Haffner Energy
Decarbonize · Innovate · Regenerate

Haffner Energy's Position Paper

Contribution to the European Union's New Strategy on Hydrogen

1. Haffner Energy and its technologies

Haffner Energy (Euronext Growth Paris, Vitry-le-François, France) designs biomass-to-molecules units that produce renewable hydrogen or purified syngas, with biochar and biogenic CO_2 as co-products. Combined with downstream technologies, the syngas is converted into biomethane, biomethanol, renewable diesel or SAF.

The company began as an EPC contractor for biomass combined heat and power (CHP) units, working with third-party technologies and a wide range of feedstocks. This hands-on experience revealed the limits of existing processes with difficult biomass: high ash content, low-ash melting temperatures causing slagging, and tar formation. Haffner Energy developed its own thermolysis technology to overcome these constraints. The company now holds 15 patent families (over 80 international patents) built on more than 30 years of experience.

1.1. How it works

One platform, many feedstocks, many molecules. First, biomass is thermolysed at about 600°C without oxygen. Then, the gases are reformed at about 1,000°C into Hypergas®, a clean syngas with over 45% vol. hydrogen. Depending on the technology configuration (see table below), biochar can be extracted. It represents up to 10% of the dry biomass input (by mass). Because it is a carbon sink, biochar lowers the project's carbon intensity. It can be stored or sold as a co-product. Alternatively, it supplies the energy needed for the allothermal process. Grid connection is optional: the units can generate their own power from part of the gas they produce and run fully off the grid.

From the outset, Haffner Energy has aimed to make its solutions economically viable, even at a small scale. This pragmatic approach shaped the design of the C-iC and C-iB lines presented below. Both lines are built on four principles:

- **Decentralized:** Units are located as close as possible to the feedstock location and to the consumers/off-takers they serve.
- **Modular**: Standardized modules reduce complexity and civil work.
- **Road-transportable:** Modules are sized for standard road transport.
- **Scalable:** Large projects combine several modules, which bring flexibility, redundancy, and easier maintenance. One module can be serviced while the others keep running, so the whole plant never has to shut down.

