

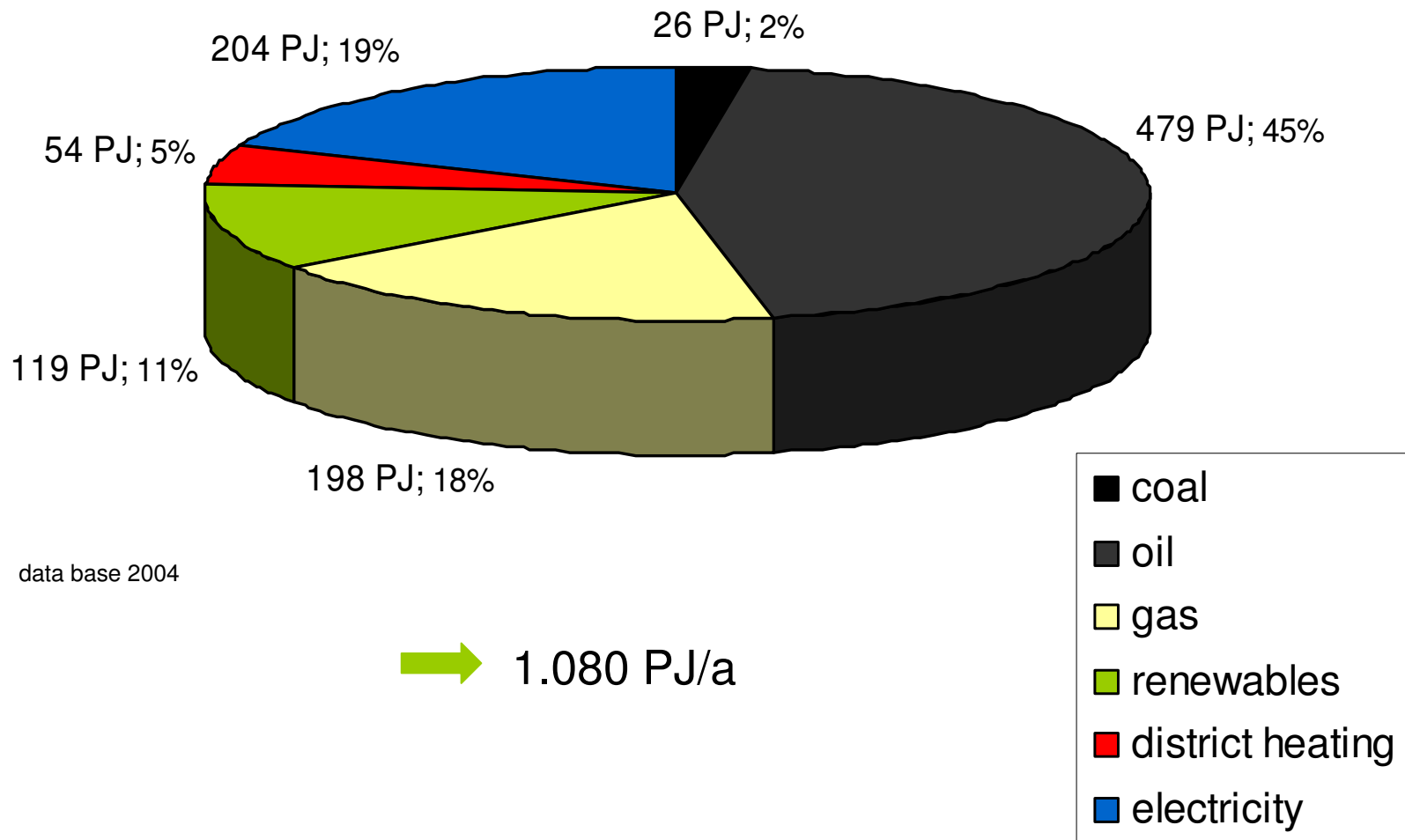
BIOMASS UTILISATION THE AUSTRIAN WAY

Presentation on the 11th October 2007

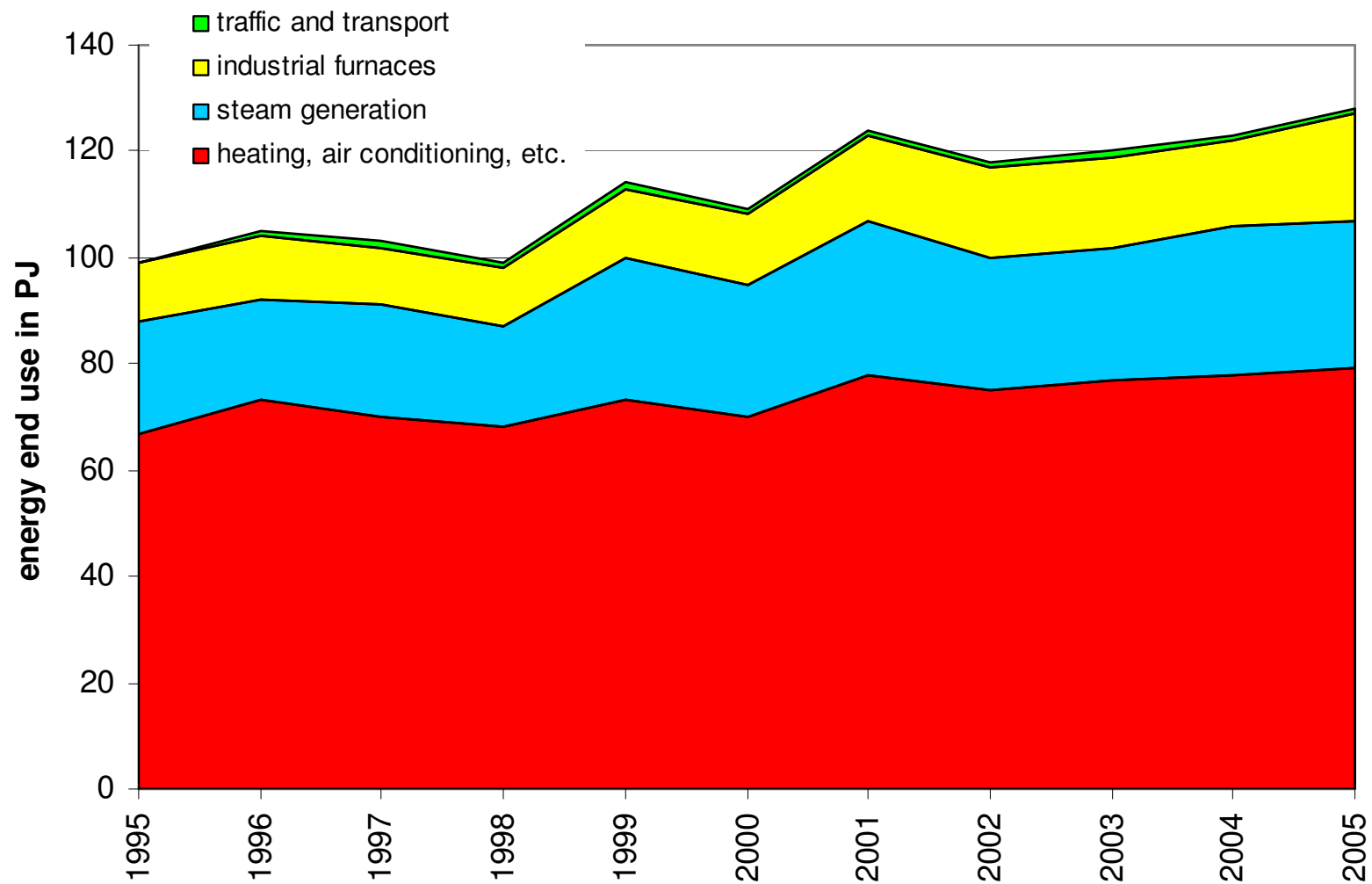
Dipl.-Ing. Dr. Horst Steinmüller

Energieinstitut at the Johannes Kepler Universität Linz

