



Decarbonising energy production through **biomass**

Presentation of the Group
and its activities

THE URGENCY OF MOVING AWAY FROM FOSSIL FUELS

Fundamental challenges



Energy independence

Developing local energy production to secure and control supplies



Decarbonisation of the economy

Reducing greenhouse gases to limit global warming



Boom in the local and circular economy

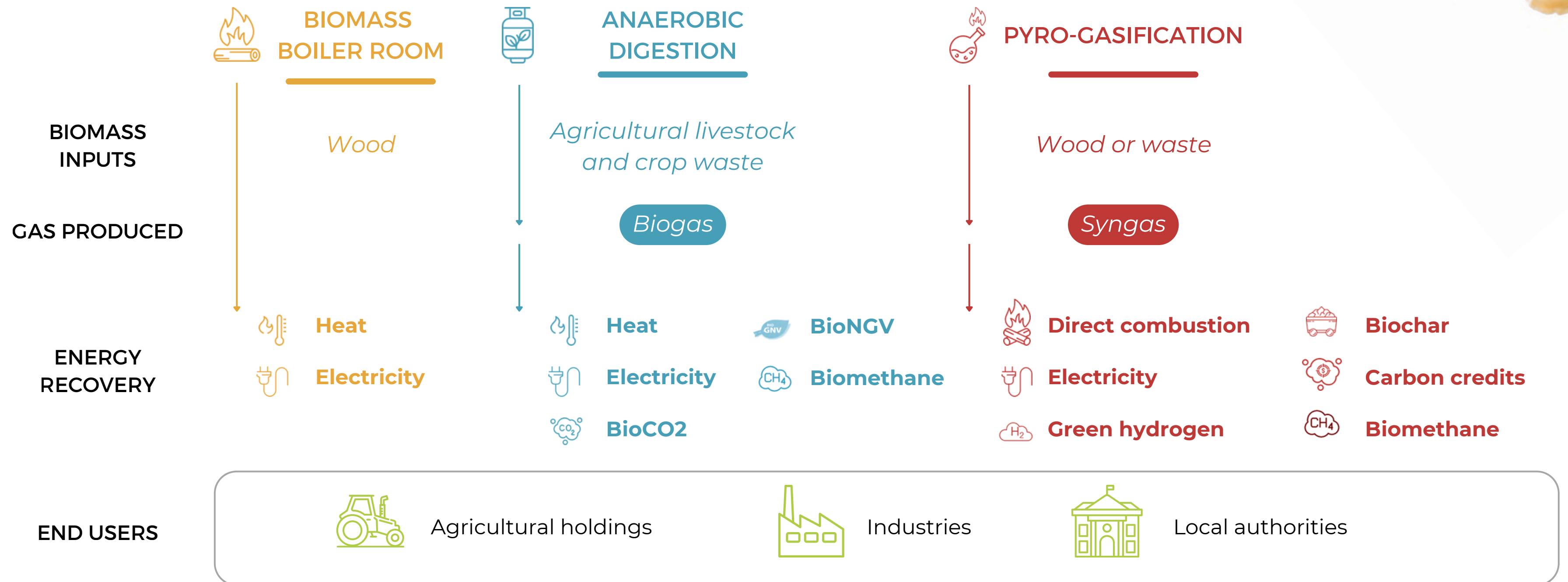
Promoting economic and social development in regions through the recovery of organic waste

SUSTAINABLE DEVELOPMENT **GOALS**



OUR EXPERTISE

BUILDING ENERGY PRODUCTION UNITS



OUR MISSION

Making the most of immediately available local resources, such as biomass

1 000 T of biomass \approx 3,5 GWh \approx 1 job created³

Forestry and recycled biomass



Forest chips



Class A wood¹



Class B wood²

Agricultural biomass



Straw



Corn cobs



Miscanthus

Fermentable biomass



Agricultural effluent



Urban sewage sludge

Economic

- Abundant local resources, not competing with food production
- Competitive prices and high visibility
- Non-intermittent energy

Environmental

- Carbon neutral use
- Better management of local natural resources and promotion of forests

Territorial

- Promotes the circular economy
- Creates local jobs
- Recycles organic waste

¹. Untreated and unpainted packaging wood waste (pallets, crates, boxes, etc.)

². Non-hazardous wood waste that has undergone minimal treatment, painting or varnishing: furniture wood (boards, plywood, etc.) and demolition wood

³. Source: French Ministry of Agriculture

COMPLEMENTARY SUBSIDIARIES TO SUPPORT CUSTOMERS FROM START TO FINISH



EPC activity: Design, construction and commissioning of turnkey biomass power plants (biomass/biogas boilers, methanisation, hygienisation, pyrogasification)



Production and sale of renewable energy for own account.
Subsidiary jointly owned with the Eiffel Gaz Vert fund, leader in financing the renewable gas sector in France.



Specialised activity in the production, exploitation and logistics of wood energy



R&D activity focused on pyrogasification, sale of biofuel trials and training courses for customers wishing to assess the feasibility and scale of their project

A DUAL ECONOMIC MODEL



Historical activity

Sale of power generation plants for operation
by third parties



Builds energy production plants (biomass boilers, methanisation, hygienisation, etc.) and sells them to customers who operate them.

