

Country Report Switzerland

Utrecht, September 20 to 22, 2005

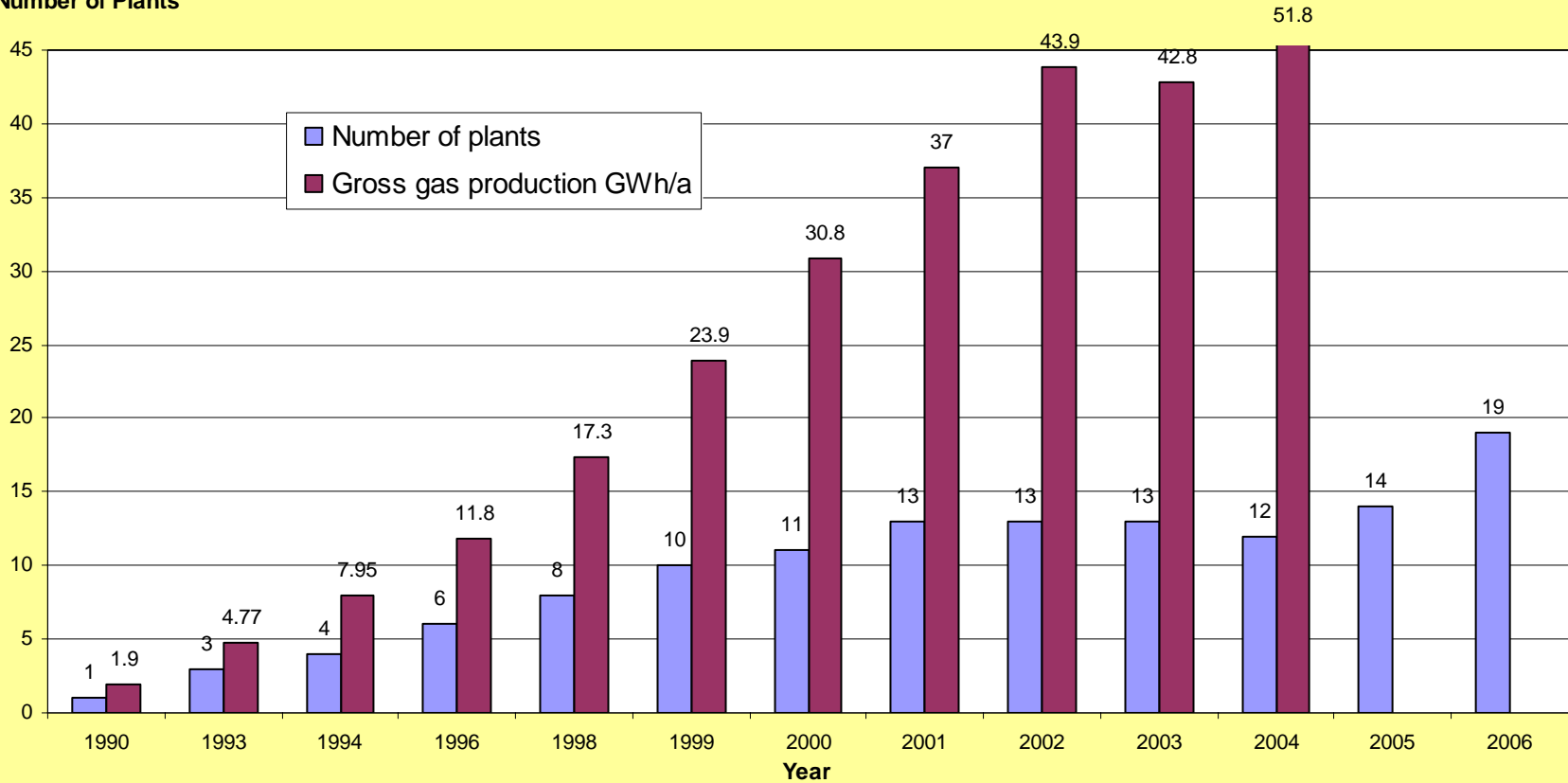
Arthur Wellinger
Nova Energie Ltd.



