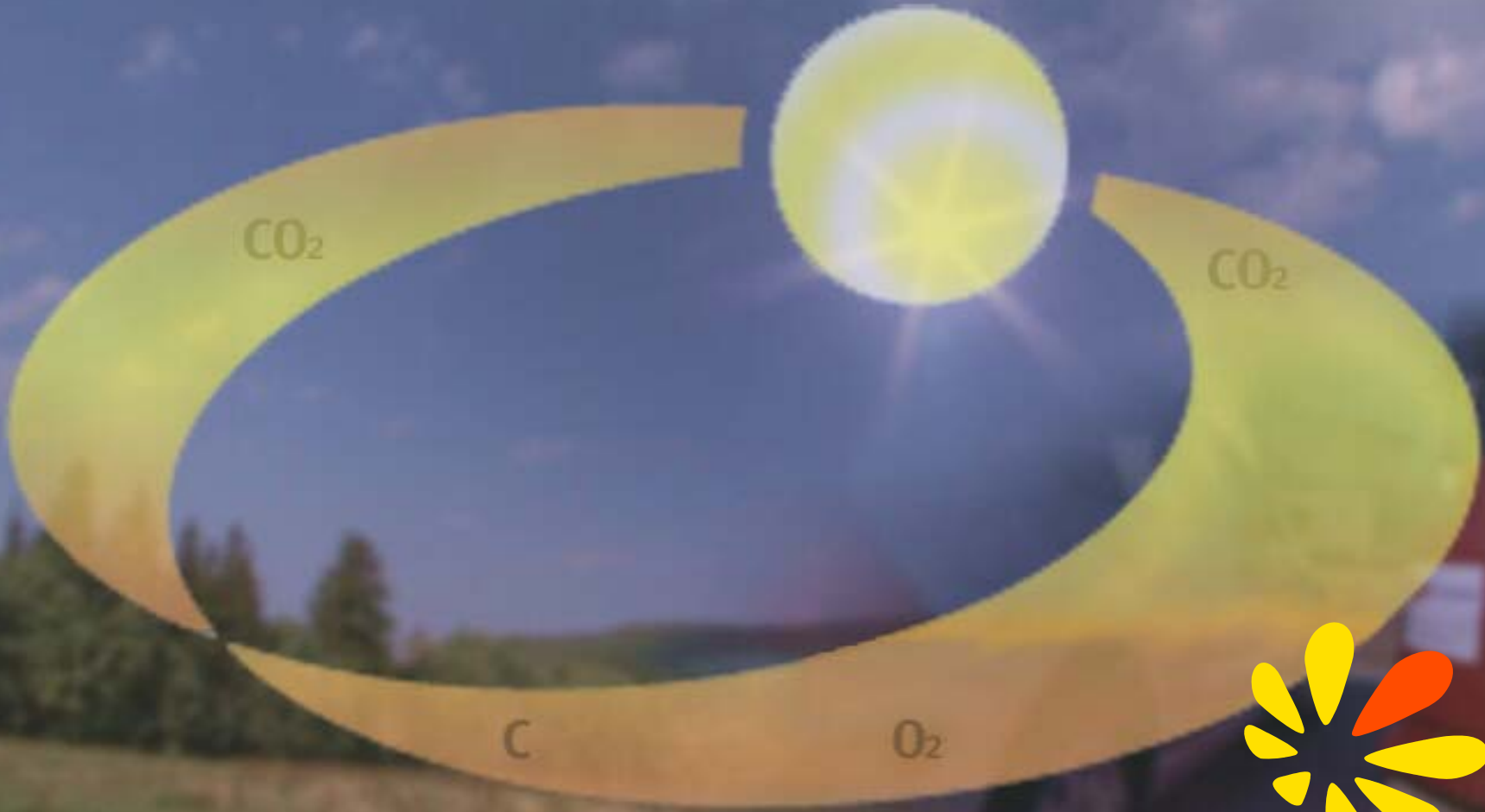


CHOREN



Tom Blades – CEO



SunDiesel
made by CHOREN

- 
- The background image shows three men in blue work uniforms and white hard hats. They are gathered around a large set of blueprints, looking at them intently. One man in the center is holding a pen. The background is a blurred industrial setting with a large red and white logo that says 'CHOREN' visible on a wall.
- German BTL (Biomass to Liquid) Technology Company
 - Core competence in gasification
 - Established 1990 out of the former DBI after the German reunification
 - World first continuous BTL production process in 2003
 - World first commercial BTL facility completed 2008 on - stream 2009
 - Patented Carbo-V[®] process
 - 260 Employees
 - Private company in partnership with Shell, Daimler and Volkswagen (minority shareholders)
 - Capital employed > €200 Mio.
 - Located in Germany (Freiberg & Hamburg), China and USA



