

IEA Bioenergy

Definition & Status Biorefineries

Task 42

Biorefineries

Co-production of Food, Feed, Chemicals,
Materials, Fuels, Power and Heat from
Biomass

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Biorefineries & Bio-based Products Congress, 15 March 2010,
RAI, Amsterdam, the Netherlands

IEA Bioenergy

CONTENT

- **IEA Bioenergy**
 - Strategic Plan 2010/2016
 - Contracting parties
 - Tasks
- **Task 42 Biorefineries**
 - Focus, aims, partners
 - Definition, classification BRs
 - Country reports, stakeholder WSs
 - Work Programme 2010 - 2012

IEA Bioenergy

- IEA Bioenergy is one of a number of Implementing Agreements (IAs) established by the International Energy Agency (IEA)
- IAs operate within an institutional structure comprising IA Executive Committees, Tasks, ...
- IAs should contribute both to the IEA technology collaboration programme and national programmes of the Contracting Parties
- Establishment IEA Bioenergy – 30 years ago

IEA Bioenergy is one of two IEA Implementing Agreements with major relevance for Bioenergy/Biofuels (the other IEA-AMF (Advanced Motor Fuels))

Annual budget over 2 M US-\$ (2010)

IEA Bioenergy

Mission Strategic Plan 2010 - 2016

To facilitate the commercialisation and market deployment of environmentally sound, socially acceptable, and cost-competitive **bioenergy systems and technologies**, and to advice policy and industrial decision makers accordingly

Copies Strategic Plan Available

Strategy 2010 – 2016 Period

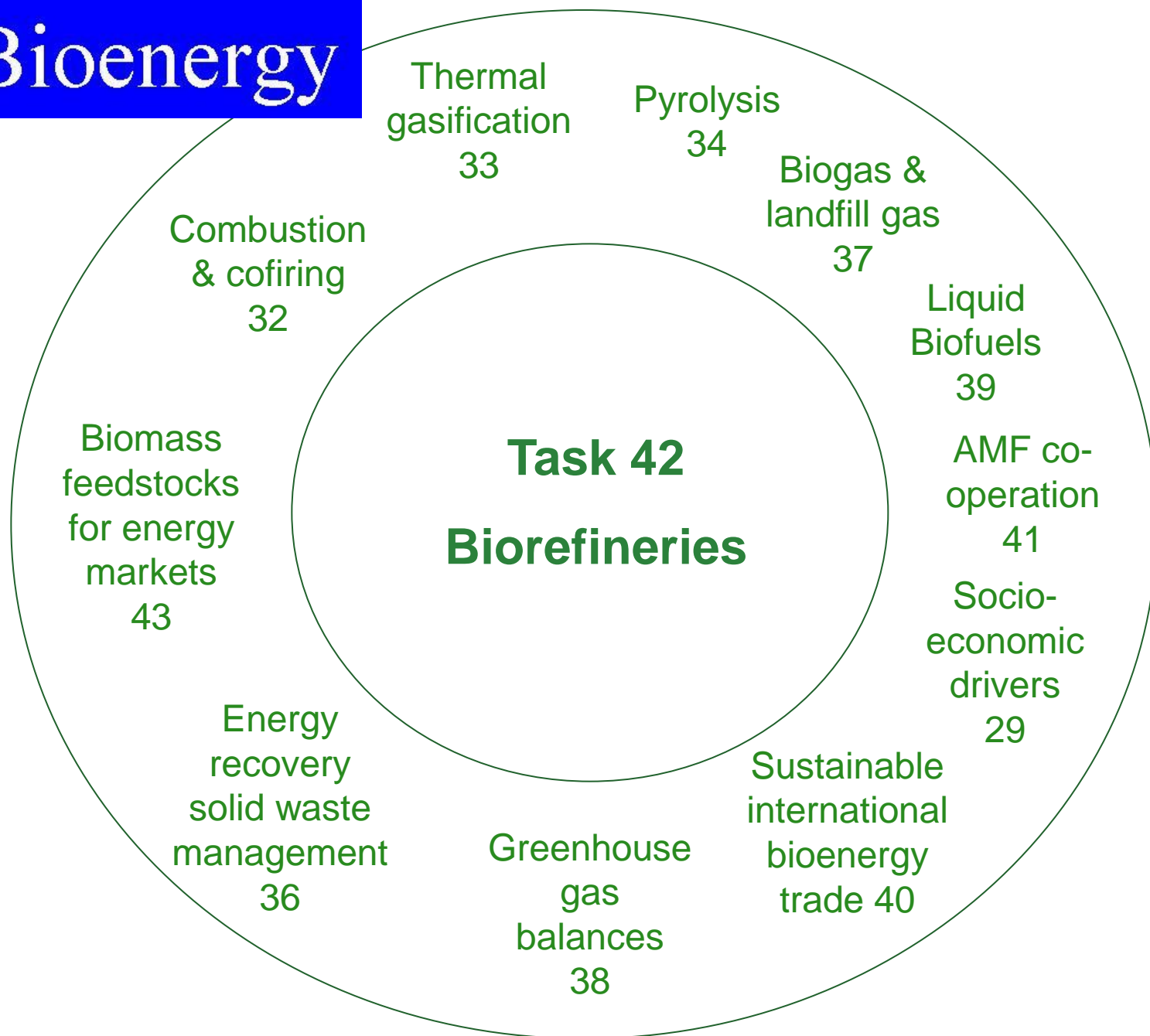
To provide platforms for international collaboration and information exchange in bioenergy research, development, demonstration and information exchange.

