Sviluppo degli E-fuel: l’impianto dimostrativo di Sarroch

Milan, 05 Dicembre 2024

Downstream player focused on Refining, Trading & Power Production

Integrated Supply Chain management

- ~150 crude cargoes every year from wide range of suppliers
- Supply & Trading company operating in Geneva since Jan 2016
- Balanced and differentiated sales portfolio...
- ... with world class oil supply chain knowledge
- Start up of bunkering activity from Aug 2019

Sarroch Industrial Operations (strictly integrated Refinery and Power plant)

- Largest single-site refinery in the Mediterranean basin (300 kbl/d, ~20% of Italy's refining capacity)
- Top-tier complex refinery (11.7 Nelson Complexity Index)
- Yields of medium & light distillates >80% of the total output
- Competitive advantage in VLSFO bunker 0.5%S production
- Petrochemical integration
- IGCC installed capacity is 575 MW, among the largest liquid fuel gasification plants in the world
- Power production of 3.5÷4.0 TWh/yr
- Ca200 MW of installed renewable power generation in Sardinia (SARDEOLICA)
- From April 2021, the IGCC Power plant was recognized essential for the Italian security power system and admitted to the "Essentiality regime"

Wholesale

- Wholesale in Italy and Spain:
  - ✓ ~4% market share in Italy
  - ✓ ~ 3% market share in Spain
- +300 kcm of additional storage capacity (on top of ~4 Mcm of the tank capacity at Sarroch refinery):
  - ✓ Arcola (La Spezia) coastal storage, with a capacity of 200 kcm
  - ✓ Cartagena (Spain) coastal storage, with a capacity of 114 kcm

Exploit market opportunities for crude oils & products

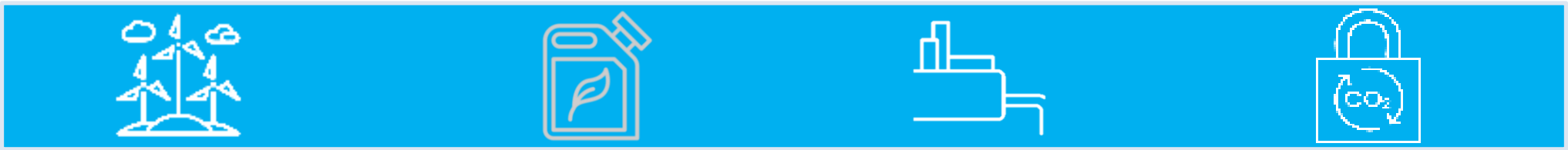
High complexity and flexible configuration for a top-tier performance

Transform heavy refining fractions (TAR) into electricity

Stabilize refining margins with downstream presence

Energy transition

In a context of growing pressure to decarbonize the Planet, the **Saras Group developed a Roadmap to accompany the Energy Transition**, while continuing with the highest commitment its production of essential energy and fuels for the Country



Renewables

- Projects for about 500 MW under VIA evaluation and others in the piping
- New Photovoltaic farm for about 70MW put on stream on last July

Biofuels

- Use vegetable oils to produce HVO in existing hydrotreating and desulphurization units (up to 200 kton/year)
- New unit for bio feedstock pretreatment
- Etherification of bioethanol for TAEE production
- "Waste to fuels" processes for circular economy development

Energy Efficiency

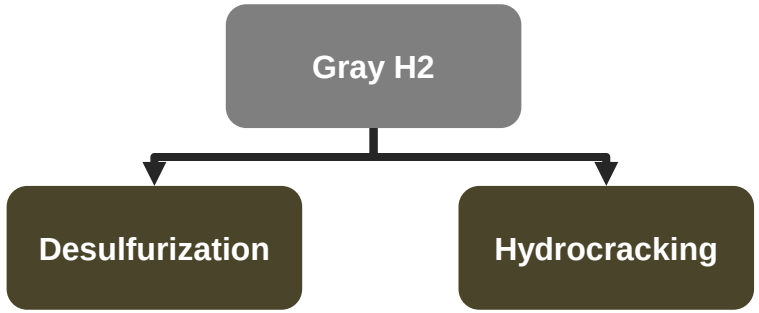
- Continuous energy efficiency improvement programme to reduce the industrial CO2 footprint
- Extensive automation and digitalization to optimize refining operations

