SIMECO

RENEWABLE ENERGIES PROJECTS

Version: 1

Waste to Fuel Plant

Client: **ENI REWIND**

Year: 2020

Contract type: LS of Engineering Services

EMHS : 40,000

Location: Porto Marghera (VE), Italy

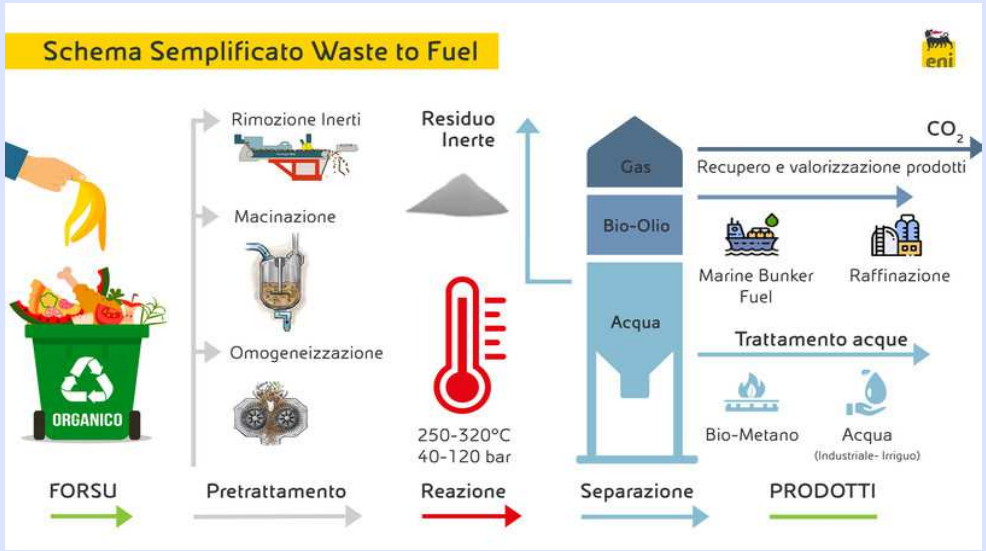
SOW: FEED

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

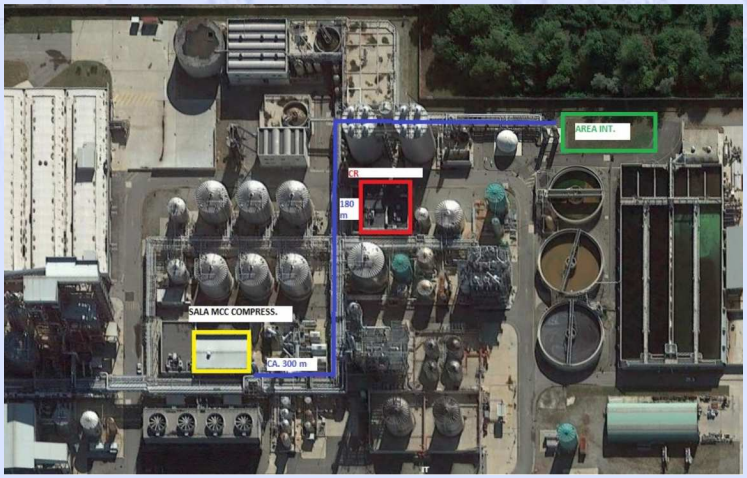
Contract type: LS of Engineering Services