New activity

Sale of energy (syngas produced by our own pyrogasification plants) to industrial companies and local stakeholders via **cPPA contracts** (see Verallia project*)

**See our press releases about the project at www.charwood.energy*



Builds the Group's pyrogasification plants



Finances the Group's pyrogasification plants



Industrialises the already proven solution and explores new technological building blocks to exploit its full potential

NEARLY 20 YEARS OF EXPERTISE IN BIOMASS

145

projects in France
and internationally

07

sanitation
projects

45

biomass boiler
rooms

06

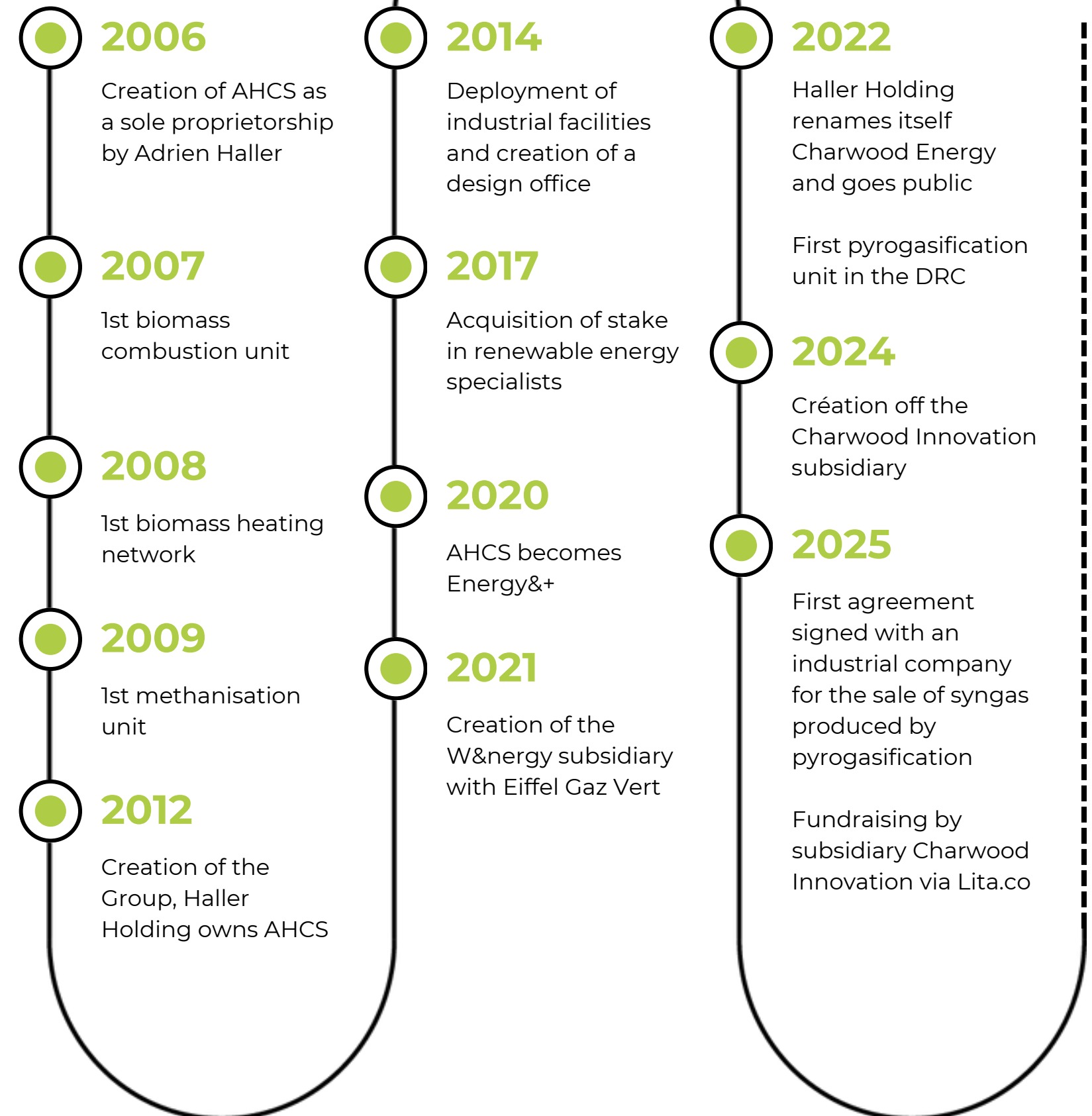
gasification units in
operation or under
development

38

anaerobic
digestion projects

60

employees across
the Group



OUR ADDED VALUE

THE EXTRAS THAT MAKE THE DIFFERENCE



Technical expertise and diversified know-how

- *More than 145 projects in France and abroad*
- *Ability to intervene across the entire value chain, from engineering to maintenance*



A dual model and integrated subsidiaries

- *Adaptation and concrete solutions to regional challenges*
- *Increased responsiveness and continuous improvement thanks to synergy between subsidiaries*



Long-term partnerships

- *Commitment to long-term, transparent collaboration with our partners and customers*
- *Selection of recognised technical partners in all our areas of expertise*



A young fern sprout with several fronds is growing out of a moss-covered log in a forest. The background is a dense, out-of-focus forest with green foliage and tree trunks.

