SIMECO

ENERGY TRANSITION PROJECTS

Version: 8.0

Production of Sustainable Aviation Fuel (SAF)

Project scope is the conceptual design, FEED and detail design of a pilot plant for production of Sustainable Aviation Fuel from green hydrogen and CO_2 at Sarroch Refinery.

The project is financed by UE under PNRR Hard-to-Abate program.

The plant, based on Reverse Water Gas Shift + Fischer-Tropsch + CPO (Catalytic Partial Oxydation) process licensed by NEXTCHEM/INERATEC will produce approx. 1000 ton/year of SAF (Jet Fuel A1).

Client: **SARLUX**

Year: 2024

Contract type: LS of Engineering Services

EMHS : 10,000

Location: Italy

SOW: Conceptual Design, FEED and Detail Design

Carbon Capture Plant

Client: **SAIPEM**

Year: 2024

Contract type: LS of Engineering Services

EMHS : 12,000

Location: Italy

SOW: FEED

Project scope was the FEED of plant for capture of 50 MTPD of CO_2 from flue gas of a power plant. The modular plant is designed to capture CO_2 with SAIPEM's proprietary enzymatic technology "CO2 Solutions by Saipem™ that achieves high selectivity and stability, ensuring effective CO_2 emission reduction and meeting stringent regulatory requirements.

With a non-toxic carbonate solvent and minimal formation of hazardous byproducts, the CO2 Solutions™ by Saipem technology prioritizes environmental safety and compliance. Further, by utilizing low-grade residual heat for operation as low as 85°C, the technology is easily integrated with any waste heat energy available, while minimizing environmental impact.

Electrification of n-paraffines production plant

Client: **SASOL**

Year: 2024

Contract type: LS of Engineering Services

EMHS : 12,000

Location: Italy

SOW: Feasibility Study

Project scope is the execution of the feasibility study for the revamping of the n-paraffins production plant at Sasol Italy, Augusta site.

The main goals of the project are the reduction of CO_2 emissions, in line with SASOL's strategy of promoting decarbonization up to the "zero carbon emission" ambition in 2050, and the reduction of production costs.

The project features: 1) installation of new electric exchangers - to rid off most of the fossil fuels currently used in the process heaters – fed by renewable electricity produced by a new photovoltaic plant; 2) revamping of the n-Paraffins production plant, by replacing several existing equipment with new and more efficient ones, in order to reduce energy consumption and production costs.

Modena Hydrogen Valley

Client: **SNAM / Hera**

Year: 2024

Contract type: LS of Engineering Services

EMHS : 20,000

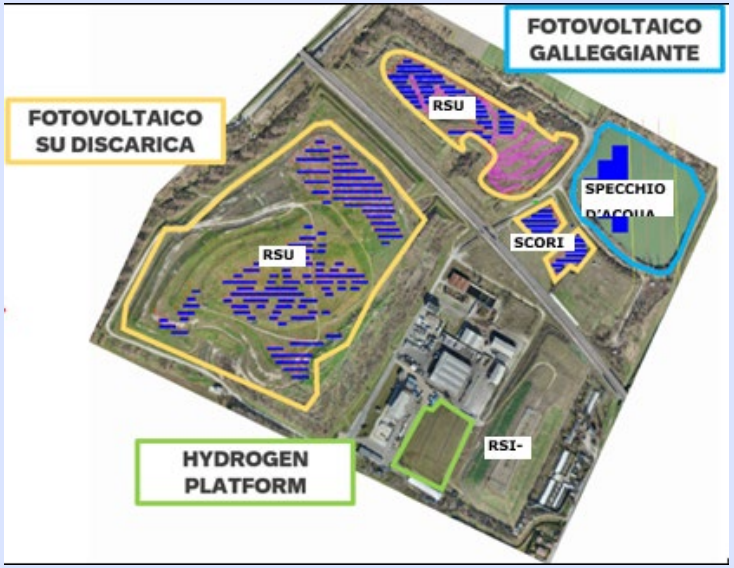
Location: Italy

SOW: FEED

The Hydrogen Valley will consist of a photovoltaic plant of approx. 6 MW, owned by Herambiente, which will power a green hydrogen production plant, owned by SNAM, with a capacity of 2.5 MW which will allow a maximum annual production of 395 t of green hydrogen with an estimated maximum water use of approx. 8200 t/year.

Green Hydrogen will be used as a fuel for a fleet of fuel-cell buses as well as for the possible fuel-cell supply in the industrial sector. The project involves the compression of the hydrogen produced for the loading of trailers at high pressure (up to 500 bar).

The area selected for the project is a former industrial area where, presently, there are two landfills.



Hybla Project

Hybla Project aims to deep decarbonization of some production processes at Sasol Italy and Sonatrach industrial sites at Augusta (Sicily, Italy).

The Project include the following units: production of green H2 by water electrolysis, CO2 capture unit (40.000 tons/year), production of green CO by CO2 electrolysis, H2 storage and loading bays for truck trailers for further distribution of H2 for mobility.

The project will rely on more than 275 MW of solar and wind energy installed power capacity and will avoid more than 80.000 tons/year of CO2 emissions.