Green Waste: Nr of Plants & Energy Production

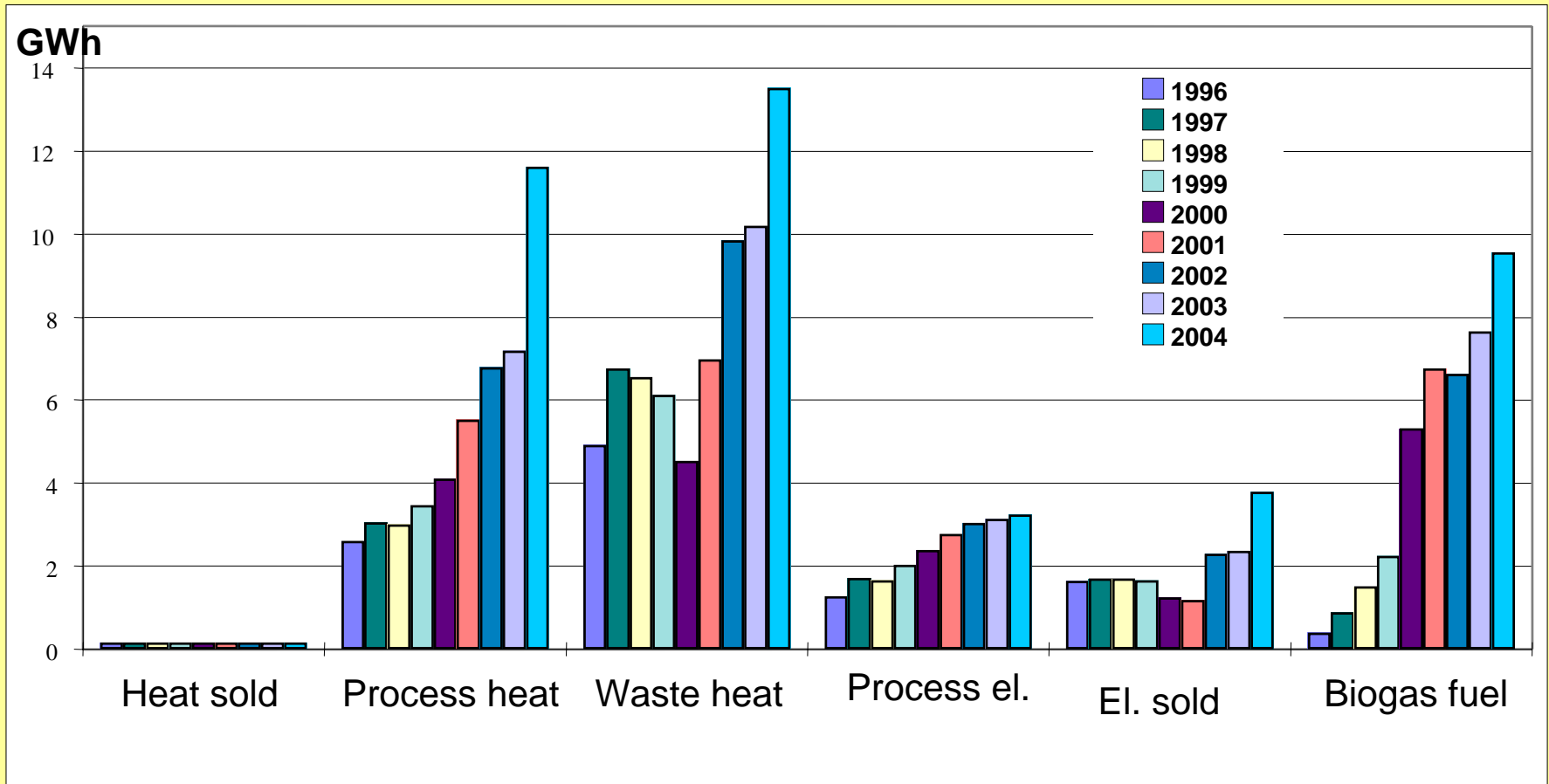
Development of Plants Digesting Green Waste