This includes:

- the development of networks
- dissemination of information
- provision of science-based technology analysis
- support and advice to policy makers
- involvement of industry
- encouragement of membership by countries with a strong bioenergy infrastructure and appropriate policies

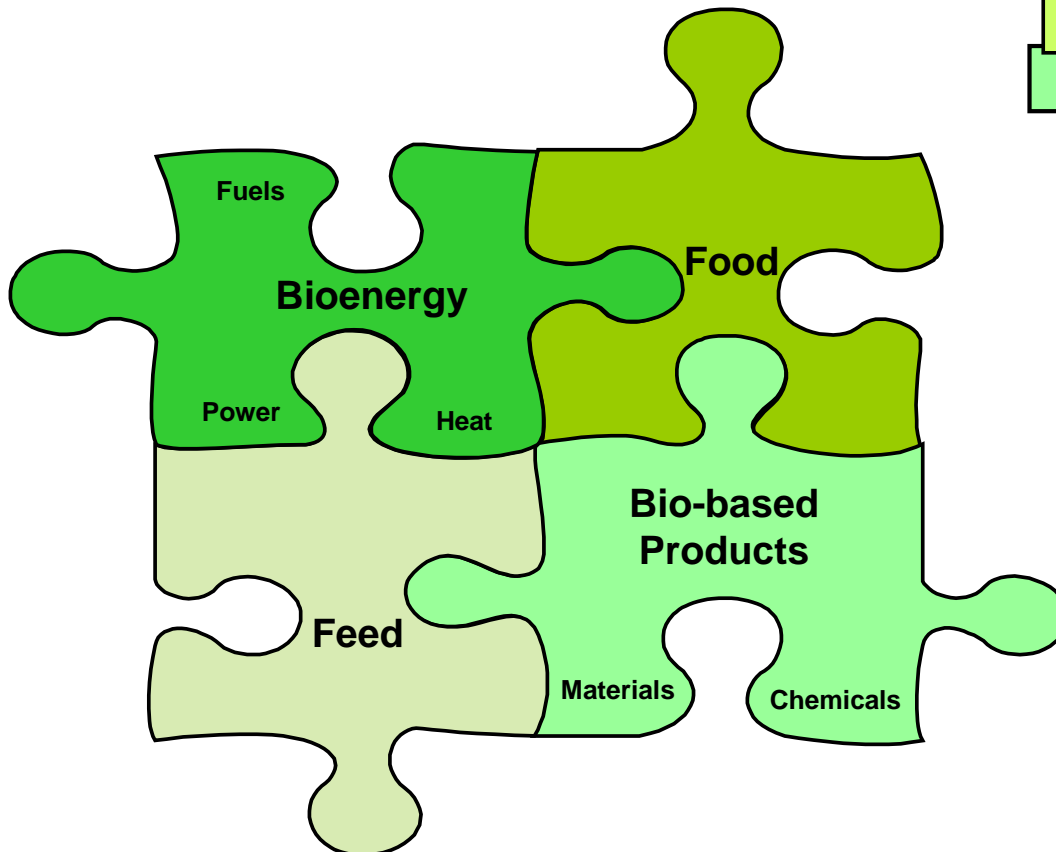
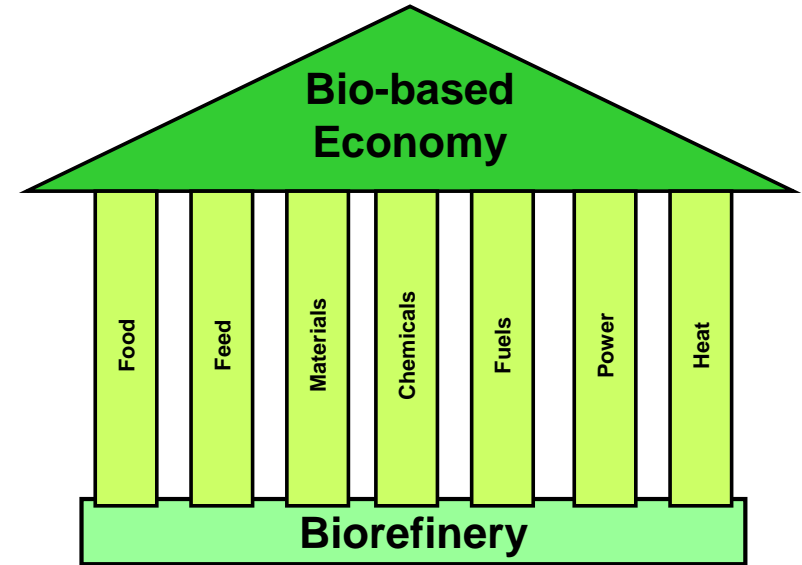
23 Contracting Parties (Member Countries)