Client: **HYBLA Consortium**

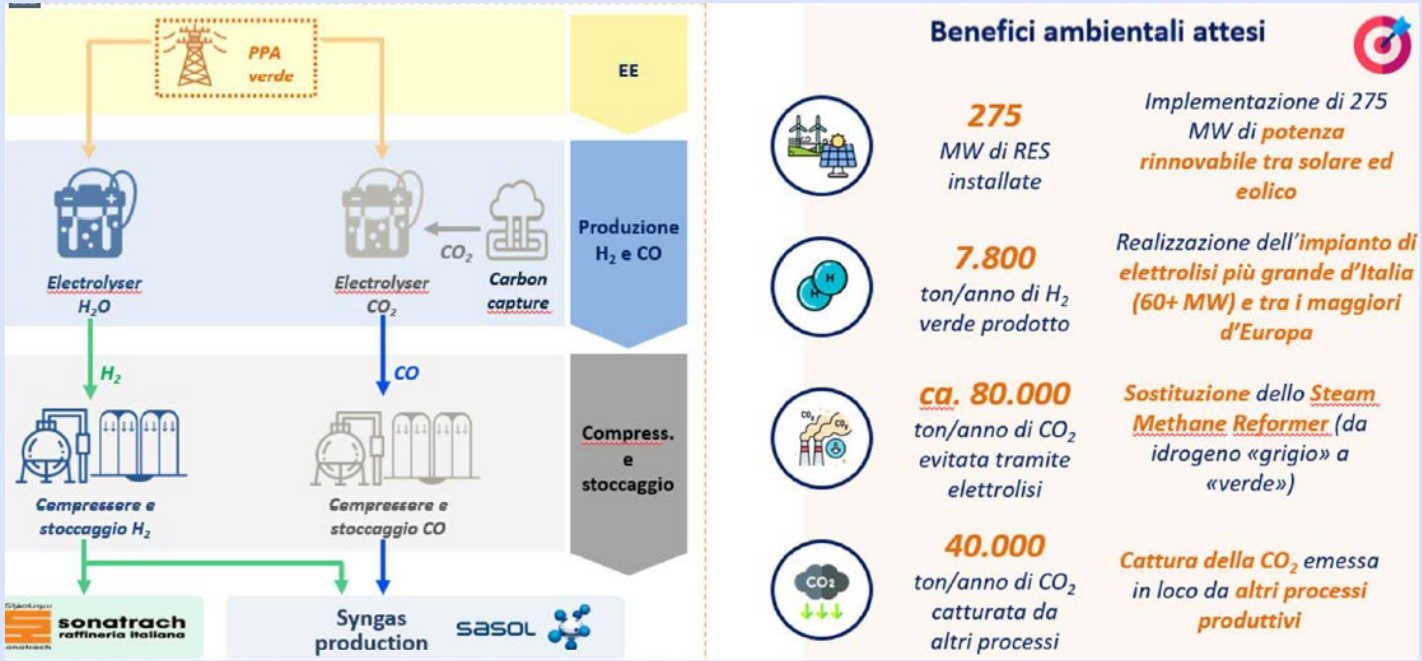
Year: 2022 – 2023

Contract type: LS of Engineering Services

EMHS : 10,000

Location: Italy

SOW: Feasibility Study



Power to X / e-fuels

Client: **Polenergia**

Year: 2022-2023

Contract type: LS of Engineering Services

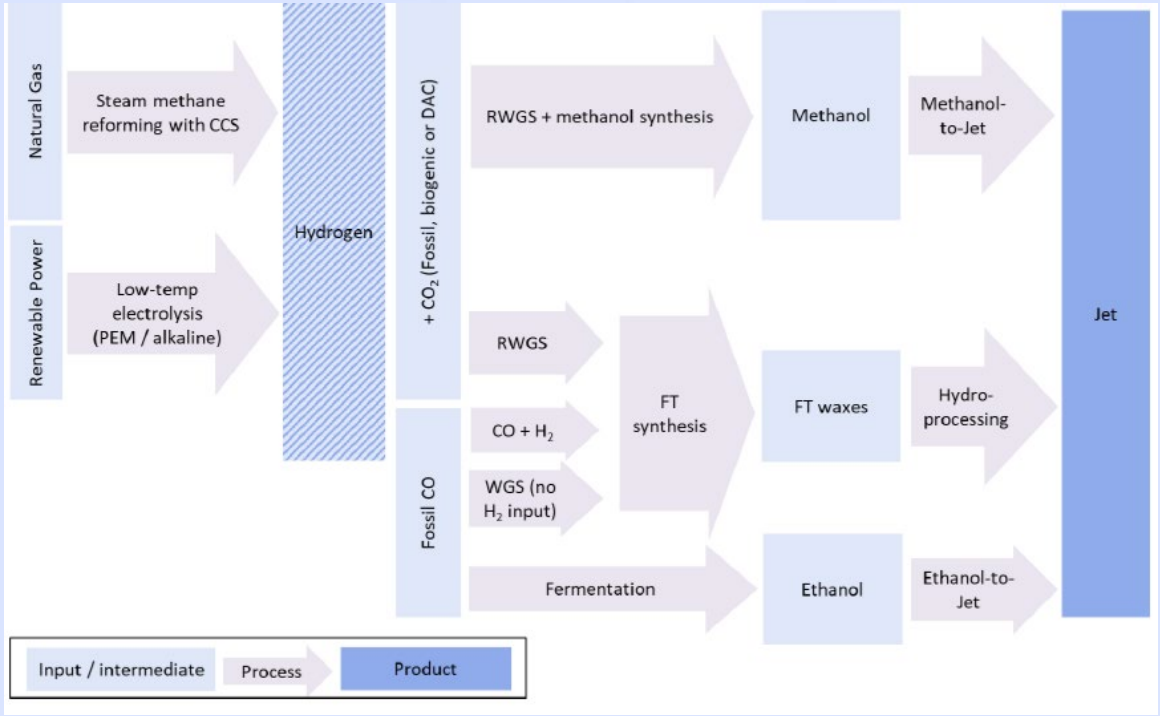
EMHS : 1,500

Location: Poland

SOW: Technical Advisory Services, Feasibility Study

Scope of the study is the analysis of the available technologies for production of SAF (Sustainable Aviation Fuel) from green H2 and CO2. The study compares the Fischer-Tropsch to Jet route vs. the Methanol to Jet route, in terms of technology readiness level, energy efficiency, CAPEX and OPEX.

The feasibility study considers three different green hydrogen capacities: 1 MW (pilot plant), 10 MW (demo-plant), 100 MW (commercial demonstration plant).



Green Hydrogen

Client: **SNAM**

Year: 2022

Contract type: LS of Engineering Services

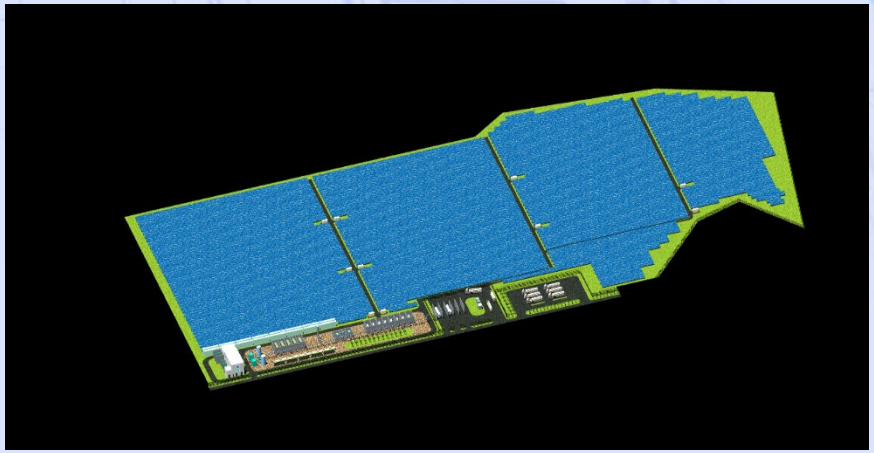
EMHS : 1,500

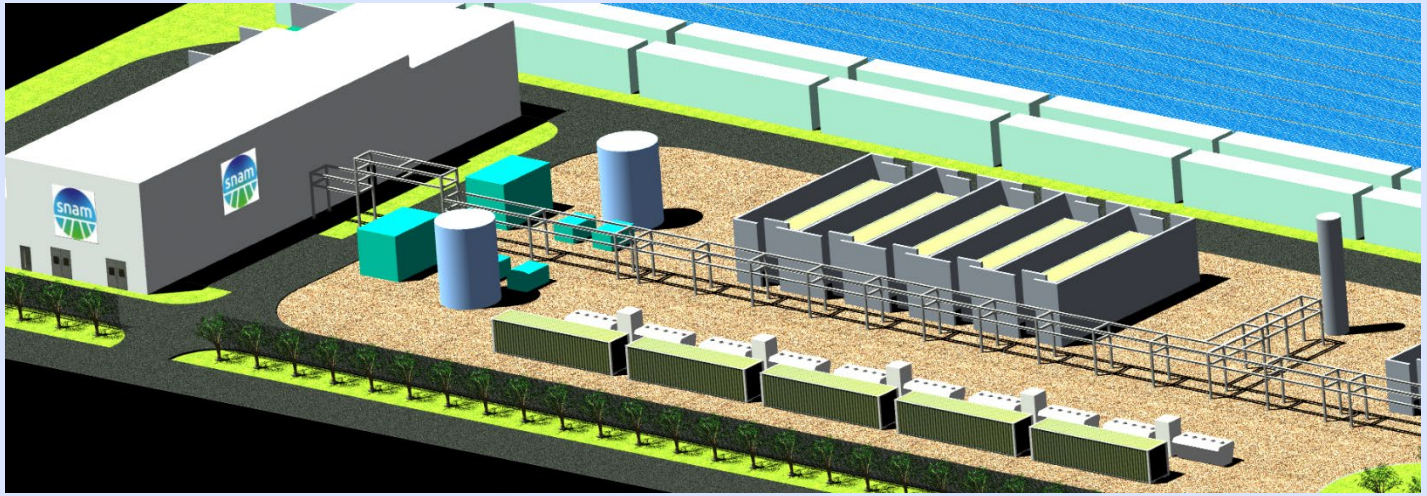
Location: Italy

SOW: Feasibility Study

The Study analysed a 10 MW electrolysis plant producing 2000 Nm^3/h of Green Hydrogen to be loaded on tube trailers for further distribution to hydrogen refuelling stations.

The electrolyser is connected to a 30 MW PV plant, to a 60 MWh Electricity Storage System (BESS) and to the national grid.





Hydrogen production in large scale power plants

Client: **ENIPOWER**

Year: 2019

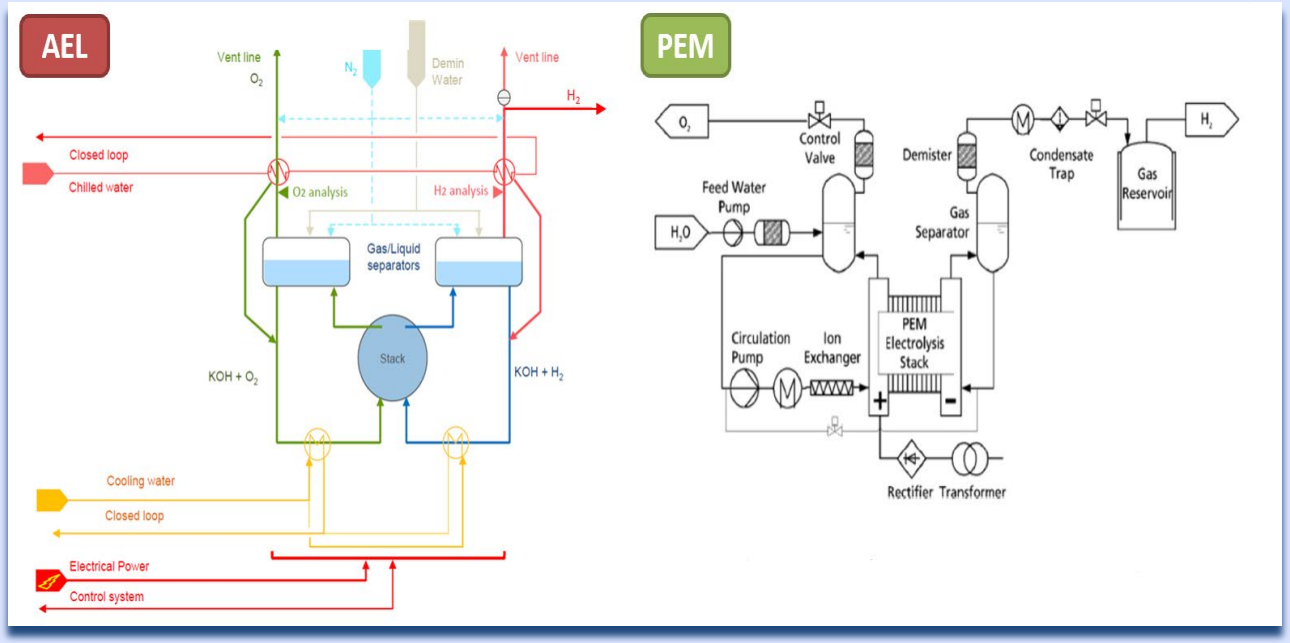
Contract type: LS of Engineering Services

