Demonstrating 2nd Generation Ethanol in Denmark

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Intelligent use of biomass is our goal

Cellulosic biomass
(Waste)

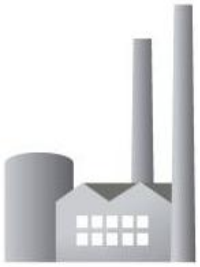
Inbicon

Ethanol

Ethanol replaces oil in transportation

C5 molasses

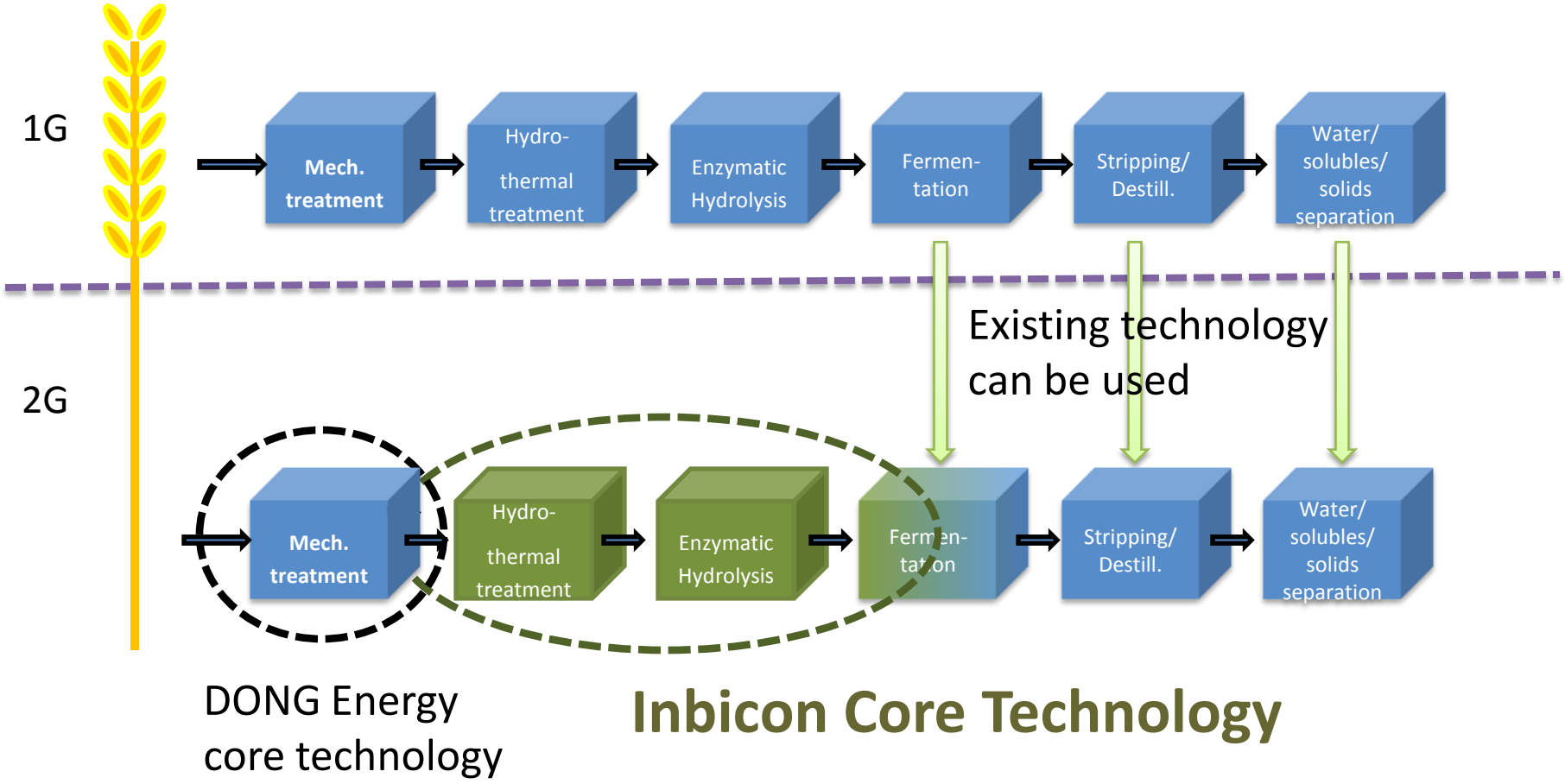
C5 molasses increases food production
- or replaces more oil in transportation
- or produces bio-chemicals



