

# Österreichische Mitarbeit in IEA Bioenergy Task 42 „Biorefining“

## 10 aktuelle Highlights 2014

Gerfried Jungmeier

Produktion der Zukunft

Stakeholderdialog Biobased Industry

Graz 22. September 2014

*The Austrian participation in Tasks 42 of IEA Bioenergy is financed by the Federal Ministry for Transport, Innovation and Technology / Department for Energy and Environmental Technologies*



# Hightlight # 1: New Task 42 Brochure 66 pages with 4 Austrian Biorefineries

IEA Bioenergy is an International collaboration set-up in 1978 by the International Energy Agency (IEA) to improve international co-operation and information exchange between national bioenergy RD&D programmes. Its Vision is that bioenergy is, and will continue to be a substantial part of the sustainable use of biomass in the BioEconomy. By accelerating the sustainable production and use of biomass, particularly in a Biorefining approach, the economic and environmental impacts will be optimised, resulting in more cost-competitive bioenergy and reduced greenhouse gas emissions. Its Mission is facilitating the commercialisation and market deployment of environmentally sound, socially acceptable, and cost-competitive bioenergy systems and technologies, and to advise policy and industrial decision makers accordingly. Its Strategy is to provide platforms for international collaboration and information exchange, including the development of networks, dissemination of information, and provision of science-based technology analysis, as well as support and advice to policy makers, involvement of industry, and encouragement of membership by countries with a strong bioenergy infrastructure and appropriate policies. Gaps and barriers to deployment will be addressed to successfully promote sustainable bioenergy systems. The purpose of this brochure is to provide an unbiased, authoritative statement on biorefining in general, and of the specific activities dealt with within IEA Bioenergy Task42 on Biorefining aimed at stakeholders from the agro-sector, industry, SMEs, policy makers, and NGOs.

IEA Bioenergy

IEA Bioenergy – Task42 Biorefining

## IEA BIOENERGY Task42 BIOREFINING



Sustainable and synergetic processing of biomass into marketable food & feed ingredients, chemicals, materials and energy (fuels, power, heat)

### BBI BioCRACK Pilot Plant (Austria)

**State-of-the-art Pilot Plant**  
The BioCRACK pilot plant is a unique facility for the production of bio-crack products. It is the first of its kind in Austria and Europe.

**Location:** BBI refinery, Leoben, Austria  
**Capacity:** 100 tonnes per year  
**Products:** Bio-crack, bio-oil, bio-gas

**Description:** The BioCRACK pilot plant is a unique facility for the production of bio-crack products. It is the first of its kind in Austria and Europe. The plant is designed to produce bio-crack products from biomass. The process involves the pyrolysis of biomass to produce bio-crack, bio-oil, and bio-gas. The bio-crack is then refined to produce bio-crack products. The plant is designed to produce bio-crack products from biomass. The process involves the pyrolysis of biomass to produce bio-crack, bio-oil, and bio-gas. The bio-crack is then refined to produce bio-crack products.

### Ecodyna Algae Biorefinery (Austria)

**State-of-the-art Biorefinery**  
The Ecodyna Algae Biorefinery is a unique facility for the production of algae-based products. It is the first of its kind in Austria and Europe.

**Location:** Ecodyna, Leoben, Austria  
**Capacity:** 100 tonnes per year  
**Products:** Algae-based products

**Description:** The Ecodyna Algae Biorefinery is a unique facility for the production of algae-based products. It is the first of its kind in Austria and Europe. The plant is designed to produce algae-based products from algae. The process involves the cultivation of algae and the extraction of products. The plant is designed to produce algae-based products from algae. The process involves the cultivation of algae and the extraction of products.

### AGRANA Biorefinery Puchendorf (Austria)

**State-of-the-art Biorefinery**  
The AGRANA Biorefinery Puchendorf is a unique facility for the production of bio-based products. It is the first of its kind in Austria and Europe.

**Location:** AGRANA, Puchendorf, Austria  
**Capacity:** 100 tonnes per year  
**Products:** Bio-based products

**Description:** The AGRANA Biorefinery Puchendorf is a unique facility for the production of bio-based products. It is the first of its kind in Austria and Europe. The plant is designed to produce bio-based products from biomass. The process involves the conversion of biomass to bio-based products. The plant is designed to produce bio-based products from biomass. The process involves the conversion of biomass to bio-based products.