CHARWOOD

ENERGY

Decarbonising energy production through **biomass**

Construction of
renewable energy
production units



Engineering Design	Construction Installation	Operation Maintenance
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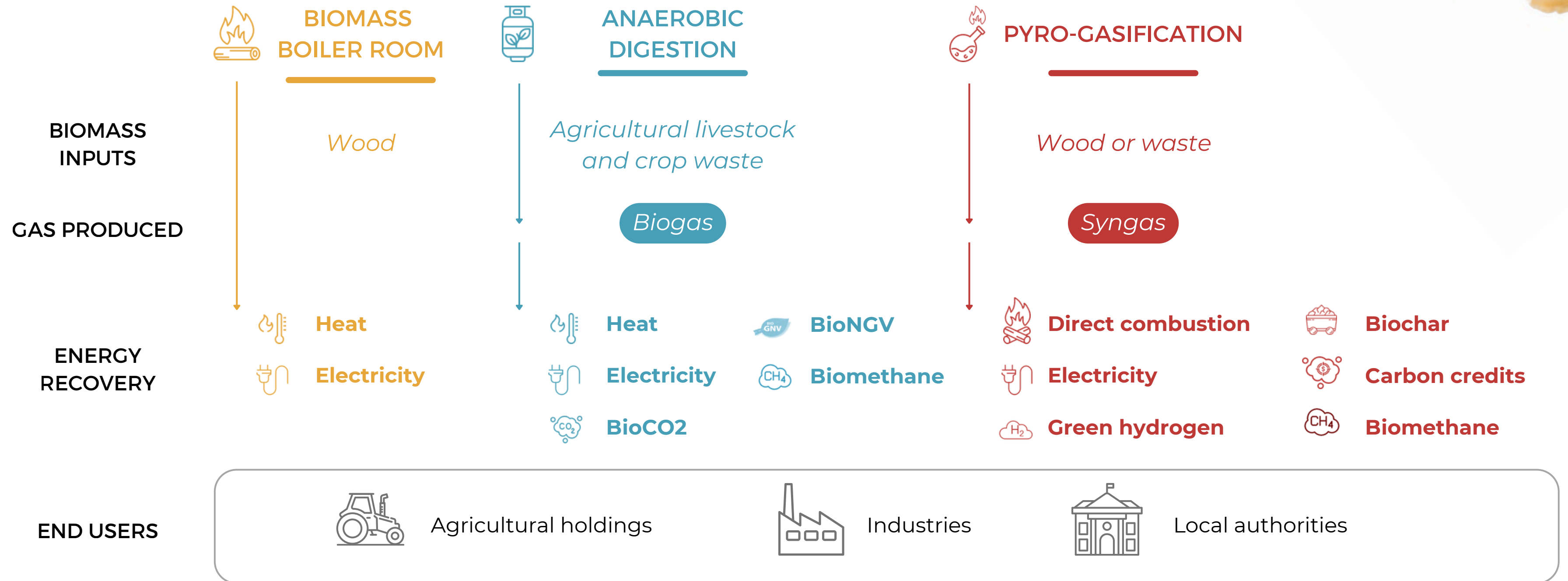
of Energy Solutions

Energy&+ is the EPC subsidiary of the Charwood Energy Group.

We design and build renewable energy production units for use by our industrial and agricultural customers and local authorities.

