



IEA Bioenergy

Technology Collaboration Programme



Country report - Italy

Gasification of biomass and waste

Donatella Barisano, ENEA

In-presence & e-meeting, 18 October 2022

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Technology Collaboration Programme

by **iea**

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The National context: PNRR and Agenda 2030



National Recovery and Resilience Plan (NRRP)



AGENDA 2030



The National context: AGENDA 2030

Quale futuro per le b | Documentazione par | D.L. 144/2022 - Ulter | Documentazione par | L'agenda globale per | SERVIZIO STUDI

temi.camera.it/leg18/agenda.html

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Are tematiche | PNRR | **Agenda 2030** | Dossier

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Cliccando sulle icone degli obiettivi è possibile approfondire lo **stato di attuazione, a livello nazionale, dei 17 obiettivi dello sviluppo sostenibile.**



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L'obiettivo è declinato in **cinque target**, gli ultimi due dei quali sono riferiti agli strumenti di attuazione (7.a e 7.b).

7.1 Garantire entro il 2030 accesso a servizi energetici che siano convenienti, affidabili e moderni;

7.2 Increase the share of renewable energy in total energy consumption by 2030;

7.3 Raddoppiare entro il 2030 il tasso globale di miglioramento dell'efficienza energetica;

7.a Accrescere entro il 2030 la cooperazione internazionale per facilitare l'accesso alla ricerca e alle tecnologie legate all'energia pulita - comprese le risorse rinnovabili, l'efficienza energetica e le

By 2030:

+ 70 GW new renewable capacity

+ 95 GWh storage capacity

via di sviluppo senza sbocco sul mare, conformemente ai loro rispettivi programmi di sostegno.

ULTIMO AGGIORNAMENTO: 20 APRILE 2022

<https://temi.camera.it/leg18/agenda.html>

https://download.terna.it/terna/Documento_Descrizione_Scenari_2022_8da74044f6ee28d.pdf

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The National Recovery and Resilience Plan (PNRR)

The energy investment projects are set out in Mission 2

(+ 3, 4)

Missione/ Componente	Investimenti/ Riforme	Risorse PNRR	Amministrazione Titolare/ Soggetto attuatore	Traguardo/ Obiettivo
M2C1	2.2 Parco Agrisolare (M2C1-I.2.2)	1.500 (sovvenzioni)	Ministero delle politiche agricole, alimentari e forestali (MIPAAF)	T4 2022 (O) T4 2023(O) T4 2024(O) T4 2026(O)
M2C2	Investimento 1.1 Sviluppo agro-voltaico (M2C1-I.1.1)	1.099 (prestiti)	Ministero della transizione ecologica (MITE)	T4 2024(T)
M2C2	Investimento 1.2 Promozione rinnovabili per le comunità energetiche e l'auto-consumo (M2C1-I.1.2)	2.200 (prestiti)	Ministero della transizione ecologica (MITE)	T4 2025 (T) T2 2026 (O)
M2C2	Investimento 1.3 Promozione impianti innovativi (incluso offshore) (M2C1-I.1.3)	675 (prestiti)	Ministero della transizione ecologica (MITE)	T4 2023 (T) T2 2026 (O)
M2C2	Investimento 1.4 Sviluppo bio-metano (M2C1-I.1.4)	1.923,4 (prestiti)	Ministero della transizione ecologica (MITE)	T4 2023 (O) T2 2026 (O)