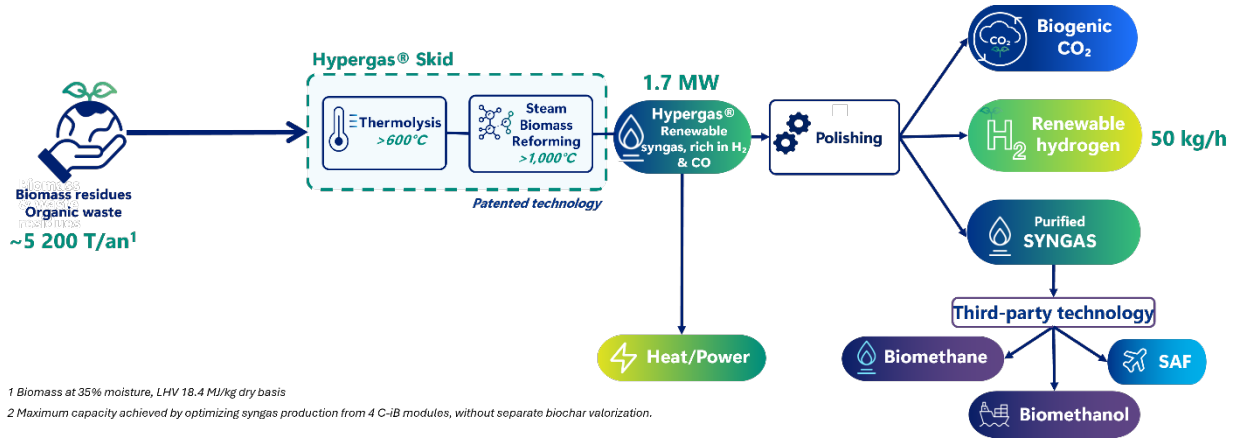

Figure 1: C-iC module

Product line (input per module)	Description	Product	Output per module (8,000 h/yr)	Biochar
C-iC 2 MW biomass input ~5,200 tonnes/yr	Standard mid-size module, based on Haffner Energy's H6 thermolysis generation. Single size, factory pre-assembled, combinable. Launched January 2026, sold through the CORE100 programme.	**SYNOCA®**	Hypergas® syngas at atmospheric pressure, for heat and power: **1.7 MW** (13.6 GWh/yr)	**No** Char is valorized in the module to provide the heat required for the thermolysis process (allothermal process)
		SYNOCA® +	Syngas at 5 bar, ready for conversion[2]: **245 kg/h methanol** (1,960 t/yr) or **139 Nm³/h methane** (1.38 MW LHV, 11 GWh/yr) + **300 kg/h biogenic CO_2** (2,400 t/yr)	
		HYNOCA®	Hydrogen > 99.97 % (ISO 14687), 30 bar: **50 kg/h** (400 t/yr) + **600 kg/h biogenic CO_2** (4,800 t/yr)	

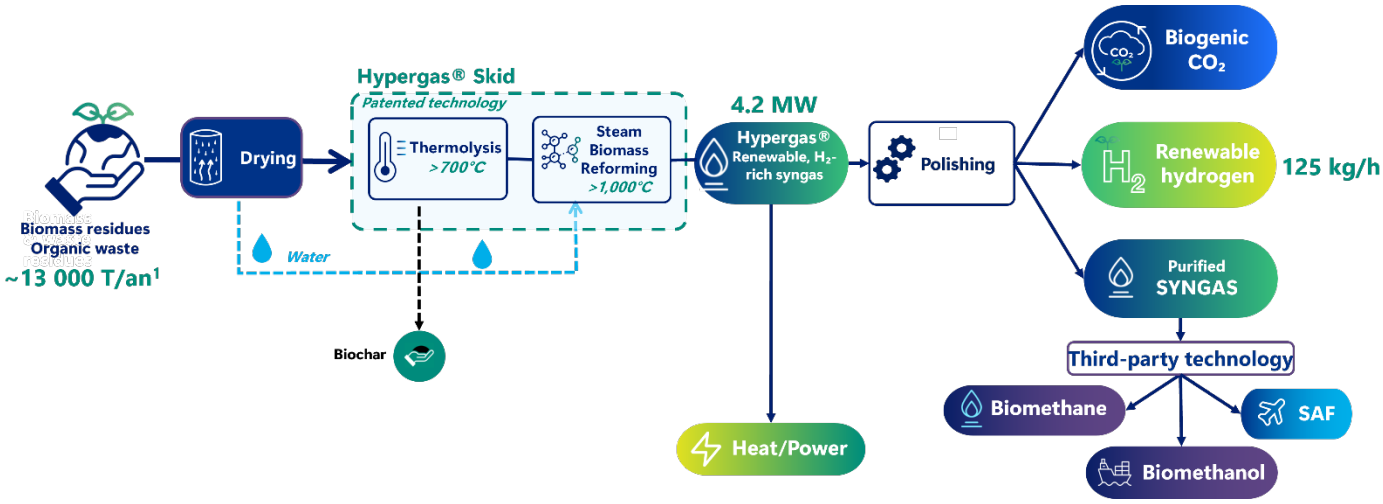

Figure 2: C-iB module

Product line (input per module)	Description	Product	Output per module (8,000 h/yr)	Biochar
C-iB ≈ 5 MW biomass input[3] ≈ 13,000 t/yr[1]	High-capacity version of the C-iC module: same H6 technology, same dimensions, most components shared. Char is extracted from the module; from 4 modules on, biomass pre-drying and char processing is shared. Up to 2.5× the C-iC output.	**SYNOCA®**	**≈ 4.2 MW** syngas (≈ 33.6 GWh/yr)	**Optional**[4] Valorized for energy on site (base case), or sold for soil amendment, industrial applications or carbon storage.
		SYNOCA® +	**≈ 605 kg/h methanol** (≈ 4,840 t/yr) or **≈ 343 Nm³/h methane** (≈ 3.4 MW LHV, ≈ 27 GWh/yr)	
		HYNOCA®	**≈ 124 kg/h hydrogen** (≈ 990 t/yr) + **≈ 1,480 kg/h biogenic CO_2** (≈ 11,900 t/yr)	

[1] Biomass at 35 % moisture. With 18.4 MJ/kg dry (11.1 MJ/kg at 35 %).

