



Getting Serious About Biofuels

Technology Potentials

Adam J. Schubert
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Serious Biofuels



Deliver Policy Objectives

- Diversity of Supply
- GHG Benefits
- Indigenous Supply

Economically Viable

- Delivery to market at competitive cost across the value chain

Functional and Reliable

- Meets the needs of existing vehicles
- Supplied consistently
- Quality Assured

Meet Consumer Needs

- Reliable vehicle operation
- Vehicle performance and range
- Cost



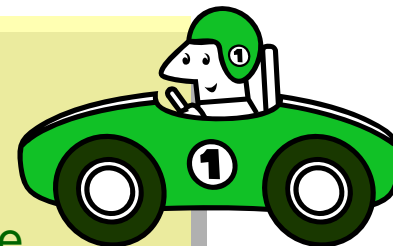
Drivers for Change



Key drivers in moving towards sustainable mobility solutions

- Security of supply & energy diversification
- Climate change issues
- Biofuels address both these issues.

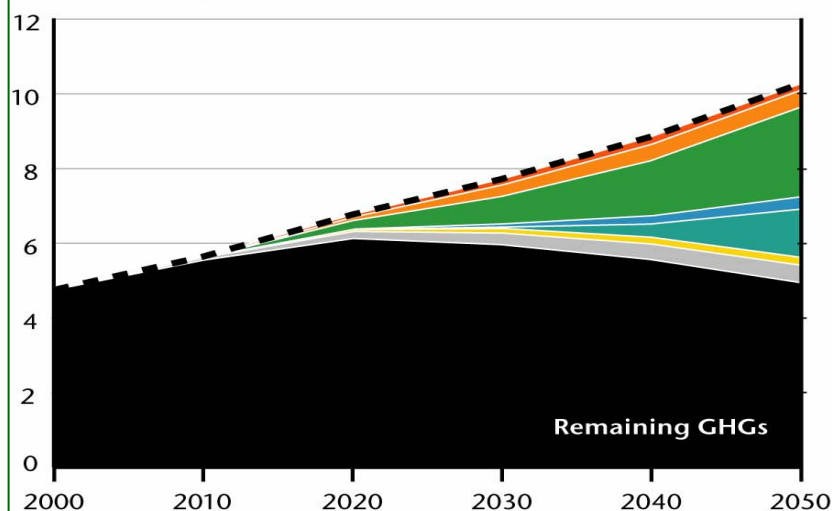




- Transport energy demand is projected to double by 2050
- Transport comprises 21% of CO₂ emissions
- A variety of technologies can reduce GHG emissions in the future
 - Vehicle efficiency
 - Biofuels and other renewable fuels
 - Demand reduction

