
Biorefinery in the Eastern Slovakia

June 23, 2015, Radoslav Jonáš



ENERGOCHEMICA SE

Company name	ENERGOCHEMICA SE
Legal form	European company, Societas Europaea SE
Headquarter	Praha 9, Prosek, Prosecká 851/64, Zip Code 190 00, Czech Republic www.energochemica.eu
Capital	82,5 mil. EUR
Ordinary shares	1 500 000
Vision	Chemical and energy holding which can become one of the leaders in the area of chlorine chemistry in Central and Eastern Europe
Sales 2014	188 mil. € - consolidated
Employees	1 950 (average number)
Chairman of the Executive Board/CEO	Ondrej Macko
Chairman of the Supervisory Board	Dušan Velič

Biorefinery – basic data

Production of 2nd generation bioethanol

1. Area: East Slovakia (Chemko, Strážske)

2. Capacity of the biomass processed: 1st stage 300 kta , 2nd stage 600 kta

3. Timetable:

- Basic design 03/2015
- EIA: 05/2015
- Start of construction: 1Q/2016
- Start of production: 2Q/2017
- Continuous operation: 2018

4. Main products:

- Ethanol 1st stage 55 kta , 2nd stage 110 kta
- Ethylene 55 kta
- Ethylene oxide 25 kta

5. Side product:

- Lignin : 1st stage 320 kta , 2nd stage 640 kta



Type of biomass

Biomass: the project represents plant material of "grassy" origin, nature straw (wheat, rapeseed, etc ...) stover or special energetic grasses;

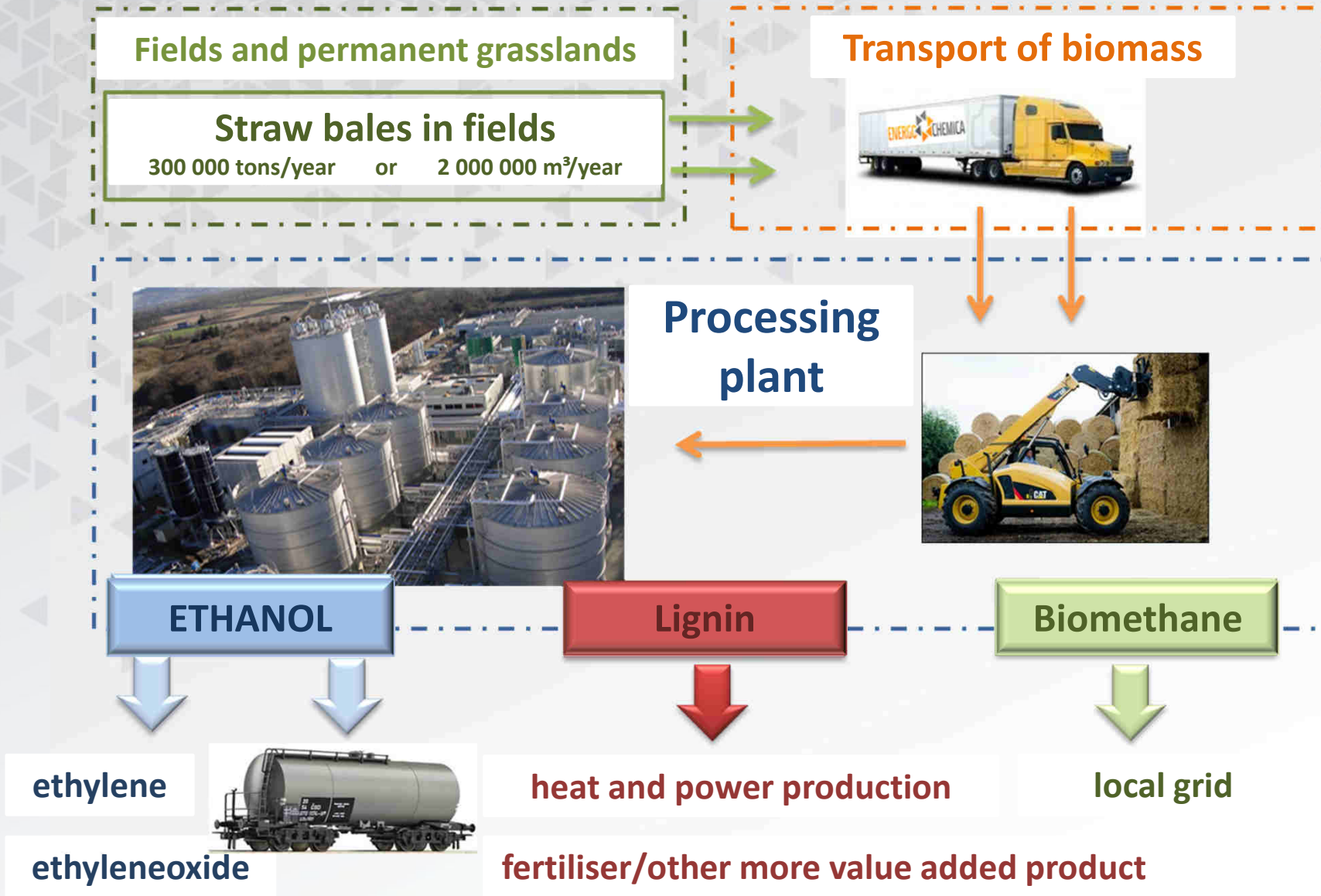
1. An existing excess of biomass and unused biomass

