

# A Gasification Project temporarily on hold

9<sup>th</sup> International Seminar on Gasification in Malmö 19-20 october 2016

## ***VärmlandsMetanol - a Pioneer Project***

***Björn Gillberg, CEO, VärmlandsMetanol AB***

Biomass as received

111 MW

Methanol energy

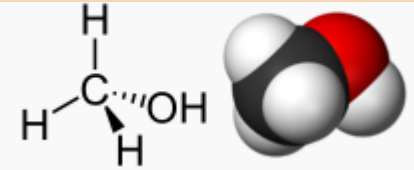
74 MW  $\approx$  315 t/day

- ✓ Investment cost € 350 million
- ✓ ThyssenKrupp Industrial Solutions EPC-contractor
- ✓ Cost, time and performance guarantee
- ✓ 1 600 share holders

Photo: Lars Nilsson  
Photomontage: Structor

# BioMethanol –

a superior CO<sub>2</sub> neutral liquid motor fuel



- ❖ **Fuel properties are excellent** due to the high octane rating. Methanol is an ideal fuel because of its efficient combustion resulting in low emissions compared to gasoline. It can be used in spark ignition port injected gasoline engines blended with gasoline (up to 25%) without any modification on the vehicle
- ❖ **Flexibel fuel** vehicles made for E85 can also run on high methanol blends, such as M85
- ❖ **BioMethanol can be introduced** on the market by **using present distribution systems** without additional costs
- ❖ **Greenhouse gas savings** exceed other liquid bio-fuels by far, 80-90% in comparison to 15-40% for agro-based ethanol
- ❖ **BioMethanol** is the most cost-efficient and environmentally friendly liquid fuel for fuel cell vehicles. Methanol can be directly fed to a fuel cell without being reformed into hydrogen.



**Nothing is new under the sun.** Nynäs was successfully marketing M 15 (15% methanol) in Sweden in the 1980s. Nynäs planned to build a large coal gasifier for production of methanol.



## **Europas M15-nät**



**European M15-net  
in the 1980s**

# Supply of Forest Biomass, Värmland 2014

	Million m <sup>3</sup> fub	Million tons	TWh
<b>Standing volume</b>	209	167	435
<b>Annual increment</b>	9.6	7.7	19.3
<b>Annual felling*</b>	6.4	5.2	12.9
<b>Annual consumption VärmlandsMetanol</b>	0.4	0.352	0.88

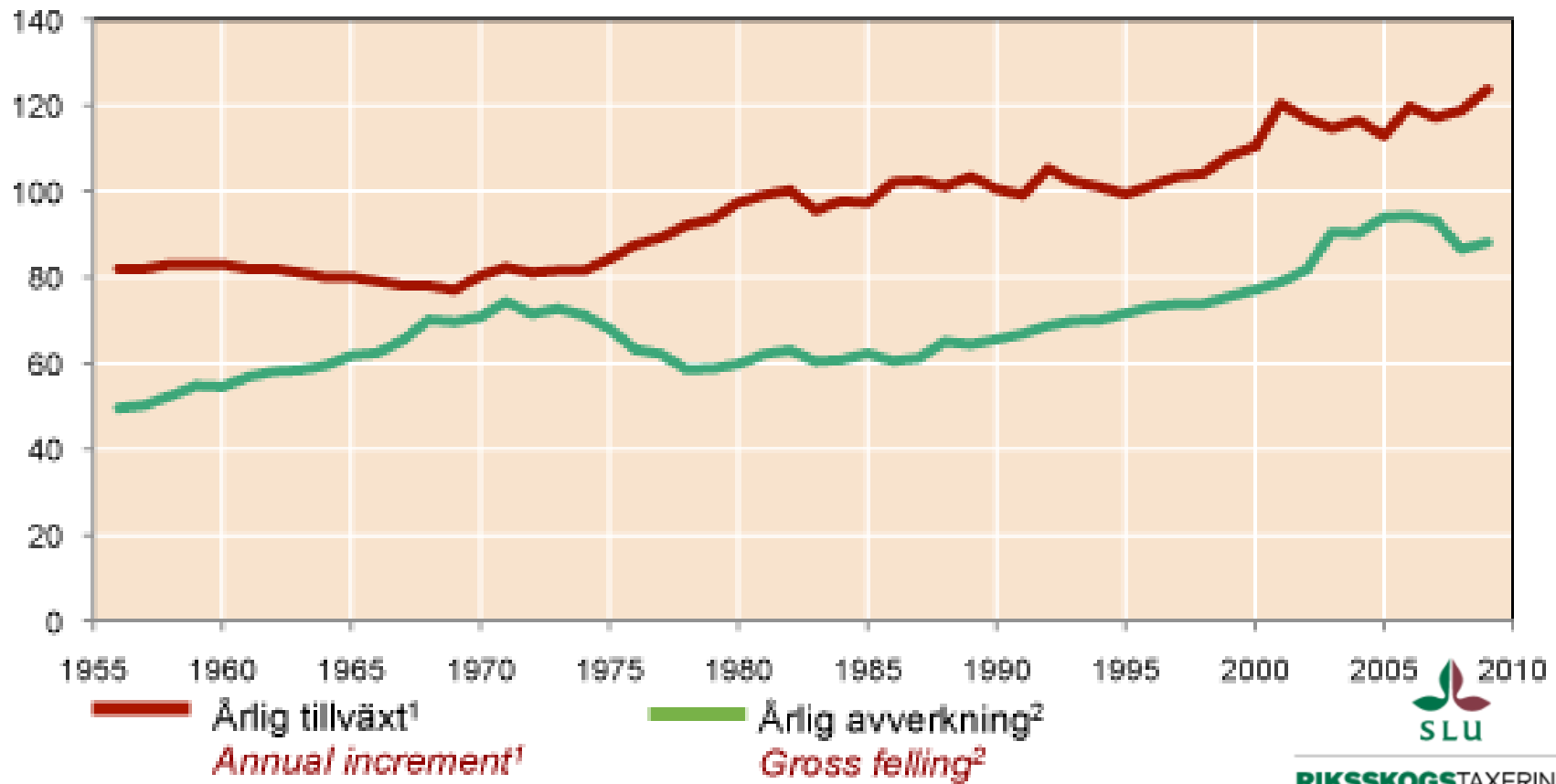
\*GROT not included (available GROT = 5,8 TWh/year)

