Mapping biofuel R&D activities in Austria

Report from an f3 synthesis project

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Content

- Background – current biofuel situation, legislations
- Domestic biofuel production
- Austrian biofuel technology providers
- Austrian R&D
- Selected biofuel related research projects
- Summary

Background

Objectives

- Map and describe the current biofuel situation, on-going R&D activities and actors related to biofuels in Austria, and investigate possibilities for collaboration with f3.

Activities

- Interviews , web and literature searches to identify the most important R&D actors.
- Meetings and interviews with key actors.
- Study visits at demonstration plants.

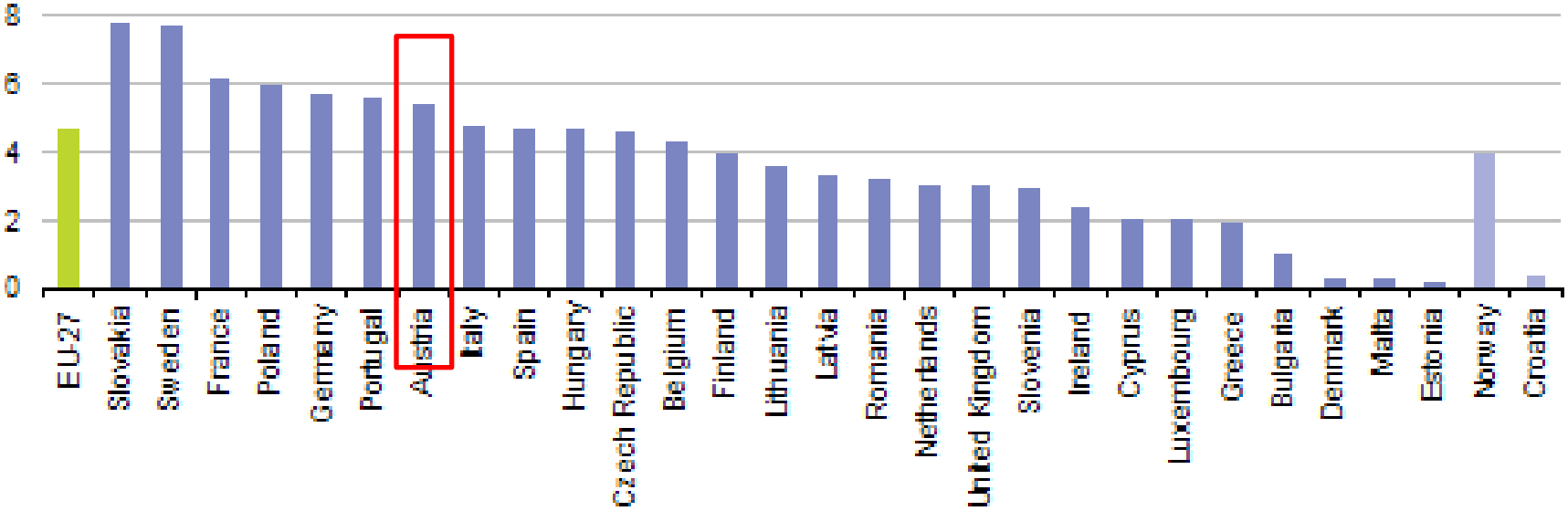
Background

- The Austrian transport sector accounts for the largest share of the final energy consumption (approx. 34 %).

- A biofuel substitution target was approved in January, 2009. Biofuels should represent a share of 5,75% of the total fuel consumed and as of October 1, 2020, the substitution goal is increased to 8,45%.

- Austria planned to introduce E10 in 2012, but has postponed it.

Share of renewable energy in fuel consumption of transport in 2010 (%)



Source: Eurostat (2013)

