



# JOINING FORCES

On Waste-to-Sustainable Fuels  
Technology Deployment

JANUARY 24, 2024





Enerkem

# ENERKEM: LEADER IN LOW-CI SOLUTIONS

For hard-to-abate sectors



285+

Highly skilled and professional employees



120+

Patents



Multiple

Projects in construction and development

## World-Class Strategic Partners





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# KEY ENABLING TECHNOLOGY

From non-recyclable waste materials to sustainable fuels and chemicals

## FEEDSTOCK FLEXIBILITY



Mixed Plastic Waste



Municipal Solid Waste (MSW)

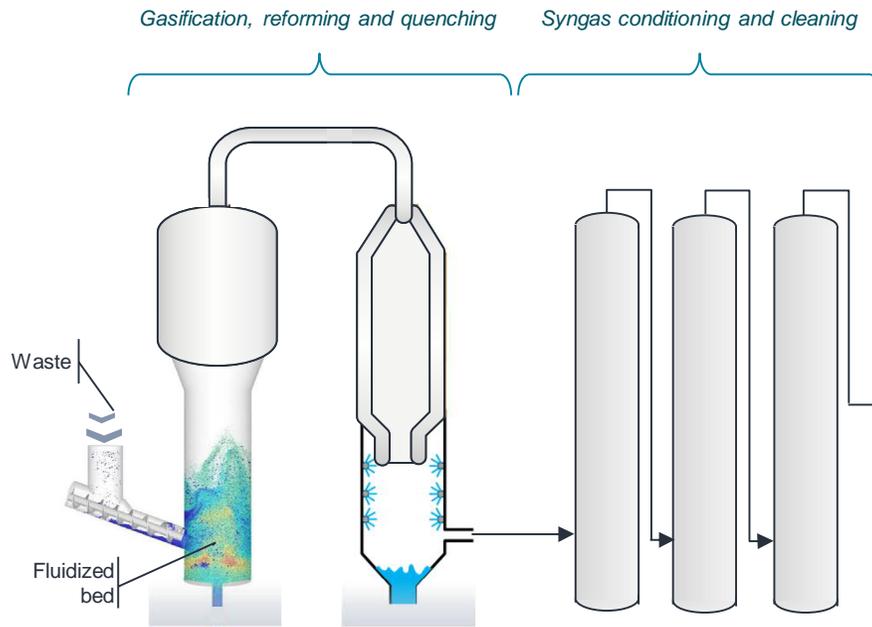


Biomass Residues  
(Forestry & Agricultural)

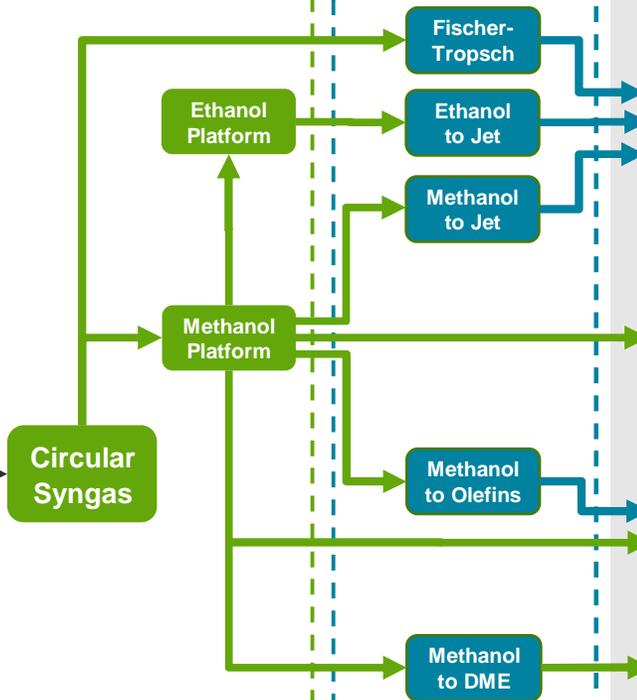


Industrial Wastes (ICI),  
Construction Wastes (C&D)

## PROPRIETARY ENERKEM TECHNOLOGY



## 3<sup>RD</sup> PARTY



## TARGET MARKETS



Aviation (SAF)



Maritime (Methanol)



Chemicals



LPG Substitution  
(Dimethyl Ether (DME))



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# OUR COMPETITIVE ADVANTAGE

Five reasons to choose Enerkem

## MATURITY



In commercial roll-out



## FEEDSTOCK FLEXIBILITY



Handling the widest breadth of feedstock

## PRODUCT DIVERSITY



Multiple low-Cl end-products pathways

## SCALABILITY



Large volumes, in and out

## VERSATILITY



Adaptable to feedstock and regulations changes

### LEADING TECHNOLOGY ENABLING LOW-Cl HYDROGEN ECONOMY



# OUR BUSINESS MODEL

A flexible and structured business model to accelerate deployment

## WHO ARE OUR CLIENTS?

What are their needs?