Location: Italy

SOW: Feasibility Study

Project scope was to evaluate the possibility to convert the electricity produced at power plants during low-demand periods, into hydrogen via electrolysis. Produced hydrogen is injected into the national gas grid, according to the max. quantity allowed by grid operator (Snam Rete Gas).

AEL and PEM and technologies have been compared in terms of CAPEX, OPEX and operability for a 80 MWe electrolyzer. State-of-the-art PEM electrolysers are more expensive, though can operate more flexibly and reactively than current AEL technology. This offers an advantage in allowing flexible operation to capture revenues as PEM technology offers a wider operating range and shorter response time than AEL.



Green Methanol by CO_2 hydrogenation

Client: RAM

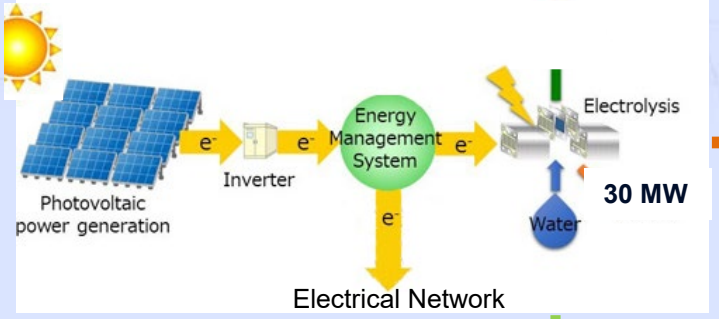
Year: 2020

Contract type: LS of Engineering Services

Location: Italy

SOW: Feasibility Study

Green Hydrogen



O_2 2,0 t/h → To refinery (for CO2 reduction)

0,5 t/h H_2

Methanol Synthesis

2,7 t/h MeOH → 

To refinery (for MTBE production)

H_2O 1,9 t/h → Water to Ely

Carbon Capture & Utilization

CO_2 (2,300 Nm^3/h) is captured from one of the refinery stacks. CO_2 removal is carried out by GV Hot Potassium Carbonate process.

4,1 t/h CO_2

Methanol is made by CO_2 direct hydrogenation (CRI technology).

Green Methanol from Municipal Solid Wastes

Client: **ENI/ENIPROGETTI**

Year: 2019

Contract type: LS of Engineering Services

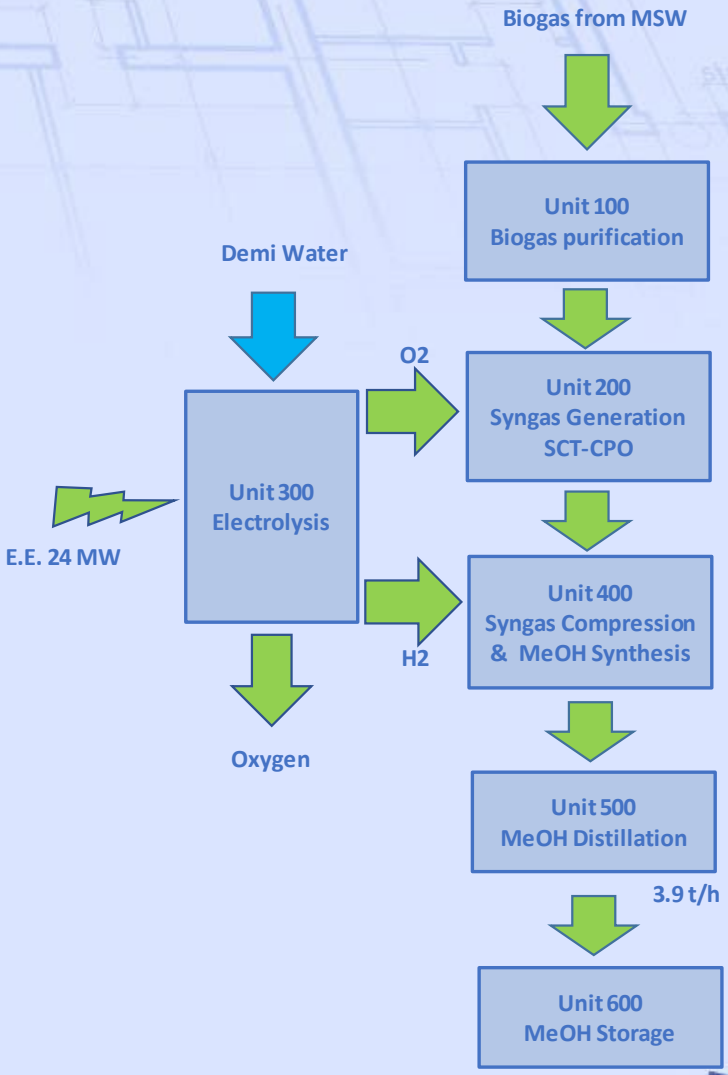
Location: Italy

SOW: Feasibility Study

Project scope was the feasibility study for a new plant producing 90 t/day of methanol from biogas generated by the anaerobic digestion of the Organic Fraction of Municipal Solid Wastes (32,000 t/y).

The new plant features 1) biogas purification to bio-methane, 2) biomethane conversion into syngas, 3) hydrogen production (via electrolysis) in order to adjust syngas composition for methanol synthesis, 4) green methanol synthesis, 5) distillation and 6) storage.

Eni's proprietary SCT-CPO syngas generation technology and conventional Stam Reforming have been compared in the study.



Power to Gas (PtG) vs Power to Liquid (PtL)

Client: **ENI**

Year: 2021-2022

Contract type: LS of Engineering Services

Location: Italy

SOW: Feasibility Study. Technology Selection

Project scope of the feasibility study is the evaluation of different technologies for the conversion of 40,000 MTPY of CO_2 captured at Centro Olio Val D'Agri (COVA), into Synthethic Natural Gas (PtG) or Methanol by reaction with green hydrogen produced by electrolysis.

Demi-water for the electrolyzers is obtained by re-using the water co-produced with the crude oil.

PtG (SNG production) has been selected as the most suitable solution for implementation at COVA. A technology selection process to select the Licensor of the CO_2 methanation unit is presently in progress.

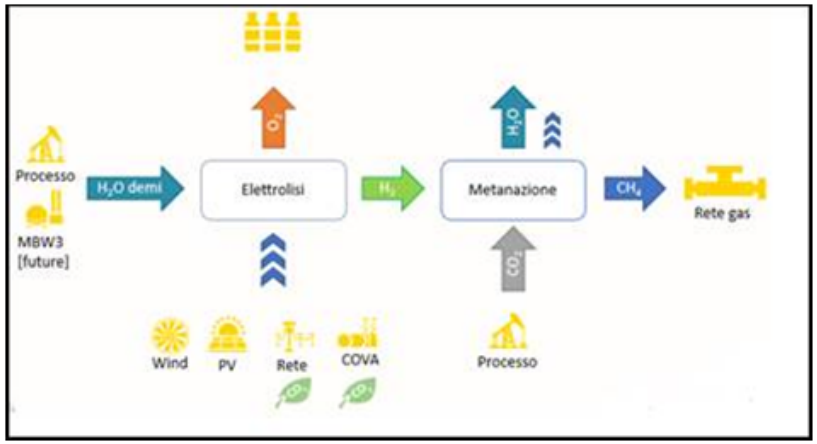


Figura 1 - Power-to-Gas (PtG)

