Presentation 2.2: Biofuels - A Strategic Option for the Global Forest Sector?

Michael Obersteiner
INSEA project scientific coordinator
IIASA

E-mail: michael.obersteiner@gmail.com

Abstract

We pose the question whether 2nd Generation Bioenergy could turn out to be a potential business opportunity for actors in forest sector. Starting from long-term global energy/forestry/agriculture scenarios we will step by step identify the opportunities and hurdles for 2nd Generation Bioenergy. In the scenario it is calculated that by 2020 the total 2nd Generation bioenergy market will be worth 80$ Billion and 300$ billion by the year 2100. As a reference the current global timber market can be estimated to be in the range of 200$ billion.

These aggregated scenarios will then be further down-scaled examining the sustainability and economic consequences of using the concrete case of methanol production as an alternative to fossil fuels for the transport sector. The estimated costs for each part of the methanol-for-fuel chain from harvesting and transporting the wood, through methanol production and transportation, to distribution to the consumer appear to be competitive given today's technology. Optimized methanol production will be presented using a geographically explicit model allowing the study of economies of scale in production constraint by increasing expenditures on transportation as well as issues of raw material supply mainly from SRF. Finally, we will shortly analyze the investment risks of black liquor gasification as a potential low hanging fruit to take leadership on 2nd Generation Biofuels. We will close with a SWOT analysis of the forest sector vis-à-vis the oil industry the emerging big player on the biofuels market.

IEA&ICFPA&FAO, 30-31 Oct. 2006

Biofuels -
A Strategic Option for the Global Forest Sector?

Michael Obersteiner & Sten Nilsson

International Institute for Applied Systems Analysis,
Laxenburg, Austria

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Global Energy Trends

- Energy Security
  - Thirsty Tigers
  - Unpredictable Middle East & Russia
- Sustainability Scores
  - Climate
  - Clean Air

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Beyond Petroleum

- Shell, bp & Car manufacturers
  - R&D for alternative fuels and biorefinery
  - Venture Capital
  - Engage in Plant Research
- Cream comes from Polyproduction
  - 40 Billion Profits of ExxonMobile come to a large part from Chemicals

Agro&Chem-Biz

- Cargill et al. ….
  - Ethanol business
    - Additional revenue stream
    - Market power in at least two outputs
    - Monopsy

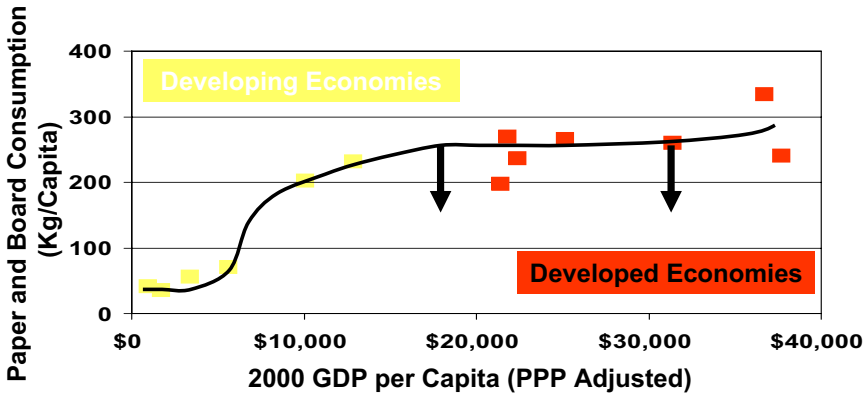
FACIT

- Biofuels a growth market
- Polyproduction increases profits

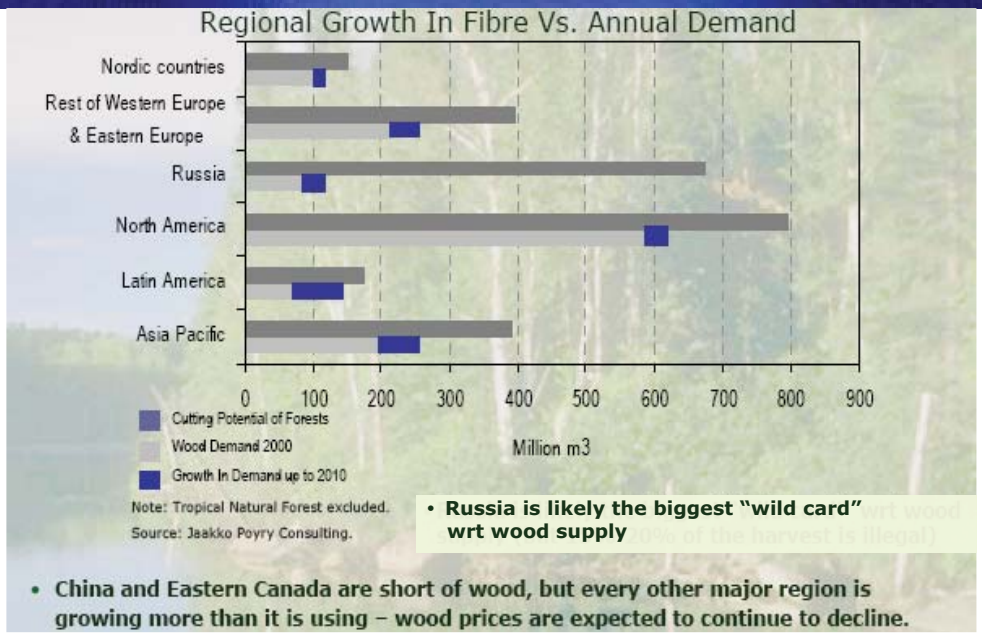
Forest Industry

- Dart Ball Problem

Relationship between P&B Consumption and GDP per Capita



Move to cheap and abundant fibre



Roberts 2006

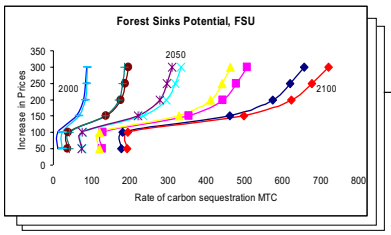
Benchmarking Industries

Energy/Agri/Chem	Forest Industry
•Proactive wrt Biofuels •Market Power –Polyproduction –Alliances	•Passive or hostile •Competitive Market –Core business –Farm out Energy

Global Biomass Scenarios

Global LU Drivers

Modeling Framework



Data Sources :Obersteiner & Rokityanskiy, FOR

Exogenous drivers for CH4 & N2O emissions:

