

Boundary conditions and costs



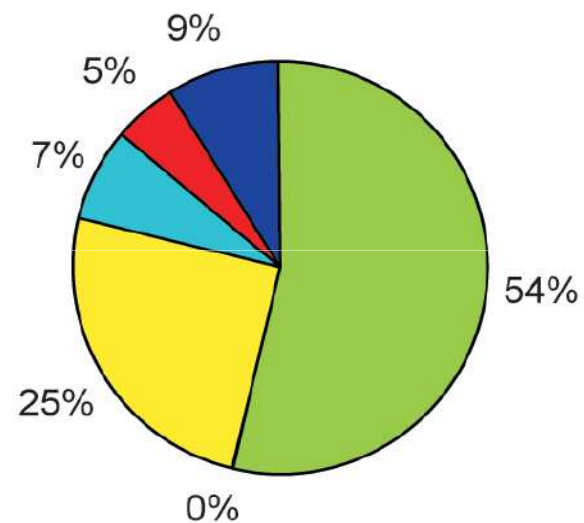
Boundary conditions for a successful biogas plant - 1

- Input quantities should be set according to the availability of organic biomass or demanded biogas yield – electrical power
- Contractual agreement regarding the supply of available organic biomass, waste, etc.
- Contractual agreement regarding the building land
- Feed-in possibility – power grid or possible connection on natural gas grid
- Contractual agreement regarding the agricultural areas for use of fermentation residue as fertiliser
- Heat use possibility – household heating, greenhouse heating, possible connection on district heating grid, wood or corn drying, etc.

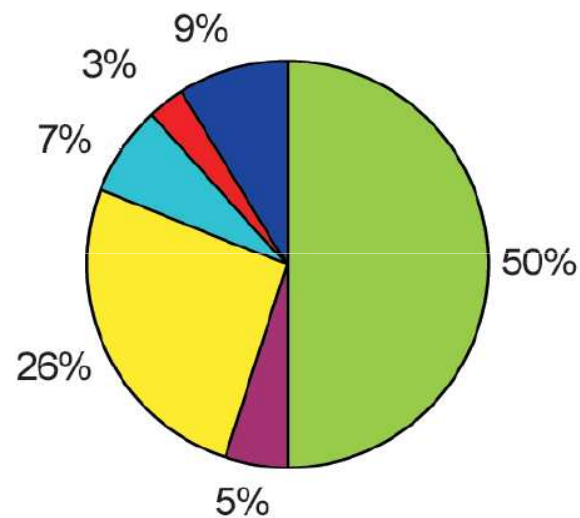
Boundary conditions for a successful biogas plant - 2

- Modules of biogas plants can be of size up to 1,5 MW_{el}, whereas expanding above there are no restrictions except
 - Reasonable logistic limits (for biomass, fermentation residue)
 - Limited feed-in capacities of power-grid – for electrical energy
- **Investment is set according to** biogas plant size, type of biogas plant, used input material, other technical requirements and can be between 4.000 to 6.500 €/kW_{el} installed electrical power
- Preparation and building of a biogas plant takes approx. 6 to 9 months when all permissions (that usually take more time) are disposable
- The duration of the building phase depends on the size of the biogas plant

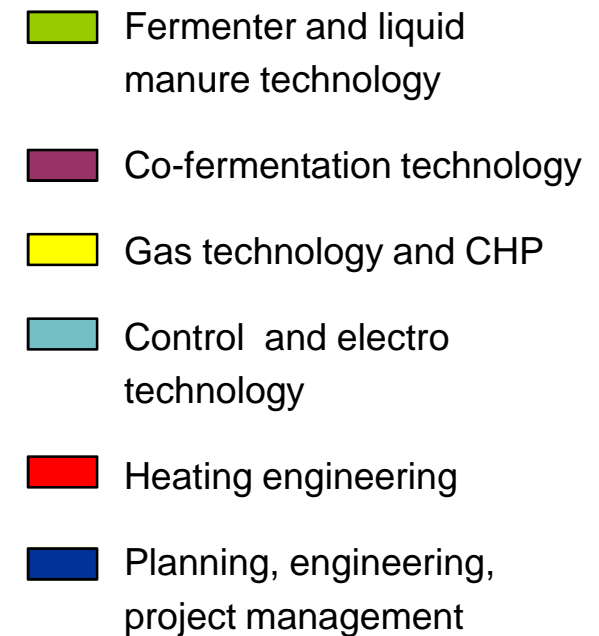
Split-up of investment costs



500 kW biogas plant only
with liquid manure



500 kW biogas plant with
liquid manure and green
biomass



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	~ 135.000,-	~ 559.000,-	~ 990.000,-
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,-
<small>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 – without co-fermentation: 0,1693 €/kWh (100 kW), 0,1398 €/kWh (500 kW), 0,1238€/kWh (1.000 kW) ³ Heat sales price assumed: 0,03 €/kWh</small>			

