DS – Decarbonized & Sustainable Industry International Conference, Bilbao 3-5 November 2026

CARTIERE DI GUARCINO SPA – ITALY
ALESSANDRO BRUSA

Push2Heat

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

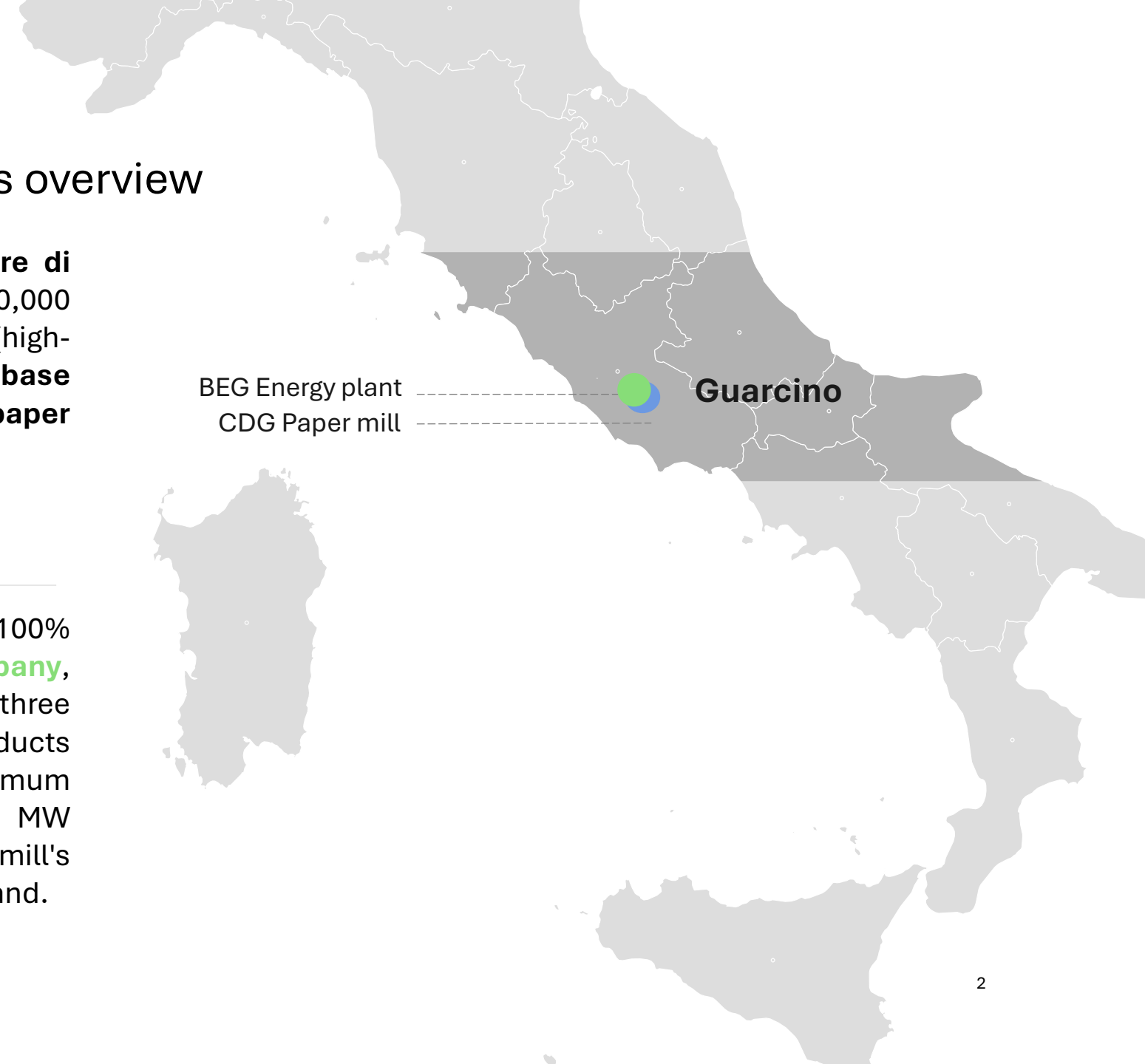
CdG production and facilities overview

Founded in 1990, the **paper mill** **Cartiere di Guarcino S.P.A.** (CDG) has a capacity of 50,000 tons/year, offers **3 product's categories** (high- and low-pressure lamination and flooring): **base paper**, **single-color paper**, **backing paper** (underlay and kraft).

177 employees (5 seconded to BEG)

10 Temporary workers

Bio Energia Guarcino S.R.L. (BEG), a 100% owned **bioliquid cogeneration plant company**, produces electricity and heat through three engines fuelled by vegetable oil and by-products with low CO2 emissions. It has a maximum capacity of 9 tons/h of steam and 20 MW electricity. BEG covers 100% of the paper mill's electricity demand and 35% of steam demand.



MISSION

To produce technical papers and integrated energy solutions with high added value, combining industrial **quality**, **circular economy** and **energy efficiency**, to support the sustainable competitiveness of downstream supply chains on market.



MISSION

To produce technical papers and integrated energy solutions with high added value, combining industrial **quality**, **circular economy** and **energy efficiency**, to support the sustainable competitiveness of downstream supply chains on market.





Décor Papers



Decorative printed papers



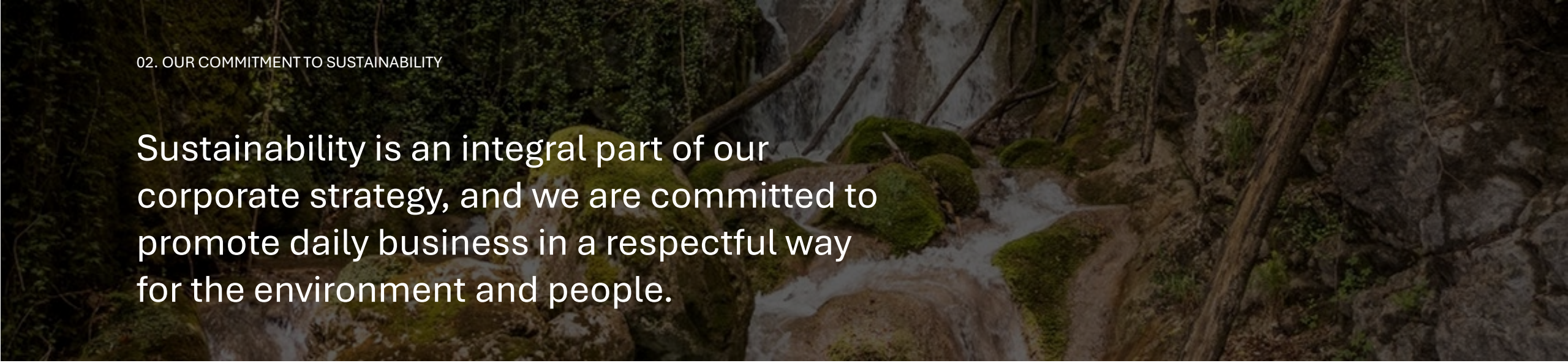
Finish Foils



Melamine Films

02.

Our commitment to sustainability



Sustainability is an integral part of our corporate strategy, and we are committed to promote daily business in a respectful way for the environment and people.

OUR ACTIONS AT CARTIERE DI GUARCINO

Generating our own renewable energy to reduce the carbon footprint (e.g. through investment in a bioliquid cogeneration plant for combined heat and power production since 2010).

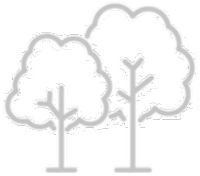
Maximizing recycled fiber content and sustainable certified virgin pulp.

Promoting safety and wellbeing in the workplace.

Constant R&D investments to reduce use of chemicals and find less impactful substitutes (such as PAE resin with low AOX levels).

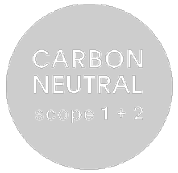
Responsible water management by reducing consumption, maximising recycling, and purifying and filtering wastewater before returning it to the river Cosa.

Sustainability sets us apart: the numbers that illustrate our efforts.



100%

Virgin raw materials (pulp) are FSC®/PEFC Certified



100%

Carbon neutral (scopes 1 & 2) since 2023



99,9%

CDG renewable electricity is produced locally through cogeneration plant feeded by renewable sources (2025)



38%

CDG renewable heat (steam) coverage by energy produced locally through BEG cogeneration plant (2025)



65%

of fuel used to fuel cogeneration plant derives from certified by-products of animal origin (ABPs), while remaining 35% consists of vegetable oil (2025): all the biofuels respect EU Sustainability criteria



16%

Recycled fibre content in our total Production (2025)

Group ratings.

Open-es ecosystem sustainability powered by Eni

score
92%

May 2025

SDA Bocconi School of Management
SUSTAINABILITY LAB

score
92.3%

February 2024

SDG ACTION MANAGER

score
86.6%

May 2025

CDP
DISCLOSURE INSIGHT ACTION

score
B
AA- B- C- C- D- D-

December 2023

INTEGRITY NEXT

score
green
yellow
red

May 2025

home INDEX

score
A
B C D E

July 2024

ESG IDENTITY

score
top performer
leader
conscious
builder

June 2025

ITALIA BEST MANAGED COMPANIES

Deloitte
October 2024

These ratings refer to the NDT group

Recent engagements.

CDG obtained, first décor paper mill in the world, the Cradle-to-Cradle certification

Current certifications

ISO 9001:2015
Quality management system

ISO 14001:2015
Environmental management system

ISO 45001:2018
Safety management system

ISO 50001:2018
Energy management system

PEFC
Programme for the Endorsement of Forest Certification

FSC
Forest Stewardship Council

A fully sustainable business model: circular economy.

