The future is our most important market
Refining with a sustainable vision

Sören Eriksson
Preems production and sales

Refining
- 80% of the total refining capacity in Sweden
- 30% of the total refining capacity in Scandinavia
- 2/3 of the production is exported

Export
- Supply of app. 15% of the energy consumption in Sweden
- Deliver app. 50% of all sold petroleum products in Sweden
- Total market share app. 30%
- 400 gasoline- and och 200 dieselstations for commercial vehicles
Swedish Oil Refining

18 Mtonnes

- Preem refinery
  Gothenburg

Preem refinery
Lysekil

4.5 Mtonnes

ST1 Gothenburg
Preem refineries
Modern, environmental- and energy efficient

The Preem refineries emits:

20% less carbon dioxide
70% less nitrogen oxides
90% less sulphur oxides

... per produced unit, compared with the average European refinery.
Preemraff Lysekil
Preemraff Gothenburg
VÅR VISION
Preem leads the transition into a sustainable society
EU:s intention?

20/20/20 – 2020
• 20% renewable share of the energy consumption,
• 10 energy % i transport fuels per MS Sweden reached abt. 12 % 2012.
• 20% increased energy efficiency (9% until 2016, base year 2001-5)
• 20% reduction of GHG, base year 1990

Unfortunately there is less and less interest from the EU member states for the original intention, regarding fulfilling the roadmap into a sustainable society, with a decreased amount of GHG, no or less interest in the security of supply question and last a less interest in the development of rural development by more and more special interests.

This year a new proposition from the commission dated 22/1 2014
EU-commission propose a 40 % reduction of GHG until 2030 (base year 2030)
The Commission propose only one target for renewable energy, 27 % of the energy used 2030, shall be renewable.
No target whatsoever for an increased energy efficiency and a decreased energy consumption.
A cost-efficient pathway towards 2050

80% domestic reduction in 2050 is feasible
- with currently available technologies,
- with behavioural change only induced through prices
- If all economic sectors contribute to a varying degree & pace.

Efficient pathway:
-25% in 2020
-40% in 2030
-60% in 2040

Källa: NV
EU:s intention?

• The Commission seems to act against the use of renewable forest based material for transport fuel production. 60% of the growth of forest in Europe is located in Scandinavia and Scandinavia has also the largest number of paper mills in Europe.

• The ILUC proposal, Part A, Annex IX with a list were renewable material is given different values, creates uncertainty for a producer in this segment, especially when the commission is changing earlier agreed positions, due to vague reasons.

• The risk is obvious that we will not be allowed to use any part of rest products from the forestry or pulp mill factories - or from the agricultural sector.

• The list in the ILUC proposal creates uncertainty for the industry, it is better to use the GHG reduction as a driving force, according to RED calculations, irrespective origin, so the EU member states can handle this question by themselves.

• With todays political decisions, the bio industry, specially when we are discussing advanced biofuels will not grow, but instead be no more.

• No more investments will be done within this sector before those questions have been clarified, and no more jobs in this sector within EU will be created.
Renewable transportation fuel

Who will buy? - must sell!

More expensive

Mandatory

Incentive

Spectra of solutions & applications

Fossil fuels still needed for transportation

Focus on feedstocks, Waste and Residues

Energy efficiency

Productivity

Infrastructure

Limited availability

Use of Resources
Can our forests improve security of supply?

Yes.
CO2 reduction from biofuels

Biofuels should contribute to a reduction of at least 35 % of greenhouse gas emissions in order to be taken into account.

From 1 January 2017, GHG emissions savings should be minimum 50 %.

Preem Talloil Diesel has CO2 reduction of 89 % (*) compared to fossil diesel.