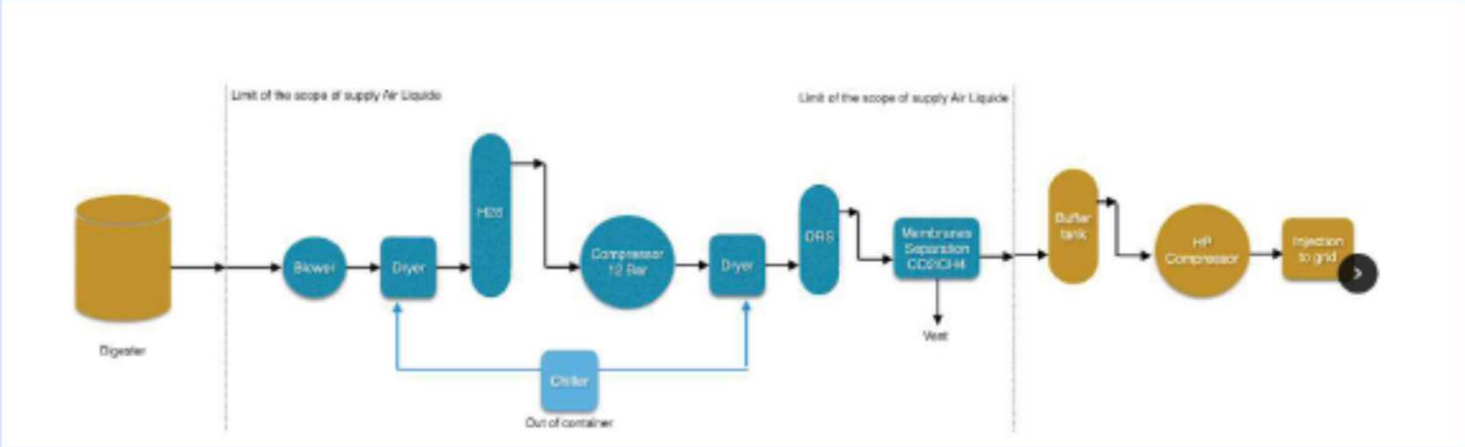
Location: Italy

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.





Hydrogen production in large scale power plants

Client: **ENIPOWER**

Year: 2019

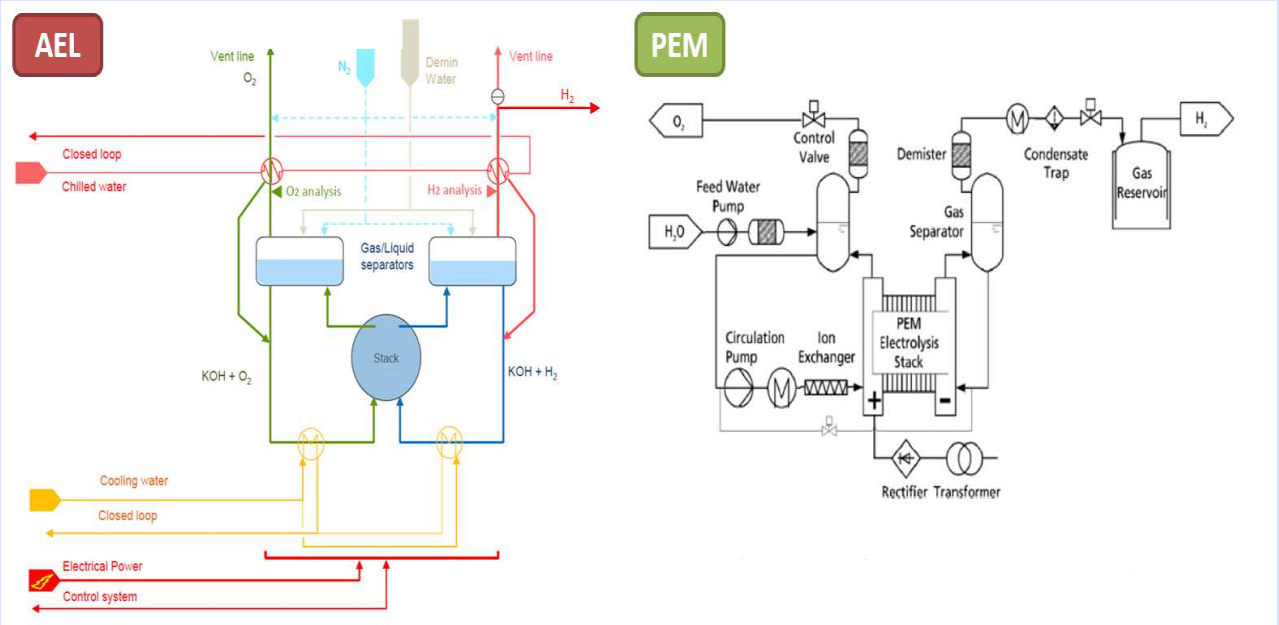
Contract type: LS of Engineering Services

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 has a shorter response time.



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

Client: **ENI**

Year: 2021

Contract type: LS of Engineering Services

Location: Italy

SOW: Feasibility Study

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 along with the crude oil.

