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Directorate-General Environment



EU Transport GHG: Routes to 2050?

Biofuels and transport GHG emissions

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Meeting 3
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Partners

www.eutransportghg2050.eu



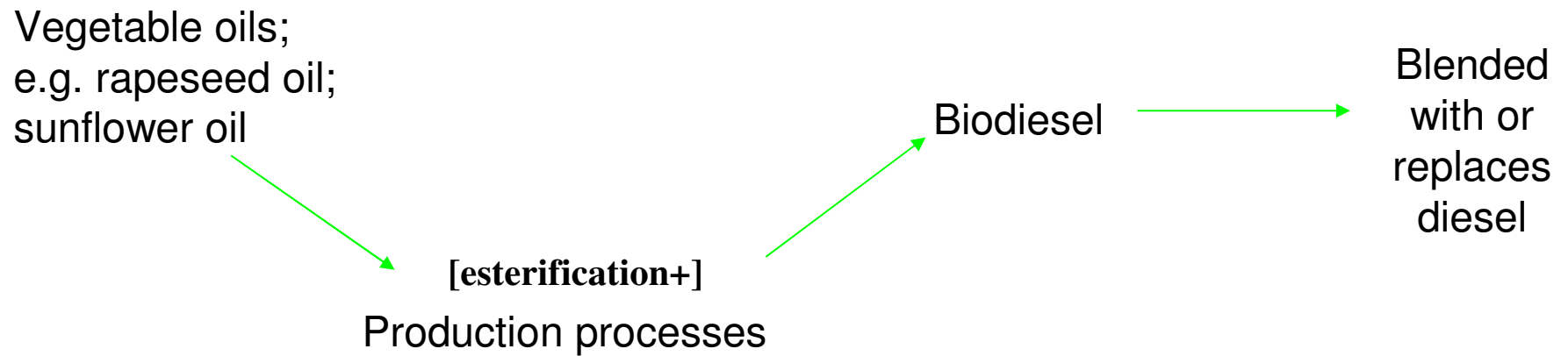
Introduction

- Based on:
 - Paper 2 – Alternative Energy carriers and Powertrains to reduce GHG emissions from transport (Nik Hill, et al)
- Presentation is based on draft findings set out in this paper
- Aim of subsequent discussion is to:
 - Agree what we know and do not know
 - Identify any omissions in our information/sources
 - Review the conclusions that are emerging

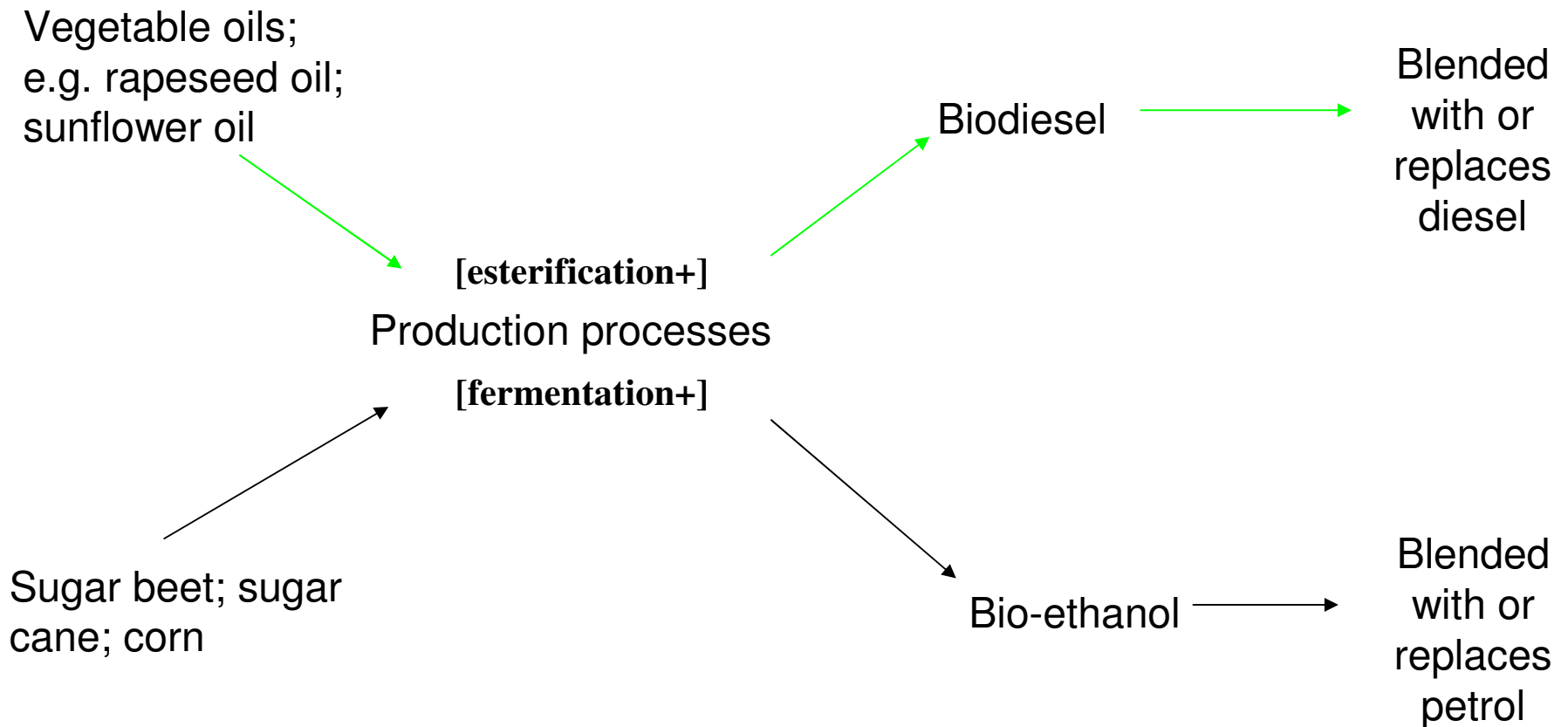
Why biofuels?

