

Planning a biogas plant



The company

- Private engineering and consulting company
- Leading in the Austrian environmental, energy and infrastructure sector
- Independent of industry and trade
- Integrated in national and international networks
- Independent advice in all areas of business activities
- From project development to financing, planning and construction supervision up to commissioning
- Quality assurance

ING GERHARD AGRINZ GMBH



Renewable Energy

**Consulting Engineers for
Drainage Engineering and Water Economy**

Consulting Engineers for Surveying

Mechanical Engineering

Data Processing & Information Technology

Subsidiaries

BIO AGROS KFT.
MÉRNÖKI IRODA

Bio Agros KFT.
Consultation - Planning - Realisation

Project management within the autonomous business segments

- Environmental engineering and water management
- Waste water management and water supply facilities
- Surveying
- IT Services
- Facility management
- Consulting
- **Renewable Energy**

RENEWABLE ENERGY

Use of biomass

- **Biogas**
- Bioethanol
- Biodiesel
- Pyrolysis
- Wood pellets



- **Combination of different technologies**
- Other sources of renewable energy



BIOGAS

Heat-, electrical power and fuel production

Biomass from

- Agriculture
- Food industry
- Animal feed industry
- Communal waste (biowaste)
- Gastronomy

Production of

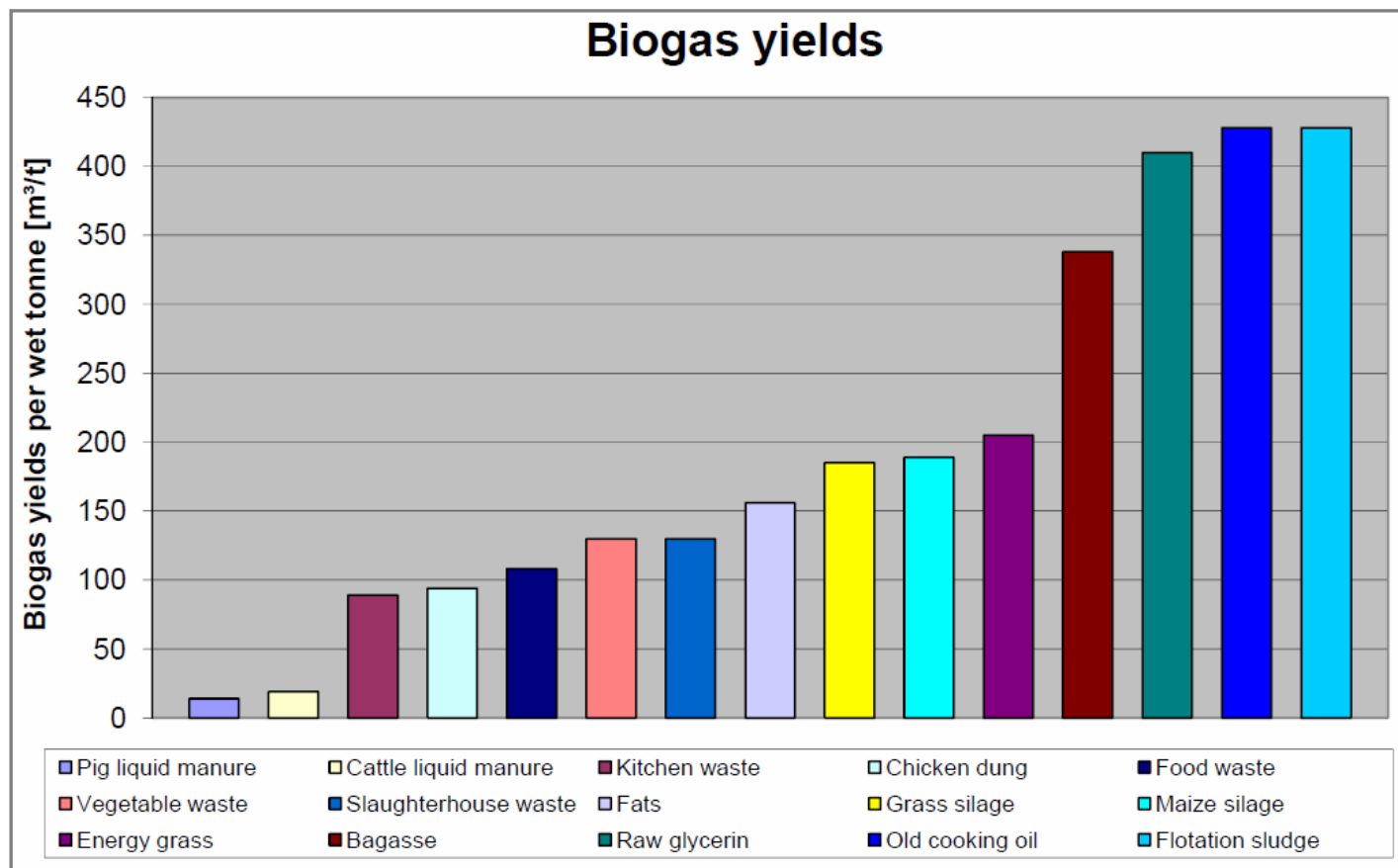
- Electrical power
- Heat
- Fuel
- Fertilizer



