Biofuels Technology Platform
Bruxelles

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Biofuels in the Global Energy Market

- the IEA Perspective

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1) What policy goals could impact on future biomass/bioenergy uptake?

- Energy supply security
- Reduction of reliance on imported fuels
- Greenhouse gas emission reductions
- Sustainable development
- Low-cost energy availability to stimulate economic growth
- Improved health
- Support for rural industries
- Water use and quality
- Waste treatment
- Reclamation of degraded lands

Policies can assist to identify these co-benefits.

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2) How much biomass will become available for "bioliquids" use?

Sustainable production of biomass and certification will limit supply.

Trade in biofuels is linked to certification but also uptake in country of origin.

Which biomass use has the lowest $/t carbon avoided?

Heat, Power, CHP, Bio-materials, Bio-chemicals, Soil conditioning Bio-refineries, Transport fuels, Aviation fuel

Rigorous analysis is needed.

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Assessments for biomass supply potential in 2050 (IEA Bioenergy)

• Energy cropping	0-700 EJ
• Energy cropping on marginal land	<60-100
• Forest residues	30-150
• Agricultural residues	15-70
• Organic wastes	5-50
• Animal manures	5-55
Total	120 - 1200

Realisable potential = 160-180 EJ/yr

= one third of total world consumer energy demand today in all sectors.

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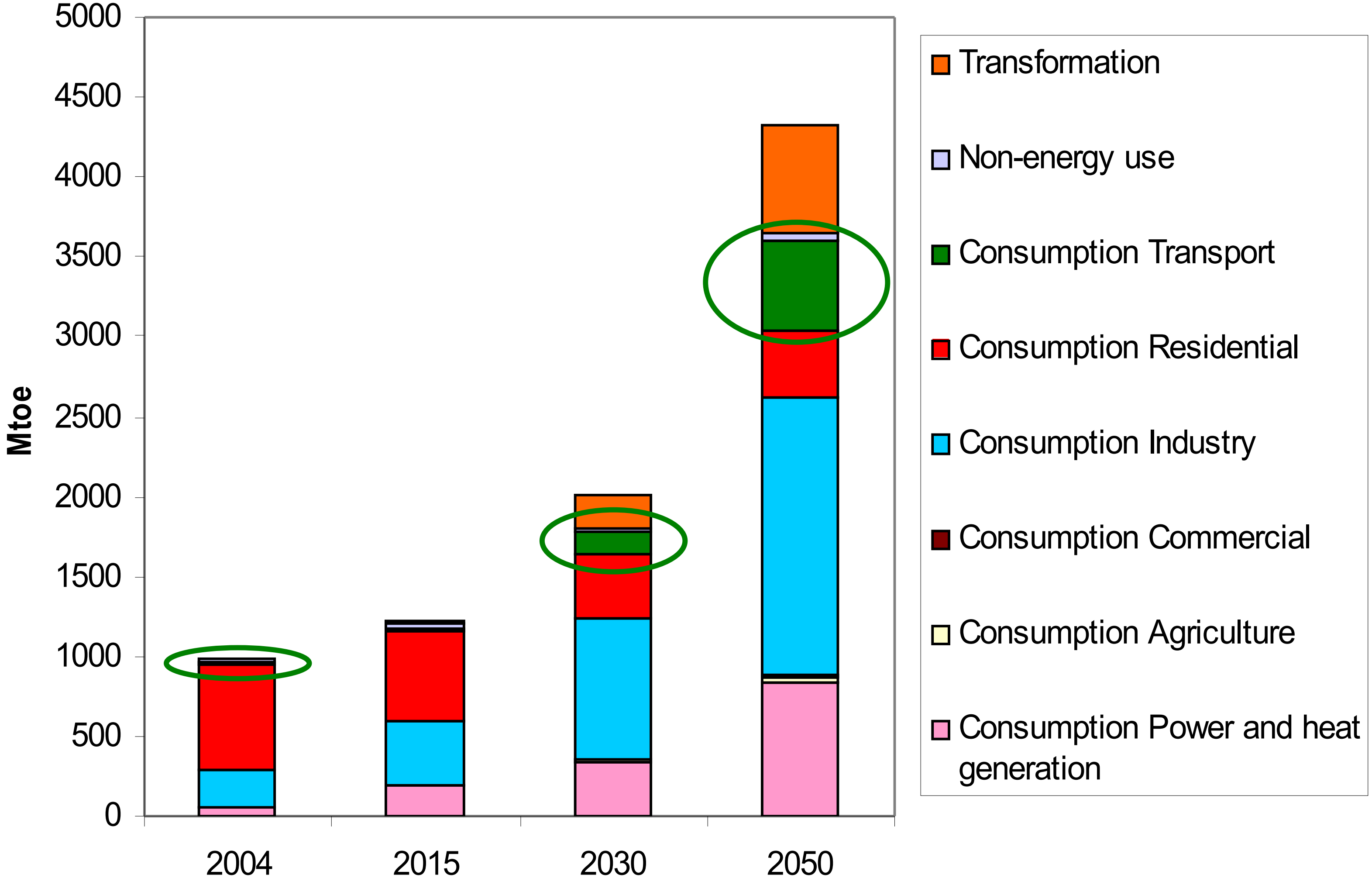
Global biomass consumption: IEA ETP "BLUE" ambitious scenario