- Potentially, very significant GHG reductions
 - 18% to 64% GHG savings for biodiesel from oilseed rape
 - 73% to 95% for second generation biofuels
- Potential to increase security of energy supply
- 10% blend will be mandated by EU Renewable Energy Directive by 2020...
 - Consensus that 5% biofuel blend will not damage engines
 - Concern regarding the impact a higher blend might have on engines...
 - ...although examples where this has not been the case

What are (first generation) biofuels?



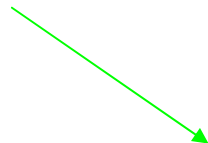
What are (first generation) biofuels?



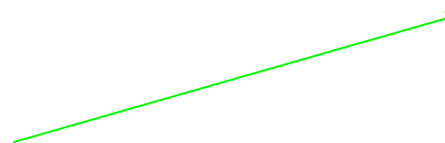
What are (2nd generation) biofuels?

Biomass to liquid (BtL) and cellulosic ethanol
(processes under development)

Biomass, e.g.
wood, straw



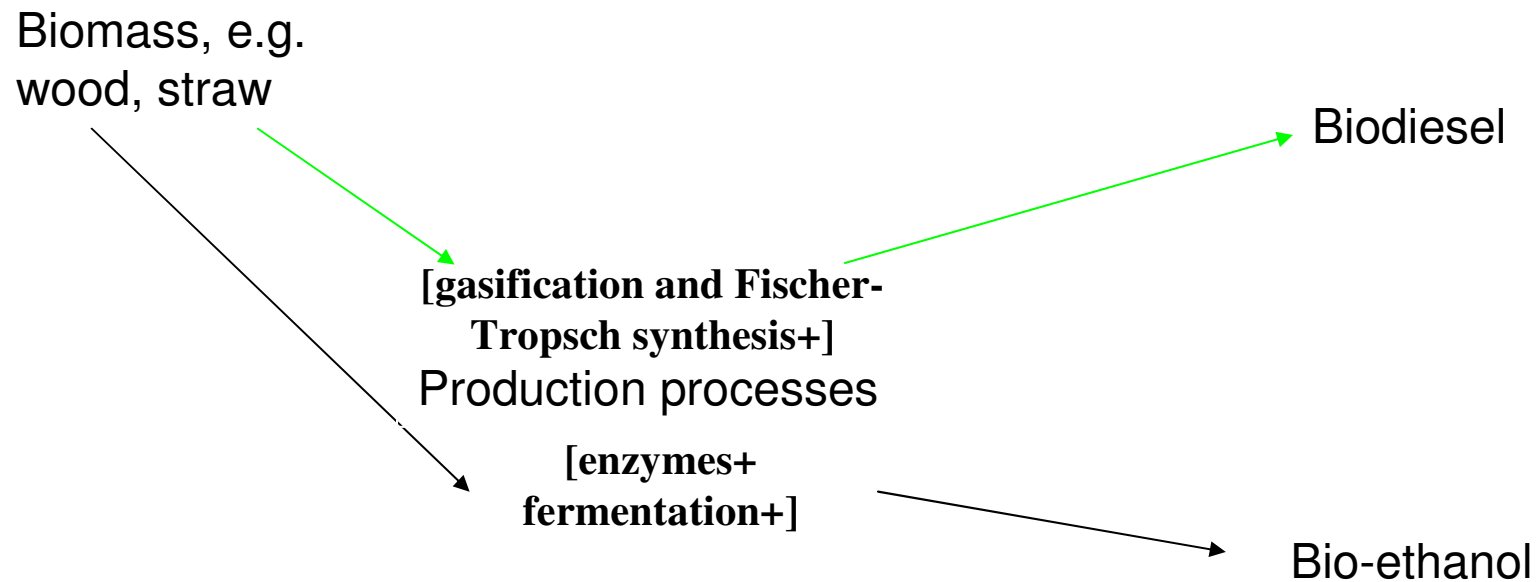
**[gasification and Fischer-
Tropsch synthesis+]**
Production processes