N-Fertilizer use, Rice production, Bovine Livestock

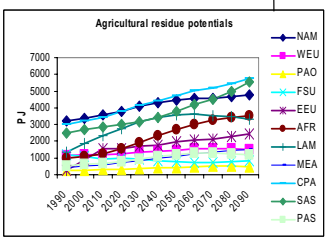
Data Sources: Fischer & Tubiello,LUC

Multigas-MESSAGE

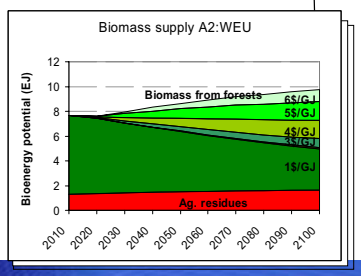
Systems Engineering IA-Model

Bottom-up mitigation technologies for non-CO2 emissions,

Data Sources:USEPA, EMF-21



Data sources: Fischer & Tubiello, LUC



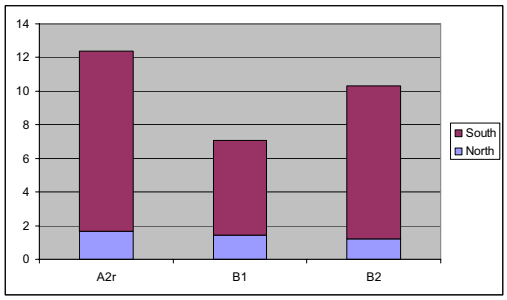
Black carbon and organic carbon emissions coefficients

Data Sources: Bond; Klimont & Kupiano, TAP

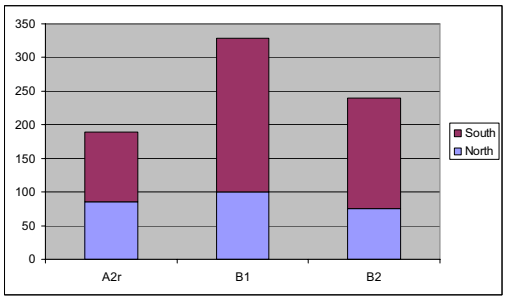
Data Sources: Obersteiner & Rokityanskiy, FOR; Tubiello & Fischer, LUC

Driver Scenarios 2100

Population (Billion)

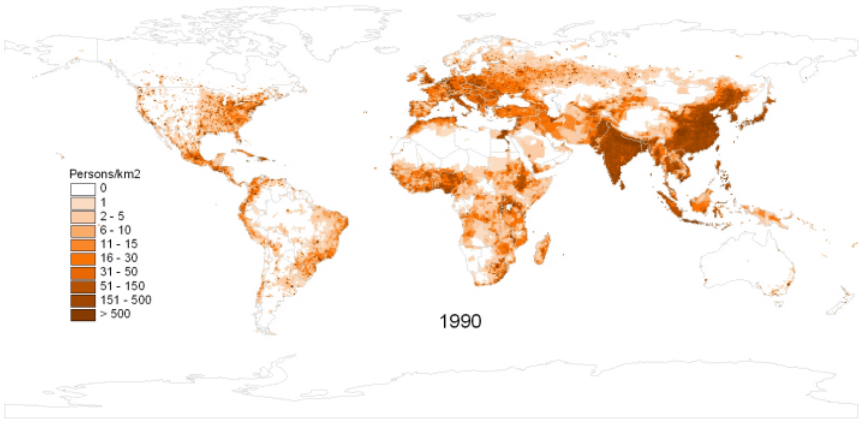


GDP (Trillion)

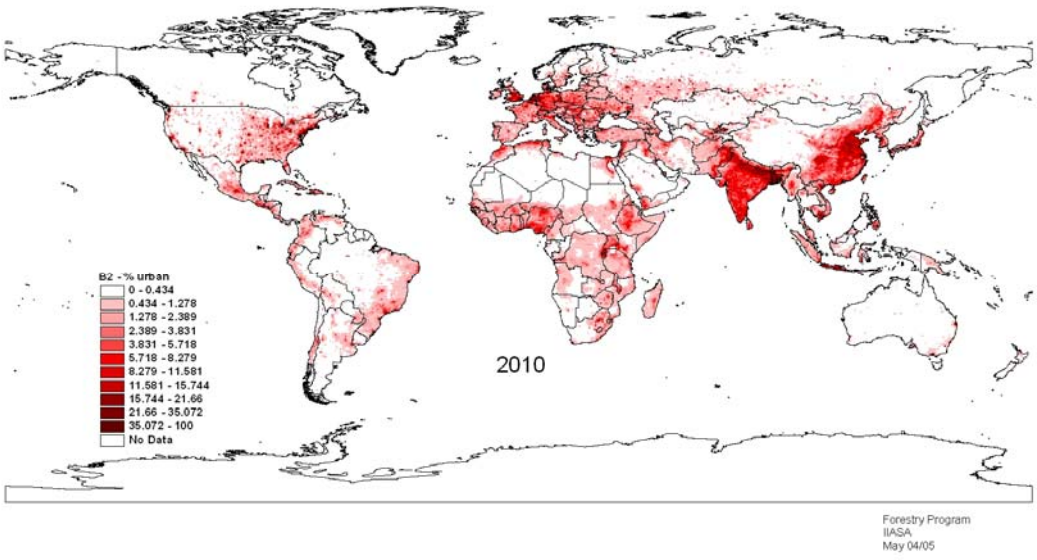


Source: O'Neill et al. 2006

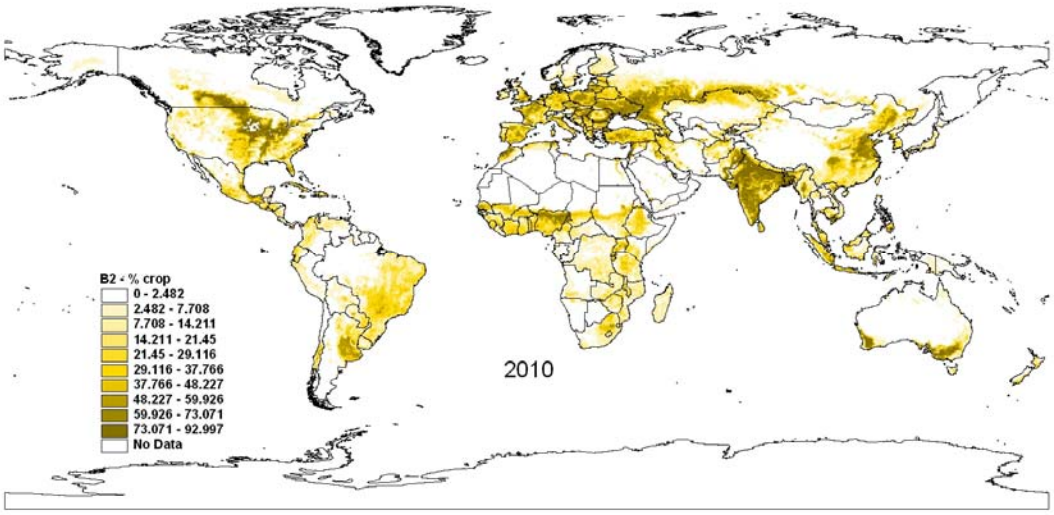
Population density dynamics 2010-2100, B1



