



Shell Global Solutions

# **“BIOCOUP”: Co-processing of upgraded bio-liquids in standard refinery units**

**Perspectives and experience in EC project participation**

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# Renewable Energy: a complex & varying mix

**Biomass** - different types, sources of biofuels - potentially v. large resource  
– transportation and logistics issues

- **Hydropower** - advantage of peak load capability
- **Solar** - photovoltaic and solar thermal
- **Wind** - doubled every 3 yrs for past decade – government support necessary. More political than technology hurdles ?
- **Geothermal** - hot fluids that can be reached economically (Iceland etc)
- **Tidal schemes** - localised solutions, but highly predictable
- **Nuclear** - Capex, waste, NIMBY, and zero CO<sub>2</sub> emissions

Most require stable investment, political climates and subsidies/tax credits

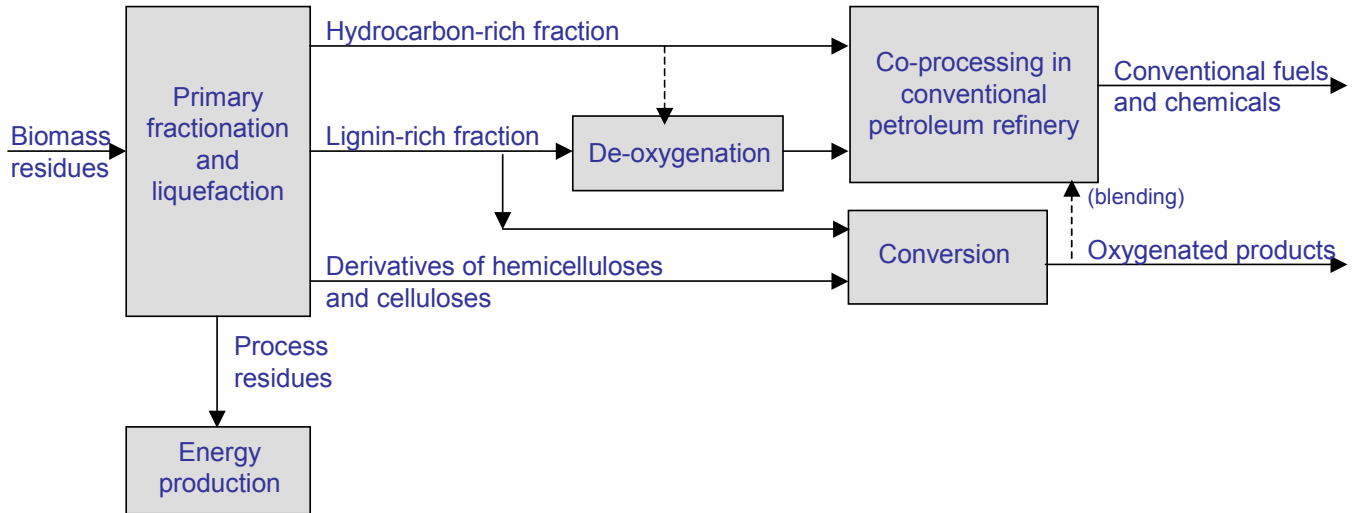
# Advantages of our bio-refinery concept

- Crude replacement: CO<sub>2</sub> emission abatement (based on a seed-to-wheel analysis)
- EU directives specify increasing amounts of biomass-derived components in mogas (2006 – 2011)
- Co-processing in archetypal refinery units with standard conventional crude oil-based feed cheaper than distributed (small-scale) dedicated biomass-processing or esterification units.
- Possible lower cost relative to conventional crude e.g. from low value waste bio-oils or residues
- Seamless integration of products to end user

# Pyrolysis oil

- Precursors do not compete with food chain
- Offers a plentiful, and potentially, inexpensive source of bio-liquids
- Liquids – allow easier handling and distribution
- Fast pyrolysis technique already established (Ensyn, DynaMotive, BTG, VTT) with designs for small units (2 - 50 tons/day)
- Multiple products accessible (energy, fuels, chemicals)
- Technical challenges - component categories pyrolysis oil
  - ~ 25% Organic **acids**, (hydroxy)**aldehydes**, (hydroxy)**ketones**
  - ~ 25% (anhydro)**sugars**
  - ~ 25% **Degraded lignin**, **phenolics**, hydrocarbons
  - ~ 25% **Water**

# Overall Biorefining Concept



# Perspectives and experiences from BIOCOP participation I

- High(er) risk project but provides significant knowledge (and financial) leverage
- Subsidy of € 7.6 mln approved over 5 years
- Little bureaucracy in proposal writing and submission
- Good communication in proposal submission and defence phase
- Role of Coordinator
- Positive that don't have to formally commit until CA signed

# Perspectives and experiences from BIOCUP participation II

- Converting Proposal to “Description of Work” took longer than anticipated
- Broad definition PEKH/sideground creates challenges/uncertainty
- Exchange of Confidential Information - Contamination issues
  - Limits collaborations in same area with 3<sup>rd</sup> parties
- Dissemination: Knowledge to be published for the benefit of scientific advancement likely at odds with commercial interests
- True legal status of Consortium Agreement unclear
- Lack of dedicated Shell person familiar with EC Contract ins and outs
- SOX compliance

# Perspectives and experiences from BIOCOUP participation III

The EC also has responsibilities

1. BIOCOUP CA only signed late April, but title of project already widely disseminated and
2. From a EC 2005 “Biomass: Green Energy for Europe” brochure:-

“Co-processing of upgraded bio-liquids in standard refinery units (BIOCOUP) is an Integrated Project coordinated by VTT, Finland. Involving 18 partners from 7 countries, it is aimed at developing a chain of process steps to allow a range of different biomass feedstocks to be co-fed to a conventional oil refinery to produce energy and oxygenated chemicals”

# Conclusions

1. EC IPs useful project vehicle for Consortium approach
2. FP7 needs to address concerns of large companies