[2] Methanol or methane conversion units not included in the base offer.

[3] C-iB in a plant of 4 modules or more; biomass counted at system input, before drying.

4 C-iB figures assume the biochar is fully valorised for energy in a shared unit. If the biochar is sold, output falls to ≈ 3.4 MW syngas

1.2. Scaling out, not scaling up.

Haffner Energy scales up capacity by adding identical modules rather than building increasingly large, custom-designed plants. The C-iB is based on the same H6 technology, has the same dimensions and shares most of its components with the C-iC. Yet it produces up to 2.5 times more syngas per module, thanks to existing technology optimization.

As a result, a plant processing 20 MW of biomass requires just four C-iB modules. Prefabricated modules housed in standardised buildings, replicated across sites, replace bespoke construction. Maintenance can be performed on individual modules without shutting down the entire plant, while redundancy requires just one additional module rather than a fully duplicated production line.

Much like electrolyser stacks or solar panels, cost reductions are driven by standardization and serial manufacturing rather than ever-increasing plant size.

This modular approach enables Haffner Energy to develop and deliver large-scale industrial projects while retaining the cost efficiency, flexibility and reliability of standardized units.

1.3. References

- **Biomass track record:** Under its former EPC business model, Haffner Energy delivered more than 40 biomass energy projects, for a total of over 600 MW of installed capacity. Although this represented a different activity from today's technology offering, these references establish the company as a recognized energy-from-biomass player.
- **Technology demonstration:** At Haffner Energy's Marolles site in France, the H4 generation demonstrated the production of mobility-grade hydrogen from solid biomass at industrial scale. The new H6 generation reached a first key qualification milestone in 2026: the international certification body DNV validated the high quality of the syngas produced, as well as Haffner Energy's production technology and process methodology. In September of that year, Haffner Energy announced that a hydrogen refueling station (HRS) will allow the site to sell up to 10 kg/h of hydrogen starting in 2027.
- **Europe:** Haffner Energy's hydrogen production solution HYNOCA® was selected for the Alkmaar "Renewable Energy Valley" in the Netherlands (Horizon Europe REFORMERS project), winner of the World Hydrogen "Clean Project" 2025 award.
- **CORE100 programme:** Launched in February 2026, CORE100 is an industrial programme to manufacture the first 100 standardised C-iC and C-iB modules in series over three years. Customers reserve production slots and their reservations will convert into firm orders after the close of the booking period. Serial manufacturing aims to lower CAPEX and shorten project development timelines, making mid-sized projects easier to finance in the absence of government subsidies. The programme has already attracted close to 80 reservations from project developers in Europe and North America.
- **Canada – Mundi Énergies:** Haffner Energy established a strategic partnership with Mundi Énergies to deploy its technologies in Canada. The first Multi-Energy Complex, a 5-MW biomethane project at the Bécancour Industrial and Port Park in Quebec, is in the engineering phase. Some twenty multi-energy complexes are to be developed across the Province, where substantial volumes of forestry and agricultural residues are available. Mundi Énergies has reserved 40 C-iB modules under CORE100 and has already invested 6 million euros in the company.
- **Pipeline:** Commercial discussions are under way with many prospects, from the United States (OroCarbo) to India.

2. A framework built around one pathway

Since 2020, the hydrogen policy of the E.U. has been designed almost entirely around electrolysis. Electrolytic hydrogen will play a major role and Haffner Energy supports it as a necessary pathway to grow the market. However, a strategy that relies on a *single* pathway concentrates risk – the Commission itself has acknowledged that deployment is slower than expected.

Haffner Energy believes in promoting a **diversified, hybrid supply mix**, rather than pitting different pathways against one another. Biomass-based hydrogen makes most sense where electricity is expensive, water is scarce, or sourcing biogenic CO_2 is challenging. Bio-based and e-fuel pathways are complementary and can be integrated within the same project: biogenic CO_2 from a biomass unit can feed e-fuel production and electrolytic hydrogen can boost the output of biomass-based syngas.