Number of Plants



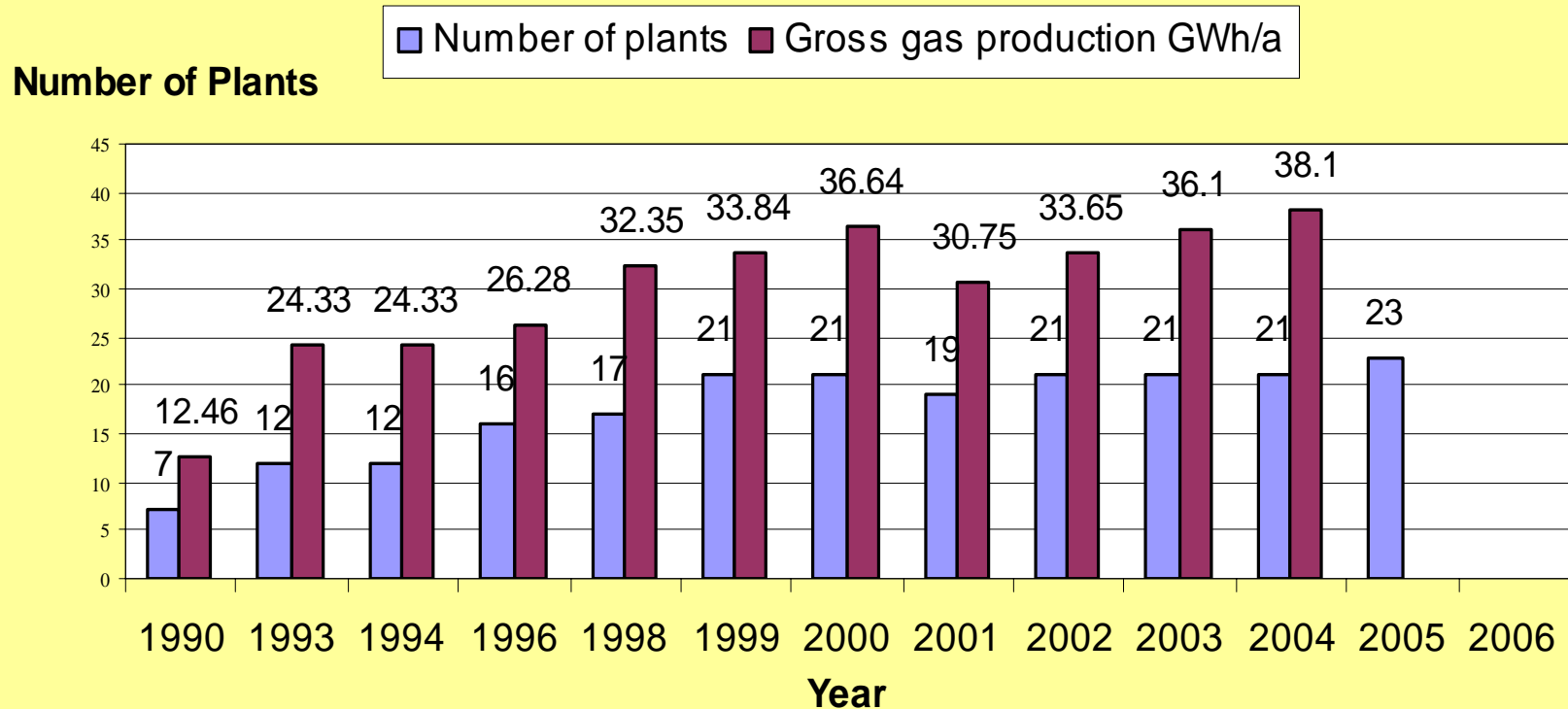
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Green Waste: Nr of Plants & Energy Production