- Australia
- Austria
- Belgium
- Brazil
- Canada
- Croatia
- Denmark
- European Commission
- Finland
- France
- Germany
- Ireland
- Italy
- Japan
- Netherlands
- New Zealand
- Norway
- South Africa
- Sweden
- Switzerland
- Turkey (from March 2010)
- United Kingdom
- United States



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Task 42 Biorefineries



Task 42 – Biorefineries

Focus

Biorefinery as a facility that optimises the integrated sustainable production of food, feed, chemicals, materials, fuels, power and heat, maximising the value derived from a biomass feedstock

Aims

- Assess the worldwide position and potential of biorefineries
- Gather new insights of the possibilities for the simultaneous manufacture of Bioenergy and Bio-based Products.



Partners Task 42

Founding (2007) members (8):

Austria, Canada, Denmark, EU, France,
Germany, Ireland, **the Netherlands**

New Members:

2009: Australia, Italy

2010: USA, United Kingdom, Turkey
(to be decided: Belgium)

Task 42

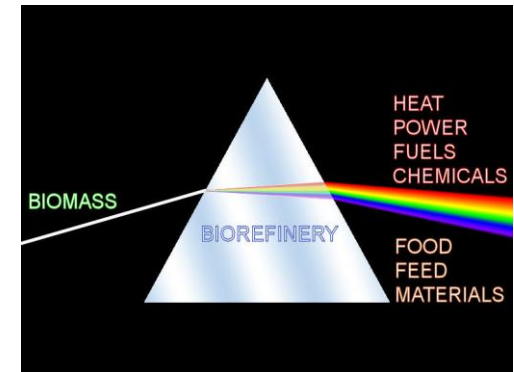
Results 2007 - 2009

- Common definition for biorefineries
- Common classification system for biorefineries
- Country reports on current processing potential and mapping of existing plants.
- Identification of biorefinery related RD&D programmes in participant countries
- Annual biorefinery seminar for stakeholders.
- Linking of ongoing international activities through joint events and new initiatives

Task 42

Definition Biorefineries

Biorefining is the sustainable processing of biomass into a spectrum of marketable Bio-based Products and Bioenergy



Sustainable: maximising economics, socially acceptable, optimal environmental performance

Processing: upstream processing, transformation, fractionation, thermo-chemical and biochemical conversion, extraction, separation, downstream processing