OUR AREAS OF EXPERTISE

COMPLEMENTARY TECHNOLOGIES



BIOMASS EXPERT FOR NEARLY 20 YEARS

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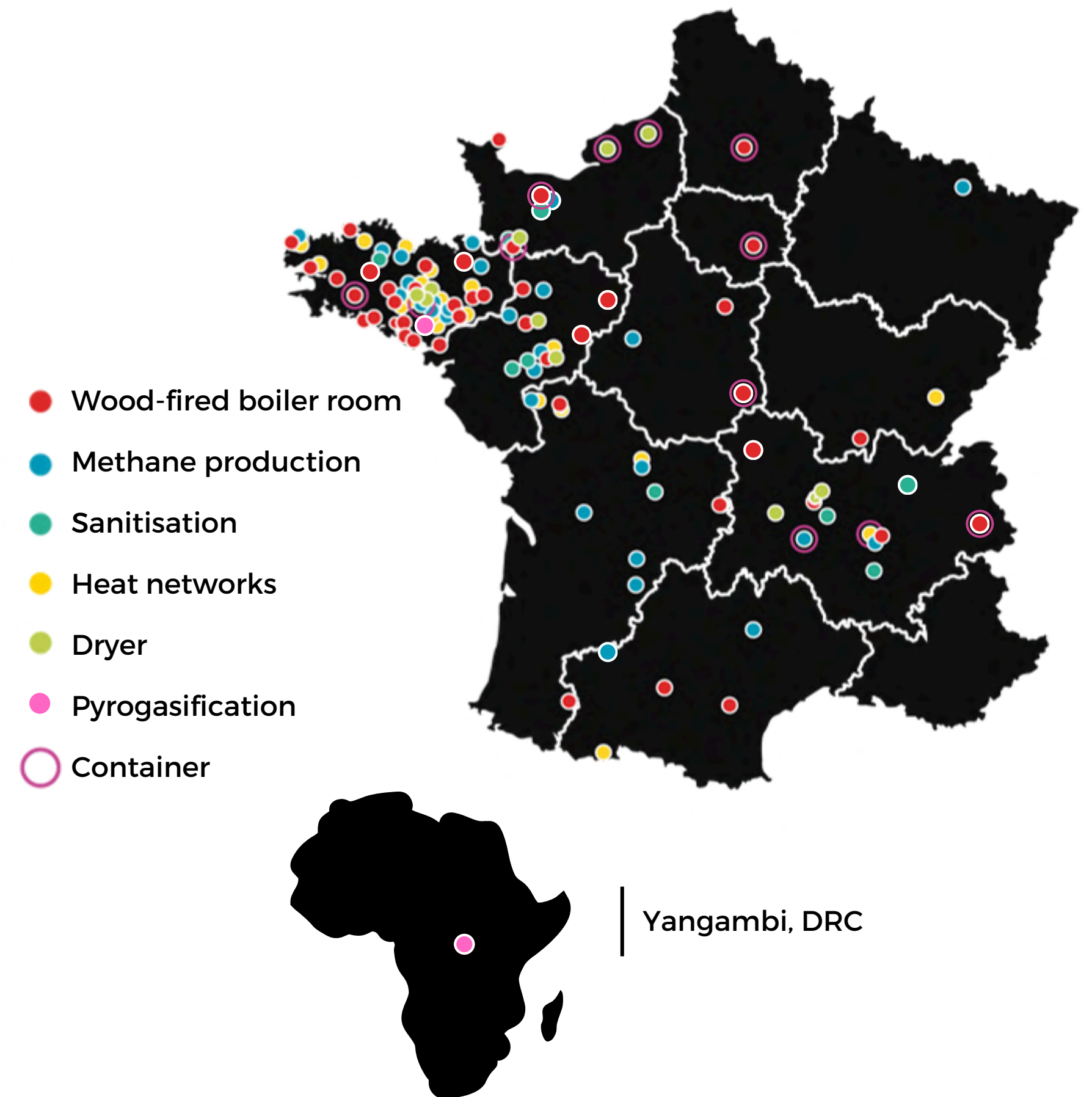
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OUR CRAFTS