Industrial Waste: No of Plants & Energy Production

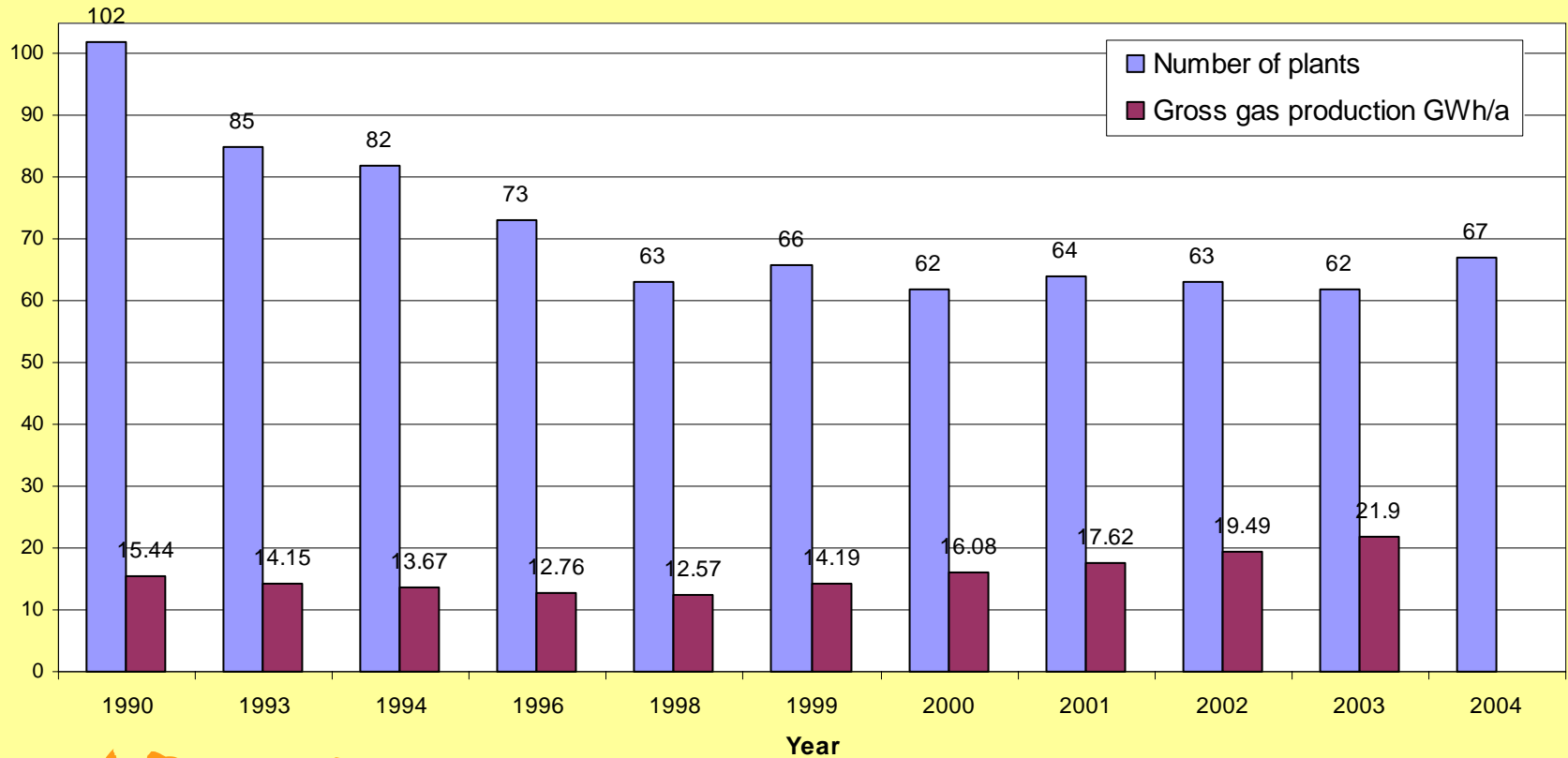
Development of Industrial Plants



Agricultural Waste: Number of Plants & Energy Production

Agricultural Plants