### Pilco Biorefinery (Austria)

**State-of-the-art Biorefinery**  
The Pilco Biorefinery is a unique facility for the production of bio-based products. It is the first of its kind in Austria and Europe.

**Location:** Pilco, Austria  
**Capacity:** 100 tonnes per year  
**Products:** Bio-based products

**Description:** The Pilco Biorefinery is a unique facility for the production of bio-based products. It is the first of its kind in Austria and Europe. The plant is designed to produce bio-based products from biomass. The process involves the conversion of biomass to bio-based products. The plant is designed to produce bio-based products from biomass. The process involves the conversion of biomass to bio-based products.



# Hightlight # 2: Classifications System is used more and more...

Joint European Biorefinery Vision for 2020  
**Star-COLIBRI**  
 STRATEGIC TARGETS FOR 2020 – COLLABORATION INITIATIVE ON BIOREFINERIES

**Green building blocks for biobased plastics**

PAULIEN HARMSEN AND MARTIJN HACKMANN

ICS 13.020.20, 65.040.20, 71.020      VDI-RICHTLINIEN      Februar 2014

|                             |   |                                |
|-----------------------------|---|--------------------------------|
| VEREIN DEUTSCHER INGENIEURE | Klassifikation und Gütekriterien von Bi Raffinerien | VDI 6310<br>Blatt 1<br>Entwurf |
|-----------------------------|---|--------------------------------|

Classification and quality criteria of biorefineries

Einsprüche bis 2014-07-31

- Vorgeschrieben über das VDI-Richtlinien-Einspruchsportal <http://www.vdi.de/einspruchsportal>
- in Papierform an VDI-Gesellschaft Technologies of Life Sciences Fachbereich Biotechnologie Postfach 12 11 50 40002 Düsseldorf

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VDI-Gesellschaft Technologies of Life Sciences  
 Fachbereich Biotechnologie

VDI-Handbuch Biotechnologie  
 VDI-Handbuch Energietechnik  
 VDI-Handbuch Ressourcenmanagement in der Umwelttechnik  
 VDI-Handbuch Technik Biomasse/Boden  
 VDI-Handbuch Verfahrenstechnik und Chemieingenieurwesen, Band 1: Bewertung/Stoffwerte  
 VDI-Handbuch Verfahrenstechnik und Chemieingenieurwesen, Band 2: Planung/Projektierung  
 VDI-Handbuch Verfahrenstechnik und Chemieingenieurwesen, Band 5: Spezielle Verfahrenstechnik

THE INNOVATION COMPANY

**Roadmap Bi Raffinerien**

im Rahmen der Aktionspläne der Bundesregierung zur stofflichen und energetischen Nutzung nachwachsender Rohstoffe

Veröffentlichung – auch für innerbetriebliche Zwecke – nicht gestattet

# Highlight #3: Biorefinery Fact Sheets

## Part A: Biorefinery Plant

**Biorefinery FACT SHEET**

**"2-Platform (electricity/heat, syngas) biorefinery using wood chips for FT-biofuels, electricity, heat and waxes with steam gasification"**

**Part A: Biorefinery plant**

The demonstration scale energy driven biorefinery "2-platform (electricity/heat, syngas) biorefinery using wood chips for FT-biofuels, electricity, heat and waxes with steam gasification" is shown in Figure 11.

Within the "2-Platform (electricity/heat, syngas) biorefinery using wood chips for FT-biofuels, electricity, heat and waxes with steam gasification" the wood chips are gasified with steam to produce a syngas, which is used to produce gas FT-biofuels via a catalyst reaction (Fischer-Tropsch). The final quality of the transportation FT-biofuel is reached in the upgrading step, e.g. hydroprocessing. The process residues are combusted to produce electricity and heat. As a further product waxes are produced.