### TRADITIONAL CLIENTS

Desire to operate, owners of the facilities, need for adaptation, developers

### OFFTAKERS CLIENTS

Those interested solely in the product, partners who have land or raw materials, etc.

## OUR OFFER

### Enerkem Technologies

- **Engineering services:** support for pre-feasibility / feasibility, PDP, support for feed, etc.
- **Proprietary equipment**
- **Support services:** marketing, feedstock evaluation, training, pre-commissioning and commissioning, operations, etc.

### DevCo

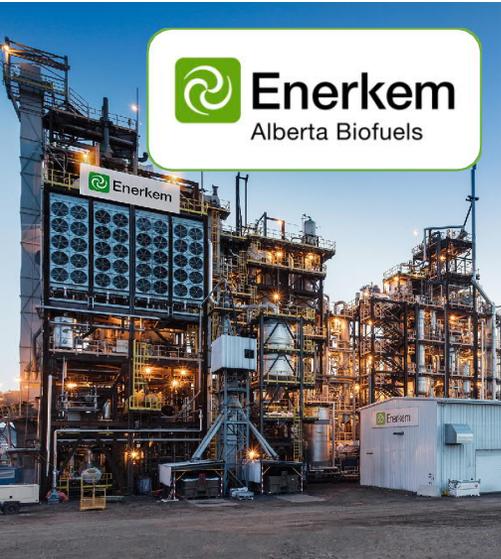
- Project development: sites, permits, feedstock & H2 sourcing, financing, replicability (MeOH)
- Feed via 3<sup>rd</sup> party EP (Core Process & BOP)
- **Product purchase agreement offtake required to obtain AssetCo financing**
- Project execution via AssetCo or traditional client

Technology License  
 Commercial collaboration with Technip  
 Development with technological partnerships (e.g. SAF, DME, ..)



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# COMMERCIAL ROLL-OUT



**Enerkem**  
Alberta Biofuels



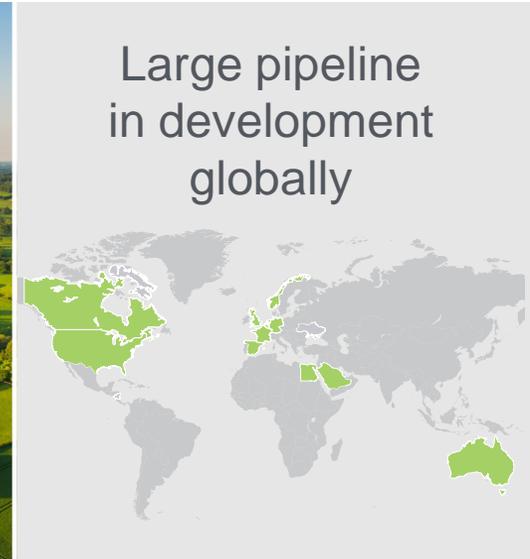
**VCR** | Varenes  
Carbon  
Recycling



**ecoplanta**  
SOLUCIONS DE REICLATGE MOLECULAR



**Dimeta**



Large pipeline  
in development  
globally

Partners



Partners



Partners



Partners



Partners

Focused  
on methanol  
for marine fuel  
and SAF

Sustainable methanol

Sustainable methanol

Sustainable methanol

Renewable and recycled  
carbon dimethyl ether (DME)



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## LEVERAGING OUR PARTNERSHIP



**Enerkem**

- Technology License
- Proprietary Equipment
- Support Services



**TECHNIP  
ENERGIES**

- Concept / Feasibility Studies
- Front End Engineering Design (FEED)
- Detailed Engineering
- Procurement
- Fabrication / Construction management

# A leading Engineering & Technology company for the Energy Transition



# Technip Energies at a glance

Listed on <b>Euronext Paris</b> Stock Exchange	Headquartered in <b>Paris</b>	<b>65</b> Years of operations
<b>€6.4B</b> Full year 2022 adjusted revenue	A leading Engineering & Technology company for the Energy Transition	<b>~€18B</b> Backlog at end September 2023
<b>~15,000</b> Employees in 35 countries	<b>25+</b> Leading proprietary technologies	<b>450 projects</b> Under execution