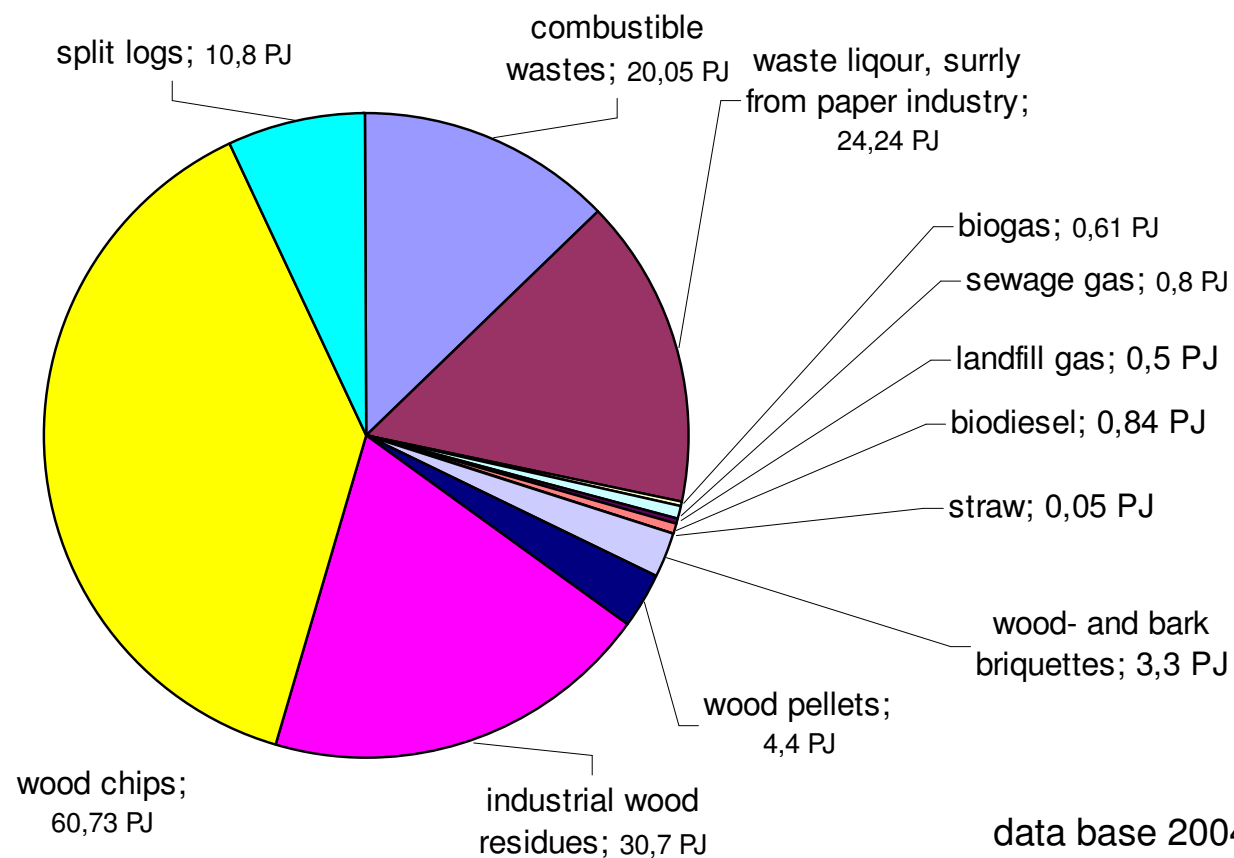
ENERGY END USE IN AUSTRIA



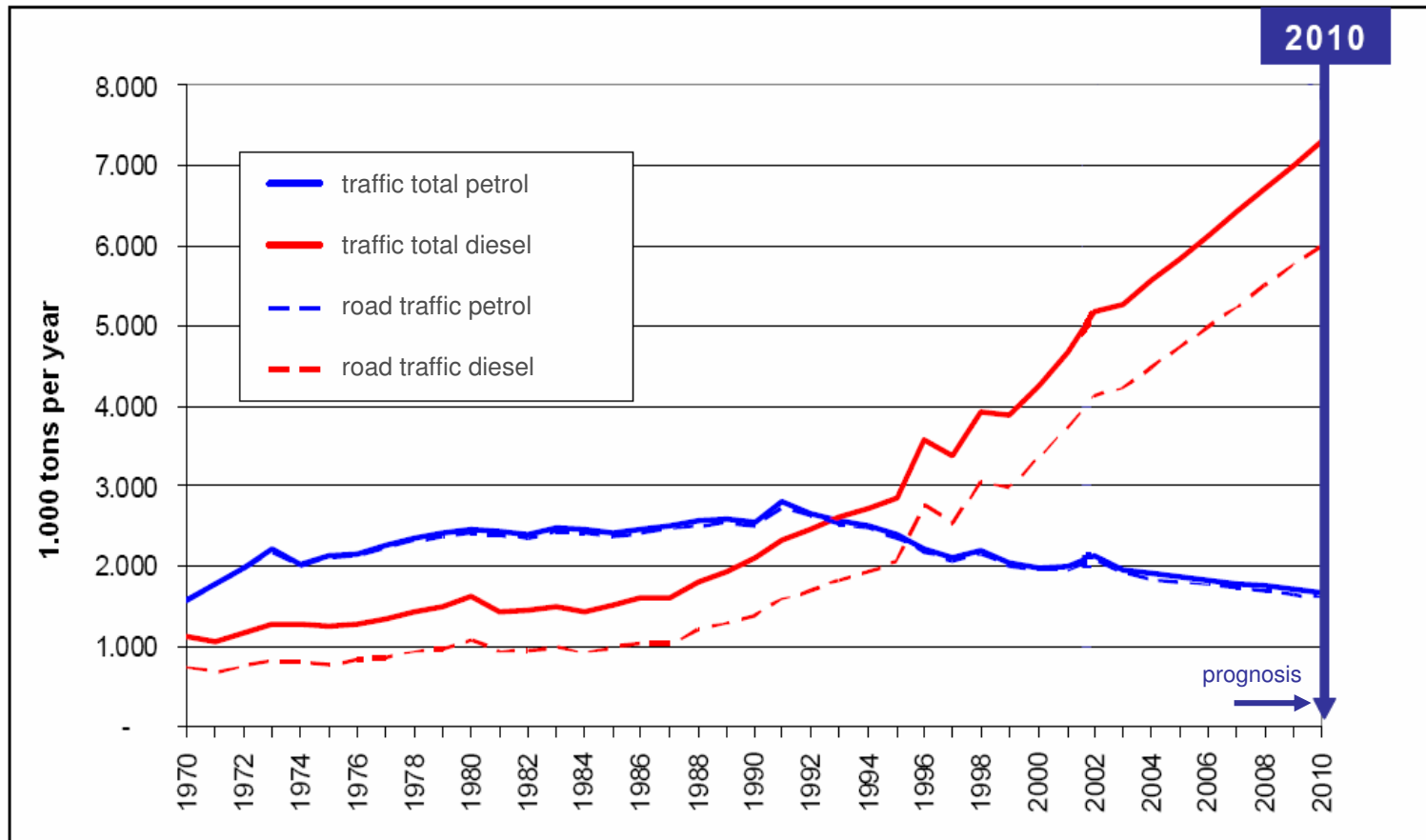
ENERGY END USE OF RENEWABLES in Austria



AUSTRIAN DOMESTIC CONSUMPTION OF BIOENERGY



GROWING FOSSIL FUEL CONSUMPTION IN AUSTRIA (1970 – 2010)



