

From 1st to 2nd Generation Biofuels

Current IEA Activities within GBEP

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COP Bali 12 December 2007
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IEA's contribution to GBEP to date includes

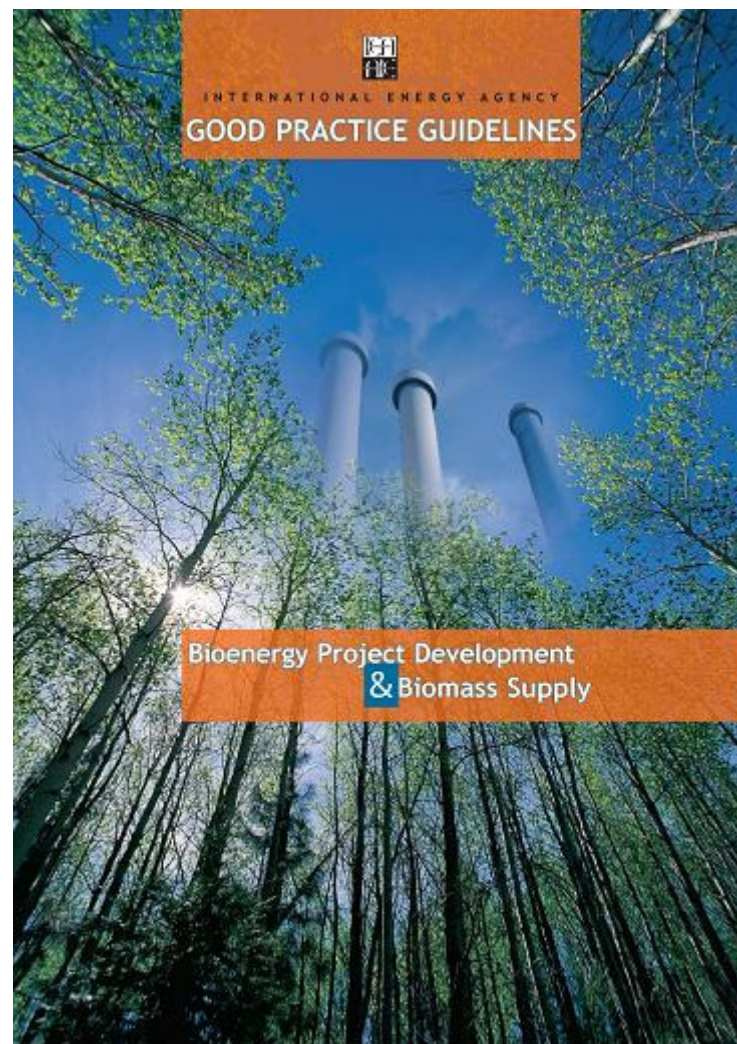
- Representation at high level GBEP Steering Committee meetings.
- Presented at the 2nd Technical Working Group at CSD preparatory meeting, NY February 2007.
- Reviewed several GBEP papers including *Review of the current state of Bioenergy Development in G8 +5 countries*.
- Presented at GBEP side event at SEP Waste Technologies , Padova.
- Related work of the IEA Bioenergy Implementing Agreement, particularly Tasks 29 and 40, acknowledged on GBEP web site.
- IEA *Bioenergy Project Development & Biomass Supply - Good Practice Guidelines* and *Renewable Energy Heating and Cooling – untapped potential* used by GBEP for various analyses.