PAPER PRODUCTION

CDG uses only FSC (Forest Stewardship Council) cellulose that comes from certified sustainable

The fuel used by the BEG power plant comes from certified tallow oil (ABP) , other by-products and vegetable oil

BEG → CARTIERE DI GUARCINO

BEG supplies 100% of the electricity and 35% of the steam to the paper mill

Next step:
NEW BIOMASS PLANT
- boiler aiming to full thermal coverage

RECYCLING PAPER WASTE

CDG reuses all internal waste and collects a significant volume from various printers

A fully sustainable business model: step 1 - Bioliquid cogeneration plant

Paper Factory (**CDG**)

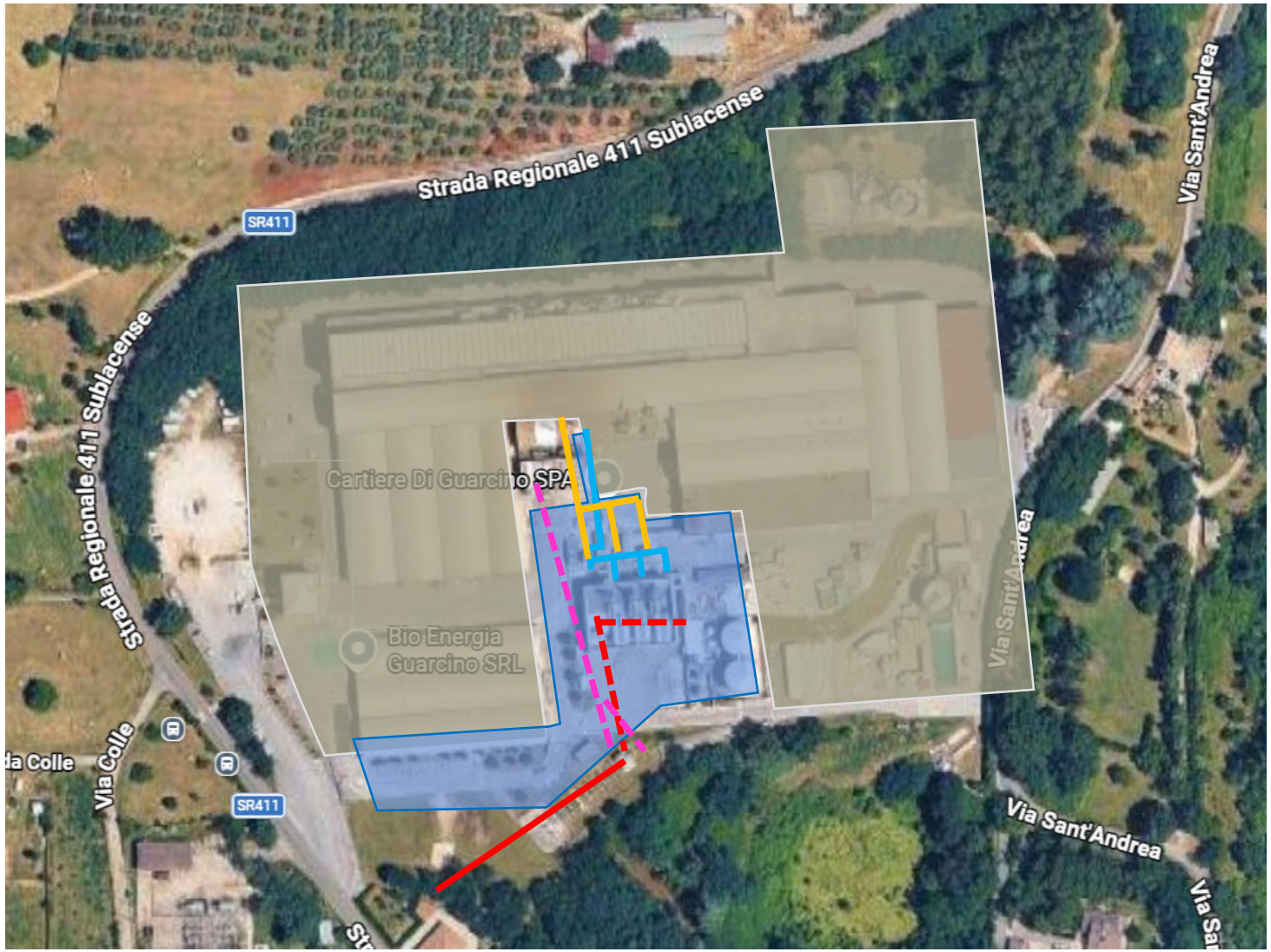
Bioliquid cogeneration plant (**BEG**)

Hot water from cogeneration heat exchanger (**90°C**)

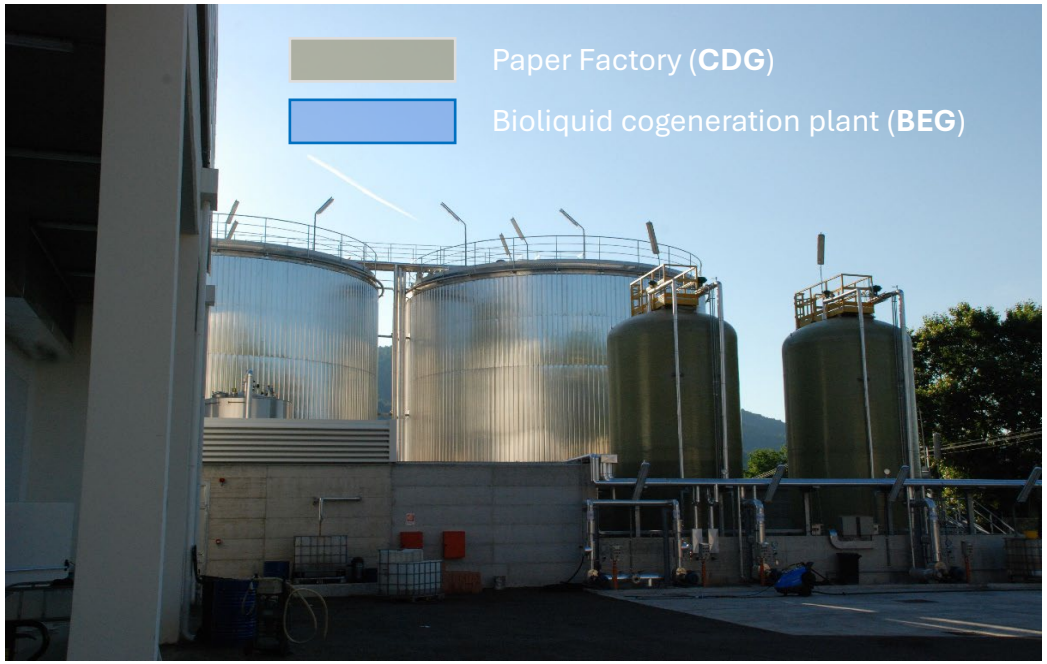
Power to the public grid (**13 MWe**)

Steam from cogeneration plant (**6 MWth**)

Power to the paper factory (**7 MWe**)



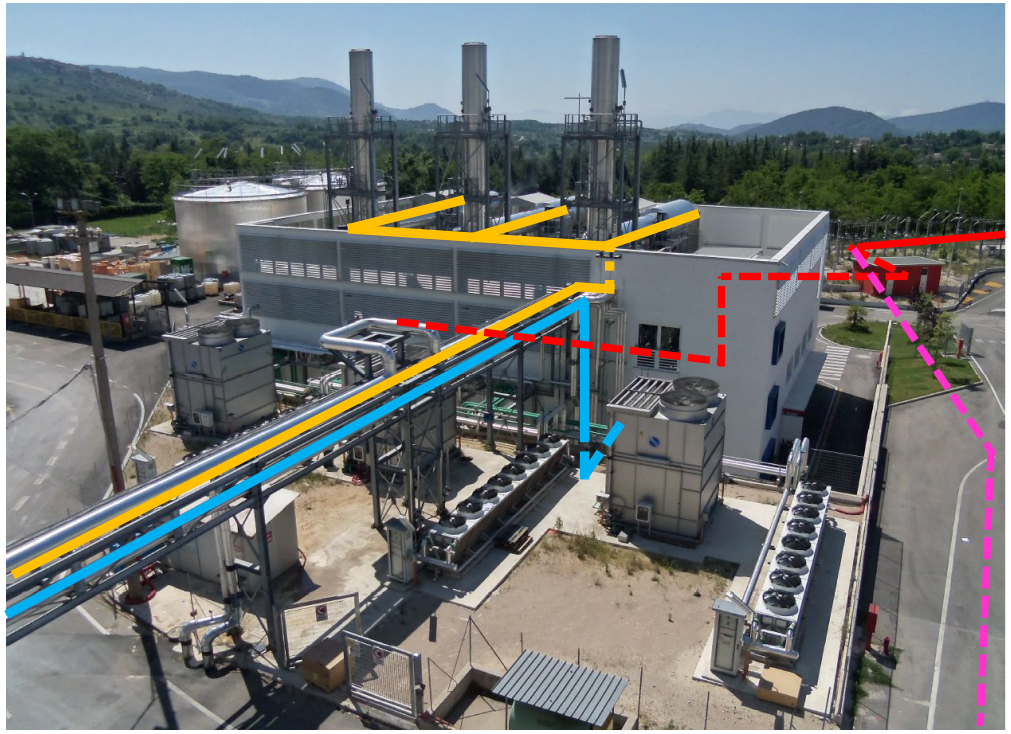
A fully sustainable business model: step 1 - Bioliquid cogeneration plant