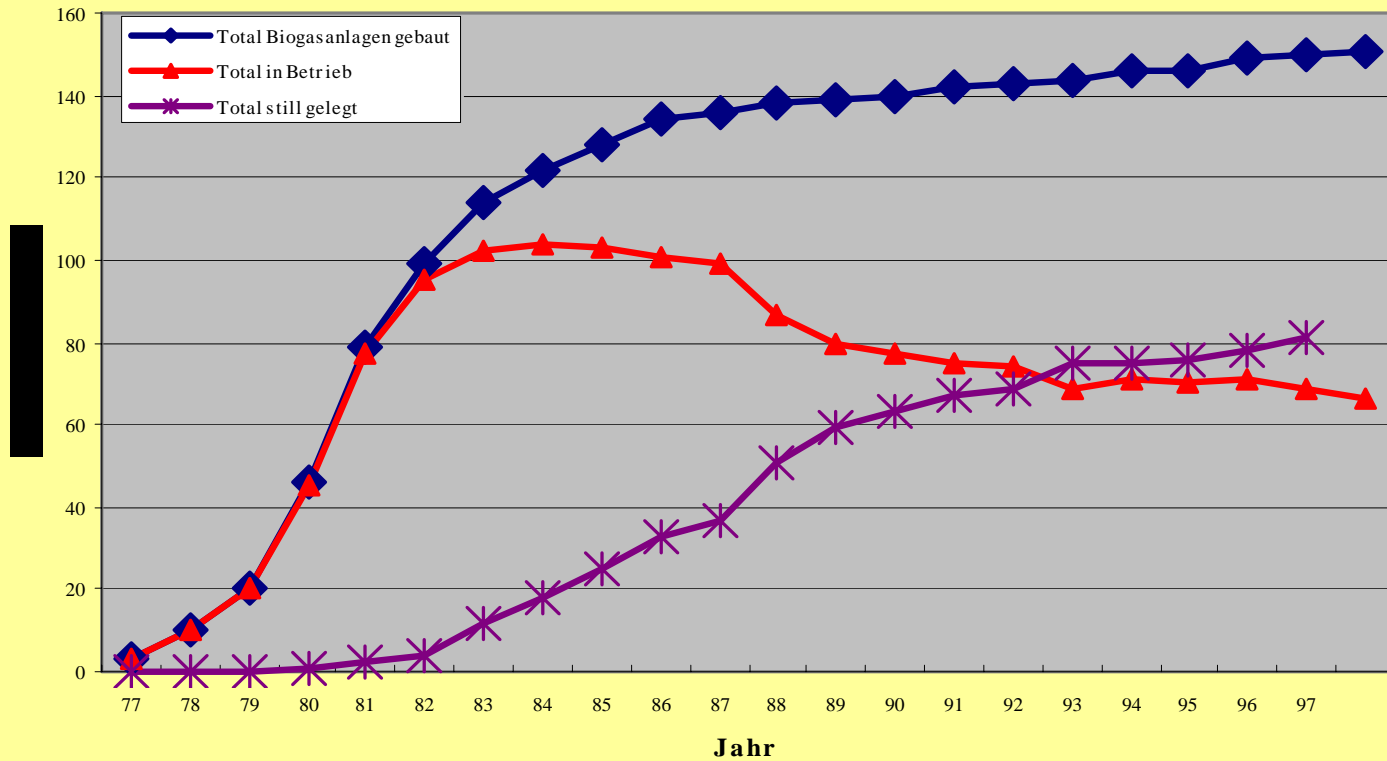
Number of plants



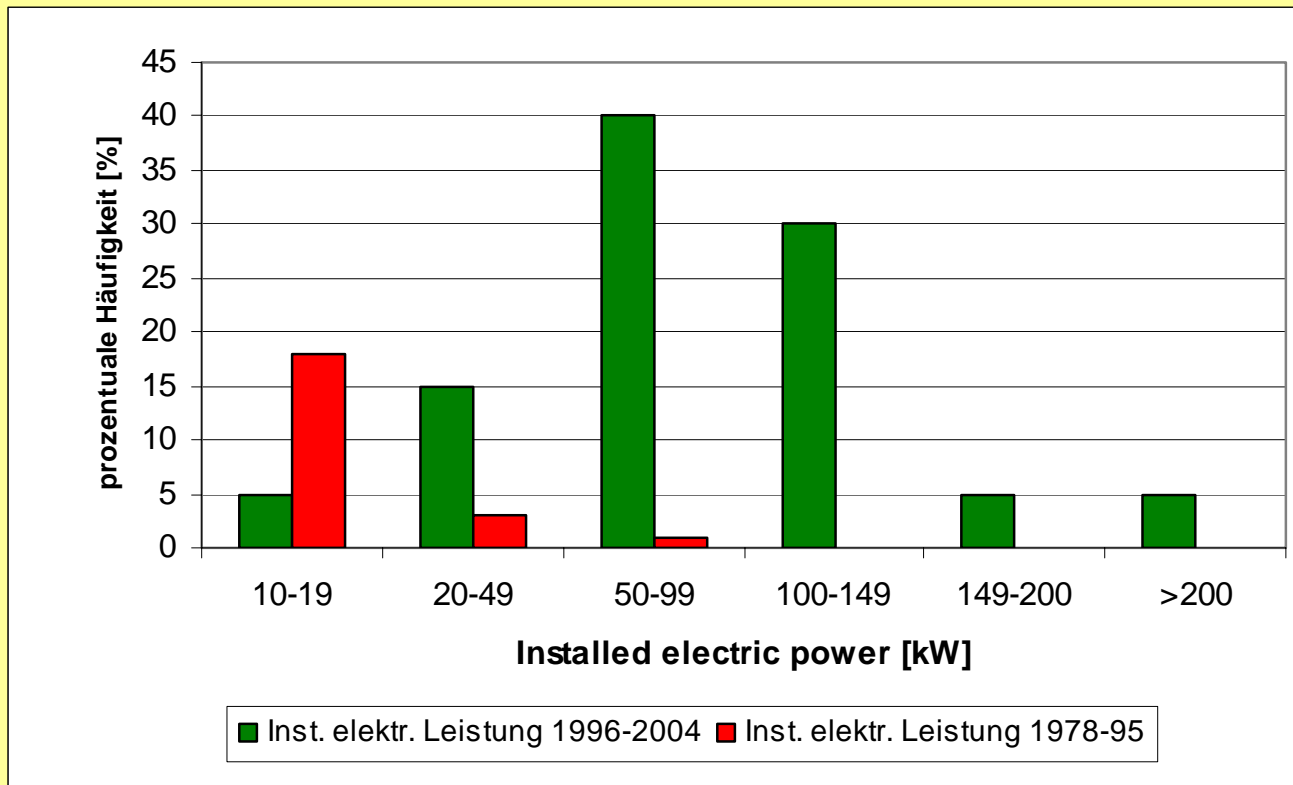
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Agricultural Waste: Development