Combined Technology Case

Gigatonnes CO₂-Equivalent GHGs

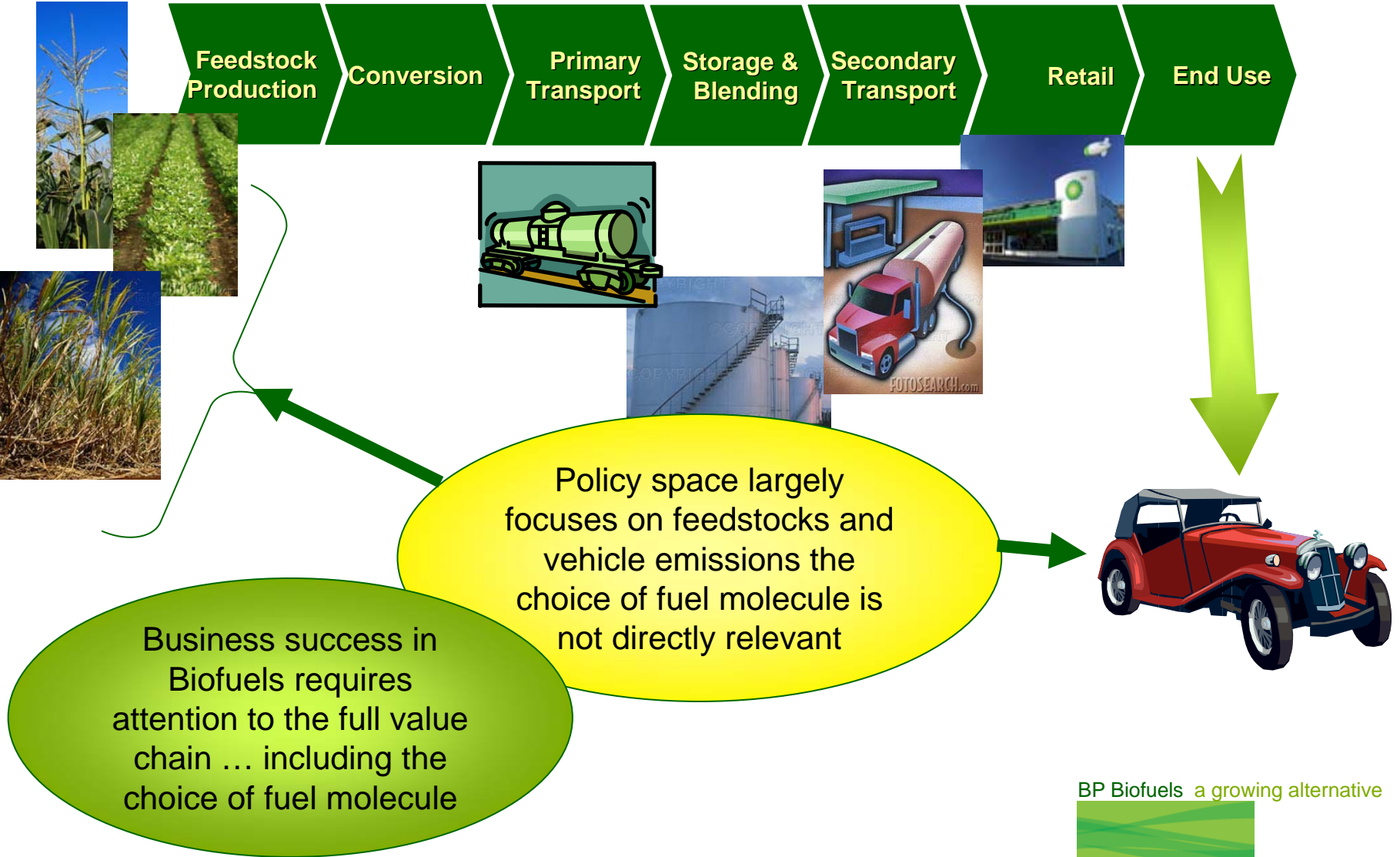


- Reference Case Level (Road Transport)
- Increments**
- 1 Diesels (LDVs)
 - 2 Hybrids (LDVs + MDTs)
 - 3 Biofuels (80% Low GHG Sources by 2050)
 - 4 Fuel Cells (Fossil Hydrogen)
 - 5 Fuel Cells (80% Low-GHG Hydrogen by 2050)
 - 6 Mix Shifting (10% Fuel Economy Improvement)
 - 7 10% Vehicle Travel Reduction (All Road Vehicles)

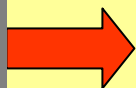
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Biofuels Value Chain



Conventional Bio-Components



Ethanol for
gasoline

sugar & starch crops



Esters for
Diesel (FAME)

oil crops

- Conventional biofuels are a positive first step in use of biomass
- GHG reductions modest, not all biofuels are equal
- Benefit rural economy
- Limitations :
 - Competing land use issues – food vs power generation
 - Not ideal fuel molecules: OEMs limit blending; handling/quality issues
- Ethanol issues:
 - Significant additional infrastructure costs due to Vapor Pressure
 - Success at scale requires ‘whole of market’ introduction



Agricultural and Rural Impact



- Extremely large quantity of biomass needed
 - transport requirement
 - heat and power
- Change in crop types
- Different farming practices
- Risks - locked to energy / transport markets
- Opportunities to utilize low value land and waste