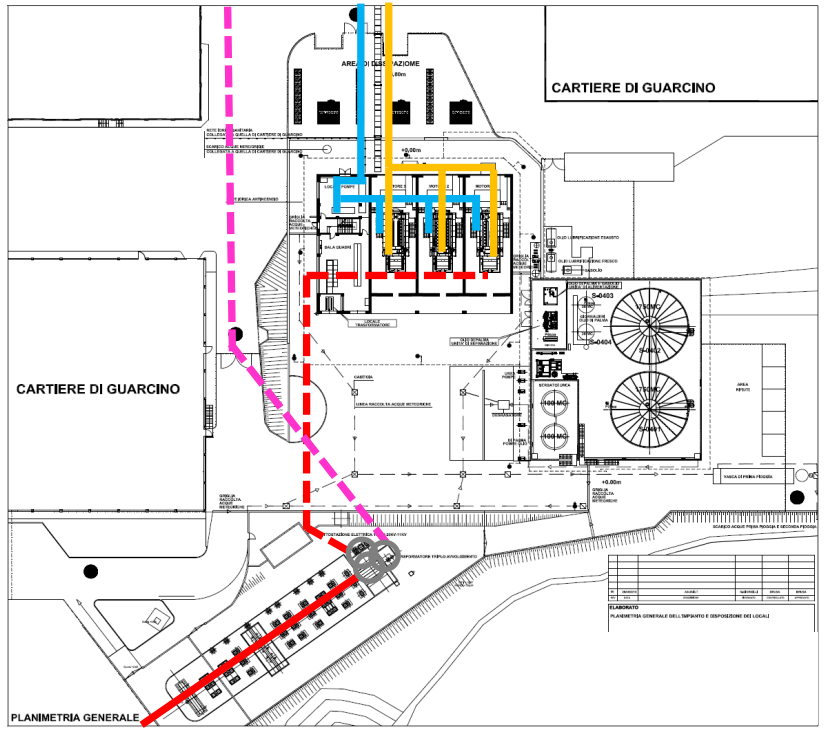




The cogeneration plant is fuelled by **vegetable oil (35%)** (not for food purposes) and **tallow oil (65%)**, a by-product from food processing industry: some 35.000 tons/y fulfilling criteria of **renewable sources**, **sustainability standard** (according to RED III criteria) and **circular economy** requirements.

A fully sustainable business model: step 1 - Bioliquid cogeneration plant





Hot water from cogeneration heat exchanger (**90°C**)

Steam from cogeneration plant (**6 MWth**)

Power to the public grid (**13 MWe**)

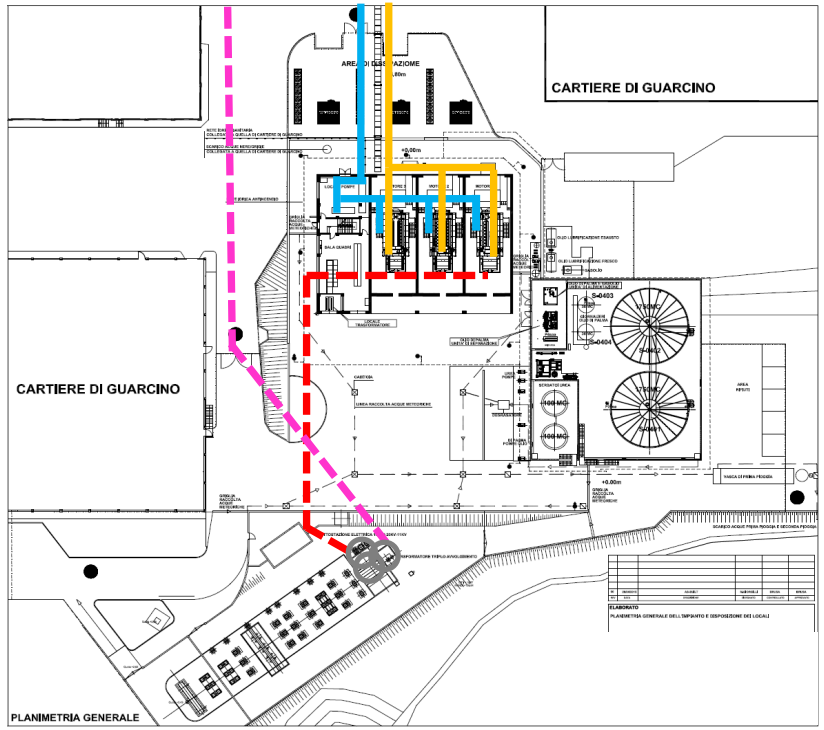
Power to the paper factory (**7 MWe**)

A fully sustainable business model: step 1 - Bioliquid cogeneration plant

Power to the paper factory (**7 MWe**)

Steam from cogeneration plant (**6 MWth**)

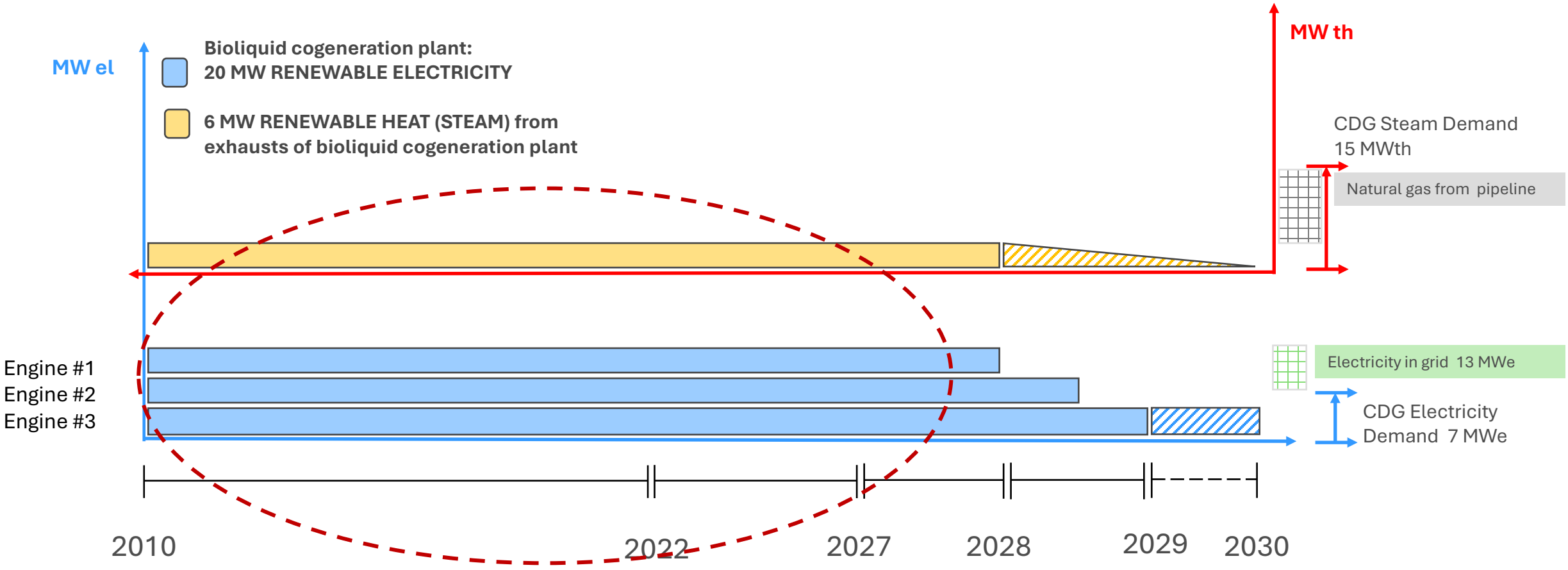
Hot water from cogeneration heat exchanger (**90°C**)



The Paper Factory Cartiere di Guarcino benefits of:

- 100% of renewable electricity produced on site.
- 35% of steam from exhausts of cogeneration plant.
- Availability of some 2 MW/engine hot water (90°C), used for process and heating purposes.

A fully sustainable business model: step 1 - Bioliquid cogeneration plant



A fully sustainable business model: step 2 – Heat Pump and AHT system

Paper Factory (**CDG**)

Bioliquid cogeneration plant (**BEG**)

HP – MVR / AHT (**CDG**)



A fully sustainable business model: step 2 – Heat Pump and AHT system

PUSH2HEAT OUTLINE & OBJECTIVES

Push2Heat

TECHNOLOGY RELATED OBJECTIVES:

- Optimization of **four heat upgrade technologies**

MARKET/BUSINESS RELATED OBJECTIVES:

- **Pushing forward the market potential, new business models : HAAS vs. CAPEX** and actions towards market deployment

Demonstration of 4 full-scale industrial HTHP pilot plants :

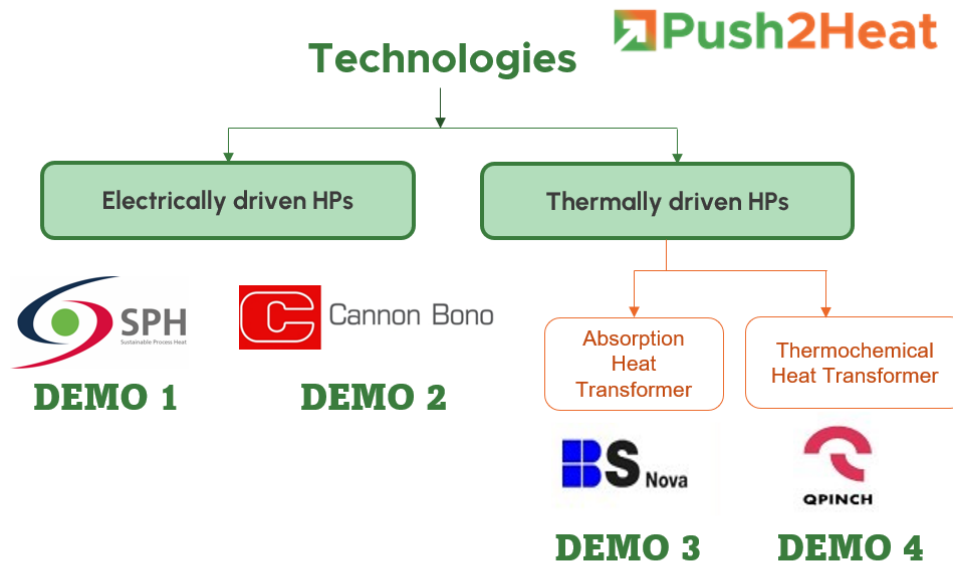
- Waste heat → 40-90 °C
- Heat supply → Generate steam 1-6 barg, < 160°C
- System size → **0,5 - 1 MW**