Landwirtschaftliche Biogasanlagen



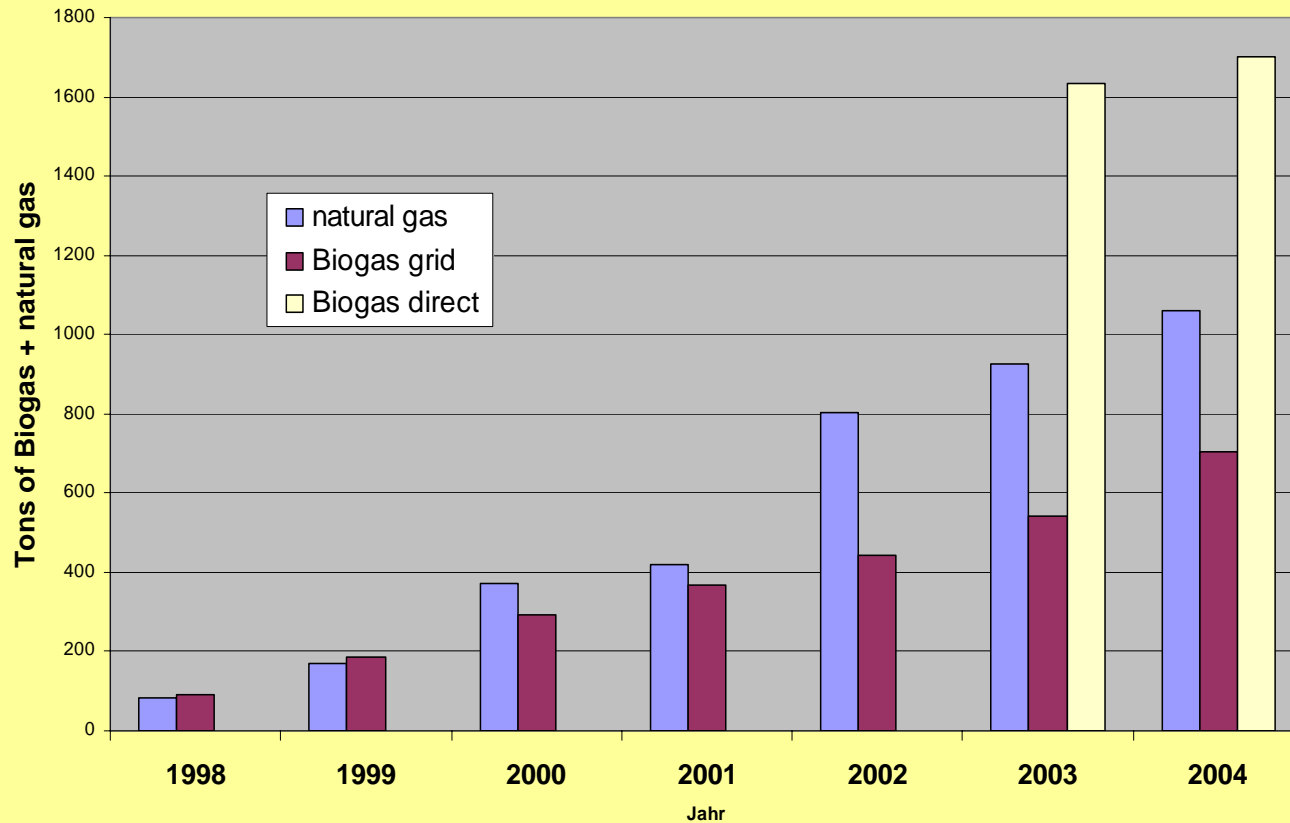
Agricultural Waste: Electric Power



Biogas fuel in Switzerland (2004/05)

| | 2004 | 2005 |
|-----------------------------|---|------|
| Number of gas vehicles | 730 | 1400 |
| No of upgrading plants | 3 | 5 |
| Number of fuelling stations | 35 | 60 |
| Share of biogas | 45% | 40% |
| Price at pump station | Biogas: 0.67 €/kg (0.56 €/l petrol equivalent) Natural gas: ca. 1.00 €/kg (0.64 €/l petrol equivalent) | |

Gas as fuel in Switzerland








Biogas covers 60% (resp. 40% in the grid) of the fuel gases

The number of brands and models is increasing

| | Passenger cars | Light transporters |
|--|----------------|--------------------|
|  | 2 | 2 |
|  | 4 | 2 |
|  | 7 | 2 |
|  | 3 | 1 |
|  | 1 | 2 |
|  | 1 | 1 |
|  | 1 | 0 |
|  | 3 | 0 |
|  | | |
|  | | 2 |

Busses and Trucks

| | Busses | Trucks |
|---|--------|--------|
|  | 4 | 2 |
|  | 2 | 2 |
|  | 2 | 1 |
|  | 2 | 0 |
|  | 0 | 2 |

ADAC crash test



Opel Zafira CNG achieved 9 out of 16 points in a crash test which is comparable to a conventional petrol car (10 points).

The slight difference is due to the increased weight

IKEA & Mobility



The largest IKEA shop in Switzerland has leased 3 Ford buses and has opened an own fueling station with Kompogas

Research Projects

Completed research projects by mid 2005:

- Energy from whey : comparison of biogas and bioethanol (EREP)