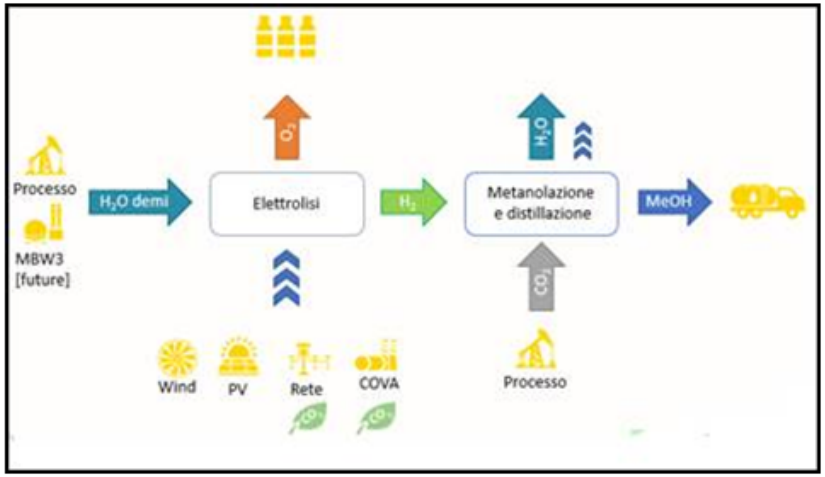


Figura 2 - Power-to-Liquid (PtL)

Blue Hydrogen Plant (Steam Reforming + CO_2 capture)

Client: **ENI**

Year: 2021

Contract type: LS of Engineering Services

Location: Italy

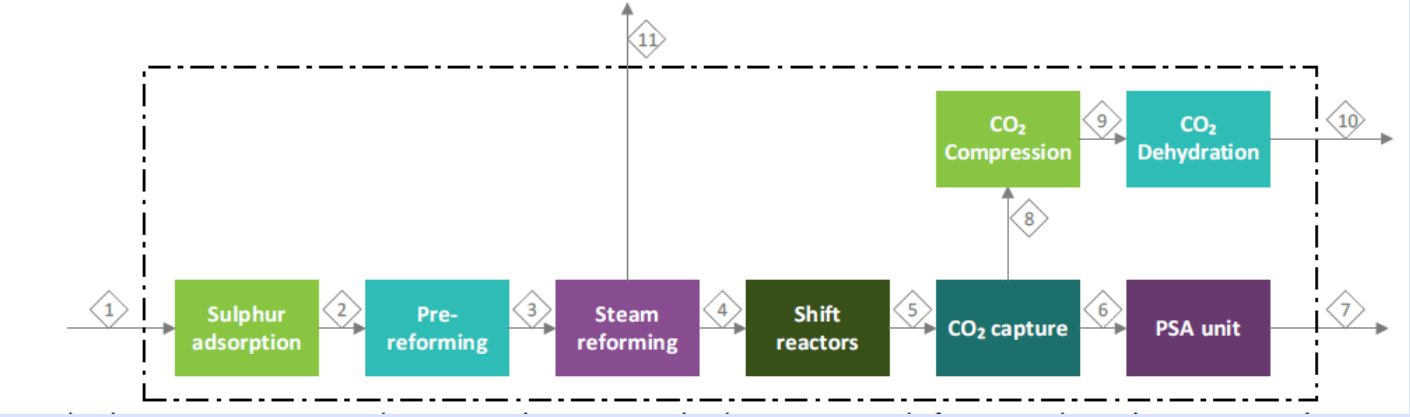
SOW: Feasibility Study

Project scope was the feasibility study of a new 50,000 Nm^3/h Hydrogen Generation Unit featuring Steam Reforming of Natural Gas with CO_2 capture.

The study addressed a comparison between a conventional steam-reformer (SMR) and a novel steam methane gas-heated reformer (GHR). The advanced SMR process achieves a minimal/zero net export of steam, with the condensate/steam recovery system integrated across the process. The GHR uses the hot effluent from the SMR as the heating medium for preheating the feed to reforming catalyst tubes simultaneously reducing steam generation and increasing the energy efficiency of the process.

The injected steam for the reforming process is generated by recovering the heat from reformer flue gas and the hot process gas.

The feasibility study also addressed the comparison of pre-combustion and post-combustion schemes for CO2 removal.



Blue Hydrogen Plant (ATR + CO2 capture)

Project scope was the feasibility study of a new 100,000 Nm3/h Hydrogen Generation Unit featuring Autothermal Reforming (ATR) of Natural Gas and CO2 capture.

Comparison with a 50,000 Nm3/h plant was also addressed in the study.