Input material used

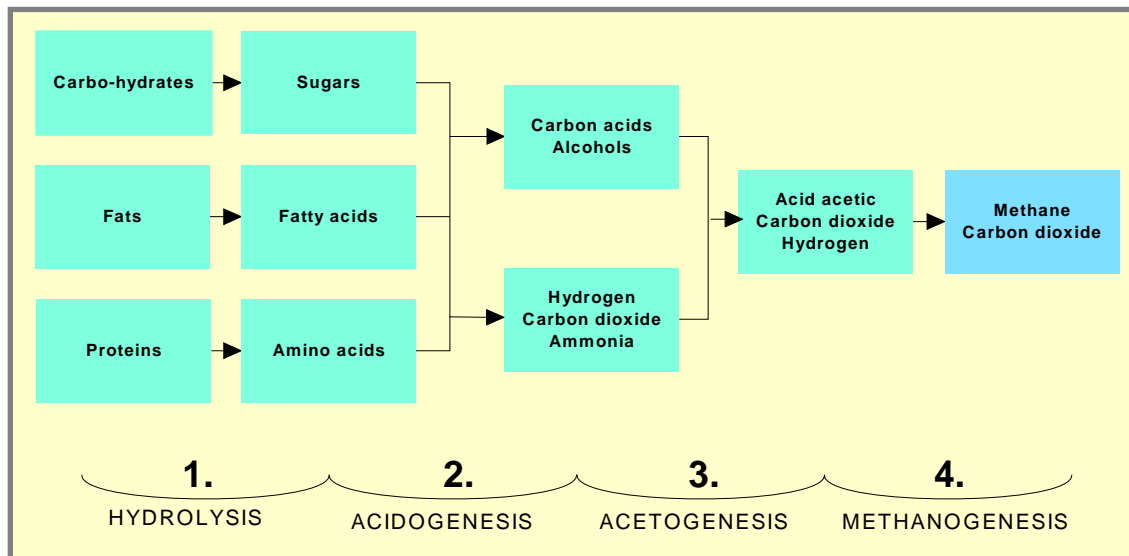
Input material

Corn silage, grass silage, pig liquid manure, cattle liquid manure, chicken dung, energy grasses, vegetable waste, pomace, food waste, kitchen waste, biowaste, old cooking oil, chip fat, flotation sludge, glycerin, slaughterhouse waste,



Biogas process

- Multi-step fermentation process
- Breakdown of organic substances with high molecular weight into substances of lower molecular weight until it reaches methane
- Damp anaerobic environment