Missione/ Componente	Investimenti/ Riforme	Risorse PNRR	Amministrazione Titolare/ Soggetto attuatore	Traguardo/ Obiettivo
M2C2	Investimento 3.4 Sperimentazione dell'idrogeno per il trasporto ferroviario	300 (prestiti)	Ministero delle infrastrutture e della mobilità sostenibili (MIMS) in collaborazione con MITE	T2 2023 (T) T2 2026 (O)
M2C2 - 3.5 hydrogen research and development				
M2C2	Investimento 4.3 Sviluppo delle infrastrutture di ricarica elettrica (M2C4-I 4.3)	741,32 (sovvenzioni)	Ministero della transizione ecologica (MITE)	T2 2024 (O) T4 2024 (T) T4 2025 (O)
M2C2	Investimento 5.1 Rinnovabili e batterie (M2C2-I 5.1)	1.000 (prestiti) di cui:	Ministero dello sviluppo economico (MISE)	T2 2022 (T)
M2C2	5.1.1 Tecnologia Fotovoltaica - PV (M2C2-I 5.1.1)	400	Ministero dello sviluppo economico (MISE)	T4 2025 (O)
M2C2	5.1.2 Industria eolica (M2C2-I 5.1.2)	100	Ministero dello sviluppo economico (MISE)	



POR H2
(research operational plan H2)



<https://www.mite.gov.it/comunicati/pnrr-firmato-accordo-di-programma-mite-enea-ricerca-sull-idrogeno>;
<https://www.enea.it/en/news-enea/news/energy-euro110-million-enea-mite-hydrogen-plan-kicks-off>

M2C2	Investimento 2.1 Rafforzamento smart grid (M2C2- I 2.1)	3.610 (prestiti)	Ministero della transizione ecologica (MITE)	T4 2022 (T) T4 2024 (O) T2 2026 (O) T2 2026 (O)
M2C2	Investimento 2.2 Interventi su resilienza climatica delle reti elettriche (M2C2-I 2.2)	500 (prestiti)	Ministero della transizione ecologica (MITE)	T4 2022 (T) T2 2026 (O)
M2C2	Investimento 3.1 Produzione di idrogeno in aree industriali dismesse (hydrogen valleys) (M2C2- I 3.1)	500 (prestiti)	Ministero della transizione ecologica (MITE)	T2 2023 (T) T2 2026 (O)
M2C2	Investimento 3.2 Utilizzo dell'idrogeno in settori hard-to-abate (M2C2- I 3.2)	2.000 (prestiti)	Ministero della transizione ecologica (MITE)	T2 2023 (T) T2 2026 (O)
M2C2	Investimento 3.3 Sperimentazione dell'idrogeno per il trasporto stradale (M2C2- I 3.3)	230 (prestiti)	Ministero delle infrastrutture e della mobilità sostenibili (MIMS) in collaborazione con MITE	T2 2023 (T) T2 2026 (O)

M2C2	5.1.3 Settore Batterie (M2C2-I 5.1.3)	500	Ministero dello sviluppo economico (MISE)	T4 2024 (O)
M2C2	Investimento 5.2 Idrogeno (M2C2- I 5.2)	450 (prestiti)	Ministero della transizione ecologica (MITE)	T2 2022 (T) T2 2026 (O)
M2C2	Investimento 5.3 Bus elettrici (M2C2- I 5.3)	300 (prestiti)	Ministero delle infrastrutture e della mobilità sostenibili (MIMS) in collaborazione con MISE e in sinergia con MITE	T4 2021 (T)
M2C2	Investimento 5.4 Supporto a start-up e venture capital attivi nella transizione ecologica (M2C2-I 5.4)	250 (prestiti)	Ministero dello sviluppo economico (MISE)	T2 2022 (T) T2 2026 (O)

M4C2 – 2.1 IPCEI

M3C2	Investimento 1.1 Green Ports (M3C2-I 1.1)	270 (prestiti)	Ministero della transizione ecologica (MITE)	T4 2022(O) T4 2025 (T)
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<https://temi.camera.it/leg18/pnrr/politiche/OCD54-5/energia.html>

Important Projects of Common European Interest (IPCEI): Hy2Use



Commission approves up to €5.2 billion support by 13 Member States for an Important Project of Common European Interest (IPCEI) in the **Hydrogen value chain** “IPCEI Hy2Use”