CCS and E FUELS

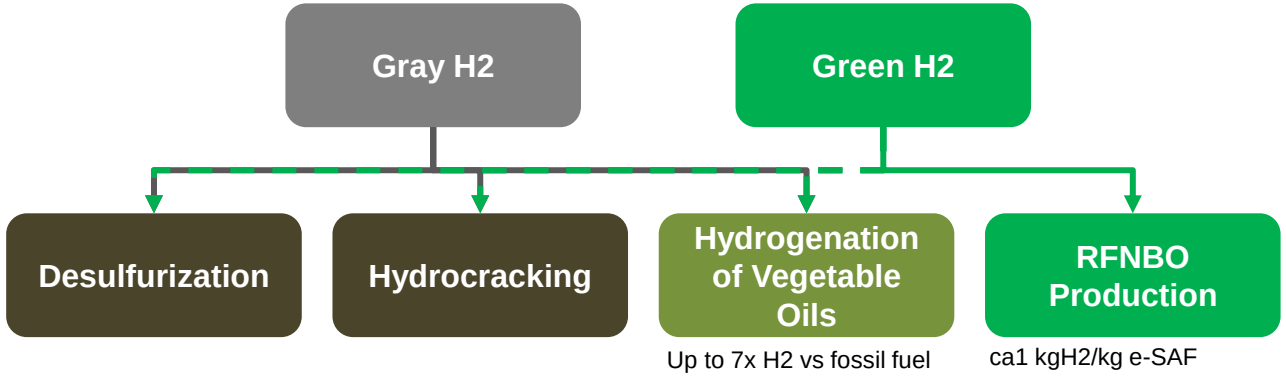
- MoU with Air Liquide to study solutions for the capture and storage of CO2
- Pilot sperimentation of e-fuel production financed by Italian PNRR

The role of e-fuels in the context of the refining sector

Refining Today



Refining Tomorrow



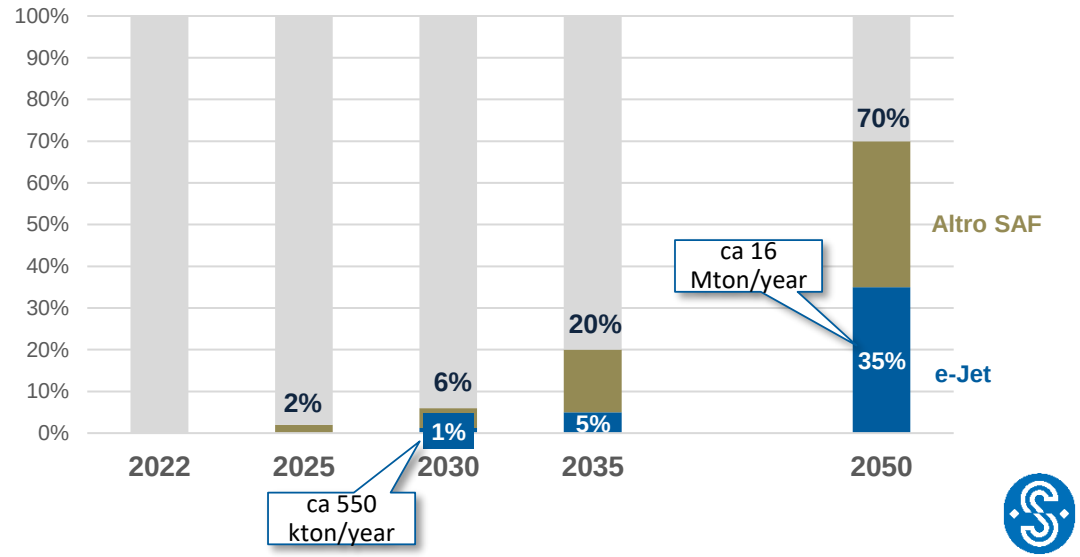
Annual Jet Fuel Production and Demand

~46,5 Mton
2019 demand[1]

~2,6 Mton
2023 production[2]

~0,2 Mton
2023 production[3]

EU SAF mandate and RFNBO share, % of total fuel



1. Source: Eurostat; 2. Source: MASE, bollettino petrolifero “lavorazioni raffinerie Dicembre 2022”; 3. dati interni Saras; 4. https://www.europarl.europa.eu/news/en/press-room/20230424IPR82023/fit-for-55-parliament-and-council-reach-deal-on-greener-aviation-fuels