Bioenergy Project Development & Biomass Supply Good Practice Guidelines

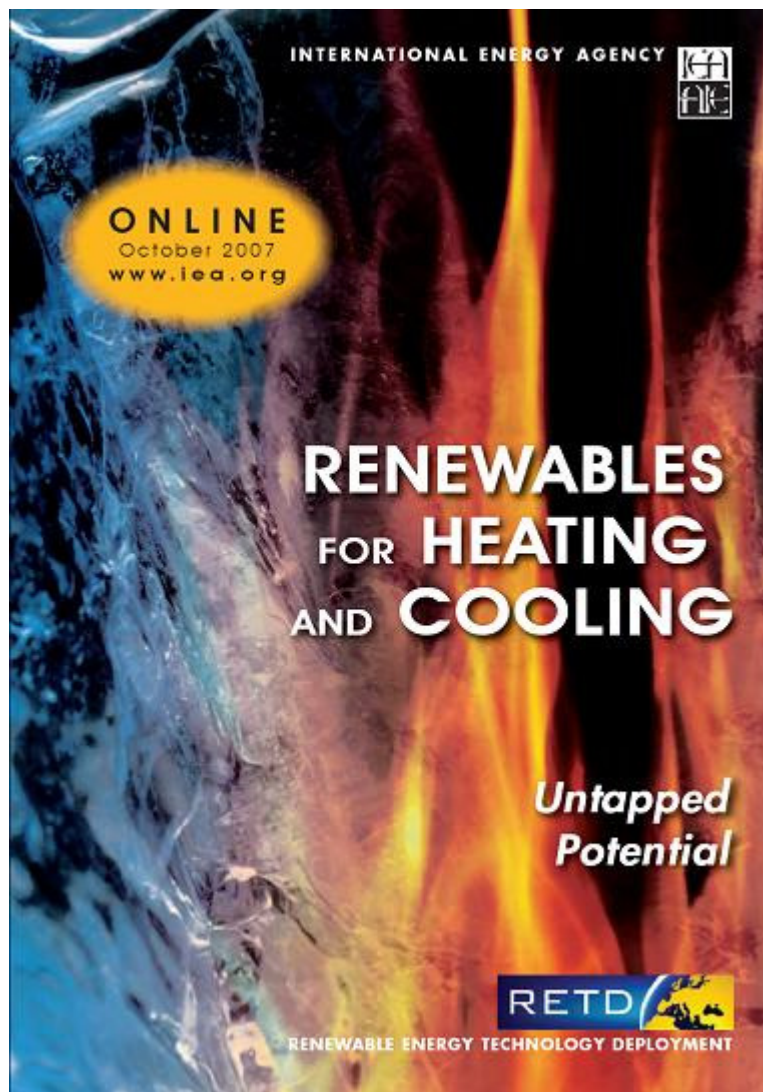
A publication to facilitate the deployment of bioenergy plants aimed at policy makers, planners and developers.

June 2007 61 pages.

Available as a free download at:
www.iea.org



REHC - A joint publication by the IEA Renewable Energy Technology Deployment Implementing Agreement and the Renewable Energy Unit of the IEA Secretariat



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**with major contributions
from the**

- Bioenergy,
 - Geothermal,
 - Solar Heating and Cooling and
 - SolarPACES
- Implementing Agreements

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Why Focus on 2nd Generation Biofuels?

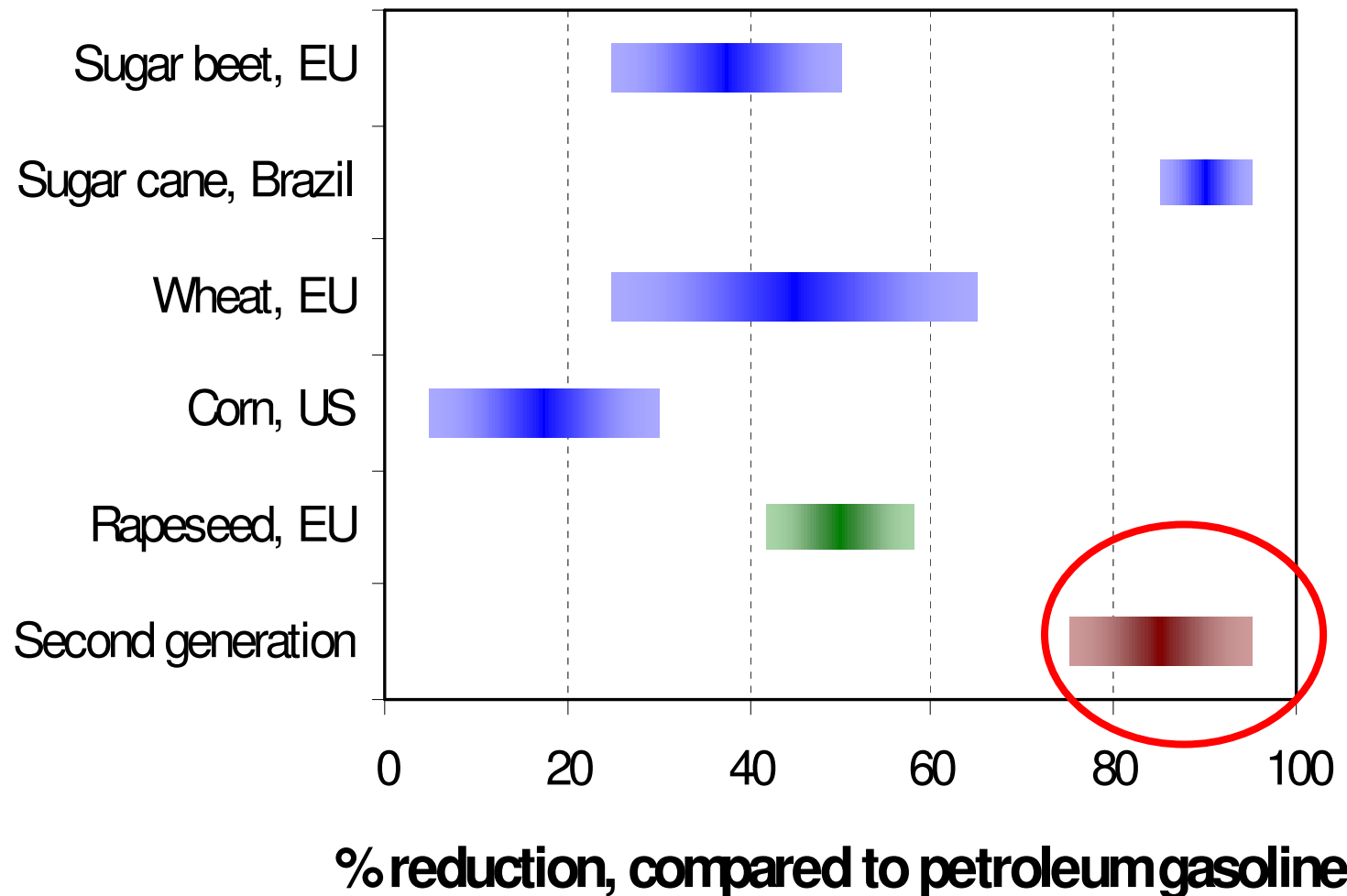
- Issues and limits of 1st generation biofuels
- Potential technology development and cost reduction
- Potential of biofuels in IEA world energy scenarios

