

Advanced Biofuels and more from biorefinery – cooperation is the key to success

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St1 Oy



Vision, strategy
and business areas

St1 home market

ST1

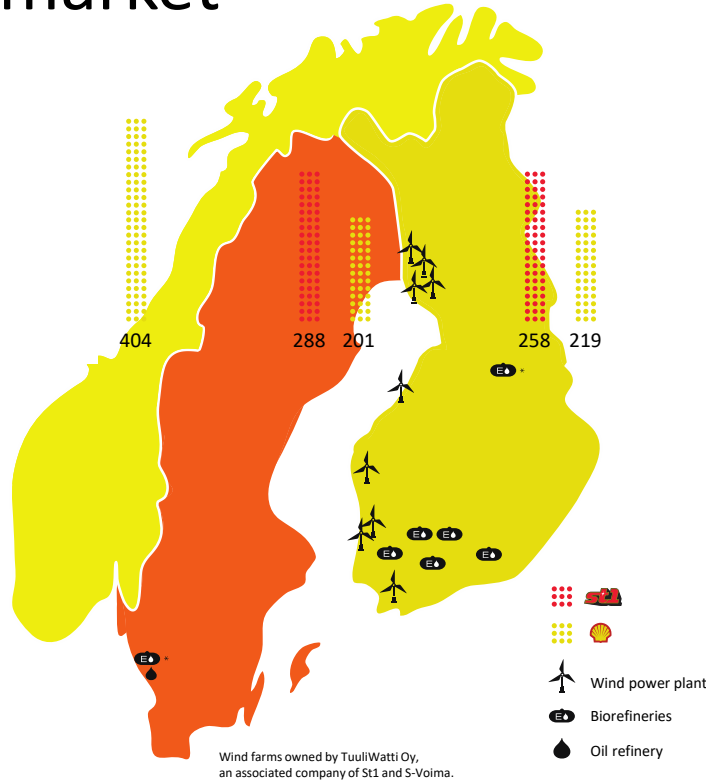
Home market consists of Finland, Sweden and Norway.
Headquarters in Helsinki.
Employs more than 770 people.
Operations are strengthened by strategic long-term partnerships in various areas.

STATION NETWORK

Total of ca. 1300 St1- and Shell-sites in Finland, Sweden and in Norway.

ENERGY PRODUCTION

Biorefineries producing waste-based advanced ethanol. Industrial wind power plants. Geothermal pilot heat plant under construction. Oil refinery in Sweden.



