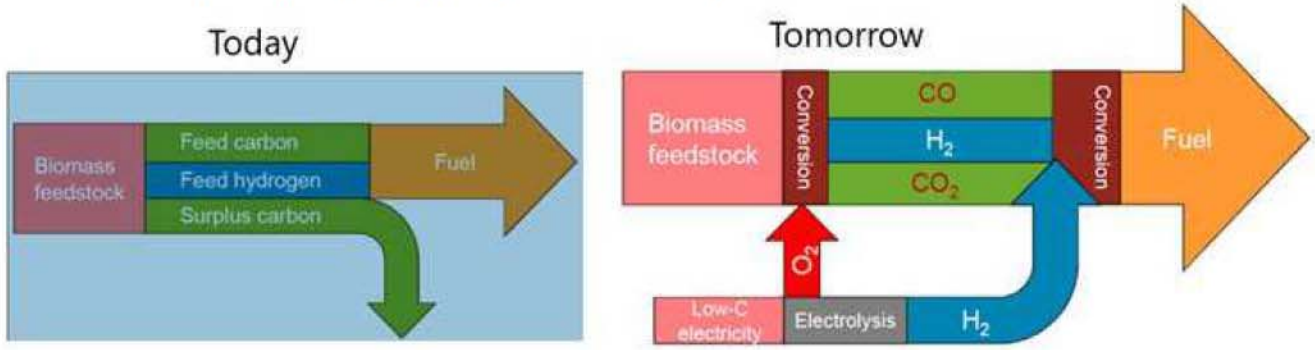
For Registration : https://synergy-in-energy-research-eera-jp-fch-bioenergy.eventbrite.com/

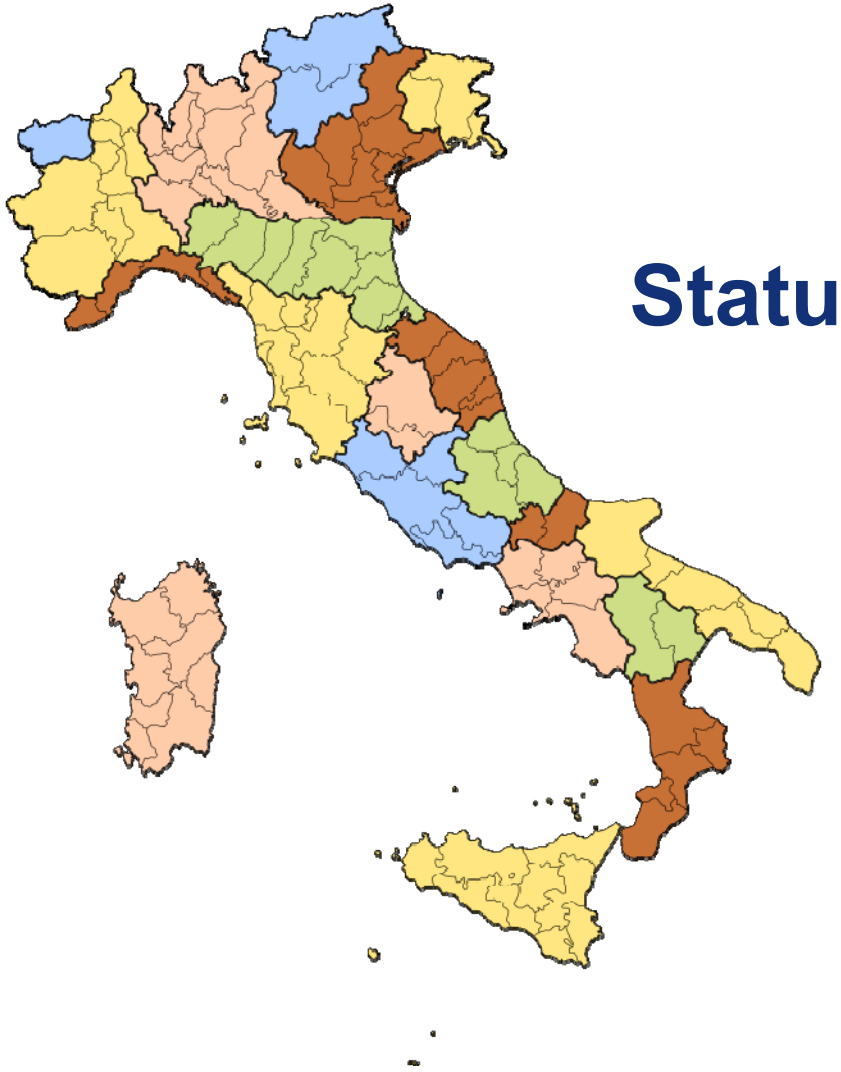
Day 1: Joint Workshop with JP Bio:	**14:00**	
Welcome, Presentation of the interdisciplinary centre of climate change	10'	UNIBO
UniBO research in energy fields	15'	UniBO, C.A. Nucci
Presentation of EERA and scope of the workshop	10'	EERA SEC
Presentation of JP FCH research priorities and KPIs	20'	JP FCH (S McPhail)
Presentation of JP Bio research priorities and Strategic Agenda	15'	JP Bio (A Monti)
A word from industry: Hydrogen Europe on priorities in FCH&Bioenergy	10'	O. Bucheli
Coffee Break	**15:50-16:20**	
Presentation of FET Flagships in Energy: Energy-X and Sunrise	15' each	N. Armaroli, G. Centi
RICH and MERIL: European Research infrastructures and NCP services	15'	D. Gizzi
Overview of cross-cutting opportunities in the next AWPs: Horizon 2020	15'	B. Cimatti
Hydrogen Europe Research: FCH and Bioenergy common topics	15'	M. Maroño
Bioenergy & FCH cross fertilization opportunities and enhanced efficiency	15'	F. Basile
Round-table discussion, wrap-up and next joint actions	30'	All
Close of Workshop	**18:00**	