Built-up land % dynamics 2010-2100, B2



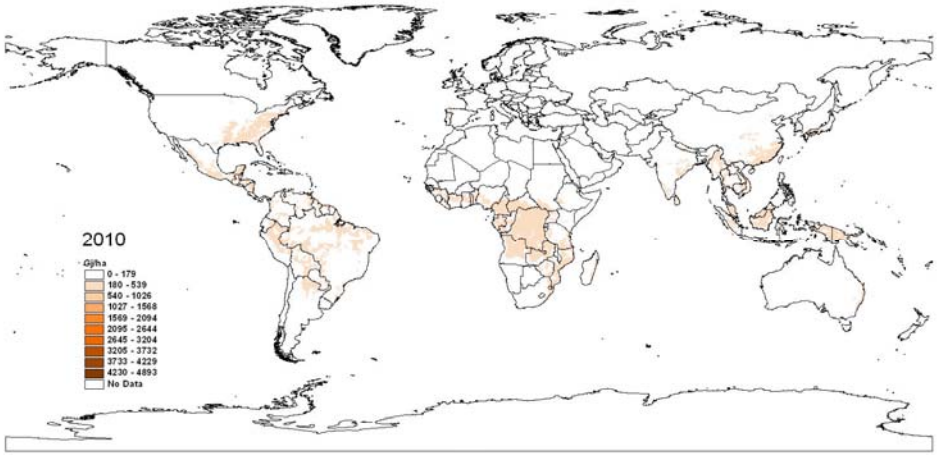
Cropland % dynamics 2010-2100, B2



Forestry Program
IIASA
May 04/05

IASA

Bioenergy Supply for 2000-2100
B2 (Price < 6$/GJ)



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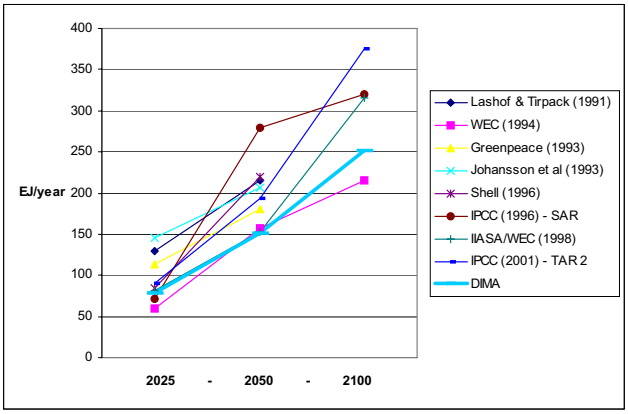
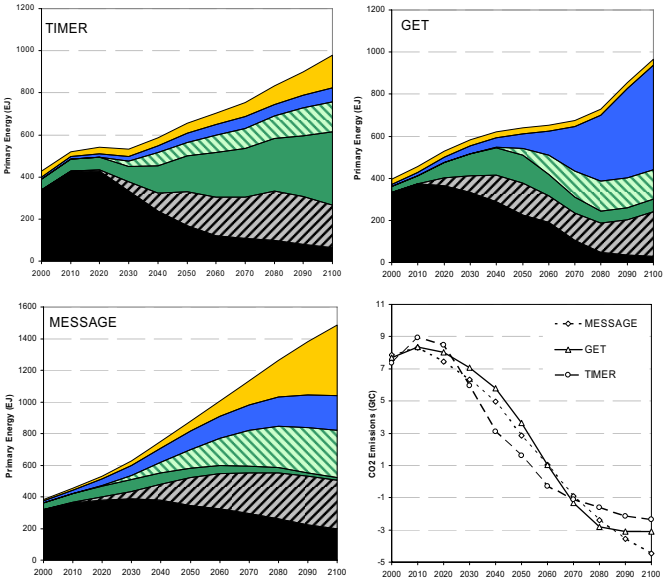
Global Bioenergy Potentials

