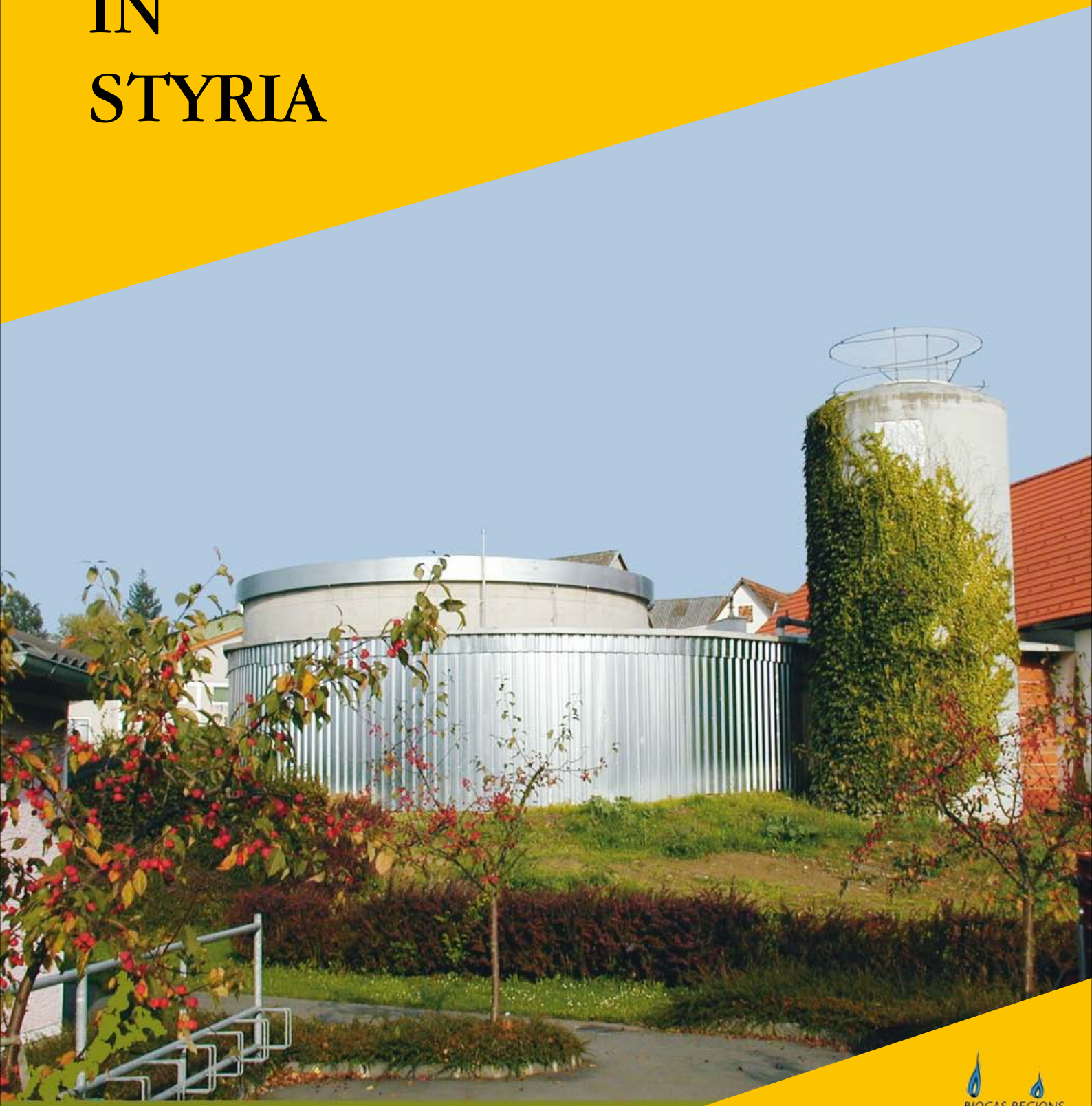
BIOGAS IN STYRIA

Energiebeauftragter des Landes Steiermark



BIOGAS REGIONS

LandesEnergieVerein Steiermark

Lokale Energie Agentur Oststeiermark

Intelligent Energy Europe

BIOGAS IN STYRIA

This information brochure was prepared the Regional Energy Agency of Styria (LEV) and the Local Energy Agency of Eastern Styria (LEA GmbH) with co-funding from the European Programme "Intelligent Energy Europe (IEE)".