Funded by the European Union

Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

A fully sustainable business model: step 2 – Heat Pump and AHT system

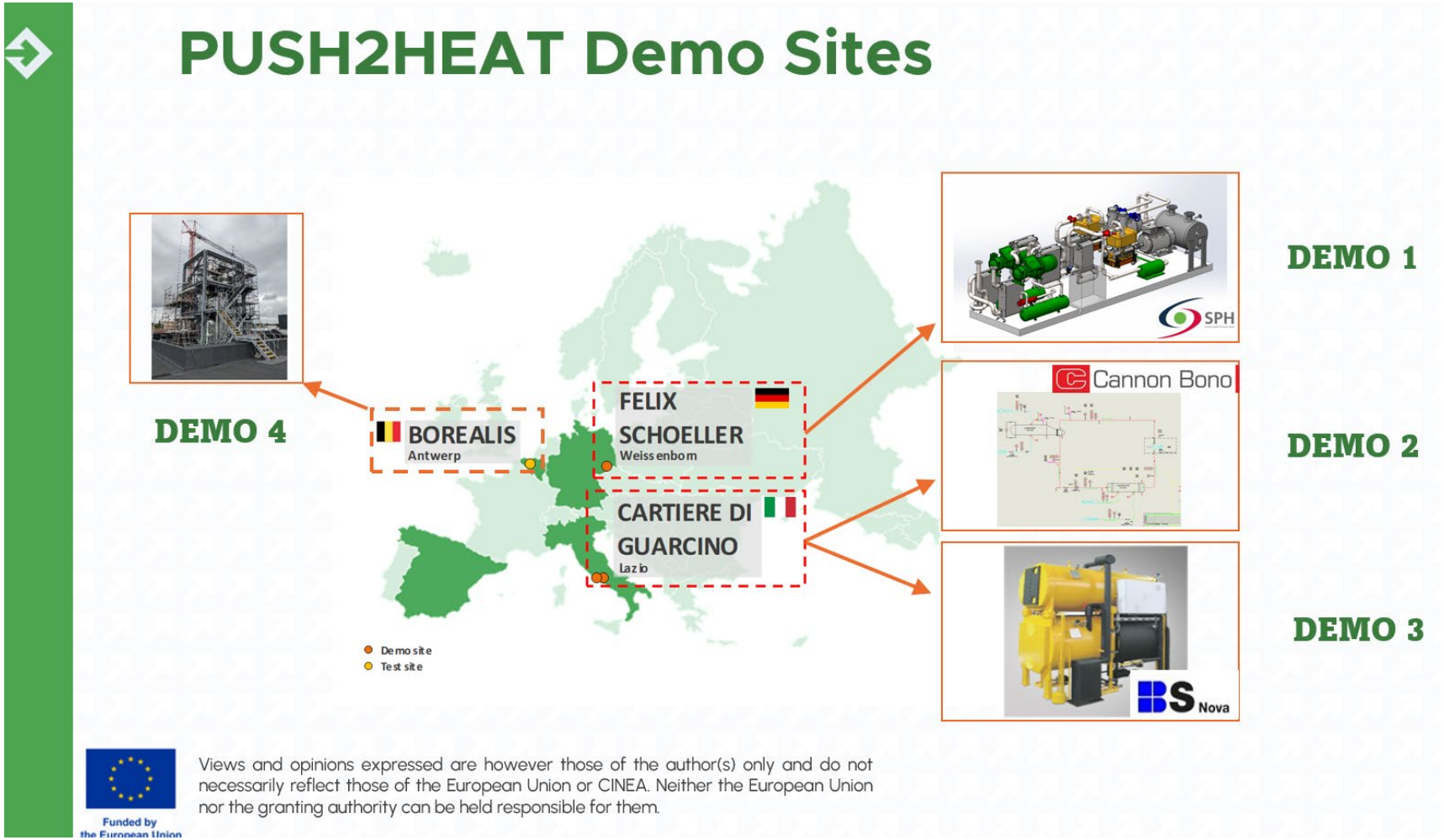
PUSH2HEAT TECHNOLOGIES AND DEMO SITES



Funded by the European Union

View only CINE held

A fully sustainable business model: step 2 – Heat Pump and AHT system



A fully sustainable business model: step 2 – Heat Pump and AHT system

DEMO 2
HTHP WITH
SCREW
COMPRESSOR

R515B & R1233zd
Hydro Fluoro Olefins with low GWP



Push2Heat

Cannon Bono Energia

CARTIERE DI GUARCINO

POLITECNIC MILANO 1863

DEMO 2: paper industry
Cartiere di Guarcino (Italy)

Location	Lazio, Italy
Sector	Paper industry - CHP plant
Plant owner	Cartiere di Guarcino
Technology	HTHP (by CANNON BONO) + MVR

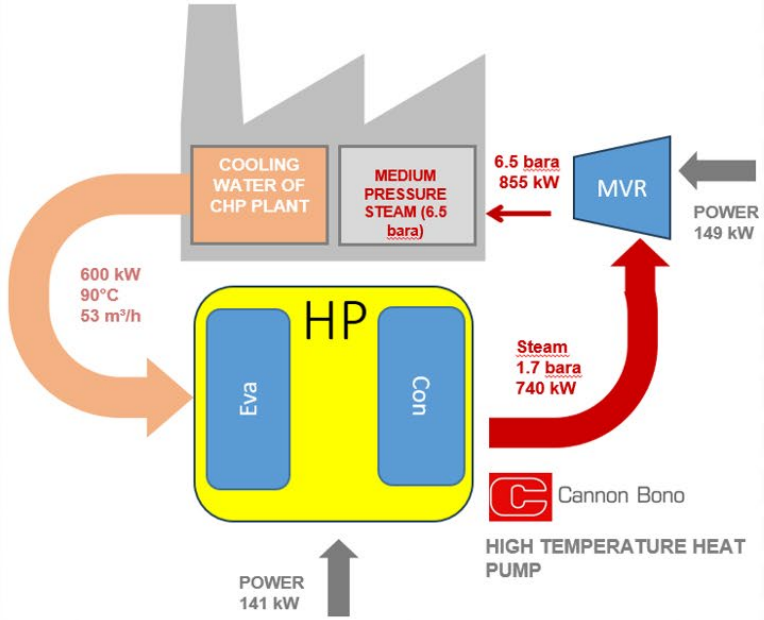
Funded by the European Union

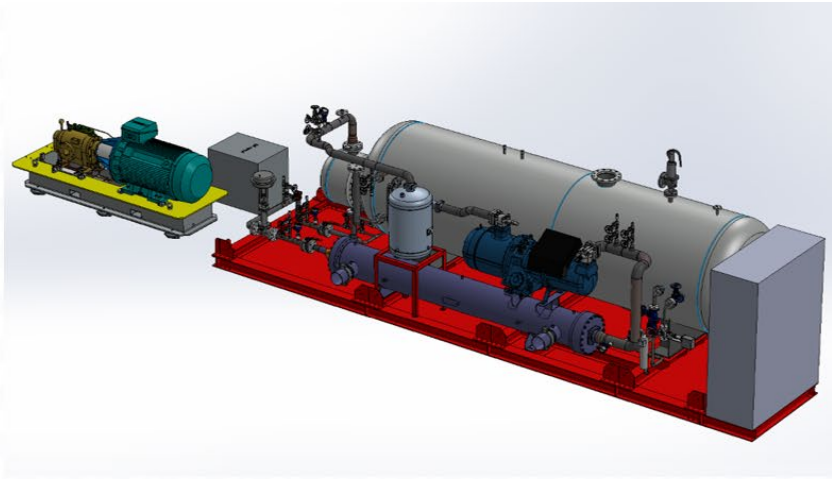
Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

A fully sustainable business model: step 2 – Heat Pump and AHT system

DEMO 2 – HUT integration and technology

HIGH TEMPERATURE HEAT PUMP WITH SCREW COMPRESSOR + MVR





COPel (HTHP / System)	5 / 3
Op. hours (h/y)	7000
PE savings (MWh/y)	3487
CO2 savings (tCO2/y)	707

* Expected values

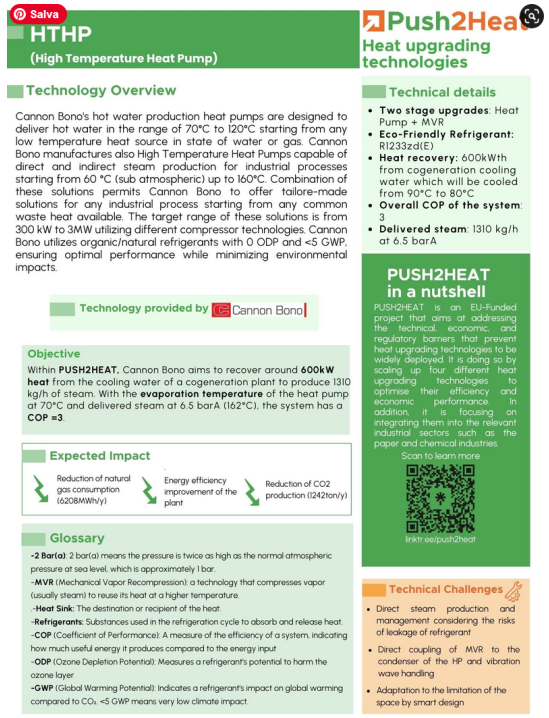
TECHNOLOGY FACTSHEET:

Heat-Upgrading-technologies-HUT.jpg (1414×2000)

Funded by the European Union

Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

A fully sustainable business model: step 2 – Heat Pump and AHT system



https://push2heat.eu/wp-content/uploads/2025/06/Heat-Upgrading-technologies-HUT.jpg

Salva
HTHP
(High Temperature Heat Pump)
Push2Heat
Heat upgrading technologies
Technology Overview
Cannon Bono's hot water production heat pumps are designed to deliver hot water in the range of 70°C to 120°C starting from any low temperature heat source in state of water or gas. Cannon Bono manufactures also High Temperature Heat Pumps capable of direct and indirect steam production for industrial processes starting from 60 °C (sub atmospheric) up to 160°C. Combination of these solutions permits Cannon Bono to offer tailore-made solutions for any industrial process starting from any common waste heat available. The target range of these solutions is from 300 kW to 3MW utilizing different compressor technologies. Cannon Bono utilizes organic/natural refrigerants with 0 ODP and <5 GWP, ensuring optimal performance while minimizing environmental impacts.
Technology provided by Cannon Bono
Technical details
Two stage upgrades: Heat Pump + MVR
Eco-Friendly Refrigerant: R1233zd(E)
Heat recovery: 600kWth from cogeneration cooling water which will be cooled from 90°C to 80°C
Overall COP of the system: 3
Delivered steam: 1310 kg/h at 6.5 barA
PUSH2HEAT in a nutshell
PUSH2HEAT is an EU-Funded project that aims at addressing the technical, economic, and

A fully sustainable business model: step 2 – Heat Pump and AHT system

HTHP + MVR have been placed and aligned by CdG site.

Commissioning ongoing.

It will soon start test phase.

Expected time on duty: 1° half 2027





A fully sustainable business model: step 2 – Heat Pump and AHT system

DEMO 3 Absorption Heat Transformer

LiBr & Water



Push2Heat

BS Nova

CG CARTIERE DI GUARCINO

Cannon Bono

tecnalia MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

Technische Universität Berlin

DEMO 3: paper industry
Cartiere di Guarcino (Italy)

Location	Lazio, Italy
Sector	Paper industry - CHP plant
Plant owner	Cartiere di Guarcino
Technology	Absorption Heat Transformer (AHT) (by BS-NOVA) Working fluid: H2O/LiBr

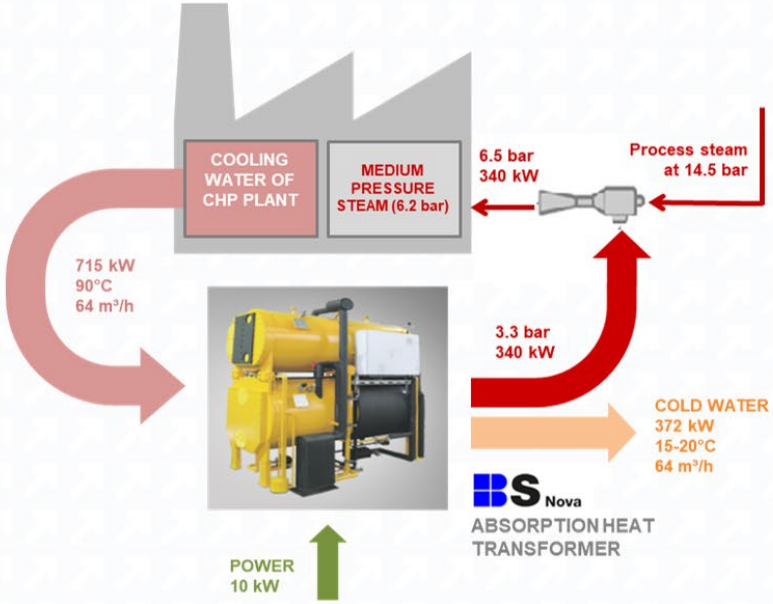
Funded by the European Union

Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

A fully sustainable business model: step 2 – Heat Pump and AHT system

DEMO 3 – HUT integration and technology

ABSORPTION HEAT TRANSFORMER + STEAM GENERATION AND UPGRADE



COP (Thermal/electric)	0,48 / 35
Op. hours (h/y)	7000
PE savings (MWh/y)	2800
CO2 savings (tCO2/y)	500

* Expected values





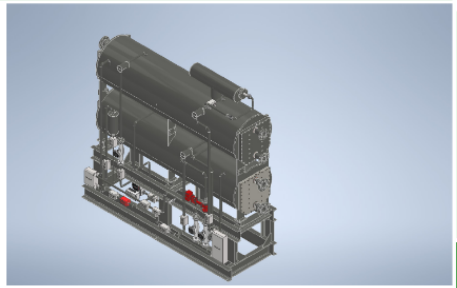
Funded by

Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

TECHNOLOGY FACTSHEET: factsheet BSNOVA-1.pdf

A fully sustainable business model: step 2 – Heat Pump and AHT system

Absorption heat transformer



Technology provided by BS Nova

Technology overview

The **Absorption Heat Transformer cycle** operates as follows:

1. The waste heat drives the cycle by enabling the **desorption** separating the refrigerant from the absorbent solution, which is normally an aqueous LiBr solution. This occurs in the **generator**.
2. The **refrigerant vapour** flows through the **condenser**, where the vapour **latent heat** is transferred to a dissipation sink at a low (ambient) temperature.
3. After being **condensed**, the refrigerant is **pumped** to a higher pressure, where the refrigerant is **evaporated** by the waste heat source.
4. Finally, the **vapour** goes from the **evaporator** to the **absorber**. The **LiBr concentrated solution** absorbs this **vapour** and due to this **exothermic process**, the **absorption heat** is released at higher temperature. Thus, the **revalorised stream** from the **Absorption Heat Transformer** may be delivered to the corresponding application.

Objective

The **goal** of the technology is to show how using **mechanical vapour compressors** and **thermally driven heat pumps** can **improve** and **reuse** large-scale **waste heat** (over 500 kW). The main **focus** is on doing this **efficiently**, **recovering** and **improving** waste heat while reaching temperatures between **90-160°C**.

Operating conditions

Component	Nominal Heat (kW)*	Inlet Temperature (°C)**	Outlet Temperature (°C)***	Volumetric Flow Rate (m3/h)****
Usable Heat Circuit (Absorber)	448	111	116	80.4
Driving Heat (Desorber)	448	85	75	39.6
Driving Heat (Evaporator)	486	85	74.6	41.2
Low Temperature Sink (Condenser)	486	15	25	41.8

*Expected heat transfer capacity; **Initial temperature of the working fluid; ***temperature of the working fluid as it exits the component; ****rate at which the working fluid flows through the component.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

Push2Heat
Heat upgrading technologies

Technical details

- **Production Waste heat:** 981 kW
- **Max. operating pressure:** -1 / 5 bar
- **Max. operating pressure:** 0 / 145°C
- **Working Fluid:** H_2O/LiBr
- **Upgraded heat use:** temperature range of 110-120°C
- **Application of Upgraded Heat:** The upgraded heat is used for **preheating chemical products** up to **110°C** or for **generating steam** at **1.5 bar absolute pressure.**

PUSH2HEAT in a nutshell

PUSH2HEAT is an EU-Funded project that aims at addressing the technical, economic, and regulatory barriers that prevent heat upgrading technologies to be widely deployed. It is doing so by scaling up four different heat upgrading technologies to optimise their efficiency and economic performance. In addition, it is focusing on integrating them into the relevant industrial sectors such as the paper and chemical industries.

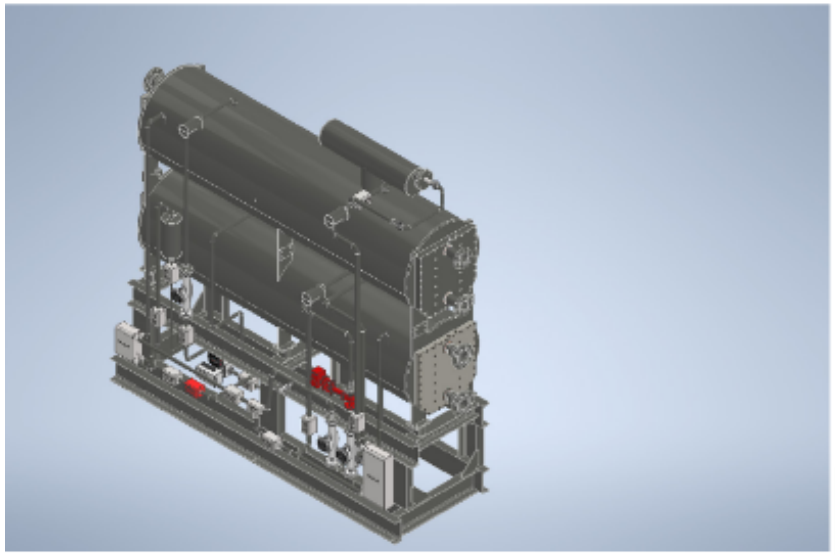
linktr.ee/push2heat

Glossary

- **Desorption:** The removal or release of a substance (like refrigerant) from another substance (absorbent solution), particularly occurring in the generator during the absorption refrigeration cycle.
- **Latent Heat:** The heat absorbed or released during a phase change without a temperature change. In the condenser, refrigerant vapor releases latent heat as it changes into a liquid.
- **LiBr Solution:** water-based solution containing lithium bromide (LiBr).
- **Waste Heat:** This is heat produced as a byproduct of an industrial process that would typically be discarded.