Depending on the further successful development beside the steam gasification of wood which is suitable for smaller to medium sized gasifiers also the gasification with oxygen for large applications (e.g. methanol flow gasification) might become interesting. The large amount of syngas will then be an optimal starting point to produce additional synthetic products depending on the market demand for biomass based chemicals, e.g. methanol.

(Flow study example)

Figure 11: 2-Platform (electricity/heat, syngas) biorefinery using wood chips for FT-biofuels, electricity, heat and waxes with steam gasification

## Part B: Value Chain Assessment

**Part B: Value Chain Sustainability Assessment**

The method of the sustainability assessment - economic, and environmental - is given in Annex 1. The main assumptions and modeling choices, are documented in Annex 2. It shows the missing improvements of the assessment might be possible:

- Reduction of coal-based costs
- Use of renewable energy for auxiliary energy
- Further products made from syngas with higher revenues
- Lower area demand due to an yield increase
- Using of straw for various products

Figure 14: Comparison of biorefinery with conventional reference system on whole liquid output basis (1% of oil treatment)

**Annex:**

**Methodology of sustainability assessment and data with references**

- 8 Biorefinery Fact Sheets are ready
- Cooperation with Task 34 "Liquid Fuels" and Task 37 "Pyrolyses": identify 2 – 4 common biorefinery fact sheets



# Highlight #4: Austrian Country Report 2014

The grid contains 41 numbered thumbnails, each representing a slide from the report. The thumbnails are arranged in a grid with 5 columns and 8 rows, with the last row containing only 6 thumbnails. The thumbnails are as follows:

- 1: Country Report Austria
- 2: Content
- 3: Country specific energy consumption (1)
- 4: Country specific energy consumption (2)
- 5: Country specific energy consumption (3)
- 6: Country specific energy consumption (4)
- 7: Country specific energy consumption (5)
- 8: Country specific energy consumption (6)
- 9: Biomass use for energy and non-energy applications (1)
- 10: Biomass use for energy and non-energy applications (2)
- 11: Biomass use for energy and non-energy applications (3)
- 12: Biomass use for energy and non-energy applications (4)
- 13: Biomass use for energy and non-energy applications (5)
- 14: Biomass use for energy and non-energy applications (6)
- 15: Biomass use for energy and non-energy applications (7)
- 16: Biomass related (national) policy issues
- 17: Biomass related sustainability aspects (1)
- 18: Biomass related sustainability aspects (2)
- 19: Running commercial biorefineries (1)
- 20: Running commercial biorefineries (2)
- 21: Running commercial biorefineries (3)
- 22: Running commercial biorefineries (4)
- 23: Running commercial biorefineries (5)
- 24: Running commercial biorefineries (6)
- 25: Running commercial biorefineries (7)
- 26: Running commercial biorefineries (8)
- 27: Biorefinery pilot plants (1)
- 28: Biorefinery pilot plants (2)
- 29: Biorefinery pilot plants (3)
- 30: Biorefinery pilot plants (4)
- 31: Biorefinery pilot plants (5)
- 32: Biorefinery demonstration plants (1)
- 33: Biorefinery demonstration plants (2)
- 34: Biorefinery demonstration plants (3)
- 35: Major R&D projects (1)
- 36: Major R&D projects (2)
- 37: Major national stakeholders involved in the field of biorefining (1)
- 38: Major national stakeholders involved in the field of biorefining (2)
- 39: Major national stakeholders involved in the field of biorefining (3)
- 40: Major national stakeholders involved in the field of biorefining (4)
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# Highlight #5: Working Document „Biorefinery Complexity Index“

Working Document - 2014-07-09

## The Biorefinery Complexity Index

Gerfried Jungmeier<sup>1</sup>

with contributions from: Rene van Ree<sup>2</sup>, Henning Jørgensen<sup>3</sup>, Ed de Jong<sup>4</sup>, Heinz Stichnothe<sup>5</sup>, Maria Wellisch<sup>6</sup>

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<sup>2</sup>WUR, Wageningen, The Netherlands; <sup>3</sup>University of Copenhagen, Copenhagen, Denmark; <sup>4</sup>Avantium Chemicals BV, Amsterdam, The Netherlands; <sup>5</sup>VTI, Braunschweig, Germany; <sup>6</sup>Agriculture and Rural Development, Edmonton, Canada; all members of IEA Bioenergy Task 42 'Biorefining: Co-production of Fuels, Chemicals, Power and Materials from Biomass' (<http://www.iea-bioenergy-task42-biorefineries.com/>).