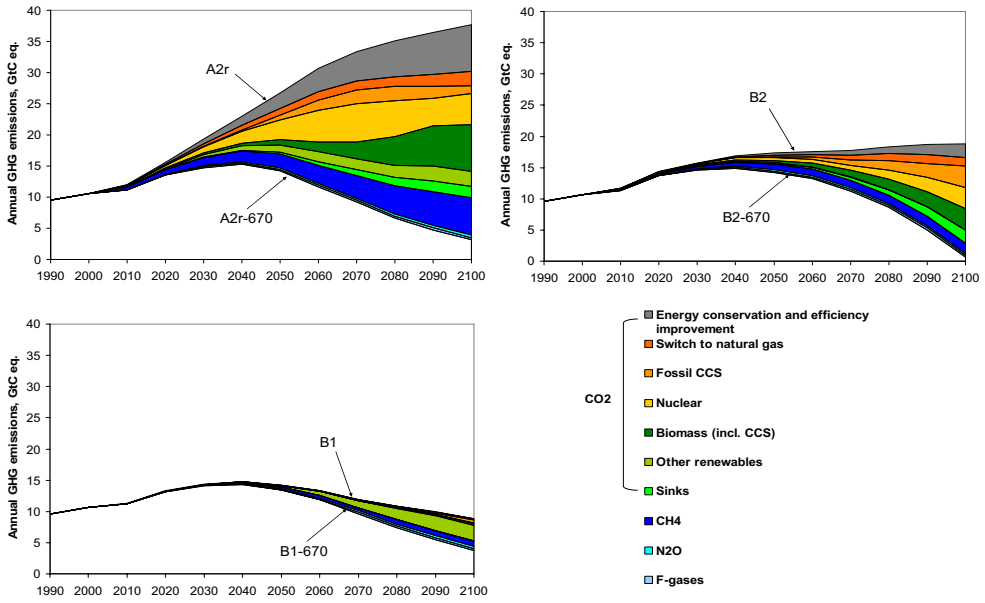


Global Energy Portfolio



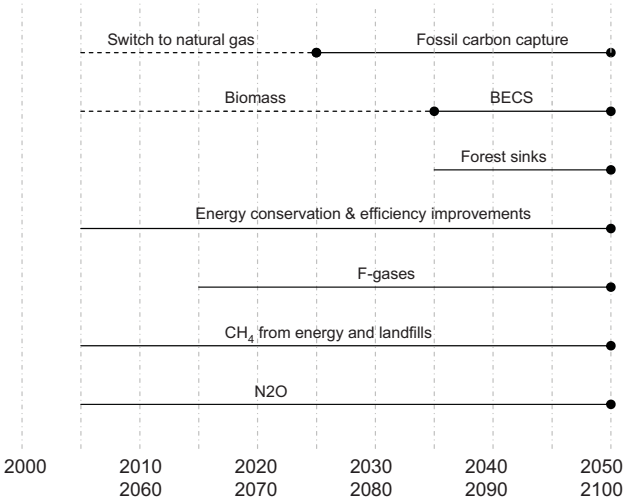
Multigas Stabilization Portfolios

670 ppmV-eq



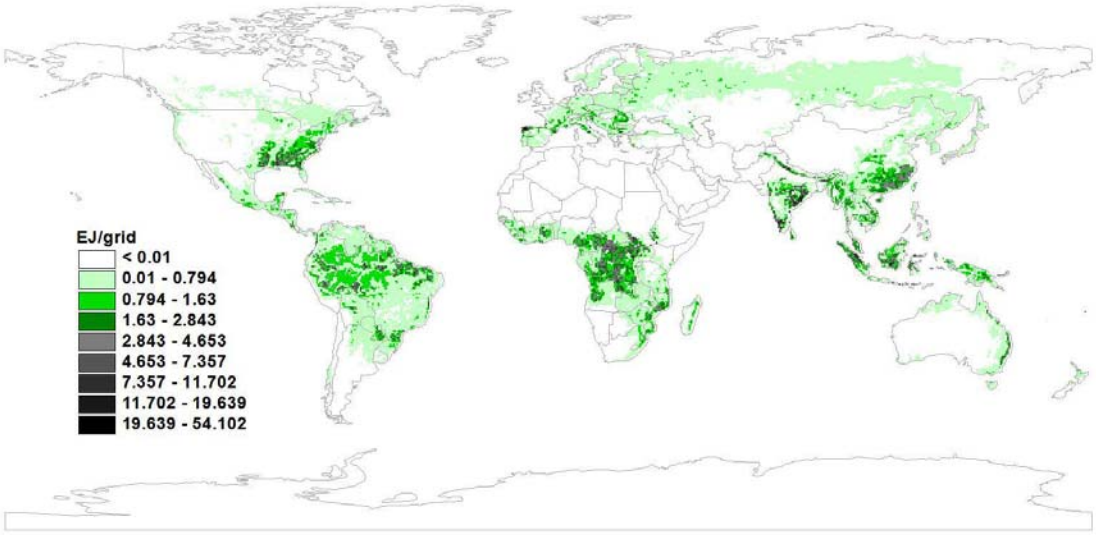
Source: Riahi et al. 2006

Timing of Mitigation

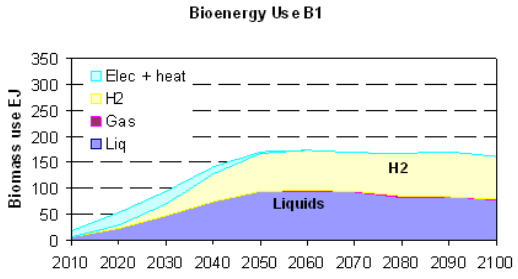


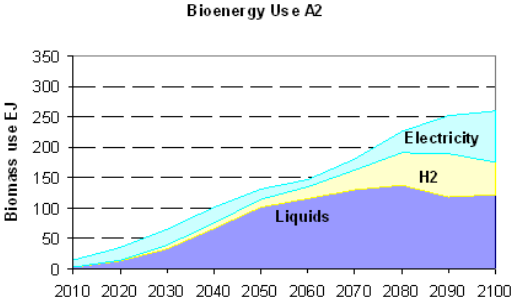
Source: Riahi et al. 2006

Cumulative biomass production (EJ/grid) for bioenergy between 2000 and 2100
A2r scenario (country investment risk excluded).