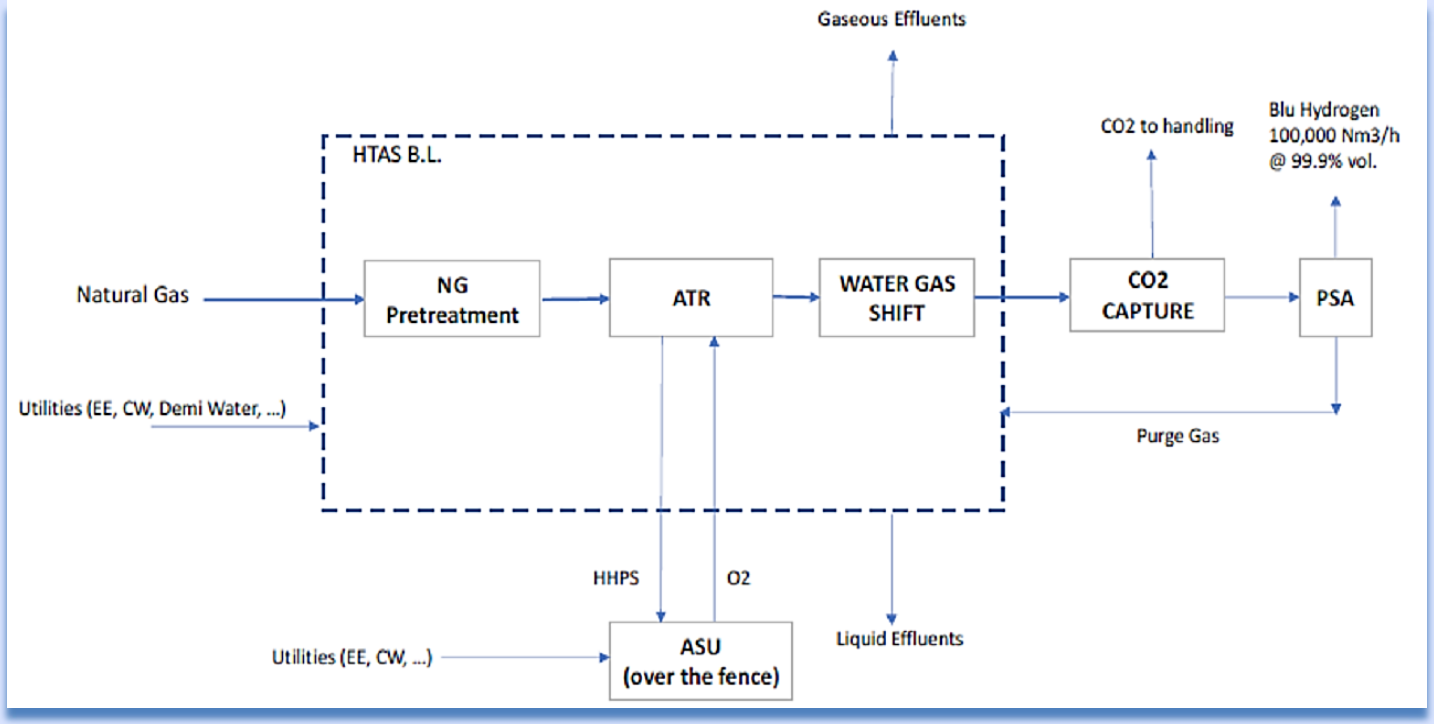
Client: **ENI**

Year: 2020

Contract type: LS of Engineering Services

Location: Italy

SOW: Feasibility Study



CO_2 Capture unit

Client: ENI

Year: 2020

Contract type: LS of Engineering Services

Location: Italy

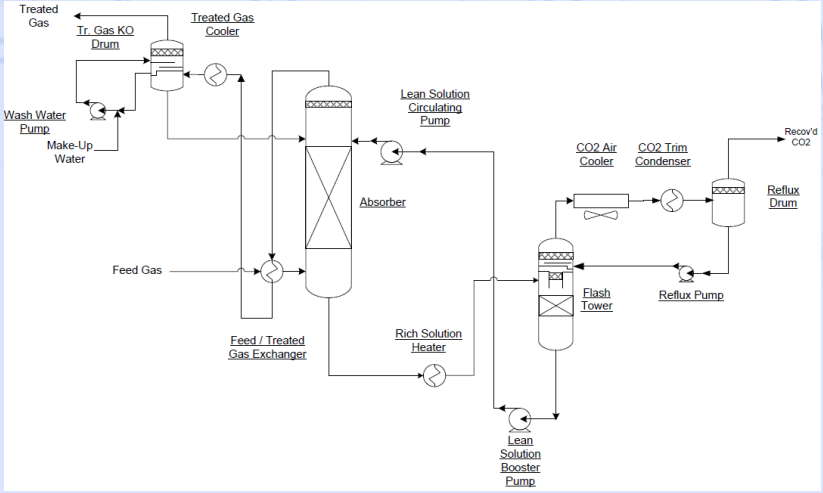
SOW: Feasibility Study

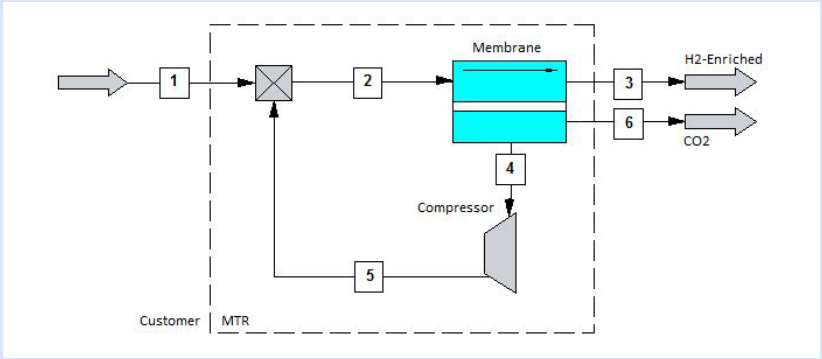
The feasibility study addressed the comparison of three technologies for the capture of 12,500 kg/h of CO_2 (300 MTPD) from a CO_2 rich process stream of the Steam Reforming plant

The technologies compared were:

1. UOP Amine Guard Process
2. Giammarco-Vetrocoke Hot Potassium Carbonate
3. Membrane Technology Research

The study compared CAPEX, OPEX and plot plan required for each technology and provided recommendations for the selection of the solution most fit for the purpose.





CO_2 Capture Unit

Project scope was the Detail Design, the procurement of Equipment & Bulk Materials and the Home Office Project Management Services for a 10,000 Nm^3/h (20 t/h) CO_2 Removal Unit at an iron ore reduction plant. The Unit, based on Giammarco-Vetrocoke Hot Potassium Carbonate process, was extensively modularized in order to facilitate the construction by local labour.

Client: **Danieli Far East**

Year: 2011-12

Contract type : LS for Engineering, Procurement & Management Services .

Location: Far East

SOW: Detail Engineering Design, HazOp Study, Procurement Services of Equipment & Bulk Materials, Home Office Management Services

Hydrogen Pipeline

Client: **ENI**

Year: 2020

Contract type: LS of Engineering Services

Manhours:

Location: Venice, Italy

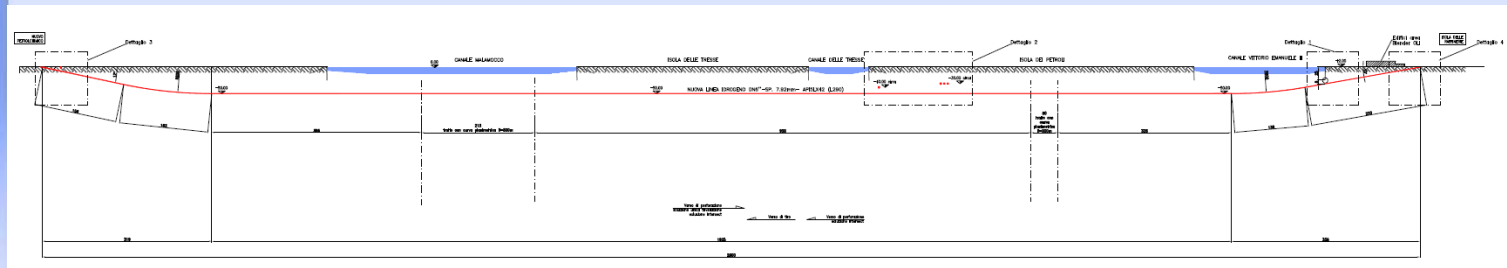
SOW: FEED

Simeco's Scope of Work was the feasibility study and FEED of a 6'' subsea hydrogen pipeline to interconnect Versalis petrochemical plants in Porto Marghera to Eni's Venice Green Refinery.

The pipeline is designed to transport up to 12.000 Nm3/h of pure hydrogen.

The study included: definition operating conditions of the pipeline and of the safety systems; selection of pipeline materials; study of the Drilling methodology: H.D.D. (Horizontal Directional Drilling).

Pipeline length is approx 4 km. Length of HDD section is 2300 m.



Waste to Fuel Plant

Client: **ENI REWIND**

Year: 2020

Contract type: LS of Engineering Services

EMHS : 40,000

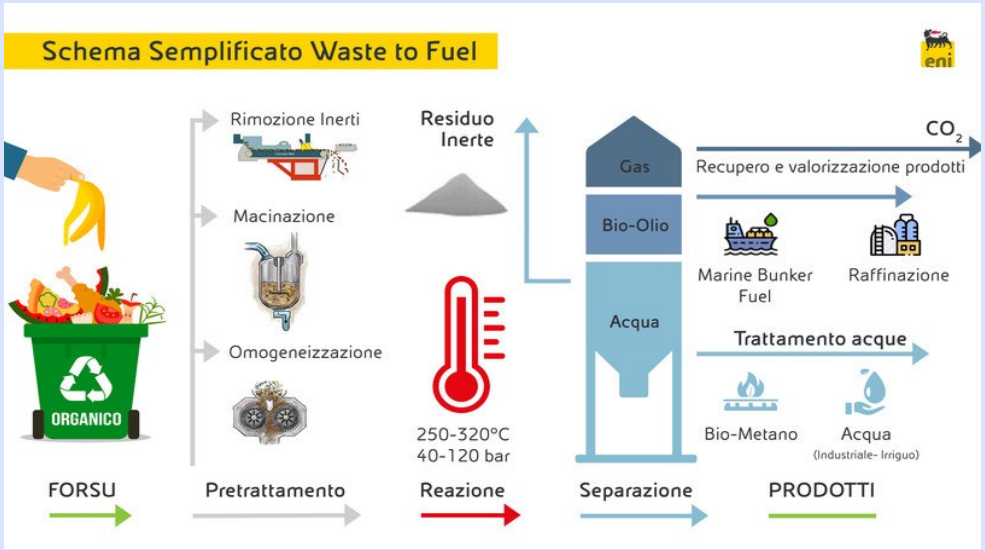
Location: Porto Marghera (VE), Italy

SOW: FEED

Project scope was the development of the process design package and the execution of the Front End Engineering Design for a new plant - based on Eni's proprietary W2F - producing Bio-Oil (LHV = 35 MJ/kg) by thermo-liquefaction of 150 ktpy of organic fraction of Municipal Solid Wastes (FORSU) (dry matter 35% wt.).

Bio-Oil target yield is approx. 40% on dry matter.

Residual solid LHV is 22 MJ/kg, therefore it can be used as a fuel for production of electricity in a W2F technology has been extensively tested by Eni on a demo plant at Gela Refinery.



Biomethane Plant

Client: **VERSALIS**

Year: 2020

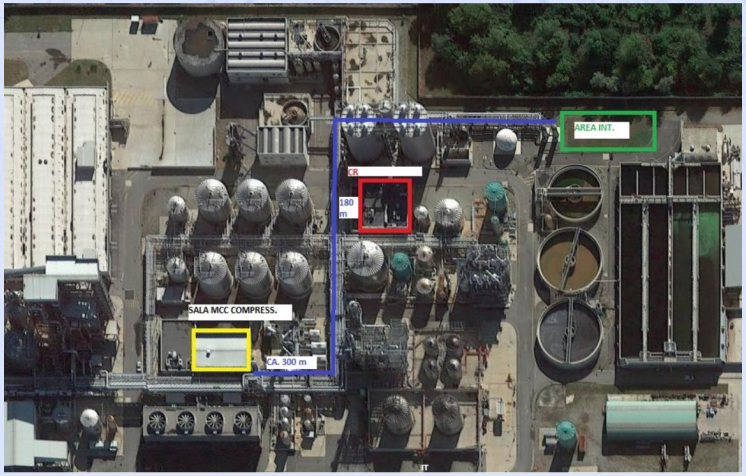
Contract type: LS of Engineering Services