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This brochure was created in the framework of the IEE Project "Biogas Regions". Visit www.biogasregions.org

European Union
Intelligent Energy Europe (IEE)

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ENERGY FROM BIOGAS

Already in the 80s, after the first big oil and energy crisis, the production of biogas from biogenous wastes in Austria, back then primarily from excrements, seemed like an option for generating heat and electricity from renewable energy sources. The sinking oil price, however, prevented a wide-spread use of these already very advanced technologies.

The discussion surrounding the climate crisis, rising energy prices and the increasingly threatening dependence on the import of fossil fuels lead to a "green electricity directive" in 2002 with attractive feed-in tariffs for green electricity that encouraged countless investments in green electricity plants – 47 biogas plants were built in the province of Styria in the years 2003 and 2004 alone. The resources in use were no longer restricted to animal waste products. Also the use of organic resources from agriculture such as corn became increasingly popular. The product still remained electricity and heat. Unfortunately the biogas boom came to rest as the attractive feed-in tariff was revoked by the incumbent government in 2005 – at a point in time where a large amount of technical know-how and experience already existed.

The requirement for new strategies to apply the gained knowledge and to make up for the lost revenues from the sale of electricity and heat lead to a transition to the production of biogas as a fuel and particularly the injection into the local natural gas network, an option that offers hope due to the use of inexpensive resources and rising demand for "green" fuels.

This brochure presents good examples from the aforementioned areas and can be used as evidence that, even under difficult conditions, renewable energy can provide a way out of the dependence on imported fossil fuels.

Dipl.-Ing. Wolfgang Jilek
Energy Commissioner of Styria

RENEWABLE ENERGY IN STYRIA

Styria is a pioneer region in renewable energy and energy efficiency. The large academic community is one reason for the strong movement against nuclear power in the seventies and eighties. This movement put forward a variety of actors, which were not just against nuclear power, but offered new and alternative solutions like "do-it-yourself" construction solar-thermal collectors or small biomass district heating plants. Soon a high degree of national and cross-border renownedness was reached.

Today, green energy has developed into an active and dynamic economic sector. The sector already generates more than 5% of the gross regional product and gives more than 9,000 jobs. Over the last years, the growth rates continually are beyond 10%. The high gross expenditure on R&D of 3,9% in 2008 (Lisbon target: 3%) ensures a large academic community (7 universities, several research organisations) and innovation capacity.

Solid biomass, biogas, solar thermal energy, hydropower and energy efficiency in buildings are the Styrian fields of excellence. 25% of the regional energy supply originates from renewable energy sources (figures of 2008):

Biomass

- *more than 327 MW_{beat} of local district heating systems from solid biomass*
- *world market leading producers of biomass boilers*
- *13 MW_{el} biogas plants*
- *a world market leader in technologies for producing biodiesel from multi-feedstock*
- *more than 7000 jobs*

Solar thermal energy

- *420,000 m² of solar thermal panels are installed, aiming at 1,200,000 m² by 2020 (1 m² per inhabitant)*
- *an internationally renowned research institute*
- *world market leading manufacturers for large solar panels (equipping e.g. the Olympic Games in Beijing 2008)*
- *more than 600 jobs*

Hydro power

- *500 MW of large hydro power plants (10 MW)*
- *117,1 MW of small hydro power plants*
- *10,85 PJ of electricity (3015 GWh) in 2005*
- *world leading producer of hydro power turbines and pumps*
- *potential for few more large hydro power plants and double capacity for small hydro power plants*

Wind power

- *33 plants with capacity of 51,3 MW*
- *potential to double this capacity to reach 2% of Styria's electricity demand*

Energy efficiency in buildings

- *over 7,000 low energy houses*
- *compulsory use of renewable energy sources by the Styrian programme for subsidised housing*
- *large environmental and ecologic potential in energy efficient renovation (over 1,500 jobs in 2007)*

Many specialised organisations manage and serve the Styrian green energy cluster:

- *The energy commissioner influences the legislation, sets targets and issues grants*
- *The regional energy agency LEV runs a quality management programme for biomass district heating plants, promotes energy efficiency on a municipal level and manages the research network jointly with the energy commissioner.*
- *The energy advice unit, LEV and many local energy agencies give energy advice to consumers*
- *The chamber of agriculture is active in developing biomass as renewable energy sources and assisting farmers to become energy suppliers*
- *The Initiative for a Sustainable Economy (WIN) is active in supporting companies to use and install renewable energy sources*
- *ECO WORLD STYRIA serves the active business community in green energy.*
- *Local energy agencies focus on the local energy visions. For biogas, the Local Energy Agency of Eastern Styria is an important contact point.*