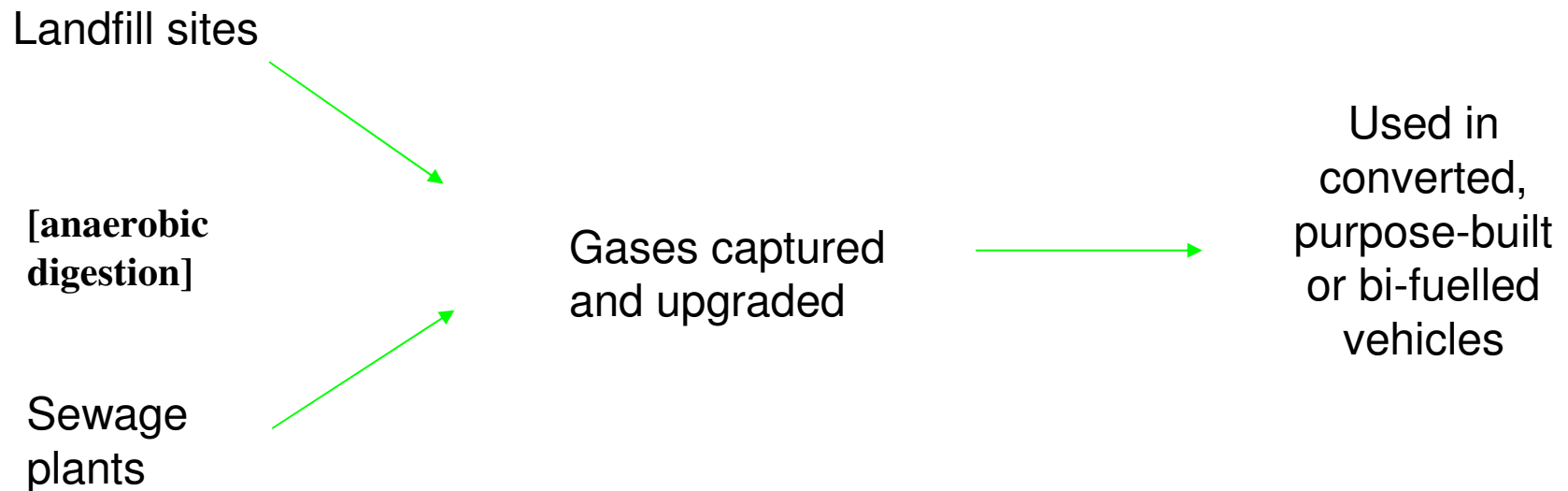
Biodiesel

What are (2nd generation) biofuels?

Biomass to liquid (BtL) and cellulosic ethanol
(processes under development)



What is biogas?



Concerns related to biofuels

- **Sensitivity analysis by AEA/North Energy showed LCA assumptions can have a big impact on GHG reductions:**
 - Land use change
 - Assumptions on NO₂ soil emissions
 - Country specific influences (variations in yield, fertiliser application rates, energy mix)
 - Source of process heat and/or electricity
 - Transport distance for feedstock
 - Allocation methodology (e.g. energy content method gives better results)
- **Price varies according to feedstock and country of origin**
 - However, bioethanol from sugar cane in Brazil and corn in US are competitive with gasoline
- **Barriers**
 - Sustainability issues
 - Competition with food crops
 - Emissions savings are country-specific
 - Direct and Indirect Land Use Change can increase emissions elsewhere
 - Potential impact on commodity prices
 - Studies suggest lower lifecycle emissions if used for heating or co-firing