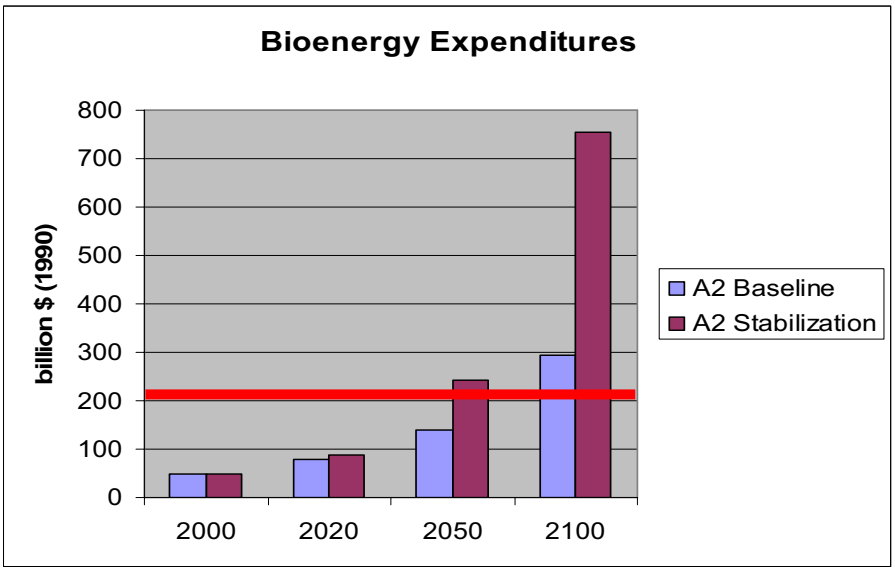


Biofuels dominant





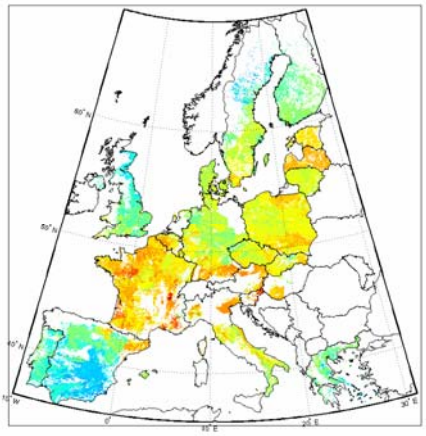
Financials of Biomass Supply

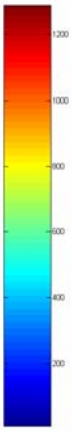


Regional Biomass Scenarios

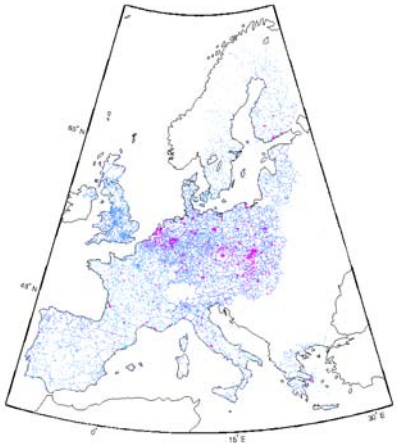
Transport fuel from Wood Gasification

European Model





Poplar production in Tonne/year/km^2



European cities

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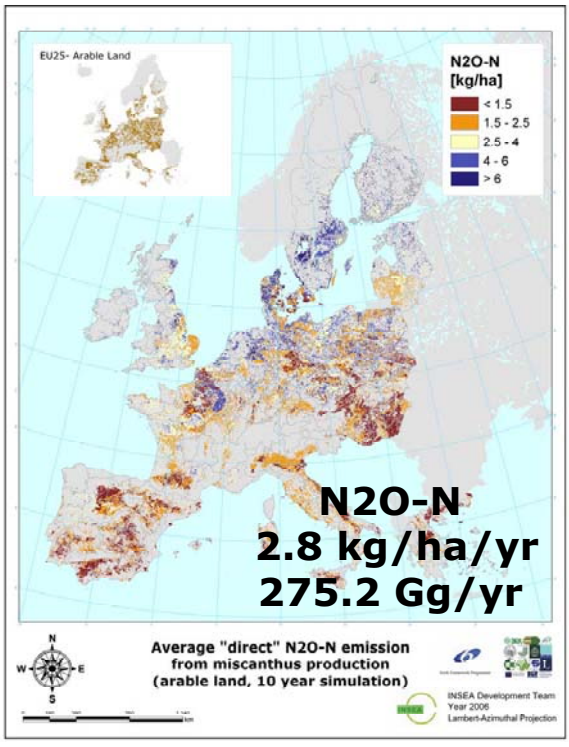
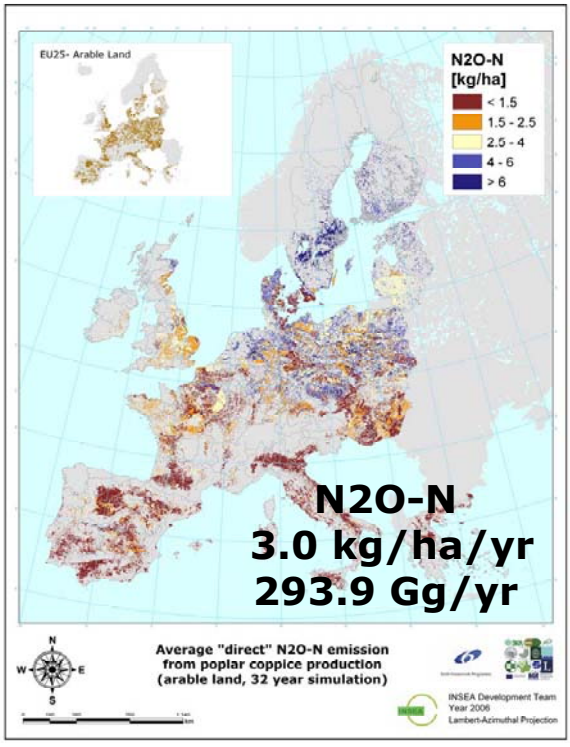
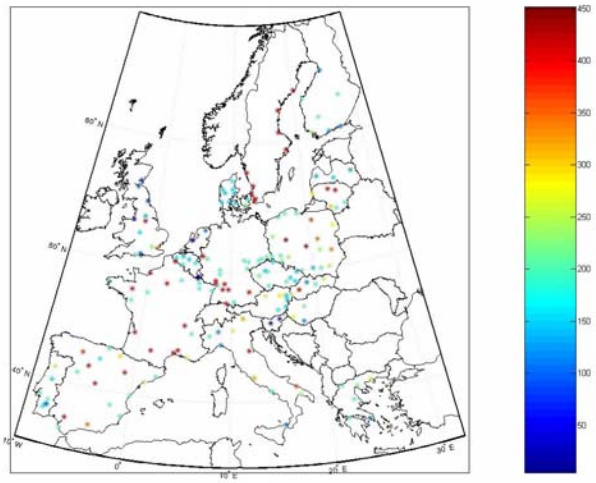
miscanthus direct N2O poplar coppice