Stages of fermentation

1. Hydrolysis
2. Formation of acid
3. Formation of acetic acid
4. Formation of methane

Biogas plants

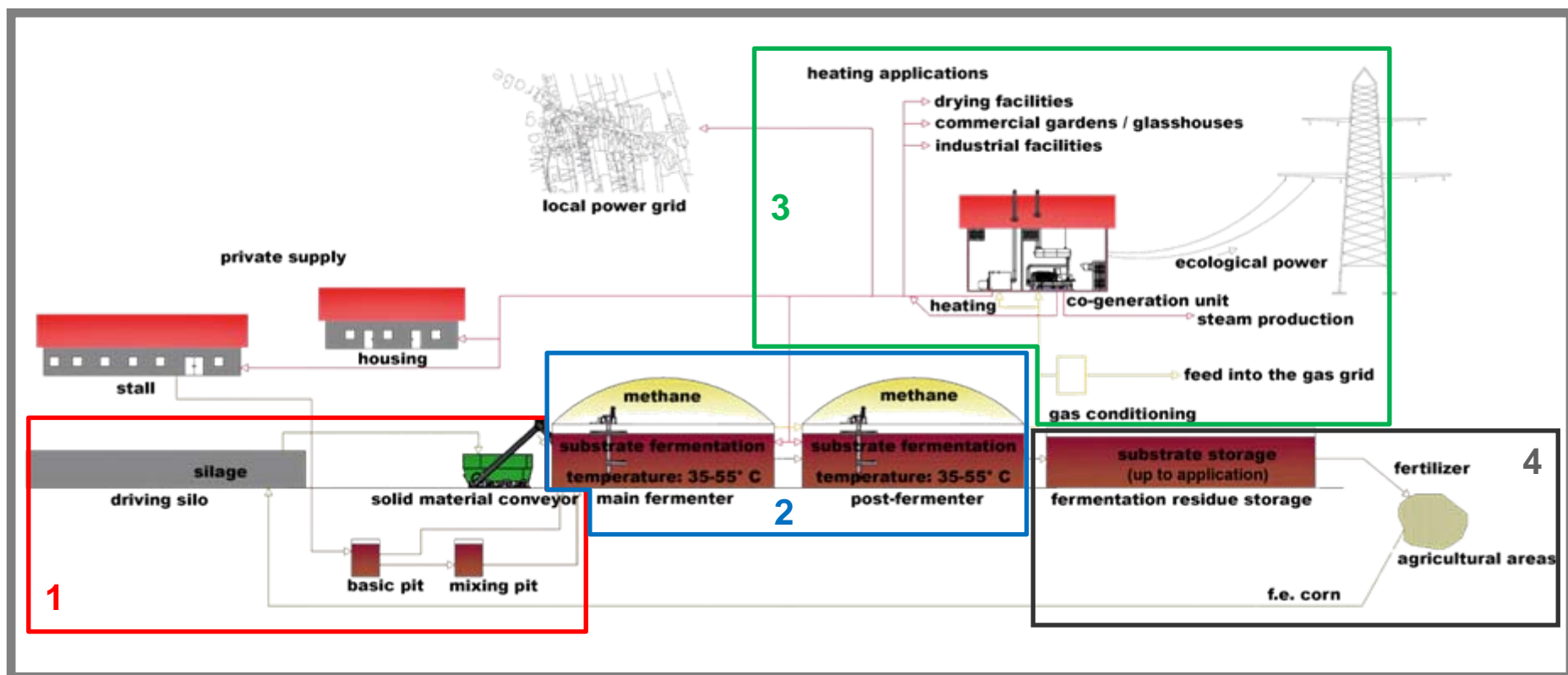
Depending on the input material there are 3 types of biogas plants:

- **Waste biogas plants** (biogenic waste from food industry, gastronomy, slaughterhouses, animal feed industry, biowaste from households, ...)
- **Agricultural biogas plants** (manure and dung from cattle, pig, chicken, ... and agricultural by-products and products)
- **Co-Fermentation biogas plants** (main components are agricultural waste and products combined with biogenic waste)

This 3 types of biogas plants vary in the design, in the equipment and in the operating mode.