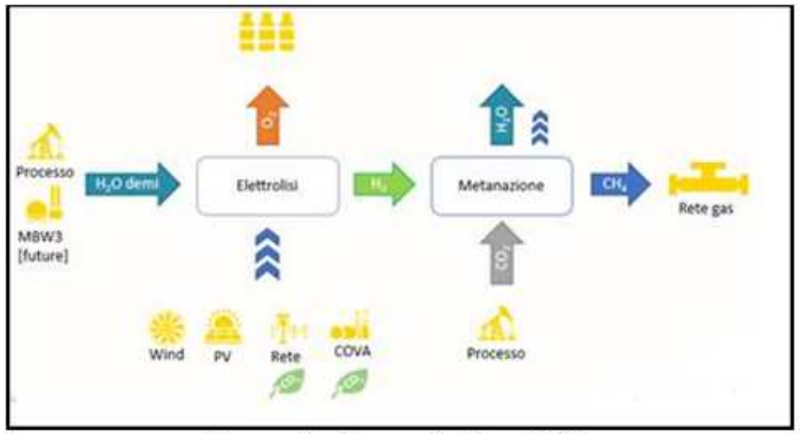


Figura 1 - Power-to-Gas (PtG)

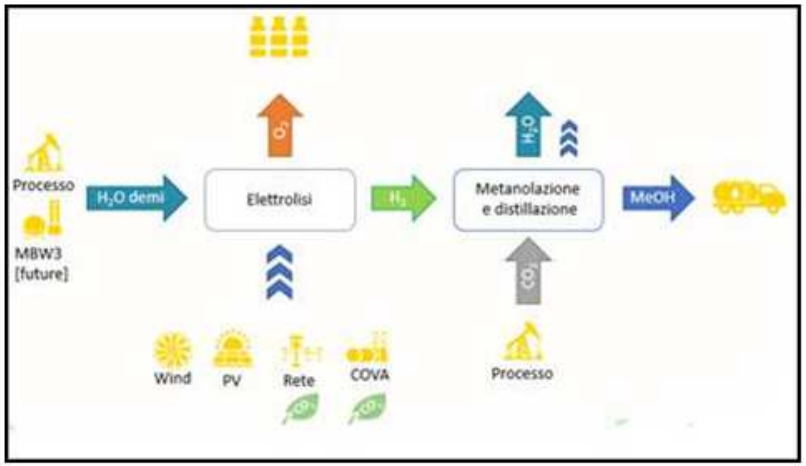


Figura 2 - Power-to-Liquid (PtL)

Blue Hydrogen Plant

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.

