

Market Assessment for Biogas / Fuel Cell Applications regarding Germany, Slovakia and Austria

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Introduction to EBV Group



- founded in 1994, with business focus on planning, realisation, installation and management of renewable energy projects in Germany and abroad with an emphasis on wind energy
- business areas are divided into: project development and financing, funds issuance, building development and services
- realised projects so far: 20 wind farms (146 wind turbines with 161,4 MW total installed capacity) and 1 hydro power plant (0,407 MW installed capacity)
- October 2003: EBV became 100% subsidiary of Gamesa Energía; new board of executives: Holger Maug, Stefan Blankemeyer and Marta Fernández Bordóns

Basic Principles of the Market Assessment



- The market assessment will be based on the total substrate potential for anaerobic digestion in the respective countries and will therefore demonstrate the maximum market potential.
- To which extent this maximum market potential will be exploited depends on the market environment and the existing barriers and can therefore be influenced by politics.
- If future biogas applications will be combined with fuel cells depends on the outcome of their competitive race with internal combustion engines. The evaluated market potential is therefore primarily related to biogas technology as such.

Market Assessment Germany Substrate Potential for Biogas Production



Substrate	Substrate Potential in Mio. t/a	Biogas Potential in Mio. m ³ /a
Manure and other agricultural residuals	180	5,491
Energy Crops	58	10,000
Sewage Sludge	33	833
Organic Waste	15	1,453
Total	286	17,777

Source: Institute for Energy and Environment, 2002 and own calculations

Market Assessment Germany Energy Production Potential



Substrate	Potential for electricity production in GWh/a	Potential for heat production in GWh/a	Potential for installed el. capacity in MW
Manure and other agricultural residuals	12,493	16,063	1,562
Energy Crops	22,750	29,250	2,844
Sewage Sludge	1,896	2,438	237
Organic Waste	3,306	4,250	413
Total	40,445	52,001	5,056



Market Assessment Germany Market Environment and Main Barriers

- Market Environment**
- Access to the grid is guaranteed by the Renewable Energy Law
 - Fixed feed-in tariffs for 20 years:
8.70-10.23 €cent / kWh depending on the electrical capacity of the biogas plant
 - Loans with low interest rates are available via the state owned KfW bank
 - Complicated authorisation procedure especially for larger plants

- Main Barriers**
- Feed-in tariffs are still not sufficient to ensure an economic viability for agricultural biogas plants (will be probably enhanced by an amendment to the Renewable Energy Law)
 - Availability and disposal fees for organic wastes are decreasing
 - Comprehensive authorisation procedures



Market Assessment Slovakia Substrate Potential for Biogas Production

Substrate	Substrate Potential in Mio. t/a	Biogas Potential in Mio. m ³ /a
Manure and other agricultural residuals	13.2	333
Energy Crops	0.8	138
Sewage Sludge	1.2	29
Organic Waste	1.2	108
Total	16.4	608

Source: University of Nitra, 2004 and own calculations

Market Assessment Slovakia Energy Production Potential



Substrate	Potential for electricity production in GWh/a	Potential for heat production in GWh/a	Potential for installed el. capacity in MW
Manure and other agricultural residuals	758	975	95
Energy Crops	314	404	39
Sewage Sludge	66	85	8
Organic Waste	246	316	31
Total	1,384	1,780	173

Market Assessment Slovakia Market Environment and Main Barriers



Market Environment

- No guaranteed access to the grid
- No special feed in tariffs for renewable energy
- No special loans available for renewable energy projects
- Subsidisation of fossil fuels' usage
- Strong lobby of fossil fuel industries

Main Barriers

- Financial viability of biogas projects cannot be achieved in the existing economic environment
- Strong lobby of fossil fuel industries constrains political support for renewables
- Technology is not available / import is too expensive
- Low level of public awareness regarding environmental issues

Market Assessment Austria Substrate Potential for Biogas Production



Substrate	Substrate Potential in Mio. t/a	Biogas Potential in Mio. m ³ /a
Manure and other agricultural residuals	26.9	753
Energy Crops	6.6	1,150
Sewage Sludge	3.7	94
Organic Waste	1.2	88
Total	38.4	2,085

Source: Haas, 2001 and own calculations

Market Assessment Austria Energy Production Potential



Substrate	Potential for electricity production in GWh/a	Potential for heat production in GWh/a	Potential for installed el. capacity in MW
Manure and other agricultural residuals	1,714	2,204	214
Energy Crops	2,616	3,364	327
Sewage Sludge	213	274	27
Organic Waste	201	258	25
Total	4,744	6,100	593



Market Assessment Austria Market Environment and Main Barriers




Market Environment

- Access to the grid is guaranteed by the Green Electricity Act
- Fixed feed in tariffs for 13 years:
10.30-16.50 €cent / kWh depending on the electrical capacity of the biogas plant
- Subsidies and loans with low interest rates are available via the financial institution "Kommunkredit Austria"

Main Barriers

- Obligate heat usage is difficult to achieve (current amendment of the Green Electricity Act regarding enhanced efficiency criteria)



Key Success Factors for using Fuel Cells in Biogas Applications



- The fuel cell has to outperform the internal combustion engine economically regarding the use of biogas in order to replace the currently used biogas / internal combustion engine combination by the innovative biogas / fuel cell technology.
- Governments and therefore the society have to be willing to support the innovative technology for a transition period in order to enable its further development and the realisation of its cost reduction potential.
- The fuel cell / biogas technology has to gain or further develop a positive image in public based on non economic benefits in order to qualify for the necessary political support.



Summary and Conclusions

- A remarkable potential for the production of renewable energy from organic substrates was identified in Germany, Slovakia and Austria
- The utilisation of the potential depends on the support mechanism in place. The market environment is currently most beneficial in Austria, followed by Germany. Slovakia is still lacking appropriate support mechanisms.
- The avoidance of external costs of conventional energy systems has to be taken into account in order to provide for the necessary economic environment
- Fuel cell systems have to be developed further in order to be able to replace internal combustion engines in their combination with biogas technology