Process flow of a biogas plant



Agricultural biogas plant (500 kW)

Biogas plant Margarethen / Moos (Austria)

Substrate used (9.980 t/a):
Corn silage, Sudan grass, liquid manure

Output:

electrical: 500 kW_{el}

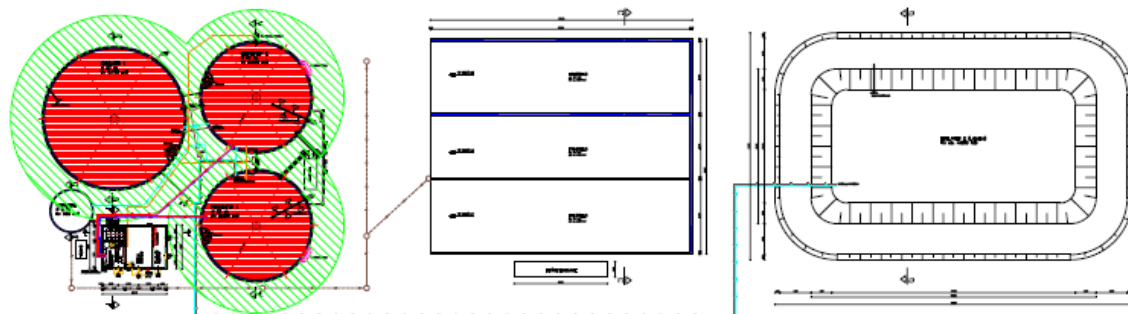
thermal: 535 kW_{therm}

Energy yield per year:

Biogas: 1,4 Mil. Nm³/year

Electricity: 3,9 Mil. kWh/year

Heat: 4,2 Mil. kWh/year



Agricultural biogas plant 500 kW

Biogas plant Margarethen / Moos



Agricultural biogas plant 500 kW

Biogas plant Margarethen / Moos



Agricultural biogas plant 500 kW

Biogas plant Margarethen / Moos



Agricultural biogas plant 500 kW

Biogas plant Margarethen / Moos



Biogas plants

Biogas plant Japons 500 kW



Biogas plant Lichtenwörth 500 kW



Biogas plant Wallsee 500 kW



- (1) Bunker silo
- (2) Liquid manure pits
- (3) Main fermenter
- (4) Post fermenter
- (5) Fermentation residue storage

Biogas plants

Biogas plant Gabersdorf 1.000 kW



Biogas plant Orth a. d. Donau 1.000 kW



Plant size, quantities, income, investment

Electrical power	100 kWel	500 kWel	1.000 kWel
Heat capacity	110 kWth	540 kWth	1.090 kWth
Biomass in tons per year (for example)¹:			
Liquid manure (t/year)	1.000	5.000	10.000
Cow dung (t/year)	2.000	10.000	20.000
Corn silage (t/year)	1.000	4.500	9.000
Income:			
Biogas (m ³ /year)	410.000	1.960.000	3.900.000
Current (kWh/year)	800.000	4.000.000	8.000.000
Current (€year)²	~ 58.400,- ~ 67.700,-	~ 292.000,- ~ 338.400,-	~ 584.000,- ~ 676.800,-
Heat (kWh/year)	880.000	4.320.000	8.720.000
Heat (€year)³	~ 26.000,-	~ 129.000,-	~ 261.000,-
Digestate = fertiliser (t/year)	3.500	16.800	33.900
Plot size, investment:			
Site (ha)	0,4	1,4	2,6
Investment level (€)	800.000,-	2.600.000,-	3.900.000,-

¹ Possible biomass: grass silage, pig liquid manure, chicken dung, energy grasses, sugar sorghum, food waste, kitchen waste, slaughterhouse waste and so on.