Working document

Content

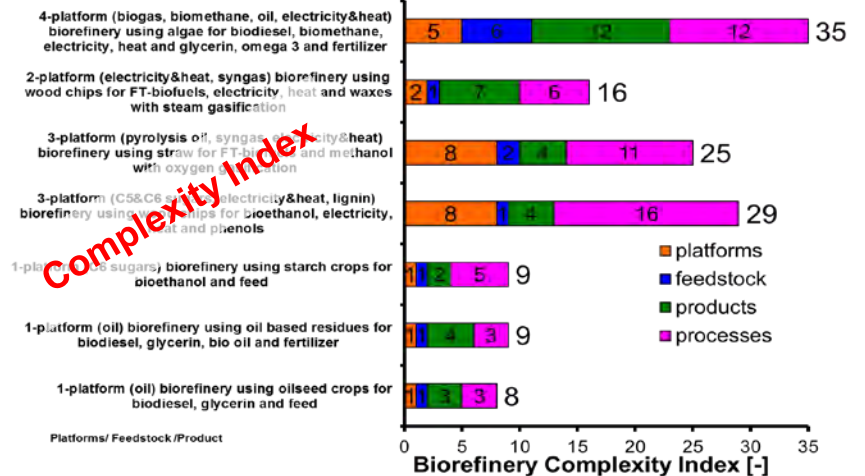
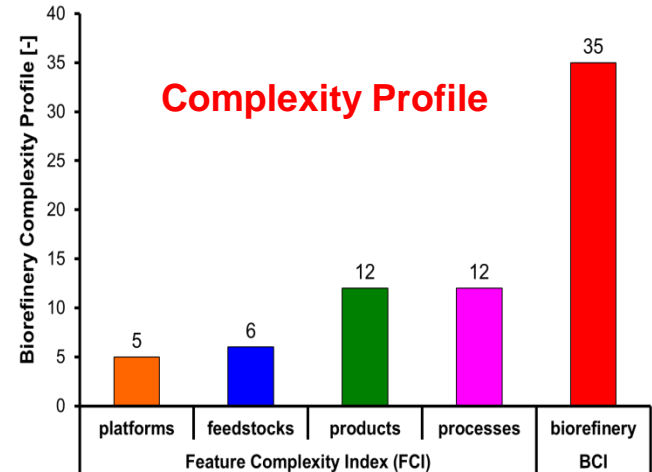
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Biorefinery Complexity Index

Page 1





# Highlight #6: 3<sup>rd</sup> European Biorefinery Training Course



**3rd European Biorefining Training School**

Budapest  
7-10 July, 2014

eit  
Climate-KIC

The 3rd European Biorefining Training School aims to offer an introduction to the key subjects and provide insight into many of the diverse issues that surround the bioeconomy transition. The school will deliver the latest knowledge and developments by internationally renowned researchers to PhD students, decision makers and professionals on the emerging field of bioeconomy.

**Partners**

The concept of the school has been developed and trademarked by three world class research institutes: the National University of Athens of Greece, Wageningen University of the Netherlands and INRA of France. The 3rd edition of the school will be organized by Climate KIC Central Hungary.

**Media partners**

greenea  
NNFCC  
The Bioeconomy Consultants  
IL BIOECONOMISTA  
The First Bioeconomy Blog - Bioeconomy news, politics and business  
Bio based Industries Consortium