Sources: Swedish National Forest Inventory  
Potential för skogsbränsle i Värmland (Projekt SWX-Energi)

# Standing forest volume is increasing in Sweden

**Figur 7.2 Årlig avverkning och tillväxt**  
*Annual gross fellings and increment*

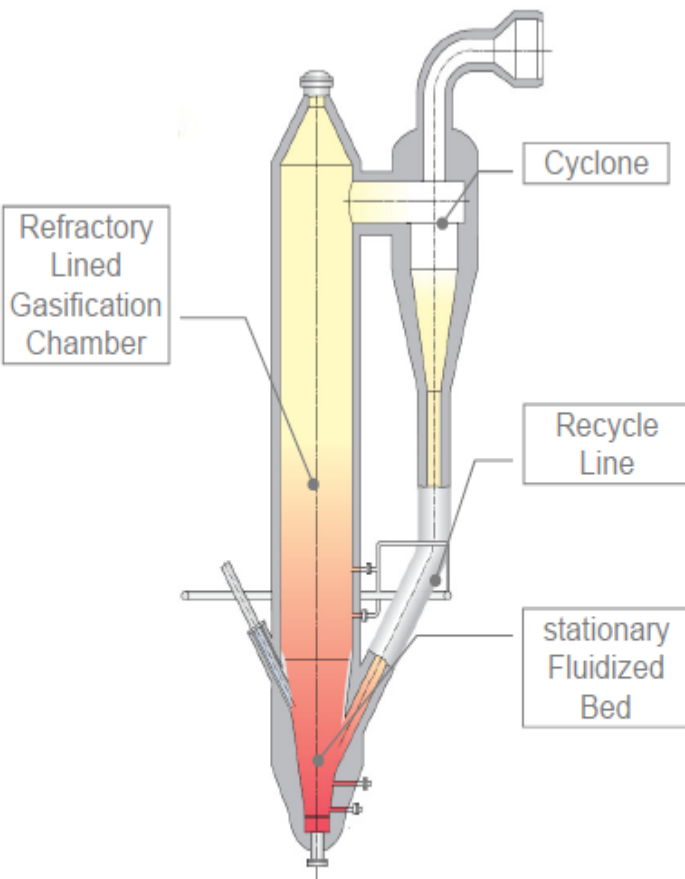
Milj m<sup>3</sup>sk, mill. m<sup>3</sup> standing volume incl. bark