Regulation is the key barrier. Under RED III, hydrogen from biomass counts as renewable energy, but it cannot qualify as a renewable fuel of non-biological origin (RFNBO) which, by definition, is produced from renewable energy "other than biomass". Yet **RFNBO status is the condition for most hydrogen-specific targets and support. Hydrogen from biomass can meet the RED sustainability and GHG savings criteria, yet it falls outside the instruments that create demand and financing for hydrogen:**

EU instrument	Electrolytic RFNBO hydrogen	Renewable hydrogen from biomass
RED III industry target (42% by 2030, 60% by 2035)	Counts	Does not count
RED III transport RFNBO sub-target (1% by 2030)	Counts	Does not count
European Hydrogen Bank auctions	Eligible	Not eligible
ReFuelEU Aviation synthetic sub-mandate	Counts	Does not count
FuelEU Maritime RFNBO multiplier	Applies	Does not apply

The result is a market where an industrial buyer bound by the 42% target cannot use a renewable, potentially carbon-negative and lower-cost molecule produced next door. Member States without abundant wind and solar power face a similar problem: in February 2026, Belgium, supported by Czechia, Hungary, Poland and Slovakia called on the Commission for a technology-neutral approach based on life-cycle GHG savings. This principle should apply equally to renewable hydrogen from biomass.

More broadly, the EU hydrogen debate is framed as RFNBO vs. low-carbon and assumes that "renewable" is short-hand for "RFNBO". Even the Commission's targeted stakeholder consultation on the renewed strategy follows this shortcut, as its questions on barriers and revenue support refer only to RFNBOs and low-carbon fuels. Yet "RFNBO" is not synonymous with "renewable fuels": Under RED III, hydrogen produced from biomass is also renewable.

The renewed strategy presents the opportunity to rectify and improve the regulatory framework. Its scope should reflect all renewable pathways, not electrolysis alone.

3. What biomass-based hydrogen brings to the strategy

Biomass-based hydrogen complements electrolysis where electrolysis struggles: in regions with limited renewable power or scarce water, at sites far from hubs and pipelines, and where continuous supply is needed.

3.1. Competitive cost

A levelized cost of hydrogen below €2.5/kg for a HYNOCA® C-iC unit, producing 50 kg/h renewable hydrogen, compared with more than €7.8/kg for grid-powered electrolysis at €70/MWh (company estimates). Costs can fall further with larger units, such as the C-iB range, thanks to economies of scale.

3.2. Biomass Availability

Concerns about limited biomass availability in Europe often assume that bioenergy means wood. Yet agriculture provides nearly 70% of the EU's biomass supply (JRC, 2023), and close to half of agricultural production is left as residues, mainly cereal straw (JRC, 2018). Even after leaving enough fields to protect soils, the sustainable potential of crop residues alone is estimated at about 124 million tons of dry matter per year (JRC, 2019). The EU also generates about 147 million tons of dry biowaste each year (JRC, 2023). A 2025 study by Utrecht University and TNO for Concawe concludes that domestic sustainable residues are sufficient to meet projected advanced biofuel demand in 2030 and 2050, alongside competing uses. Because these are residues and waste streams rather than dedicated crops, they do not compete with food production or require additional land. The constraint is less resource availability than the ability to convert it:, including residues with high ash content, low ash-melting points or up to 55% moisture. It can therefore use agricultural and forestry residues and organic waste that have no food, feed or material use, rather than dedicated crops or quality wood. Because few other uses compete for these residues, they are among the cheapest feedstocks available: primary energy costs below €30/MWh, which keeps operating costs low. Furthermore, this creates local jobs related to the collection, transport, and processing of biomass residues and waste streams. Valorizing this biomass, which was previously largely lost and, in some cases, even incurred a cost, generates additional revenue for the agricultural sector, for industries specializing in the processing of agricultural and forestry biomass, and for local authorities.

3.3. Carbon-negative hydrogen

Where biochar is extracted, it stores carbon durably: about 3 t CO_2-eq net per ton of biochar, with 90% of its organic carbon highly refractory. When biogenic CO_2 is also captured and permanently stored, the process can remove up to 15 kg CO_2 per kg of hydrogen.