Description and project objectives

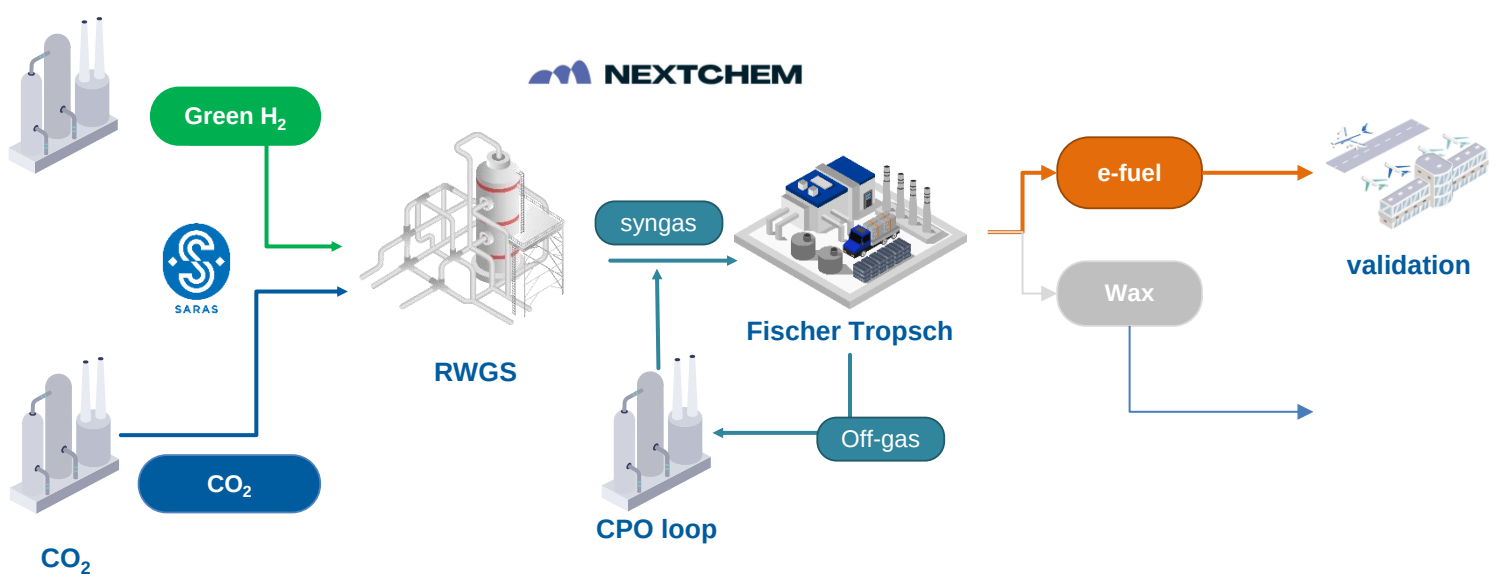
Objectives

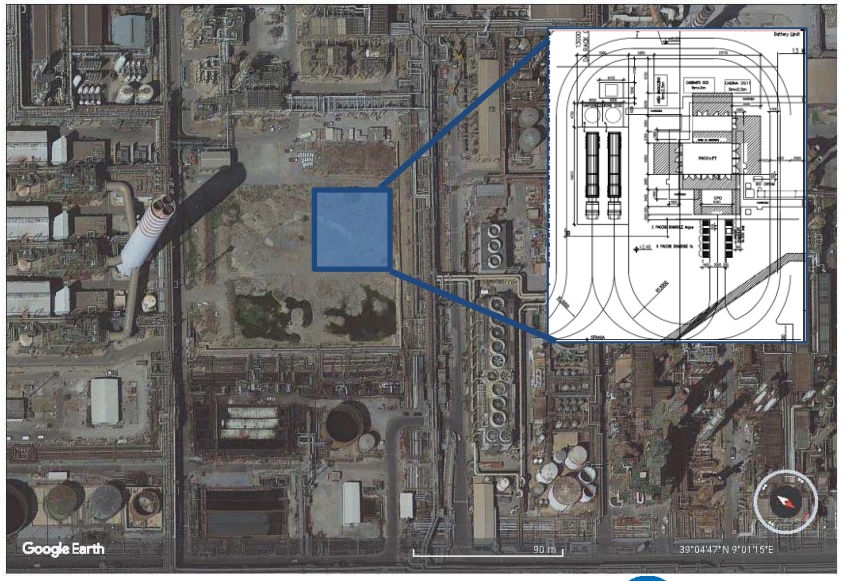
- To build the first scale demonstrator in Italy for the production of synthetic fuel from CO2 hydrogenation
- Integration with Sarlux and its upstream and downstream plants
- Testing and experimentation on configurations, set-ups and catalysts in collaboration with PoliMi
- Scale-up study to reach industrially relevant size
- Definition of a path to make the e-fuel compatible with international standards and definitions through certification and compliance with EU regulations

KPIs

- **E-fuel production**: up to 150 t/year (e-fuel)
- **Start-up date**: 2025
- **Project duration**: 34 months
- **CAPEX**: ca 11,5 M€