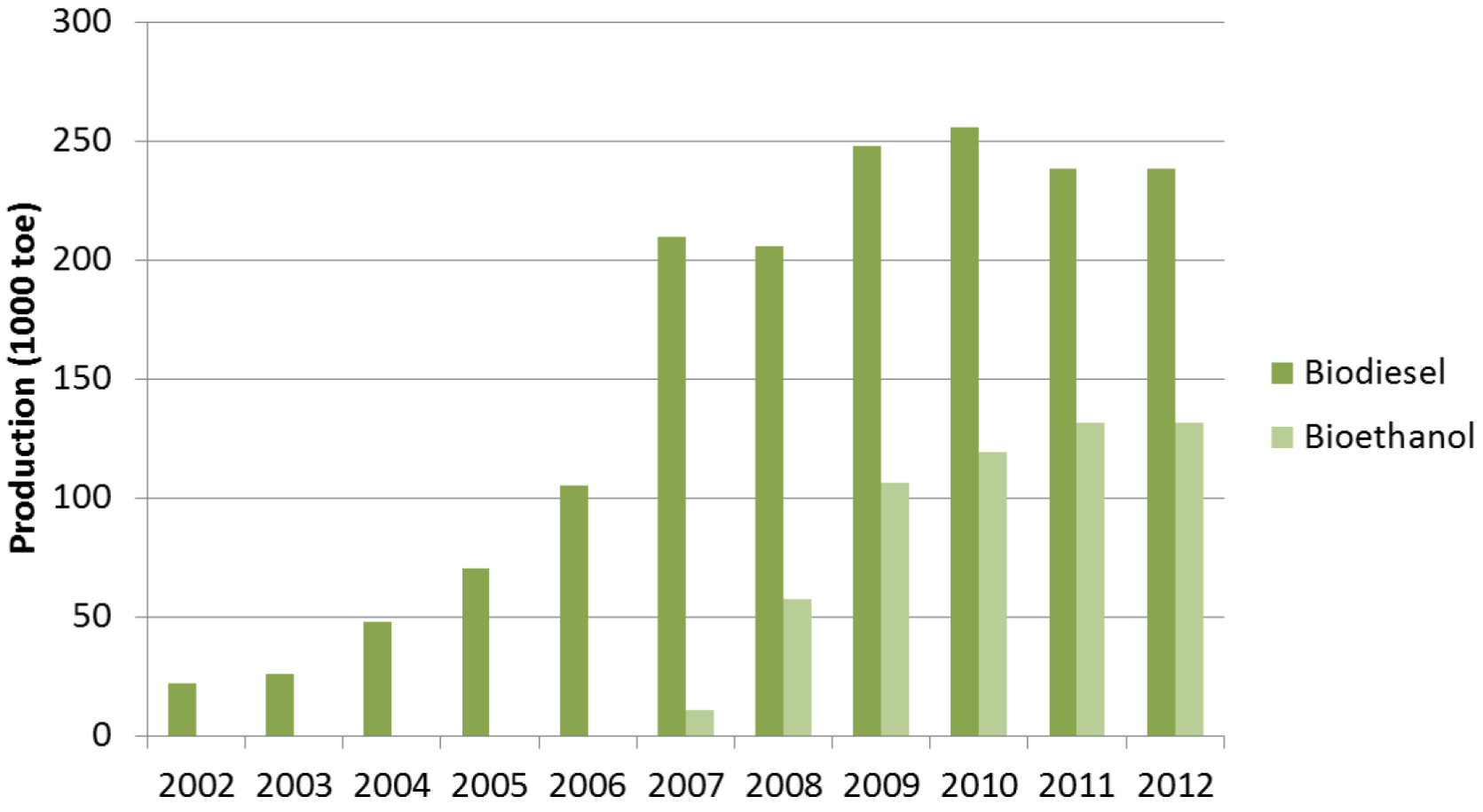
Current biofuel legislations in Austria

- The mineral oil fiscal law was adjusted to establish the minimum biofuel content requirement in order for fuels to be applicable for lower tax rates.

- An increase in the mineral oil tax has applied since the beginning of 2011. As compensation for drivers, the commuting travel allowance was increased by 10%.