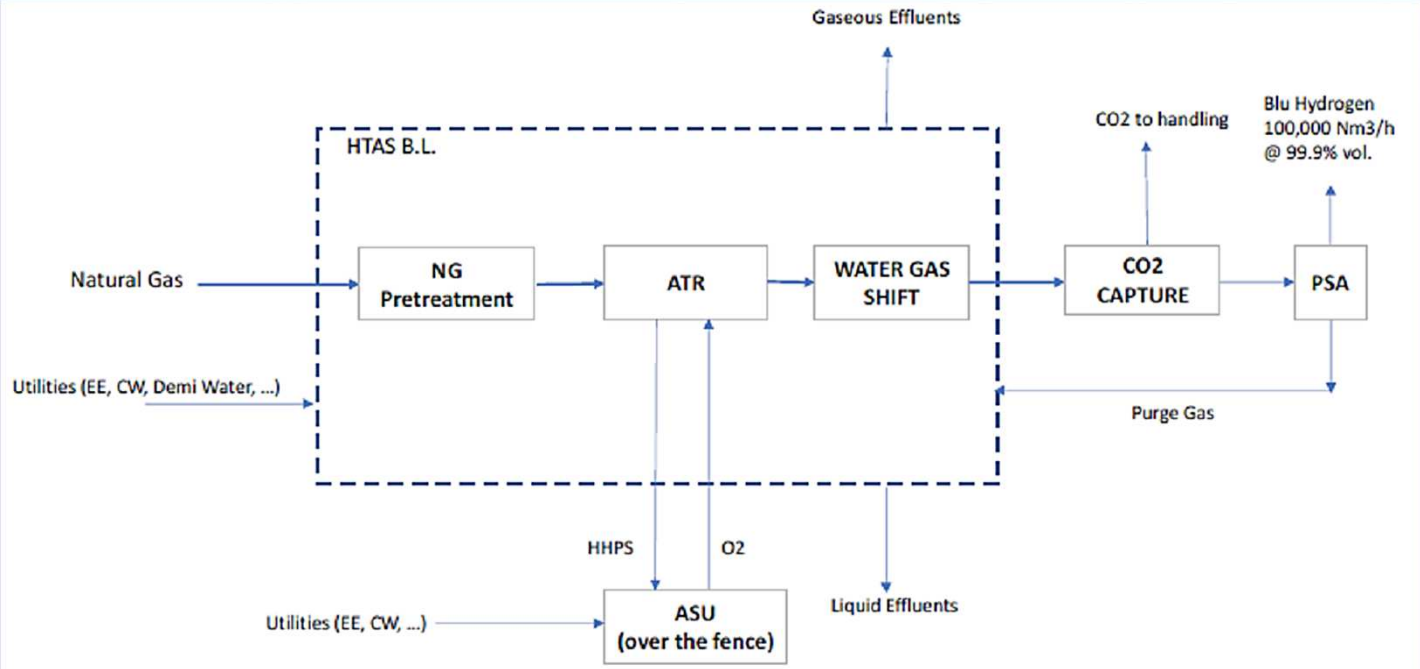
Client: **ENI**

Year: 2020

Contract type: LS of Engineering Services

Location: Italy

SOW: Feasibility Study



Green Methanol from Municipal Solid Wastes

Client: **ENI/ENIPROGETTI**

Year: 2019

Contract type: LS of Engineering Services

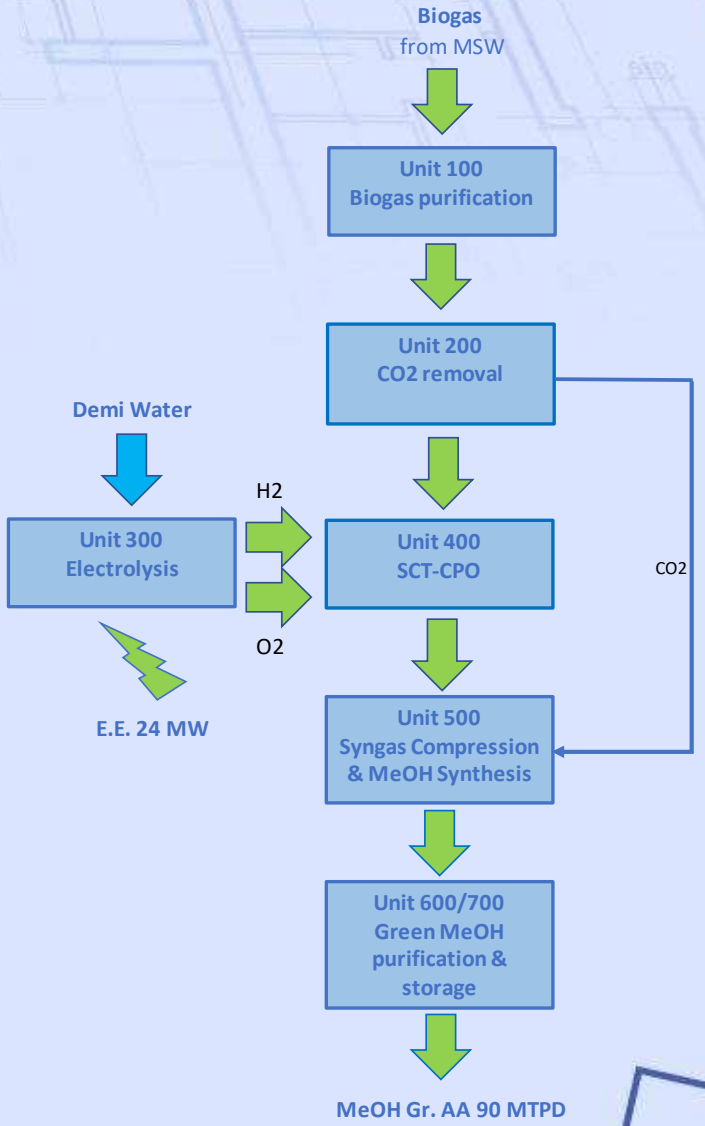
Location: Italy

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.



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.