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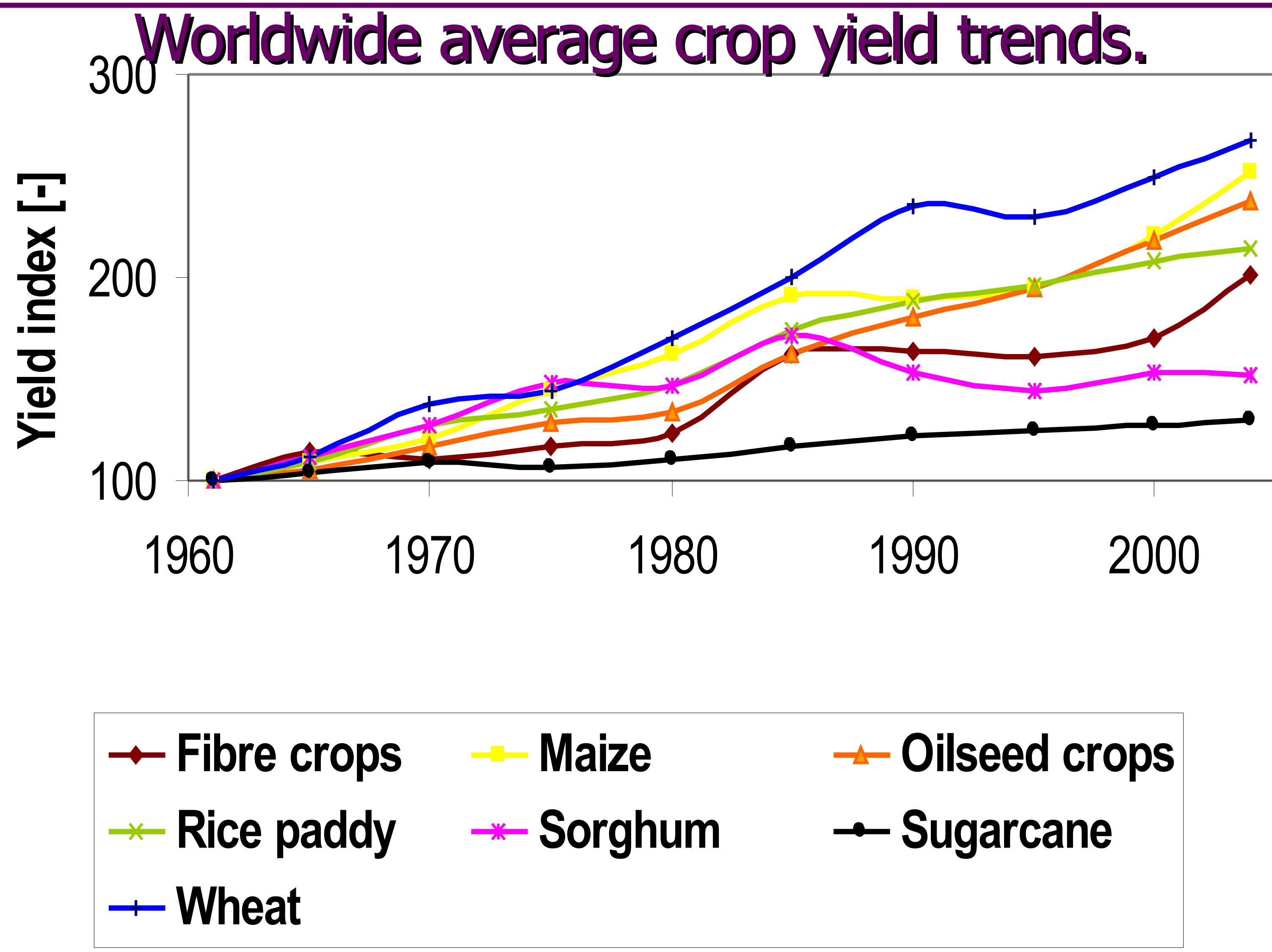
3) Can historic increases in crop yields continue and are they sustainable?



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4) Can the supply chain systems be improved to reduce the delivered costs of biomass?

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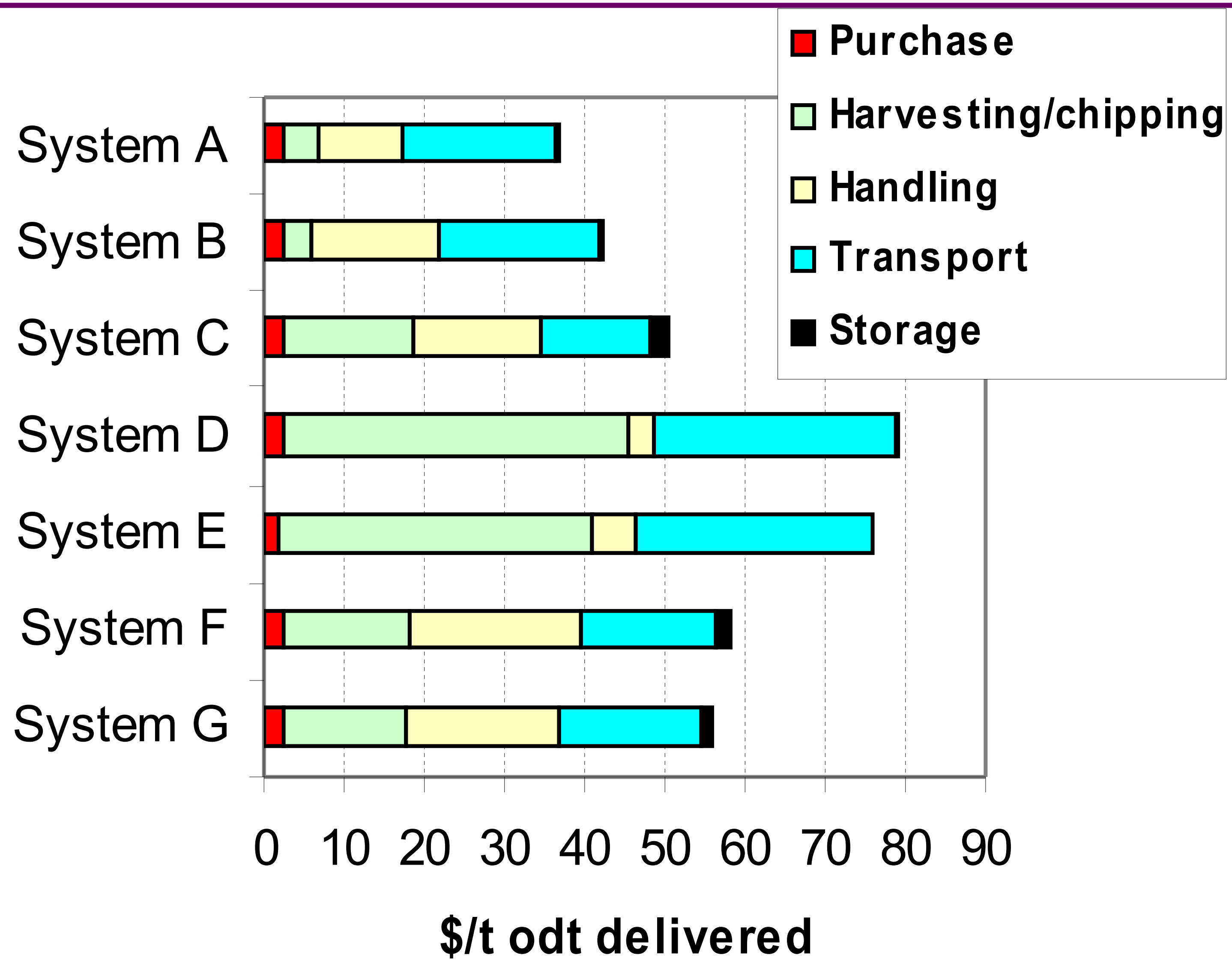
Complex interactions exist between volume, weight and moisture content of biomass.

e.g for 85m^3 truck and trailer unit

Example of delivered supply cost variations for forest residues.



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5) What technology improvements in bioenergy conversion plants can be expected by 2050?

- Black liquor gasification
- Biofuel production linked with Carbon Capture and Storage?
- Linked with soil carbon uptake – bio-char.

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5) What technology improvements in bioenergy conversion plants can be expected by 2050?

BIGCC potential

- Learning rate 3% /yr

	2010	2015	2030	2050
Assumed growth rate	5	25	15	5%
Investment cost $/kW	2500	2300	1900	1750
Resulting capacity GW	1	3	46	130

- Linked with Carbon Capture and Storage?