3.4. Hydrogen Purity

Hydrogen from biomass is often assumed to be less pure than electrolytic hydrogen. It is not. Hypergas®, the syngas produced by Haffner Energy's process, already has a high hydrogen content and low levels of impurities, which makes final purification simpler. Haffner Energy designs and controls this polishing step in-house. It delivers hydrogen of over 99.97% purity that meets the ISO 14687 standard for mobility applications, one of the most demanding specifications on the market.

3.5. Little or no pressure on the power grid.

The process can cover its own energy needs with part of the gas it produces. This frees renewable electricity from the grid for direct electrification, which the Commission priorities.

3.6. Marginal water use.

Depending on the type of biomass used, Haffner Energy's process uses little or no water because the moisture contained in the feedstock supplies the required steam. Electrolysis, by comparison, consumes about 20 to 30 liters of water per kilogram of hydrogen once purification and cooling are included. This matters in regions facing growing water stress.

3.7. Low air emissions.

Unlike direct biomass combustion, the process converts biomass into a gas without oxygen. The limited heat it requires is generated within the process, from streams far cleaner than raw biomass. Emissions of nitrogen oxides (NOx), sulphur oxides (SOx), volatile organic compounds (VOCs) and particulate matter are therefore far lower than those of a conventional biomass boiler, and well below the applicable EU and national limits. Units can operate close to farms, industrial sites and towns without degrading local air quality.

3.8. Decentralized and fast-to-deploy

Modular, standardized C-iC units pre-assembled in factory and installed in under one month with little civil engineering, within close range of industrial users, farms, and in rural areas. This brings hydrogen to SMEs and regions that large hubs will not reach. Production runs continuously (8,000 h/year minimum) from local (European) residual feedstock and it can operate without a grid connection, shielding users from gas and electricity price volatility.

3.9. Long-lasting Job Creation

The implementation of the biomass thermolysis process to produce renewable hydrogen creates jobs not only for the installation phase but also for the operation of the biomass thermolysis process throughout its entire lifespan, in all regions even on isolated islands.

3.10. A direct path to advanced biofuels

For fuels and chemicals, hydrogen does not have to be an intermediate step. Hypergas®, a hydrogen-rich syngas made from local biomass, is delivered purified and with a composition suited to the downstream synthesis. It feeds proven technologies directly: methanation for biomethane, methanol synthesis for biomethanol, and Fischer-Tropsch or methanol-to-jet for renewable diesel and SAF. There is no need to produce hydrogen first and then recombine it with captured CO_2. Making methanol from CO_2 takes three molecules of hydrogen, while making it from the carbon monoxide already in syngas takes two. That saves energy, equipment, and cost.

3.11. Complementary with electrolysis

The co-produced biogenic CO_2 is a key input for e-fuels such as methanol and SAF: each tonne of biomethanol yields enough CO_2 for about one tonne of e-methanol. Biomass and electrolytic pathways can therefore benefit from operating together on the same site.

4. Biogenic CO_2: The missing piece of the hydrogen economy

The strategy cannot deliver hydrogen derivatives without a sustainable carbon source. E-methanol, e-SAF and other e-fuels each need roughly 1.4 to 3 tonnes of CO_2 per tonne of fuel. Under the RFNBO GHG methodology, CO_2 captured from fossil sources in power plants and industrial installations will stop counting as avoided emissions after 2035 or 2040, depending on the source. Biogenic CO_2 and direct air capture (DAC) will then become the main long-term options. Biogenic CO_2 is by far the cheaper of the two: DAC still costs several hundred euros per tonne.

In a hydrogen configuration, Haffner Energy's process co-produces up to 12 tonnes of biogenic CO_2 per tonne of hydrogen, enough to make about 8 tonnes of e-methanol with additional electrolytic hydrogen. In a biomethanol configuration, each tonne of biomethanol yields enough CO_2 for about one tonne of e-methanol.

Biogenic CO_2 can serve three uses:

Use of biogenic CO_2	Benefit for the strategy
Carbon feedstock for RFNBO e-fuels (e-methanol, e-SAF)	Makes electrolytic derivatives possible once fossil CO_2 stops counting (after 2035/2040); biomass and electrolysis on one site
Permanent storage (BioCCS)	Carbon removals of up to 15 kg CO_2 per kg of hydrogen, eligible for certification under the CRCF
Industrial and commercial uses: food and beverages, greenhouses, chemicals, healthcare, water treatment, refrigeration	Provides a local, renewable and reliable supply for sectors that today rely largely on fossil CO_2, much of it a by-product of ammonia plants whose output is declining and proved unreliable during the 2022 gas crisis

Biogenic CO_2 links the two hydrogen pathways: The biomass pathway supplies the carbon that the electrolytic pathway needs.