Only two impacts have been considered: fossil fuel consumption and greenhouse effect. The following two cases were compared: i) replacement of fuel-oil by biogas for heat production and ii) replacement of conventional gasoline by “essEnce5”. There was no significant difference. The treatment of one cubic meter of cheese whey allows in either way saving more than 20 litres oil eq. of fossil fuel and 60 kg of CO₂ eq. emission.

Research Projects (2)

Completed research projects by mid 2005:

- Separation of digestate from manure and co-substrates (EREP)

| DATE | DIGESTAT | | | | | LIQUIDE | | | | | SOLIDE | | | | | SOLIDE STOCKE (10 JOURS) | | | | |
|----------|--------------|--------------|------|--------------------------------|---|--------------|--------------|-----|--------------------------------|---|--------------|--------------|------|--------------------------------|---|--------------------------|--------------|------|--------------------------------|---|
| | MS [% MF] | MO [% MS] | C/N | NH ₄ -N [kg/1MS] | P ₂ O ₅ [kg/1MS] | MS [% MF] | MO [% MS] | C/N | NH ₄ -N [kg/1MS] | P ₂ O ₅ [kg/1MS] | MS [% MF] | MO [% MS] | C/N | NH ₄ -N [kg/1MS] | P ₂ O ₅ [kg/1MS] | MS [% MF] | MO [% MS] | C/N | NH ₄ -N [kg/1MS] | P ₂ O ₅ [kg/1MS] |
| 11.09.03 | 10,3 | 80,6 | 22,9 | 0,93 | 22,5 | — | — | — | — | — | 26,7 | 87,5 | 36,7 | 0,95 | 18,7 | 23,5 | 84,5 | 29,9 | 1,37 | 22,6 |
| 08.12.03 | * | * | * | * | * | 4,9 | 67,3 | — | 53,0 | 30,4 | 27,5 | 87,8 | — | 0,95 | 15,2 | 27,2 | 46,4 | — | 0,8 | 14,1 |
| 29.07.04 | — | — | — | — | — | 6,1 | 69,9 | 5,0 | 48,9 | 26,7 | 25,8 | 86,8 | 35,5 | 1,16 | 14,6 | 37,9 | 84,5 | 28,1 | 1,27 | 16,7 |