Biofuel use in road transport

- **Biodiesel:**
 - Generally used in blends up to 5% (B5) – requires no modification on vehicles
 - Future biodiesels could be 100% compatible with conventional diesel – new infrastructure might be needed
- **Bioethanol:**
 - Also generally used in blends, e.g. E5 in Germany, E20 in Brazil; up to E85 in flexi-fuel vehicles
- **Problems (with first generation biodiesel):**
 - Significantly more expensive than conventional diesel
 - Increased fuel consumption
 - Decreased power
- **Performance of second generation biodiesel comparable to (and possibly better than) conventional diesel**

Biogas for buses

- Can be produced from **various sources**
 - For example, Oslo will be running 80 buses on bio-methane captured from a sewage plant
- Schemes to make use of biogas will tend to make use of **local waste ‘resources’**
 - Synergies between efforts to reduce waste and climate change goals
- **GHG reductions**
 - ~44 tonnes per bus at the Oslo project taking account of electricity usage at the sewage plant
- **Reduced fuel costs**
 - Price for Oslo biogas is around 0.27 Euro per litre vs 0.67 Euro per litre for diesel (Jan 2009)
- **NG buses are more expensive**
- Advantages of **captive fleets**

Biofuels on rail

Potential limited as:

- 80% of rail tonnekm and passenger kms are via **electric traction** in Europe
- **Conventional diesel is also often cheaper** (due to lower tax compared to road transport)

Current usage:

- Biodiesel is only used in **20% blend** (B30 may increase lifecycle costs)
- Therefore, overall GHG reductions will be limited
- Virgin Trains (UK) trialled 20% blend in 2007
- National Biodiesel Mission in India is aiming to increase production levels so 20% blend can be sold by 2012

Second generation:

- Could be used in all blends in existing engines without need for modification
- Potential improved performance compared to 1st generation and conventional diesel, e.g. lower freezing point, higher energy content

Aviation and biofuels

- Need to be of a type ('drop-in') that require **no aircraft modifications**
- **Short-medium term** viable options:
 - Biofuel produced from hydrotreated vegetable oil (HVO)
 - Synthetic kerosene from Biomass-to-liquid (BtL) processes
- **Long-term potential: Uncertain**, as depends on competing demands and development of new feedstocks
- **Some industry stakeholders** believe: 30% take up of biofuels by 2030 needed to meet industry's longer-term CO2 reduction targets
- Number of **ongoing industry initiatives** to accelerate commercialisation of biofuels
- Barriers for BtL:
 - Need to develop cost-effective and sustainable supply
 - High capital costs of plants – HVO more viable short-term option, but currently has more issues with feedstock sustainability
- Issue: How demand for aviation biofuel will impact on/by demand in other sectors

Source: (AEA, 2009)

Biofuels in water vessels

Marine vessels:

- Issue of **competition** with road transport, lower cost of **marine fuel**
- Research:
 - Concentrated on vessels that use diesel (not fuel oil)
 - Undertaken to produce biodiesel for marine applications that will not compete with road transport (e.g. Biox process that produces pure plant oil)
 - Trials on ships have been undertaken
- Barriers:
 - Main barrier is **economic**, e.g. price compared to marine fuel
 - **Technical barriers** include: For a given power output, fuel consumption would be higher, thus requiring larger tanks or smaller ranges.
- While increased lubricity reduces wear and tear, biodiesel may be more corrosive
- Supply might be a problem if large volumes required

Inland waterways vessels:

- 5% blend might be “dangerous”; B20 could be OK

Summary

- Crucial issue (in terms of GHG reductions) is how **biofuels are produced**
- In the short term **1st generation biofuels** are playing a (limited) role in reducing GHG from transport
- In the medium term **2nd generation biofuels** may play a greater role
- Wider **land use/land use change** and **sustainability concerns** are a problem that need to be resolved
- **2050 vision: Active role for second generation fuels??? Or replaced by other energy carriers??**

Findings by mode:

- **Road vehicles:** Short-term, lower blends work; potential for better future fuels in longer-term
- **Buses:** As above, but also biogas?
- **Rail:** Potential on diesel trains; fully electrified in longer-term?
- **Aviation:** Actively being researched; seen as a short-term option
- **Marine:** Research being undertaken
- **Inland waterways:** Not with lower blends' possible with B20

Discussion points

- Do you agree with the short- and long-term potential?
- Do you agree that there are currently significant barriers? How might these be overcome?
- Do you agree with the findings by mode?
- What is your 2050 vision for biofuels?