Hydrogen Infrastructure

- Air Liquide France
- Air Liquide Netherlands - CurtHyl
- Air Liquide Netherlands - ELYgator
- Bay of Biscay Hydrogen (Petronor/Repsol)
- Bondalti
- Cartagena Hydrogen Network (Repsol)
- ENGIE Belgium
- ENGIE Netherlands
- Fluxys
- H2 Aboño (EDP)
- H2-Fifty
- H2 Los Barrios (EDP)
- HyCC
- Iberdrola
- MassHylia (TotalEnergies and ENGIE France)
- Ørsted
- P2X Solutions*
- PKN Orlen
- Shell
- Uniper

Hydrogen applications in Industry

- Borealis
- Enel Green Power/Endesa
- ENGIE Belgium
- Everfuel*
- Hybrit Development
- IAM Caecius
- NextChem
- RINA-CSM
- RONA
- SardHy Green Hydrogen
- Solar Foods*
- South Italy Green Hydrogen
- TECforLime
- TITAN Cement
- VERBUND

Competition

*SMEs

Important Projects of Common European Interest (IPCEI): Hy2Use

“Development of new technologies for hydrogen production, storage, transport and distribution, as well as on applications in the mobility sector to be also applied to steel, cement and glass industries”

ICPEI – 2nd Call on Hydrogen: 500 mln € grants to 4 Italian companies (TOT EU budget: 5.2 bln €):
NextChem-Maire Tecnimont, Rina-CSM, SardHy, South Italy Green Hydrogen

(<https://www.mise.gov.it/index.php/it/notizie-stampa/idrogeno-quattro-le-imprese-italiane-finanziate-dalla-ue-con-500-milioni>)



(JV: SardHy Green Hydrogen srl)



(JV: South Italy Green Hydrogen)

Circular Hydrogen™
H₂ from Non-Recyclable Plastic Waste Chemical Conversion

90%* less CO₂ production

Additional revenue stream from waste management, synergies with waste companies

0 carbon intensity H₂ achievable with carbon capture

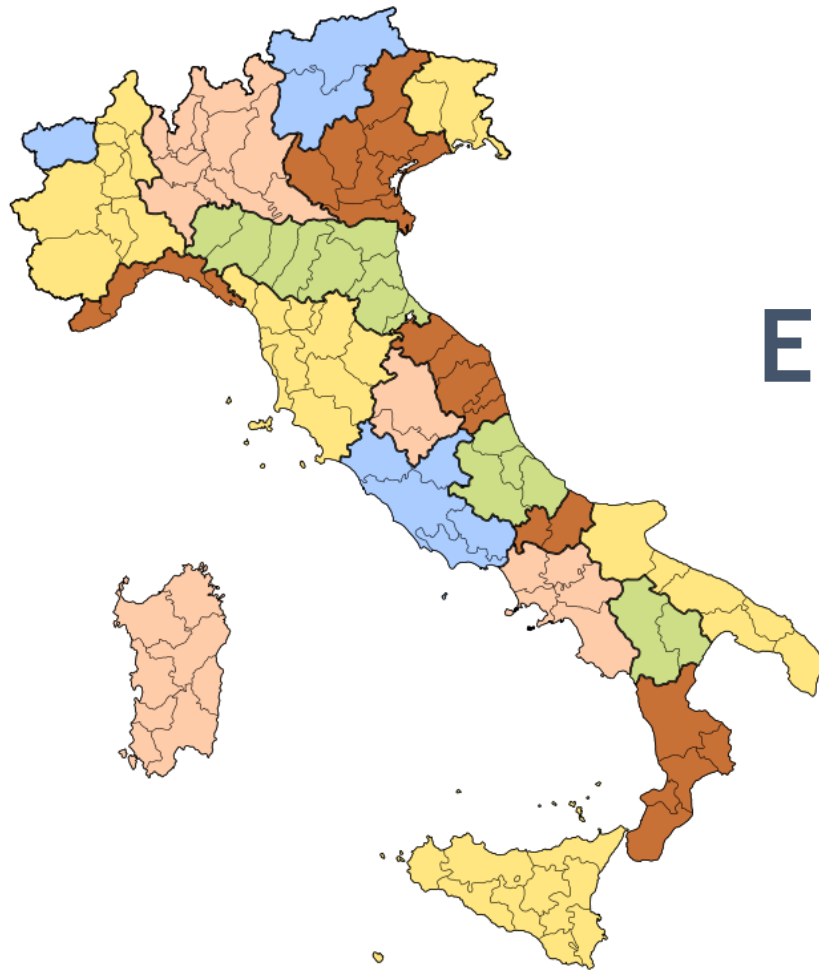
*vs. conventional SMR Grey Hydrogen and waste incineration carbon neutrality achievable with CO₂ capture.