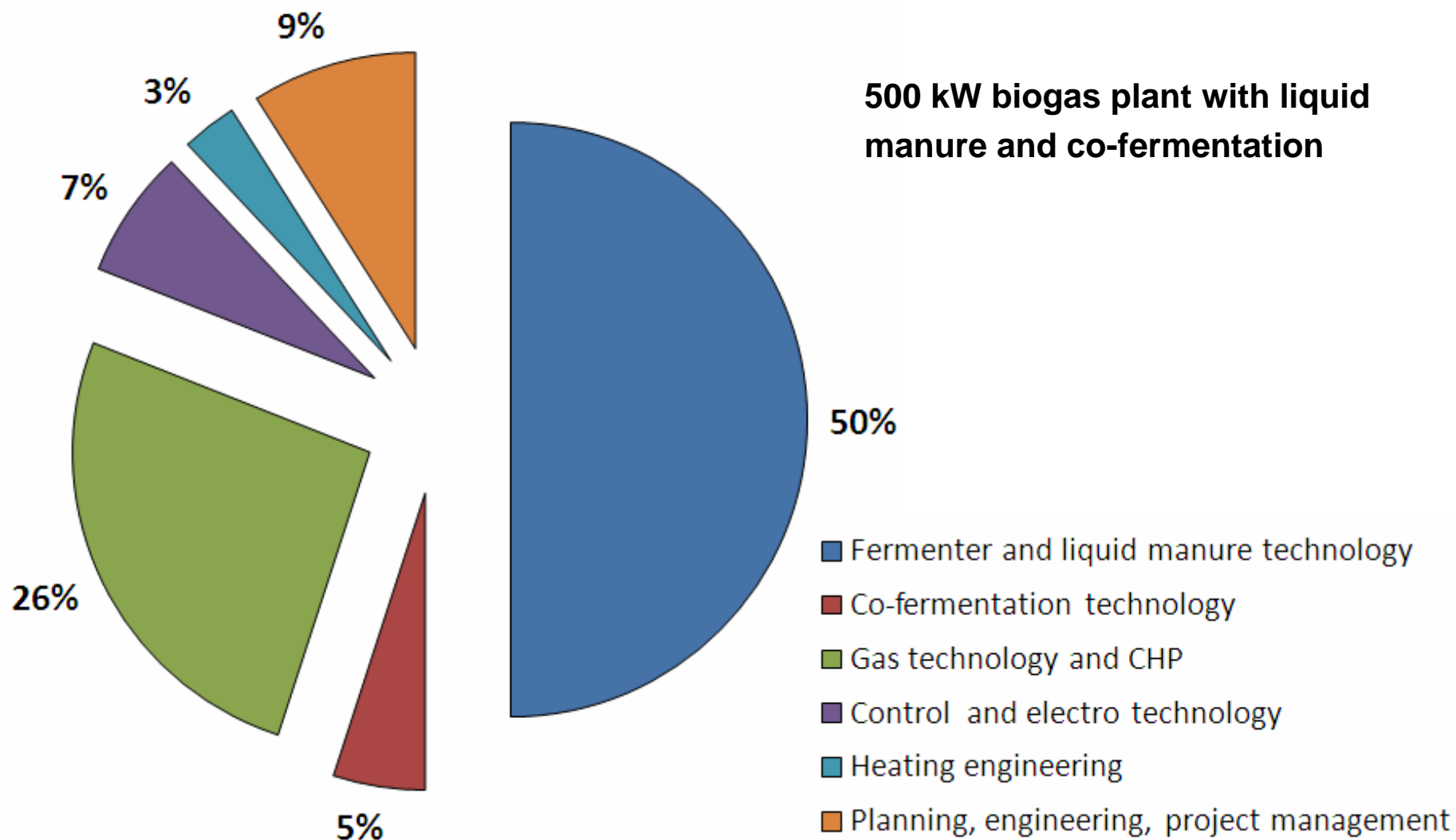
² Current feed-in tariff assumed: 0,0730 €/kWh (interconnected system, 0,0846 €/kWh (non-interconnected islands))

³ Heat sales price assumed: 0,03 €/kWh

The investment costs depend on the equipment of the biogas plant, utilized biomass, location etc.