# History of VärmlandsMetanol AB

- 2001 VM was founded to build and operate a pilot gasification plant for production of biomethanol from forest residue
- 2003 Conceptual design study completed - 21 MWth (17 000 t/a)
- 2006 Pilot plant upscaled to 100 MWth, 90 000 t/a
- 2007 VM goes public
- 2009 ThyssenKrupp Industrial Solutions (former ThyssenKrupp Uhde) selected as technology supplier and engineering partner
- 2010 EPC-contract agreement between VM and Uhde
- 2011-2013 Engineering, licence agreements with providers of key technologies, selection of other technology providers, Environmental Impact Assessment (EIA) and Risk Assessment
- 2013 Project temporarily on hold due to uncertainty concerning future taxation of bio-fuels
- Ready for start-up 36 months after investment decision

# VärmlandsMetanol Project: EPC-contractor ThyssenKrupp Industrial Solutions



HTW™ Gasifier

## HTW™

### HTW™ Gasification

Rt1

- Pressurised, fluidised bed
- Temperature: 800 - 1000 °C
- Pressure: 10 - 30 bar
- Operates below ash melting point (ideal for coals with high ash melting point, biomass, lignite, waste)

### For the VärmlandsMetanol Project, Sweden:

- Biomass to Methanol plant
- Feedstock: Domestic forest residue
- Grain size: < 4mm for biomass