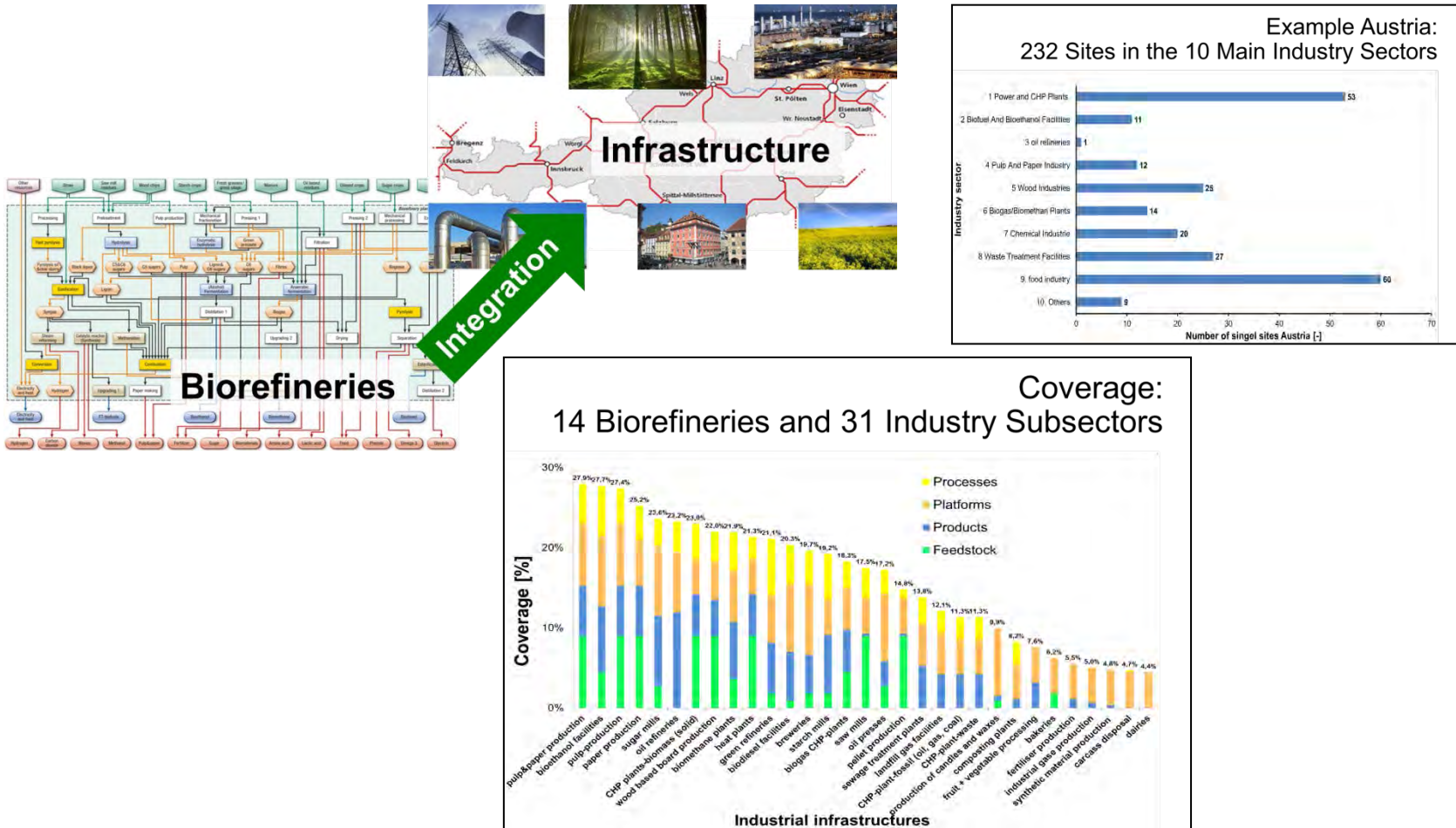
JOANNEUM RESEARCH  
RESOURCES

INRA  
SCIENCE & IMPACT

IEA Bioenergy  
Task 42 Biorefineries

- Presentations:
  - 9 Plenary presentations
  - 18 presentations in parallel modules
- 80 participants
- Task 42 contributions:
  - „IEA Bioenergy Task 42 Biorefining – Sustainable Processing of Biomass for Food and Non-food Applications“, Rene van Ree, Task leader
  - “Value Chain Assessment of Biofuel-driven Biorefineries”, Gerfried Jungmeier, Austrian Team Leader

# Highlight #7: Integration of Biorefineries into Existing Industrial Infrastructure






# Highlight #8: Stakeholder-Workshop

IEA Bioenergy  
Task 42 Biorefining

Workshop @ i-SUP2014



The role of industry  
in a transition  
towards the  
BioEconomy (BE) in  
relation to  
biorefinery

i-SUP2014, Antwerp, Belgium,  
Wednesday afternoon 3 September 2014

## ■ Scope

- What are the opportunities for upgrading existing industrial infrastructures to sustainable biorefineries?
- What are the changing roles of the different industrial stakeholders (agro, energy, chemical, feed/food industry) in the transition to a BE?