https://push2heat.eu/wp-content/uploads/2024/02/factsheet_BSNOVA-1.pdf

Absorption heat transformer



Technology provided by BS Nova

Push2Heat
Heat upgrading technologies

Technical details

- **Production Waste heat:** 981 kW
- **Max. operating pressure:** -1 / 5 bar
- **Max. operating pressure:** 0 / 145°C
- **Working Fluid:** H_2O/LiBr
- **Upgraded heat use:** temperature range of 110-120°C
- **Application of Upgraded Heat:** The upgraded heat is used for **preheating chemical products** up to **110°C** or for **generating steam** at **1.5 bar absolute pressure.**

PUSH2HEAT in a nutshell

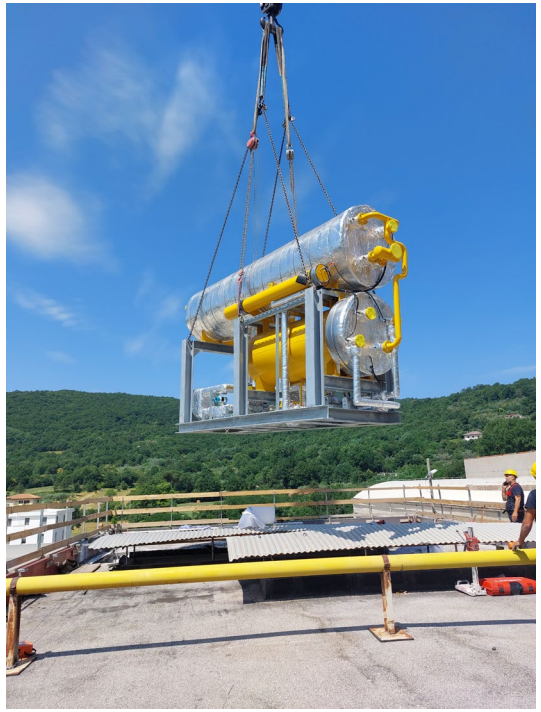
PUSH2HEAT is an EU-Funded proj-
ect that aims at addressing the

A fully sustainable business model: step 2 – Heat Pump and AHT system

AHT has passed commissioning phase

It starts tuning works to variable CDG steam demand

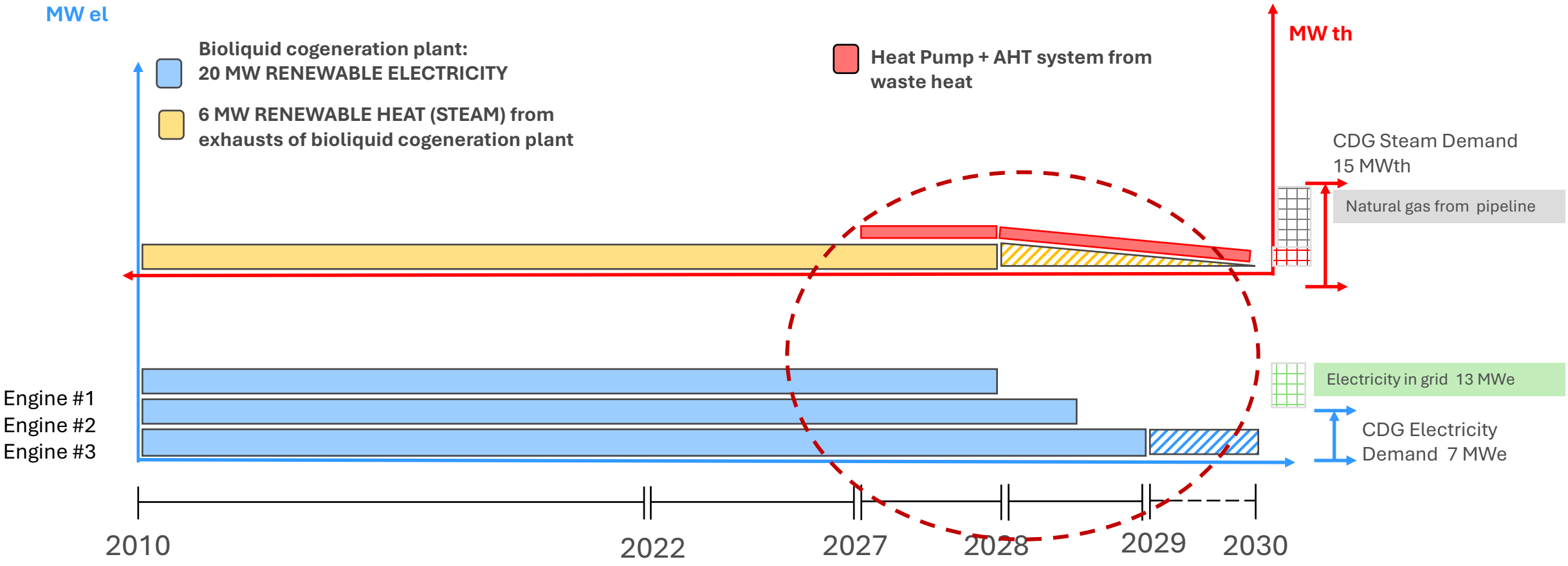
2027 will continue its duty with the first official results.





Push2Heat

A fully sustainable business model: step 2 – Heat Pump and AHT system

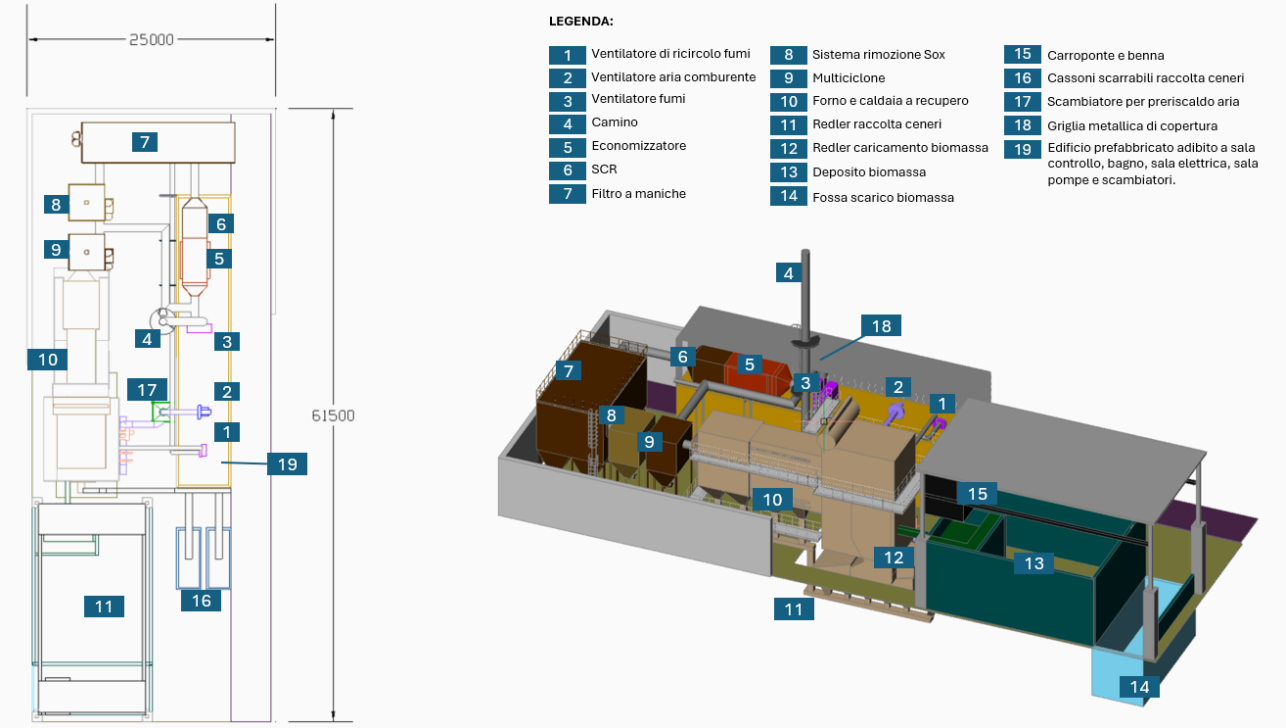


A fully sustainable business model: step 3 – Biomass plant for steam generation

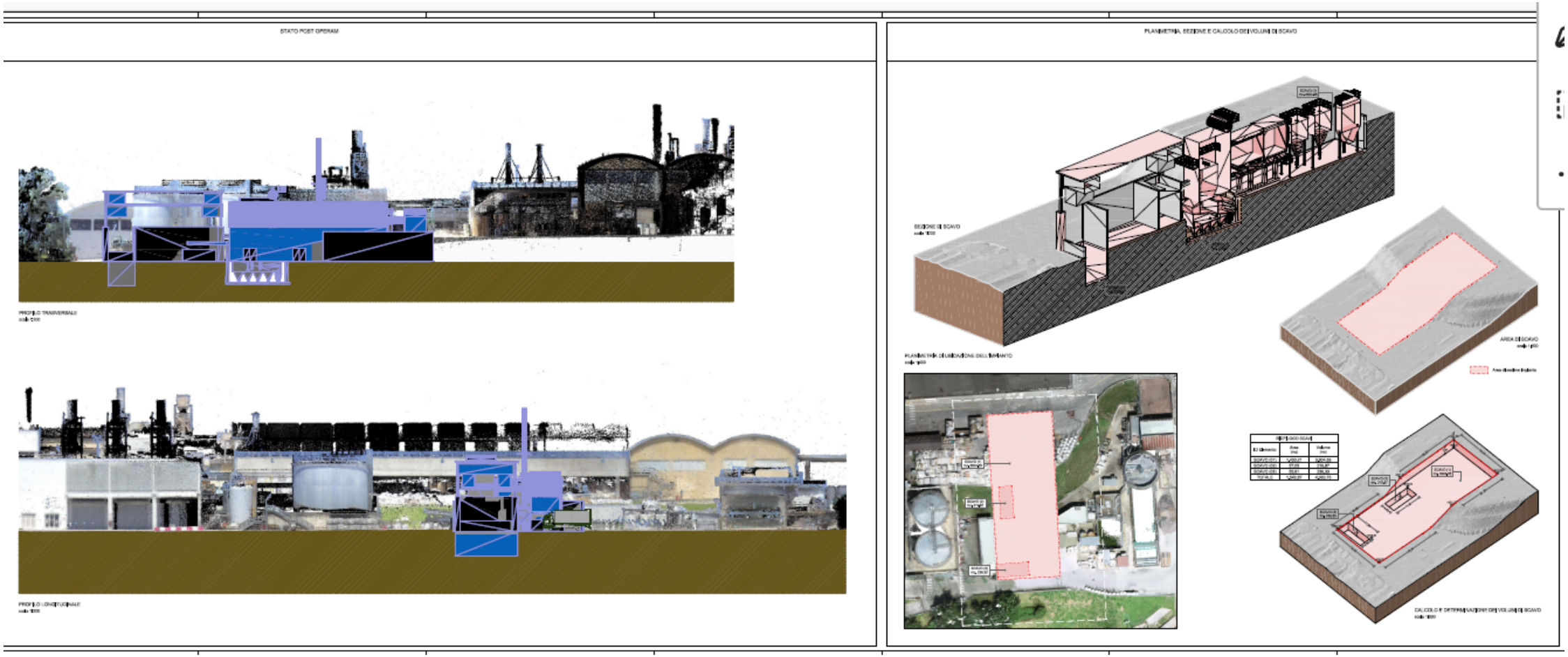
The ETS scheme and the vision to sustainability and circular economy set a new step: a biomass plant for steam generation and the promotion of a local certified biomass system.