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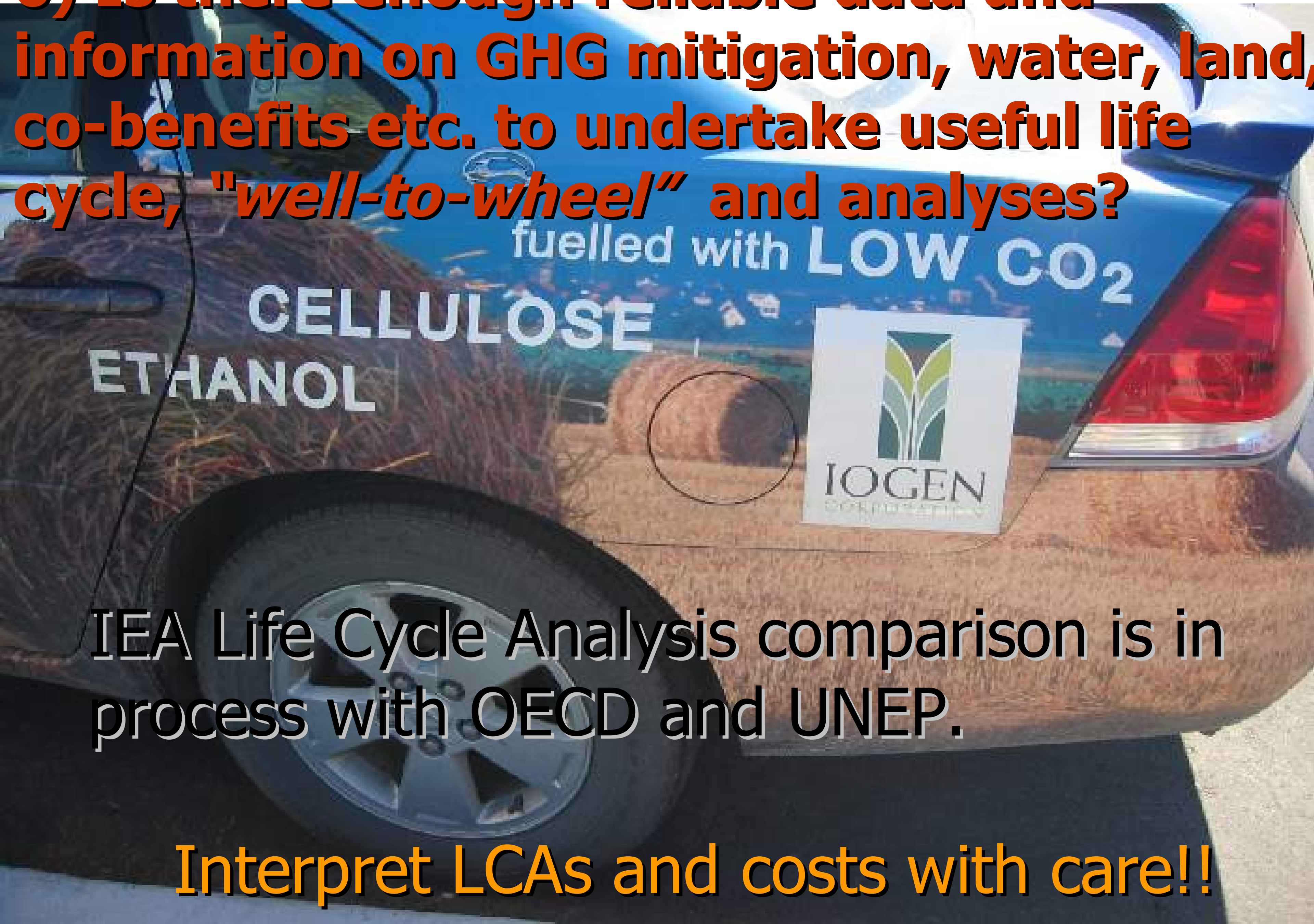
6) Is there enough reliable data and information on GHG mitigation, water, land, co-benefits etc. to undertake useful life cycle, "*well-to-wheel*" and analyses?

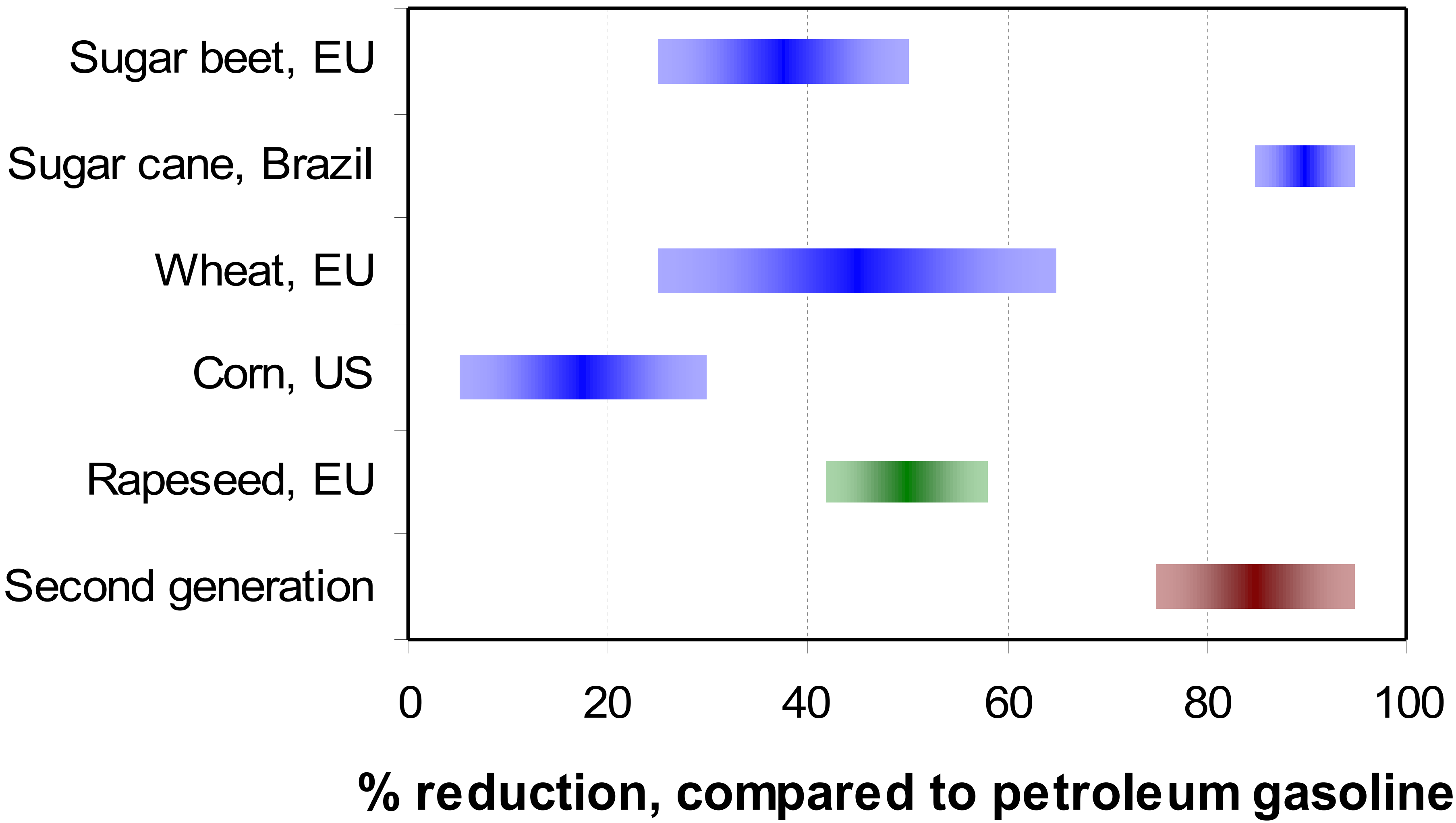


IEA Life Cycle Analysis comparison is in process with OECD and UNEP.