Environmental and Social considerations



- **Standards being developed through Low Carbon vehicle partnership**
- **GHG Certification**
 - Not all biofuels equal on GHG basis
 - LowCvp study showed ethanol can vary between 7 – 87% GHG savings
 - Methodology to quantify supply chains in process of development
- **Environmental Sustainability**
 - 6 principles with 25 criteria as well as enhanced criteria
 - RSPO an example of environmental sustainability standard
- **Social and Ethical**
 - ILO worker standards
 - Moving indigenous populations
 - Child labor



Next generation Biofuels



- Advanced biofuels respond to all drivers - deliver on GHG, security of supply & support agriculture sector
- Biobutanol has a number of attractive properties:
 - Produced from same feedstocks as ethanol with minimal process modifications
 - Easily blended into gasoline
 - Can use existing fuel infrastructure without major modification
 - Potential to be used at higher blend concentrations than ethanol in unmodified vehicles
 - An energy content closer to that of gasoline than ethanol – reducing the impact on fuel economy for the consumer
- Biobutanol is complementary to ethanol and can enhance the performance of ethanol blends in gasoline
- Second generation biofuels are expected to be even less carbon intensive because they will be manufactured using non-food crops (lignocellulosic) and with a different processing technology



BP's New Biofuels Business



- Formed a new Biofuels business in June
- Announced plans to invest \$500 M in new Energy Biosciences Institute to provide a pipeline of biofuels technology for the business
- Will partner with science company DuPont to develop advanced biofuels-the first introduction is bio-butanol.
- BP & DuPont collaborating with British Sugar on introduction of bio-butanol into UK
- Launched targetneutral in the UK as a consumer education, non-profit programme that gives motorists the chance to 'neutralize' the CO₂ emissions from their driving



targetneutral

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BP's biofuels activity



Europe

- First major to introduce 5% FAME blend in Germany
- Across Europe ETBE replaces MTBE
- EBI Institute University TBD
- Targetneutral UK launch August 2006. Germany introduction during 2007

Asia

- Roundtable Sustainable Palm Oil

US

- Largest user of Ethanol in gasoline
- 20 new markets added in 2005
- Biodiesel to small number of B2B, evaluating more widespread customer offer
- EBI Institute University TBD
- Targetneutral introduction in CA during 2007

India

\$9.4M project of Jatropha "oil bearing crops" for diesel fuel

ANZ

- Supplying Ethanol to retail sites in Queensland
- Renewable diesel via tallow

ing alternative



Biofuels – Summary



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- Climate change and energy supply diversification will continue to underpin increased use of biofuels
- Conventional biofuels are a positive first step in use of biomass
 - GHG reductions modest, not all biofuels are equal
 - Land use and competition for food crops are serious issues
- Standards are needed for carbon certification of biofuels and to ensure sustainable biomass production
- BP is working in partnerships to develop processes for production of second generation biofuels
- If Biofuels are to make a significant impact of the two key drivers of energy supply security and climate change, then in the longer term, we will need:
 - Better feedstocks
 - Better processes
 - Better fuel molecules