INTRODUCTION TO BIOGAS

Biogas – the exception

Biogas is the all-rounder among renewable energy sources. It can be used to generate electricity and heat, as a fuel for transport or it can be injected into the natural gas grid.
Biogas can be produced from biogenous residues as well as from energy crops specifically planted for the production of biogas.
Once the biogas is injected into the gas grid, it can be transported easily to the users. Thus the final energy (heat, electricity, light, …) can be produced where and when it is needed.
Among all renewable energy sources biogas is a very dense and powerful one. It shows the highest energy yield per area of biomass cultivation.
The biogas technology offers an energy supply with positive aspects for the environment, the region and the agricultural sector. The highly versatile energy source biogas will contribute increasingly to climate and environmental protection. In strong regions – such as Styria – biogas is regarded as a very interesting stimulant for the economy.

Biogas – in cycle with nature

Biogenous resources absorb solar energy as they grow. The biogas plant converts this energy into biogas. The absorbed nutrients remain in the biogas slurry which can be used as a high-quality organic fertilizer as well as a resource for the chemical industry. The biogas technology represents a CO_2 neutral alternative to fossil fuels if the biogas slurry is used as a fertilizer in agriculture.

Biogas – the creation

If organic material such as manure, plants or food leftovers are stored in an airtight space ("anaerobic"), a biological process with methane-producing bacteria is started that leads to the formation of a gas – biogas! In nature this process takes place in swamps and marshes or in the digestive tract of ruminating animals. Biogas is technically produced through anaerobic fermentation in digesters or fermentation towers.
The gas created this way consists mainly of methane, carbon dioxide, water vapor, nitrogen, oxygen, hydrogen, hydrogen sulphide and ammoniac. The heating value of one m^3 of biogas amounts to around 6.4 kWh, depending on the methane content.

Biogas – the omnivore

Input – the substrates

Basically any type of biogenous substance (biomass) that can be decomposed by bacteria can be used to produce biogas. The range of possible substrates is also nearly endless due to the extreme diversity of bacterial anaerobiosis. Some substances, however, are decomposed very slowly and with difficulty due to their special chemical structure. One of these substances is e.g. lignin, the structural substance of wood.

The resources that can be used include:

from livestock: *(cows, pigs, chicken etc.)*	*liquid manure, manure, animal feeding residues, etc.*
from the field:	*corn, sunflowers, rye loppings, Sudan grass, lucerne, etc.*
from grassland:	*grass, waste from lawns, etc.*
from industries:	*protein-rich waste water (e.g.: brewery, dairy, etc.)* *carbon-rich waste water (e.g.: sugar industry, draff, etc.)* *fat- and protein-rich residues (e.g.: slaughterhouse waste, grease skimming residues, etc.)*
from humans:	*faeces, sewage sludge, biogenous waste, food leftovers, fruit and vegetable waste, etc.*

The amount and the quality of the produced biogas depend on the composition of the substrate. Knowledge about the gas formation process is an important instrument for planning and dimensioning a biogas plant as well as for estimating the amount of substrate needed over the course of a year for a given power rating of a biogas plant.

Output – energy and nutrients

Among the many possible energetic uses for biogas are:

• *gas combustion*	*heat, light*
• *cogeneration (CHP)*	*electricity, heat*
• *fuel cell*	*electricity, heat*
• *micro gas turbine*	*electricity, heat*
• *injection into the gas grid*	*heat, large-scale electricity production, cooking, light, transport*
• *use as a fuel*	*transport*
• *CO_2-production*	*food growing*

The digestate is a high-quality, natural fertilizer. In combination with a biorefinery it is also possible to produce a high-quality resource for industrial use (plant fibers and acids).