IN-HOUSE EXPERTISE



Engineering



Piping and welding



Equipment manufacturing



Electricity



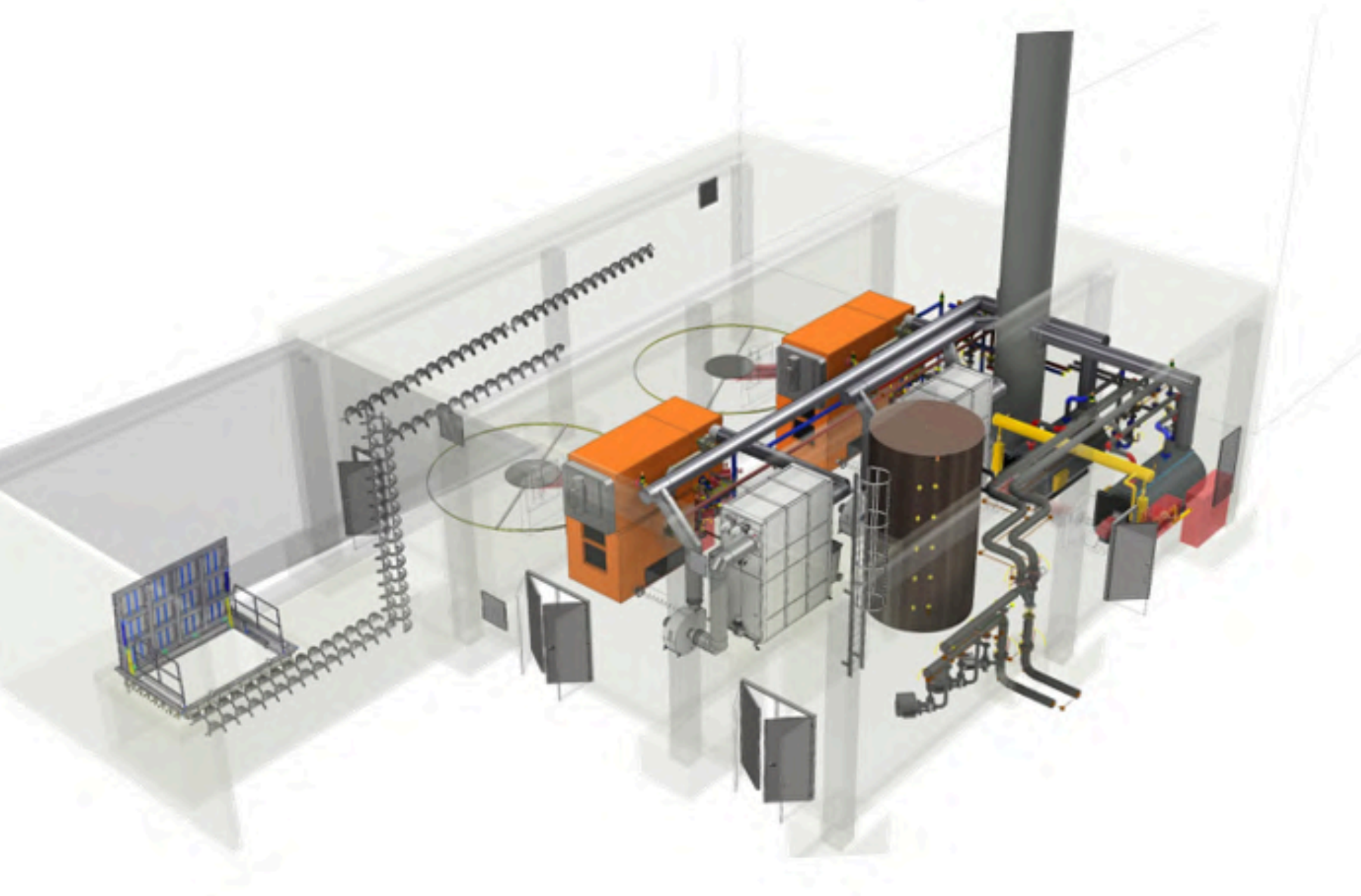
Prefabrication

A workshop covering more than 2,000 m² dedicated to prefabrication:

- 4 overhead travelling cranes
- Welding tables
- Laser cutting
- Dedicated team

BIOMASS BOILER ROOM

OUR EXPERTISE



We support farmers, manufacturers and local authorities with their biomass boiler projects, ranging from a few kW to several MW.

Our boilers can be delivered in shipping containers or concrete, or built using traditional construction methods depending on site constraints and customer preferences.

Our various areas of expertise enable us to support our customers throughout their projects, adapting to their needs:

- Engineering
- Equipment manufacturing
- Piping - welding
- Electrical work
- Prefabrication

BIOMASS BOILER ROOM

FROM 30KW TO SEVERAL MW

Traditional construction

Design and construction work

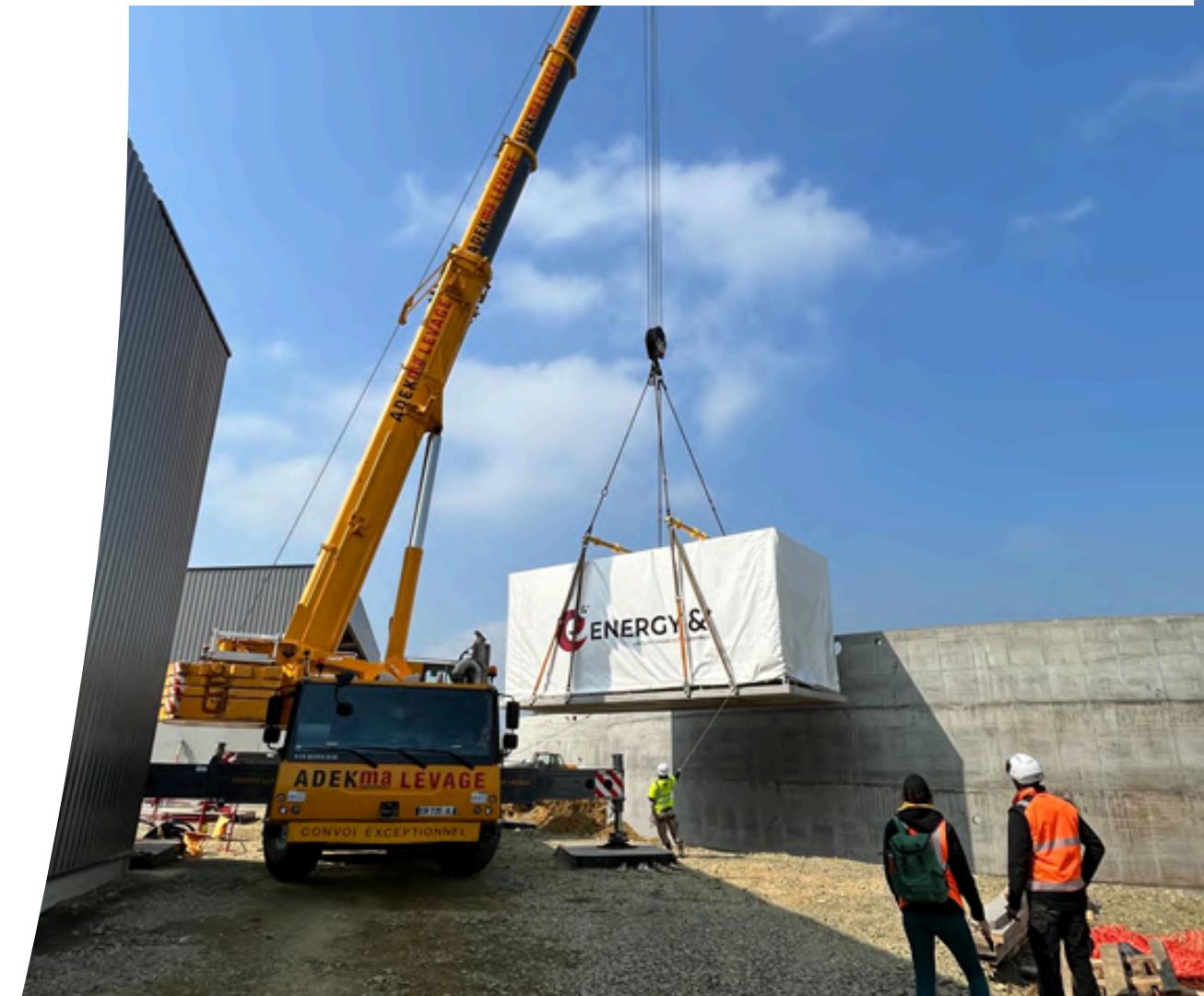
Building permits - Civil engineering - Biomass process - Heating network

Prefabricated construction

Plug & Play solution

Turnkey or biomass process

- Solutions for biomass delivery and storage
- Customised architectural integration
- Recognised technology partners



ALL ABOUT BIOGAS

METHANE PRODUCTION, SANITATION, BIOGAS
HEATING SYSTEMS...