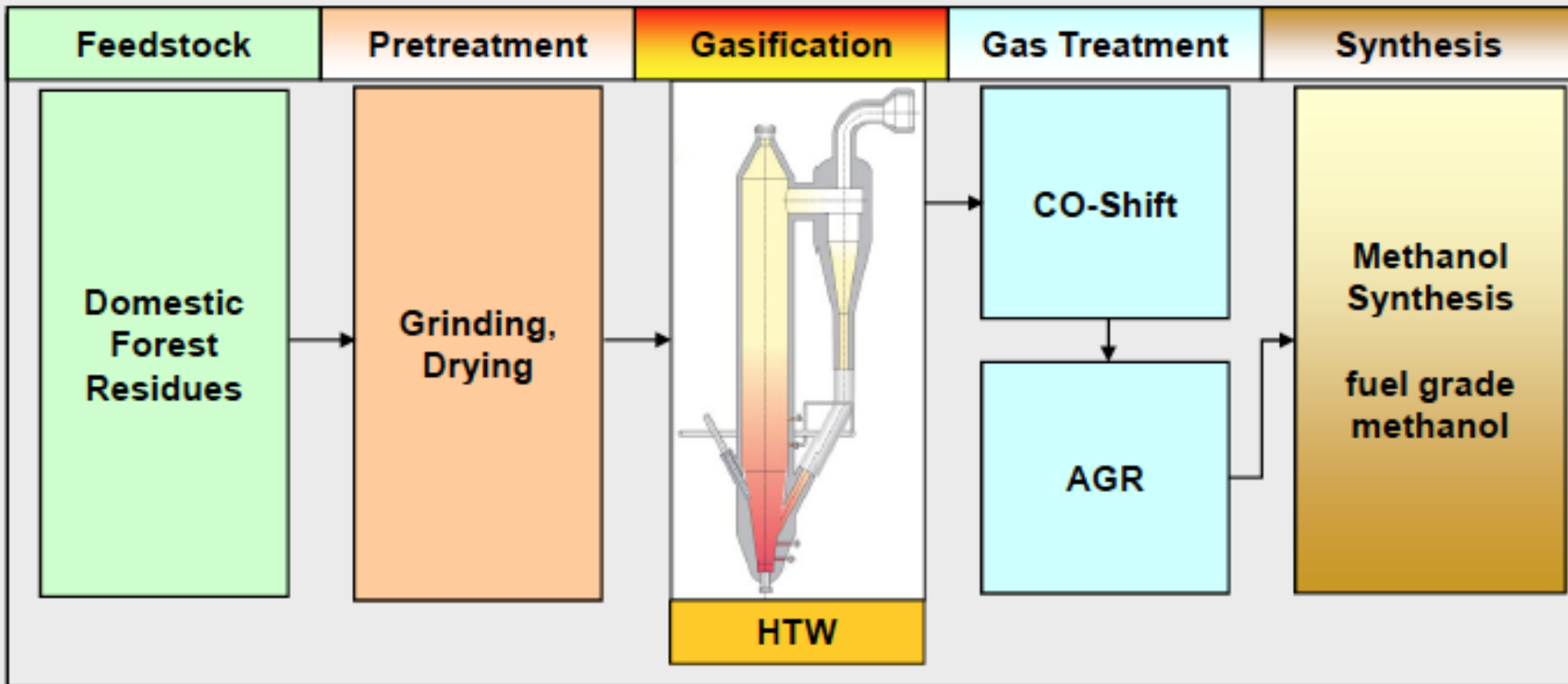
ThyssenKrupp

- ❖ Project target: to produce fuel grade bio-methanol used as liquid motor fuel substituting fossil fuels
- ❖ The HTW fluidized bed gasifications has a capacity of 111 MW<sub>th</sub> and uses domestic forest residue to produce 100 000 t/a of fuel grade methanol



# VärmlandsMetanol AB

## Integrated Process Chain for the Production of Bio-Methanol

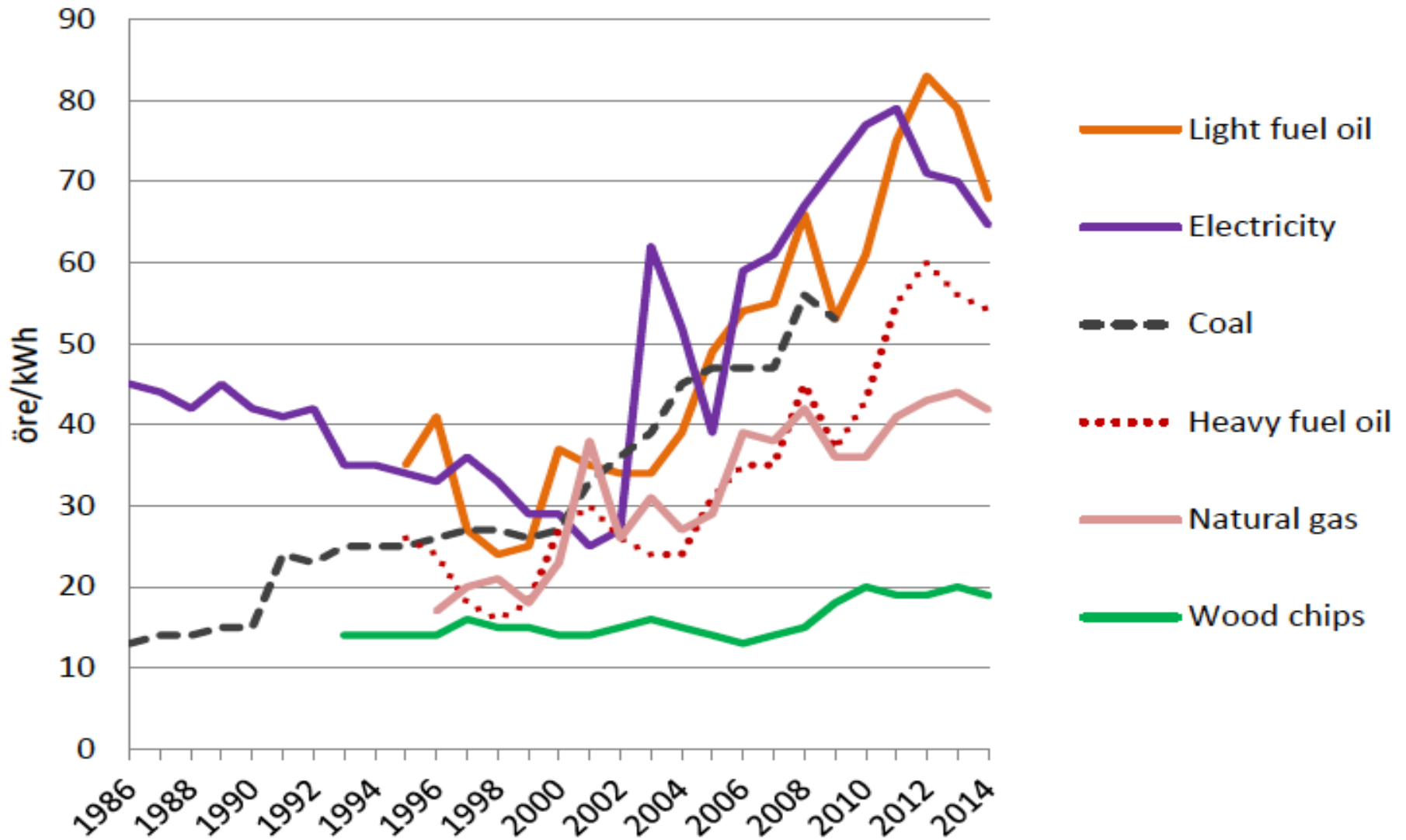


Biomass to Methanol, VärmlandsMetanol, Sweden  
Applying HTW Fluidized Bed Gasification

ThyssenKrupp Industrial Solutions



# Commercial energy prices in Sweden, real (2014)



Source: Swedish Energy Agency. Statistics Sweden. Eurostat. SPBI.