Annual assessment

Considering 1 year of agricultural production:

1 ha corn		**electricity for 7 households**		**8.5 tons**
or	=	or	=	of
20 cows		**75,000 car km**		**CO_2 reduction**

Plant Installations – The Styrian Market

The first Biogas plant for anaerobic digestion in Styria was built in 1978, a real boom started at the end of the 1990s. The biogas community is constantly changing. It has evolved from small sizes (15 kW_{el} - 80kW_{el} in the 1990ies) to the average size of 500 kW_{el} (in 2008). Now it is changing towards new energy production like biogas grid-injection or biogas for transport.
In 2009 there are 42 biogas plants operating (total electric capacity of about 17 MW). With this capacity installed, about 25.000 households can be delivered with electricity. Recent studies show a potential for supplying 150.000 households with electricity from biogas.
Wet fermentation and a mesophile, continuous process characterizes all Styrian biogas plants. About 65% of the plants use energy crops like maize and grass as input material. The rest are co-fermentation plants mixing various substrates. About 80% of the plants are operated by farmers.
Often the produced gas is used in combined heat and power units (CHP). Producing electric energy with biogas (co-generation) is „state of the art". The electricity is delivered to the national grid with special feed-in tariffs. A small amount of produced heat is used to increase the temperature of the digesters to optimal conditions. The surplus of heat is often used to feed in a district heating system.
Currently (2009) in Styria there are some activities to force biogas for the public gas grid. The biogas plant in Leoben is the first project for biogas grid injection. A project for biogas as transport fuel is launched.

Training

The Austrian „Wasser- und Abfallwirtschaftsverband" (ÖWAV – Austrian Association for Waste and Waste Water) in cooperation with the „Lokale Energieagentur" (LEA GmbH) has been very successfully offering special, individual and customized training programs for the target groups ***operating personnel of biogas plants*** *and* ***biogas planners and specialty firms*** *since 2006.* ***Each of the training programmes takes place once a year****. A total of* ***170 persons*** *have been trained to date.*
A standardized training nationwide is ensured through the two ÖWAV-training programs. The training programs are approved, recognized and recommended by the responsible authorities.

The chamber of agriculture, in collaboration with the rural education institute (LFI), has been offering specialized biogas training programs for the target group ***agrarian biogas plant operators*** *for many years.*

ÖWAV-training program for operating personnel of biogas plants

The demand for biogas plant operating personnel with the best possible training is greatly increasing. The ÖWAV offers a training program specially designed for operating personnel of biogas plants with waste fermentation (biogenous residues) with/without organic resources (energy crops) and animal secretes (e.g. manure, liquid manure) and of sewage treatment plants with fermentation towers that also use waste for co-fermentation that is specifically designed for

the needs of a modern plant operator. The participants of the program are trained to become competent biogas plant operators and can go on to operate biogas plants at the highest possible quality. By participating the training program the operating personnel of biogas plants is able to connect the acquired basics and interrelations with practical knowledge. This way the personnel can work professionally during the plant operation. The operating personnel of a biogas plant should further be well trained in avoiding interruptions and, if necessary, in taking the appropriate steps in the case of critical/problematic situations.
The contents of the training for the operating personnel of biogas plants are summarized in a ***norm sheet*** *(ÖWAV-norm sheet 516) and represent the foundation for the training program. A consistent standard for all of Austria for the training of biogas operating personnel and the verification of professional knowledge and skills was created for the first time with this norm sheet. ÖWAV-norm sheet 516 further standardizes the training contents for operating personnel of biogas plants.*
The ÖWAV training program for operating personnel of biogas plants (compliant with ÖWAV-norm sheet 516) has become a requirement for the approval by the authorities.

Duration of the training: *7 days, completion with a written and an oral exam as well as a training certificate*

Contents:

- *Biogas plant 101*
- *Legal basics*
- *Micro biology, process control, start-up / powering down operation*
- *Calculation of the material flow, treatment of fermentation residues*
- *Existing plants and technical equipment*
- *Employee protection*
- *Excursions to biogas plants*

BIOGASkompetent – a seminar for experts

Training program for project development, business management and planning basics of biogas plants for biogas planners and specialist companies

Expert biogas knowledge is in demand! The ÖWAV in cooperation with the Lokale Energieagentur (LEA GmbH) offers the training program "BIOGASkompetent" in order to impart a common knowledge base to different kinds of professionals.
The goal of the training program is to turn the personnel of ***biogas planning offices*** *and* ***specialist companies*** *into biogas experts. After absorbing this training the participants should be able to plan, construct and optimally operate biogas plants at the highest possible level of quality. They also acquire knowledge about a range of technological sectors that are vital for the smooth operation of the complete "biogas plant" system.*

Duration of the training: *6 days, completion with a written exam and a training certificate*

Contents

- *Biogas basics and decision making processes*
- *Technical guidelines for the evaluation of biogas plants*
- *Approval procedures for biogas plants*
- *Calculation of profitability of biogas plants*
- *Problems and solutions for biogas plants*
- *Odor emission of biogas plants*
- *Resources for biogas plants – gas generation and energy crops*
- *Industrial and commercial biogenous residues*
- *Treatment and utilization of fermentation residues*
- *Fields of use and processing of biogas*
- *2 excursions to biogas plants*