Lignin biofuel

Biofuel replaces coal in power and heat generation

Inbicon technology process steps - from 1G to 2G



The technology has worked in the pilot plant since 2005

Inbicon technology results

- Inbicon technology is optimised on wheat straw
- Succesfully tested on bagasse, corn stover and sorghum
- All process steps validated
- Dry matter 20-40 % in all process steps
- Only enzymes, yeast and water added
- 12% vol. ethanol after fermentation
- Succesfull distillation (less than 0.1 % in stillage)
- 100 t/day Demonstration plant under construction

A demonstration plant is under construction to take the technology to industrial scale

Input:
30,000 t wheat straw

Output:
5.4 mill. l ethanol
8,250 tons biofuel
11,250 tons C5-molasses

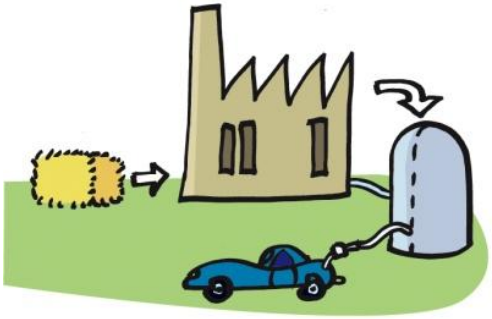
Kalundborg, Denmark – 7. January 2009

Start of operation:
December 2009

Pre-qualified enzyme suppliers:
Danisco Genencor and Novozymes

Investment:
€40 mill, incl.
€10 mill gov't support

Commercial results and perspectives



- Inbicon technology company established to further develop and commercialise the technology world-wide
- First order for feedstock test received
- Engaged consultants in USA to establish presence there and get involved in North American projects
- Demonstration plant is going to be the cornerstone of planned Biofuel Cluster Denmark in town of Kalundborg

A Show-Case for EU R&D Programs

10 X multiplication effect of original EU investment:

Initial technology project: "Co-production biofuels", budget €13.5m, EU contribution (FP5): €6.5m

Demonstration plant: Budget €40m, Danish gov't support €10m

Total project expenditure till end of 2009: +/- €65m

New projects based on the initial project:

HYPE

Develop consolidated and more cost-effective bioprocessing, budget €5.4m, EU contribution €3.6m

Renescience

Pre-treatment of waste with enzymes for introduction in pressurised gasifiers, budget €7.3 million, contribution from Danish sources approx. €3.8m

2nd generation biofuel for cars of the future

Comparison of pretreatment technologies, budget €5.6m, DK gov't contribution approx. €2.8m

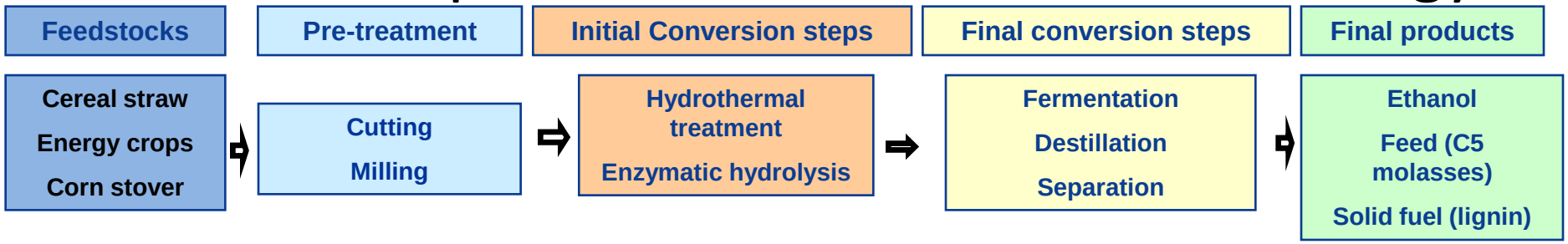
Biomass for biofuel and bioethanol on pilot scale

Optimisation, budget €1m, contribution from Danish sources approx. €0.8m

Plus

????

Summary:
Value chain of potential relevance to EII Bioenergy



Critical technologies and status of maturity for the proposed value chain/feedstocks

- Hydrothermal treatment (current status: pilot, demo plant in operation 2009)
- Enzymatic hydrolysis (current status: pilot, demo plant in operation 2009)
- C5 fermentation (current status: lab scale)

Core technologies: Hydrothermal treatment

Perimeter/scope of envisaged demonstration and rough scale

- Pretreatment, Initial conversion steps, final conversion steps. Industrial scale: 500 t/d

Order of magnitude of cost for needed demo (+ /- 50 %): 100 M€

Critical partners needed for demo: Feedstock suppliers, technology suppliers, equipment manufacturers, plant operators, enzyme suppliers, c5 organism suppliers, project management

Sustainability issues addressed: Local wheat straw feedstock, integration with power plant to use surplus heat, substantial CO2 reduction