Upgrades to anaerobic digestion plants

New projects and optimisation of existing facilities

Piping, connections, cogeneration, etc.

Design and construction of sanitation units

Recycling of agricultural waste, crops, etc.

Option to containerise the process and heat with gas or wood

Design and construction of biogas boiler rooms

From 100kW to 1MW

Biogas, propane, LNG, natural gas, mixed fuels



PYROGASIFICATION

OUR EXPERTISE

Units ranging from a few kW to several MW

Syngas production and biochar co-production

Electricity, heat, direct combustion, green hydrogen, biomethane

In France and internationally

Containerisation possible

Turnkey solution, training

- 6 units in operation or deployment
- Technology proven over more than 20 million hours



OUR REFERENCES

IN FRANCE AND INTERNATIONALLY

BIOMASS BOILER ROOM



ALL ABOUT BIOGAS



PYROGASIFICATION



LONG-TERM PARTNERSHIPS



MORE REFERENCES



www.energy.bzh



A young fern plant with delicate green fronds is growing out of a large, moss-covered log in a forest. The background is a dense, out-of-focus green forest with sunlight filtering through the trees.

CHARWOOD

ENERGY

Decarbonising energy production through **biomass**

Supplier of syngas
through decentralised
pyrogasification

INDEPENDANT POWER PRODUCER (IPP)

Charwood Energy has partnered with the Eiffel Gaz Verts fund to become an independent power producer (IPP) through a dedicated subsidiary, W&nergy, by acquiring stakes in dedicated companies that own pyrolysis plants designed and built by Energy&+.

These SPVs sell the energy produced directly to the customer through a power purchase agreement (cPPA).

The plants recover biomass by producing syngas and biochar, which can be recovered and generate carbon credits.



Builds the Group's pyrogasification plants



Finances the Group's pyrolysis plants



Supplies wood resources to the Group's power stations



Industrialises the already proven solution and explores new technological building blocks to exploit its full potential.

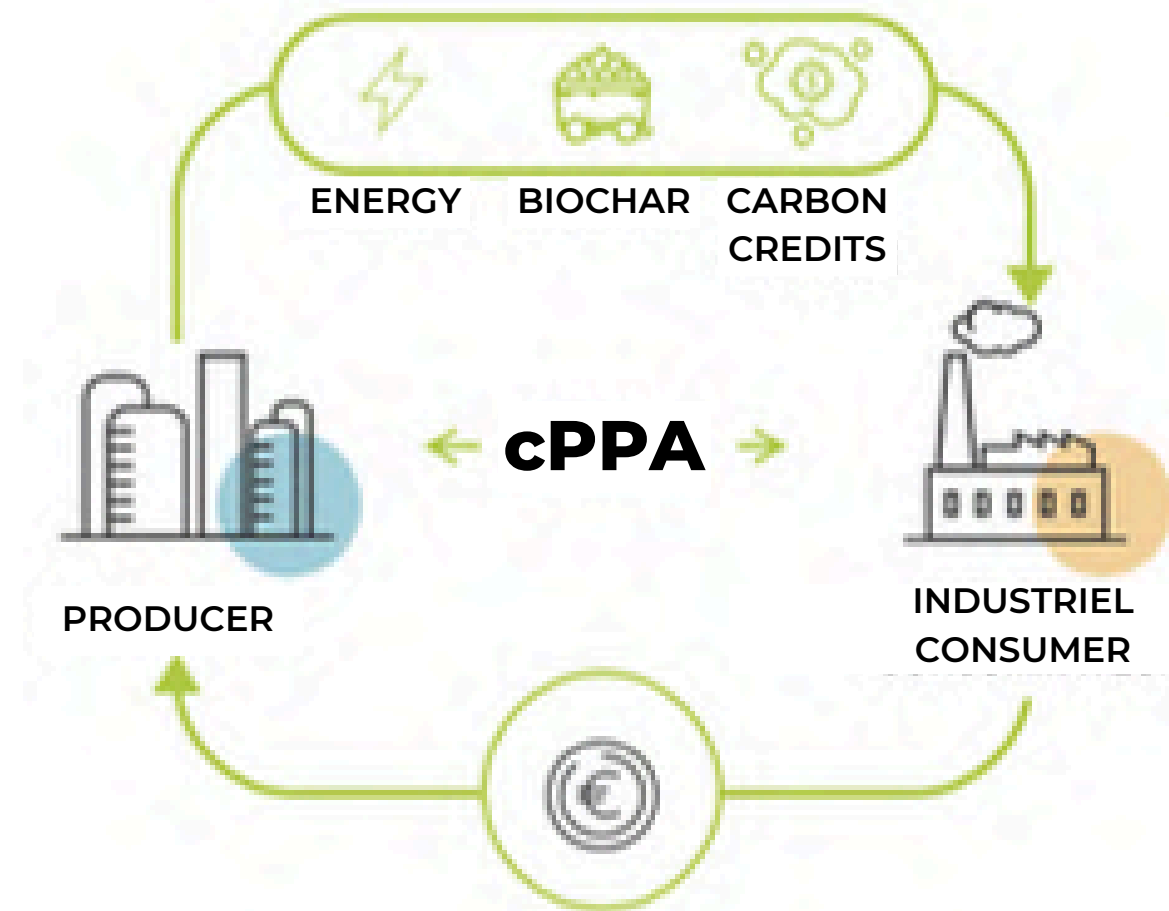


Sells the syngas produced to the industrial company for a period of 20 years, through a cPPA contract.