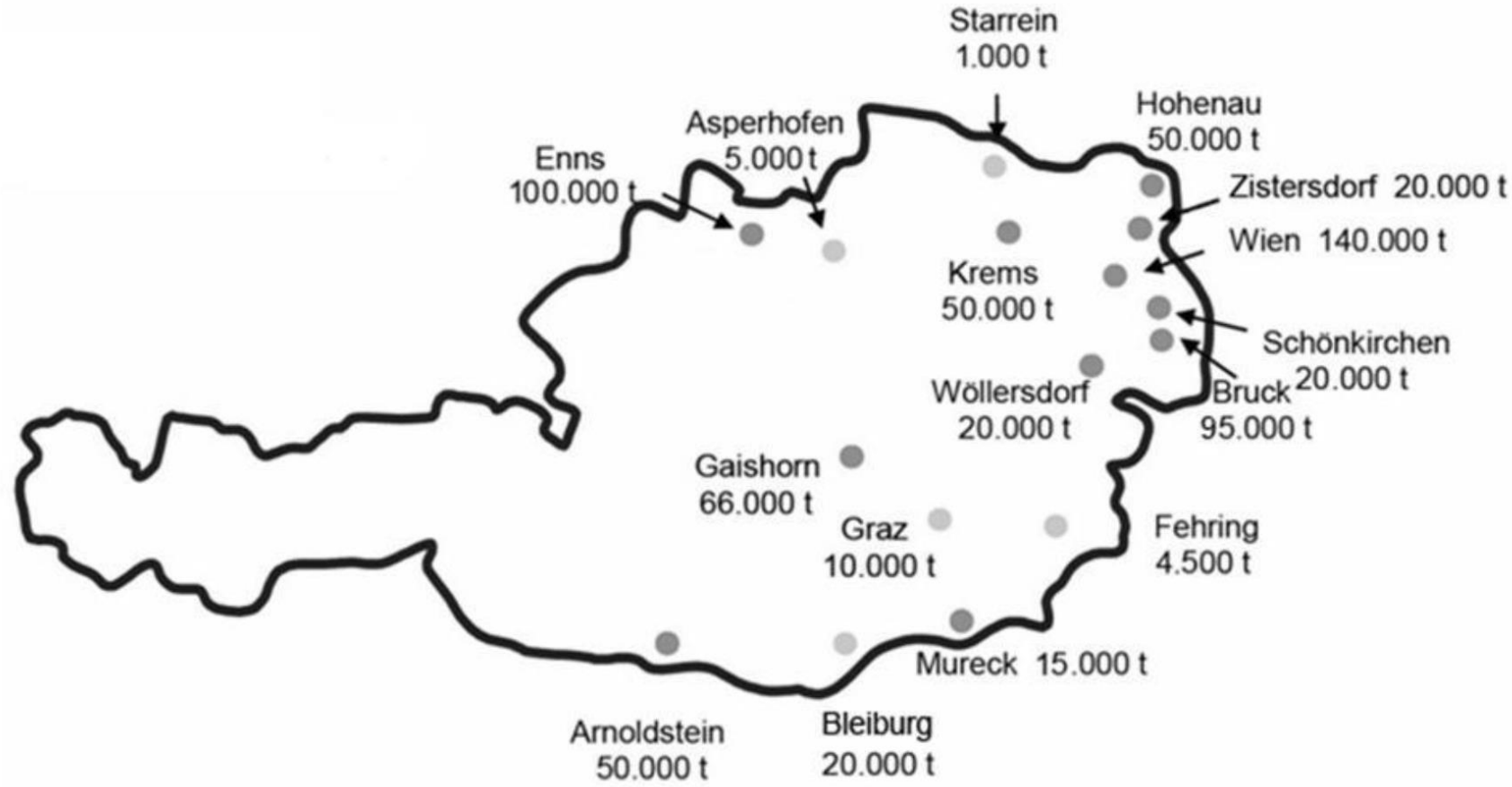
- Pure biofuels are exempted from this tax.

Domestic biofuel production



Source: BP (2013) and Woergetter (2013)

Biodiesel production capacity



Total biodiesel production capacity: 650 kton per year.

Bioethanol production capacity

- The AGRANA bioethanol plant in Pischelsdorf (commissioned in June 2008) is the only bioethanol production plant in operation.
- The plant has a capacity of 190 000 tons of bioethanol per year. Raw materials are primarily wheat and corn, up to 620 000 tons of crops per year.
- The by-product replaces 1/4 of the Austrian soy-based animal feed imports through DDGS co-production.

Source: AGRANA (2013)

Other biofuels

- **Pure vegetable oil** is increasingly used as fuel, in particular in agricultural vehicles and road freight transport.
- Biogas is mainly used on site for heat and power production, with an estimated production ranging from 380 – 600 million m3 of biogas per year.
- Efforts are made to introduce bio-CNG into the transport fuel market.

Source: Bacovsky et. Al (2011)

Technology providers

- **BDI – BioEnergy International.** Constructs biodiesel plants with a technology suitable for multi-feedstocks (crude vegetable oils, used cooking oils, animal fats etc). Carries out R&D regarding algae cultivation for biodiesel production.
- **VOGELBUSCH Biocommodities**. Commercializes bioethanol production based on cellulosic and hemicellulosic feedstocks. They recently announced the opening of a plant in Argentina October 2013. The plant, owned by the company Promaíz, has a capacity of 420 000 litres per day which makes it the largest in Argentina.