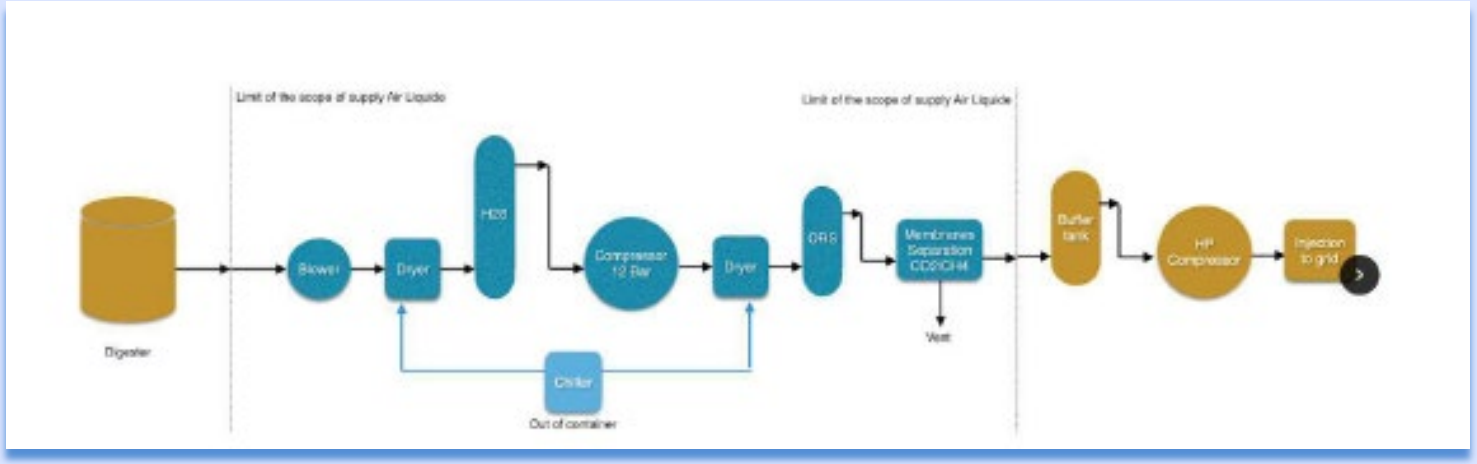
Location: Italy

SOW: FEED

Project scope was the development of the basic and the Front End Engineering Design for a new plant producing 12'000 Nm³/day of biomethane starting from the biogas obtained by the anaerobic digestion of the biomass contained in the waste water of the bio-ethanol plant.

CO_2 is removed from biogas by selective membranes. Produced biomethane is partially used as fuel gas at site and partially injected into nearby natural gas grid.





Used Cooking Oil (UCO) Pretreatment for HVO Plant

Project scope is the pretreatment of 20 t/h of Used Cooking Oils(UCO) to remove contaminants like metals, Na, K, P, N, Ca, Mg, Fe, Cl, in order to make the treated oil suitable as a feedstock for the HVO (Hydrotreated Vegetable Oil) plant based on Eni/UOP Ecofining technology.

Two different treatment schemes - one step and two-step wet degumming - have been analysed and recommendation on the preferred solution have been issued.

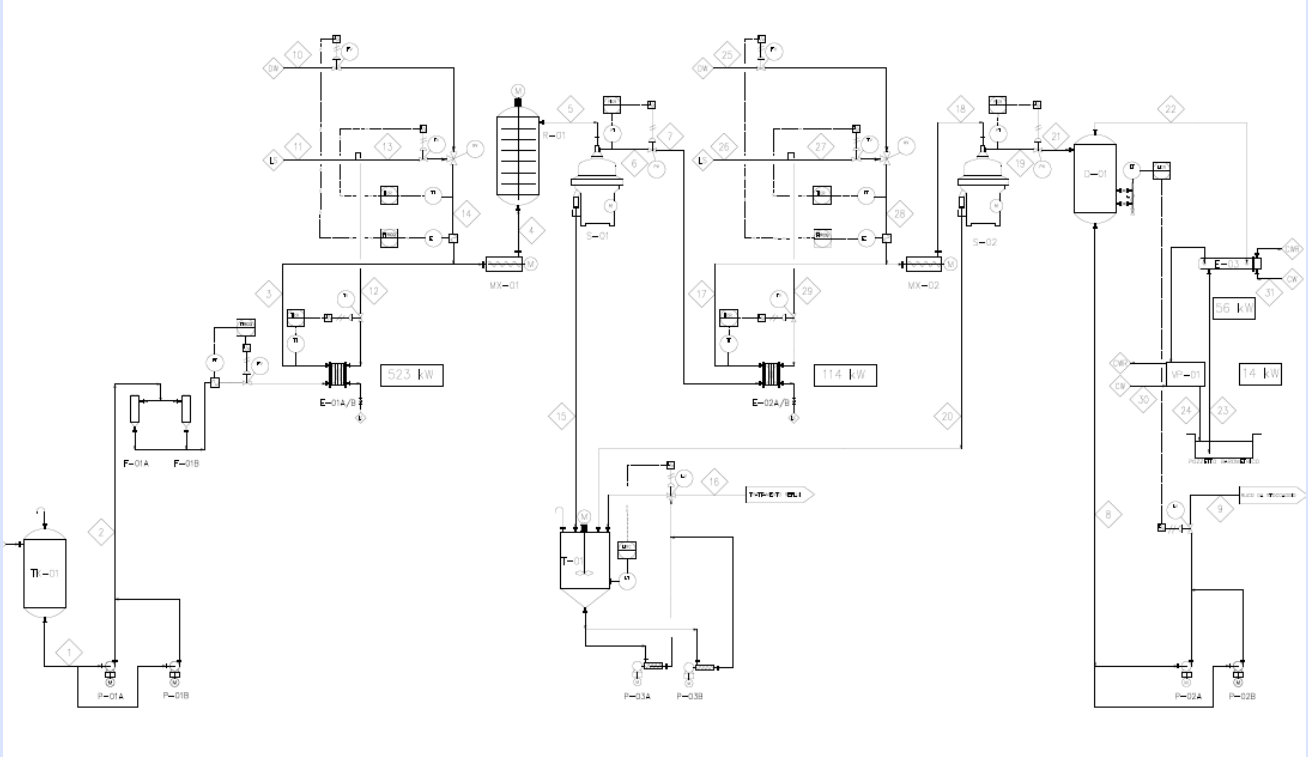
Client: **Eni S.p.a**

Year: 2019

Contract type: LS of Engineering Services

Location: Venezia Green Refinery, Italy

SOW: Feasibility Study and Basic Design



Unconventional Vegetable Oils – Oil pretreatment

Used Cooking Oils (UCO), Palm Oil Mill Effluent (POME) and Tallow are increasingly required as feedstocks for production of advanced renewable fuels.

However, these unconventional oils and fats require a careful pre-treatment to remove impurities (P, Metals, organic Cl, N, FFA,…) that may cause catalyst deactivation or equipment corrosion in processing plants.

Simeco, through the technical partnership with Technoilogy-CBM Italy, selects the most suitable technical solution for pre-treatment in order to make UCO and/or POME and Tallow suitable feedstock for diesel hydrotreaters, HVO plants or conventional biodiesel (FAME) plants.