NextChem
Maire Tecnimont for Energy Transition

Grant of €194 million assigned to Nextchem as part of the “IPCEI Hy2USE” EU project for the development of the first waste to hydrogen plant in the world.

- The project sets up the **Hydrogen Valley of Rome**, the first industrial-scale technological hub for the development of the entire national **hydrogen** supply chain
- The **waste-to-hydrogen** plant will produce up to 20,000 tons/year of hydrogen at full capacity, using 200,000 tons/year of non-recyclable solid waste as raw material

(<https://www.mairetecnimont.com/en/media/press-releases/grant-eu194-million-assigned-nextchem-part-ipcei-hy2use-eu-project-development-first-waste>)



Update on EU and National Projects

Update on EU Projects on gasification involving Italy

Name	Funding	Aim	Reactor design	Present Status	Partners	link
REFLECT AFRICA	HZ2020	Renewable energies for Africa: effective valorization of agri-food wastes	Different tech.	From 1 Nov 2021 to 31 Oct 2026	UJA (ES) , several African Countries, TREE S.r.l. (IT), UniPI (IT), TIFEO SRL (IT) et al.; 29 partners	https://www.reffect-africa.eu/
GOLD	HZ2020	Bridging the gap between phytoremediation solutions on growing energy crops on contaminated lands and clean biofuel production	Different tech.	From 1 May 2021 to 30 April 2025	CERTH (GR) , RE-CORD (IT), ETA (IT), UniBO (IT) et al.; 19 partners	https://www.gold-h2020.eu/
CERESIS	HZ2020	Contaminated land Remediation through Energy crops for Soil improvement to liquid biofuel Strategies	SCWG	From 1 Nov 2020 to 30 April 2024	NTUA (GR) , CERTH (GR), Strath (UK), Uni Tuscia (IT), CNR (IT), et al.; 12 partners	https://ceresis.eu/
FlexSNG	HZ2020	Flexible Production of Synthetic Natural Gas and Biochar via Gasification of Biomass and Waste Feedstocks	Fluidized bed	From 1 June 2021 to 31 May 2024	VTT OY (FI) , CERT (GR), EIFER (DE), WOOD (IT), ETA (IT) et al.; 12 partners	https://www.flexsng.eu/
WASTE2H2	HZ2020 - CSA	Producing hydrogen from waste biomass (via gasification)	Different tech.	From 1 Jan 2021 to 31 Dec 2023	IPPortalegre (PT) , KTH (SE), ENEA (IT), KIT (DE)	https://waste2h2.eu/
GICO	HZ2020	Development of small to medium scale residual biomass gasification plants integrated with CO2 capture and conversion (outputs: CHP and Biofuels)	Dual Fluidized Bed gasifier	From 1 Dec 2020 to 30 Nov 2024	USGM (IT) , ENEA (IT), TECNALIA (ES), ICI (IT), TU/e (NL), CSIC (ES), MTEC (FR), CALIDA (DE), FZJ (DE), IRIS (IT).	https://www.gicoproject.eu/
AUGIA	LIFE	Sewage oxy-gasification for chemicals production	Downdraft	From 1 Sept 2020 to 31 August 2023	UniMolise (IT) , UniPI (IT), SIME srl (IT), BioSyn srl (IT), COSIB (IT)	http://www.life-augia.unimol.it/