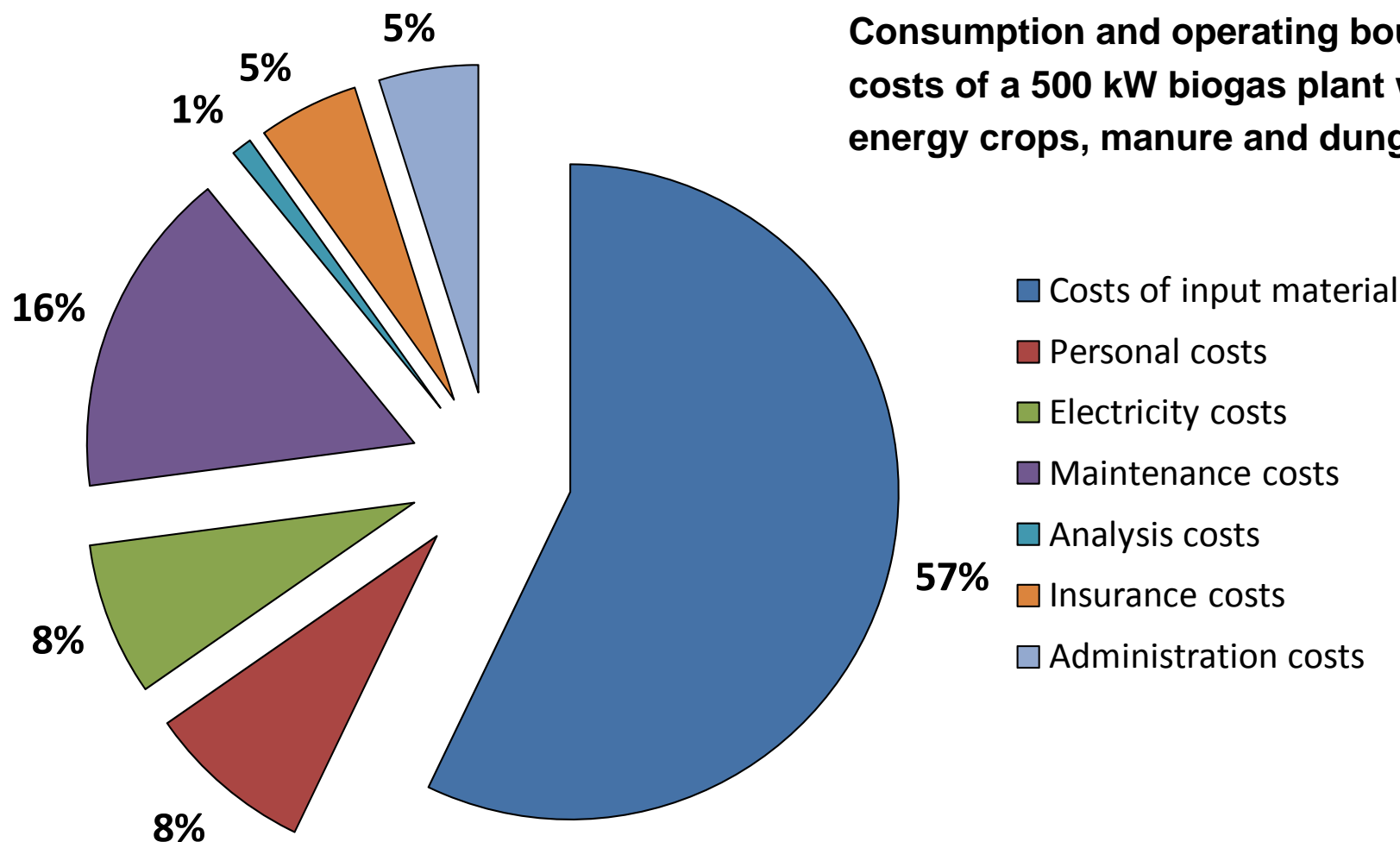
On site a connection to the power grid and the possibility for power feed-in is required.

