



# Biorefineries Strategy for the Netherlands

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*Biorefinery.nl*

This workshop



## Biomass-related policy goals

- 10% Renewable Energy in 2020 (5% in 2010) [Min.of EA]  
About half of it ( $180 \text{ PJ}_{\text{th,affu}}$ ) has to be provided by biomass
- Biofuels for transport: 2% 2005, 5.75% 2010 (25% 2030?) [EU]
- Substitution of 30% of the fossil fuel use in the Dutch economy – both as fuel and raw material – by biomass in 2030 [PGG]
- ....

*Biomass has to be used in a variety of the market sectors of the Dutch economy !!!*



# Current biomass use and goals for power/CHP applications

Technology	Avoided fossil fuel use [PJ]		2010 Goal Biomass Action Plan
	2004	2005*	
Cofiring power plants	14.0	29.0	34
Waste combustion	11.1	11.5	20
Cement furnaces	1.7	1.7	-
Combustion – CHP	2.3	2.6	8 – 18
Dom./Ind. Wood heaters	7.4	7.4	7
Landfill gas	1.7	1.6	2
Digestion – CHP	0.2	0.3	4-6
Sewage/waste water treatment	3.2	3.1	
<b>Total</b>	<b>41.7</b>	<b>57.0</b>	<b>75 - 87</b>



# Long term potential for biomass in the Dutch economy (1)

ECN/WUR i.o.v. PGG

- Ambition PGG: replacement 30% fossil fuel use by biomass in 2030
- Starting points:
  - total primary energy consumption 2030 is 3000 PJ
  - biomass contributions: 60% in transport, 25% in power production, 20% in raw materials for chemicals, and 27% for heat production
- Methodology:
  - review current Dutch energy balance, with each energy carrier for the year 2000
  - estimation 2030 situation
  - analysis potential role biomass



# Long term potential for biomass in the Dutch economy (2)

ECN/WUR i.o.v. PGG

Ambition PGG	Results analysis ECN / WUR	Remarks
3000 PJ primary energy cons. in 2030	3000 taken as starting point	Less than expected on basis recent developments. Extra efforts on energy savings and efficiency improvement necessary to meet this level.
60% contr. Transportation	40% contr.	60% is too ambitious, 40% more in line with application in other sectors and EU vision
25% contr. Power prod.	10% contr.	25% only poss. by replacement some based-load coal / natural gas fired plants by biomass; only co- firing limit to about 10%
20% contr. raw mat. Chemicals	25%	25% potential possible but a large RD&D effort is required
17% contr. Heat production	17% or higher	Large-scale SNG production and implementation required. More biomass to heat -> 21-23 prim. energy cons. subst. by biomass -> 30% possible
Total 2030	21-23% primary energy cons.	Existing infrastructure cannot be fully depreciated between now and 2030 -> limits biomass poss.



# Long term potential for biomass in the Dutch economy (3)

ECN/WUR i.o.v. PGG

## *Main conclusions*

1. A primary energy consumption of 3000 PJ<sub>th</sub> is a very optimistic starting point
2. Existing infrastructure cannot be fully depreciated between now and 2030 which restricts the type of biomass use
3. 21-23% substitution primary fossil energy carriers by biomass – instead of 30% suggested by PGG – more expectable
4. 23% substitution requires about 900 PJ<sub>th</sub> raw biomass (60 Mt d.m.); 30% requires 1200 PJ<sub>th</sub> (80 Mt d.m.)
5. Potential biomass availability in 2030: primary products – 6 Mt d.m. (100 PJ<sub>th</sub>), secondary/tertiary by-products – 12 Mt d.m. (200 PJ<sub>th</sub>), specific domestic cultivation of crops – 9 Mt d.m. (150 PJ<sub>th</sub>) -> total: 450 PJ<sub>th</sub>/a -> at least 60-80% of the necessary green raw materials have to be imported
6. Especially within the field of biochemicals, biomaterials and bioproducts an extensive R&D-effort is necessary to develop technologies required



# Technological options 2030

- Biofuels for transport:
  - Gasification-related fuels: BtL, DME, SNG, ..., H<sub>2</sub>
  - Fermentation-related fuels: cellulosic-ethanol, butanol, ...
- Biopower:
  - Advanced co-firing
  - Stand-alone BG-CCs
- Biochemicals/products:
  - Functionalised from refinery processes (raw material + process energy savings)
  - Gasification-based BioSyngas-related
- Bioheat:
  - Digestion/Gasification-related SNG