Issues of 1st Generation Biofuels

- **Will producing more biofuels have impacts for food prices and environment?**
- “Yes” for 1st generation in OECD countries – already apparent due to competition for land and food products in US and Europe.
- “Maybe” for 1st generation in developing countries – but need careful assessment of land use / soil types / nutrient recycling / water demand and to:
 - respect environmental impacts, e.g. deforestation and land use change;
 - consider social / cultural issues e.g. labour, land ownership, sustainable development opportunities;
 - Encourage, where appropriate, biofuel uptake in domestic markets as well as for export.

Indicative ranges of greenhouse gas abatement potential from biofuels

Well-to-wheel emission reductions



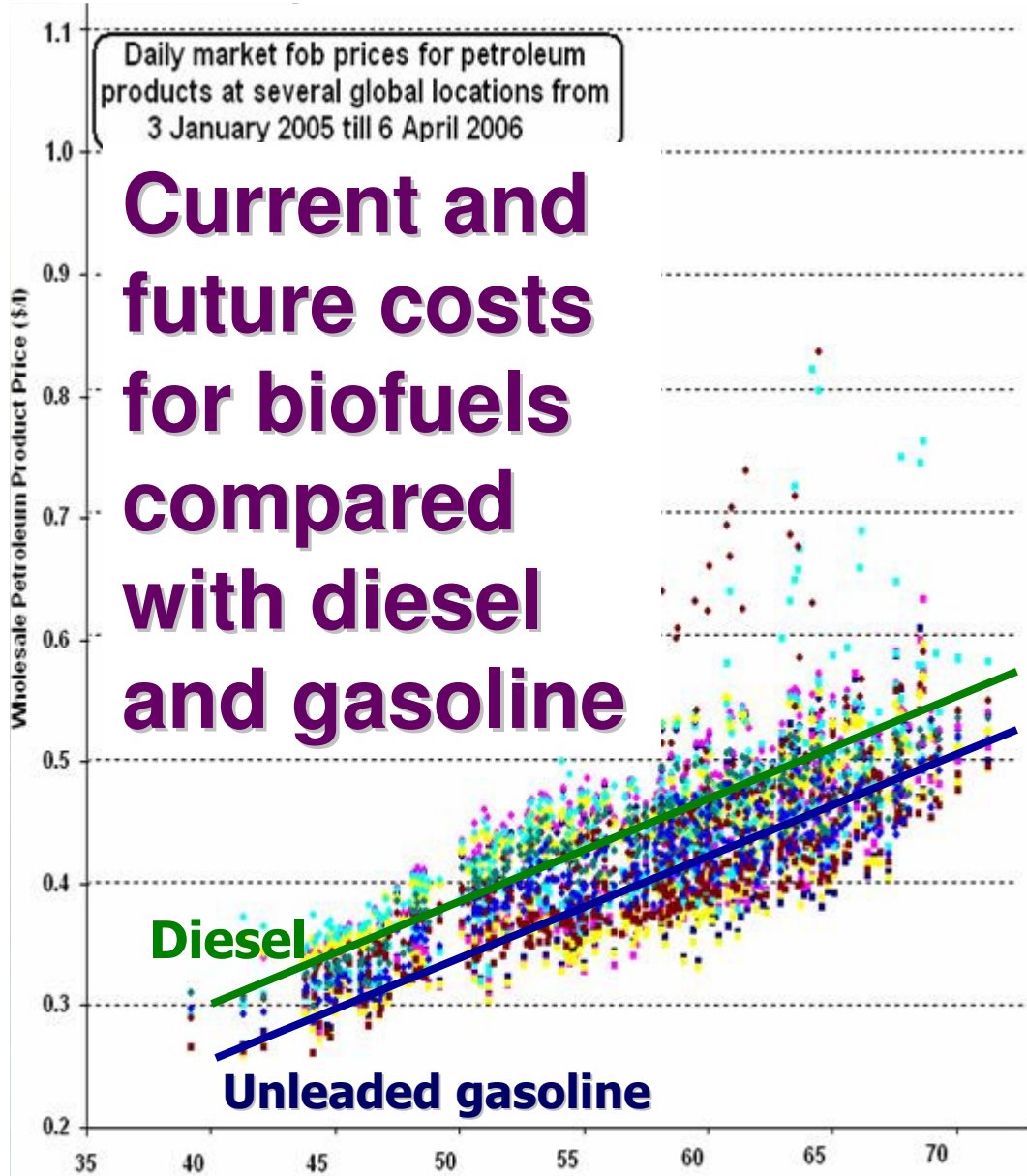
Wide ranges are partly due to varying LCA assumptions and methodologies.