Biomass: residues, crops, algae

Spectrum: multiple product outlets

Marketable: volumes, prices

Bio-based Products: food, feed, chemicals, materials

Bioenergy: fuels, power, heat

Task 42

Definition Biorefineries

In general Product-driven and Energy-driven Biorefineries can be distinguished

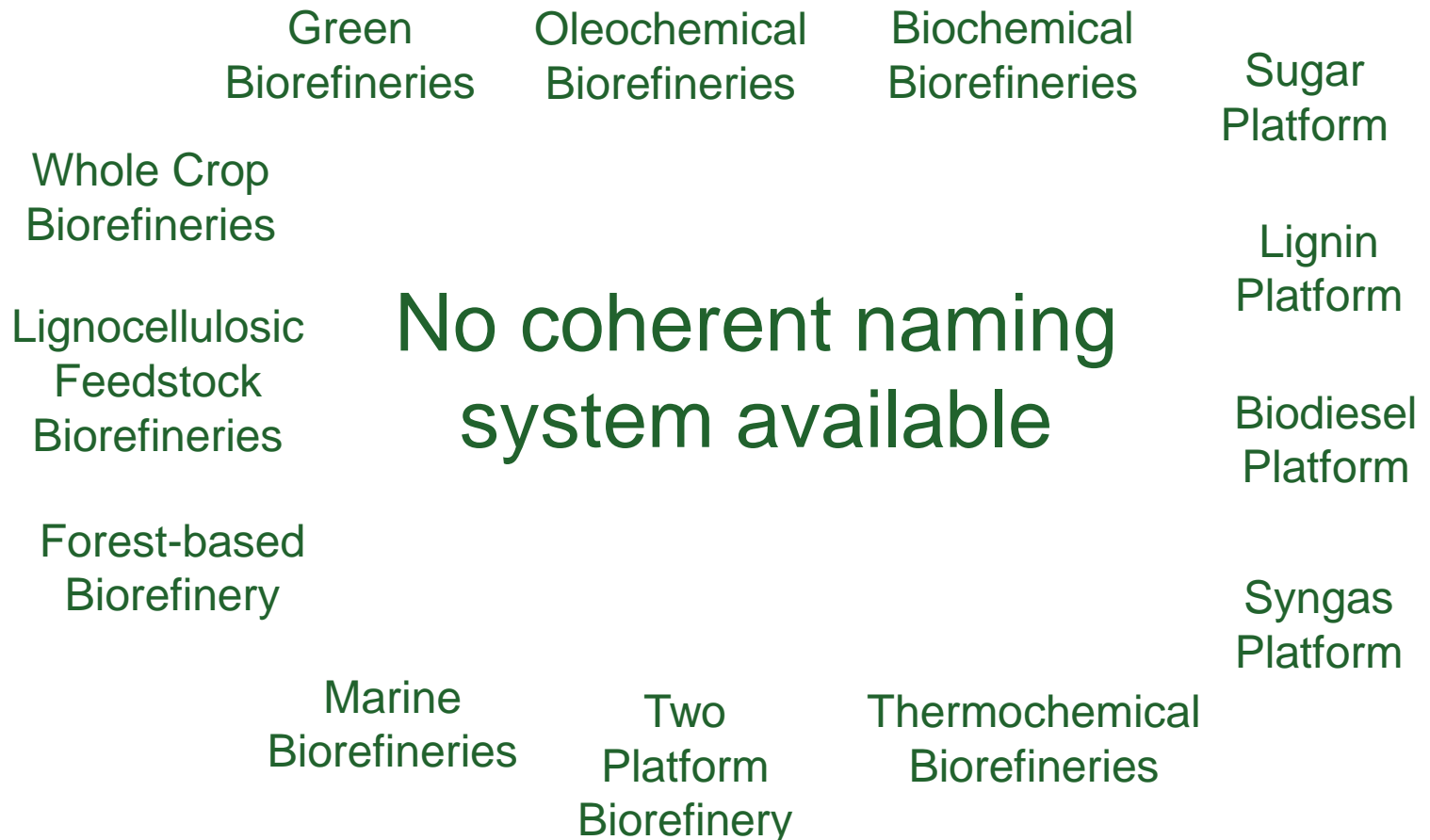
PDB: main goal is the production of one/more Bio-based Products; process residues are used to produce Bioenergy for internal/external use

EDB: main goal is the production of one/more Energy Carriers (fuels, power and/or heat); process residues are valorised to BBPs to maximise the economic profitability of the overall process