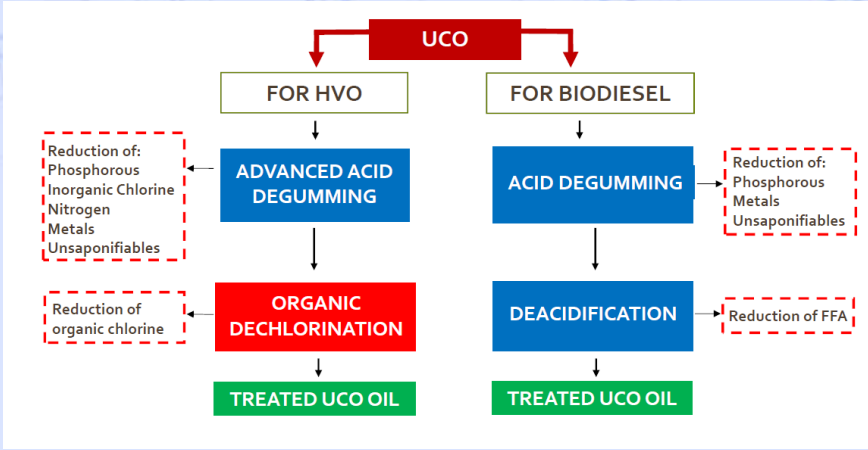
Client: **Various**

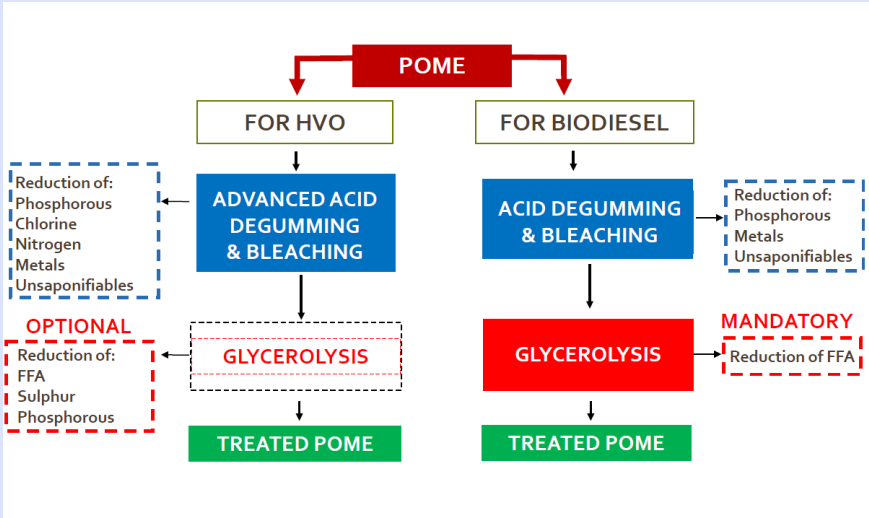
Year: 2020-2021

Contract type: LS of Engineering Services

Location: Italy

SOW: Feasibility Study and Basic Design





Thermal Energy Storage in power plants

Client: **ENIPOWER**

Year: 2020

Contract type: LS of Engineering Services

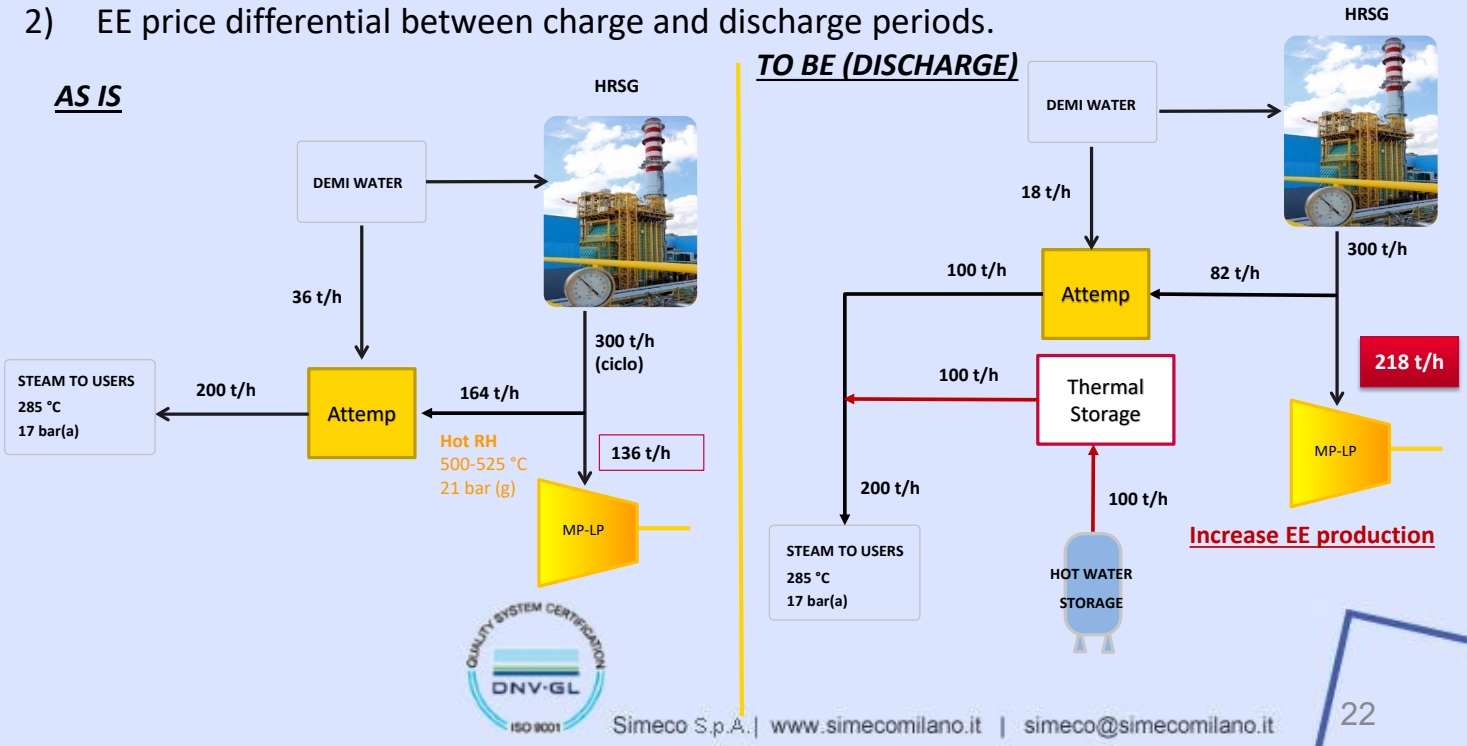
Location: Italy

SOW: Feasibility Study

Project scope is the analysis in terms of CAPEX, OPEX and operability of a Thermal Storage based on super-heated water and molten salts. The thermal storage allows to follow the price trend of the electricity market: min. electricity production when the price is low → steam used to re-charge the thermal storage; max. electricity production when the price is high → steam produced.

The thermal storage size is optimized considering:

1) duration of charge/discharge cycles;
2) EE price differential between charge and discharge periods.



Thermal batteries for energy storage in power plants

Client: **ENIPOWER**

Year: 2021

Contract type: LS of Engineering Services

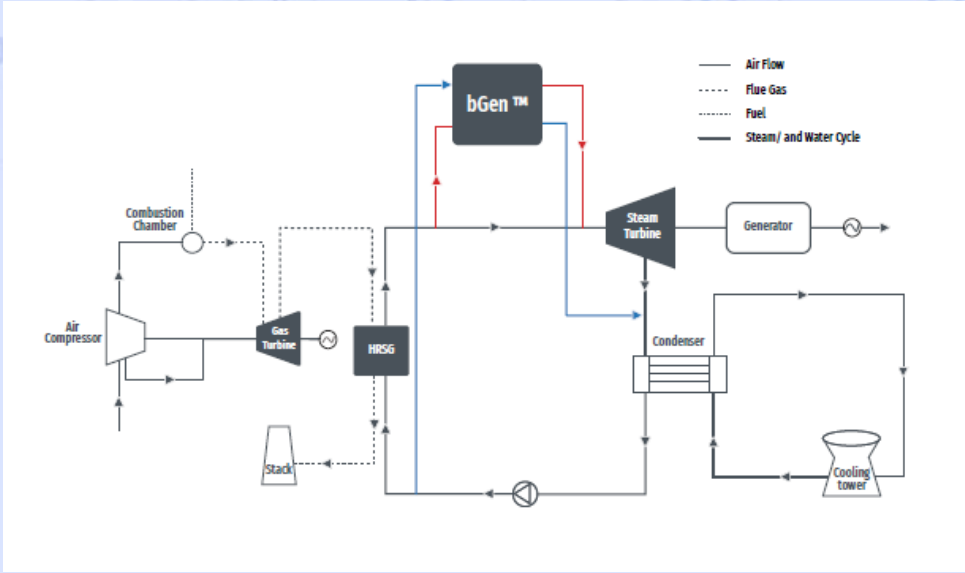
Location: Italy

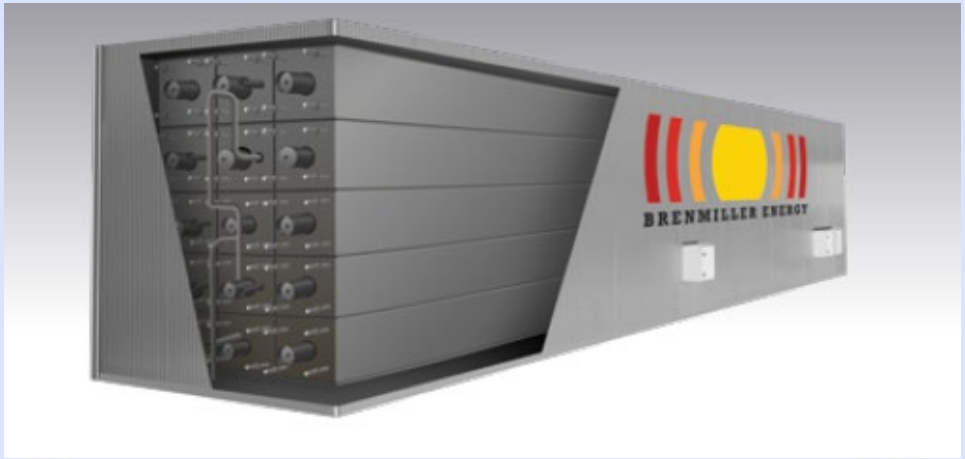
SOW: Feasibility Study

bGen™ is a patented high temperature thermal energy storage solution, incorporating three key elements: 1) Heat exchanger, 2) Thermal storage (crusehd rocks) and 3) Steam Generator.