Source: Umweltbundesamt

EUROPEAN BIOFUELS DIRECTIVE

5.75 % → 2010

20 % → 2020



↳ Austrian fuel regulation

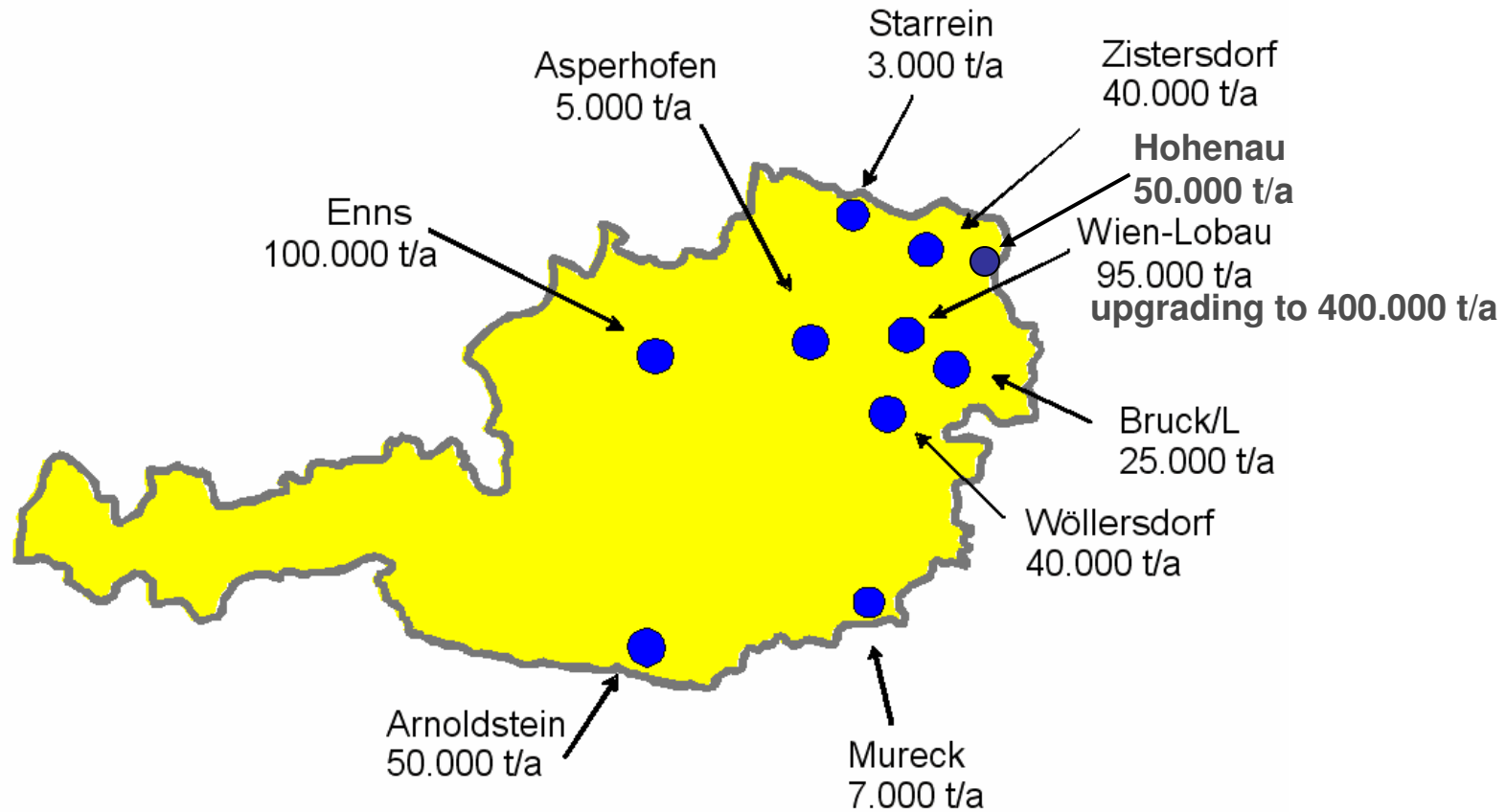
from 1.10.2007 → 4.30 %

from 1.10.2008 → 5.75 %

**→ 415.000 t/a
of biodiesel in Austria**

**→ 180.000 t/a
of bioethanol in Austria**

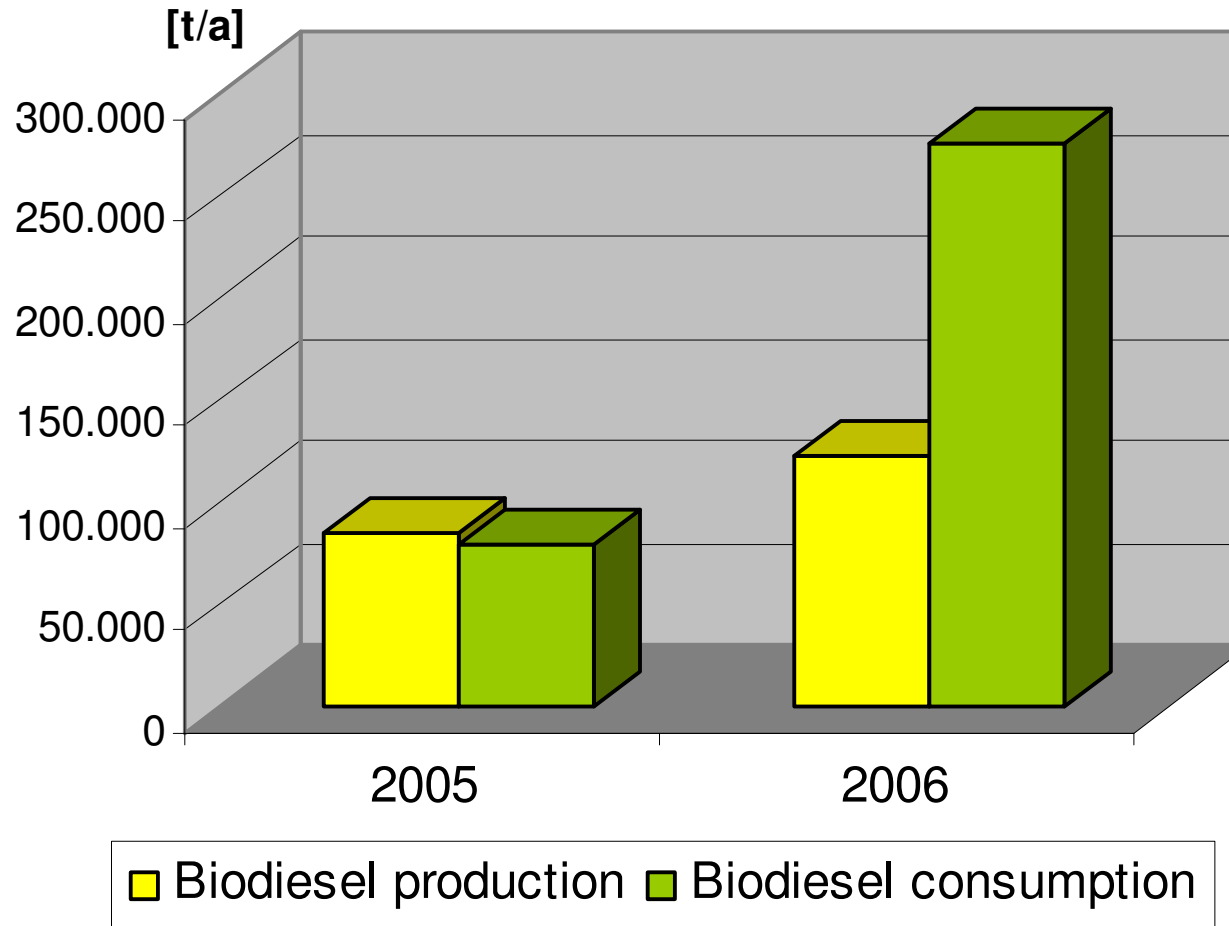
BIODIESEL PRODUCTION CAPACITY IN AUSTRIA