MARKET SHARES 2018

FINLAND

Petrol	23%
Diesel	19%
Light fuel oil	21%

SWEDEN

Petrol	19%
Diesel	15%
Light fuel oil	22%

NORWAY

Petrol	23%
Diesel	20%
Marine gas oil	22%

KEY FIGURES 2018

Net Sales, MEUR

6,885

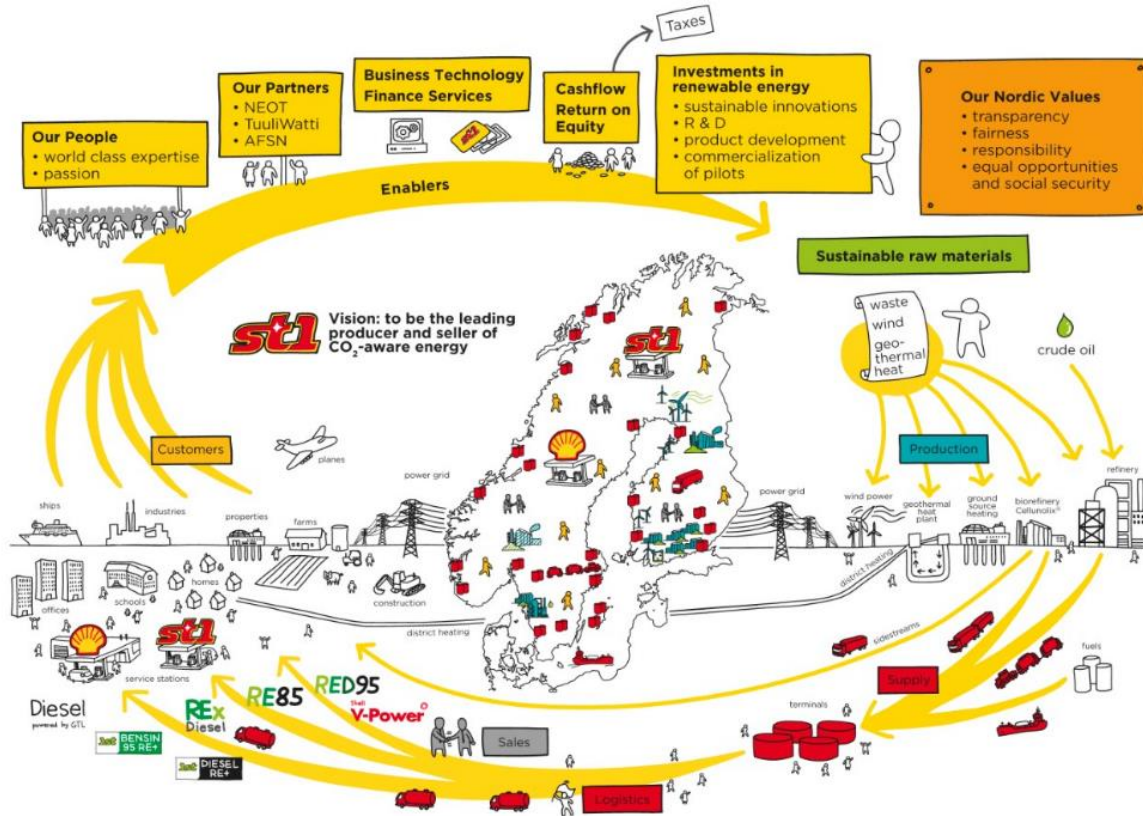
Profit for the period, MEUR

55.3

Return on Equity, %

7.0

STI VALUE CHAIN



[St1 value chain video](#)



St1 vision: "To be the leading producer and seller of CO₂-aware energy"

Our goal is to

- Develop and commercialize functional and environmentally sustainable solutions
- Deliver these solutions profitably

Each solution must be

- Technically ready for use today
- Ecologically and ethically sustainable
- Logistically feasible

$$E = St^1$$

St1 Biorefinery Business Development & Production



St1 Advanced Ethanol Production in Circular Economy

- Over a decade St1 has developed waste based advanced ethanol production concepts for various waste feedstocks.
- Biorefinery concept and technology development is done hands-on from lab to pilot and furthermore to demonstration scale ending up to a commercial replication.
- Current development focus is in
 - new feedstock
 - Process enhancement
 - own enzyme onsite production
 - biorefinery side products to valuable renewable products.
- Development is made in partnership with world class commercial and academic partners.