It will lead to a factory where energy, sustainability and circular approach will meet together.

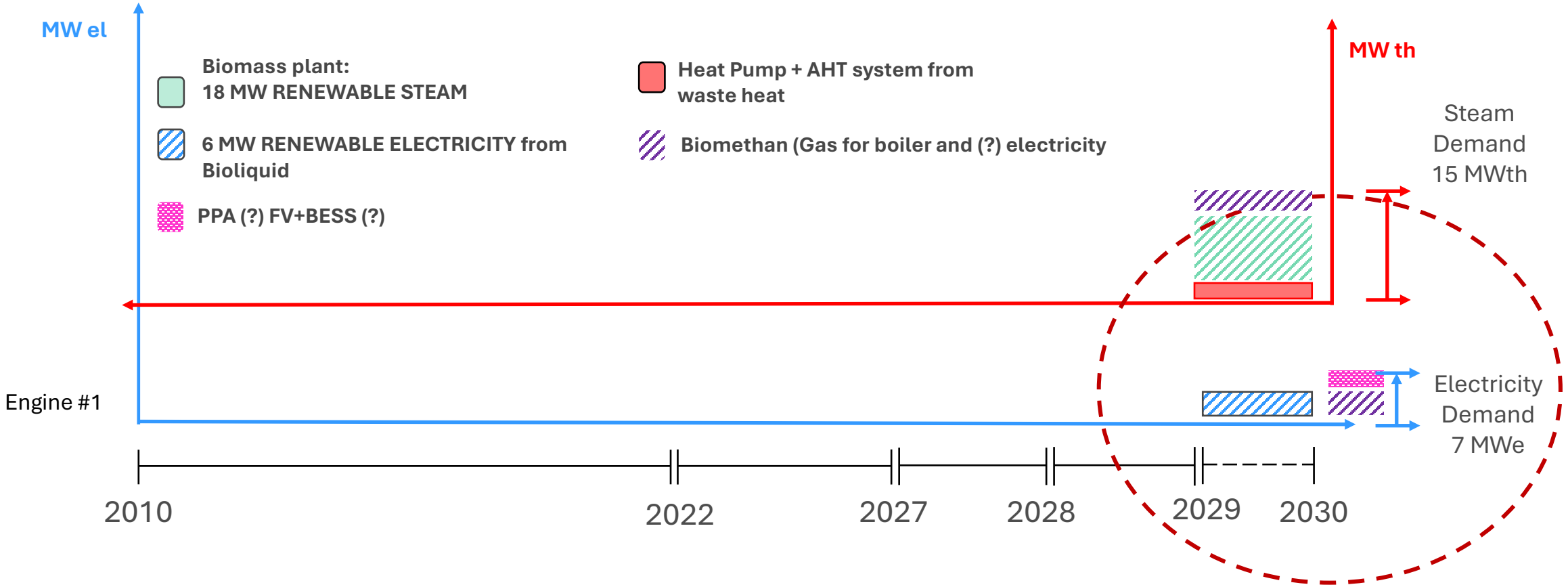
HTHP+MVR and AHT will continue to operate contributing to an higher biomass plant efficiency.



A fully sustainable business model: step 3 – Biomass plant for steam generation



A fully sustainable business model: step 3 – Biomass plant for steam generation





03.

C2C-certified products

Redefining paper for a changing world: our line of certified Cradle-to-Cradle products.

ECOWHITE DECORATIVE WHITE PAPERS

A paper line developed primarily for printers but is also suitable for impregnation applications.

BALANCING AND KRAFT PAPERS

A strong, resistant paper line typically used as the core of High-Pressure Laminates (HPL) or Continuous Pressure Laminates (CPL).

READY FOR LAUNCH IN 2026

BLACK COLORED PAPERS

DECORATIVE COLORED PAPERS

NATURAL PAPERS

Ecowhite
Decorative White Papers

This paper line has been developed primarily for printers but is also suitable for impregnation applications. The certification, issued by an independent third-party body, ensures alignment with five sustainability standards and it is considered the most advanced standard for safe, circular, and responsible materials and products.

Improving environmental performance

PRODUCT TARGETS	FIRST PERFORMANCE TEST IN 2024	FUTURE TARGETS
INCREASING FIBRE FROM RECYCLED CONTENT*	**25%**	**40%** by 2026
REDUCING CARBON FOOTPRINT	**0.335** tonne CO_2 per paper tonne	**0.05** Tonne CO_2 per paper tonne in 2030

*Fibre obtained from recovered wood waste



Balancing and Kraft Papers

Kraft - Balancing and Kraft Papers is a strong, resistant paper line typically used as the core of High-Pressure Laminates (HPL) or Continuous Pressure Laminates (CPL). We offer three types of kraft paper: Kraft Avana/Brown and Kraft Black for use in HPL or CPL; and Kraft Semidecorative available in a range of colours for full-coloured body compact or multilayered panels for use in walls, dividing panels, surfaces and for other functions.

Improving environmental performance

PRODUCT TARGETS	FIRST PERFORMANCE TEST IN 2025	FUTURE TARGETS
INCREASING FIBRE FROM RECYCLED CONTENT*	**68%**	**100%**** by 2026
REDUCING CARBON FOOTPRINT	**0.195** tonne CO_2 per paper tonne	**0.05** Tonne CO_2 per paper tonne by 2030

*Fibre obtained from recovered wood waste

** FSC-certified virgin fibre is available as an alternative to customers, but our aim is to support a full shift forward kraft paper from recycled content



Balancing Papers

Balancing Paper is a high-performance technical paper specifically developed for balancing applications in High Pressure Laminates (HPL), Continuous Pressure Laminates (CPL) and Low Pressure Laminates (LPL).

Applied on the reverse side of the panel, it is engineered to counterbalance the decorative surface, ensuring dimensional stability, flatness and long-term reliability of the laminate. Designed to maximise the use of recycled content and recovered wood waste while preserving structural integrity, our new Balancing paper line represents a key functional component in circular laminate systems.

Improving environmental performance

PRODUCT TARGETS	FIRST PERFORMANCE TEST IN 2025	FUTURE TARGETS
INCREASING FIBRE FROM RECYCLED CONTENT*	**90%**	**100%** by 2026
REDUCING CARBON FOOTPRINT	**0.335** tonne CO_2 per paper tonne	**0.05** Tonne CO_2 per paper tonne (by 2030)

*Fibre obtained from recovered wood waste

** FSC-certified virgin fibre is available as an alternative to customers, but our aim is to support a full shift forward kraft paper from recycled content



The Cradle-to-Cradle certification establishes a new standard for quality and environmental responsibility, combining high performance with independently verified sustainability.

This rigorous certification is issued by the **Cradle-to-Cradle Products Innovation Institute**, an independent, non-profit organization dedicated to maximizing the positive impacts of products and materials.

The Cradle-to-Cradle (Full Scope) Certified Product Standard provides a framework for assessing the **circularity** and **sustainable** performance of materials and products in the five categories listed on the right.

