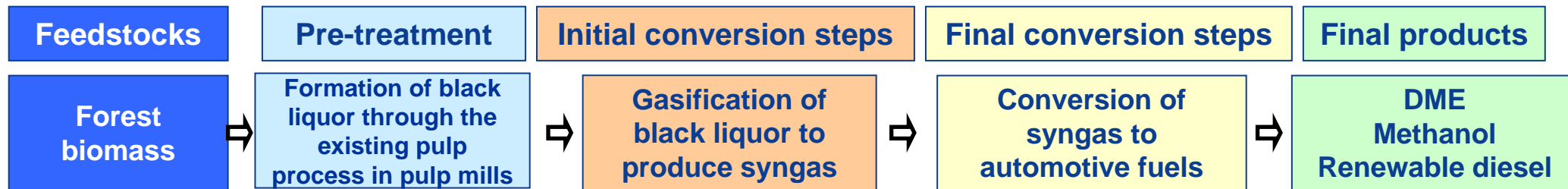


# The identification of Bioenergy Value Chains of potential relevance to EII-B

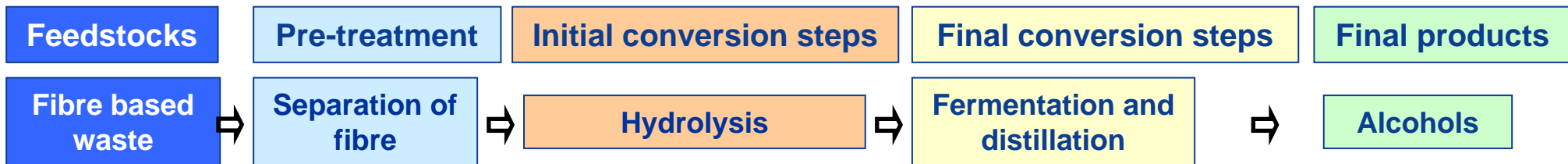
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- Bioenergy value chains are considered related to feedstock base available:
  - Forest industry value chains
    - Black liquor and extractives based biofuels at pulp mills
    - Solid wood based biofuels at pulp mills and other biorefineries
    - Biofuels produced from recycled fiber and agro fiber residues
    - Wood based bio crude for final processing at oil refineries
  - Plant oils processing at large oil refineries
  - Sugar cane based biofuels from southern hemisphere
  - Straw, energy crops and food industry residues to next generation biofuels
    - Ethanol and other components from straw
    - Biogas to natural gas grid and independent filling stations
  - Future options of algae and aqua biomass



- **Critical technologies and status of maturity for the proposed value chain/feedstocks:**
  - Pulp and paper mills are currently the single largest handlers of biomass
  - Black liquor gasification
  - Best well-to-wheel energy efficiency of all second generation automotive fuels
  - Gasification of black liquor has been successfully verified in large pilot scale (20 tds/day of black liquor) and is ready for 25 times scale-up to commercial demonstration scale.
- **Perimeter/scope of envisaged demonstration and rough scale:**
  - Commercial demonstration scale (500 tds/day of black liquor, equivalent to 75 MW) including the whole chain gasification to fuels production
- **Sustainability issues**
  - Lowest well-to-wheel fossil CO<sub>2</sub> emissions of all second generation automotive fuels (according to EUCAR/Concave/JRC)

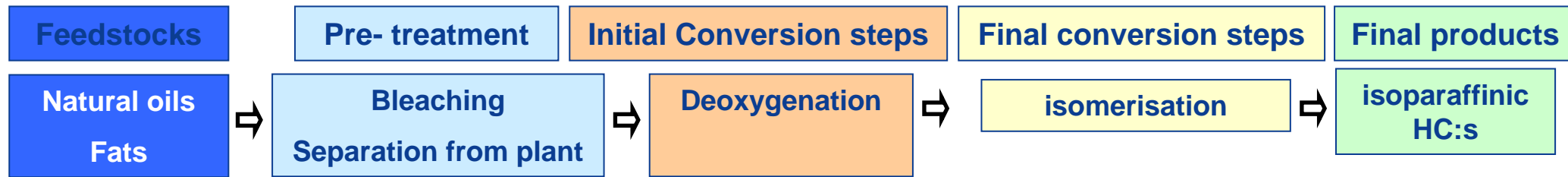
# Value chain of potential relevance to EII-B Waste Fibre Based Ethanol