**Installed production
capacity: 415.000 t/a**

Source: FJ-BLT Wieselburg - updated

BIODIESEL PRODUCTION / CONSUMPTION IN AUSTRIA



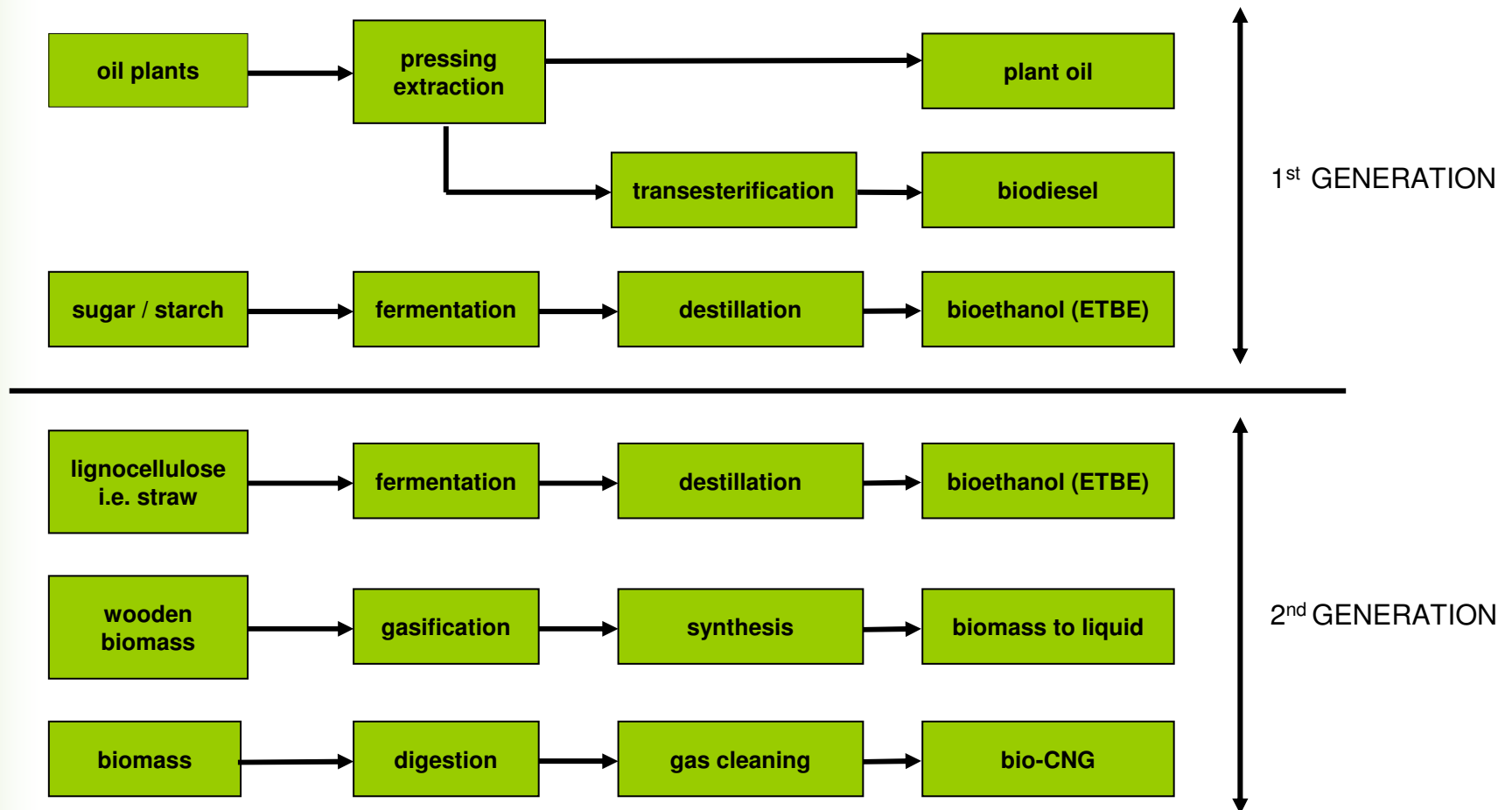
Source: European Biomass Statistics 2007

BIOETHANOL PRODUCTION CAPACITY IN AUSTRIA

- ➔ **Bioethanol plant in Pischelsdorf
200.000 cubic meter
of bioethanol from starch**
- ➔ **Start up in spring 2008 due to high
feedstock price**