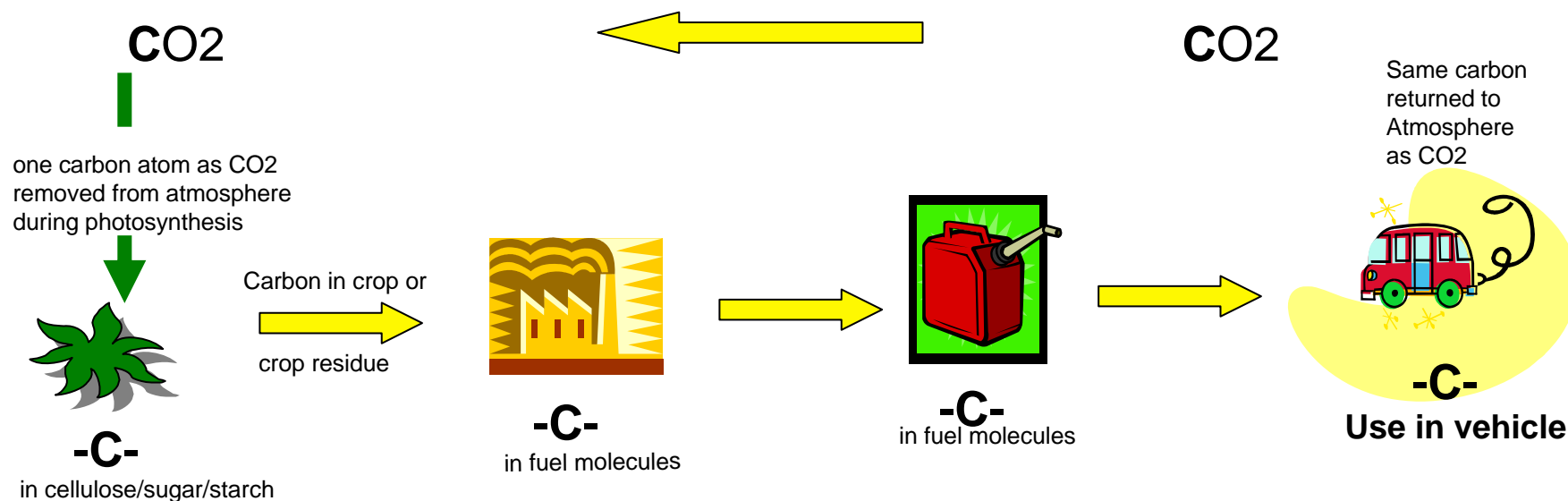


Introducing BP Biofuels

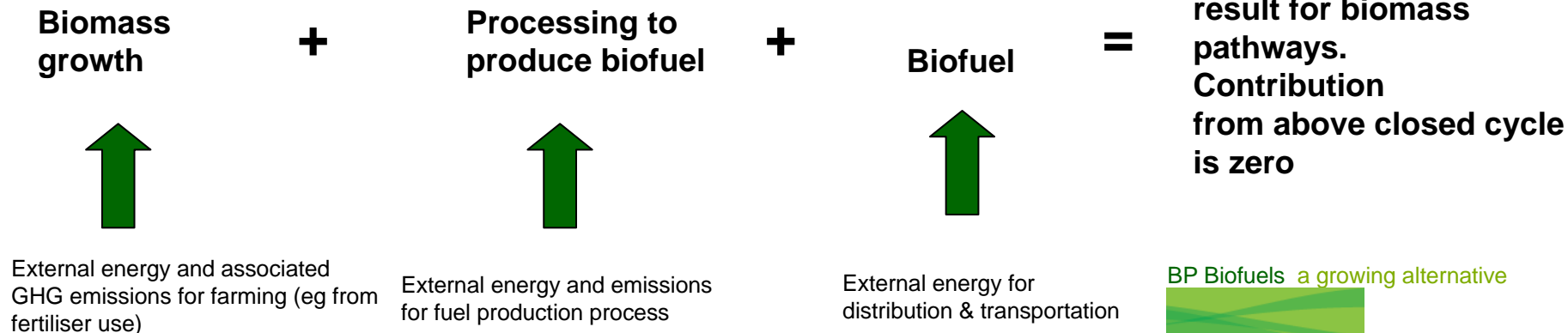
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Biofuels Overview - the carbon cycle