Notes: Prices for sectors not participating in EU ETS. The taxes are calculated with respect to industry's general tax exemptions.

# Obstacles

## ➤ **2012**

- No energy tax and no CO<sub>2</sub> tax on biofuels

## ➤ **2013 - 2014**

- Low level blends of biofuels:
  - up to 5% (volume) in gasoline no CO<sub>2</sub> tax but 11% energy tax
  - up to 5% (volume) in diesel no CO<sub>2</sub> tax but 16% energy tax
  - above 5%: full energy tax and full CO<sub>2</sub> tax
- Up to 15% HVO in diesel no energy tax and no CO<sub>2</sub> tax
- E85 and other high blended biofuels no energy tax and no CO<sub>2</sub> tax

# Obstacles

## ➤ 2015

- Low level blends of biofuels:
  - up to 5% (volume) in gasoline no CO<sub>2</sub> tax but 11% energy tax
  - up to 5% (volume) in diesel no CO<sub>2</sub> tax but 92% energy tax
  - above 5%: full energy tax and full CO<sub>2</sub> tax
- HVO in diesel (any blend) no energy tax and no CO<sub>2</sub> tax
- E85 and other high blended biofuels no energy tax and no CO<sub>2</sub> tax



# Obstacles

## ➤ **2016 Biofuels must never be cheaper than gasoline/diesel**

Bill, concerning future taxation of biofuels, approved by the parliament in December 2015. A general tax exemption from January 1 2016 when it comes to biofuels - no CO<sub>2</sub> tax but energy tax. No energy tax on bioMethanol.

The energy tax rates are, referring to the EU commission, chosen to avoid the risk for "overcompensation". Price of biofuels at the pump must be equal to the price of fossil fuels. This means that energy tax on biofuels will go up or down depending on the price of fossil fuels.

The following tax rates will apply:

### **January 1 2016**

Methanol: no tax

Ethanol low blend: 0,97 SKR/litre

Ethanol high blend: 1,00 SKR/litre

FAME (biodiesel) low blend: 2,16 SKR/litre

FAME (biodiesel) high blend: 1,18 SKR/litre

### **August 1 2016**

Methanol: no tax

Ethanol low blend: 0,45 SKR/litre

Ethanol high blend: 0,99 SKR/litre

FAME (biodiesel) low blend: 1,51 SKR/litre

FAME (biodiesel) high blend: 0,30 SKR/litre

# Opportunities

- 2020 – EU requires 10% biofuels (to replace 40 million m<sup>3</sup> fossil fuel)
- 2020 – EU has decided a 7% cap for agrobased biofuels in favour of cellulose and lignine based fuels
- 2030 – The Swedish parliament requires a fossil free automobile fleet (to replace 8 million m<sup>3</sup> fossil fuel)
- Methanol is a basic building block for hundreds of chemical products. At present methanol is produced from natural gas. International corporations are planning to replace fossil methanol with biobased methanol.

# VM's Business Plan

- The business plan is to produce bioMethanol from forest residue and sell it as low blend in 95-octane unleaded petrol and/or as a raw material for the chemical industry
- Present-day gasoline engines and distribution systems can handle a blend of 25% bioMethanol without vehicle modifications, or additional costs for distribution
- A primary business objective is to develop a "turnkey" concept in cooperation with ThyssenKrupp and build additional plants in Sweden and other forest rich countries

# Time is ripe for breakthrough for BTL fuels by gasification

- Proven technology available – no need for research
- There is a surplus of biomass feedstock in Swedish forests
- The infrastructure – the gas stations – already exist
- It is important to reduce the dependence of foreign oil suppliers

And it must pay off to fill up green!





# There 's no need to reinvent the wheel!

Gasification is a proven technology with decades of experience in successfully operating plants worldwide



Illustration: Goddard

This is Professor R.E.Cycle – discoverer of the infinitely expanding research grant