- wheat straw (as well rye, or barley)
- rapeseed straw
- corn stover

2. Targeted biomass production - "energy crops"

- Switch grass (*Panicum virgatum* - Switchgrass)
- Miscanthus (progressive establishment of plantations in the future in the direct neighborhood of Strážske)

Basic Value Chain – 1st stage



Heat and power unit

- **Biogas Plant**

The process: anaerobic digestion

Source: effluent lignin separation unit with the waste water from biological and fermentation process

Downstream processing: biogas upgrade to biomethane and its supply to the local grid (possible transport fuel as „CNG“- compressed natural gas)

- **Fluid boiler for the heat and power production (electric power 40 MWe and 87 MWt thermal power)**

Process: Combined power and heat generation by CFB technology (combustion in circulating fluidized bed)

Source: biomass in the form of lignin

Environmental benefits: elimination of NO_x, SO_x, CO₂

Biochemical production

- **Ethylene**

- catalytic dehydration of ethanol
- Reaction environment: 300°C in water/steam
- conversion rate of ethanol will be on 100% level
- after the cooling and de-watering the mixture is pressured and dried and later divided in low temperatures in order to reach high purity product able to polymerize

- **Ethyleneoxide**

- high-selective oxidation of ethylene by oxygen on silver catalyzer
- exothermic and reaction
- efficiency of the ethylene oxide production is on the level of 80 – 85 %
- pure ethylene oxide is separated in rectification unit

Benefits of the project

➤ State of the art technology

- The third factory of licenser in the world, which will work with top technology for the processing of second-generation cellulosic biomass as renewable resource;
- Biochemicals production

➤ Energy

- Primary combustion of by-products (lignin) – heat and power from renewable resources;
- Highly effective combined heat and power generation using renewable resources- primary energy savings of over 40% compared to separate production of heat and electricity;
- Contribution to energy selfsufficiency concept of EU

➤ Climate change

- Contribution to the objectives of the EU about 10% share of renewable energy in transport by 2020;
- Greenhouse gas emissions : saving over 99 % in production process;

➤ Employment

- Location in the region with high unemployment – 21%;
- Creation of jobs - 160 new direct and 600 new indirect and keeping existing jobs in declining existing production

➤ Industrial symbiosis

- Old brownfield/chemical industry site
- WWTP and landfill on spot
- Local railway and steam, gas and electricity grids + Local customers

➤ Agriculture

- The change of the agricultural residues treatment in Slovakia (which stays on fields)
- Energy plants on areas not used for food crops - ILUC compliance
- Use of ash in agriculture as fertilizer

Final Slide

Thank you for your attention !!