Source: Bacovsky et. Al (2011)

Technology providers

- **REPOTEC.** Constructs steam blown fluidised bed gasifiers. Today the company constructs plants in Germany, Sweden, France, Italy and Brazil.
- **ANDRITZ GROUP**. Supply of processing equipment and systems solid/liquid separation, feed and biofuel technologies. Process steps include biomass handling, biomass feeding, and thermal and mechanical pre-treatment. The group's R&D and pilot projects are deployed in Austria and the US. Active in developing and deploying advanced biofuels processing equipment.

Source: Bacovsky et. Al (2011)

R&D actors

- **BLT Wieselburg.** Research focus on logistics and agricultural process engineering for dedicated energy crops. Also studies on short rotation forestry mainly examined the mechanization, labor input and production chain costs. Heavily involved in the biofuels standardization process at national and international levels. The main focus is property analysis of vegetable oil (pure plant oil, PPO) and biodiesel (FAME).
- **Graz University of Technology**. Focuses on enzymatic degradation of complex plant material through hydrolytic microbial organisms and/or the direct use of isolated enzymes.
- **Bioenergy 2020+.** Fundamental research regarding the synthesis of mixed alcohols.

Source: Bacovsky et. Al (2011)

R&D actors

- **JOANNEUM RESEARCH.** R&D regarding lignocellulosic bioethanol concepts. Large focus is put on integration of a lignocellulosic bioethanol plants in existing infrastructures, e.g. in the pulp and paper industries. They also work life-cycle analysis (LCA) of bioenergy chains.
- **Vienna University of Technology** (TU Wien). The Institute of Chemical Engineering. Large focus on fungal strain improvement for enzymatic degradation of cellulosic biomass for biofuel production. TU Wien also performs research activities including biogas upgrading using gas permeation for the separation of CO2. Hydrogen from biomass and the integration of biomass gasification with refineries is also in focus.

Source: Bacovsky et. Al (2011)

R&D actors

Photo: Joakim Lundgren,
Luleå University of Technology

- A large part of the biomass gasification R&D of **TU Wien** is carried out at the demonstration plant in Güssing, where synthesis gas is produced at industrial scale with 7 000 hours of operation per year for nearly a decade.
- Production of advanced biofuel like BioSNG, FT-fuels, mixed alcohols as well as hydrogen are or have been investigated.