*In Task 42 both types of BRs are dealt with,
however, with a focuss on EDBs (IEA
Bioenergy)*

Task 42 – Classification System

Current Naming in Literature



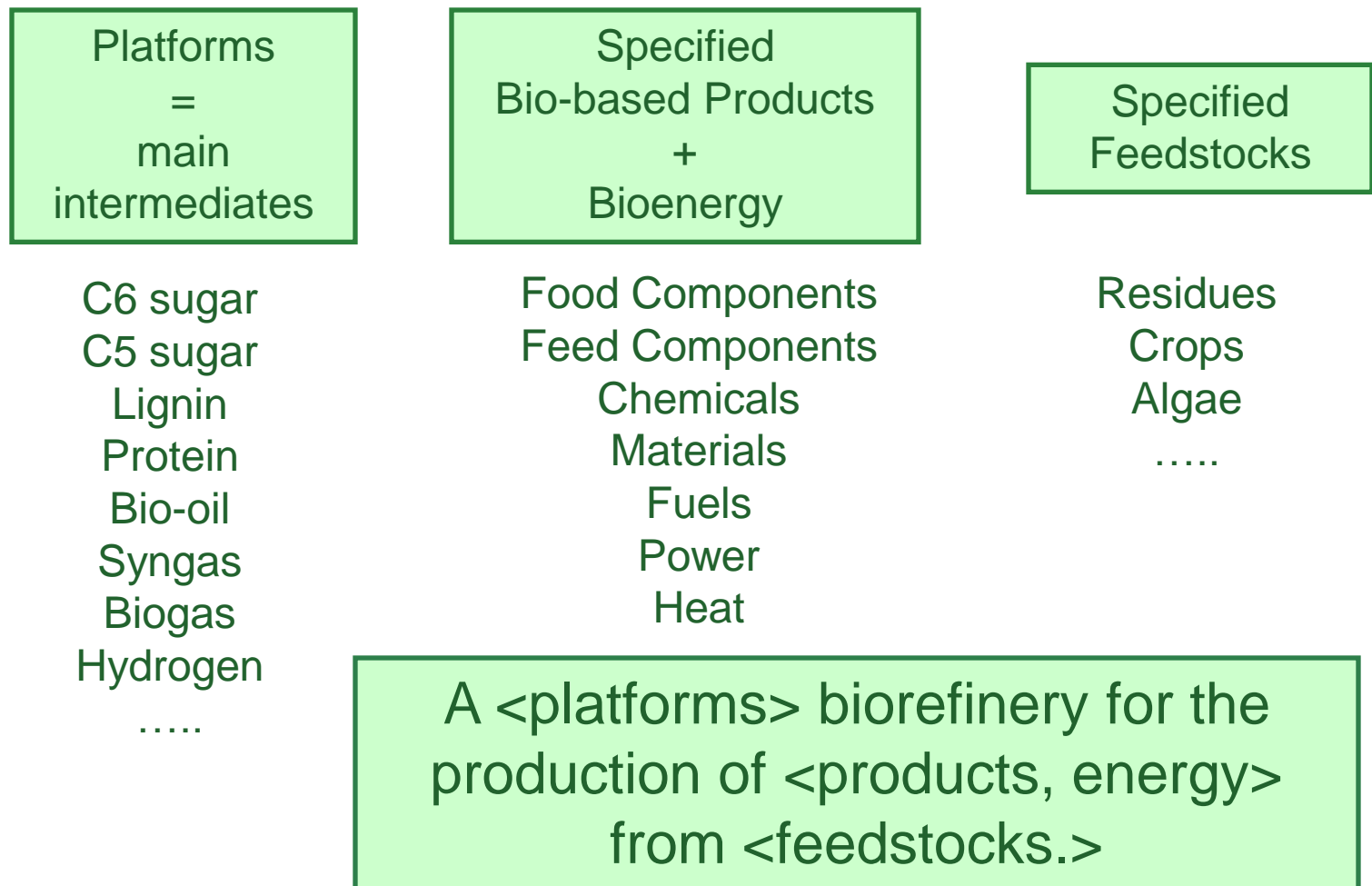
Task 42 – Classification System

Aim Classification System

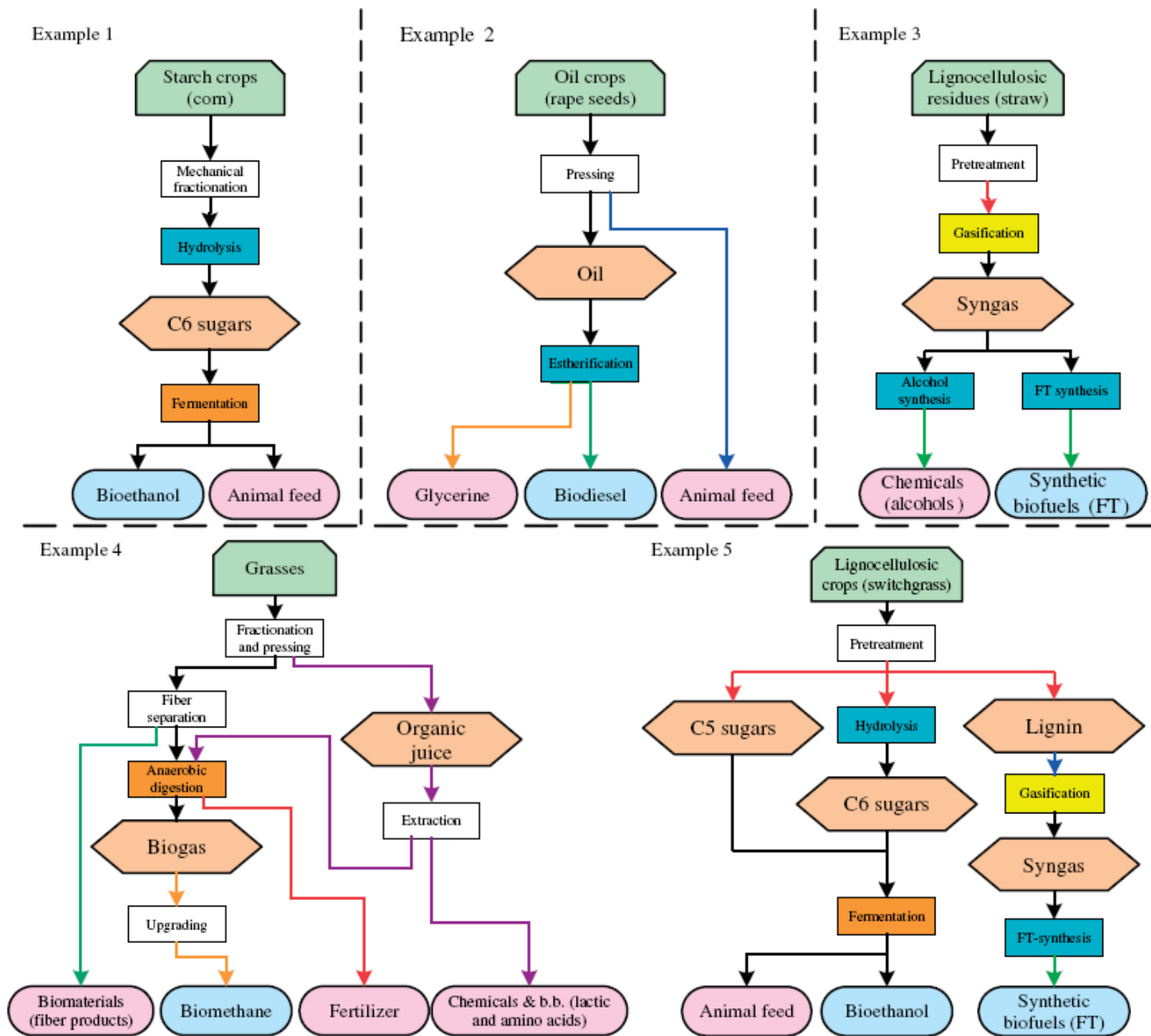
- Should be unambiguous for all stakeholders within the Biorefinery field
- Both the feedstocks used and the main intermediate and final products produced should be part of the naming
- The naming should reflect the complexity of the Biorefinery facility
- The naming should be as specific as possible