Life Cycle Assessment of Biofuels

- Life cycle assessments essential but need transparency and improvements in the assumptions used
 - eg how to handle co-products in a standard way.
- IEA currently making a review of existing LCA of biofuels to identify best practices
 - until February, 2008
 - With UNEP
- Input to GBEP GHG Methodology Task Force

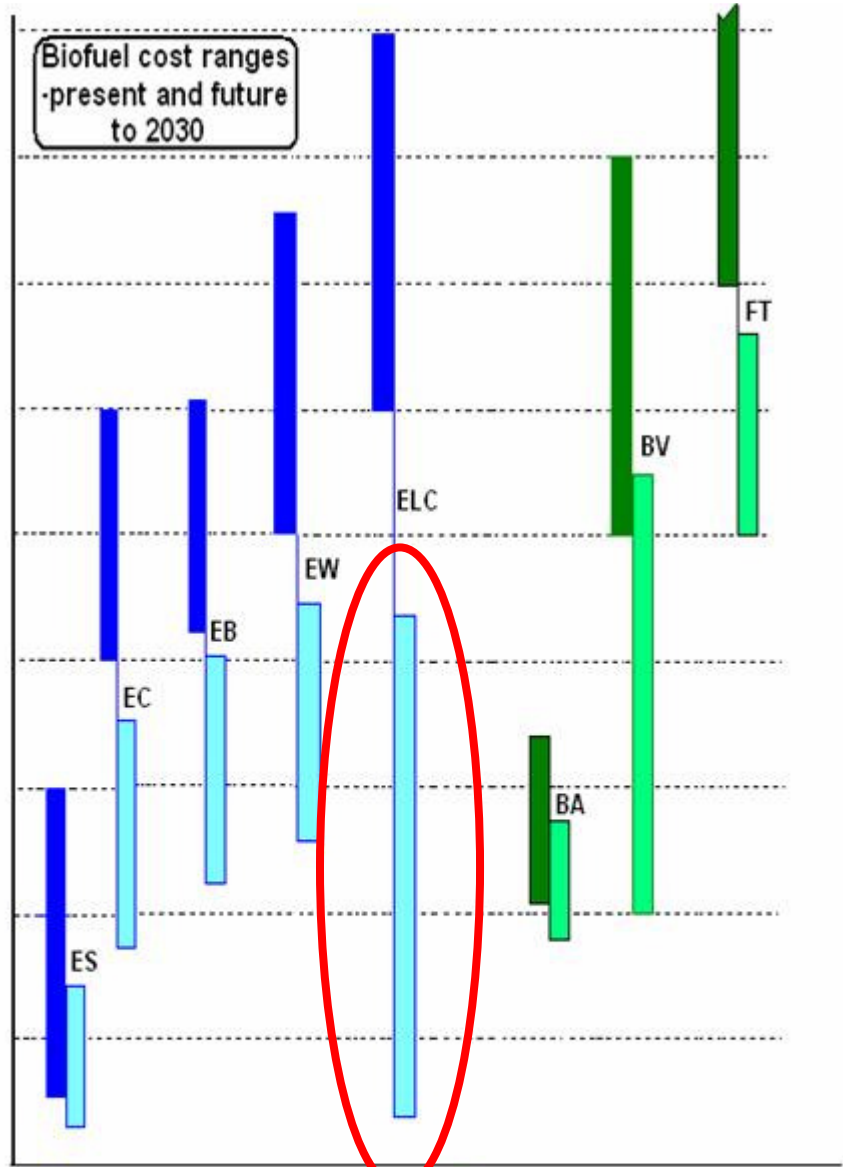
Daily market fob prices for petroleum products at several global locations from 3 January 2005 till 6 April 2006