GREENSTOVE	LIFE	Gas Renewable Eco Energy Nature Stove	Downdraft	From 01/09/2021 End Date: 29/02/2024	PALAZZETTI (IT) , ATECH (IT), RVD (IT)	https://greenstove.eu/it
GLAMOUR	HZ2020	Full conversion of the crude glycerol into biofuels (synthetic paraffine kerosene (FT-SPK) to be used as jetfuel and into marine diesel oil (MDO))	auto-thermal reforming/gasification/chemical looping	From 1 May 2020 to 30 April 2024	University of Manchester (UK) , TU/e (NL), TNO (NL), CSIC (ES), VITO (BE), CiaoTech (IT), SIIRTEG NIGI S.P.A (IT), Argent Energy (UK), INERATEC (DE), C&CS (DE)	https://www.glamour-project.eu/
BioSFerA	HZ2020	Gasification of biogenic residues and wastes to produce biofuels for aviation and maritime transport via syngas fermentation (hydrotreatment of triacylglycerides)	Dual Fluidized Bed gasifier	From 1 April 2020 to 31 March 2024	EKETA (EL) , VTT Oy (FI), CARTIF (ES), BBEU (BE), CSIC (ES), Q8 R&T (NL), RINA (IT), Sumitomo SHI FW (FI), SeaNRG BV (NL), NTUA (EL), Environment Park S.p.A (IT)	https://biosfera-project.eu/
BLAZE	HZ2020	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 2023-05-31	USGM (IT) , UNIVAQ (IT), ENEA (IT), EPFL (CH), Walter Tosto (IT), SOLIDpower (CH), HyGear (NL), VERTECH GROUP (FR), EUBIA (BE)	http://www.blazeproject.eu/
CLARA	HZ2020	Chemical Looping gasification for sustainable production of biofuels .	Dual fluidized bed reactors	From 2018-11-01 to 2022-10-31	EST , REPOTEC, CHALMERS, UNIVAQ et al.; 13 partners	https://clara-h2020.eu/
LIG2LIQ	RFCS	Economically efficient production of liquid fuels , such as FT fuels or methanol, from lignite and SRF from municipal waste.	HT-Winkler reactor	From 2018-08-01 to 2022-01-31, ongoing	TUDA , UNIVAQ, ULSTER, CERTH, ICHPW, RWE, TKIS	https://www.lig2liq.eu/
BRISK II	HZ2020	Biofuels Research Infrastructure for Sharing Knowledge II	Fluidized and Fixed Beds	From 2017-05-01 to 2022-10-31	KTH , BIOENERGY 2020+ GMBH, ECN, KIT, ENEA et al.; 15 partners	https://www.brisk2.eu/
MEMBER	HZ2020	Advanced MEMBRANES and membrane assisted processes for pre- and post-combustion CO2 capture	Different tech.	From Jan 2018 to 30 June 2022	TECNALIA,, ECO RECYCLING SOCIETA A RESPONSABILITA LIMITATA	https://member-co2.com/content/objectives
Heat-To-Fuel	HZ2020	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 2022-04-30	GUSSING Energy Technologies , RE-CORD, TUV, BIOENERGY 2020+, RE-CORD, PoliTO, CRF et al.; 14 partners	http://www.heattofuel.eu/
BECOOOL	HZ2020	Brazil-EU Cooperation for Development of Advanced Lignocellulosic Biofuels (twinned with the Brazilian BioVALUE project)	Indirect Circulating Fluidized Bed	From 2017-06-01 to 2022-05-31	UniBO (IT) , BIOCHEMTEX SPA (IT), CREA (IT), RE-CORD (IT), BTG, ECN et al.; 13 partners	https://www.becoolproject.eu/