Waste & process residues sources



Food Industry & Retail



Municipal & Commercial



Wood Industry



Recycling

Feedstock & Sourcing Partners

St1 Biorefinery Solutions



Etanolix®



Bionolix®



Cellunolix®

Technology & Development Partners

Products and co-products

Ethanol

Biogas

Heat & Power

Advanced Biofuels & Renewable Energy

Animal Feed

Soil Improvers

Fertilizers

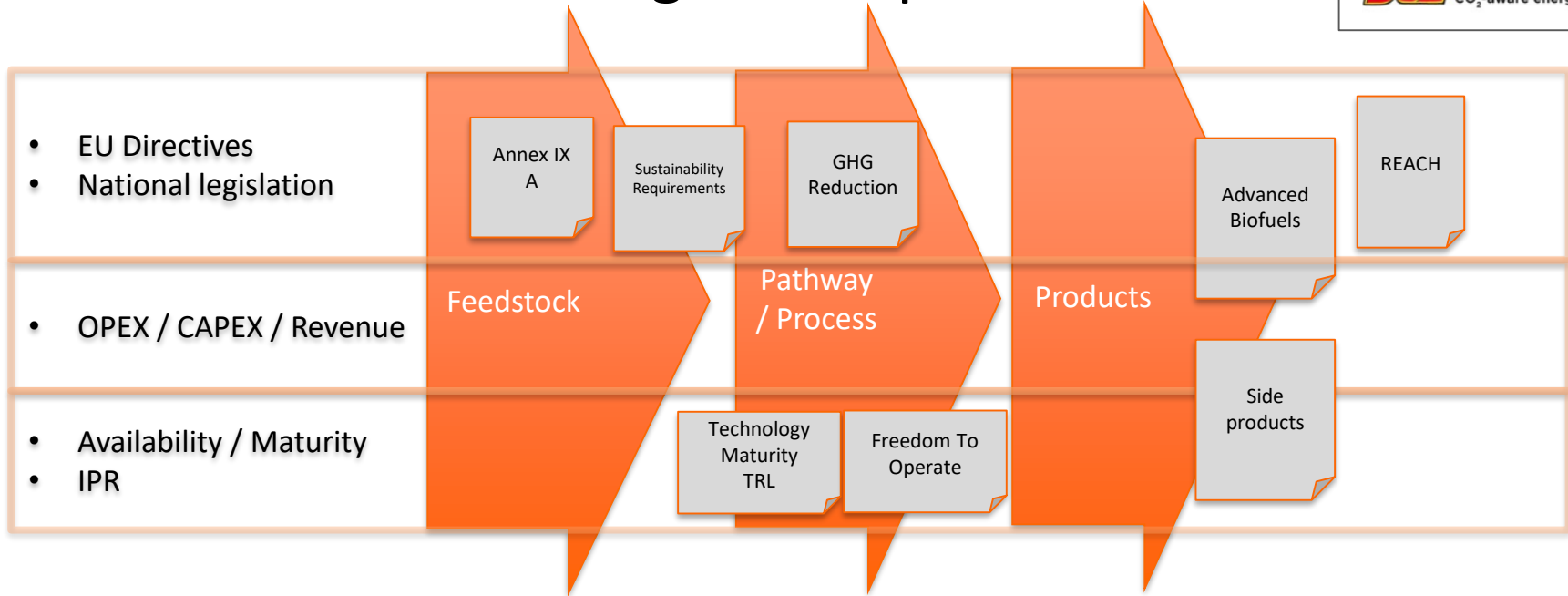
Agriculture & Nutrient Recovery



Future Products

Off take & Development Partners

Solid Biomass Refining Development

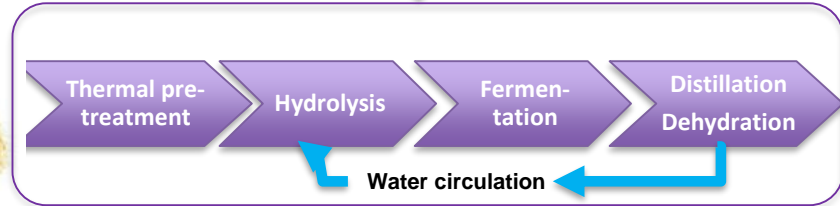


- St1 Follows global advanced biofuels feedstock, technology and product market development with special focus in Nordics (sawmill residues) and Thailand (cassava starch mill residues).

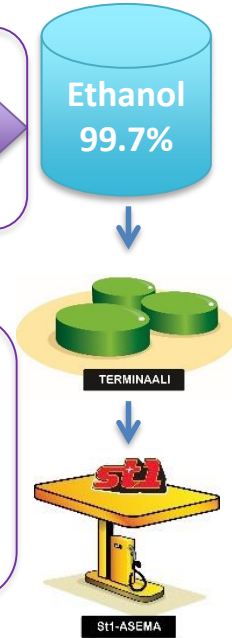
St1 Cellunolix[®] process is optimised for softwood saw dust



Energy	Additives	Utilities
<ul style="list-style-type: none"> • steam • electricity 	<ul style="list-style-type: none"> • enzymes • yeast • chemicals 	<ul style="list-style-type: none"> • water • cooling water