Interpret LCAs and costs with care!!

Biofuels greenhouse gas abatement

Well-to-wheel emission reductions



7. What are the potentials and costs for biofuels worldwide?

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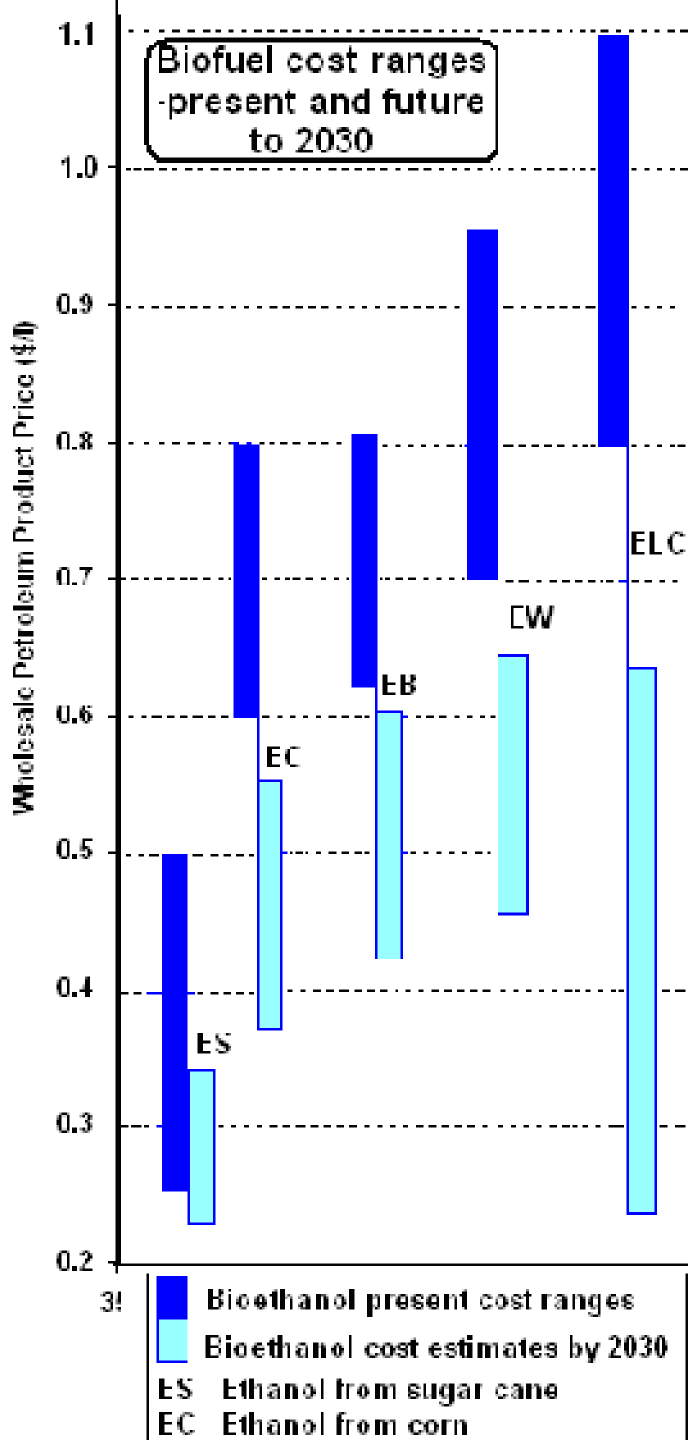
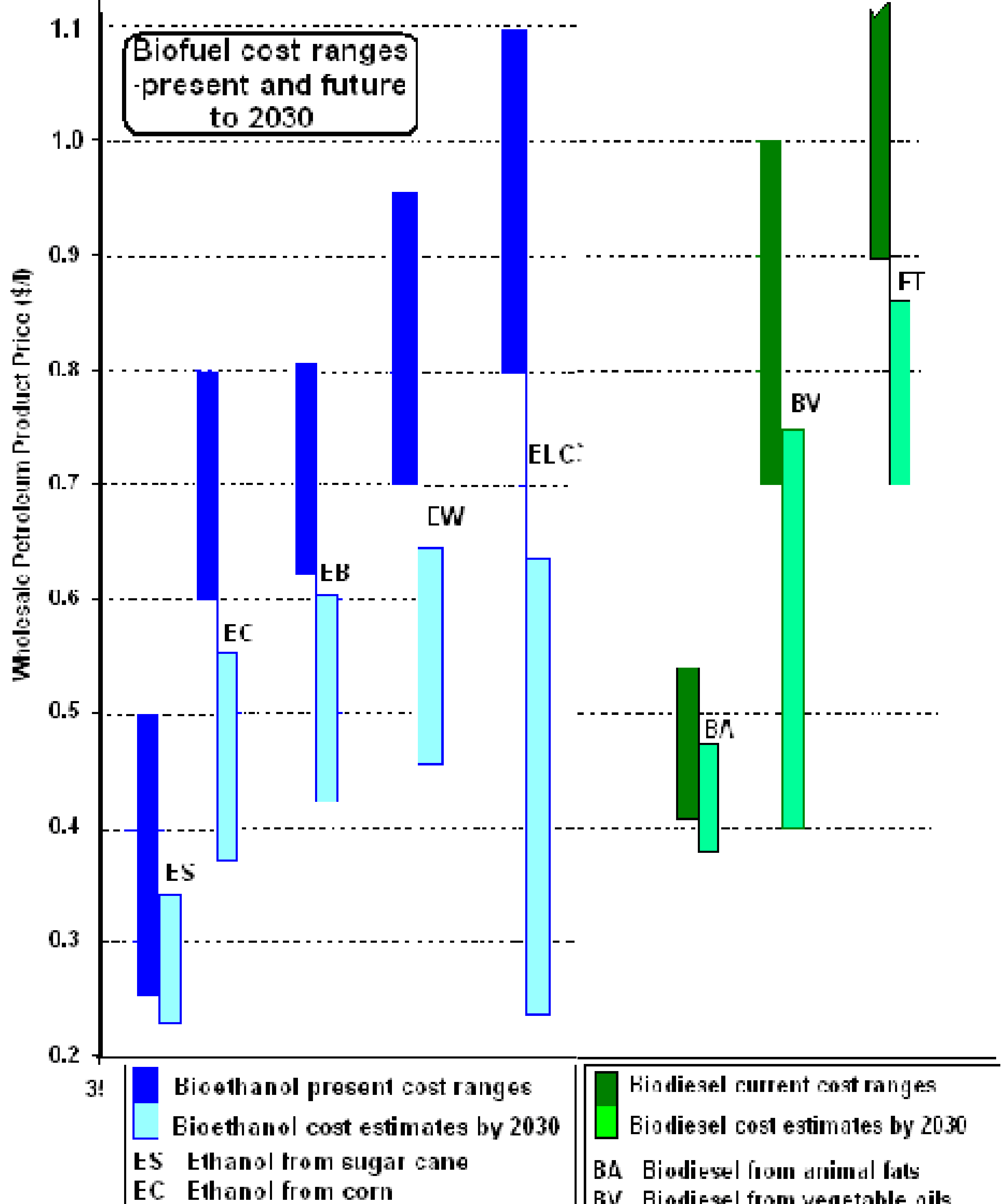