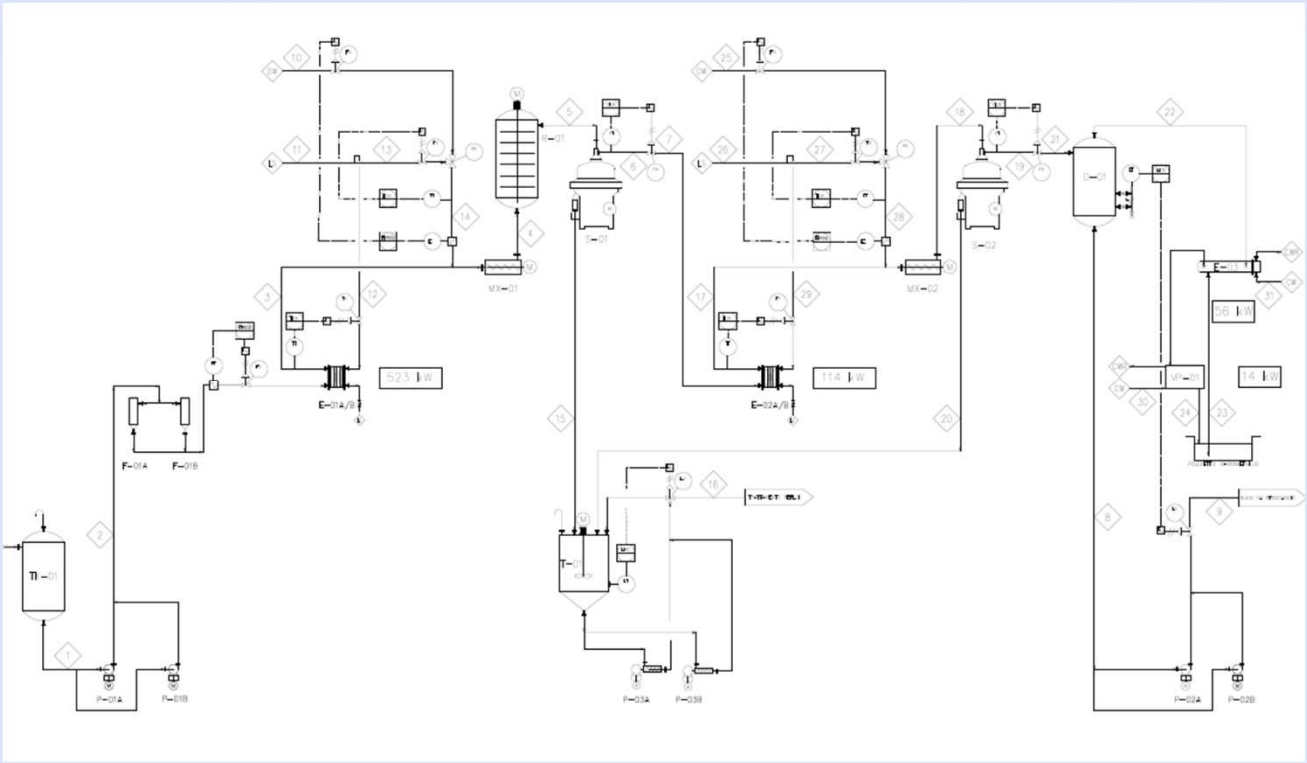
Client: **Eni S.p.a**

Year: 2019

Contract type: LS of Engineering Services

Location: Venezia Green Refinery, Italy

SOW: Feasibility Study and Basic Design



Unconventional Vegetable Oils – Oil pretreatment

Client: **Various**