# Talented global workforce across 35 countries

Providing flexible execution and proximity to customers

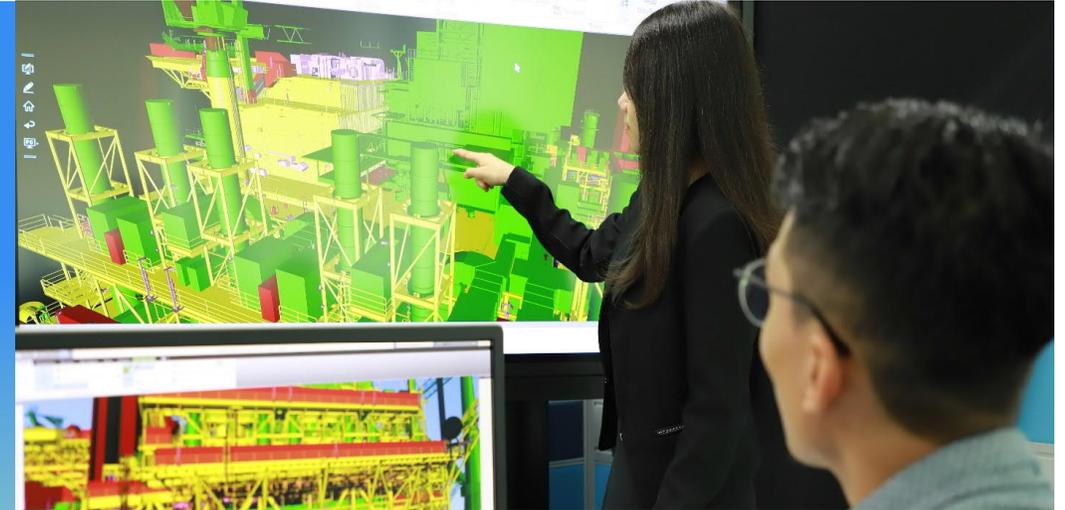


# A diversified provider of projects, technologies, products and services



**Projects Delivery**

- Engineering and project management expertise
- Technology integration on complex projects
- Balanced portfolio. Diversified contract models and commercial selectivity.



**Technology, Products & Services**

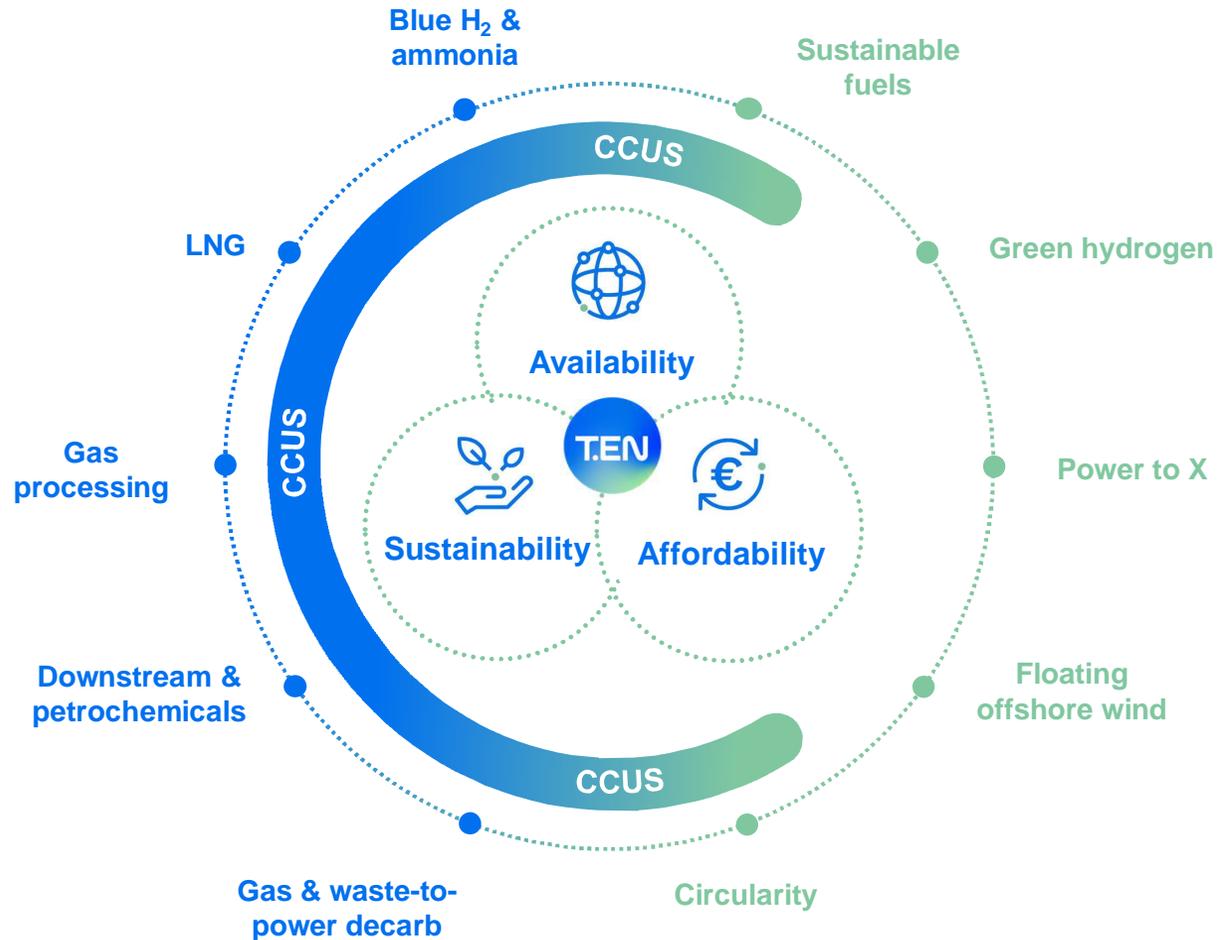
- Technology and proprietary products
- Concept, feasibility, FEED, studies and licensing
- Advisory and consultancy accelerated by digital