Split-up of investment costs

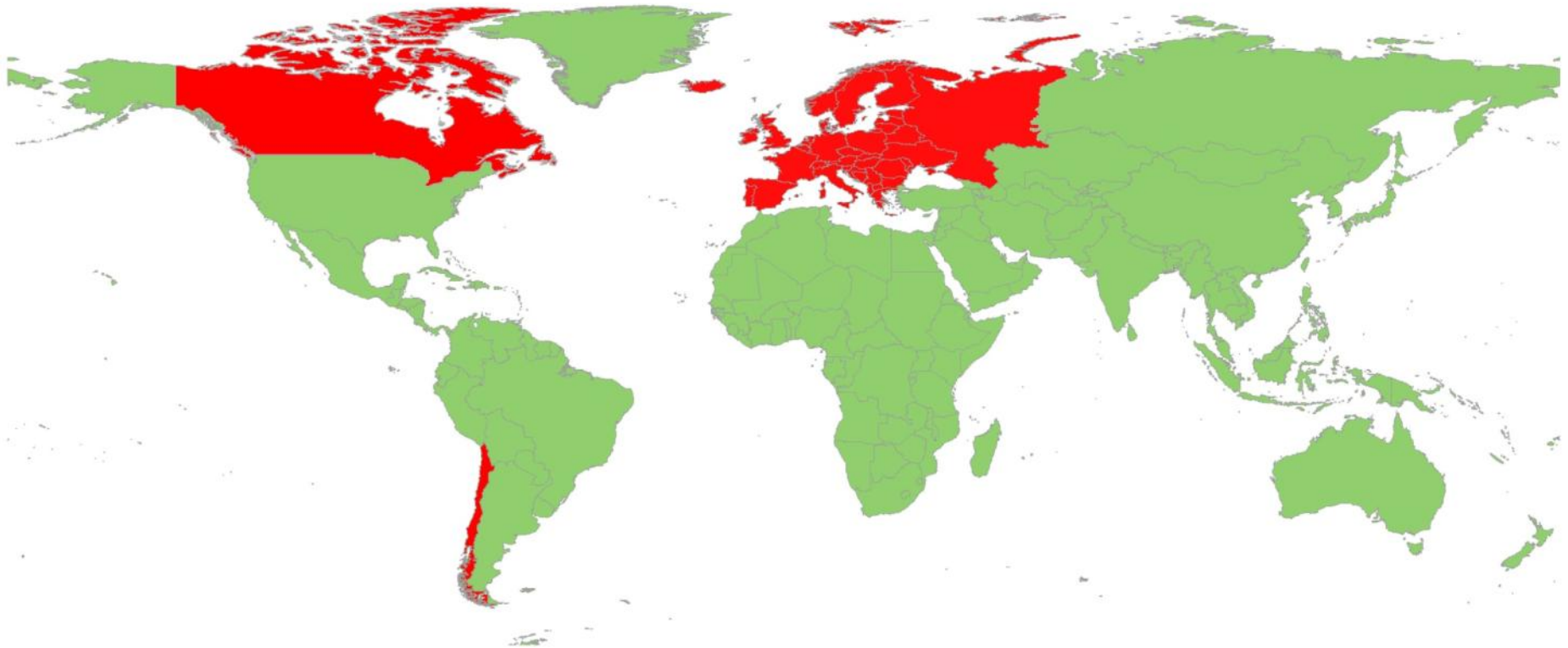


Operating costs

Consumption and operating bound costs of a 500 kW biogas plant with energy crops, manure and dung



REFERENCES



- 35 planned plants in Austria
- 70 planned plants worldwide
- Projects in Austria, Hungary, Slovenia, Germany, Croatia, Serbia, Bosnia-Herzegovina, Russia, Canada and Chile



Thank you for your attention !!

Consulting & Information

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