Diagram of the Saras e-Jet demonstrator





Syncrude production – fuel production technology

100 %
liquid hydrocarbons

Chemical nature
Nonpolar liquid hydrocarbons

Technical specification
Color: transparent
Delivery form: Liquid

COMPOSITION OF FISCHER-TROPSCH SYNCRUDE

COMPONENT	wt. %	COMPONENT	wt. %
C_5H_x	0,13%	$C_{18}H_x$	6,08%
C_6H_x	0,93%	$C_{19}H_x$	5,07%
C_7H_x	2,69%	$C_{20}H_x$	3,94%
C_8H_x	4,73%	$C_{21}H_x$	2,78%
C_9H_x	6,25%	$C_{22}H_x$	1,76%
$C_{10}H_x$	7,07%	$C_{23}H_x$	1,05%
$C_{11}H_x$	7,67%	$C_{24}H_x$	0,71%
$C_{12}H_x$	8,17%	$C_{25}H_x$	0,35%
$C_{13}H_x$	8,61%	$C_{26}H_x$	0,29%
$C_{14}H_x$	8,51%	$C_{27}H_x$	0,10%
$C_{15}H_x$	8,07%	$C_{28}H_x$	0,02%
$C_{16}H_x$	7,79%	$C_{29}H_x$	0,00%
$C_{17}H_x$	7,22%	$C_{30}H_x$	0,00%

The innovative role of CPO

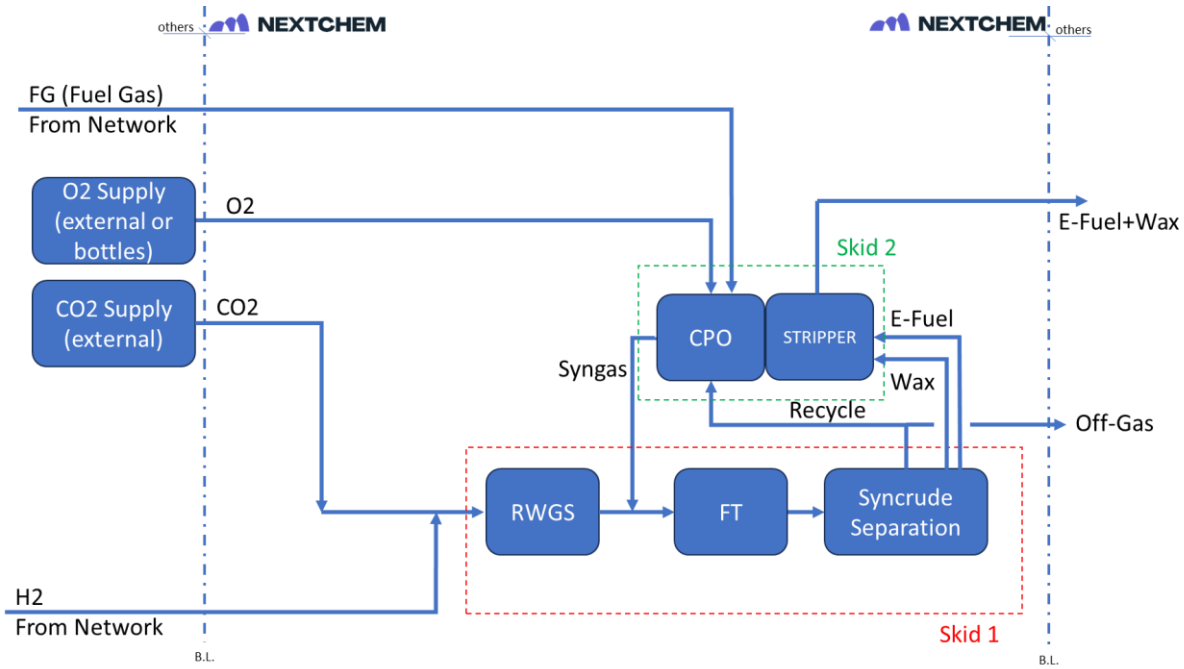
CPO- Catalytic Partial Oxidation

CPO is a complementary section to Fischer -Tropsch (FT) module which allow to treat the off gas (methane and other hydrocarbons) coming from FT reactions to increase the yields of e-fuels by about 30%.

The unit is a catalytic stage where reactions occur with oxygen in substoichiometric mode in order to produce syngas (mixture of CO and H2) . Several exothermic reactions take place in the reactor which is refractoried and operating in adiabatic conditions.

The syngas produced is fed back to the FT section increasing the system overall yields by off gas recovery and minimizing the necessary hydrogen external supply.

Moreover the CPO module will allow to exploit the possibility to test and evaluate the utilization of other refinery off-gasses increasing the possible integration of the available refinery streams to the FT-System



E-fuels – barriers and opportunities

1. To date, there is **no liquid market for RFNBOs** capable of being a reference for European projects
2. Making the **production of green H2 competitive** will be key to maintaining the competitiveness of the sector vs EU competitors (e.g. France, Spain, Nordics) and non-EU (eg. North Africa)
3. **Clarity is needed from EU regulation** on key issues from an e-fuel production perspective: e.g. RFNBO co-processing, CO2 availability from post-2040 HtA processes
4. The **PNRR was a first key boost** to the development of the sector but:
    a. The industry needs **post-2026 visibility** and support for large-scale projects
    b. **Incentive schemes must be designed** in such a way that they do not penalize on a geographical basis and are based on realistic expected costs