Fossil Energy Inputs

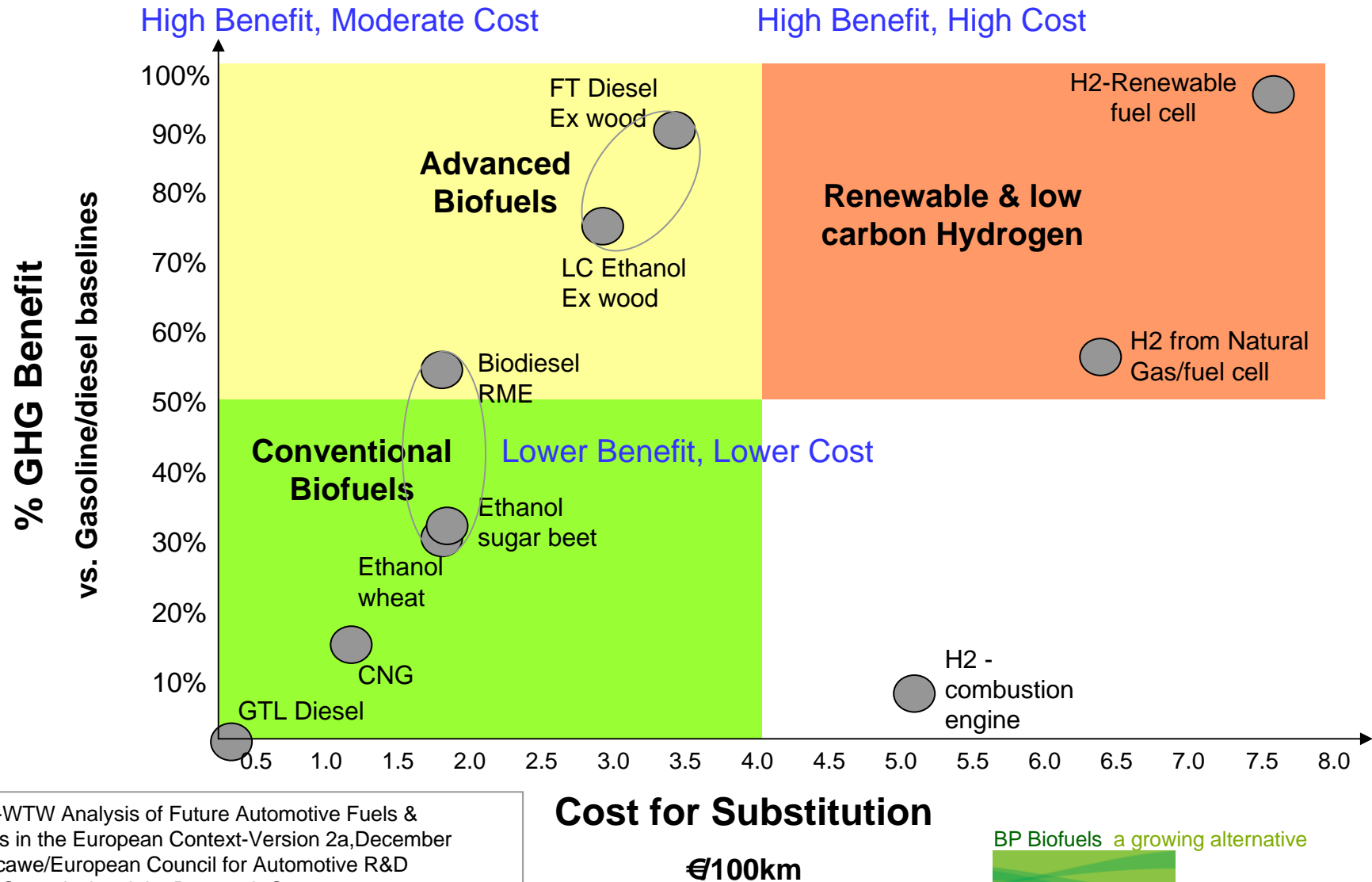


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WTW GHG benefit vs cost

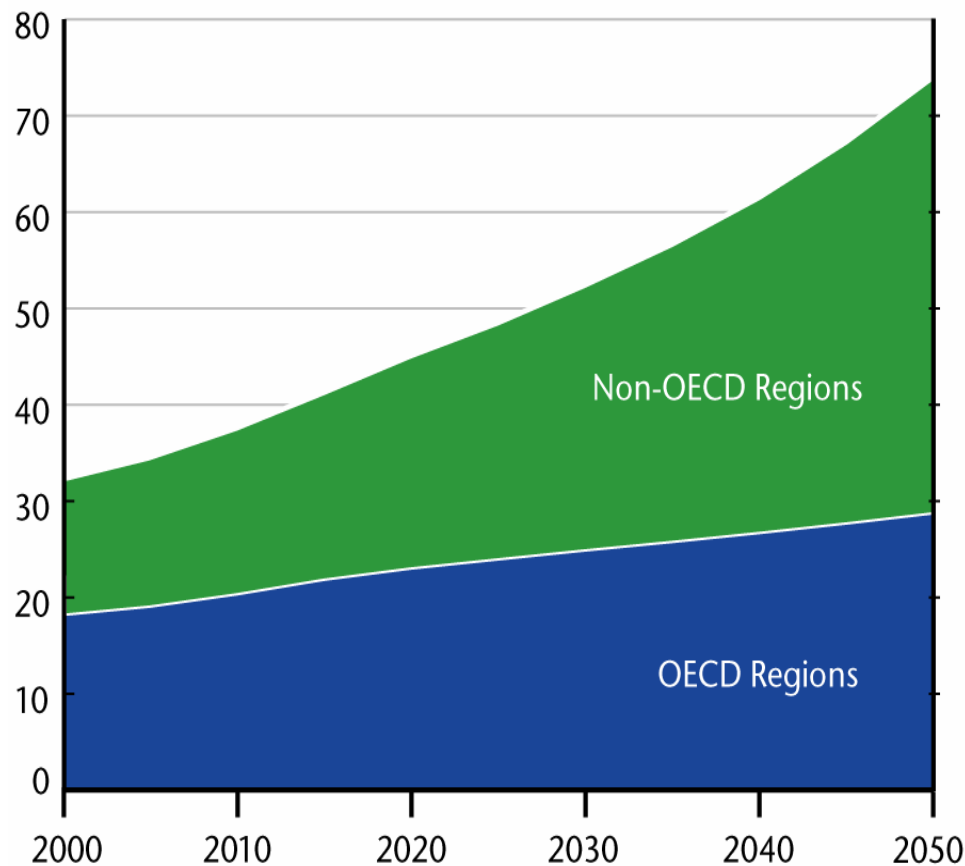


Reference-WTW Analysis of Future Automotive Fuels & Powertrains in the European Context-Version 2a, December 2005. Concawe/European Council for Automotive R&D /European Commission Joint Research Centre

Demand of transport

Personal transport activity

Trillions (10^{12}) of Passenger-Kilometers/Year



BP Biofuels Low Carbon Road Transport Strategy