Task 42 – Classification System

Approach

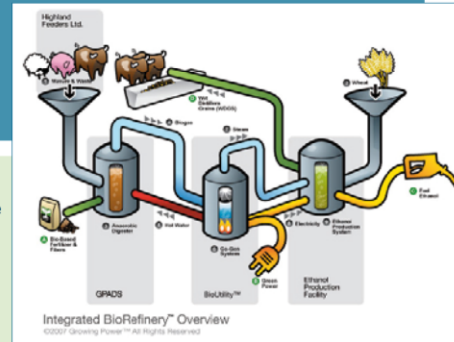


Examples Classification System (see also Brochure)



Highmark Renewables (Canada)

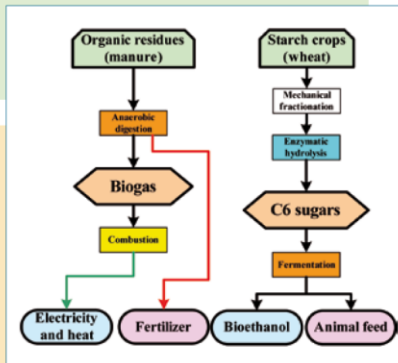
Classification: C6 sugars and biogas biorefinery for bioethanol, animal feed, fertilizer, electricity and heat from starch crops and organic residues
 State-of-the-art: Commercial
 Owner: Highmark Renewables
 Feedstocks: Wheat, manure, slaughtering waste
 Products: Bioethanol, animal feed, fertilizer, electricity and heat
 Stakeholders:



20

Highmark Renewables is developing the first Integrated BioRefinery™ in Canada. Their unique process converts grain (e.g. high-starch wheat) into fuel ethanol. The residual, distillers grains, is fed to cattle at a nearby feedlot. Cattle manure is used to generate biogas, which is converted to electricity and steam in a BioUtility process. The highly integrated process is targeted for the most cost and energy efficient production of fuel ethanol. The Integrated BioRefinery™ once it is in full production, will generate 40 million litres of ethanol, 10 thousand tonnes of BioFertilizer, and over 75 thousand tonnes of greenhouse gas emissions credits each year. Agricultural and food industry residues, often thought of as wastes, are converted into valuable energy and other renewable products. Highmark Renewables is proud of their technology development capability, technology portfolio, experience in developing renewable energy facilities, facility operation skills and world-class management team.

Highmark Renewables, a designer and operator of renewable energy facilities, developed the Growing Power Anaerobic Digestion System (GPADS) which can derive energy from high-solids and fibrous organic wastes (manure, industrial residues and municipal solid waste). After more than two years of operations, the system now can generate special value from tough to handle wastes. GPADS, our first large scale installation is the largest feedlot manure - energy plant in the world. It processes about 15% of the manure from a 36,000 head feedlot which is managed by our partners Highland Feeders and the Spring Creek Ranch (producers of verified premium Alberta beef). GPADS, currently producing 20 tonnes of biofertilizer along with up to 24,000 kWh of electricity each day is expected to grow four times in size while its technology may in the future be applied elsewhere. Highmark Renewables vision is to generate the maximum return on available resources with minimal risks.



Further reading Biorefinery Brochure

The classification system will be finalised in 2010

Task 42 – Country Reports

For the Task founding countries Austria, Canada, Denmark, France, Germany, Ireland, and the Netherlands so called “Country Reports” have been prepared.

Content

- National biomass energy use
- Non energy national biomass use
- Biomass related national policy goals
- National oil refineries
- Bioethanol, biodiesel and biogas:
production and capacity
- Existing biorefinery industries
- Pilot and demonstration plants
- R&D Activities
- National Task Leaders

The country reports are integrated in one Task Report. This report can be downloaded from the IEA Bioenergy Task 42 website:

www.IEA-Bioenergy.Task42-Biorefineries.com

Task 42

Stakeholder Workshops

In the first triennium open (industrial) stakeholder workshops have been organised coupled to the closed bi-annual Task meetings in:

- the Netherlands
- Austria
- Canada
- Ireland
- Germany

The Presentations given at these Stakeholder workshops can be downloaded from the IEA Bioenergy Task 42 website

www.IEA-Bioenergy.Task42-Biorefineries.com

Task 42

Work Programme

2010 - 2012

1. Developing a **biorefinery complexity index**, similar to what they use in the petroleum industry (Nelson complexity index), based on the Classification System
2. Identifying the most **promising bio-based products** – i.e. food, feed, added-value materials (a.o. fibre-based) and chemicals (functionalised chemicals and platform chemicals (building blocks)) to be co-produced with bioenergy
3. Assessing the **current status and development potential** of both Energy-driven Biorefineries (incl. biofuels) and Product-driven Biorefineries based on a **Full Value Chain approach**.
4. Providing a review of approaches and developing a guidance document for **sustainability assessment**, including economic, environmental and social acceptance aspects of biorefineries
5. Preparing a **Summarizing Paper** concerning “Adding Value to the Sustainable Utilisation of Biomass on a Global Scale – Biorefinery” to be used by a.o. national/international governmental organisations for their policy developments