## ■ Approach

- The Role of the Energy Sector
- Approach Integration of Biorefineries in Existing Industrial Infrastructures
- Questionnaire

# Highlight #9: Presentations of Austrian Task 42 Participation

- **The Possible Role of Biorefineries in a BioEconomy – Activities of IEA Bioenergy Task 42 “Biorefining”**, 4th Central European Biomass Conference Graz/Austria, January 15 – 18, 2014
- **Internationale Entwicklungen am Beispiel der IEA Bioenergy Task 42 “Biorefining”**, VDI-Expertenforum, “Bioraffinerien – Klassifikation und Nachhaltigkeitsbewertung”, 20. Mai 2014, Düsseldorf
- **Facts, Figures and Integration of Biorefineries in a Future BioEconomy – Findings in IEA Bioenergy Task 42 “Biorefining”**, 22th European Biomass Conference , Hamburg, Germany, June 23 – 27, 2013
- **Facts&Figures of Biorefineries Integrated in the Pulp&Paper Industry – Case Studies in IEA Bioenergy Task 42 “Biorefining”**, FUTURE.FORUM PAPER – The Austrian Paper Conference, June 4 – 5, 2014, Graz, Austria
- **The Possible Role of Wood-biorefining in a Biobased Industry**, International Conference on Processing Technologies for the Forest and Bio-based Products Industries (PTF BPI) Kuchl, September 24 -26, 2014