Year: 2020-2021

Contract type: LS of Engineering Services

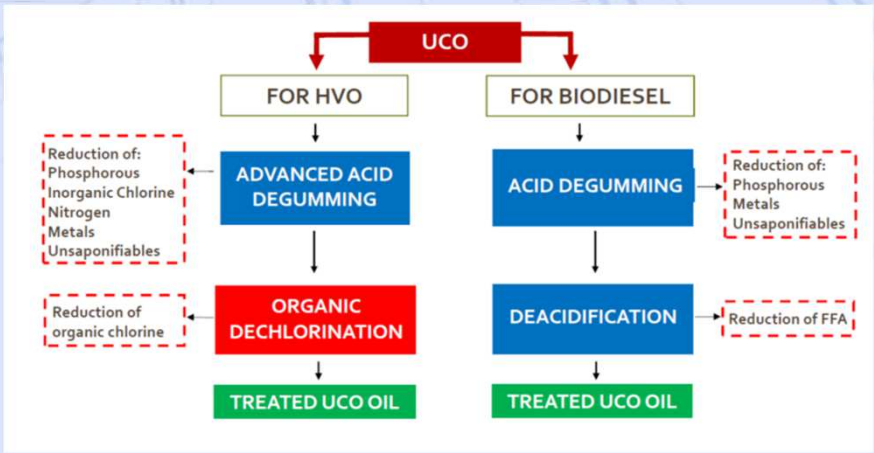
Location: Italy

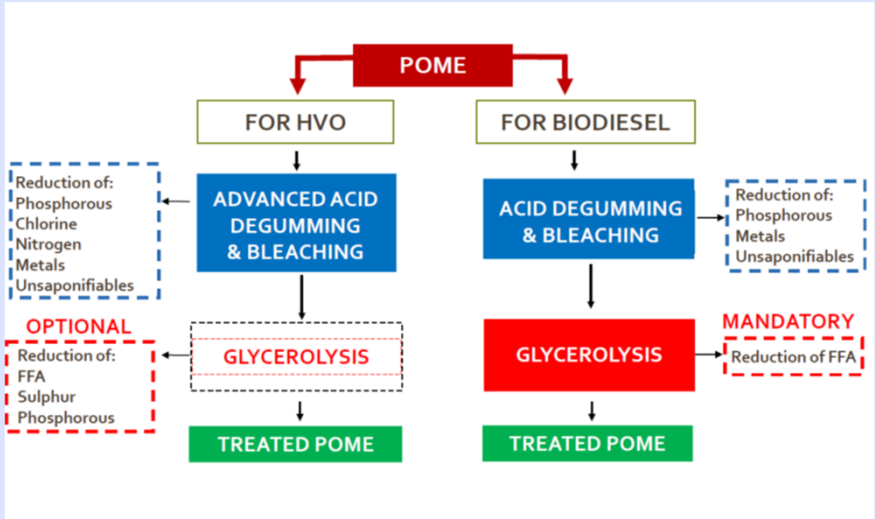
SOW: Feasibility Study and Basic Design

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.