- **Critical technologies and status of maturity for the proposed value chain/feedstocks:**
  - Fibre separation, hydrolysis and fermentation technologies, logistics
- **Perimeter/scope of envisaged demonstration and rough scale:**
  - Demonstration of selected hydrolysis technologies
  - Effect of feed specific impurities on performance of the hydrolysis technologies
  - Demonstration plan to final consumer products in > 0.1 Mt/a scale
  - Feed management and initial conversion steps into 0,1 -0,5Mt/a scale with a focus on creating CAPEX competitiveness through standardisation/multiplication
- **Sustainability issues**
  - Waste based feedstocks, High CO<sub>2</sub> reduction (>80%), Feedstocks out of the food chain

# Value chain of potential relevance to EII-B

## Mass scale natural oils/fats production



### ➤ Critical technologies and status of maturity for the proposed value chain/feedstocks:

- Mass scale aquafarming production of natural oils and fats utilizing photosynthesis and nutrient rich water: lot of science done, scale up engineering missing
- Bleaching and deoxygenation, one or more available technologies commercial
- Alternatively conversion into biodiesel (FAME) through transesterification

### ➤ Perimeter/scope of envisaged demonstration and rough scale:

- Lipid production into industrial scale of 100 - 1 000 kt/a

### ➤ Sustainability issues

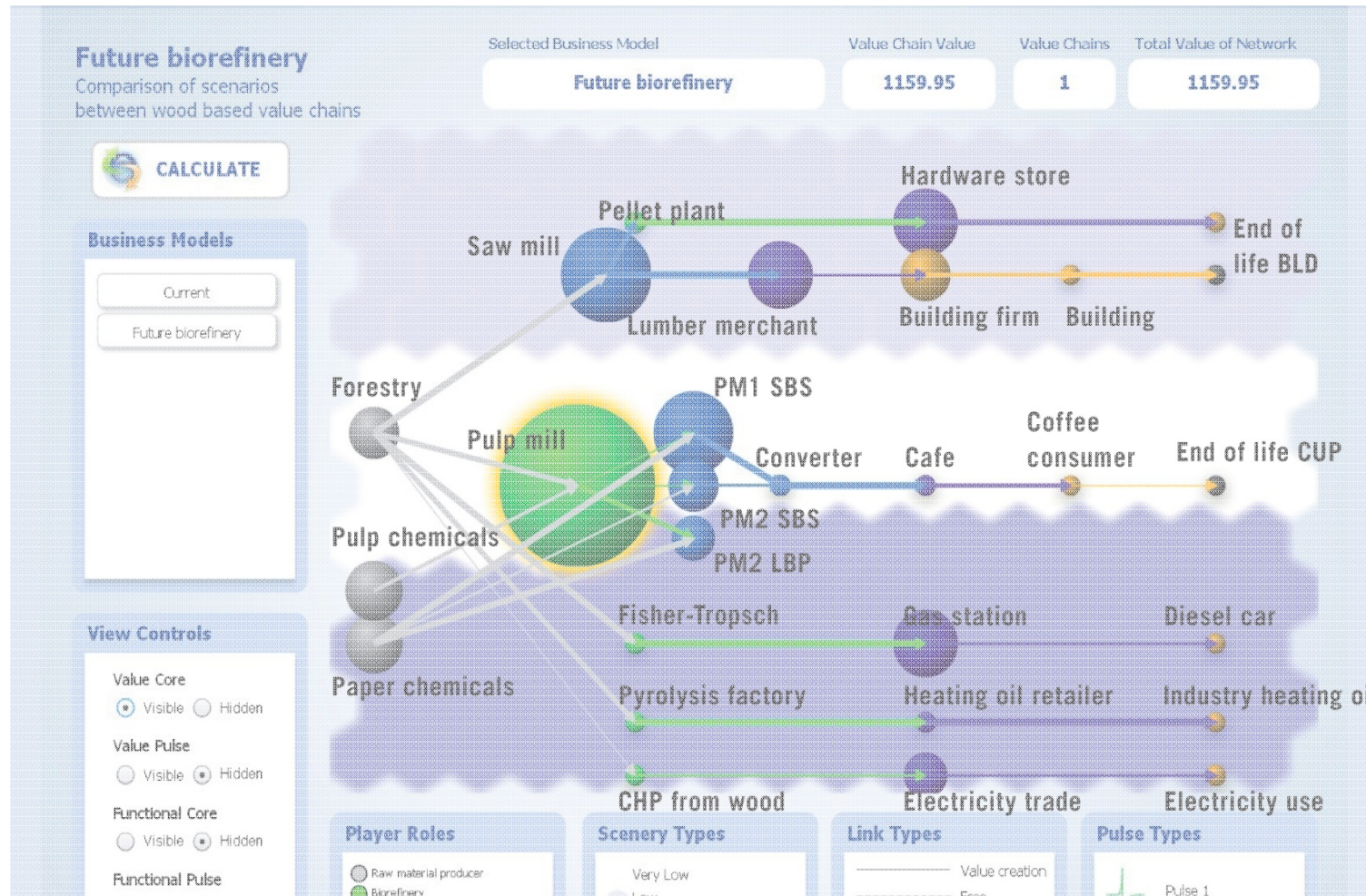
- CO<sub>2</sub> from the air, nutrients from waste water, High CO<sub>2</sub> reduction (>80%?), Feedstocks out of the food chain

