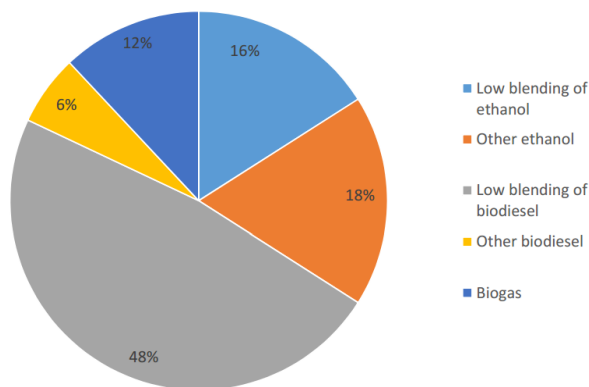


Biofuels in the Sweden

Overview of Biofuels in Sweden

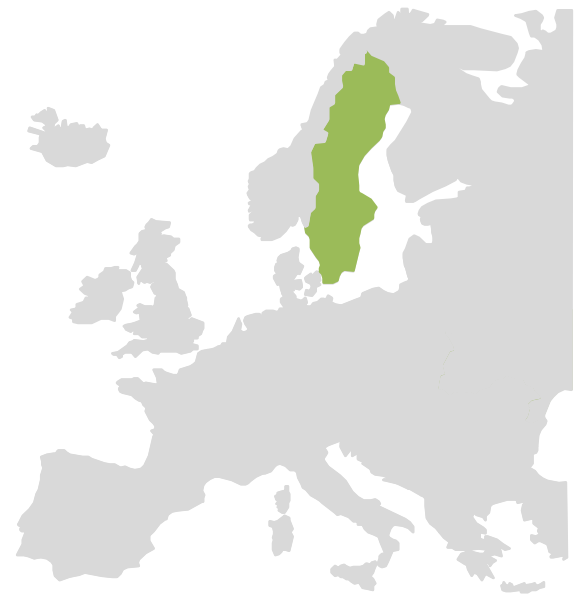
The main biofuels used by vehicles in Sweden are (in order), HVO (hydrotreated vegetable oil), FAME (fatty acid methyl ester), ethanol, and biogas. In recent years, the renewable energy used in the transport sector is increased, in 2014, the share was around 12.5% (11.7 TWh), up from 10.7% (9.7 TWh) the year before. The content of almost all petrol is 5% ethanol, while most diesel fuel is blended with 5% FAME and together with varying shares of HVO, resulting in a total average share of biodiesel at 13%. The share of biogas in vehicle gas is on average 74% in 2014. (Swedish Energy Authority, 2015)



Share of Alternative Fuel Use in 2014 (AMF Annual Report 2014) Low blending of ethanol (13.7%); Other ethanol (high blends, 2.6%); Low blending of biodiesel (incl HVO 63.9%; of which FAME 24.4% and HVO 39.5%); Other biodiesel (11.2%); Biogas (gas and small share of liquid, 8.7%)

Biofuels policy, regulations, market development

Sweden has the long-term goal of generating zero net GHG emissions by 2050. A milestone for this goal is that by 2030 Sweden should have a vehicle fleet that is independent of fossil fuels. A governmental investigation outlined in 2013 that this milestone could be realized by powering around 50% of passenger cars running on biofuels and 20% by electricity, and more than 80% of urban buses by electricity. Such a development would require about 20 TWh of biofuel production. Sweden's large forestry industry is expected to be the main source for feedstocks enabling a sustainable and resource efficient energy system. Sweden has had varying tax exemptions for biofuels since the early 1990's, which is recently extended until 2018. In addition, there are ongoing discussions to develop regulations based on the above investigation.



Country information

Sweden	
Population	9,775,572
GDP (per capita)	\$47,229
Final Energy Consumption (Mtoe)	32,38
Final Energy Consumption in Transport (Mtoe)	8,33
Final Energy Consumption in Transport Share	26%
Biofuels share in Transport Fuels	
Fuel-Mix	biofuels electricity

Advanced biofuels plants, demonstration and pilots

Plants and Demonstrations

The **GoBiGas** facility, located in Göteborg and owned by Göteborg Energi AB, was inaugurated on 12 March 2014. Converting waste wood to SNG via gasification for the methane production. Capacity 20 MW of clean SNG. After some start-up problems, in continuous production delivering SNG to the gas grid. The gasification has during 2015 run for more than 4000 hours.

SunPine AB has pioneered a "Wood to Wheel" renewable diesel process technology using crude tall oil. The company is owned by Preem, Sveaskog, Södra and Kiram AB, and operates a plant in Piteå. Capacity 100 000m³/year. Preem AB refines the raw tall oil diesel to renewable diesel, and (from 2015) renewable gasoline, in its refinery in Göteborg. Their capacity was increased to 200 000 m³/yr in 2015.

Lantmännen Energi in Norrköping (total production 235 000 m³/yr) has, since 2015, a smaller share of advanced ethanol production, based on industrial starch-rich waste material. By using waste- and biobased process energy and capturing carbon-dioxide (since 2014), CO₂ emissions are reduced by about 95%. Similar advanced ethanol production is currently under commissioning at St1 in Göteborg.

Perstorp use in Stenungsund, since 2014, partly renewable methanol in their production of RME, which together with efficient production, gives CO₂ emission reductions above 60%.

Pilots

Chemrec BioDME demonstration: Luleå University of Technology's holding company took over Chemrec and its black liquor gasification (start 2005/>26000 op. hours) and BioDME plant (start 2011/ 10000 op. hours) in 2013. LTU has entered a long-term partnership with Chemrec and also the Danish company HaldorTopsoe. The plant continues operation. Capacity 4 ton DME/day

SEKAB has in the Biorefinery Demo Plant in Örnsköldsvik developed technologies to produce cellulosic ethanol from many kinds of raw materials, including wood chips, straw and sugarcane bagasse. They are involved in several pilot studies with companies from around the world. Capacity 500 liter/day.

Chalmers University runs since 2007 a 2 MW pilot plant for indirect gasification of wood residues at the Chalmers campus in Göteborg, for research and development (2000 op.hours/yr).

Cortus Energy upgraded in 2015 their integrated production flow plant (500 kW) for drying, pyrolysis and gasification of different biofuels in Köping.

Biofuels ministries, organisations and agencies in Sweden

f3 The Swedish Knowledge Centre for Renewable Transportation Fuels

STEM - Swedish Energy Agency

SVEBIO - Swedish Bioenergy

Associaton

Swedish Transport Administration

Vinnova

Key biofuels industry and research stakeholders

Agroetanol

Bioenergy International

C5 Ligno Technologies

Chemrec AB

Chalmers University of Technology

Energiforsk AB

Göteborg Energi AB

KTH Royal Institute of Technology

Luleå University of Technology: LTU

Lund University

Perstorp

PREEM

Renewable Energy Technology

International

Scania

SEKAB BioFuel Industries

Swedish University of Agriculture; SLU

SP Technical Research Institute of

Sweden

Sveaskog

Swedish Biofuels

SÖDRA

Taurus Energy

Vattenfall

Volvo Technology