Low Carbon Road Transport Strategy

2 challenges to reduce greenhouse impact of our fuels

Reduce carbon intensity
of fuel itself

Use less fuel or use it
more efficiently

**Solution – Biofuels
are the best short to
medium term**

**Solution - consumer
education about driving
behaviour & choices**

**BP is progressing
future fuel strategy**

targetneutral is BP's response

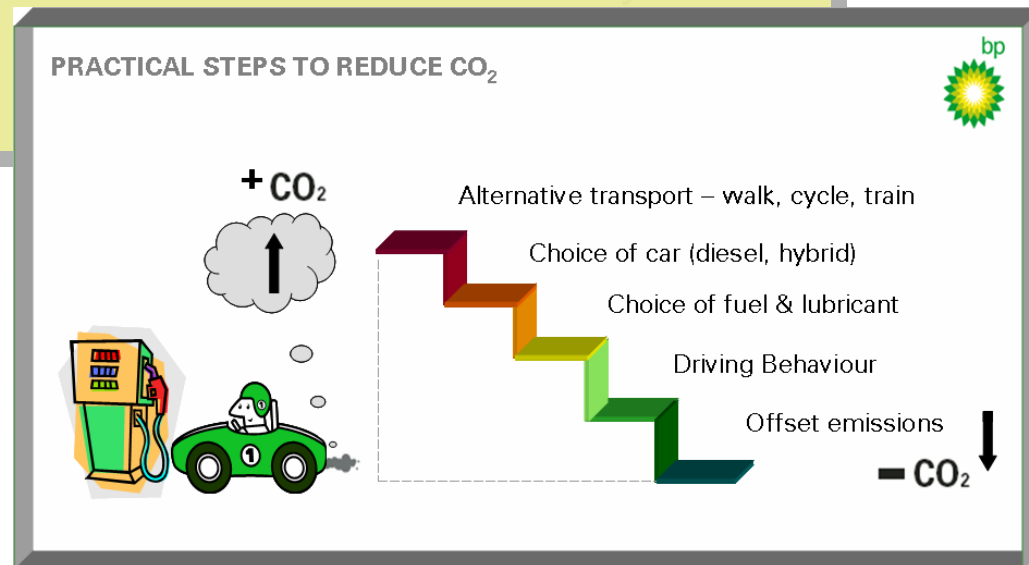
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What is targetneutral?