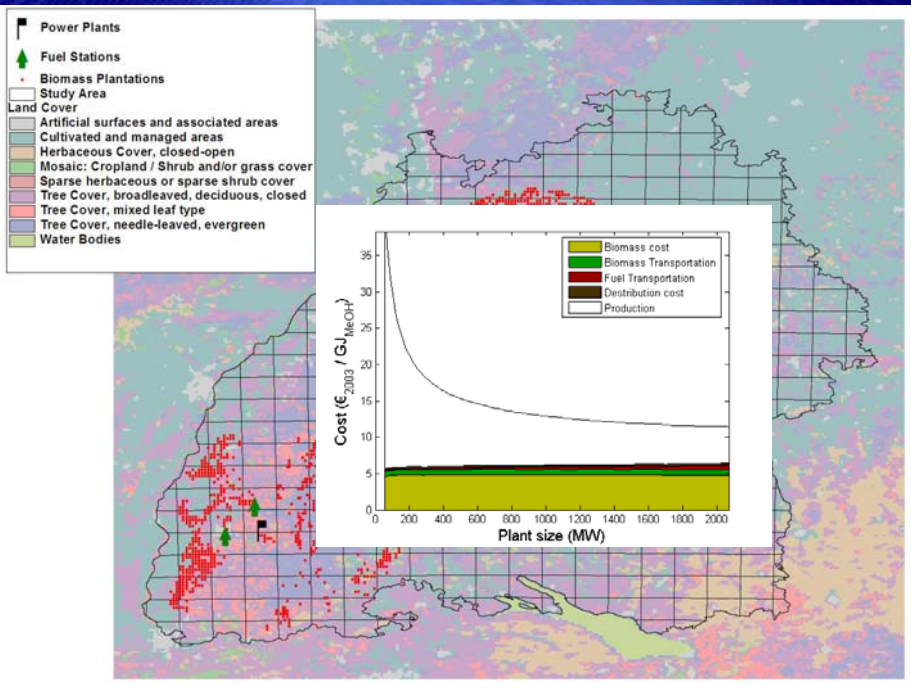




Geography of Supply



Methanol from Poplar: 10% Car Fleet, 8,3% Arable Land, 25ha Plantation / 100ha



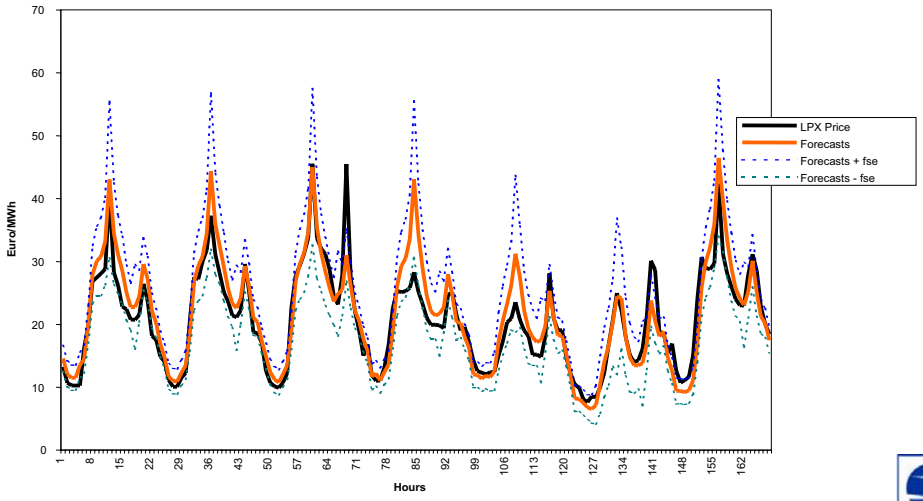
BLG

Real Options Valuation of BLG&CCS

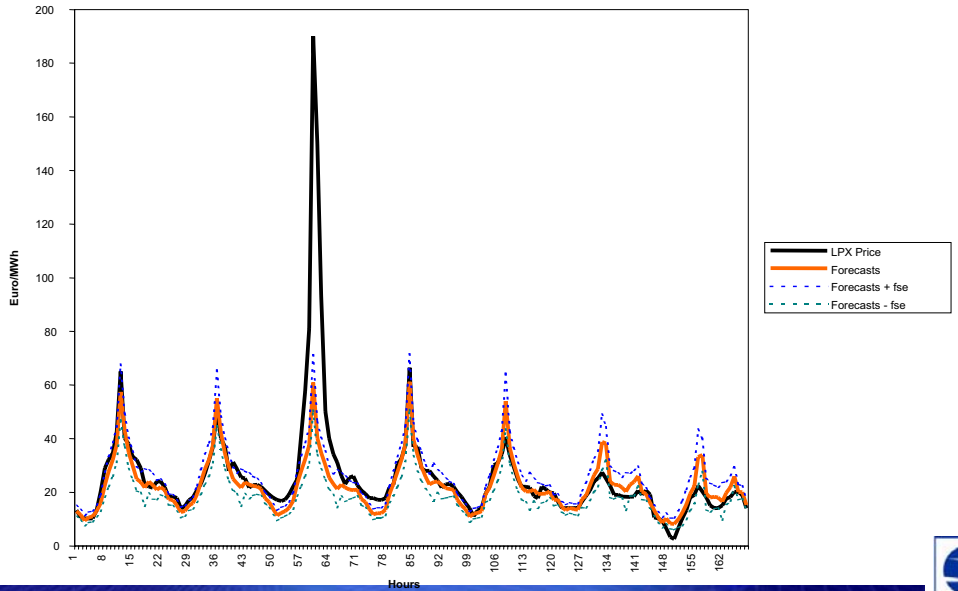
Real Option Modelling

- Optimize Corporate Portfolio according to the standard finance tools
- Unit commitment ⇔ path-dependent American Option
- Fwd Monte Carlo simulation and bwd dynamic programming
- Operational Constraints

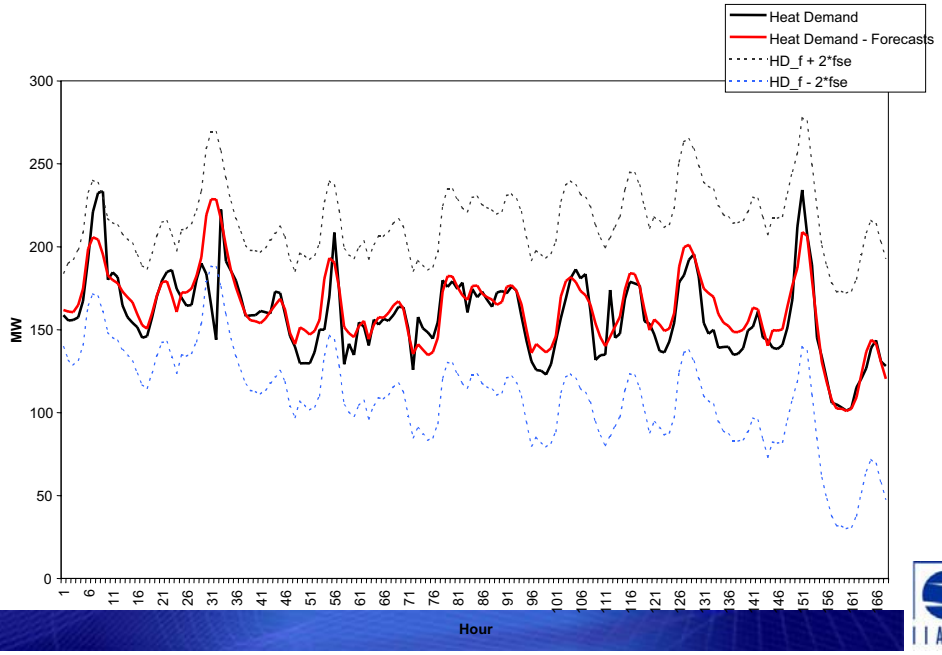
One week ahead forecasts for the 1st osp for M3 when modeling each hour separately



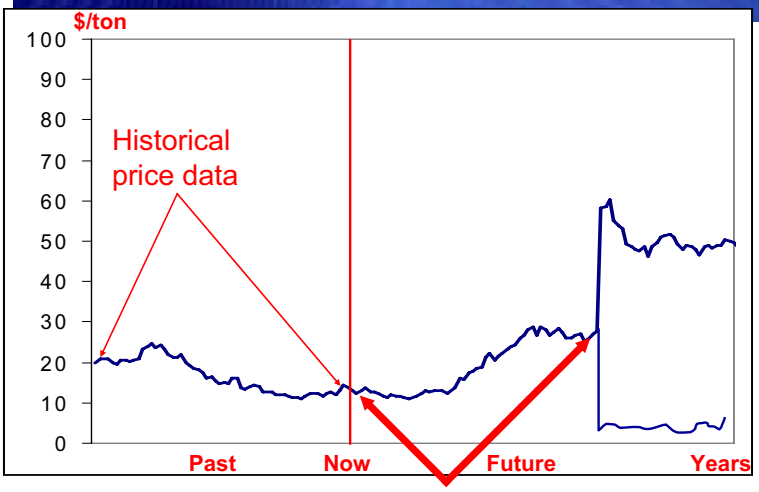
One week ahead forecasts for the 2nd osp for M3 when modeling each hour separately