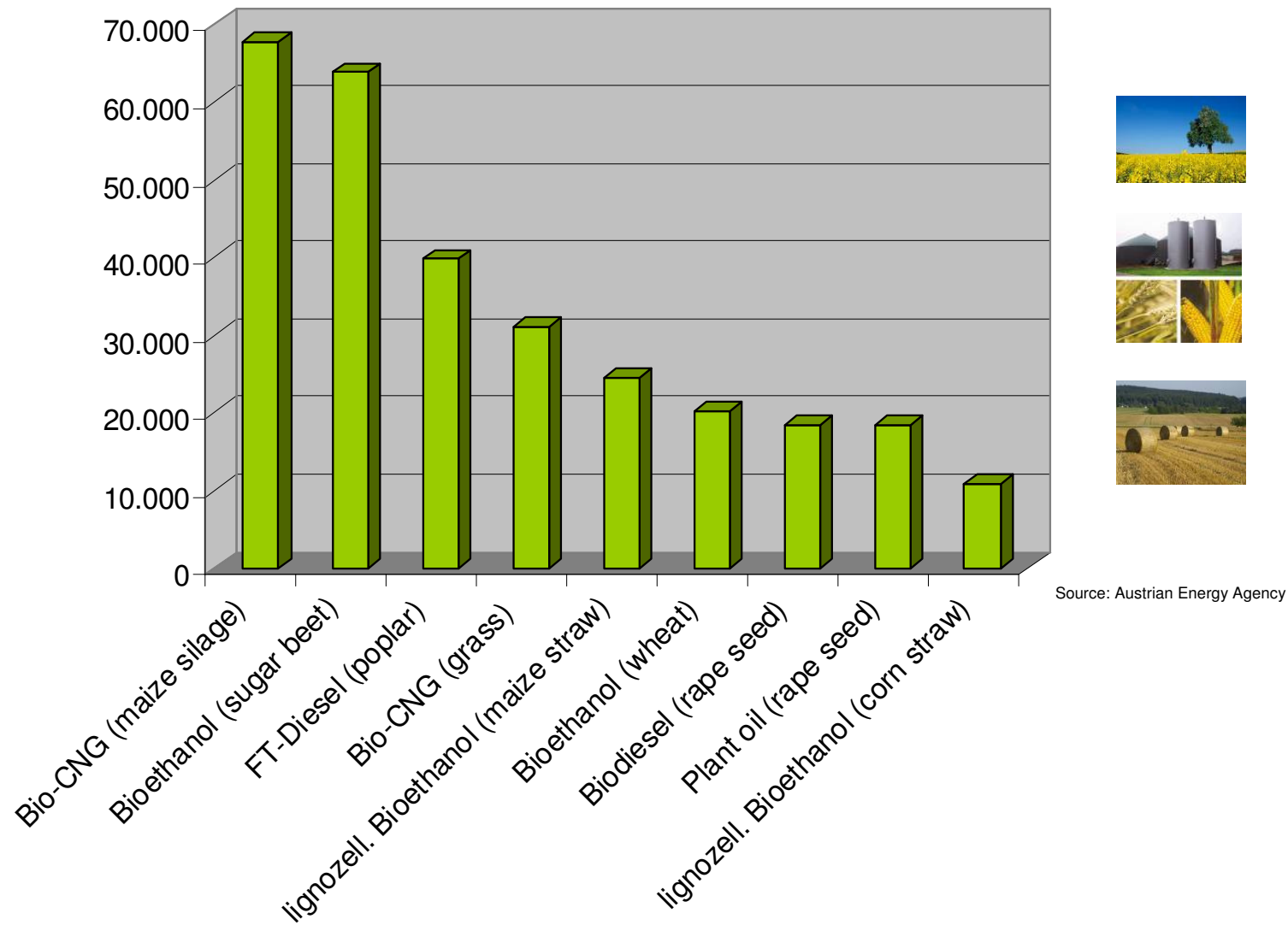


BIOFUEL PRODUCTION PATHWAYS



ENERGY OUTPUT in BIOFUEL PRODUCTION

average kilometres travelled per hectar and year



BIOFUEL PRODUCTION RESSOURCES

AT PRESENT

- Oil plants → biodiesel
- Sugar / starch → bioethanol



MEDIUM TERM

- Agricultural products → bio-CNG

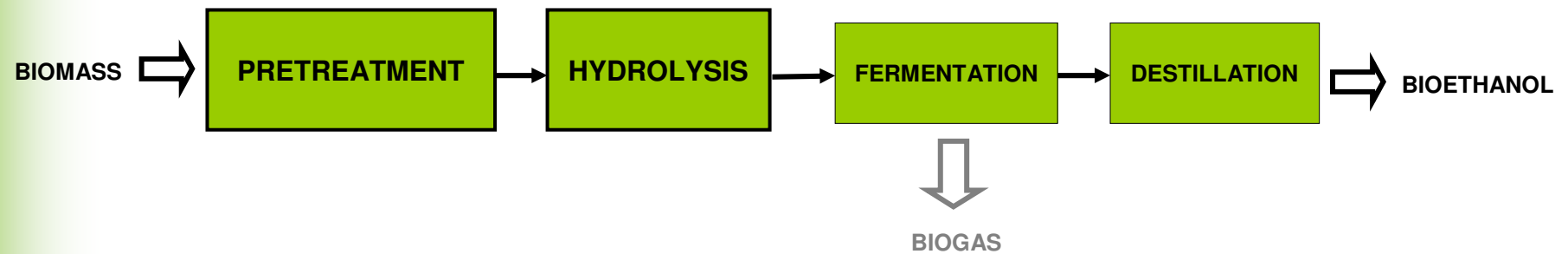


LONG TERM

- Lignocellulosic biomass → bio-CNG & bioethanol

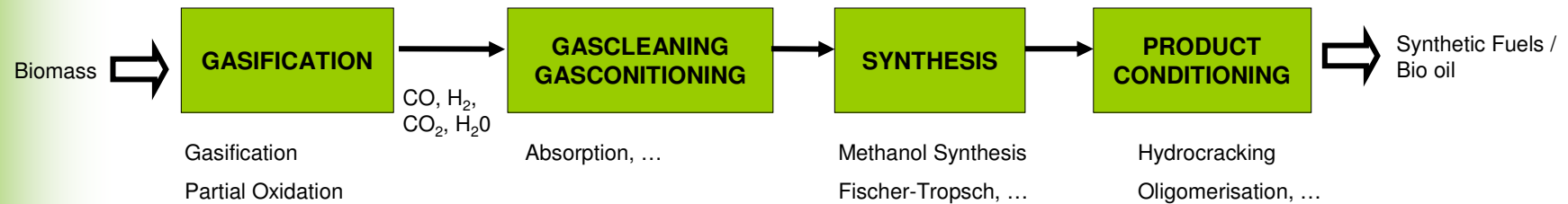
BIOETHANOL PRODUCTION

from Lignocellulosic Biomass

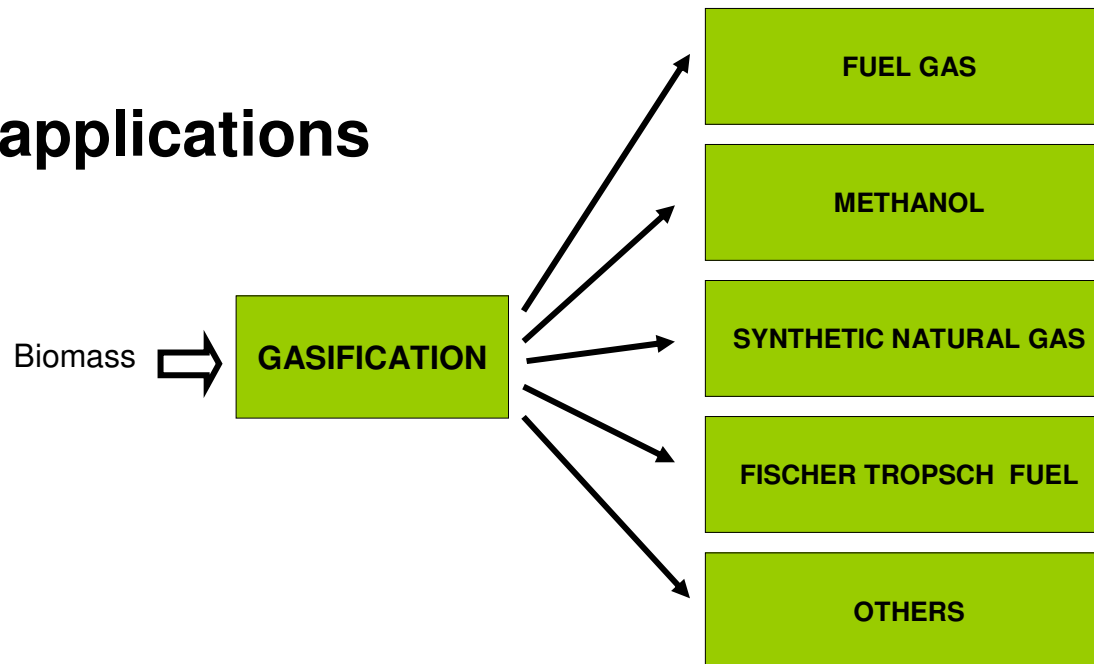


BIOMASS GASIFICATION

■ Process

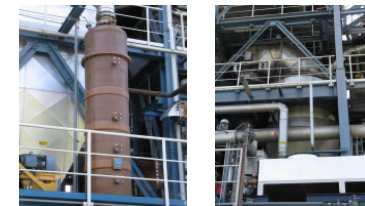


■ Product applications

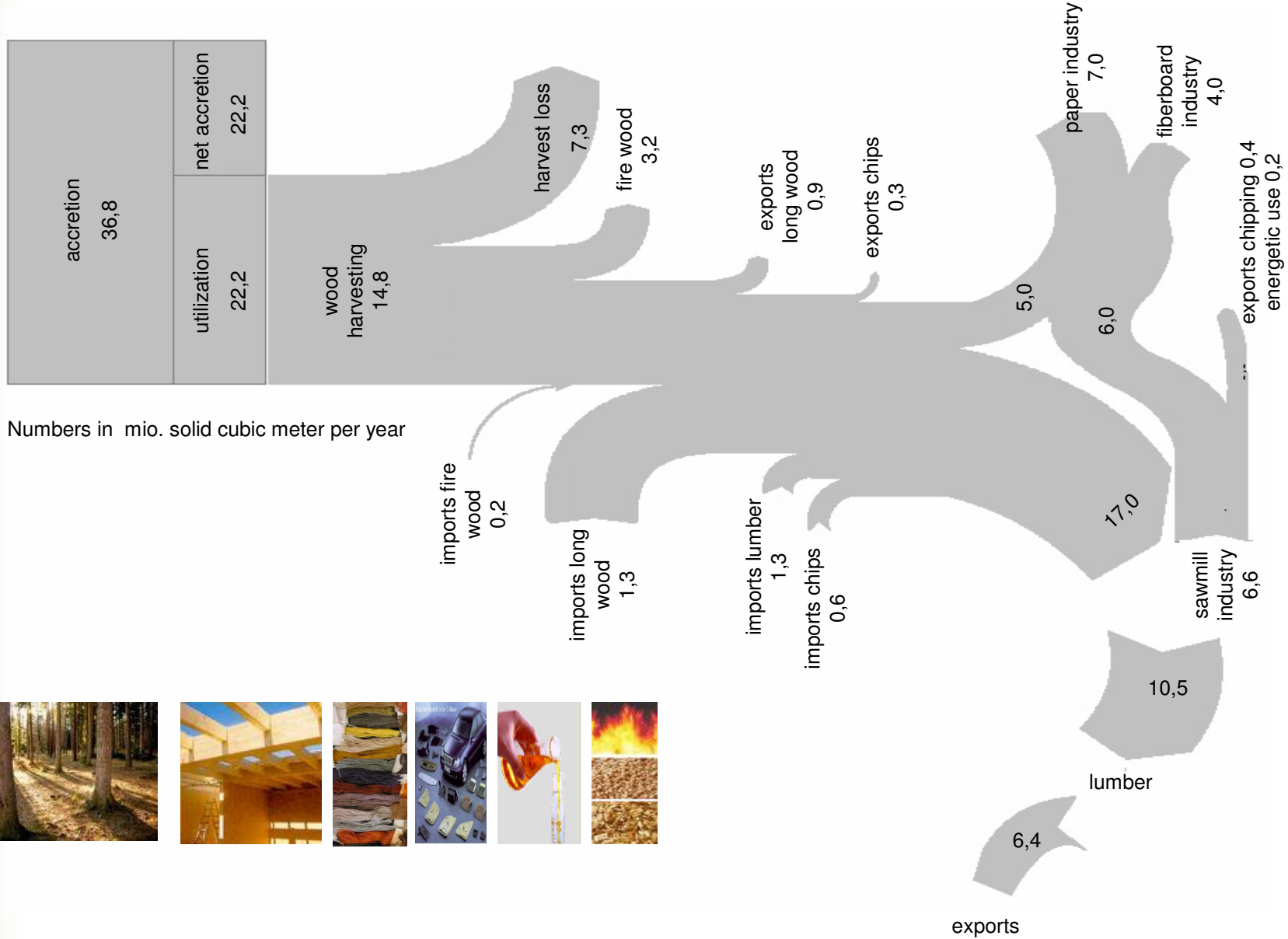


BIOMASS GASIFICATION in AUSTRIA

- Pilot plant Güssing 2 MW biomass CHP
 - ↳ Total efficiency 85 %
- Fluidized Bed Steam Gasifier → Jenbacher Gas Engine
- Fischer-Tropsch-Process with partial gas flow
- Planned Demonstration plant