Thermal Energy Storage in power plants

Client: **ENIPOWER**

Year: 2020

Contract type: LS of Engineering Services

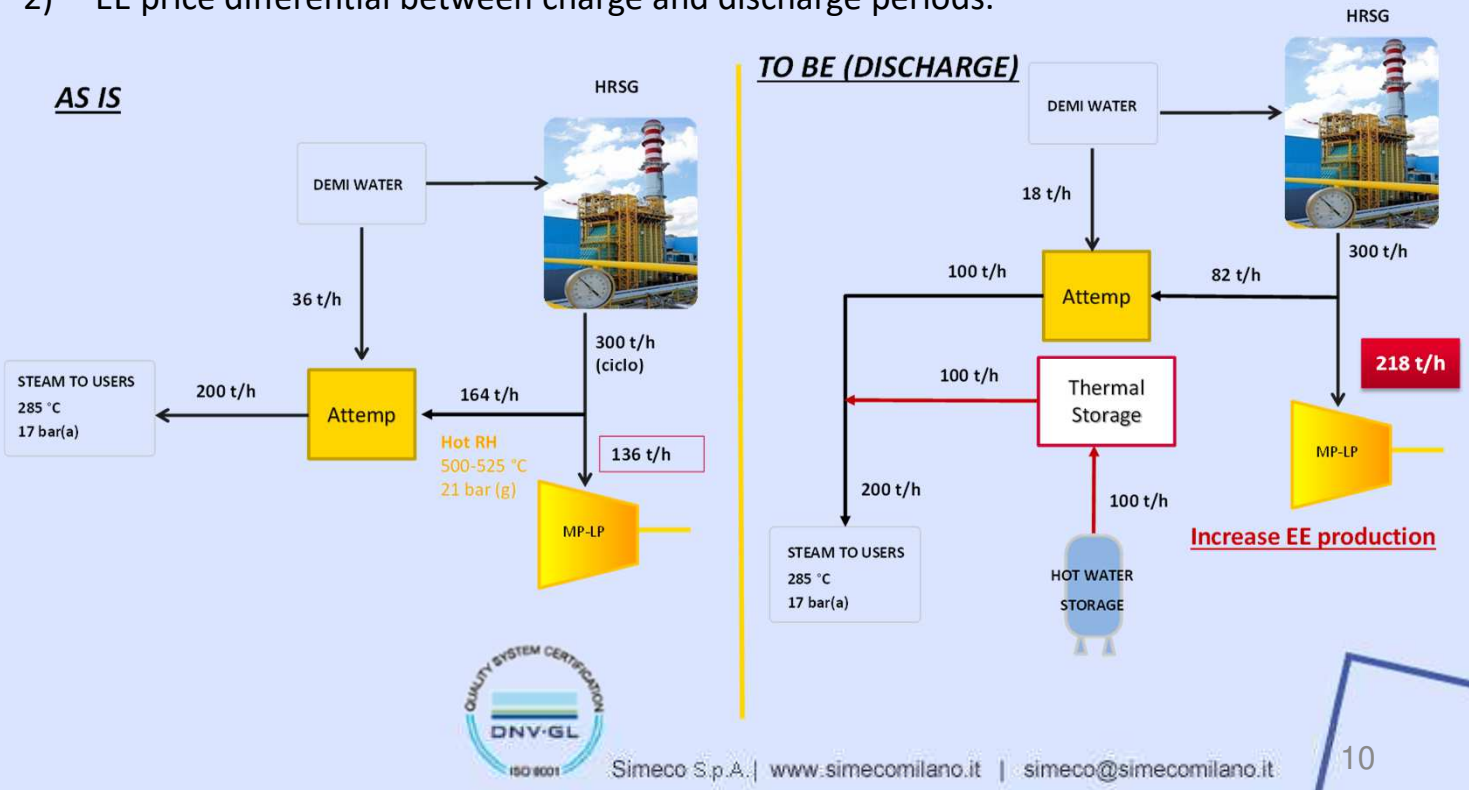
Location: Italy

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: less electric production when the price is low → steam used to charge the storage; maximize electric 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

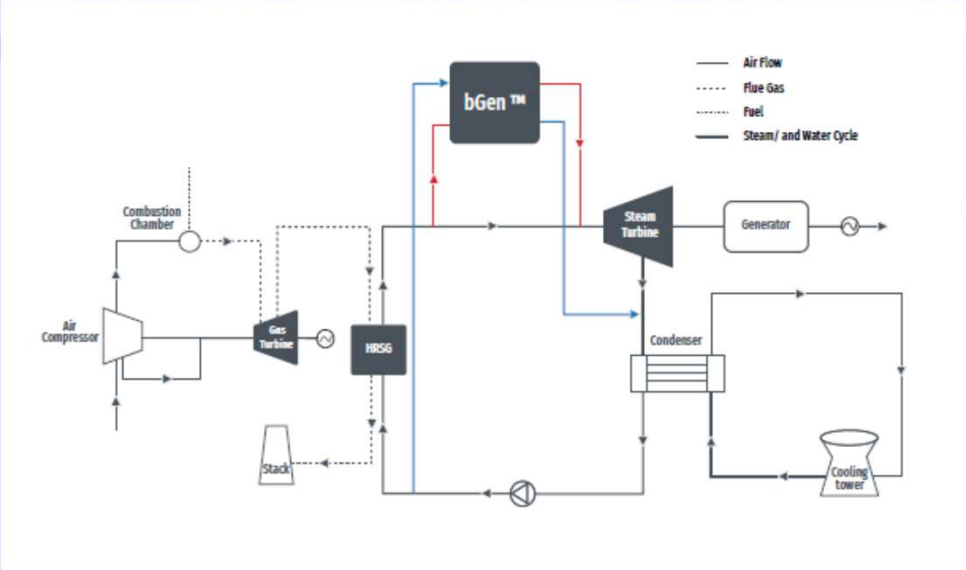
Location: Italy

SOW: Feasibility Study

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

Heat is stored in modular-sub-units, filled with crushed 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.