Task 42

Work Programme 2010 - 2012

6. The organisation of **bi-annual Task Meetings**, workshops inviting national stakeholders, and visits to running pilot/demo and commercial facilities. **External knowledge dissemination** in general will be done by: i) set-up and management of the Task website, including linkage to many other national/international websites, ii) preparation and distribution of a Task newsletter (at least 2 times a year). **Internal knowledge dissemination** will be done by means of an intranet-site coupled to the Task website.
7. Update of the **Country Reports** on Biorefinery Mapping and Biorefinery-related RD&D Programmes to help national governments to define their national biorefinery policy goals and related programmes.
8. Developing and delivering a broad **Biorefinery Summer School** to enable students, policy makers and industrial stakeholders to become familiar with the integral concept-thinking of biorefineries.

Task Meetings/SHW: 2010 – France, US; 2011 – Italy, Australia; 2012 – Netherlands/Belgium, Denmark/Canada

New professional Task website will be operational from 1 May 2010

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Task 42 Biorefineries

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Task Meetings
Conferences
Workshops
Courses

Activities
Classification
Biobased Products
Chain Assessments
Sustainability Aspects
Country Reporting
Courses
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home - news

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Second Workshop Biorefinery.nl : Towards a Technology Roadmap Biorefinery
2 juli 2009
The main goal of this second workshop was to bring together relevant stakeholders to initiate the establishment of...
[read more »](#)

Interactive biorefinery workshop. 30th March 2009
13 march 2009
30th March 2009 was the date for BioreFuture 2009, the second annual European biorefinery workshop...
[read more »](#)

Invitation kick-off meeting Biorefinery program LNV October 14 2008
3 juli 2008
Earlier this year, both the Dutch cabinet and parliament have committed themselves to realizing a bio-based economy...
[read more »](#)

New publication: Status Report Biorefinery 2007
2 juli 2007
The main goal of this second workshop was to bring together relevant stakeholders to initiate the establishment of a National Technology...
[read more »](#)

More news

» Interactive biorefinery workshop, 30th March 2009
» Invitation kick-off meeting Biorefinery program LNV October 14 2008
» EuropaBio announces a top speaker line up for Europe's first Industrial Biotechnology event
» BioreFuture workshop Februari 12th 2008
» New publication: Status Report Biorefinery 2007
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Biorefinery info participating countries

» Australia
» Austria
» Canada
» Denmark
» European Commission
» France
» Germany
» Ireland
» Italy
» The Netherlands
» UK
» USA
[Go to all participating countries »](#)

Biorefinery Database »

Newest Publications

» The results of the 1st year of the Dutch...
» Biorefining biedt kansen voor groene...
» Biomassa in de Nederlandse energietoekomst...
» Transitiepad Biorefining
» Biorefinery of vergroen van productie bio-fuel
» Cascadering van maaisel
[Go to all publications »](#)

Agenda

» 12-05-09 2nd Nordic Wood Biorefinery...
» 29-05-09 Biorefining 2009
» 01-06-09 BTL Tec 2008, Biomass to Liquids
[Go to all agenda items »](#)

Raw materials for biorefinery

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Closing Remark for discussion

(Personal view RvR)

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Task 42 Biorefineries

Biorefining is not new (food industry, ...)

—

**Sustainable biomass use taking into account
the Full Value Chain Approach is !**

**Critical Success Factors for a Bio-based
Economy**

Biomass use should be

Socially accepted

Economically profitable

Environmentally friendly

**Product-driven Biorefineries are the Road to
the future BBE ???**

**If the answer is yes – new international policy goals
on non-energetic biomass use are required !!!**

Thank you for your attention

Further information:

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www.IEA-Bioenergy.Task42-Biorefineries.com

www.IEABioenergy.com