- **targetneutral** is a voluntary, non-profit programme that gives motorists the chance to 'neutralise' the **CO₂ emissions from their driving**
- **Reduce, Replace, Neutralise**
 - Reduce means changing attitudes and behaviours to reduce fuel usage.
 - Replace means buying a product that is more energy efficient.
 - Neutralise means becoming CO₂ neutral for those emissions you cannot prevent now.
- **Managed by biofuels business**

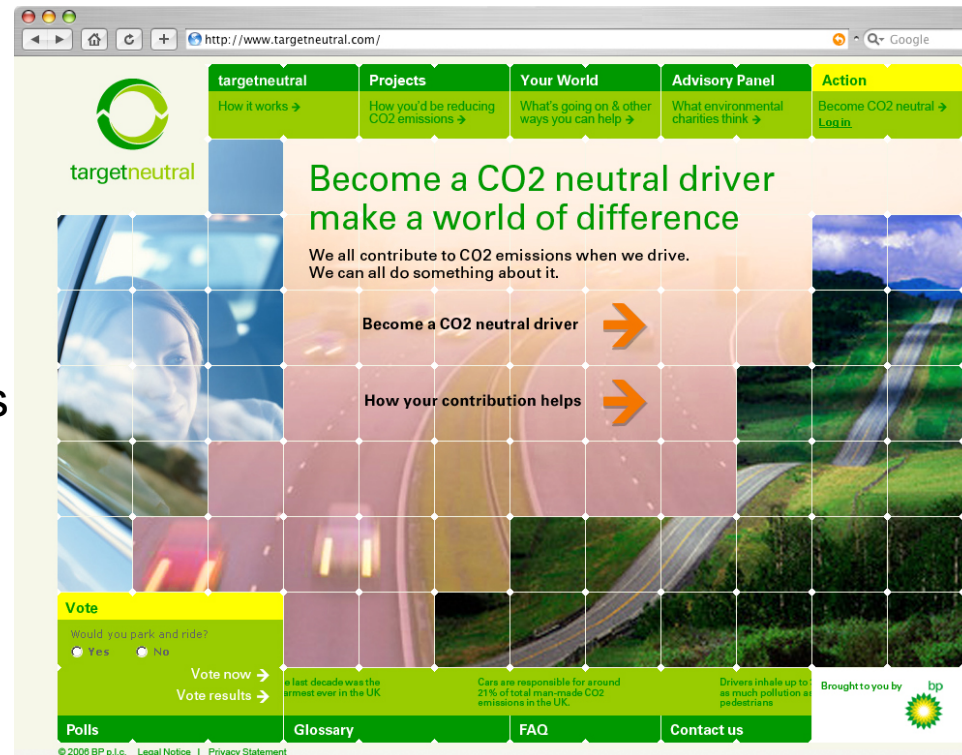


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How does it work?



- Consumer visits www.targetneutral.com calculates their annual CO₂ emissions (miles & mpg) & pays to purchase equivalent emission reductions to 'neutralise' CO₂ impact
- Average payment is approx £20pp pa
- 100% of consumer funds (Excl VAT & transaction fees) goes to emission reduction projects in developing countries
- BP will make a contribution when members refuel at BP sites (up to £0.10 per tank regular & £0.20 Ultimate)
- Members & retail value tracked via Nectar cards
- Quarterly email communication to members
- BP's UK fuel tankers are CO₂ neutral



Where does the money go?



Portfolio of developing country projects to reduce CO₂ emissions

- Renewable energy & biomass projects preferred by consumers
- Sustainability & community benefits
- Independently verified – real & quantifiable
- Credits retired upon purchase

To help counter cynicism, an independent panel of leading environmentalists, academics and opinion formers, chaired by Jonathon Porritt, has been established to oversee & monitor the scheme



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