Therefore, the strategy should treat it as a strategic resource. This requires a transparent EU certification of its origin and traceability, so that buyers and regulators can rely on biogenic claims. A cross-industry coalition, of which Haffner Energy is a member, is working on exactly this.

5. Recommendations for the renewed strategy

The European Hydrogen Bank displays the risk ahead in full view: Its auctions were opened to RFNBO hydrogen only, excluding biomass-based renewable hydrogen by design. Should the renewed strategy and the legislation that follows keep the RFNBO definition by default, every new support scheme, demand target and lead-market criterion for hydrogen, methanol and SAF will exclude a renewable, potentially carbon-negative pathway. Haffner Energy therefore asks the Commission to:

1. **Make technology neutrality a founding principle.** The strategy should define its objective as renewable molecules measured by life-cycle GHG intensity, not by the energy source. Biomass-based renewable hydrogen should be named explicitly as part of the EU supply mix, alongside electrolysis and imports.
2. **Use an inclusive definition in all follow-up legislation.** Any new instrument announced by the strategy (support mechanisms, demand-side obligations, lead markets for green products, public procurement criteria) should refer to "renewable hydrogen" meeting the RED sustainability and GHG savings criteria, rather than to RFNBO only.
3. **Extend this to derivatives.** Renewable methanol, ammonia and SAF produced from biomass-based hydrogen or hydrogen-rich syngas or thermolysis oil, should all be eligible on the same terms as their RFNBO equivalents.
4. **Let biomass-based renewable hydrogen count towards the RED III targets.** In the RED III review, assess how it can contribute to the hydrogen-specific targets: for instance, as a capped option for Member States towards the 42% industry and 1% RFNBO transport targets, or through a complementary renewable hydrogen target open to all pathways meeting the RED criteria.
5. **Open the European Hydrogen Bank and EU funding to all renewable pathways.** Future Hydrogen Bank should be open to all renewable hydrogen meeting the RED criteria. At the very least, they should include a dedicated window for non-electrolytic renewable hydrogen and decentralized production. Innovation Fund calls should also include topics suited to small modular projects.
6. **Reward carbon removal and biogenic CO_2.** Treat biogenic CO_2 as a strategic resource for the hydrogen economy; confirm it will remain a long-term eligible carbon source for RFNBO e-fuels, map supply and demand at EU level, and support a transparent EU framework to certify its origin and traceability. Link the strategy with the CRCF so that biochar and BioCCS removals are rewarded.
7. **Support decentralized production.** Add a small-scale, near-demand, local circular economy pillar to the strategy, alongside large hubs and import corridors, with simpler permitting for modular installations under 10 MW.

Biomass-based technologies widen the range of solutions available to industry, reduce the risk of missing the 2030 targets and strengthen European energy sovereignty.

6. Sources

- Commission – Have your say: Clean energy – new EU hydrogen strategy
- DG ENER – Targeted consultation on a renewed hydrogen strategy
- Haffner Energy – Our expertise (process, biochar, biogenic CO_2)
- Haffner Energy – Commissioning of the Marolles hydrogen-from-biomass unit (Press release, Feb. 2025)
- Hydrogen Central – Haffner Energy unveils the H6 generation (Nov. 2025)
- Hydrocarbon Processing – Haffner Energy launches C-iC modular units (Jan. 2026)
- Haffner Energy – Haffner Energy details the nominal performance of its C-iB line for large industrial facilities (Press release, Nov. 2026)
- Haffner Energy – Estimated 2025-2026 annual results (Press release, June 2026)
- Haffner Energy – Annual report 2025-2026
- Haffner Energy – Open letter on eligibility of low-carbon hydrogen to EU targets (Dec. 2022)
- Belgian non-paper on a technology-neutral hydrogen approach under RED III (Feb. 2026)
- PtX Hub – EU fuels categorisation for non-fossil fuels