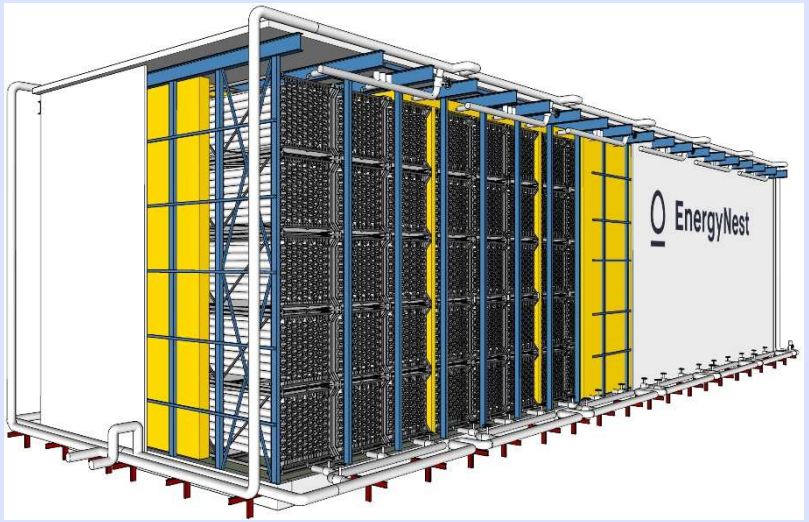


Thermal batteries for energy storage in power plants

The key components of Energy Nest Thermal Battery include a high-performance type of concrete-like 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 with steel piping 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

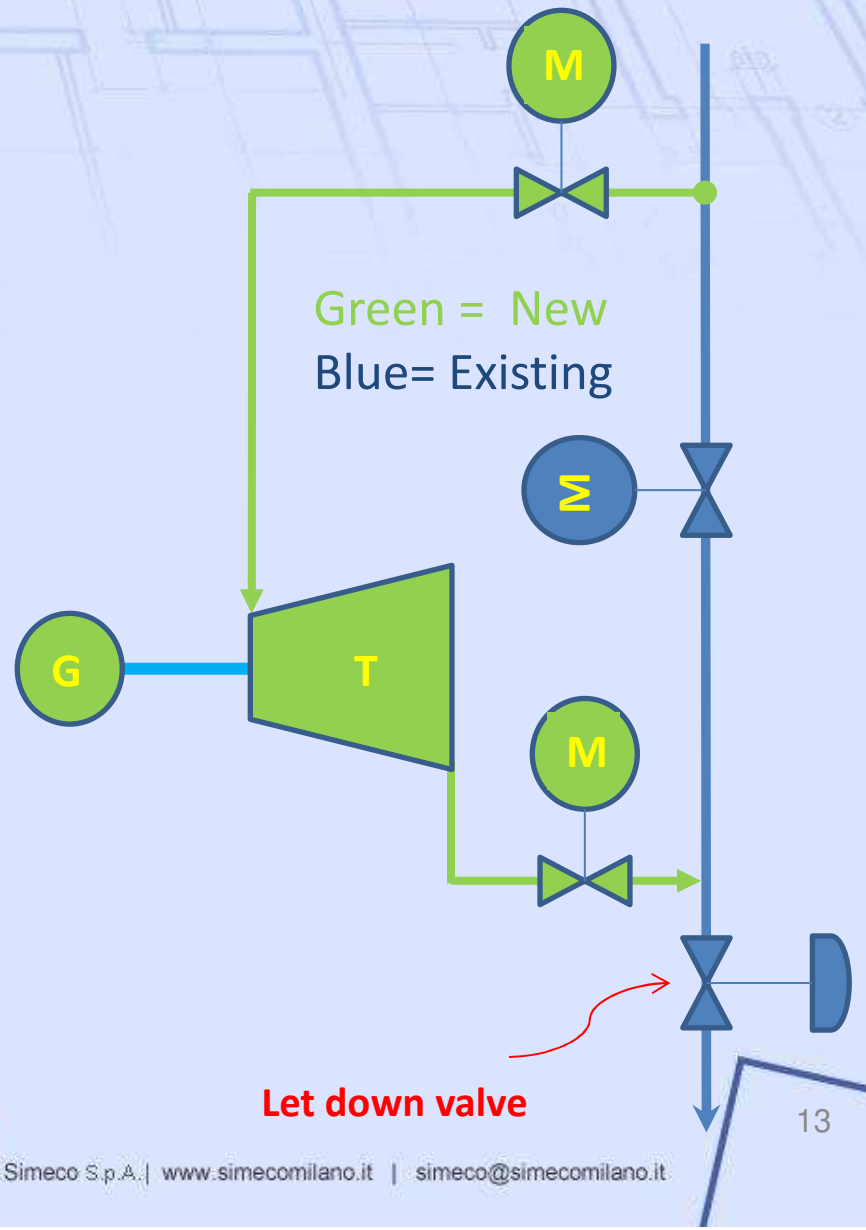
SOW: Feasibility Study

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.