THE CPPA, A NEW MODEL FOR PURCHASING RENEWABLE ENERGY

What is a cPPA ?

The cPPA is a long-term energy purchase agreement signed directly between the consumer and the producer who builds a power plant to supply their customer.



A lot of benefits for manufacturers and local authorities



Reduced carbon footprint and response to decarbonisation challenges



Access to energy independence through direct supply from the producer



Freedom from market volatility and guaranteed price stability



No CAPEX to finance



Promotion of environmental commitment among stakeholders



Pyro-gasification

feminine noun

Contraction of the terms ‘pyrolysis’ and ‘gasification’.

Pyro-gasification is a technology that enables the recovery of various types of biomass and residual waste to produce a synthetic gas that can be injected into industrial processes and gas networks for the production of electricity, heat, or the exploitation of molecules of interest (hydrogen, bio-CO₂, synthetic methane, etc.).

WHY PYROGASIFICATION ?

DISRUPTIVE TECHNOLOGY WITH A SIGNIFICANT ENVIRONMENTAL IMPACT

Carbon emissions reduction

Replacing fossil gas with low-carbon syngas: CO₂ emissions reductions of up to 85%

Local recovery of end-of-life products

Prioritising the use of locally produced end-of-life biofuels, strengthening the energy independence of regions

Carbon sequestration through biochar

The by-product of the process, biochar, enables carbon to be sequestered sustainably, contributing to a potentially negative carbon footprint.

Reducing energy costs

Greater stability and price visibility: fossil fuels and imported energy sources are heavily influenced by geopolitical events.

Creation of non-relocatable jobs

The establishment of local green gas production units supports the local economy: engineering, logistics, maintenance and operation.

Meeting the needs of local stakeholders

A non-intermittent solution that can be used for direct injection into industrial processes for the production of electricity, heat, or the exploitation of molecules of interest (hydrogen, bio CO₂, synthetic methane, etc.).

A PROVEN BUT LITTLE-KNOWN TECHNOLOGY

A technological partnership with
a leading player: Spanner Re²
GmbH



*An exclusive agreement with a leading German company
specialising in the design of cogeneration plants that
recover biomass through pyrolysis gasification.*

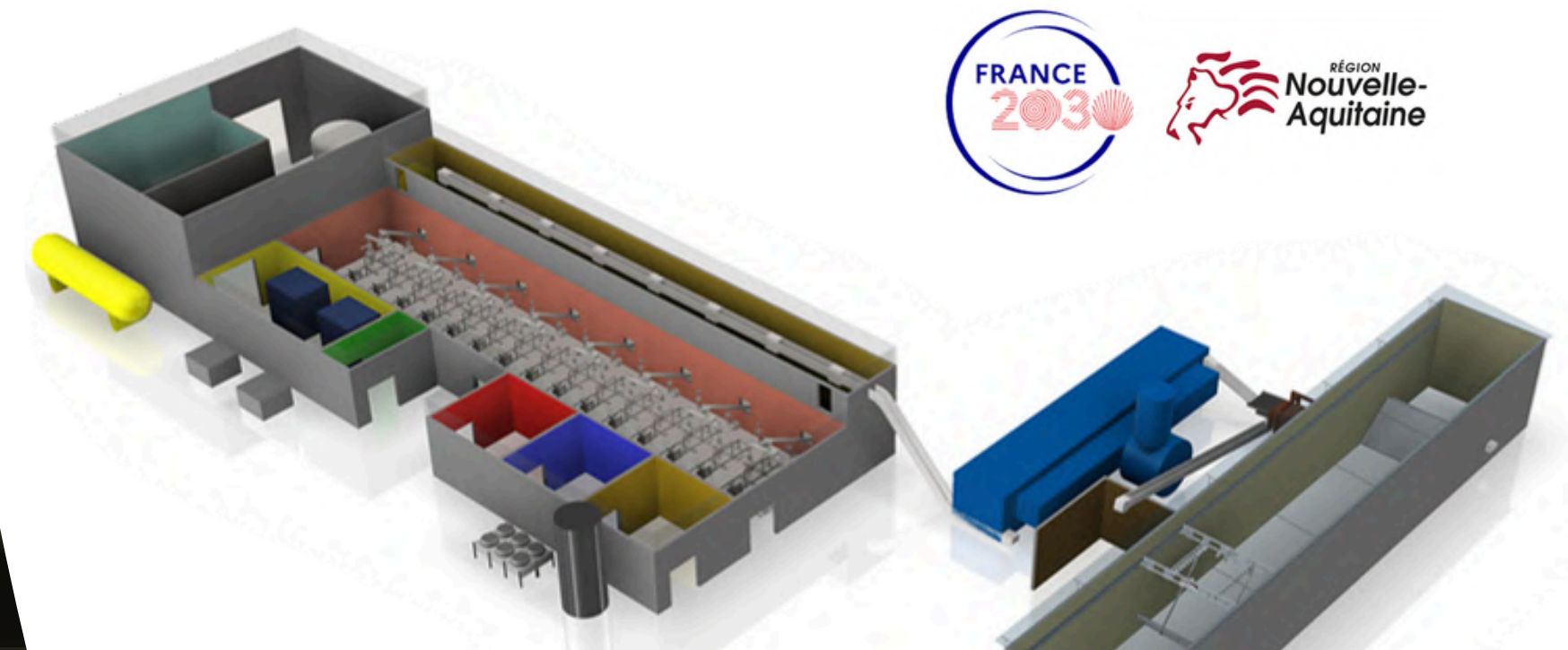
More than 1000 units since 2007
20 million operating hours