Current and future costs for biofuels compared with diesel and gasoline



- | | |
|---|---|
| <ul style="list-style-type: none"> Unleaded gasoline • PUnl 10 NWE • Premium unlead • PUnl 50 AR • PUnl 50 • Unleaded | <ul style="list-style-type: none"> Diesel and gas oil • ULSD NWE • No. 2 LS • ULSD 10ppm NWE • Gasoil 0.05% S • Gasoil 0.5% S • ULSD 50 • ULSD 50 NWE |
|---|---|

Biofuel cost ranges - present and future to 2030



- | | |
|--|--|
| <ul style="list-style-type: none"> Bioethanol present cost ranges Bioethanol cost estimates by 2030 ES Ethanol from sugar cane EC Ethanol from corn EB Ethanol from beet EW Ethanol from wheat ELC Ethanol from ligno cellulose | <ul style="list-style-type: none"> Biodiesel current cost ranges Biodiesel cost estimates by 2030 BA Biodiesel from animal fats BV Biodiesel from vegetable oils FT Fischer Tropsch synthesis liquids |
|--|--|

Could first generation biofuels foster the transition to second generation?

- First generation have **already encouraged** development of infrastructure, blending technologies, vehicle engine designs, emission monitoring, etc.
- Limitations of 1st generation are clear but public RD&D investments to give technical push are **insufficient for the transition to 2nd generation.**
- Innovation and investment follow when **market opportunities** are presented to the private sector
 - e.g. cell phones +GPS; biotechnology companies; London stock exchange investments.

Current IEA work - "From 1st to 2nd Generation Biofuels"

- An Overview of current industry and RD&D activities
- With the financial support of the Italian Ministry for the Environment, Land and Sea
- IEA contribution to GBEP
- In collaboration with other international organisations
 - OECD, UNCTAD, UNEP, FAO and others
- Duration: October 2007 – August 2008
 - Draft results expected in May 2008

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“From 1st to 2nd Generation Biofuels” - Objectives

- Carrying out a review of developing biofuel technologies and the **transition** to 2nd generation biofuels;
- Identifying existing biofuels pilot and demonstration plants and **assessing the gap** from market deployment;
- Considering the **difficulties of scaling up** to commercial plant scale and supplying the required all-year-round volumes of feedstock from sustainable sources;
- Discussing **implications** for policy-makers and scenario modellers (including providing input to the World Energy Outlook 2008).

Will production costs prove too high so markets will be limited to a few regions?

- Just looking at conversion technologies not enough
- Feedstocks 50-80% of total production costs, both today and likely in the future
- Several uncertain aspects significantly influence future feedstock costs:
 - crop yields from GM –also from arid lands;
 - value of co-products and co-benefits;
 - handling, storage, transport innovations;
 - future competing oil and carbon prices;
 - development of unconventional oil products;
 - rate of learning experience for 2nd generation crops;
 - attraction of investors into Africa, S America, India etc;
 - rate of development of 3rd generation biofuels e.g. from algae.

What is the potential for biofuels?

- IEA analyses show
 - double current 58 billion litres by 2012 – but less than installed plant capacity due to high feedstock costs (Medium Term Oil market report)
 - Ninefold increase by 2030, but still only 6% of world transport fuels by 2030 (WEO, 2007)
 - 13-25% by 2050 (ETP, 2006).
- Biofuels for rail, marine, aviation and heavy freight transport perhaps more long term potential than for small road vehicles that might use electric or hydrogen propulsion.
- Improved energy efficiency of vehicles most important whether there is increased demand for biofuels or not.

In summary

- IEA is an active participant in **GBEP**.
- Current contributions have been wide-ranging.
- Future projects now underway will concentrate on **second generation biofuels** and life cycle assessment.
- Bioenergy has **high global potential** but needs to be managed carefully so that sustainable biomass production, trade opportunities and sustainable development result.
- IEA is pleased to be a partner of the GBEP working on these issues.