- Bio-SNG (synthetic natural gas) from wood
 - ↳ Capacity: 100 – 200 m³.h⁻¹ Bio-SNG

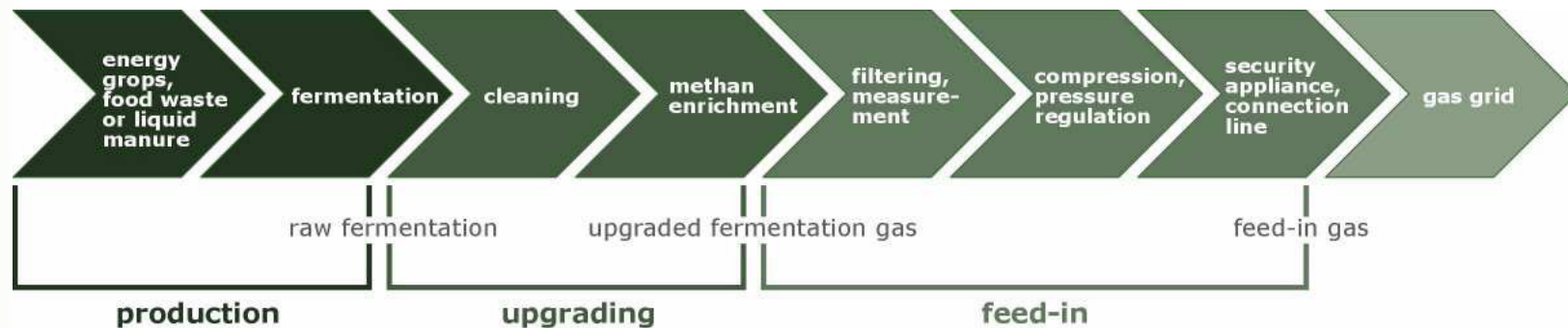


FORESTRY OPERATIONS in Austria



BIOGAS DEVELOPMENT

- **Upgrading and feed into the gas grid**
one pilot (PSA technology) and one demonstration plant (membrane technology) operate
- **Bio-CNG (80 % CNG and 20 % upgraded biogas)**
over 30 public & 40 company gas filling stations in Austria 2006



raw material mix

+

technology mix



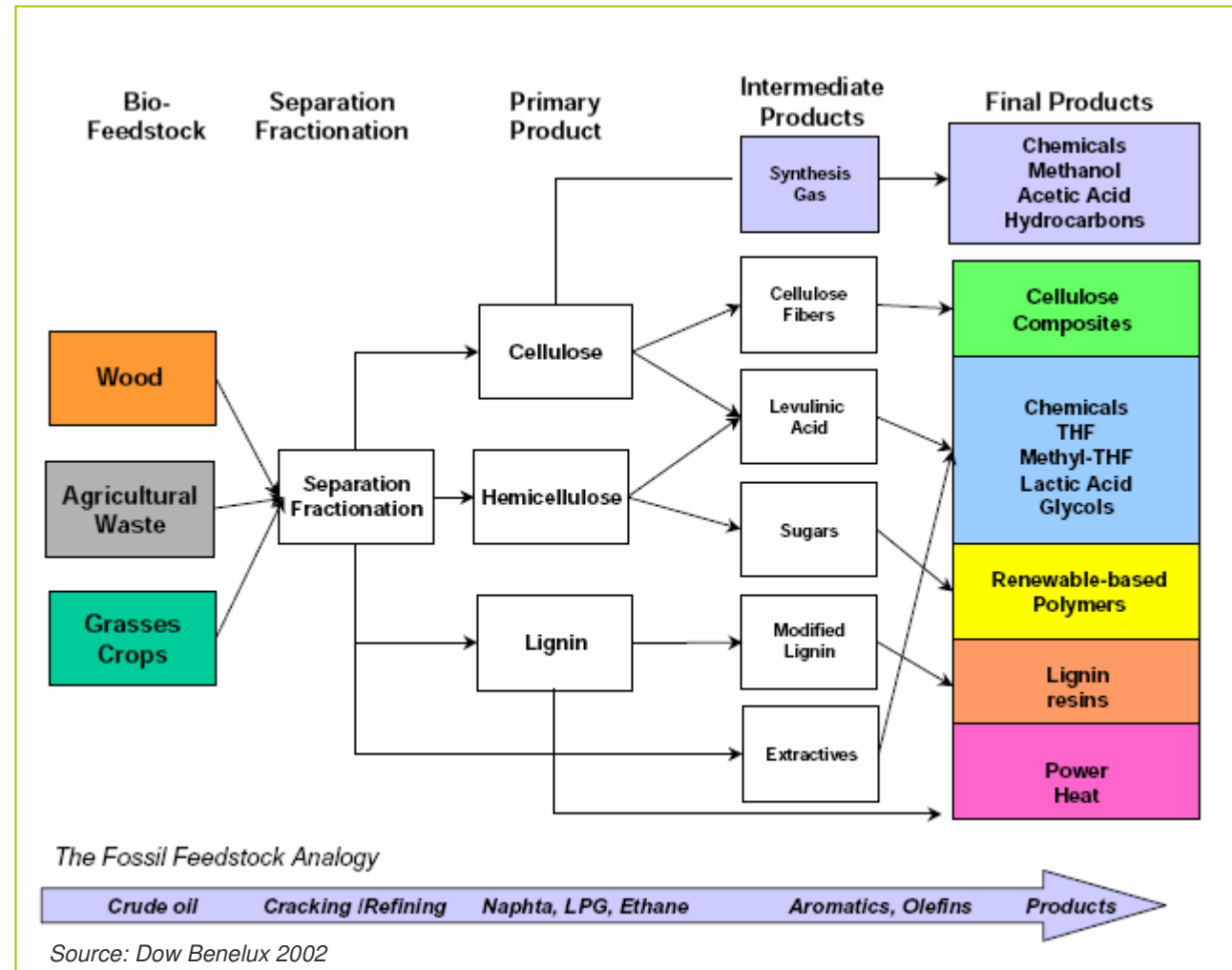
product mix

**CASCADING BIOMASS
UTILISATION**

&

ENERGY MIX

THE BIOREFINERY CONCEPT



THE AUSTRIAN GREEN BIOREFINERY

The Austrian Green Biorefinery concept utilizes solid state fermentation (ensilaging) to meet two goals:

- to generate a storable raw material for a continuous industrial process
- to convert green biomass into valuable substances such as lactic acid and amino acids as valuable products