A WORLD FIRST, IN FRANCE

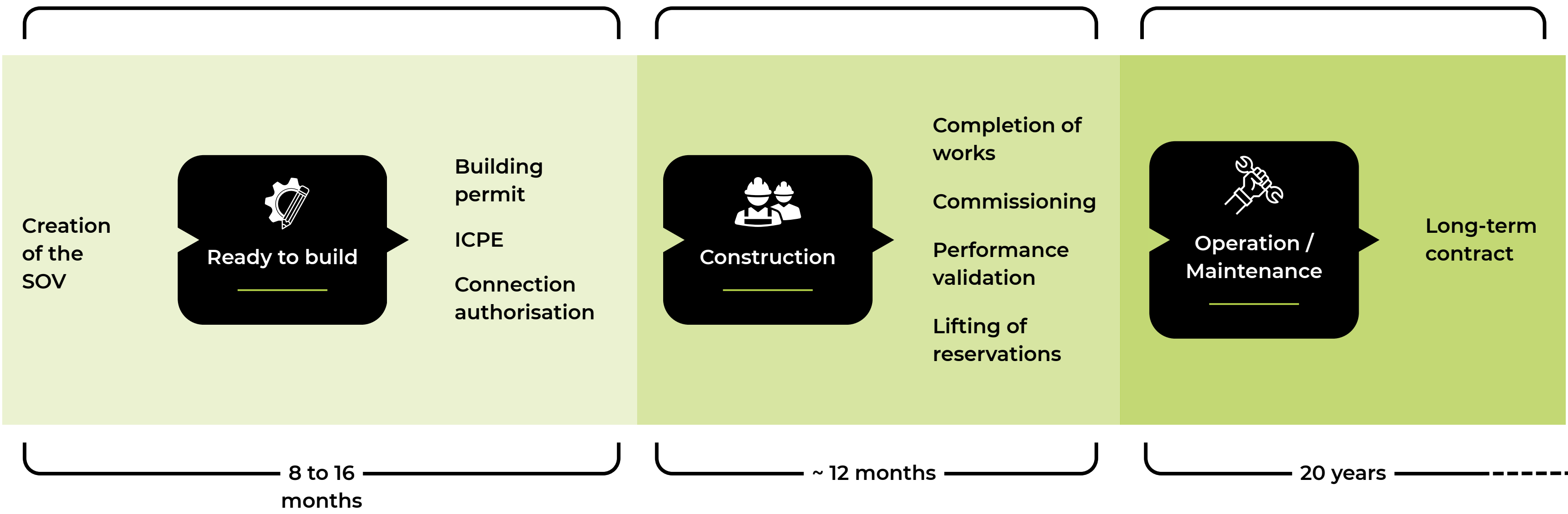


Project to sell syngas to a glass
manufacturer as a
replacement for fossil gas

- Biomass produced within a 100 km radius of the site
- 6,000 tonnes/year CO₂ savings: 84.5% decarbonisation compared to natural gas
- Subsidies: ADEME and Nouvelle-Aquitaine region



STAGES IN THE SYNGAS SALES PROCESS





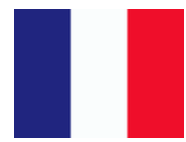
CHAR OOD

INNOVATION

France's leading independent industrial R&D
centre dedicated to **pyrogasification**

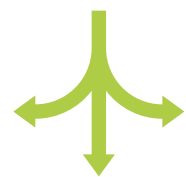
CHARWOOD INNOVATION

OUR MISSION



Demonstrate the effective operation of pyrogasification in France

The technology is mature and works, but is still relatively unknown in France.



Diversify the uses of the technology

Assemble new technological building blocks that are mature but have never been tested in combination.



Explore the potential of new local biofuel sources

Promote new resources with high potential but which have been little or not at all exploited to date.

OUR TRIAL AND TRAINING OFFERS

An offer of biofuel trials

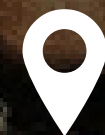
- *Real-world testing at our plant*
- *Analysis of the properties of the gas produced and the co-produced biochar*
- *Test and feasibility report, preliminary design study and project budget*

Training offer

- *Open house*
To discover the centre and the technology
- *Project set-up*
To understand the administrative, financial and regulatory aspects of successfully completing a project
- *Technical*
To understand the operation, maintenance and management of a facility in order to run your power plant

LET'S MEET AT POLLUTEC

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