Key concepts for the synergy

FCH and Bioenergy: Common Areas

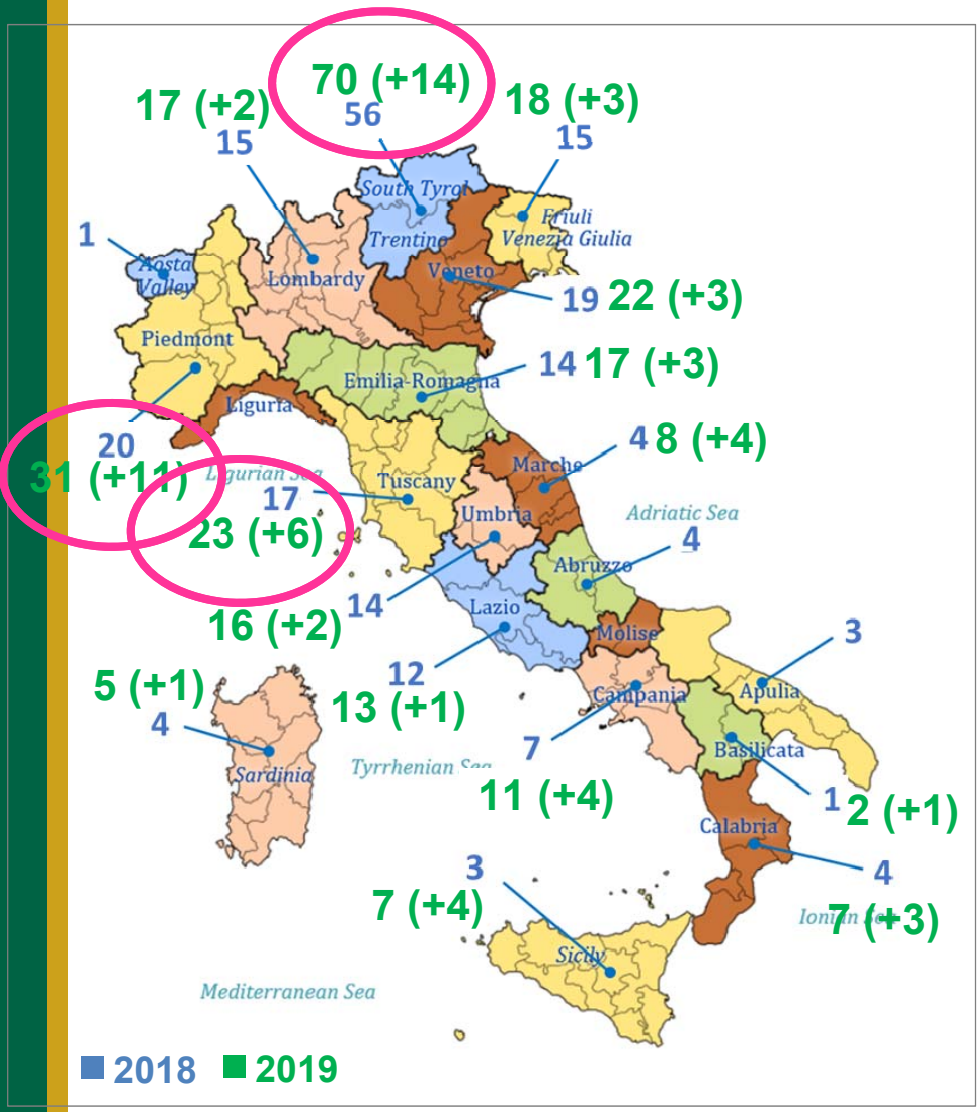
- Hydrogen is classified as alternative renewable fuel, like biofuels
- Electrolytic hydrogen (from renewable or low-C power) can intensify bioenergy/bioproduct processes
- Fuel cells can be fed with biofuels for high-efficiency, low-emission stationary CHP
- Biological hydrogen production processes (algae, bioelectrochemistry, photocatalytic reforming)
- Thermochemical hydrogen/syngas production processes from biomass