# Macro outlook: more energy, less carbon

T.EN's solutions for tackling the energy trilemma

## Investment in traditional energies

- Energy security drives urgent agenda
- Multi-year expansion phase required
- Decarbonization: CCUS, circularity, electrification



## Accelerating low-carbon energies

- Market evolution supported by Government policy
- Corporate commitments to reach net zero targets
- Creating conditions for structural long-term growth

# T.EN's Energy Transition journey



**CCUS**



**Clean H<sub>2</sub> / Power-to-X**



**Sustainable Fuels**



**FOW**



**>30Mtpa**

*T.EN portfolio from study, FEED, follow-up activities*



**>3GW**

*T.EN portfolio in study through to execution phase*



**>3Mtpa**

*T.EN portfolio in Licensing, Studies, FEED, Execute phase projects*



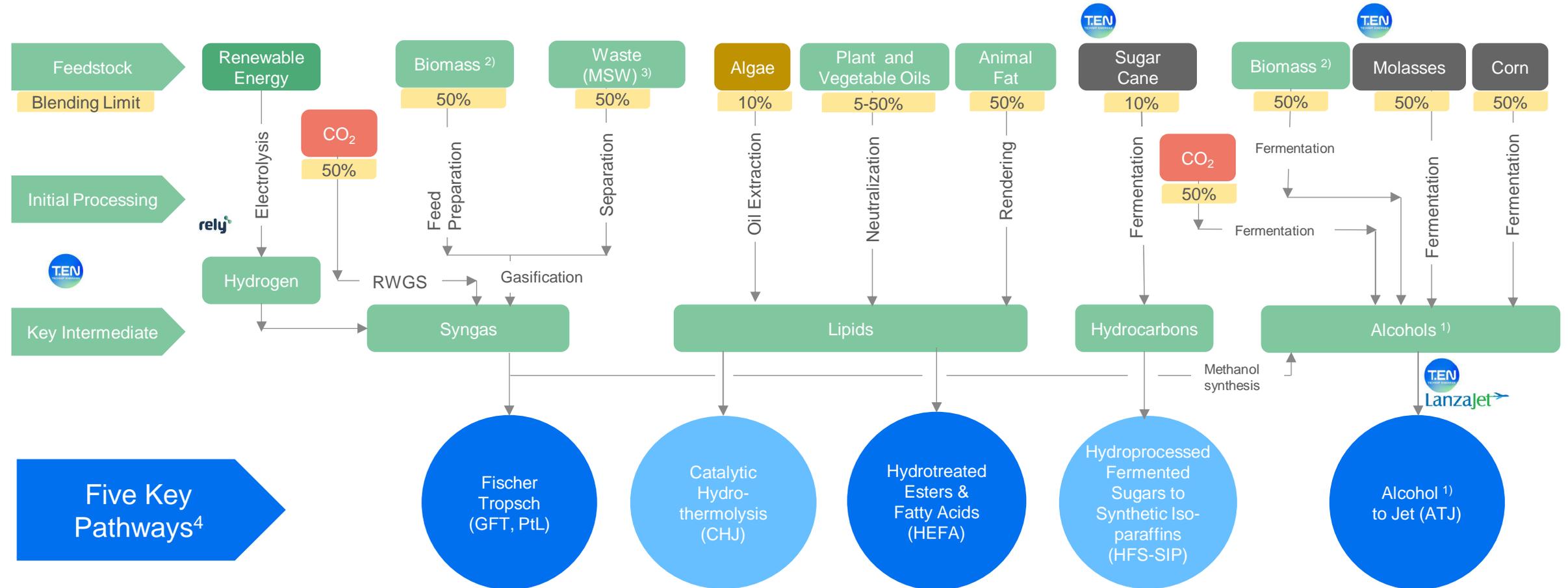
**>4GW**

*Activities in FEED stage utilizing INO15™ by T.EN*

# Five Key Process Pathways for SAF



Innovation driven by access to novel feedstocks



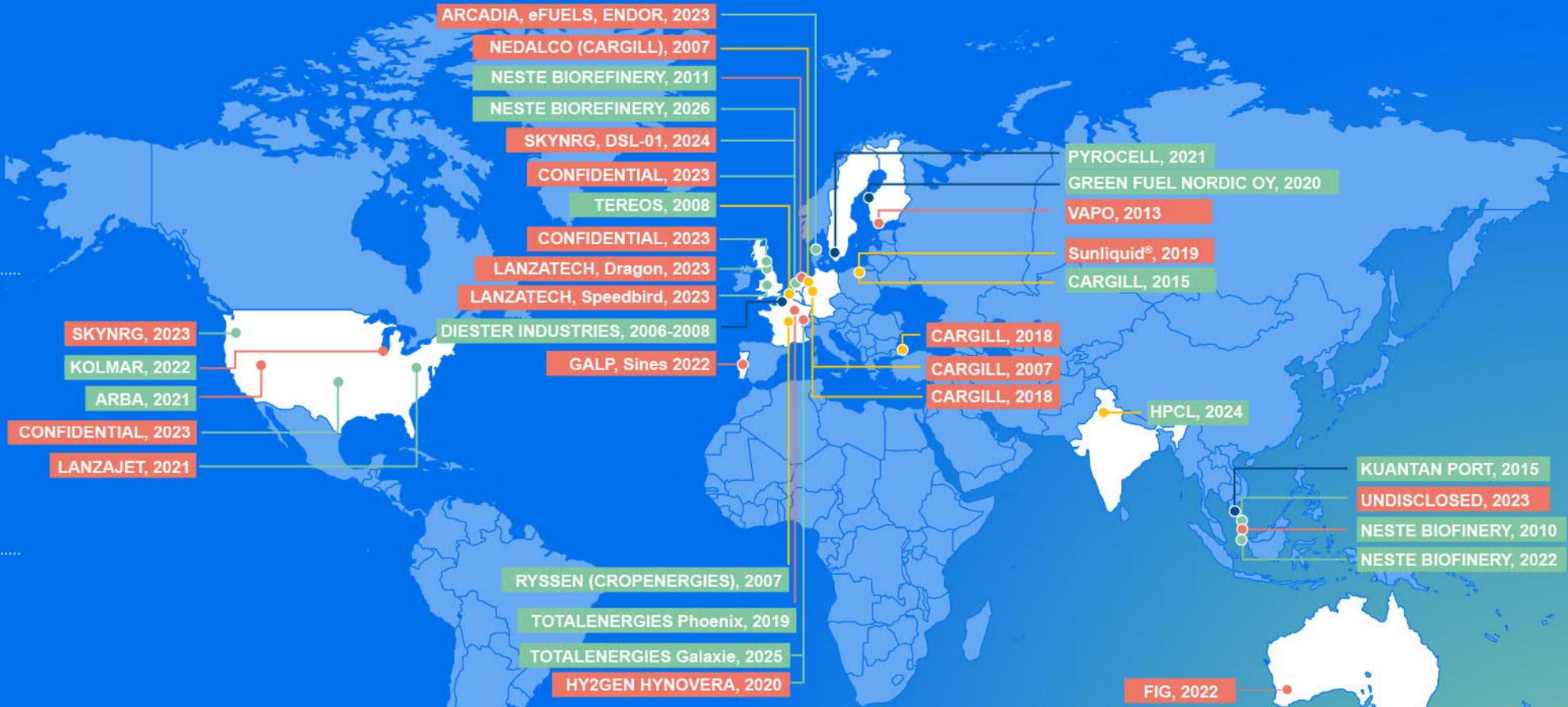
1) Alcohols currently include Ethanol and Isobutanol. Work on-going to include Methanol in future  
 2) Biomass includes agricultural residues, forestry waste and energy crops  
 3) MSW = Municipal Solid Waste  
 4) Certified pathways: PtL (Power-to-Liquid), GFT, CHJ, HEFA, Ethanol/Isobutanol-to-Jet

# T.EN Sustainable fuels project references



Our global experience across the globe

- EPsCm/EPC
- FS/PDP/FEED
- Ethanol
- Renewable Diesel
- Sustainable Aviation Fuel
- Others