DRIVING FORCE GREEN BIOREFINERY

„In Austria approx. 100.000 to 150.000 ha of pasture land will be not used for milk production any more in **2010**“

Estimation BAL Gumpenstein Doz. Dr. Buchgraber



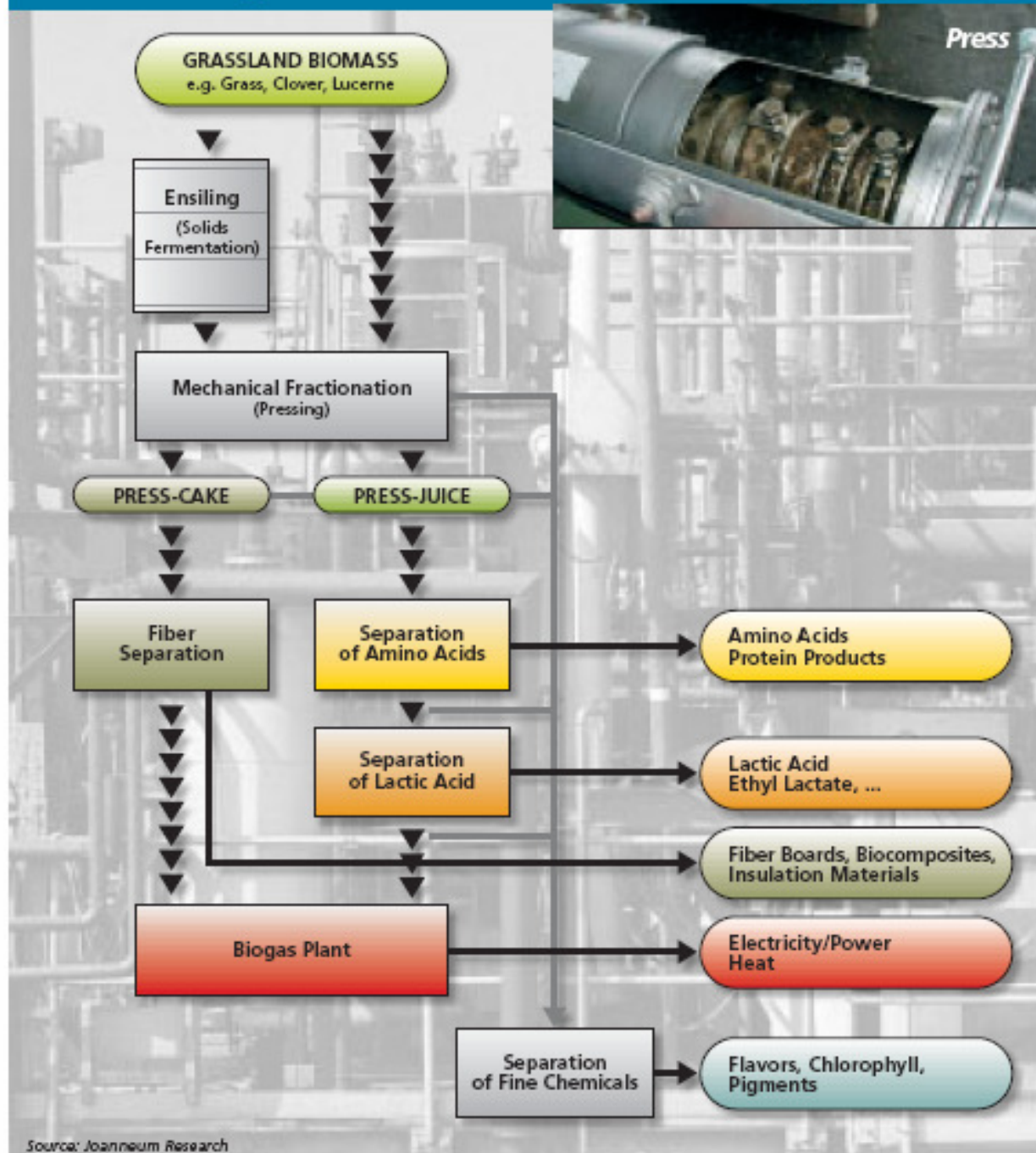
DRIVING FORCE GREEN BIOREFINERY

- Structural changes in agriculture
- Sustainable technologies are new opportunities for farmers
- Conservation of characteristic landscape

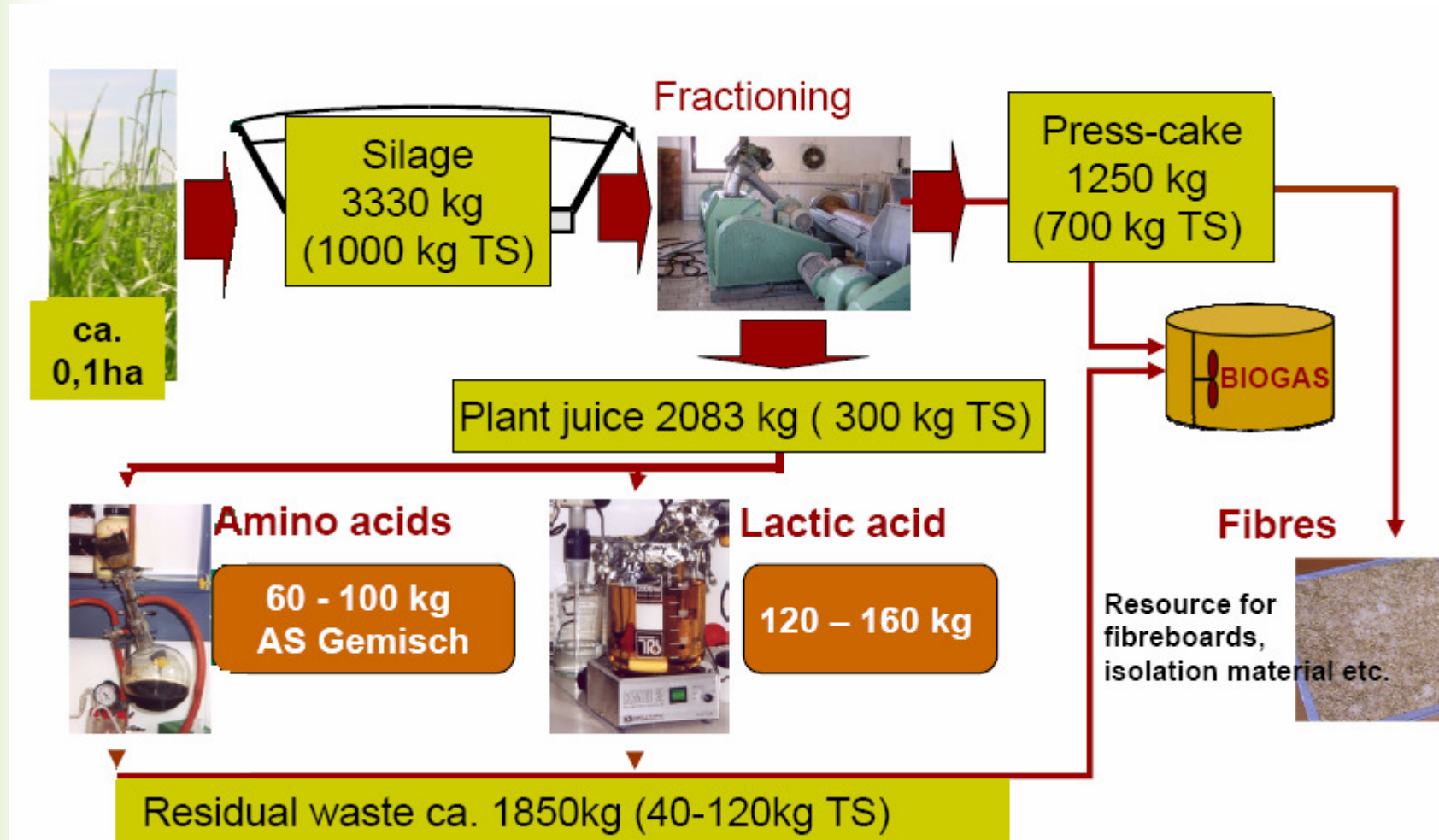
**Utilisation of grassland
for the production of
energy & renewable raw materials**