(— : non déterminé ; * : non représentatif)

Research Projects (3)

Digestion of pig manure in a membrane reactor (Hersener)

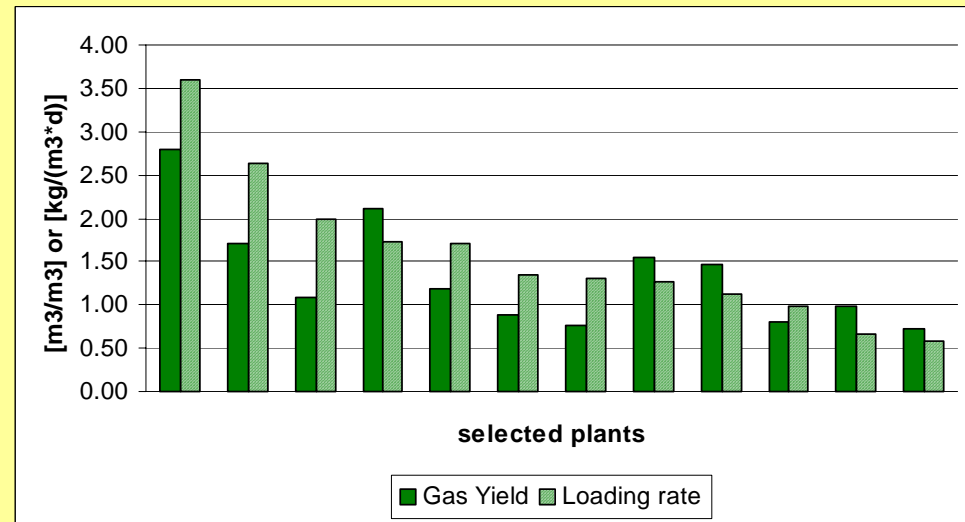
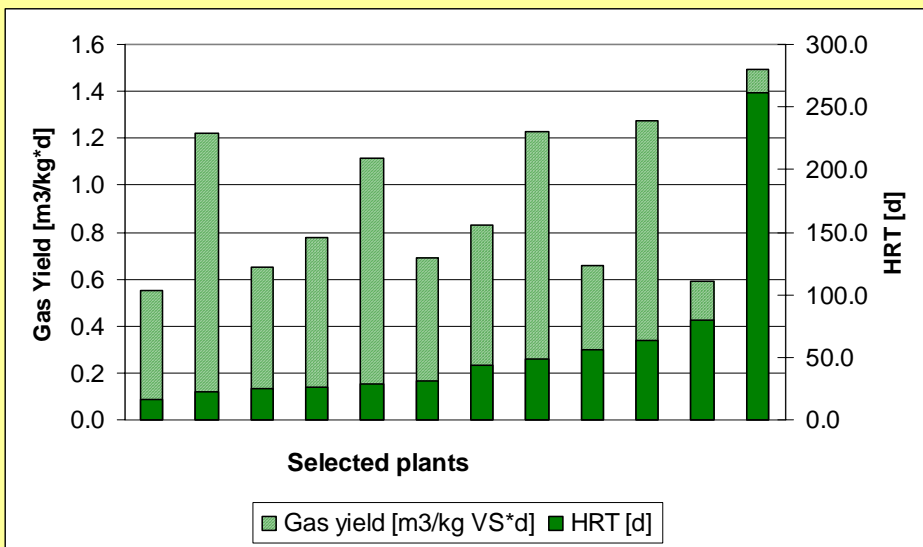


At a HRT of 10d and a SRT of 30d (LR 1.7kg/m³*d) they achieved a gas yield of 310l/kg VS. Laboratory experiments showed an 20% improved yield with UF.

The full scale plant is under construction. It will treat 35'000 TPY of pig manure and co-substrates

Research Projects (4)

Evaluation of existing agricultural biogas plants (Genesys)



Preliminary conclusion: Farmers don't say or don't know what they are doing

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