# ENERKEM SOLUTION

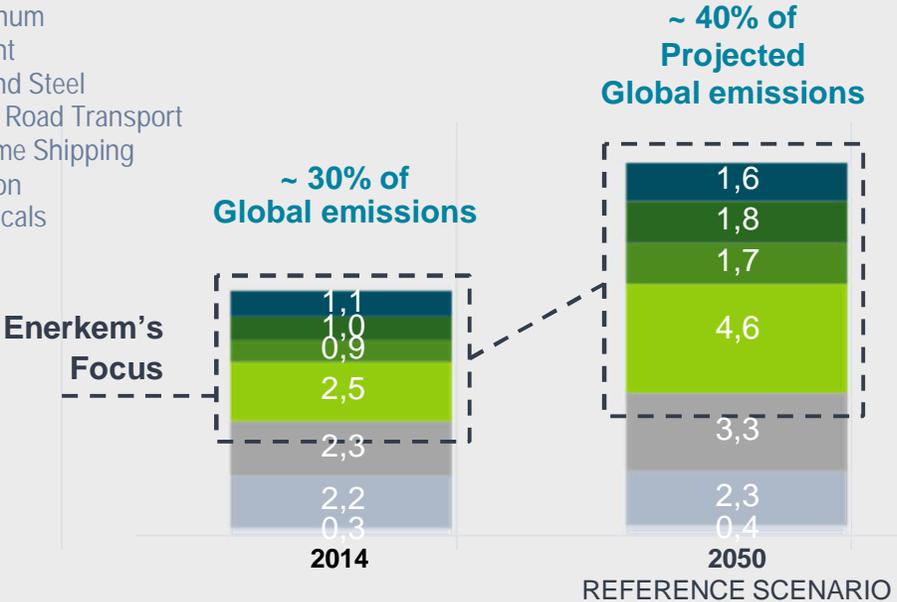
## SAF 2<sup>nd</sup> Generation

### Target Markets: Hard-to-Abate Sectors

Hard-to-abate sectors are responsible for more than ~30% of CO<sub>2</sub> emissions

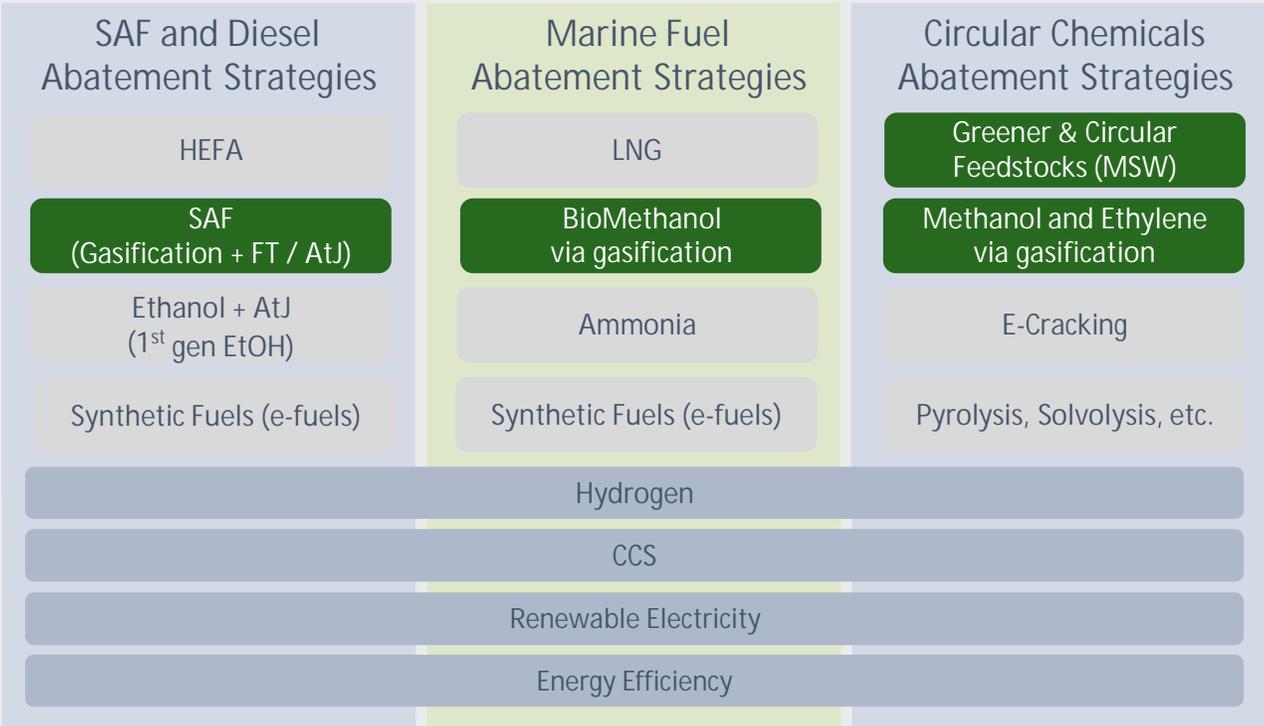
#### Direct Emissions from Hard-to-Abate Sectors (GT CO<sub>2</sub>)

- Aluminum
- Cement
- Iron and Steel
- Heavy Road Transport
- Maritime Shipping
- Aviation
- Chemicals