Status of Gasification in Italy

Gasification plants across Italy



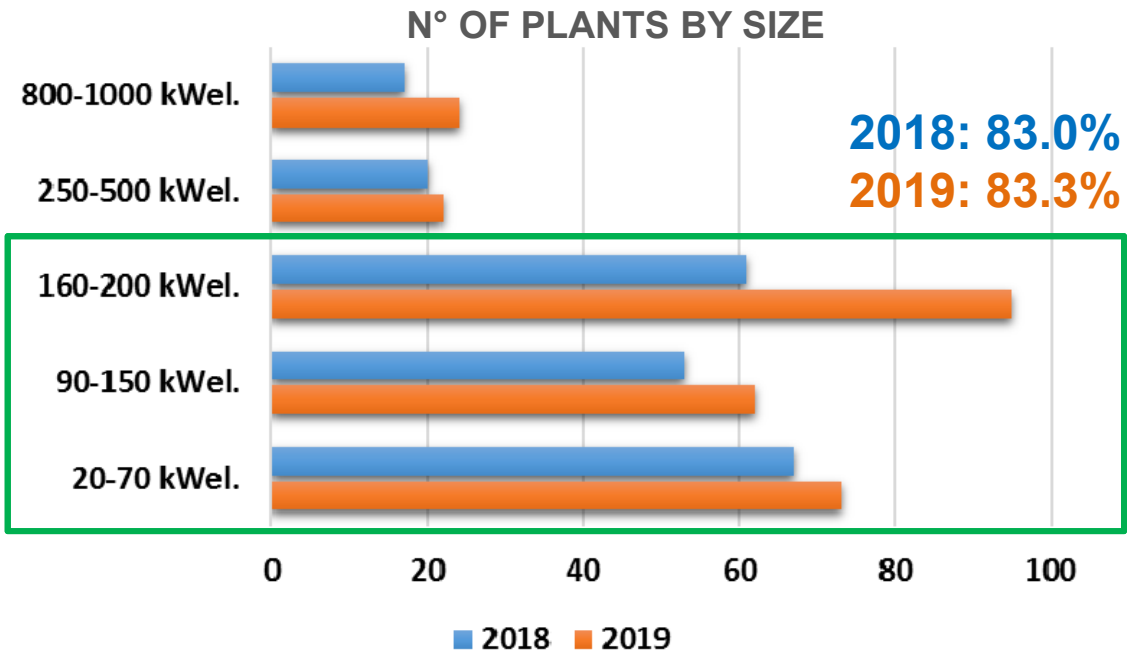
Year of ref.	2018	2019
Total Power (kWel)	43526	58387 + 14861
Total Number	218	276 + 58

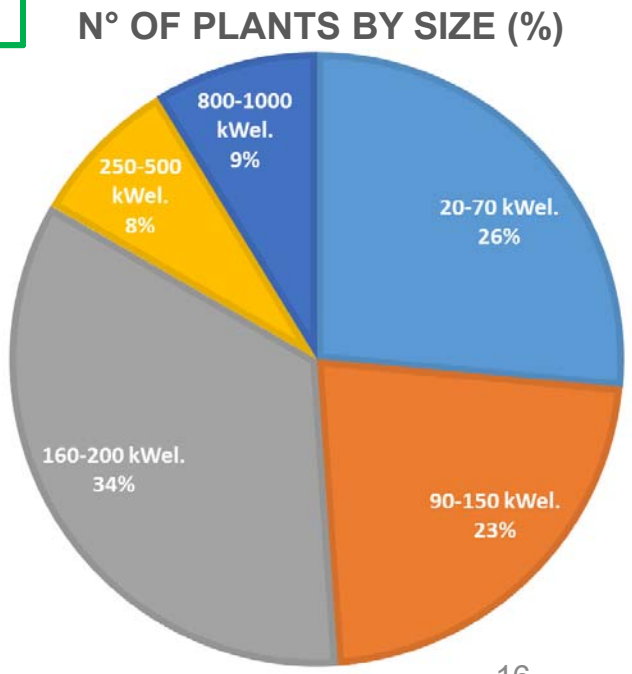
May 2019		
Geographical area	N° Plants	%
Northern Italy	176	63.8
Central Italy	60	21.7
Southern Italy and islands	40	14.5