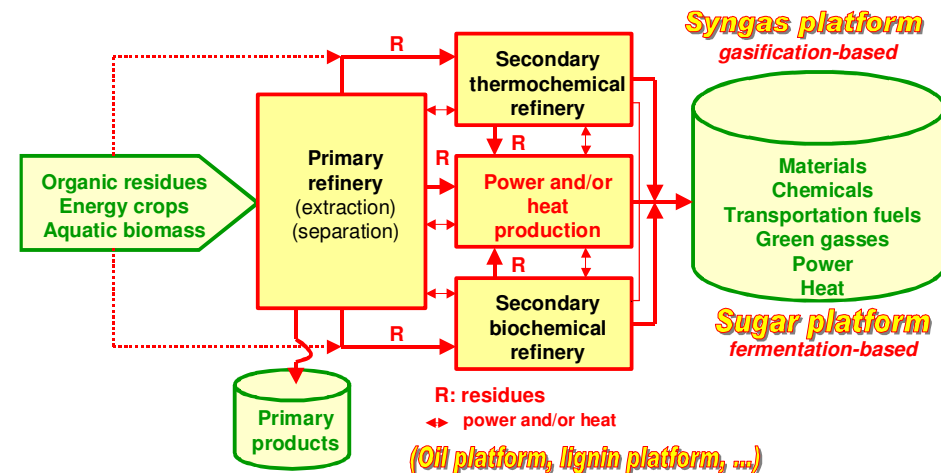
# Biorefineries

Co-production of bioproducts, biomaterials, biochemicals, biotransportation fuels, power and/or heat in a technically, economic and ecologically fully optimised integrated system.

A Biorefinery is an integrated facility for efficient co-production of materials, chemicals, transportation fuels, gaseous energy carriers, power and/or heat from biomass (analogous to today's petroleum refineries)

## Objectives:

- maximising the economic added-value of the biomass
- minimising the negative environmental impact





# Biorefinery development strategy for the Netherlands

1. Identification and analysis international SOTA (a.o. IPs, IEA)
2. Identification and analysis interests major stakeholders (industry, agro-sector, NGOs, government, R&D-institutes, universities, ...)
3. Identification and analysis national strengths (technological and agricultural knowledge-base, existing infrastructure, harbours, ...)
4. Development of a common national Biorefinery Vision
5. Development and implementation of a national Strategic Research and Agenda and Implementation Strategy

*This Strategy should be worked out by a joint effort of all stakeholders facilitated by the Dutch Network on Biorefineries  
([biorefinery.nl](http://biorefinery.nl))*

Programmatic biorefinery-based co-operation

Upstream and  
(bio)chemical  
expertise



Downstream and  
(thermo)chemical  
expertise

[www.bio2value.nl](http://www.bio2value.nl)

Dutch Network on Biorefinery

**Biorefinery.nl**



# This Workshop

## *Objectives*

1. Knowledge dissemination to potential stakeholders on international SOTA Biorefineries
2. Identification interests major stakeholders
3. Identification national strengths

## *Methodology*

- General presentation international SOTA
- Presentations industrial stakeholders three different market sectors
- 3 parallel market sector specific workshops
- Plenary discussion - reaching a common perspective, as a starting point for defining a Common Vision and related SRA and IS



## Stellingen voor middagsessies (1)

1. Bioraffinage is onontkoombaar om op een economisch en ecologisch verantwoorde wijze in de lange-termijn vraag naar biomassa-gerelateerde producten te voorzien
2. Bioraffinage begint bij het opwerken van restproducten uit bestaande industrieën
3. Bioraffinage is noodzakelijk voor marktconforme productie van bio-energie
4. Bioraffinage dient aan te sluiten op bestaande infrastructuur om zodoende implementatie te bespoedigen
5. Thermochemische versus biochemische bioraffinage is als economische versus energetische efficiency



## Stellingen voor middagsessies (2)

6. Grootschaligheid is een vereiste bij het toepassen van bioraffinage
7. De verschillende producten (verkregen via bioraffinage) mogen niet te veel verschillen qua financiële opbrengst
8. Bioraffinage is geen deelproces, maar moet de hele keten van oorspronkelijke grondstof tot uiteindelijke producten omsluiten  
Daarom is samenwerking tussen de verschillende marktpartijen van groot belang
9. De drijfveren voor raffinage van biomassa zijn reductie van depletie van de ruwe olievoorraden en diversificatie van de grond- en brandstofvoorziening, i.t.t. het veelgebruikte argument van reductie van broeikasgasemissies
10. Grootschalige implementatie van bioraffinageconcepten in de Nederlandse economie op de langere termijn vereist een gemeenschappelijk gedragen visie en RD&D Roadmap