

A strong and unique offering to deliver cellulosic ethanol projects based upon sunliquid® technology



Figure 1: Clariant's Commercial Cellulosic Ethanol Plant, Podari, Romania.

In today's growing efforts to limit global warming, action to reduce greenhouse gas emissions, especially in the transport sector, is inevitable. Cellulosic ethanol, an advanced biofuel, presents a low-emission, carbon-neutral solution. In many countries around the world, legislation already recognizes advanced biofuels to play an important role in decarbonizing the transport sector.

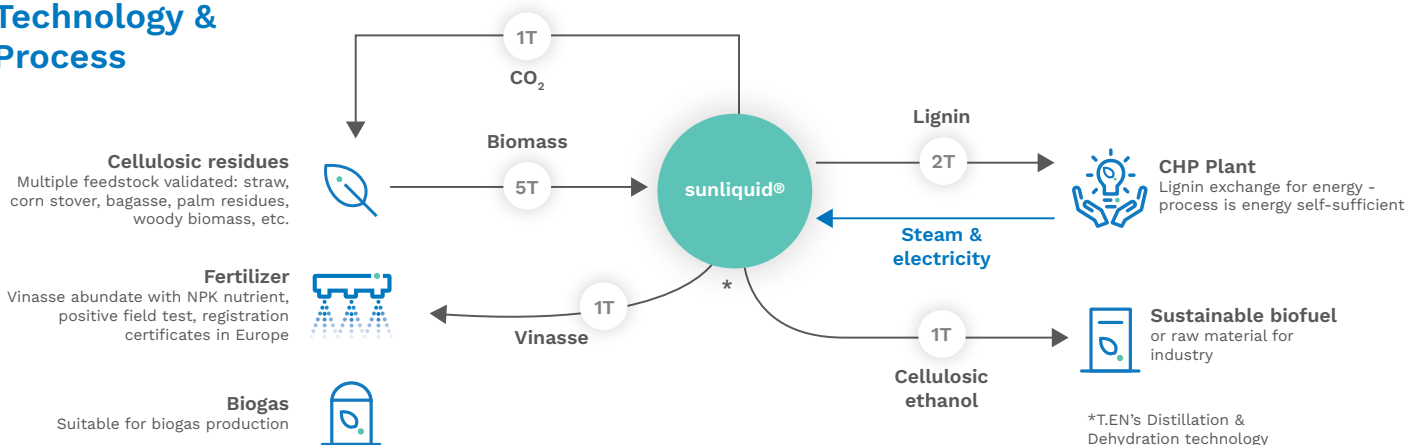
To support this action, Clariant and Technip Energies have signed a cooperation agreement in 2022 for the implementation of sunliquid® cellulosic ethanol license projects. Technip Energies is executing BDP in the frame of the licence agreement delivered by Clariant.

The agreement also covers project execution phase (FEED to EPC) where Technip Energies & Clariant can propose to the customer a bundled package combining EPC + sunliquid® license.

By choosing Technip Energies and Clariant customers can benefit from combining Clariant's proven technology with Technip Energies' experience with sunliquid® technology and proven capability as EPC contractor. It results in the following unique advantages:

- Single accountability point wrapping up the process and project guarantees
- Saving in time and in cost (possibility to overlap phases, experienced teams)
- Access to high end technology and EPC capabilities
- Possibility to go to SAF by plugging Technip Energies Hummingbird® technology

Technology & Process



sunliquid® Technology

Clariant's sunliquid® process is a highly innovative and sustainable technology to produce cellulosic ethanol from agricultural residues such as cereal straw, corn stover, or sugarcane bagasse. The cellulosic ethanol produced can be used as a drop-in solution for fuel blending and offers further downstream application opportunities into sustainable aviation fuel and bio-based chemicals.

Since 2012, Clariant has been operating its pre-commercial sunliquid® plant in Straubing, Germany, and has completed the construction of its first full-scale commercial cellulosic ethanol plant in southwestern Romania. The construction of the plant has been completed in October 2021, production start has been announced in mid-June 2022. The flagship plant, with a nominal plant capacity of 50 kta cellulosic ethanol, processes locally sourced straw.

Clariant licenses its sunliquid® technology platform globally. So far, five license agreements have been executed with renowned industry players in China, Poland, Bulgaria, Slovakia.

L+EPC full wrap package offer

Clariant and Technip Energies are offering a reliable business model to shorten project development time, reduce customer's risks and offer favored financing options for the implementation of sunliquid® cellulosic ethanol plants.

Beyond the core process offered by Clariant, Technip Energies is integrating all other units necessary for getting a full operational plant.

This contractual model (see Figure 2) allows the client to have a single point of contact and full coverage of performance guarantees until plant acceptance. It facilitates client project organization, de-risks client investment and allows a smooth project development.

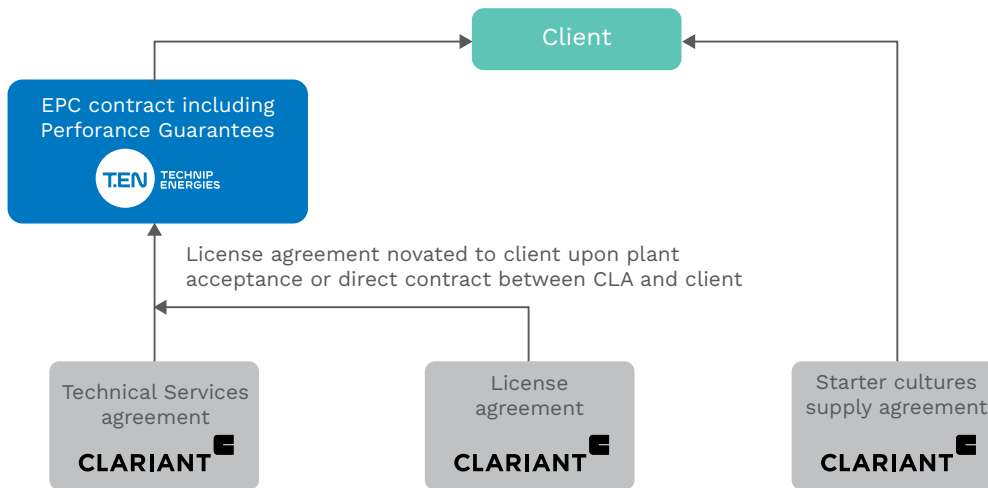


Figure 2: L+EPC Business Model type

Performance Benefits



Chemical-free pretreatment



Integrated enzyme and yeast production feedstock which are feedstock/process specific



Simultaneous C5 and C6 fermentation

Environmental Benefits



Energy self-sufficient process with no fossil-based energy sources



Up to 95% CO₂ savings compared to fossil fuel



120% CO₂ savings compared to fossil fuel with carbon capture



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