# Highlight #10: IEA Bioenergy and BioEconomy

| Australia |                            | with Country specific descriptive information   |
|-----------|----------------------------|---|
| 1         | Scope of strategies *      | ✓ Description of scope considered   |
|           | Bioeconomy (BE)            | ✓ South Australia   |
|           | Biobased economy (BBE)     | ✓ Bioeconomy  |
|           | Biobased industries (BBI)  | ✓ Pulp + Paper  |
|           | Bioenergy (BE)             | ✓ Biomass feedstocks and supply   |
| 2         | National strategies **     | ✓ Description of documents  |
|           | Document name              | Opportunities for Primary Industries in the Bioenergy Sector / National Research, Development and Extension Strategy  |
|           | Scope                      | B&E   |
|           | Published by               | Governmental Rural Industries Research and Development Corporation  |
|           | Year                       | 2014  |
|           | Priorities                 | Primary Industries Sustainability, biomass feedstocks, supply logistics, policy analysis, capacity building   |
|           | Language                   | English   |
|           | Other documents ***        | ✓   |
|           | Document name              | Pulp and Paper Industry Strategy Group - Final Report   |
|           | Scope                      | B&E   |
|           | Published by               | Pulp and Paper Industry Strategy Group  |
|           | Year                       | 2010  |
|           | Priorities                 | Innovation (i.e. potential of bioenergy/biofuel production integrated in P&P processes, support of establishing a Biorefinery Research Institute), investment (i.e. expansion of timber plantations), sustainability (i.e. sustainable biomass growth) and productivity |
|           | Language                   | English   |
|           | Document name              | Australian Government response to the "Pulp and Paper Industry Strategy Group Report"   |
|           | Scope                      | B&E   |
|           | Published by               | Australian Government - Minister for Industry and Innovation  |
|           | Year                       | 2014  |
|           | Priorities                 | Establishment of Manufacturing Industry Council, measures taken to support P&P industry strategy (i.e. incentives for private sector investment in new biomass plantations), no statement concerning the establishment of a Biorefinery Research Institute              |
|           | Language                   | English   |
|           | Document name              | Biorefinery Scoping Study: Tropical Biomass   |
|           | Scope                      | B&E   |
|           | Published by               | Correll Consulting BIOSENCE (commissioned by Governmental Department of Innovation, Industry, Science and Research)   |
|           | Year                       | 2010  |
|           | Priorities                 | Advice to government for development of Biobased Economy Strategy, focusing on the use of sugarcane   |
|           | Language                   | English   |
|           | Document name              | Scoping Bioeconomy: Temperate Biomass Value Chains  |
|           | Scope                      | B&E   |
|           | Published by               | Parrett & Associates (commissioned by Governmental Department of Innovation, Industry, Science and Research)  |
|           | Year                       | 2010  |
|           | Priorities                 | Advice to government for development of Biobased Economy Strategy, focusing on the use of temperate biomass   |
|           | Language                   | English   |
|           | Document name              | Biotechnology and Australian Agriculture  |
|           | Scope                      | B&E   |
|           | Published by               | ACU, Tasmania (commissioned by Governmental Department of Agriculture, Fisheries and Forestry)  |
|           | Year                       | 2008  |
|           | Priorities                 | Advice to government for development of a Strategy for agricultural biotechnology: optimising the contribution of the next generation of biotechnologies to Australian agriculture and downstream markets as part of an emerging bioeconomy                             |
|           | Language                   | English   |
|           | Document name              | Building a Bioeconomy in South Australia 2010-2015  |
|           | Scope                      | B&E   |
|           | Published by               | Government of South Australia   |
|           | Year                       | 2011  |
|           | Priorities                 | Strategy to foster the Bioeconomy industry in South Australia, focusing on medical devices, environmental solutions, water management and cleantech   |
|           | Language                   | English   |
|           | Web resources              | ✓   |
|           | Title                      | The Bioeconomy  |
|           | Source                     | CLIR0   |
|           | Link                       | <a href="http://www.cirra.au/Organisation-Structure/Divisions/Ecosystem-Science/The-Bioeconomy.aspx">http://www.cirra.au/Organisation-Structure/Divisions/Ecosystem-Science/The-Bioeconomy.aspx</a>   |
|           | Title                      | Bioeconomy and Industrial Biotechnology   |
|           | Source                     | Australian Government, Department of Industry   |
|           | Link                       | <a href="http://www.industry.gov.au/Industry/Biotechnology/IndustrialBiotechnology/Pages/BioeconomyandIndustrialBiotechnology.aspx">http://www.industry.gov.au/Industry/Biotechnology/IndustrialBiotechnology/Pages/BioeconomyandIndustrialBiotechnology.aspx</a>       |
|           | Title                      | BioSA   |
|           | Source                     | South Australian Government   |
|           | Link                       | <a href="http://www.bioeconomy.sa.gov.au/">http://www.bioeconomy.sa.gov.au/</a>   |
| 3         | Vision ****                |   |
| 4         | Targets *****              |   |
| 5         | Addressed economic sectors | References to documents listed above  |
|           | Forestry                   | ✓ a, b, c, d, e   |
|           | Agriculture                | ✓ a, b, c, d, e, f  |
|           | Food and feed processing   | ✓ a, b, c, d, e, f  |
|           | Pulp+Paper                 | ✓ b, c  |
|           | Woodworking industry       | ✓ d, e, f   |
|           | Chemical industry          | ✓ d, e, f   |
|           | Materials manufacturing    | ✓ d, e, f   |
|           | Bioenergy                  | ✓ a, b, c, d, e, f  |
| *         | Definitions of Scope       |   |
|           | Bioeconomy (BE)            | Food and feed industries (agriculture, forestry, horticulture, fisheries and aquaculture, plant and animal breeding, the nutrition and beverage industry) + Biobased Economy  |
|           | Biobased economy (BBE)     | Non-food industries (biotechnical, biomaterial, biomedicine, pulp+paper and wood industries) + Bioenergy (including bioethanol)   |
|           | Biobased industries (BBI)  | Industrial sectors of non-food industries: biochemical, biomaterial, biomedicine, pulp+paper and wood industries  |
|           | Bioenergy (BE)             | Electricity, heat, transportation biofuels, gaseous and solid energy carriers   |
| **        | National strategies        | Governmental Strategies   |
| ***       | Other documents            | Strategies and reports by industry, research and consulting, governmental responses to such strategies  |
| ****      | Vision, Targets            | Only if there is a national BE/BBE strategy   |