The fuel challenge



- **Security of supply**

Over 95% of the transport sector is dependant on oil. If nothing is done, **the European Union's external energy dependence will reach 70% before 2030, 90% for oil.**

- **Climate change**

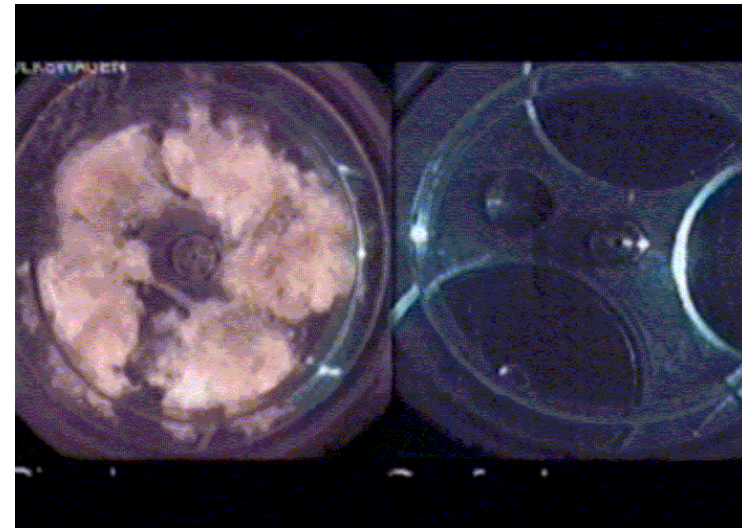
CO₂ is the main gas responsible for climate change. **Emissions from the transport sector are still growing and threatening to cancel out the reductions made in other sectors.** Road transport generates about 85% of the sector's CO₂ emissions.



BTL / SunFuel®



- Fits any diesel engine / fits current infrastructure system
- Suitable for aviation fuels
- No limit on blending (1 – 100%)
- Sustainable / renewable can be > 90% CO₂ mitigation
- Clean fuel – NO_x & SO_x, significantly reduced particle & total emissions
- Higher yield per ha. than 1st generation bio-fuel.
- Does not compete with food stocks
- High energy density (> 40 MJ per Kg)
- Produced domestically – creates jobs
- Contributes towards energy security