REQUIREMENTS	OUR SCORE
Material Health Chemicals and materials used in the product are selected to prioritize the protection of human health and the environment, generating a positive impact on the quality of materials available for future use and cycling.	**BRONZE**
Product Circularity Products are intentionally designed for their next use and are actively cycled in their intended cycling pathway(s).	**SILVER**
Clean Air & Climate Protection Product manufacturing results in a positive impact on air quality, renewable energy supply, and the balance of climate changing greenhouse gases.	**SILVER**
Water & Soil Stewardship Water and soil are treated as precious and shared resources. Watersheds and soil ecosystems are protected, and clean water and healthy soils are available to people and all other organisms.	**SILVER**
Social Fairness Companies are committed to upholding human rights and applying fair and equitable business practices.	**SILVER**

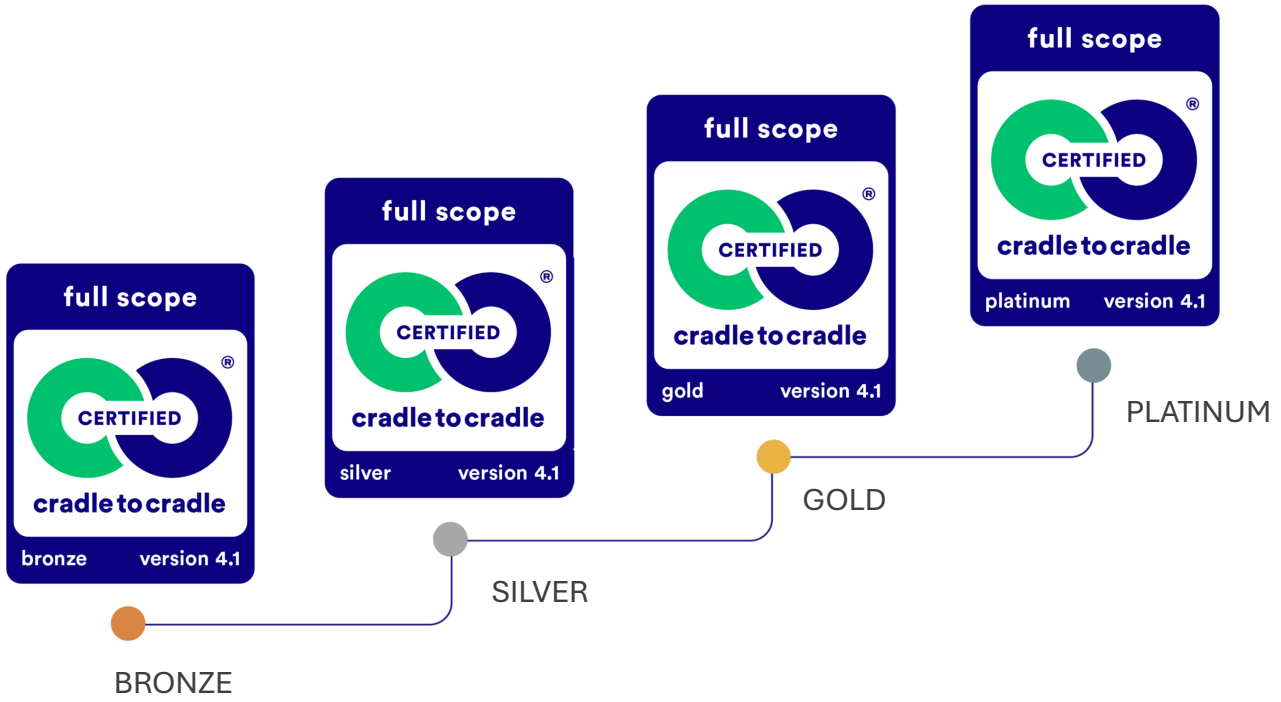
The Cradle-to-Cradle certification works upon ascending levels of achievement.

Any eligible product or material that meets the requirements of the Cradle-to-Cradle Certified Product Standard can receive certification.

The certification is awarded based upon four ascending levels of achievement: Bronze, Silver, Gold and Platinum, according to the product's performance in each category.

The product's lowest category achievement level determines its overall certification level to **encourage evolution** and **continued innovation.**

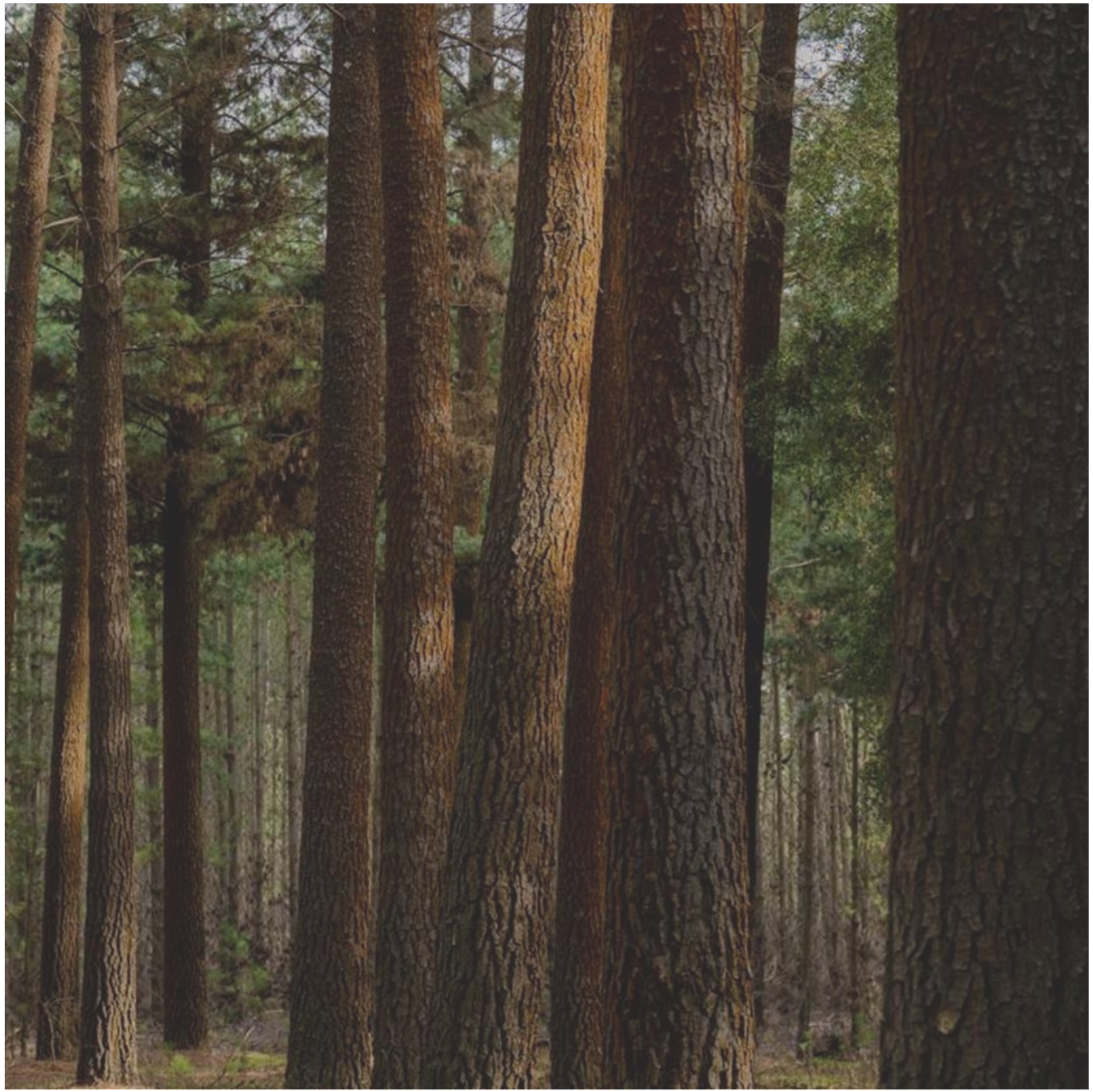
The Cradle-to-Cradle levels





04.

Looking forward: towards a circular bio-factory



VISION

Cartiere di Guarcino sees itself evolving from a traditional manufacturing enterprise to a **circular bio-factory**, a leading player in the production of sustainable materials and in the decarbonization of industrial processes.

How the CDG-BEG duo could become a **bio-factory** in the next 5-7 years.



RESEARCH AND DEVELOPMENT

Investing in research and development to identify new technologies and processes for the production of sustainable and environmentally friendly materials.



DIGITALIZATION

Developing efficient and sustainable processes, in a logic of digitalization.



DECARBONIZATION

Investing in functional technologies to achieve decarbonization.



CERTIFICATIONS AND SUSTAINABILITY STANDARDS

Achieving fundamental product differentiation through certifications that meet all sustainability standards (e.g. C2C), to ensure that production is ethical and environmentally friendly.



PRODUCT DIVERSIFICATION

Replicating the main product certification process in other product types to diversify outlet markets (natural papers and food papers), to achieve a greater positive impact on the environment.

Where we are headed: our 2026–2030 sustainability targets.



EMISSION

100% Carbon neutral (scopes 1 and 2) since 2023

ENERGY

50% renewable heat energy (2026) thanks to the PUSH2HEAT- HORIZON PROJECT

95% renewable heat energy (2030) through a NEW GENERATION BIOMASS GASIFIER, to implement the actual biofuel cogeneration plant

WATER

Water consumption reduction through the implementation of the OZONE PLANT:

25% (2026) and **40%** (2030)

+106% in recycling water (2030)

CIRCULARITY

40% recycled material in our total production (2030)

New biomass power plant Powered by biomass from the short supply chain and by-products (mowing and pruning)

The value for you, and, in turn, for your customers too.



CERTIFIED REDUCED ENVIRONMENTAL FOOTPRINT

The incorporation of pre-certified components simplifies the process of certifying your final product.



UNCOMPROMISED QUALITY & AESTHETIC

High technical performance remains the same and ensures durability and reliability in the finished product.



DESIGN INNOVATION

The Cradle-to-Cradle approach encourages creativity and innovation, allowing designers to explore new techniques and material combinations.



GROWING MARKET DEMAND

Our product responds to evolving consumer trends for green living solutions and anticipates long-term shifts in the global furniture industry.

Let’s build sustainable value TOGETHER

CARTIERE DI GUARCINO

Push2Heat

CONTACTS

Cartiere di Guarcino S.p.A.
Via Madonna di Loreto, 2, 03016 Guarcino (FR) Italy
T +39 0775 4891 | F +39 0775 46609
info@cdgspa.com – www.cdgspa.com
Capitale Sociale: Euro 10.000.000 i.v. – Cod. Fisc. 01956120131 – P.IVA 02657520459 – REA 142922
Azienda Certificata UNI ISO 9001:2015 – UNI EN ISO 14001:2015 – UNI ISO 45001:2018 – UNI CEI EN ISO 50001:2018

CARBON NEUTRAL
scope 1+2

full scope
CERTIFIED
cradle to cradle
bronze version 4.0
C2CCERTIFIED.ORG