### Gasification at Core of Decarbonisation Strategy

Versatile technology that can be used for energy, fuels, chemicals, hydrogen and reach negative CO<sub>2</sub> emissions



Source: IEA



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# THE WORLD IS EVOLVING IN THE RIGHT DIRECTION

For a sustainable future



**GHG  
Abatement**

**Net-Zero emissions  
economy by 2050**



**Key  
Regulations**

**Fostering  
robust demand for  
sustainable products**



**Financial  
Support**

**Grants, Funds, Tax Credits  
and other financial instruments  
in key jurisdictions**



**Expanding  
Markets**

**Customer demand  
follows government action  
for the energy transition**

**Waste and residues  
are a global strategic feedstock**



# POWERFUL FEEDSTOCK STRATEGY

## SUSTAINABLE



- Alternative to landfill and incineration
- Reducing demand for virgin raw materials

## FLEXIBLE



- Processing a wide-range of waste materials
- Responding to changing waste composition and availability as well as market conditions

## SCALABLE



- Ability to process large quantities of feedstock
- Addressing the global waste management challenge

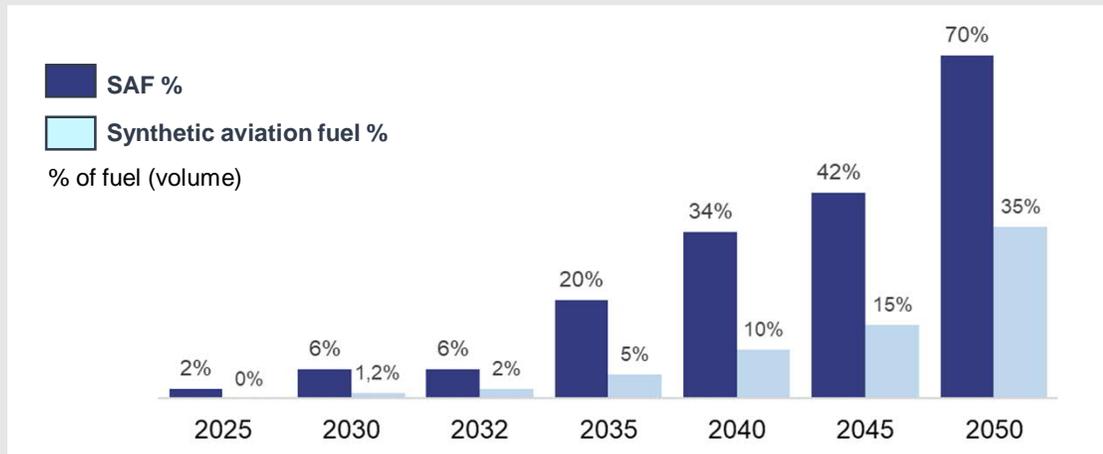


# REGULATORY CHANGES DRIVING SUSTAINABILITY

## In the Aviation Sector

### ReFuel EU Aviation Regulation

- Under this new regulation, **aviation fuel suppliers** must ensure that all aviation fuel made available to aircraft operators at each airport in the European Union contains the mandated minimum shares of SAF and synthetic aviation fuel (see below).
- Biofuels, RCF and RFNBO are eligible. Food and feed crop-based fuels are excluded.
- Non-compliance results in a fine on aviation fuel suppliers (twice the difference between avg. SAF price and avg. fossil kerosene price).



### EU ETS and RED III

#### EU ETS

- Airlines will gradually need to cover their emissions under the European Emissions Trading Scheme (ETS): 25% in 2024, 50% in 2025 and 100% from 2026.
- The emissions cap will gradually decrease every year by a factor of 4.3% from 2024-2027 and 4.4% from 2028-2030.
- This applies to intra-European flights, including departing flights to the UK and Switzerland. Emissions from extra-European flights will be covered under the International Civil Aviation Organization’s carbon offset system (CORSIA).

#### RED III

- Under the Renewable Energy Directive III, Member States must increase their targets of renewable energy or GHG emissions reduction in the transport sector.
- To encourage uptake in sustainable fuels, RED III allows Member States to use **multipliers** on the energy content of certain fuels:
  - **2.4x** Multiplier for Annex IX Part A in Aviation
  - **3x** Multiplier for RFNBOs in Aviation
- **This translates into extra credits & incentives for sustainable fuels in the aviation sector.**



# LIMITED SOLUTIONS AND MANDATORY OFFSETS TO DRIVE EXPONENTIAL SAF DEMAND

## Projected Global SAF Demand Outlook

Barrels/day, thousands



Sustainable Aviation Fuel

2025 – 2050  
CAGR: ~13%



Market Opportunity

- Total SAF demand expected to increase by CAGR of ~13% through 2050
- Stronger aviation outlook supportive of higher jet fuel consumption
- Industry likely turns to SAF to meet decarbonization goals as other measures (e.g., energy efficiency) are exhausted