Biofuel cost ranges -present and future to 2030
Wholesale Petroleum Product Price ($/l)
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
ES
EC
EB
EW
ELC
Bioethanol present cost ranges
Bioethanol cost estimates by 2030
ES Ethanol from sugar cane
EC Ethanol from corn



Biofuel cost ranges -present and future to 2030
Wholesale Petroleum Product Price ($/l)
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1.0
0.9
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0.4
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ES
EC
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EW
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BA
BV
FT
Bioethanol present cost ranges
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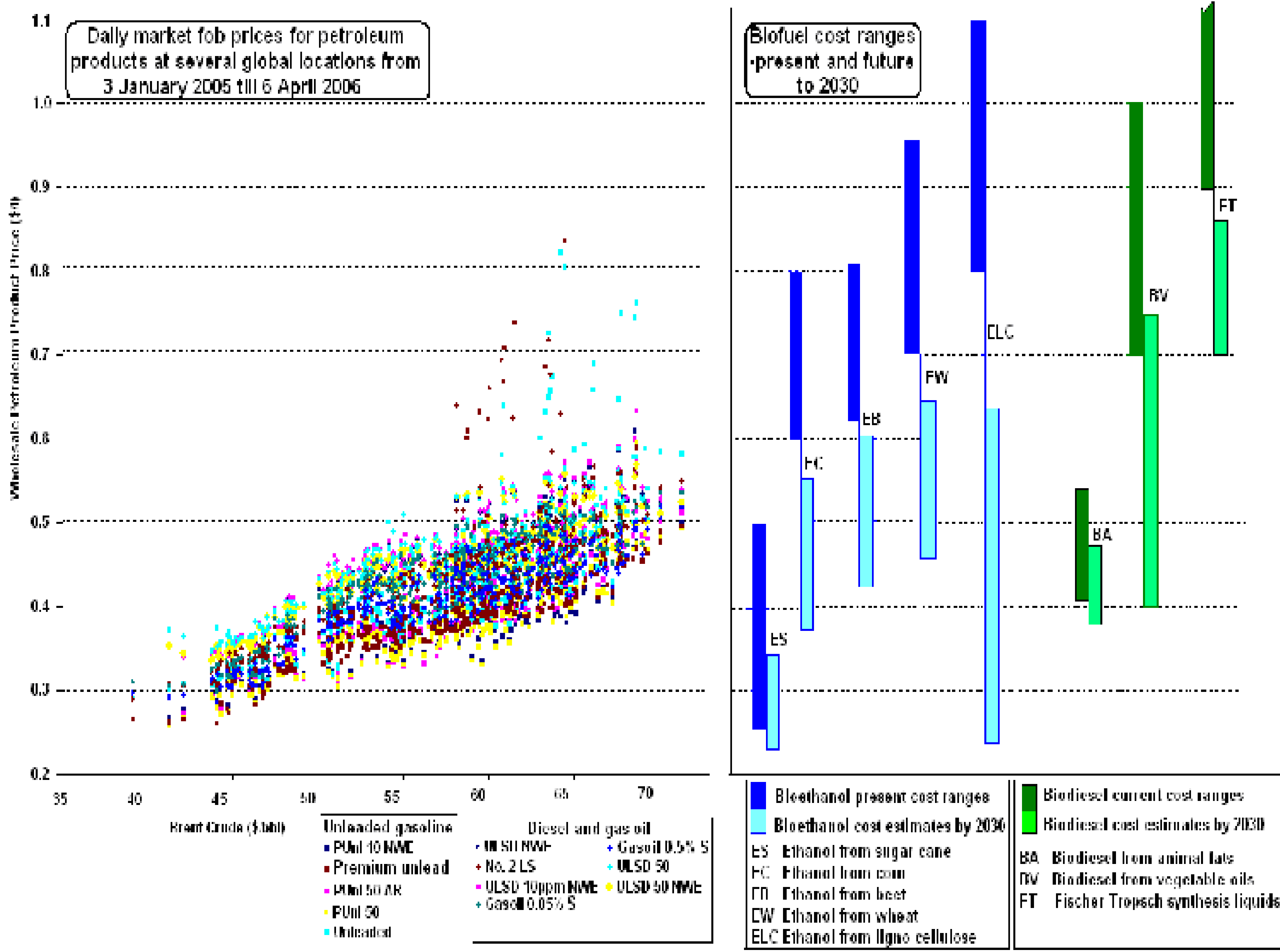
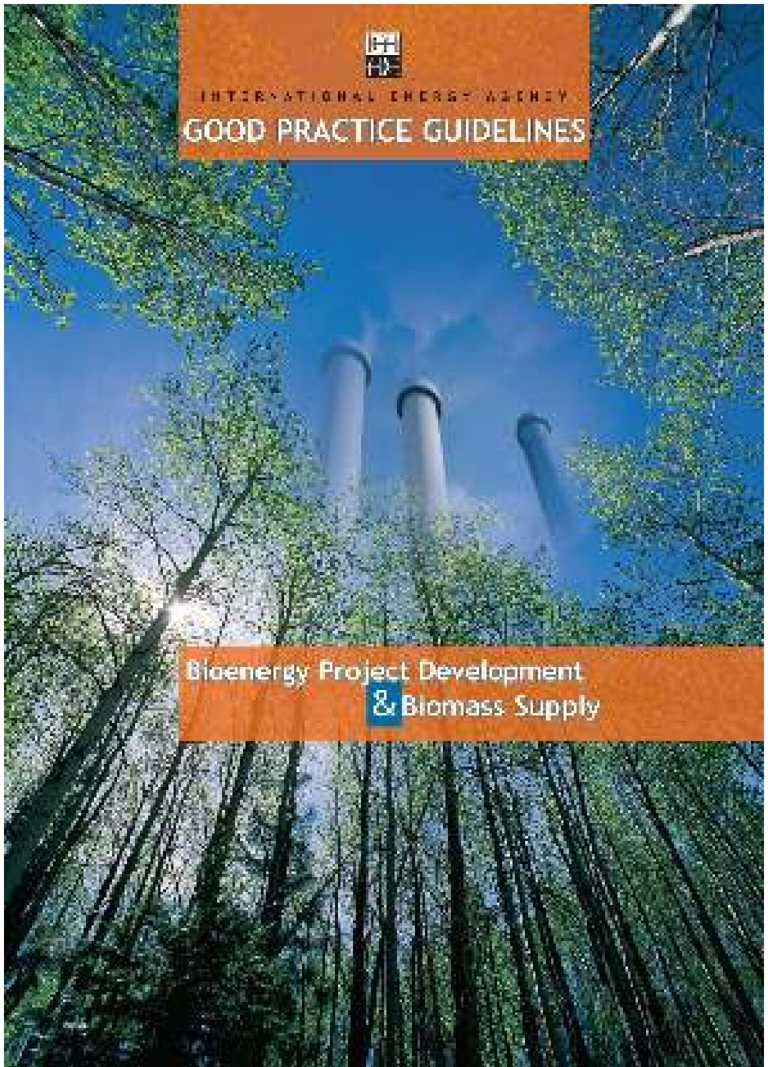
ES Ethanol from sugar cane
EC Ethanol from corn
Biodiesel current cost ranges
Biodiesel cost estimates by 2030
BA Biodiesel from animal fats