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

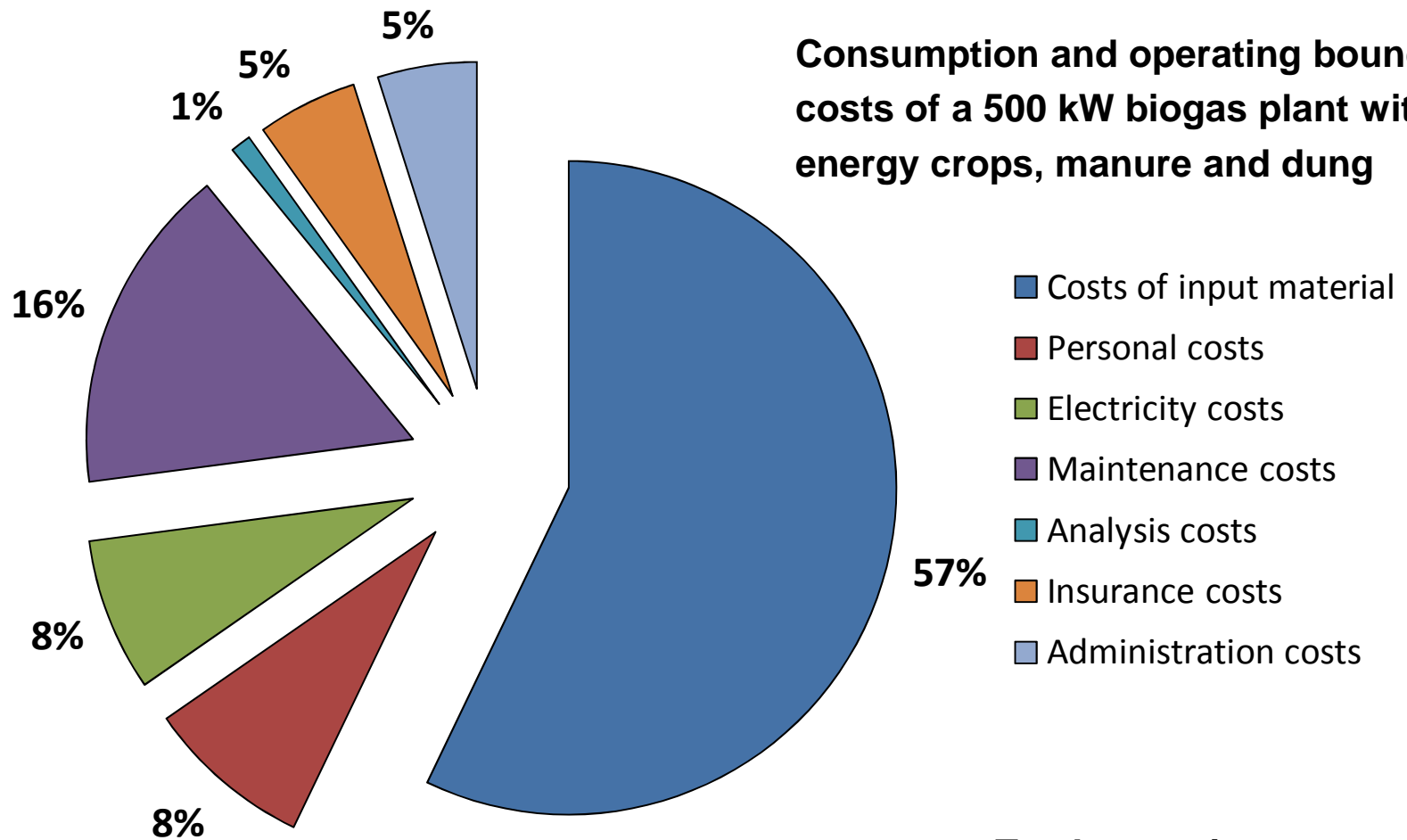
On site a connection to the power grid and the possibility for power feed-in is required.

Examples of different biogas plants

Electrical power	500 kWel	1.100 kWel	1.500 kWel
Heat capacity	520 kWth	1.200 kWth	1.690 kWth
Type of biogas plant	Agricultural	Co-fermentation	Industrial
Input material (t/a)			
Waste	Liquid pig manure 2.000	Slaughterhouse waste 6.000	Food waste 13.000
	Solid cattle manure 2.000	Solid manure 2.000	Press cake 5.000
Green biomass	Corn silage 8.000	Sudan grass 14.000	Energy grass 16.000
Biogas (Nm³/a)	4.000.000	8.800.000	12.000.000
Electric energy (kWh/a)	4.200.000	9.600.000	13.500.000
Thermal energy (kWh/a)	1.945.000	3.900.000	5.770.000
Digestate = fertiliser (t/a)	10.000	16.000	25.000
Approx. area for fermentation residue (ha)	260	660	1.250
Approx. Investment (m. €)	2,5 to 3,0	3,5 to 4,0	4,5 to 5

Operating costs

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



Income:
550.000,- to 690.000,-

Total operating costs:
400.000,- to 650.000,-

ING GERHARD AGRINZ GMBH



Thank you for your attention !!

Consulting & Information

Ing. Gerhard Agrinz GmbH

A-8430 Leibnitz, Emmerich-Assmann-Gasse 6
E-Mail: office@agrinz.at, Home: www.agrinz.at
Tel.: +43 3452/73997-0, Fax: +43 3452/73997-9