Heat is stored in modular-sub-units, filled with grinded rocks. When the unit is charged, a controlled temperature profile is maintained, transforming the feed water flow into a steady and stabilized superheated stream.

The system controls the pressure and temperature of the steam, regardless of the unit charging level.



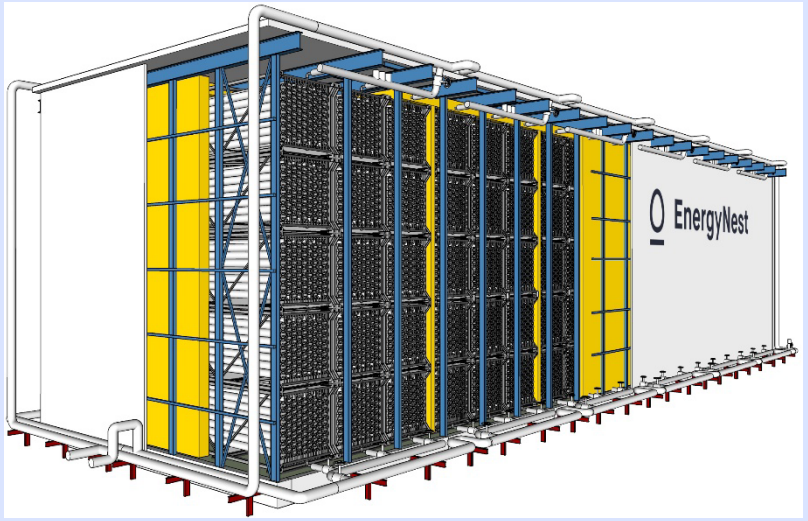


Thermal batteries for energy storage in power plants

The key component of Energy Nest Thermal Battery is a high-performance concrete-like thermal storage material (HEATCRETE®).

Energy in form of heat at high temperature is transferred to the Thermal Battery using a heat transfer fluid (HTF) inside pipes cast into the Thermal Battery elements. There is no direct contact between the heat transfer fluid and HEATCRETE®, and the thermal elements are compatible with common HTFs such as thermal oil, water/steam or compressed gas etc., which enable straightforward integration within a wide range of applications.

Multiple elements are combined in a Thermal Battery Module, which form the basic units that make up the Thermal Battery System. The modules are designed for easy transportation, on-site assembly and the majority of piping works to be prefabricated and pressure tested before installation.



Energy recovery from an oil pipeline

Client: **ENI**

Year: 2015

Contract type: LS of Engineering Services

Location: Italy

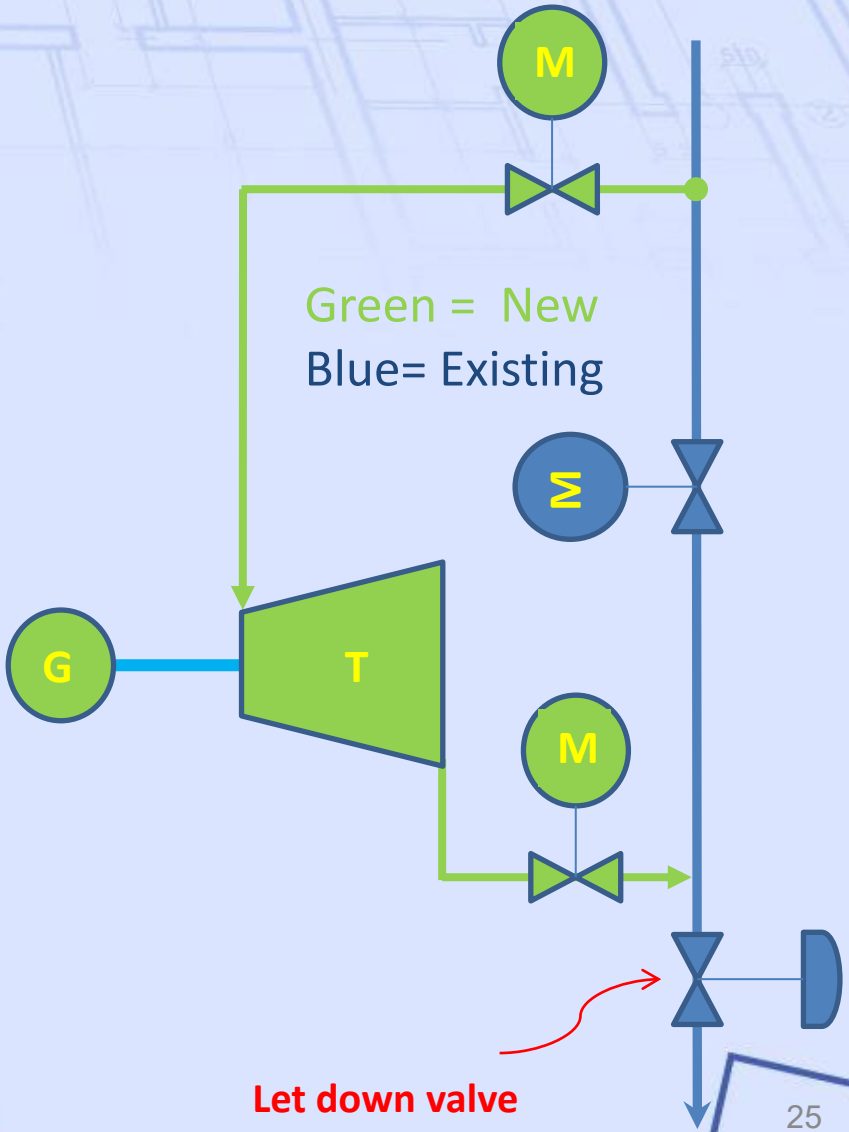
SOW: Feasibility Study

Monte Alpi-Taranto oil pipeline is 136,7 Km long.

The height difference between the highest and the lowest point at Taranto Refinery is 1300 m.

The study addressed the possibility to recover the hydraulic energy presently lost, due to pressure reduction across the pipeline end valve (let down valves), by installing a hydraulic turbine.

Addition of drag reducers to reduce the oil viscosity thus reducing pressure drop along the pipeline, in order to increase the energy recovered, was also investigated.



PV plants - Reference List

Client: **ENIPOWER**

Contract type: LS of Engineering Services

Location: Italy

SOW: FEED, Permitting

Centrale fotovoltaica, Mellitah (Libya)	Studio elettrodinamico centrale fotovoltaica Potenzialità impianto 2MW	Studio di fattibilità
Centrale fotovoltaica di Taranto	Impianto fotovoltaico da 1 MW. Ingegneria di dettaglio inclusa predisposizione specifiche tecniche per gare di appalto e tutta la documentazione da sottoporre agli enti competenti per l'ottenimento dei permessi	Progetto Definitivo (FEED)
Centrali fotovoltaica di Ferrandina	Impianto fotovoltaico da 4,5 MW. Ingegneria di dettaglio, inclusa predisposizione specifiche tecniche per gare di appalto e tutta la documentazione da sottoporre agli enti competenti per l'ottenimento dei permessi	Progetto Definitivo (FEED)
Centrale fotovoltaica Navicell Pisa Sud	Centrale fotovoltaica Potenzialità impianto 3,4 MW	Progetto definitivo (FEED)
Impianti fotovoltaici su tetti scuole Roma Sud	Impianti fotovoltaici su tetti di edifici scolastici Potenzialità complessiva impianti 1 MW	FEED
Centrale fotovoltaica Arezzo	Sistema di generazione fotovoltaico Potenzialità impianto 1 MW	FEED

Agiba (Western Desert) Solar Project

Client: **ENIPOWER**

Year: 2011-2012

Contract type: LS of Engineering Services

Location: Egypt

SOW: FEED

The stand-alone electrical grid at Aghar Oil Field, Egypt, is composed of a Power Generation System (PGS) and a set of Crude Oil Pumps (donkey pumps).

The PGS includes two different power sources, i.e.:

1) a 110 kW photovoltaic power plant
2) a 200 kW Caterpillar diesel generator.

The Photovoltaic (PV) field is composed by 504 modules, whose individual power is 220 W, arranged into 12 arrays.

Each array has a peak power of 9.24 kW, composed by two strings in parallel connected to a 10 kW inverter.

The project included the design of the Power Management System, a web application for remote control of the whole system.