Daily market fob prices for petroleum products at several global locations from 3 January 2005 till 6 April 2006
Biofuel cost ranges -present and future to 2030
Wholesale Petroleum Product Price ($/l)
Brent Crude ($/bbl)
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
35
40
45
50
55
60
65
70
ES
EC
EB
EW
ELC
BA
BV
FT
Unleaded gasoline
PUnl 10 NWE
Premium unlead
PUnl 50 AR
PUnl 50
Unleaded
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
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
Biodiesel current cost ranges
Biodiesel cost estimates by 2030
BA Biodiesel from animal fats
BV Biodiesel from vegetable oils
FT Fischer Tropsch synthesis liquids

8) By how much can the deployment of bioenergy projects be speeded up?



A new publication to assist the difficult experience of developing a bioenergy plant.
www.iea.org

9) What will be the economic potential for future bioenergy uptake by 2050 given international prices of:
$US 20, 50, 100 and 200 /tCO_2?

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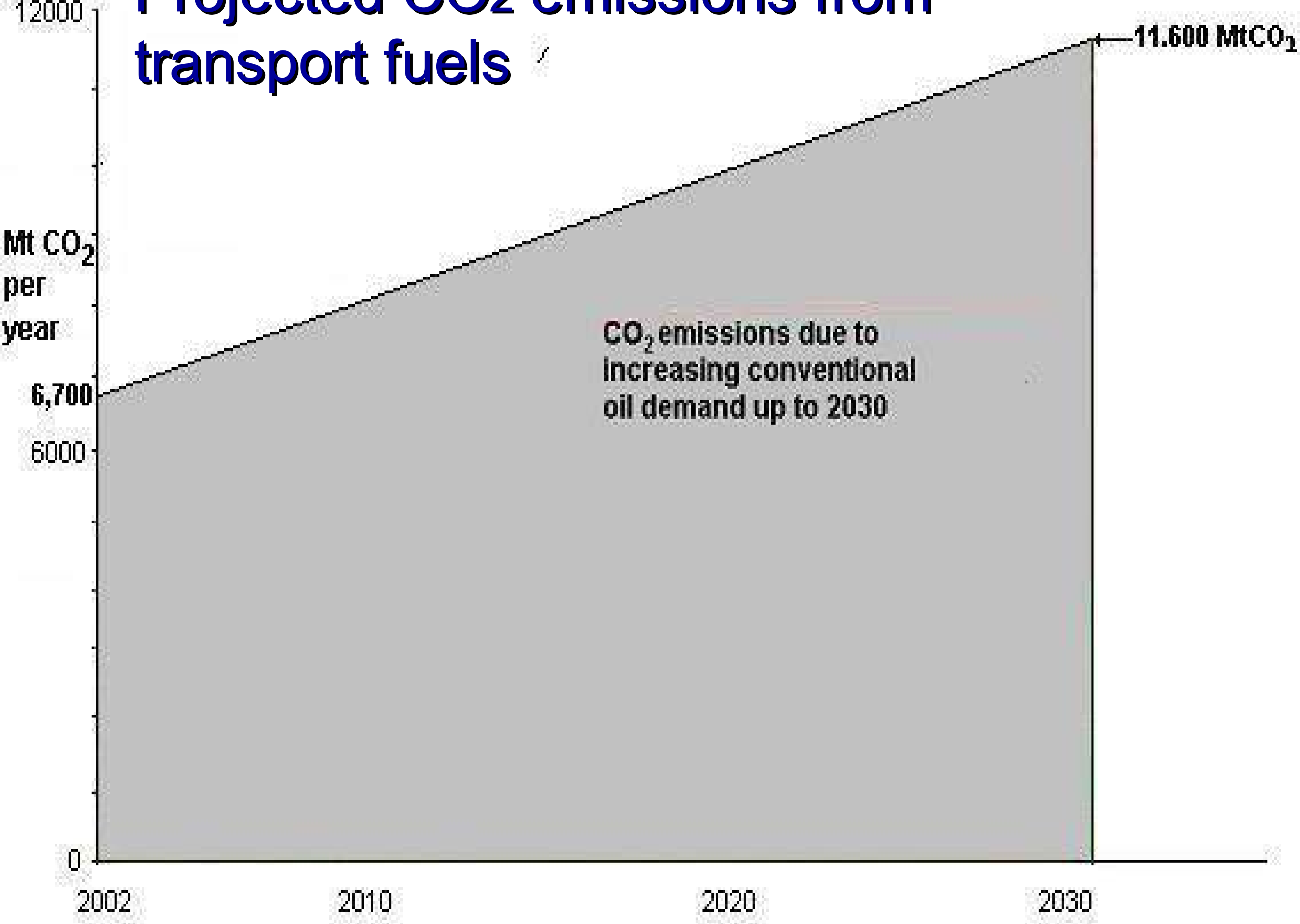
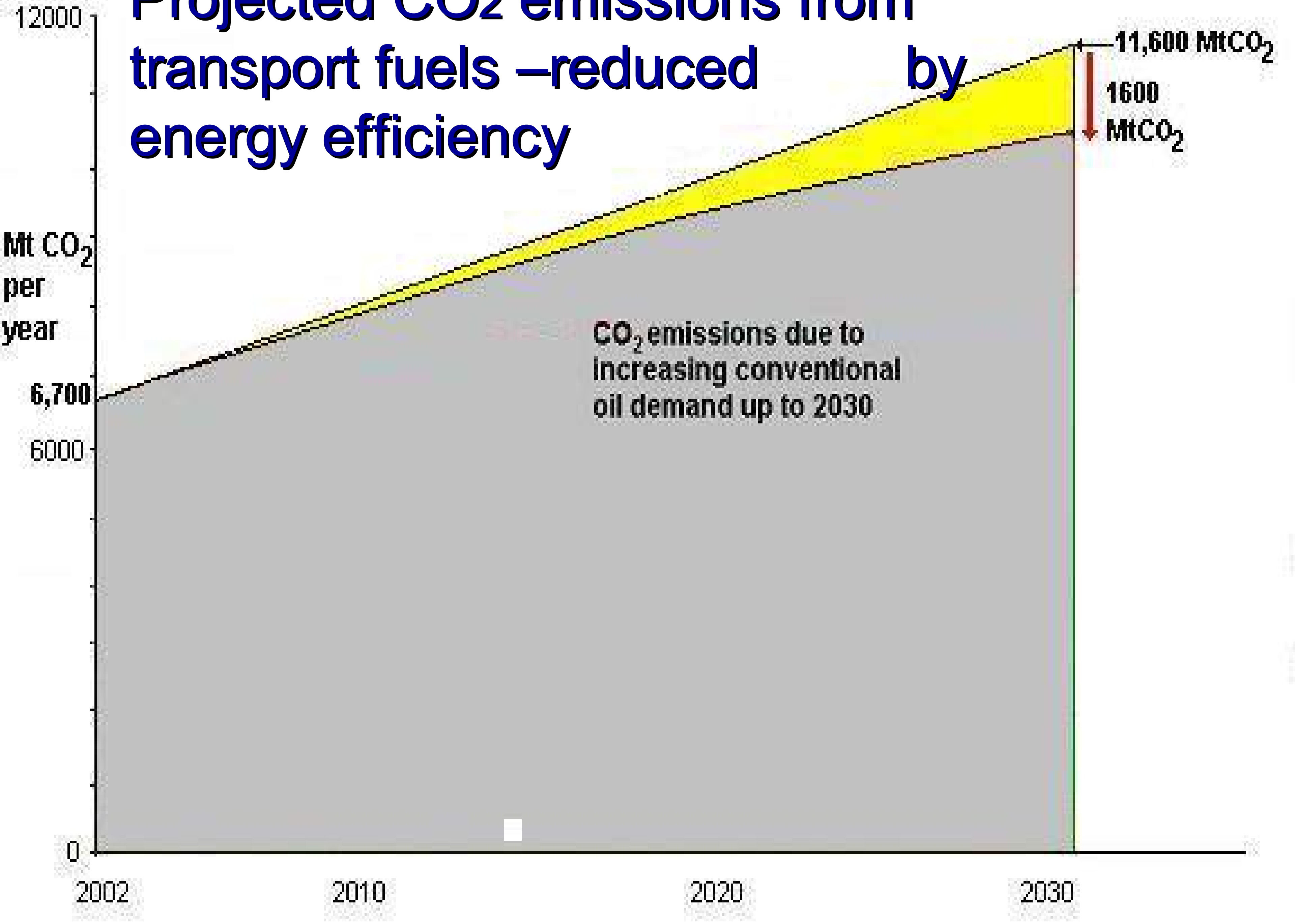
Projected CO_2 emissions from transport fuels