Potential for SAF

- SAF is a leading solution for the aviation industry with numerous airlines supporting its development through offtake and equity investments
- Existing infrastructure further supports SAF as a “drop-in” fuel; with certain pathways allowed to blend up to 50%



Regulatory Support

- EU will impose a blending mandate for SAF on airlines, and aviation will be included in the EU carbon market
- In the US, 40B (2023-24) 45Z PTC credit applicable to SAF is between \$1.25 -1.75/gallon
- In British-Columbia (Canada), aviation will be included in the LCFS, with a dual mandate for jet fuel (CI based + volume)

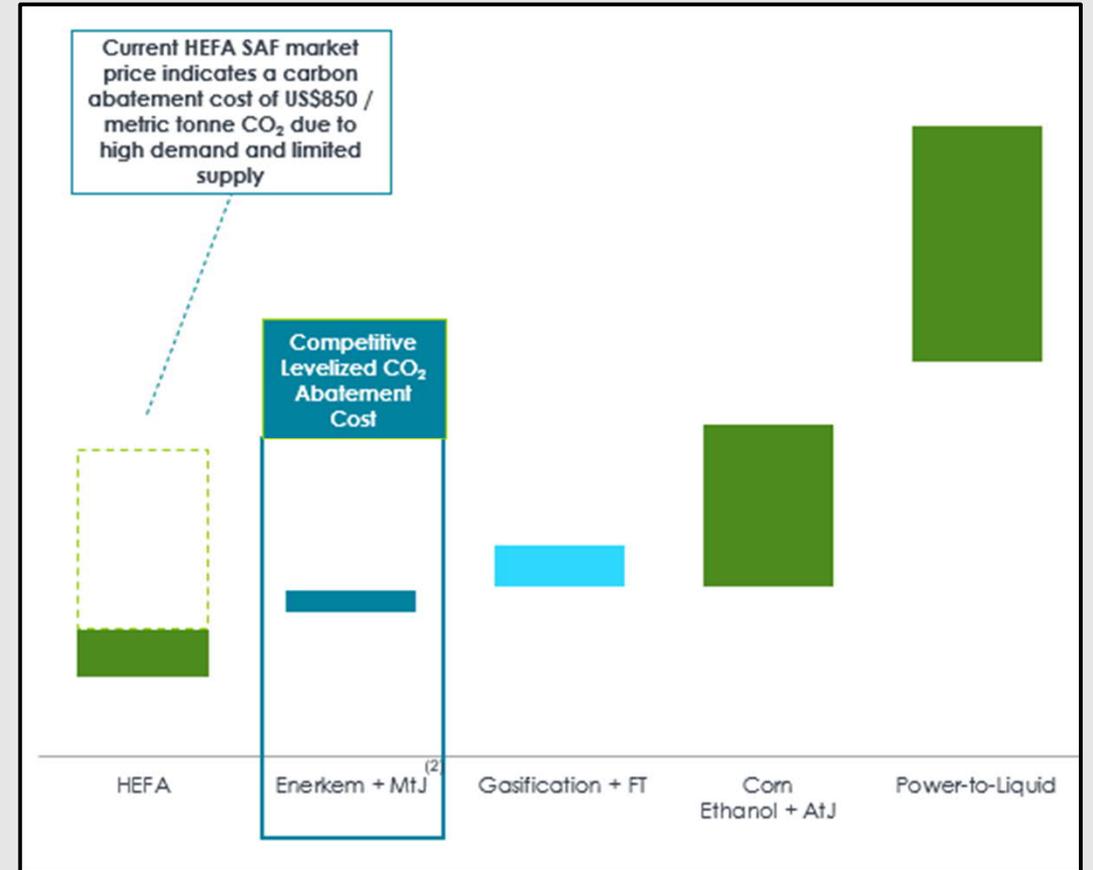


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# SAF CO<sub>2</sub> ABATEMENT COST

Enerkem Competitive Position

Enerkem's cost structure and scale provides best-in-class CO<sub>2</sub> abatement cost relative to existing and future alternatives



• Carbon Abatement Cost | (\$US / metric tonne CO<sub>2</sub>)

# Key takeaways

Breaking boundaries together to engineer a sustainable future



- HEFA, AtJ & FT pathway SAF projects implemented/ under implementation/ development by T.EN, work on-going on other pathways
- Strong T.EN track record for project delivery incl. modular design, often embedded with innovative technologies
- Enerkem's groundbreaking waste gasification technology is successfully producing sustainable methanol
- Enerkem-T.EN joining forces to deploy Enerkem's technology to convert waste into sustainable and valuable products (SAF in future)
- Collaborative approach among various stake holders is key success factor for decarbonization of the transport sector

**Thank you**