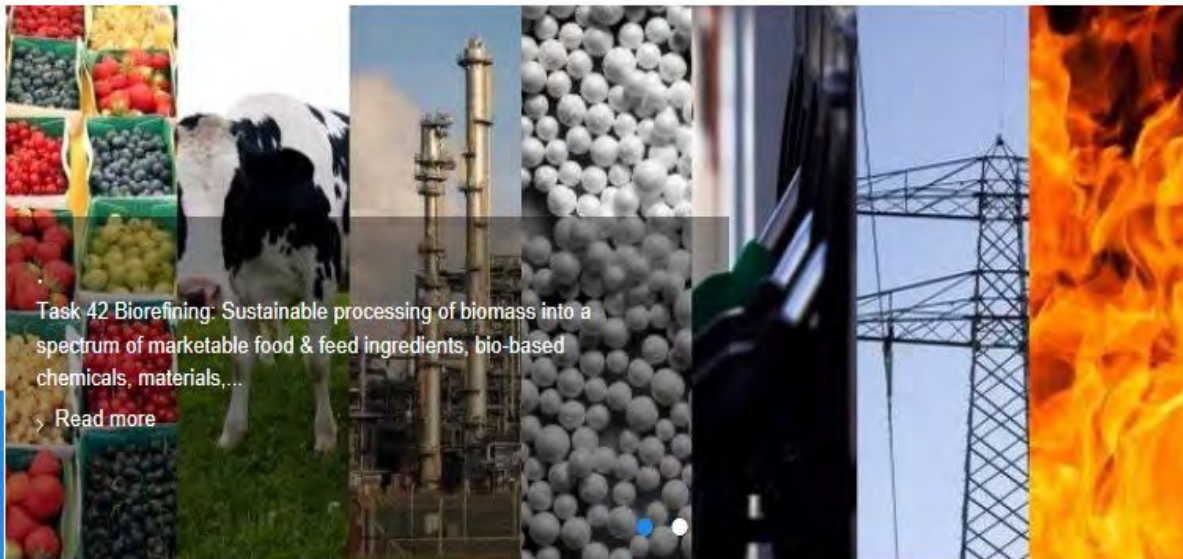
## ■ Identification BioEconomy Strategies in IEA Bioenergy Member Countries

- current status
- approaches
- opportunities for IEA Bioenergy

## ■ Cooperation Italy and Austria

- JOANNEUM: 11 Task 42 countries (Australia, Austria, Canada, Denmark, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, United States)
- ITABIA/ENEA: 11 non-Task 42 of IEA Bioenergy (Belgium, Brazil, Croatia, Finland, France, Korea, Norway, South Africa, Sweden, Switzerland, UK )

IEA Bioenergy aims to facilitate the commercialisation and market deployment of environmentally sound, socially acceptable, and cost competitive bioenergy systems and technologies



Task 42 Biorefining: Sustainable processing of biomass into a spectrum of marketable food & feed ingredients, bio-based chemicals, materials,...

Read more



Activities

Knowledge dissemination

Market deployment

Stakeholder positioning

Sustainable biomass valorisation

Policy advice

Training

News

New map of US biorefineries available
March 28, 2014

Project results presented at conference
February 17, 2014

Meeting in Graz
November 6, 2013

Biofuel-driven Biorefineries Report 2013
February 1, 2013

Poster IEA Bioenergy Task42

Calendar

- April 8, 2014
7th ...
Conference
2014: A Conference for a Low Carbon Future - Edmonton, Canada
May 12, 2014 - Conference
9th Biopolymer Symposium- Philadelphia, USA

More calendar

Recent publications

Green Building Blocks for

Austrian Team Leader

Gerfried Jungmeier
JOANNEUM RESEARCH
gerfried.jungmeier@joanneum.at

- Multi-sectoral stakeholder involvement in the development and implementation of sustainable value chains
Technology development and biorefinery scale-up using best

www.IEA-Bioenergy.Task42-Biorefineries.com
www.nachhaltigwirtschaften.at/iea