FICFB Technology – Güssing Plant

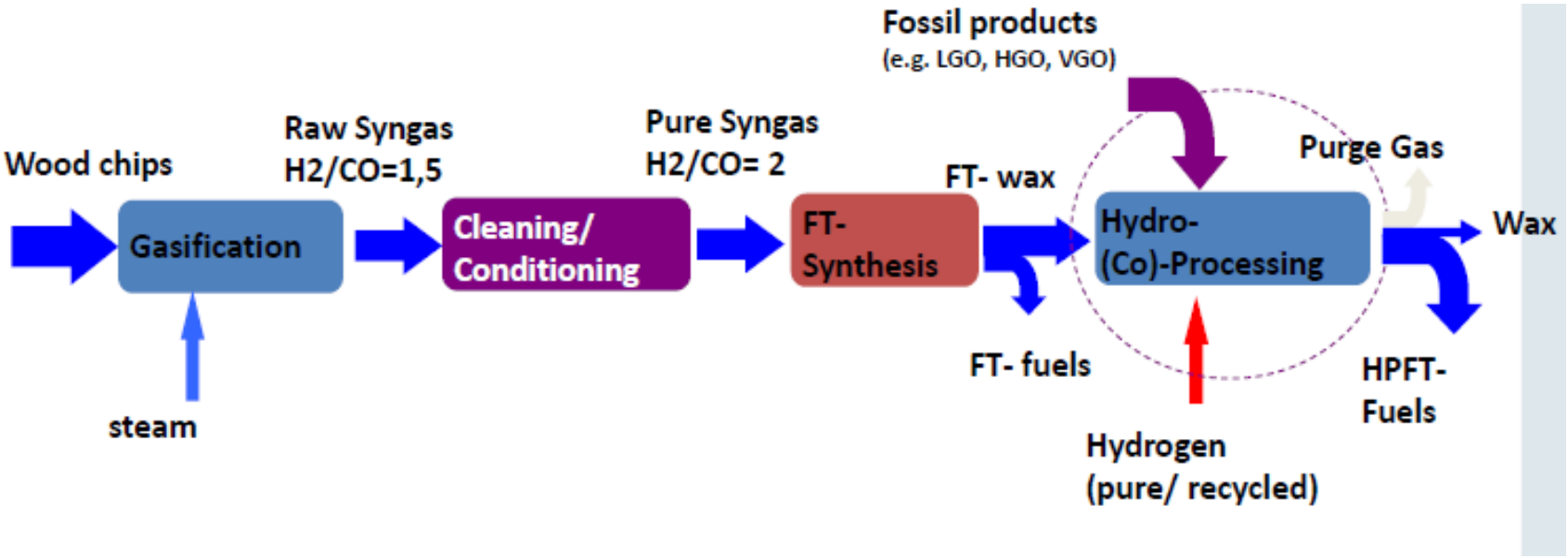


Figure from Landälv (2013)

R&D actors

- **IIASA** (International Institute for Applied Systems Analysis) uses advanced systems analysis to conduct policy-oriented research in the areas of energy and climate change, food and water, poverty and equity. IIASA and Luleå University of Technology originally developed the BeWhere model.
- **Austrian Biofuels Institute** (ABI) works with feasibility studies and business plans, plant and process optimization

Source: Bacovsky et. Al (2011)

Projects - BioSNG

- The EU-funded BioSNG project demonstrated the entire value-chain: from wood to synthetic natural gas, including use in a CNG vehicle.

Photo: Joakim Lundgren,
Luleå University of Technology

Projects - BioSNG

- December 2008: First coversion of product gas into rawSNG
- June 2009:
  - BioSNG with high quality was produced
  - Inauguration-CNG cars were fuelled using BioSNG
  - CNG-car was successfully operated 1000 km with BioSNG

Source: Rauch (2012)

Projects – ”Neue Energien 2020”

- Federal Ministry for Transport, Innovation and Technology supports R&D for the development of innovative propulsion technologies and alternative fuels – Total budget € 30 million.
- Funded projects 2011:
  - BioLNG-Snow Groomer: Bio-liquefied natural gas (LNG) propulsion for heavy groomed-trail vehicles
  - LDS: LNG drives for the Danube inland waterway
  - New Diesel: For increasing the efficiency of commercial vehicle diesel engines
  - BioCrack: Pilot plant for combined conversion of solid biomass and heavy mineral oil to diesel-like fuels
  - BIOGAS MOBIL: Feasibility study for fermenting organic wastes and feeding them into the grid for use in public bus transport

Source: IEA (2012)

Projects – BIODIEPRO

- EU-funded project with the full title of "Demonstration of the Production of Biodiesel from Tallow and Recovered Vegetable Oil (RVO)".
- Karl-Franzens-University Graz investigated whether prion proteins are inactivated and/or destroyed by a biodiesel production process.
- The high depletion factor for the entire process chain lead to the conclusion that the applied biodiesel process was safe for treatment and use of ABP of category 1.

Source: IEA (2012)

Projects – Local and Innovative Biodiesel

- Carried out by the Austrian Biofuels Institute as a part of a clustered project within the European Altener program.
- The project aims at extending the biodiesel feedstock resources by searching for new raw materials world-wide, including non-food oil crops.
- The research group seek the “ideal fatty acid profile”, but as the same fatty acid has positive and negative influence on the biodiesel properties, any “ideal” profile can only be a compromise.

Source: IEA (2012)

Projects - BioFIT

- FT synthesis is currently being investigated in the Güssing laboratory.
- 5-10kg/day of FT raw product
- Slurry reactor, with excellent heat transfer and easy scaling up
- Gas treatment removes Sulphur to below 10 ppb
- Fully automatic

Summary

- Austria has a larger domestic biofuel production than Sweden. Biodiesel production dominates.
- Large research focus on biomass gasification and synthesis. Focus put on SNG, FT-fuels, Mixed Alcohols and Hydrogen.
- Austria is an active member of several IEA Implementing Agreements, IEA Bioenergy and IEA Advanced Motor Fuels.
- Good f3 collaboration possibilities

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