May 2019		
Geographical area	kWel.	%
Northern Italy	43030	73,7
Central Italy	9552	16,4
Southern Italy and islands	5805	9,9

Data source: GSE (Gestore Servizi Energetici, Energy Service System Operator).
See also Atlaimpianti (https://atla.gse.it/atlaimpianti/project/Atlaimpianti_Internet.html)

N° of gasification plants and power distribution





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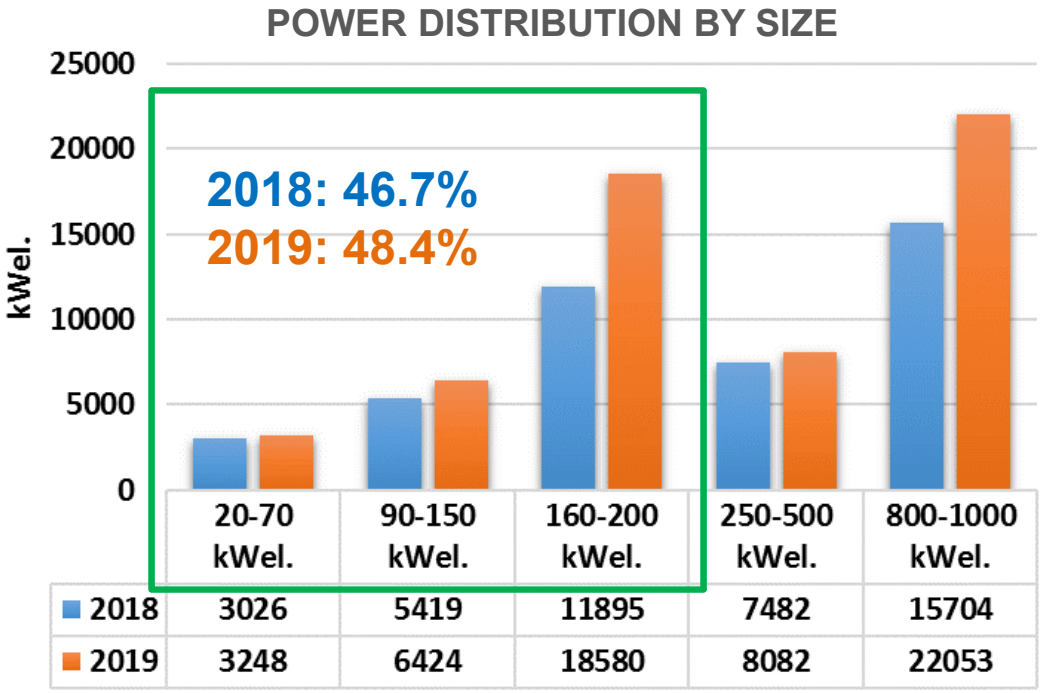
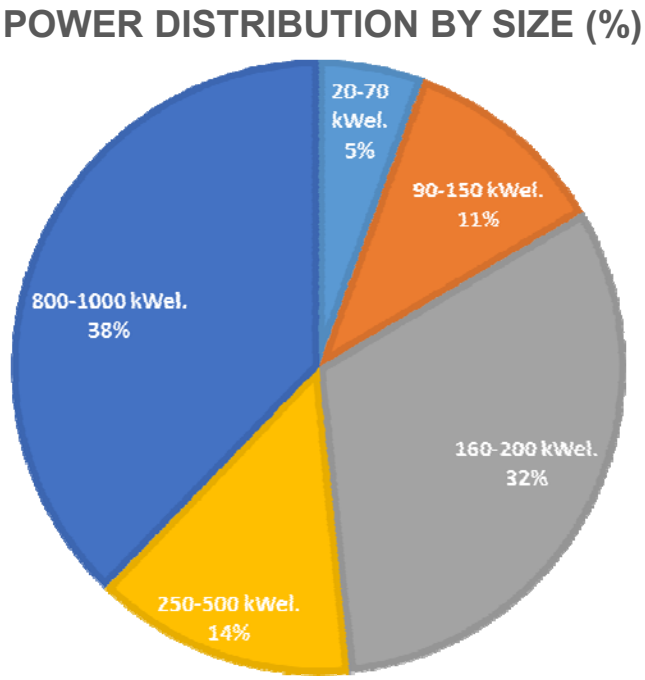
N° of gasification plants and power distribution





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Thank you

Contact Details

Donatella Barisano
CR ENEA Trisaia
SS Jonica 106, km 419 + 500
75026 Rotondella (MT)
ITALY

donatella.barisano@enea.it

IEA Bioenergy Website
www.ieabioenergy.com

Contact us:
www.ieabioenergy.com/contact-us/