Projected CO_2 emissions from transport fuels –reduced by energy efficiency



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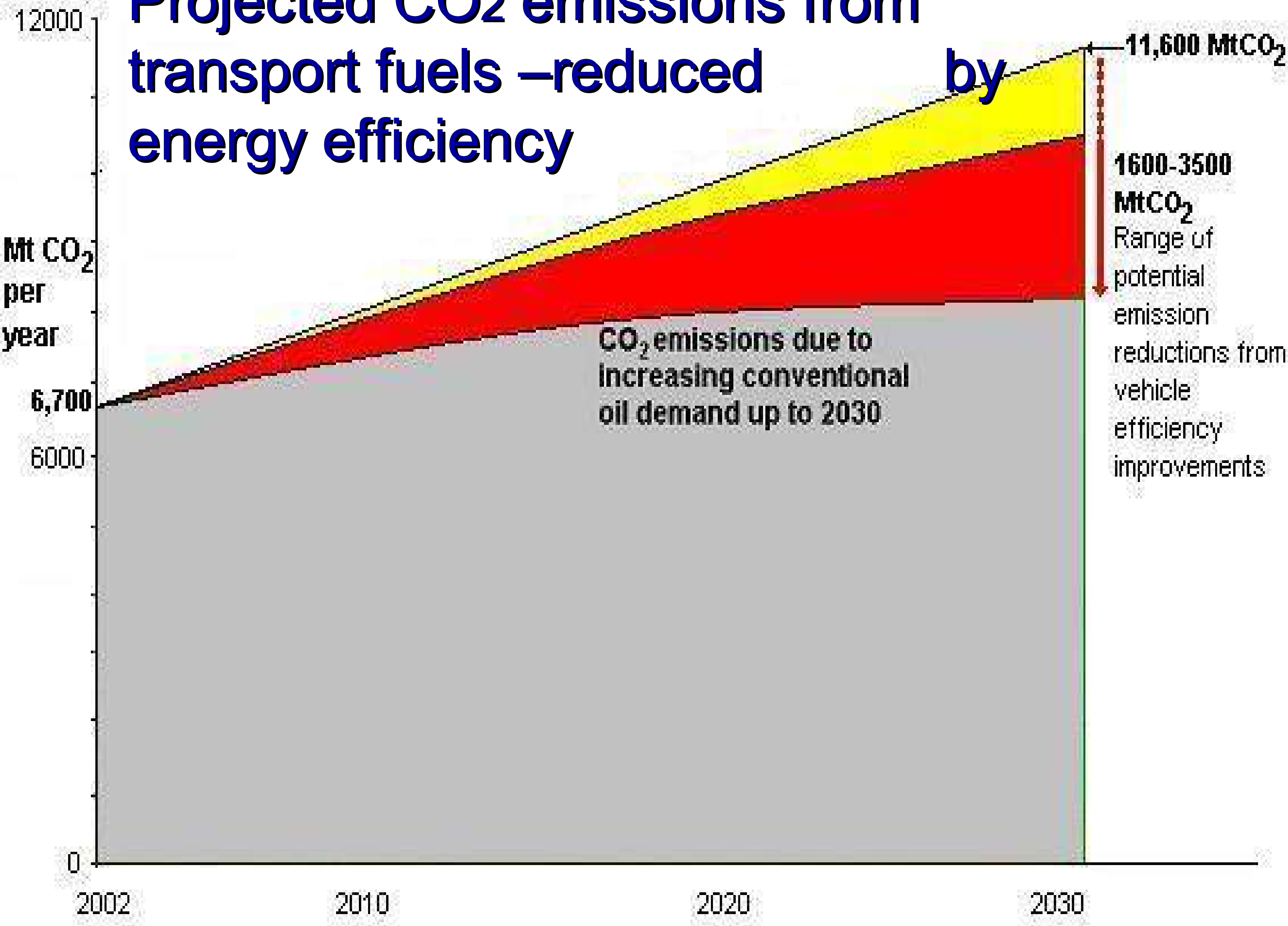
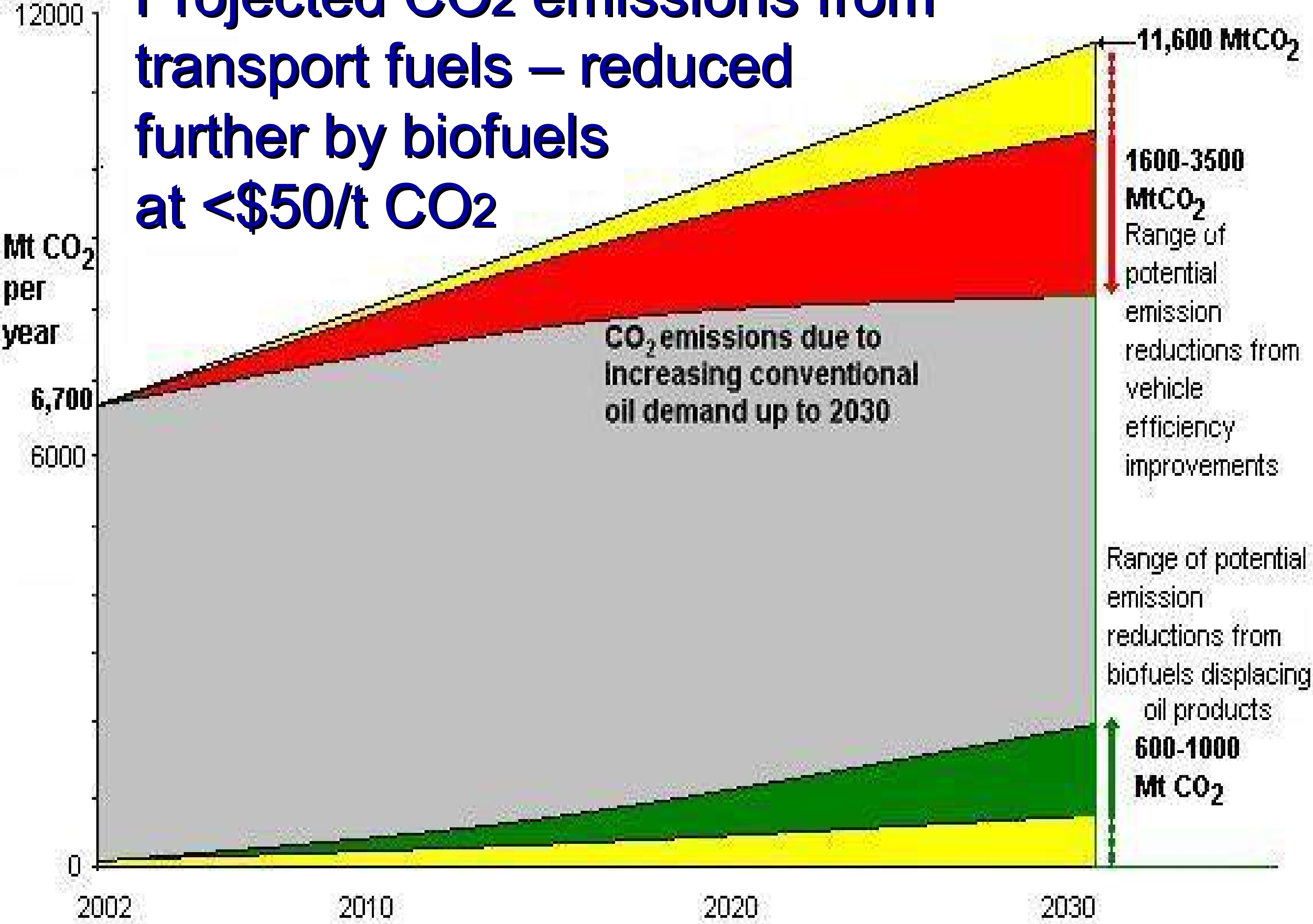
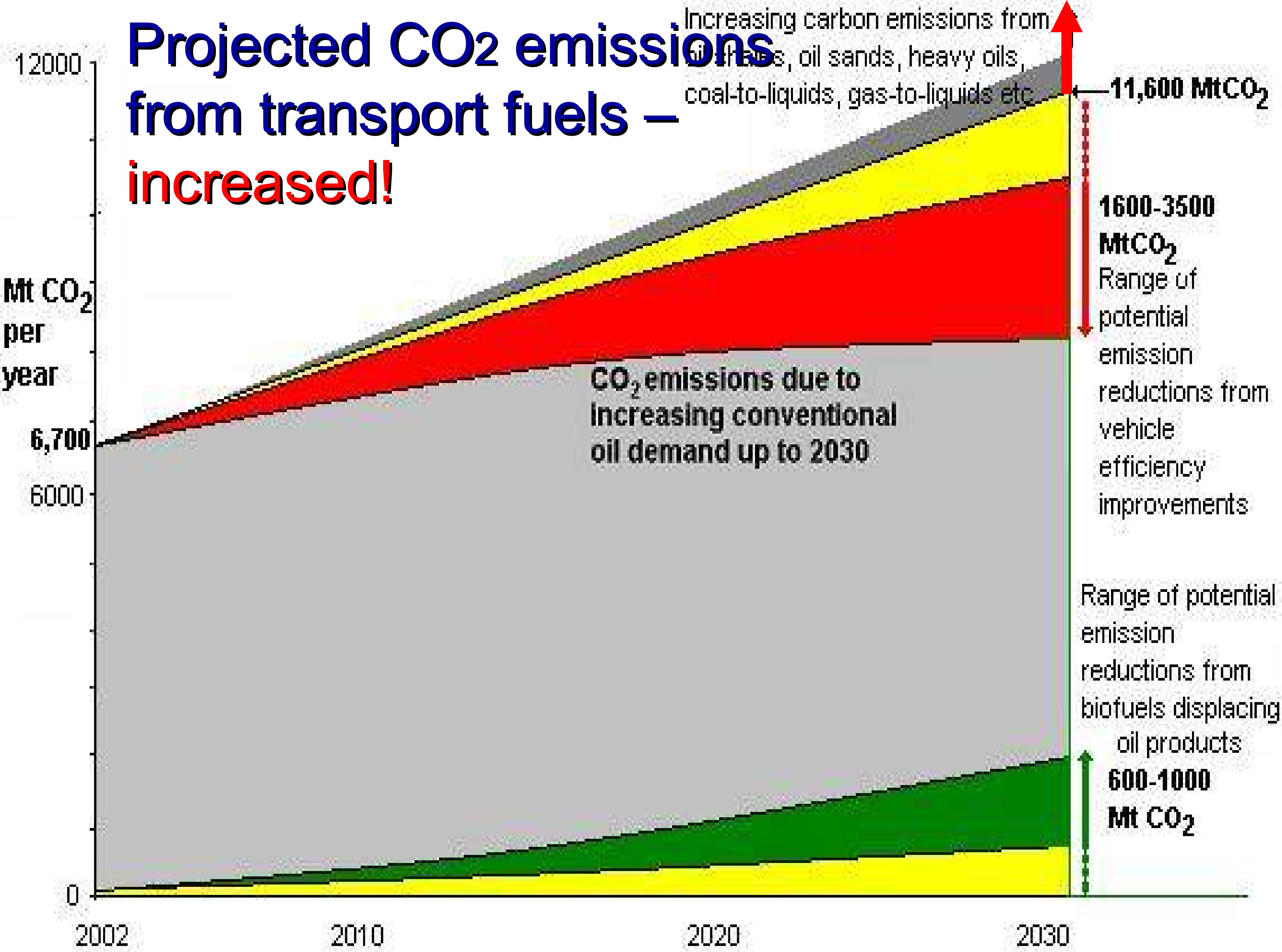


Projected CO_2 emissions from transport fuels – reduced further by biofuels at <$50/t CO_2



Projected CO_2 emissions from transport fuels – increased!



In summary

- The future potential for the contribution of sustainable biomass to future world energy supply is uncertain - but significant - using agricultural and forest residues initially and a transition to specialist energy crops.
- Further R D D & D investment will be needed to better determine transport logistics, life cycle analyses, carbon emission reductions, 2nd and 3rd generation biofuel processes etc.
- Project deployment will vary widely with the biomass feedstock and conversion technology under consideration.
- Biofuels for transport have potential for up to 1 GtCO_2 greenhouse gas mitigation by 2030 and increasing going out to 2050 and beyond.