1-week ahead forecasts of heat demand by M9 (17-23 April)



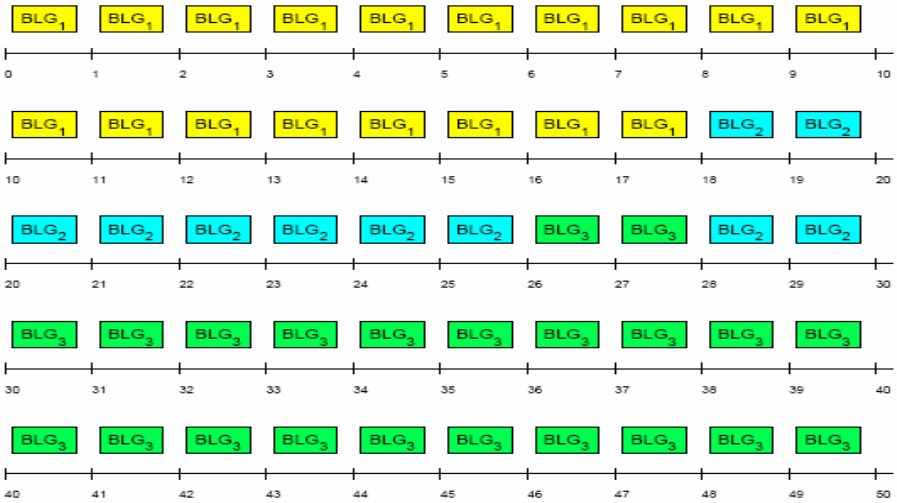
Modeling uncertain CO2 prices



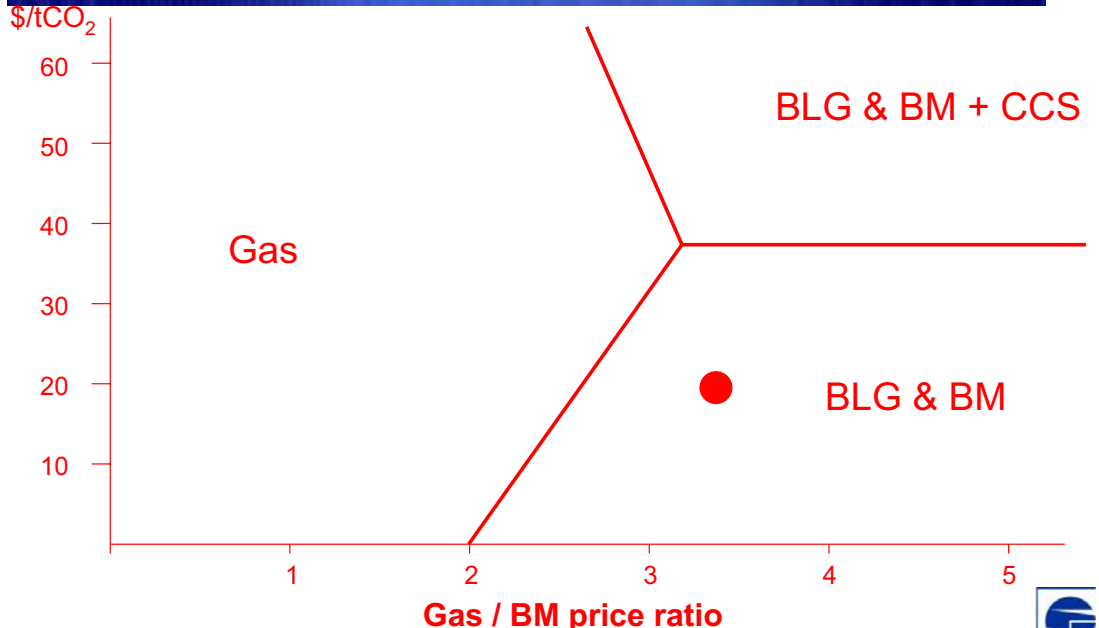
C Price Shock ± 100% to quantify C price impacts

Carbon price is projected to find the breakeven point where the investment is marginally cost-effective