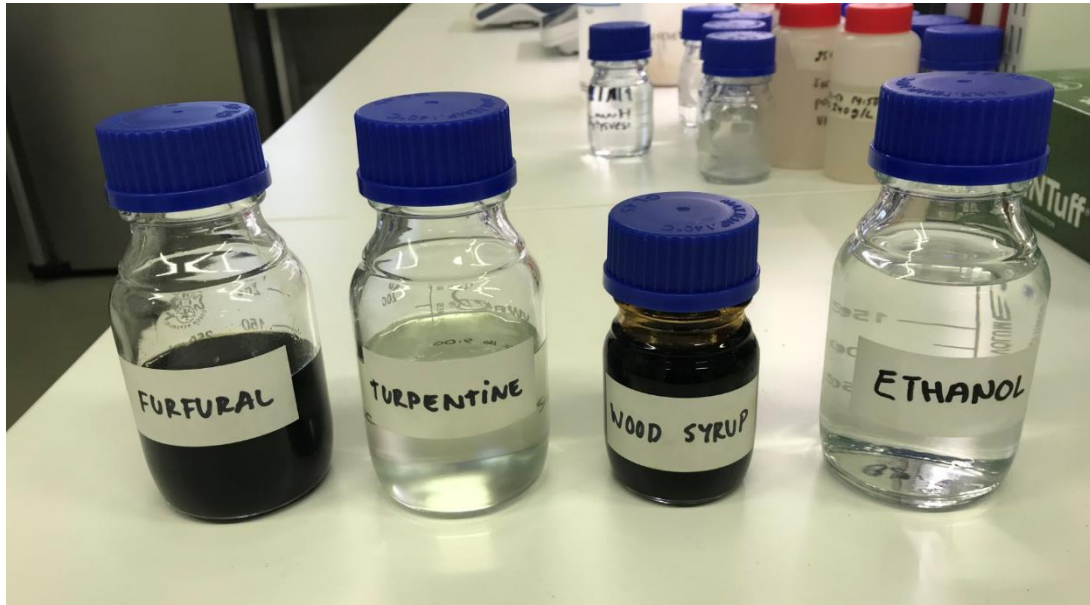


Biorefinery products:	Waste water
<p><small>T1_Cellunolix_FULL_2m14s_WEB</small></p>	<ul style="list-style-type: none"> • anaerobic digestion • existing waste water treatment plant • water systems



Cellunolix® Products

Sustainable & biobased solutions for different uses and applications



But how to get real sales?



Cellunolix[®] Wood Vinasse

- Sustainable **organic** nitrogen fertilizer enhances sustainable agriculture and food production

Fertilizer company

Farmer



St1 Cellunolix[®] lignin – Research co-operation

- St1 lignin research started in May 2017
- Wide co-operation with companies, research institutions and universities on lignin utilization
- Information on lignin applications and lignin quality
- Several approaches on lignin utilization
 - Lignin to pellets to replace coal
 - Lignin to bio-oil
 - Lignin biochemicals and biomaterials
 - Lignin to biogas and butanol
 - Lignin to replace bitumen



Carbon Cycle 2020-project

CO2 aware ecosystem & value chain building through St1 Biorefineries

BUSINESS
FINLAND

Project schedule: 2/2020 – 2/2022
Project Budget: 3,8 M € (Business Finland support 40 %)
Personnel resources: 16

WP1 Biorefinery ecosystem
and value chain building
from feedstocks to products

WP2 Lignin recovery and
valorization from new
biorefinery process

WP3 Thermochemical value
chains to produce drop-in
biofuels

WP4 Enzyme business
development for existing
and future biorefineries

Results:

New biochemicals and
bioproducts to replace
fossil based chemicals

Valorization and
commercialization of
biorefinery products to
create more value

New commercially ready
technologies to produce
drop-in biofuels

Profitability
improvements of current
biorefineries

Commercialization &
sale of St1's enzyme
know-how

Collaboration projects:

Kemira Oyj
Move to Renewable
Raw Materials

Soilfood Oy
High concentration
organic fertilizer from
biorefinery side streams

University of Oulu
Parallel Use of
Fractionated Lignin in
multiple application

Fifth Innovation Oy
Valuable end-products
from activated lignin
foams

Other collaboration partners:

Fertilizer
companies

Feedstock
producer
companies

Technology
developers

Plastic
producers

Enzyme
producers

Universities &
research centers

Chemical
manufacturers

New biorefinery products:

Biobased chemicals

Organic fertilizers

Enzymes

Biobased plastic

Biobased resins

13 Biofuel components
Biobased bitumen for asphalt applications
New biobased materials for construction
Activated carbon
Biobased urethane
New animal feed components





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