Fossil Diesel

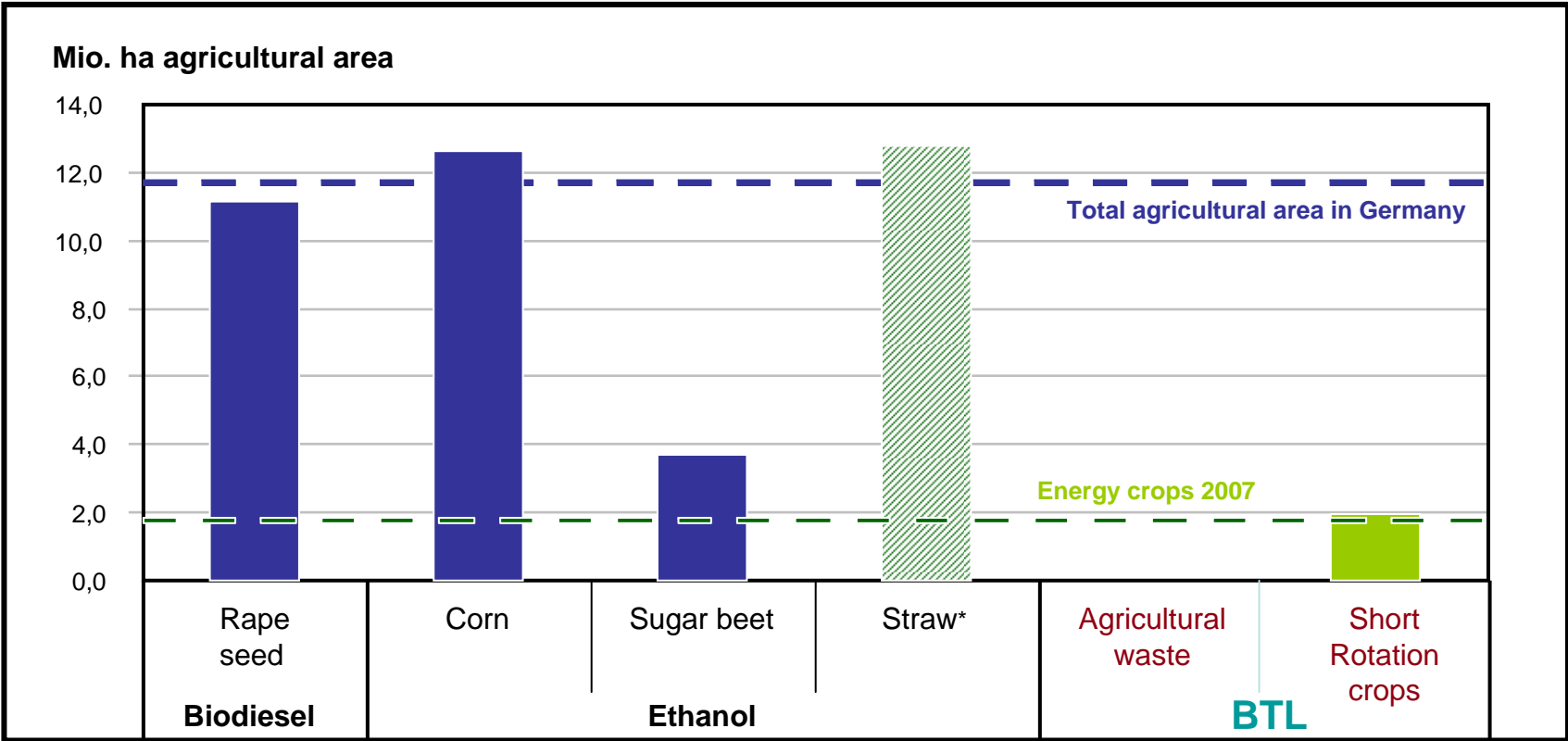
SunDiesel



BTL – highest CO₂ mitigation / area



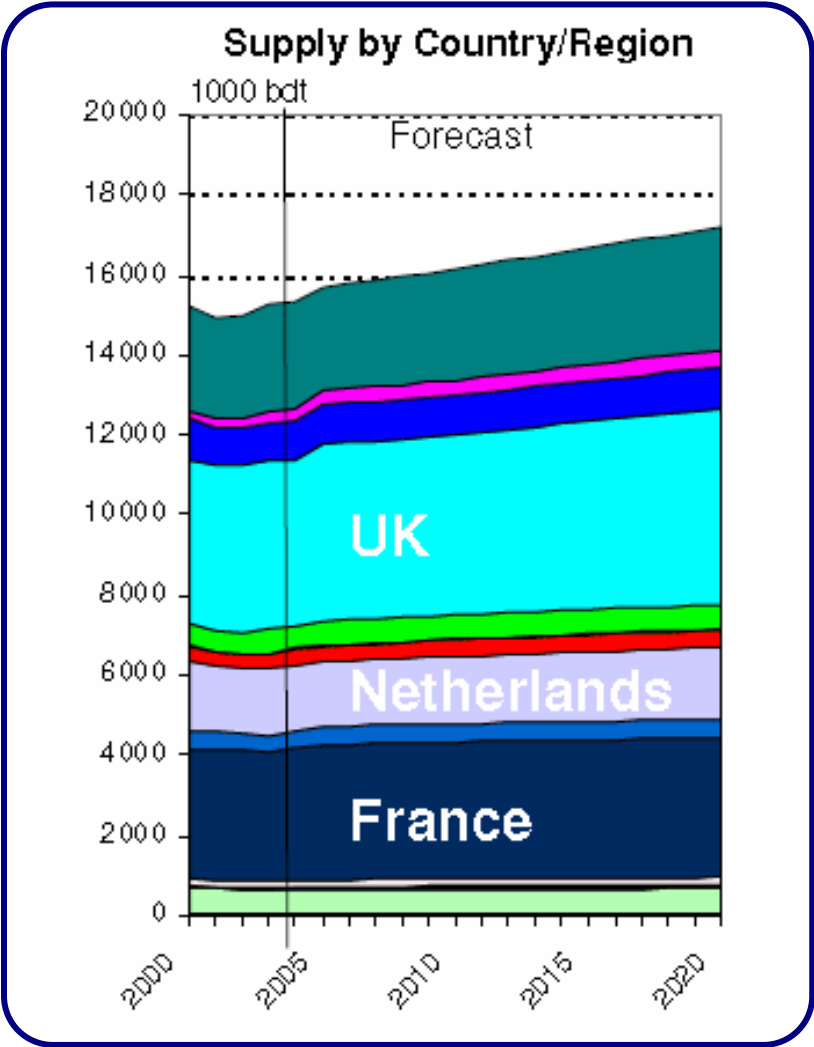
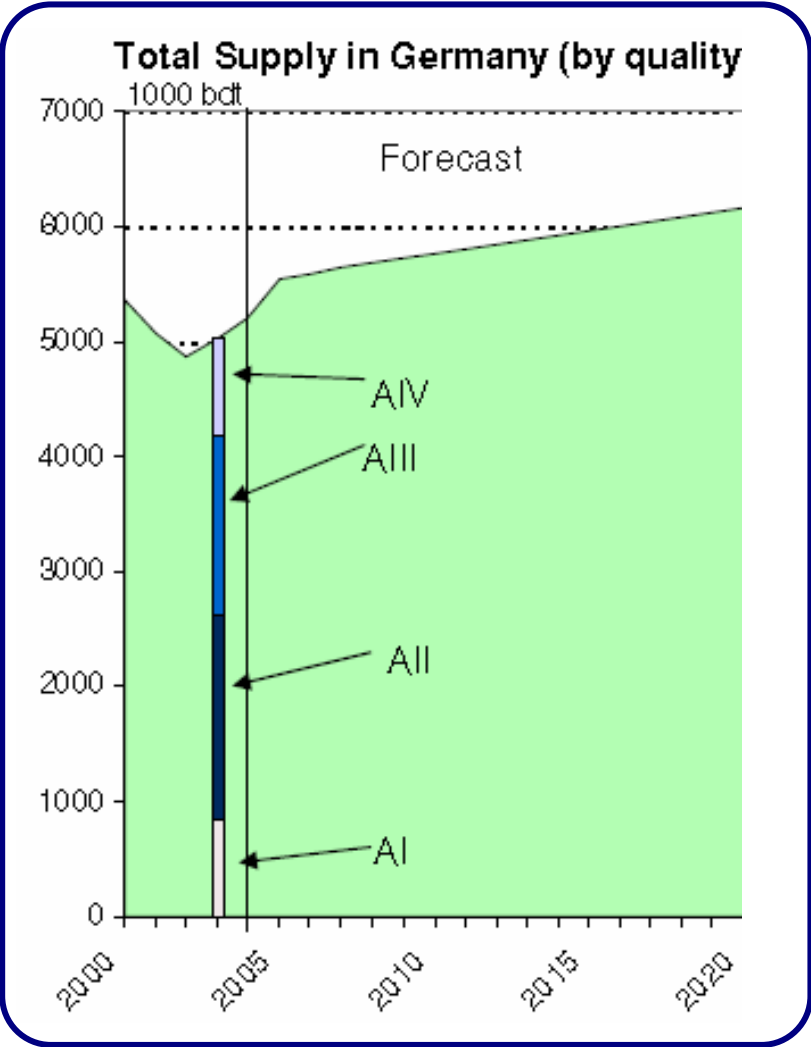
Theoretical agricultural area required to achieve Germany's -10% traffic CO₂ reduction target with only a single biofuel



* Straw could be used sustainably as a by-product from wheat and corn production. The required agricultural area would then not be in competition with food crops. However, potential is limited.

Source: FNR 2006, EU Commission 2008

Europe: ~ 4 mt BTL from from 18 mt waste wood



Source: Manthau & Pöyry

Readily available biomass - USA



- **Agricultural waste**
>> 500 mil t



- **Saw mill residue**
~ 40 mil t



- **Demolition waste wood (C&D)** ~ 60 mil t



- **Hurricane debris**
~ 20 mil t



- **Pulp & Paper biomass** ?????