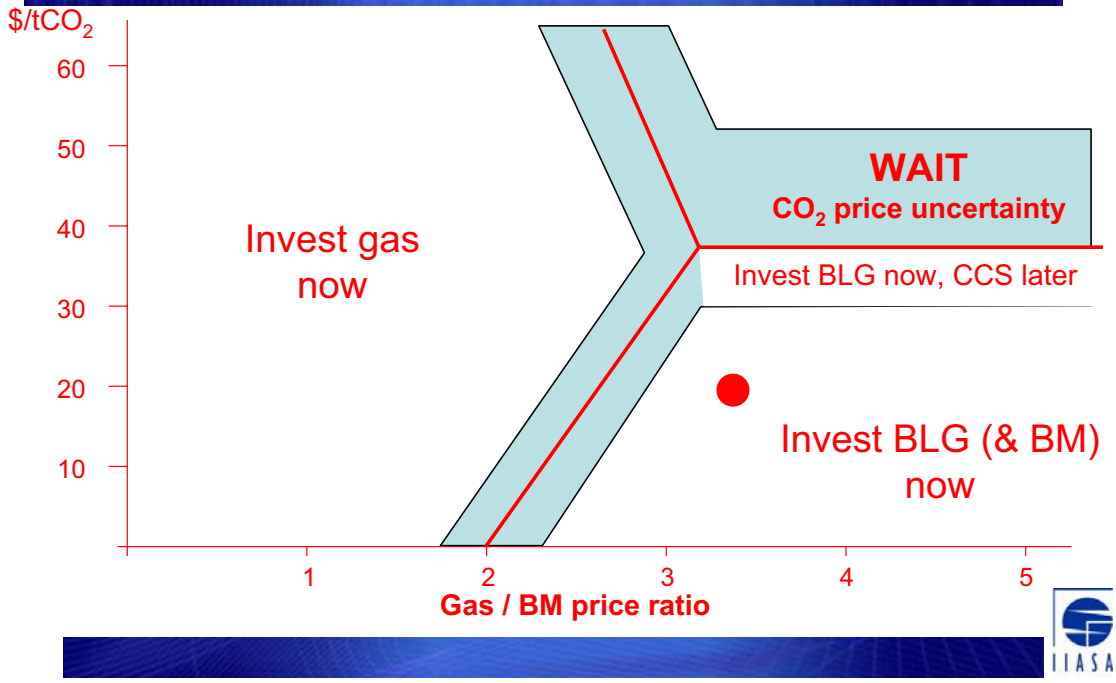
Beispiel BLG1,2,3



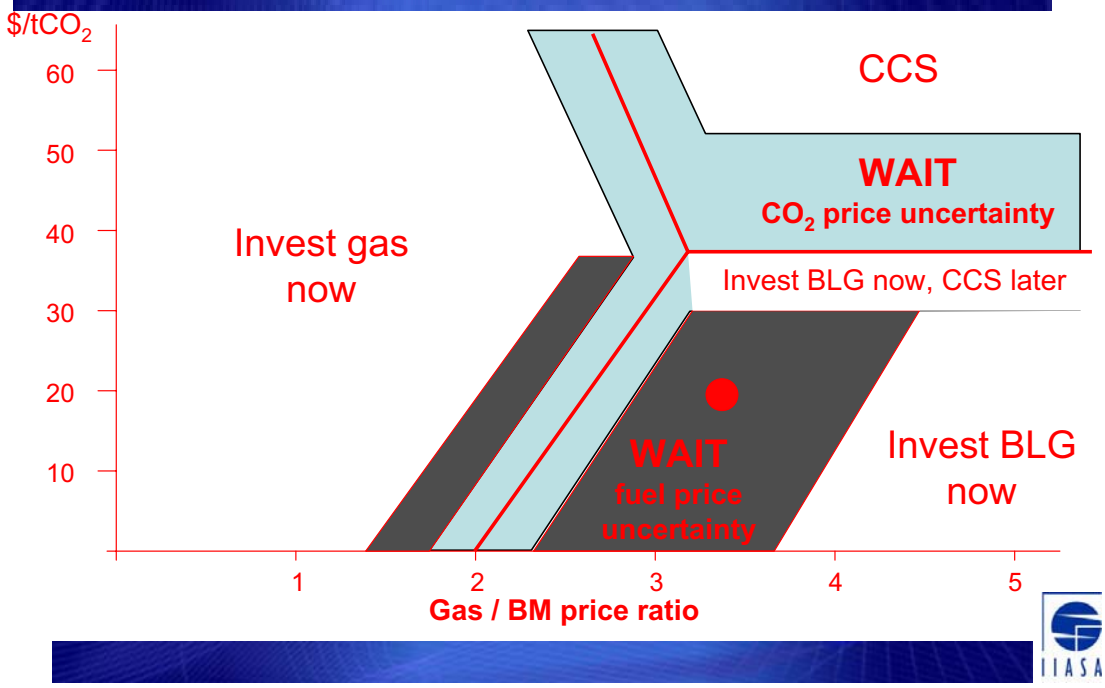
Investment under deterministic prices



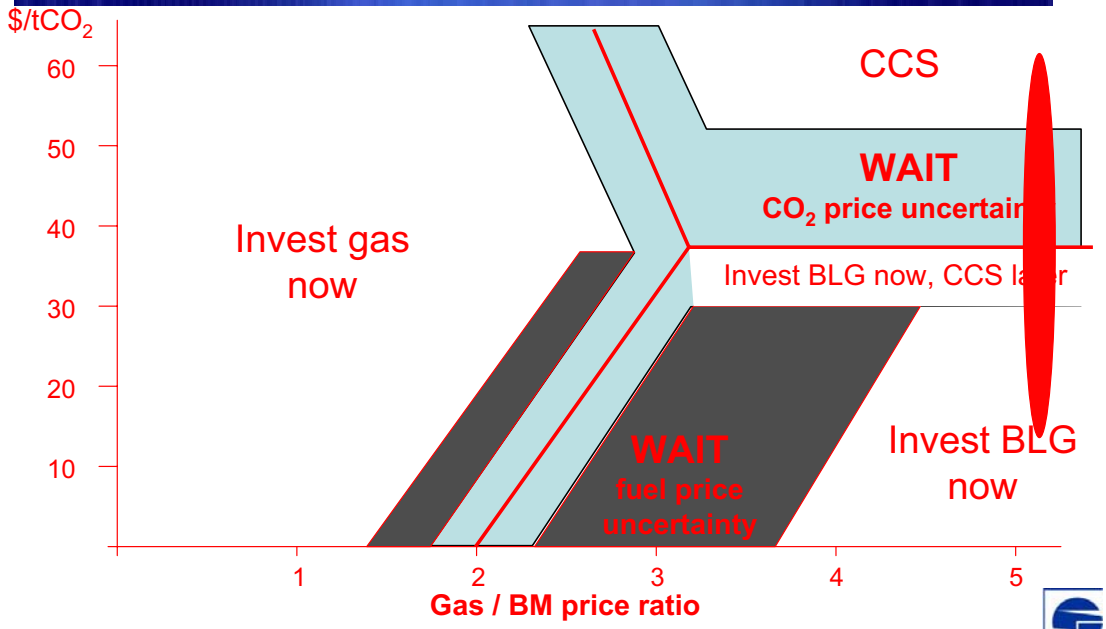
Investment under carbon price uncertainty



Investment under fuel price uncertainty

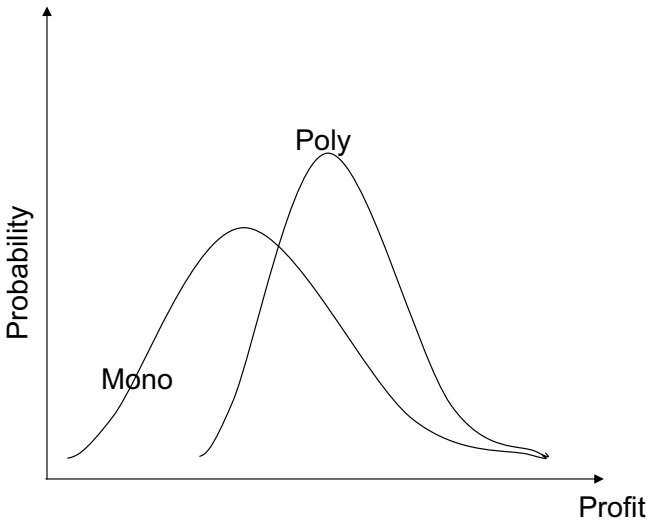


Investment under uncertain fuel&electricity



Profits under Polyproduction

- Transport fuels
- Methan
- Heat
- Electricity
- Chemicals



Conclusion

- Bioenergy is on the Radar Screen of Potent Competitors
- Land is becoming a scarce resource
- Polyproduction increases competiveness in marginal products
- CoOpetition (Cooperate to Compete)
  - Material Operator and Coordinator
  - R&D

Final word

If you want to win the climate and alternative fuels battle – you need to have the mind of leading a war!

Lord Oxbourgh, Former Chair of Shell Trade and Finance