

Business Model Case Study 4: Forestry residues

Steeper Energy and Silva Green Fuel in Hurum, Norway

Introduction

Steeper Energy developed the Hydrofaction™ technology which converts organic wastes into advanced biofuels for heavy road transport, airplanes and marine engines. The technology has been licenced to Silva Green Fuel who is building a demonstration plant which will be commissioned in 2019. The plant will take residues from the forestry industry and convert it into renewable crude oil, which will then be upgraded and sold as road fuel. Capacity of the demonstration plant will be 4,000L per day. The plant will provide vital experience to test feedstocks, processes and the technology, ahead of upscaling to full commercial operation and rolling the technology out globally.

Business model canvas

The business model (details on next page) shows much resemblance with the potential model for the AgriMAX biorefinery supply chain, in terms of complex international partnerships. The developer Silva Green Fuel and the technology provider Steeper Energy struck a deal to develop the technology further, investing both and sharing the risk of upscaling the technology – with anticipated economic benefits for both partners when commercial scale application is technically feasible and evidenced with operational data.

Drivers and barriers

National- and business targets to reduce carbon emissions are the driving forces behind this business initiative. The sustainability of the business model depends on the presumption that biofuels emit less carbon than fossil fuels, which needs to be substantiated by evidence of replanting biomass at the same or higher rate than currently harvested by the forestry industry supplying the residues to Silva Green Fuel.



Circular business model canvas: Steeper Energy and Silva Green Fuel, Forestry residues

Key partnerships

The demonstration plant has a complex international partnership structure. The plant is realised by Silva Green Fuel, a joint venture between the Norwegian Statkraft and Swedish Södra. The joint venture combines Statkraft's expertise in renewable energy with Södra's expertise in- and supply security of forestry materials. Steeper Energy, a Canadian-Danish company, licences their technology to Silva Green Fuel i.e. it is a resource acquisition partnership. For Steeper Energy, the collaboration offers the opportunity to collect operational data to reduce risk for future investors in full-scale application of the technology, in the competitive and uncertain context of emerging biofuel markets. The demonstration plant is financed via a partnership with Enova.

Activities to create, distribute, sell and recover values

Steeper Energy solves problems by developing new technology. Silva Green Fuel produces biofuel to specification for their customer segments.

Physical, financial, human and/or intellectual assets needed to create, distribute, sell and recover values

Demonstration plant. Intellectual property of Hydrofaction™. Expertise in renewables and forestry markets. Committed financial investment.

Value added proposition, e.g. economic, technical, social and /or environmental value of product or service

The demonstration plant will convert residues from the forestry industry into renewable crude oil, through the innovative technology of Hydrofaction™. The crude oil has low oxygen content and can be processed in conventional oil refineries. The expected price is less than \$70/barrel. Crude oil can be used by customer segment [A]. Upgraded with hydrogenation, the biodiesel is expected to cost less than \$90/ barrel and can be marketed to customer segment [B]. Customers can reduce their carbon emissions with this biofuel. This fuel has the added benefit of easily integrating into existing petroleum infrastructure and technologies due to its similar physical characteristics. The demonstration plant will also generate operational data. Steeper Energy aims to use this as evidence to reduce investor risk for their trade-marked technology. Investors (customer segment [C]) can also benefit from the high conversion efficiency of calorific value from feedstock into oil, and low water input requirements. The demonstration plant will further develop the technology and processes and use this data to de-risk the full-scale commercial plant for Silva Green Fuel.

Types of customer relationships

Forthcoming.

Communication, distribution, sales and other channels used to reach customers

Forthcoming.

Customer segments

[A] Renewable crude oil could be used directly by customers, in large compression engines used for electricity generation and in marine- and rail transport. This is a potential future market. [B] First, the upgraded biofuel will be marketed to heavy road transport, a growing mass market that is under legislative pressure to reduce carbon emissions. Later the jet fuel market may be explored. [C] Future investors and developers of advanced biofuel plants.

Types of costs to create, distribute, sell, and recover value (e.g., financial, social and environmental costs)

The demonstration plant is an investment of €50.6 Million, and additional costs for process- and technology development, market research and taking ownership of intellectual property are anticipated. Common operational costs such as staff, insurance, energy bills etc.; expected to decrease per unit of produce with the upscaling of the plant, reaching economies of scale.

Types of benefits for your business and the mechanisms required to capture them

Silva Green Fuel: Income from sales of biofuels.
Steeper Energy: Licence fees.
Carbon reductions realised by using advanced biofuels instead of fossil fuels.

Costs and benefits created and shared in the wider circular supply chain

This business model helps to monetise forestry residues and solves an organic waste issue. The technology also has the potential to competitively process other organic wastes irrespective of high/ varying moisture contents, such as segregated urban food waste, agricultural wastes and algae.

Context: Wider costs of- and benefits to the economy, society and/or environment

Carbon pricing and targets for renewable energy usage are important drivers for the viability of advanced biofuel plants. Companies' carbon reductions targets also drive technology uptake. The use of waste-based biofuels can be more sustainable but, in this case, depends on the replacement rate of trees harvested in the forestry operations.