

# 2<sup>nd</sup> generation Bioethanol Where is Europe?

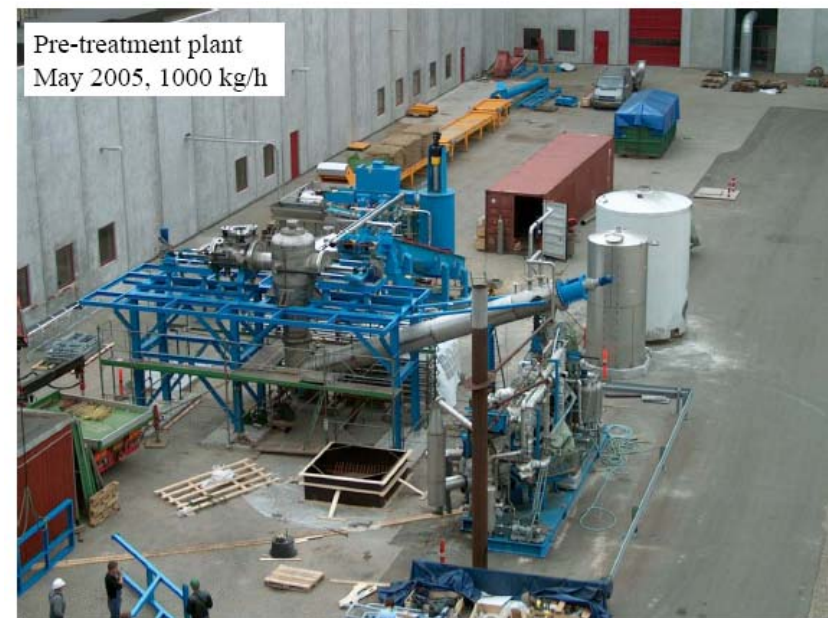
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## 2nd generation bioethanol getting ready for the last phase before full commercialization

- The major technical bottlenecks have been solved
  - Enzymes
  - Biomass Processing
  - Biomass logistics
  - Energy integraton
- A major part of the technology is based in EU and the IPR rights are (still) in EU
- The commercialization phase requires large investments
- Who will be first (EU or US)?



## 2<sup>nd</sup> generation -a multi sugar proces

- Sugar types
  - Cellulose and hemicellulose in stems, leaves, husks etc.
  - Starch from kernels
  - Succrose from tubers and canes
- Sources
  - Agriculture
  - Forestry (hardwood)
  - Municipal solid waste
  - Industrial waste
- Average ethanol yield from north European agriculture
  - Whole crop corn 5000-7000 l/ha
  - Sugar beet 7500-9000 l/ha



# 2<sup>nd</sup> generation hotspots



## The IBUS project

- Integration of a straw based bioethanol-refinery with a combined heat & power plant
- Funded by EU under FP5 – participants from UK, DK and ES. Pilot-scale 24 t/day process running (located in Denmark)
- Energy efficient process
- Hot water & enzymes only
- Multi-feedstock process
- Good economics
- National funding is in place; 120 t/day plant will be ready in 2007.



# R&D Breakthroughs!



But something is missing.....



# Bioenergy needs biomass!

- A coordinated effort with the agricultural sector is prerequisite.
- We believe we can boost the biomass output from agriculture by a factor 2-5.
- The challenge is to do this and:
  - Not create imbalances in our food and feed supply.
  - Not destroy our eco-systems,
  - We must improve the biodiversity and lower the environmental impact from agricultural production.
- This is possible but it requires a new agricultural practice with ***a dedicated production of energy crops.***

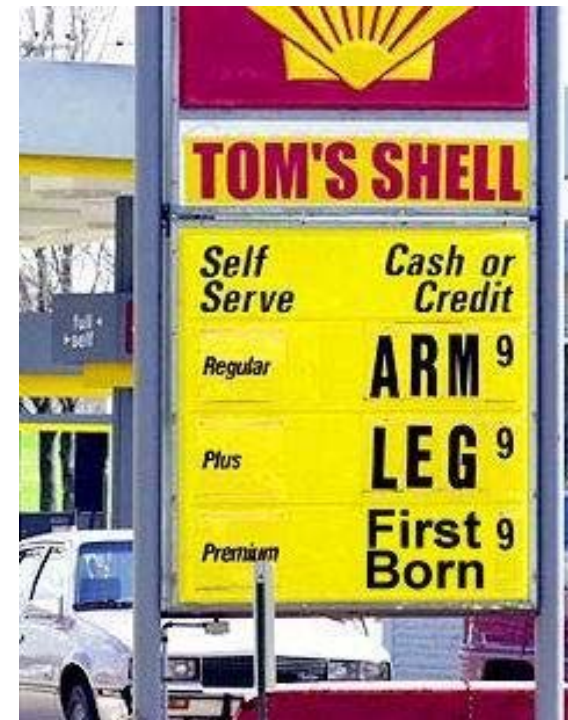


# A likely scenario for bioethanol

- If we can maintain a diversified production (feed and fuel) we probably have 20% of the agricultural land in EU available for biofuels
- What can we make on 32.5 mill ha?
  - 1 generation : 55 mill t + 50 mill t feed
  - 2 generation : 162 mill t + 130 mill t feed
  - New agricultural practice may boost this even further!

## Bioenergy R&D in EU -A view from below

- **Pro's**
  - At the moment EU has a strong R&D position
  - EU has a very good infrastructure for biomass supply
  - We already know how to handle biomass for CHP
  - We are very strong in white biotechnology
  - We are strong in many parts of biomass R&D
  - We already have a diversified energy supply
- **Con's**
  - EU Research funding has not sufficiently clear focus
  - The EU project evaluation system is more like a lottery
  - We need an European center for Renewable Energy!
  - The US will soon "buy" the technology rights from EU -if we do not provide the investments and market needed for commercialization



# The EU would like to say; Thank you Mr. President!

February 1 2006:

"America is addicted to oil, which is often imported from unstable parts of the world. The best way to break this addiction is through technology ... "

"We will increase our research in.....cutting-edge methods of producing ethanol,not just from corn but from wood chips, stalks,or switch grass."

**The technology race is on!**  
**EU has a major business opportunity!**