# Conclusions

- The European climate and energy policy is supported by strong Directives for reducing the green house gas emissions and increasing the green electricity and transportation fuels production in member states.
- The purpose of EII-B is to develop promising and innovative bioenergy and biofuels value chains and boost bioenergy development.
- An approach for identifying the bioenergy value chains of potential relevance to EII-B has been made. In the approach, critical and core technologies for value chains are identified as well as scope and costs for possible demonstrations are determined. In addition, sustainability issues for the value chains have been considered.
- To reach the ambitious targets for bioenergy utilization, reliable value chains with large enough volumes have to be identified.
- As forest industry's core competences are process integration and handling large raw material stream logistics, biofuels and bioenergy form a good opportunity to forest sector renewal.
- Demonstration of the sustainable economic and environmental performance over the complete value chain will be needed to gain social acceptance and secure financing for commercial large scale deployment.

# Forest industry renewal – biorefinery

## Value chain evaluation model

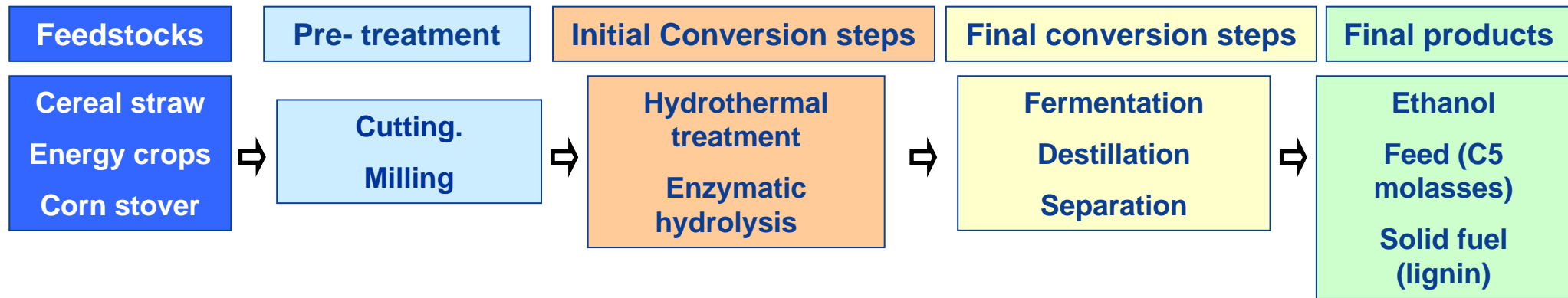


# Thank you for your attention!

Source: Pöyry/P.Vasara

# Value chain of potential relevance to EII-B

## Straw / energy crops



- **Critical technologies and status of maturity for the proposed value chain/feedstocks:**
  - Hydrothermal treatment (current status: pilot, demo plant in operation 2009)
  - Enzymatic hydrolysis (current status: pilot, demo plant in operation 2009)
  - C5 fermentation (current status: lab scale)
- **Perimeter/scope of envisaged demonstration and rough scale:**
  - Pretreatment, Initial conversion steps, final conversion steps. Industrial scale: 500 t/d





- **Critical technologies and status of maturity for the proposed value chain/feedstocks:**
  - **Item: develop a system for the oil extraction a pellet production from cellulosic by-products. State of Maturity: 2**
- **Core technologies (critical technologies which are bio-feedstock specific):**
  - **Oil extraction from seeds**
  - **Agro-pellet production from cellulosic by-products of oil crops**
- **Perimeter/scope of envisaged demonstration (part of the value chain needing demonstration) and rough scale (in ton/day of feed):**
  - **Unit with a production of 5.000 t/year of oil and 10.000 t/year of agro-pellet (to serve around 5.000 ha)**