(*) Talloil counted as a co-product.
Preems road map-“Green” strategy”

Production

• Move from Heating Oil to Transportation Fuels
• Blending of 1:st generation bio fuels established
• Co-operation regarding CO2 capture and sequestration
• Wind Power expansion
• Excess hot water sales

Transport fuels

• Co-processing of forest based “green” feed stocks initiated, like Tall oil diesel - doubling the capacity 2015
• Residues from pulp mills - Lignin upgrading in existing units
• Residues from other forestry industry- upgrading in new units
• New (old) technologies (Slurry Hydro Crackers ) upgrading of HFO to diesel and gasoline. Units have already been sold both in Europe as well as in the Far East, gives the possibility to co process biomaterial in a large extent
Biorefining CO-Processing

Vegetable Oils & Fats → Pre treatment → Hydrogenation → Gasoil from crude → Synsat or MHC Hydrogenation → Fuel gas

- Pre treatment: 5-70%
- Gasoil from crude: 30-95%
- Synsat or MHC Hydrogenation
- Fuel gas
- Green Diesel
From Forest to the consumer

1. Raw talloil is a restproduct recovered from the black liquour stream in the Kraft papermill

2. SunPine in Piteå produces rawtalldiesel from the Raw talloil

3. In Preems converted refinery in Gotheburg the raw talldiesel is upgraded to high quality diesel. EN590 incl, MK1 standard

4. Evolution Diesel – a high quality diesel, containing only diesel type hydrocarbons. Reduces the emissions of CO2 by more than 30%. Can be used in all diesel vehicles. The future fuel – in todays vehicles.
SunPine Talloil Process

Paper mill – kraft process

Wood chips → White Liquor → Recovery boiler → "Soot" → H2SO4 → CTO → Pulp → SunPine

New Process

TO Fatty acids

Resins

RTD TO PREEM

BIO- OIL, Tall oil Pitch, HEAVY RESIN ACIDS, δ-SITOSTEROL, ETC
From RTD into Swedish MK1 Evolution Diesel (EN590)

Investment abt. 250 MSEK in our refinery, totally after 2015 - 900 MSEK
Preem Evolution Diesel

• Today Up to 35% renewable product content
• Reduces the CO2 emissions more than 30%
• The same type of hydrocarbons as in fossil diesel
• Can be used in any diesel vehicles

During 2013, reduced the CO2 emissions by 480 000 ton (corresponds to emissions from 216 000 cars).
The Pulp mill

About 30% of the log consists of lignin, today burnt in the recovery boiler

Lignin is the dominating component in the black liquor, Abt. 6-8 million tons per year.

Lignin is today used as a fuel for creating heat and electricity. When introducing new processes in the pulp mill the amount of lignin will increase - making it difficult to increase the throughput in the mill without large investments.

Lignin used as a transport fuel, will increase the capacity in the mill as well as the total value chain.

About 10- 20 Twh lignin is possible to use every year as a fuel feedstock, according to the Pulp industry.
The transition has already begun. Renewable gasoline next step

- Can be used in all gasoline engines.
- 70% of the private cars in Sweden are using gasoline.
- The estimate is that about 1-2 million tonnes of lignin could be recovered from the Kraft papermills.
- Target to start a renewable gasoline production by 2017.
Lignin deoxygenation by catalytic hydrogenation – Avoiding Molecular Hydrogen

Some active academics in Scandinavia

Tanja Barth
professor
Chemistry institute
Universitetet i Bergen


Patent appl WO 2012/121659

Title: REDUCTION OF C-6 BONDS BY CATALYTIC TRANSFER HYDROGENOLYSIS

Figure 1.

Hydride Donors available in biooil(s)!!
WTW performance Hydrogenated TOD

- WTW GHG (g CO₂eq / km)
- WTW Energi (MJ / 100 km)

- Bensin & Diesel
- Etanol Vetet
- Etanol Sockerbetor
- Etanol Cellulosa
- Etanol Sockerrör
- Bio-diesel
- Biogas
- DME (Svartlut)
- Talldiesel waste (4/188)
Advantages with forest based renewable gasoline and diesel

- 60% of the growth of forest in Europe is located in Scandinavia
- Lower carbon footprint
- “Security of supply”
- Rural development
- Creates more job. Especially in northern Europe
- Innovation creates innovation, new value chains are created
- Low production costs compared with earlier technologies
- Fulfills todays standards like EN590 or EN 228 with more than 50 % renewable content
- No new infrastructure is needed
Thank you!