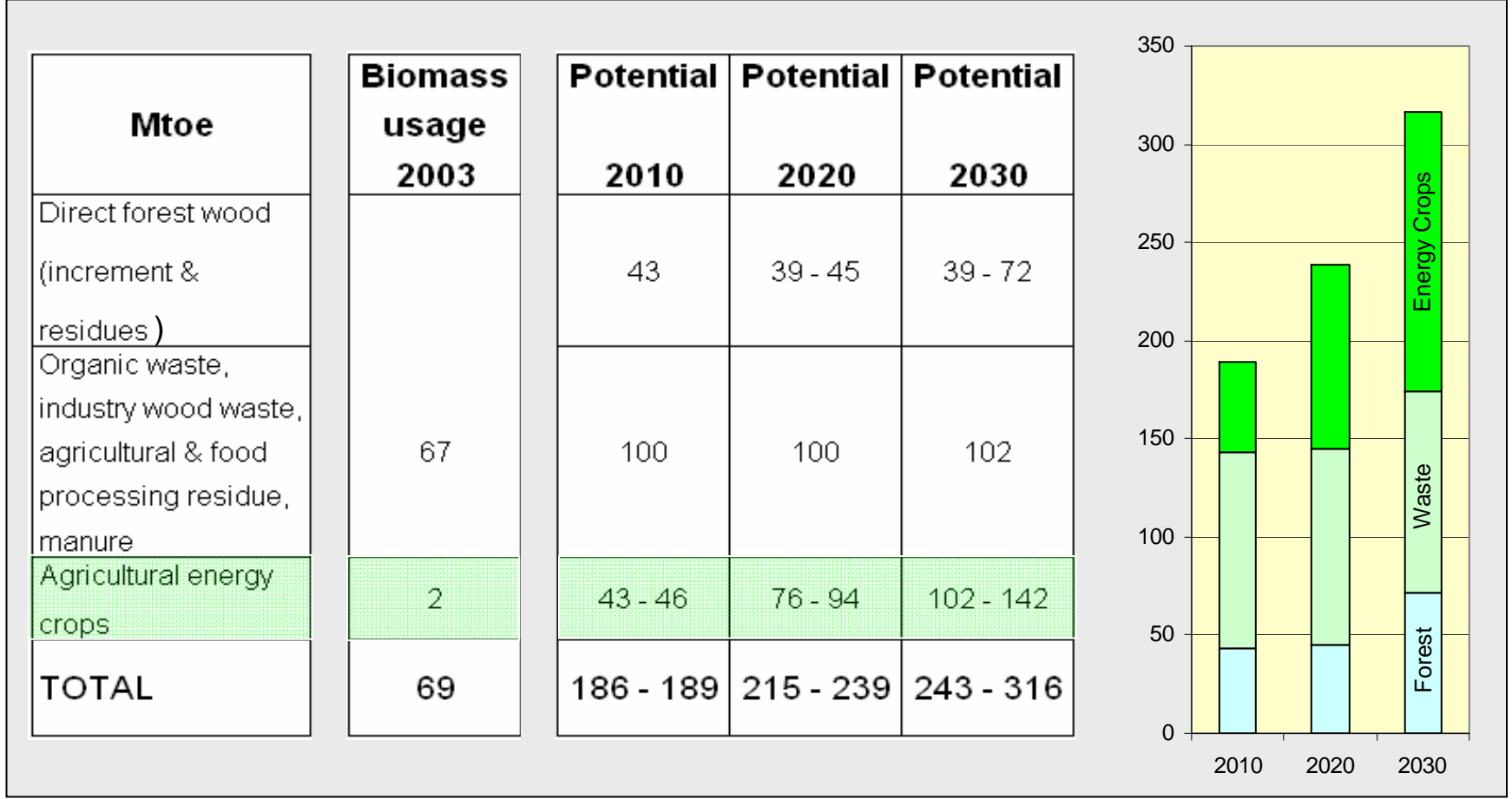
Estimates range as high as 3 bil t per annum

120 mil t per annum of waste wood alone could yield 24 – 40 mil t of BTL Diesel pa

Note: Gasification renders contaminants such as arsenic, mercury etc. inert, eliminating otherwise harmful emissions that arise from simply burning this material in land-fills.

Many US P&P companies are going bankrupt, leaving behind vast plantations

EU ~ 100 mil bdt additional energy crops



Source: EU Biomass Action Plan 2005

80 mil ha could yield 8.5 MMboed



- ▶ **Current daily oil consumption is ~ 85 million bopd.**
- ▶ **Sustainable mean annual increment in Latin America ~ 20 bdt / ha**
 - ▶ 5 bdt ~ 1 t BTL
 - ▶ 1 t BTL ~ 8.4 bbd
- ▶ **Equates to:**
 - ▶ 80 mil ha
 - ▶ An area with radius 500 km

Conclusions



1. Impact of second generation biofuels

- ▶ Increased yield per unit area
- ▶ Significantly reduced CO2 emissions
- ▶ None direct compete with food chain
- ▶ Superior product quality entirely compatible with current and future engine technology

BTL will enable a meaningful 'bio' contribution to the fuel mix

3. Biomass is available but will require a 'new approach'

- ▶ Recycling
- ▶ Short rotation crops
- ▶ International trade & logistics

2. BTL commercial production is imminent

- ▶ Beta plant ~ 15,000 t/yr as of 2009
- ▶ Sigma plant Schwedt ~ 200,000 t/yr potentially as of 2012/13
- ▶ Sigma plant US ~ 300,000 t/yr potentially as of 2013/14
- ▶ Additional plants through technology licensing

BTL will not displace crude oil but can make a significant contribution towards sustainable mobility