Functional Diagram of the Austrian Green Biorefinery

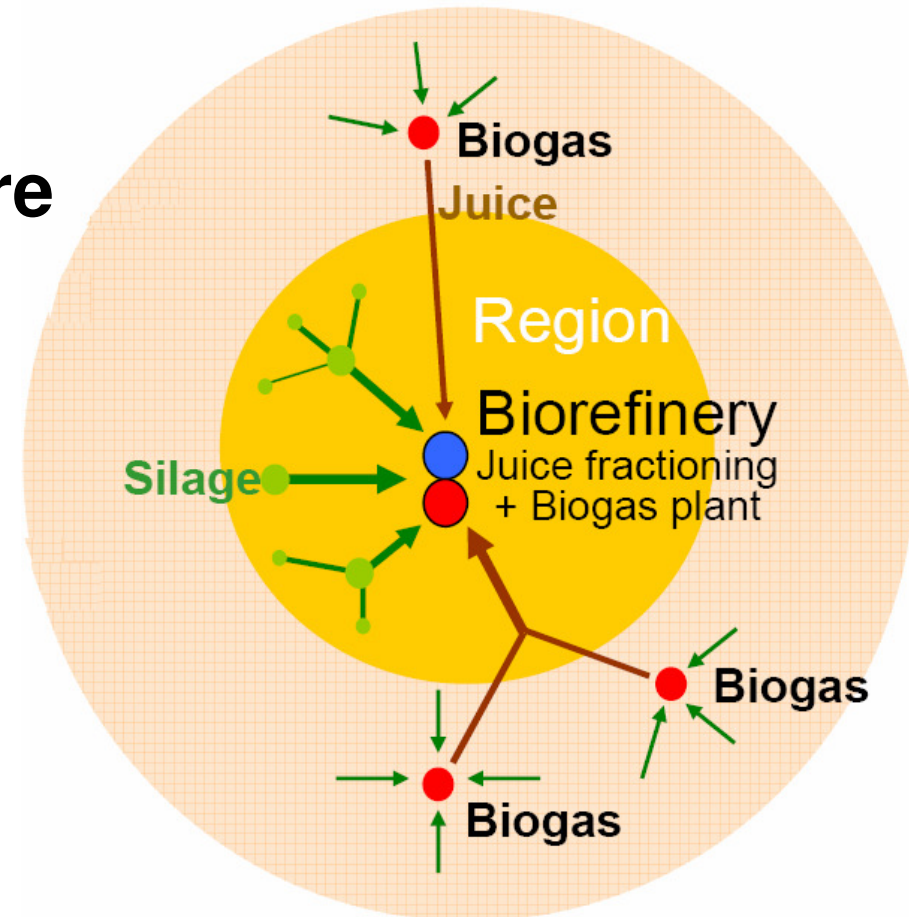


MASS BALANCE OVERVIEW



LOCAL EMBEDDING OF THE BIOREFINERY

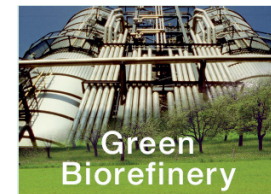
**Biorefinery in the centre
crosslinked to
raw material supply &
output recipient**



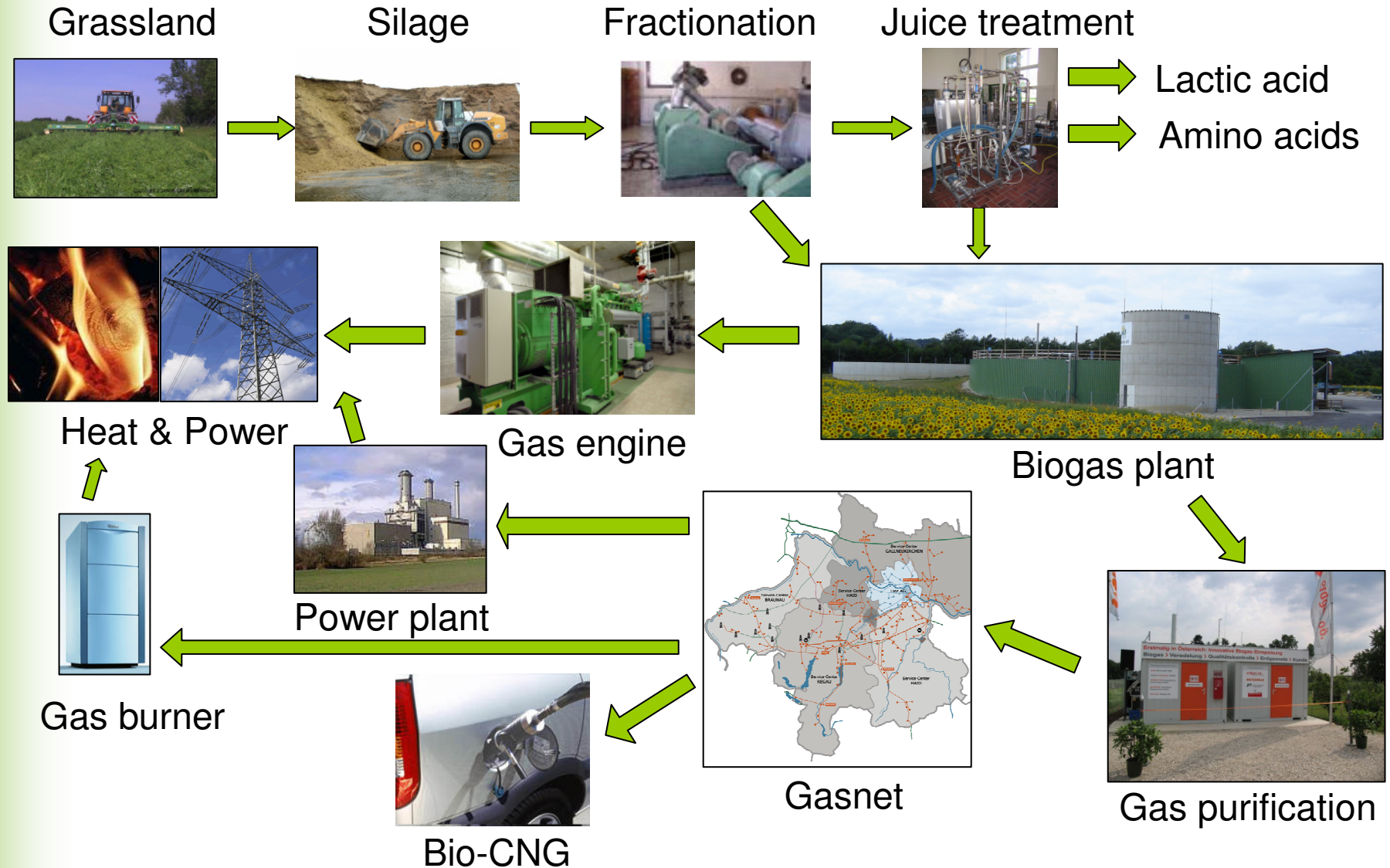
Source: Joanneum Research

R & D STATUS

- Development of process technology in lab scale finished – proof of concept
- At present up-scaling and design of demonstration plant
- Test phase of 2 to 3 years for data collection and gaining long term experience
- Adoption of products for market requirements
- Large scale implementation



The Concept in Upper Austria



DEMONSTRATION PLANT

- Location: Utzenaich in Upper Austria
- Existing biogas plant with 500 kW
- Planned capacity to process silage from 100 ha per year
- Investment of 1,7 million Euro
- Running cost in the next 3 years 1,5 million Euro
- Start up 2008



SUMMARY

- Austria uses already a large amount of renewables
- Heating is the main market in the energy sector
- bio-fuels are well established
- R&D for second generation bio-fuels technologies is going on
- lignocelluloses (mainly harvest residues) and fodder from grassland will be the raw materials for tomorrow
- bio-refineries and biomass cascade use are the challenges in the future