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

CORDIS: <https://cordis.europa.eu/search>

LIFE: <https://webgate.ec.europa.eu/life/publicWebsite/search/advanced>

Update on EU Projects on gasification involving Italy

Name	Funding	Aim	Technology/Reactor design	Present Status	Partners	link
PLASTICE	HORIZON EU	New technologies to integrate PLASTIC waste in the Circular Economy	Gasification chemical treatment and post-	From 1 June 2022 to 31 May 2026	CIRCE (ES), 5 IT (RINA CONSULTING, CNR, PRT POLYURETHAN RECYCLING TECHNOLOGY SRL, CHEMICAL EMPOWERING SRL, FONDAZIONE ICONS). Overall: 25 Partners	Website to be published (GA ID: 101058540)
Micro-Bio-CHP	HORIZON EU	Development of a novel highly efficient energy supply system for energy autonomous multi-family buildings based on biomass gasification coupled with an SOFC and a PV system	Updraft gasifier	From 1 October 2022 to 30 September 2025	WINDHAGER (AU), BIOS BIOENERGIESYSTEME GMBH (AU), FRAUNHOFER (DE), HYSYTECH SRL (IT), CATATOR AB (SE), WUPPERTAL INST. (DE)	Website to be published (GA ID: 101083409)

Projects on Gasification funded by National/Regional Programmes: Updates

Italian Region	Name	Funding	Project aim/Activity on Gasification	Reactor design	Present Status	Note
Abruzzo, Lazio, Puglia	AIRE	MIUR	Gasification and biomethane synthesis	Dual FB	March 2021	NEXTCHEM , UNIVAQ, Walter Tosto, DIZIINOXA, USGM, UNISALENTO, UNIROMA2
Basilicata & Campania	RECOVERY	MISE	Energy valorization of residual materials coming from the agro-food industry through syngas from gasification for self-production and self-consumption of electricity .	Downdraft	Next start (January 2022)	CMD S.p.A , Giaguaro S.p.A, ENEA
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 (January 2022)	ENEA , CNR, UNICAL, UNIBA, POLITO, SOTACARBO, CALABRA Maceri, et al.
Basilicata & Campania	EMERA	Regional	Efficient Micro Energy networks powered by only RES for the autonomy and independence of rural areas from the centralized system.	Downdraft	1 February 2022	CMD S.p.A , DIGIMAT, EES, ESA, ENEA, CNR
Campania & Basilicata	GREEN FARM	MISE	Power production from residual biomass via gasification, integrated with other RES, for self-reliance in cultivation and food processing systems.	Downdraft	In progress (2020-2023)	UniNA , CMD SpA, CNR, Graded SpA
Basilicata	PIBE	Regional	Infrastructure and R&D activities aimed at producing biofuels, innovative biolubricants, biomethane and syngas for frontier energy applications.	Different types	In progress	ENEA , CNR, UNIBAS
Basilicata & Sicily	EMAP	Regional	Demonstrative plant for energy and material recovery (activated carbon for super capacitor electrodes) from disposed tires.	Pyro-gasifier	In progress	Baucina Tyre , Energia Futura , ENEA
Basilicata, Campania, Apulia, Sardinia, Lazio	COMETA	MUR	Use of residual biomass for CHP and biofuels production.	Downdraft & BFB	In progress	Novamont , ENEA, CREA, Uni Sassari, CIHEAM-Bari, et al. https://www.novamont.com/cometa
Campania	PROMETEO	MISE	Gasification technology industrialization for energy recovery and cost-effective management of waste from urban green and agri-food residues industry.	Downdraft	In progress	CMD S.p.A , EPM https://prometeoenergia.com/
Emilia-Romagna	UNIHEMP	MUR	Use of biomass from industrial hemp for energy production and new biochemicals .	Downdraft	In progress	DHITECH , Avantech, CREA, UniMORE, et al. http://unihemp.dhitech.it/
Sardinia	CEEP-3	Regional	Optimization of BFB gasification process for hydrogen production from plastic waste	Fluidized Bed	In Progress	Sotacarbo http://www.sotacarbo.it/en/
Sardinia	Bi.Ar.	Regional	Energy recovery from brewer's spent grain	Down-draft	In Progress	Sotacarbo , UNISS, Porto Conte Ricerche
Sicily	NAUSICA	MUR	Exploitation of ship-generated waste via catalytic thermal gasification and treatment under supercritical gasification conditions for low carbon fuel production.	Bubbling Fluidized Bed, SCWG	In Progress	NAVTEC , CNR-ITAE, UniPA, UniCT, et al.

Thank you

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