Styrian Biogas Economy

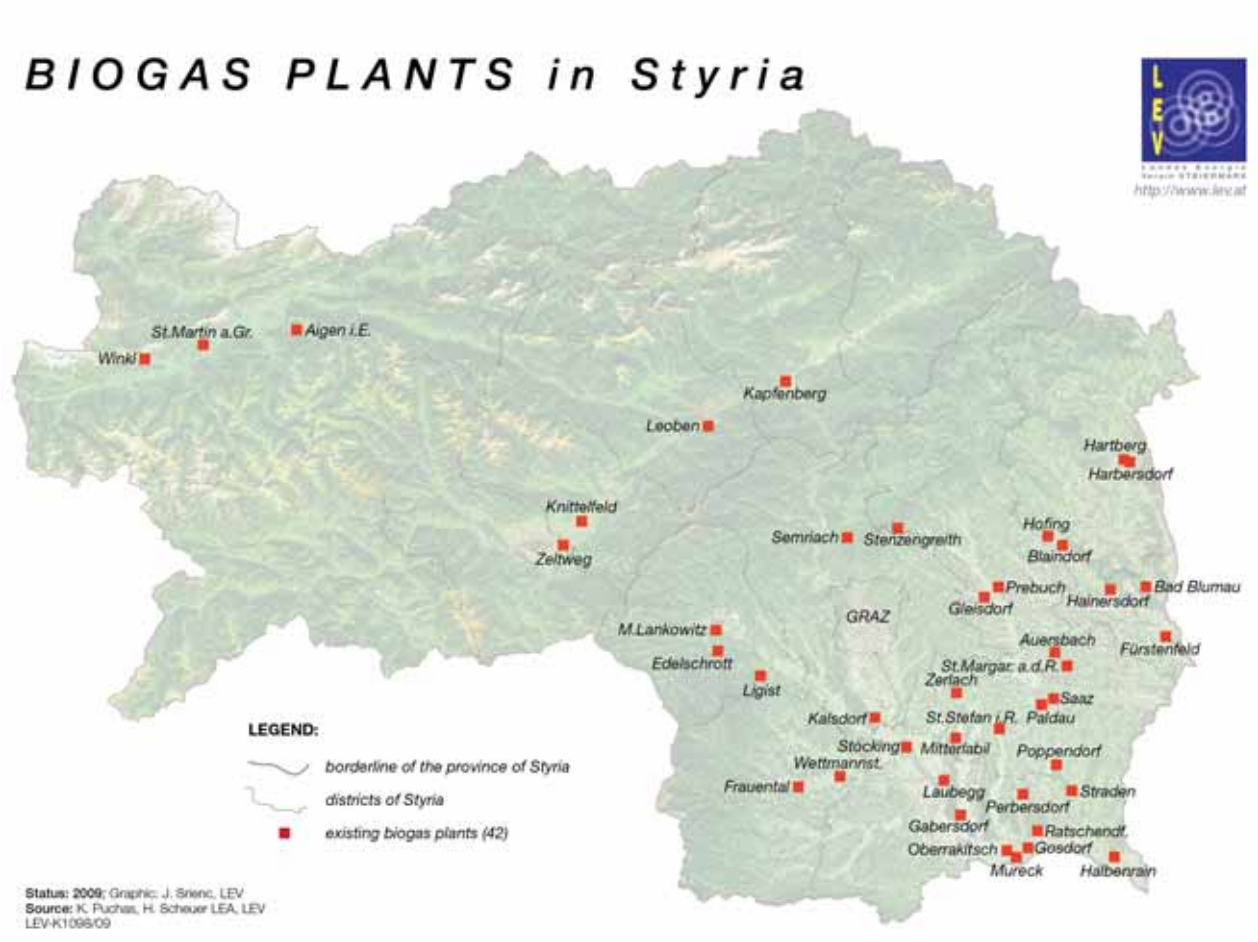
The advantages of biogas are not only ecological. Biogas fosters the regional economy. A comparison by the Austrian Biogas Association shows that 95% of the added value created from biogas remains in the country of origin whereas for fossil fuels, this is true only for ¼ of the added value. The majority of ¾ leaves the country.
Already 1,500 people are employed in the Austrian biogas sector. In Styria, about 150 people are working in the biogas sector. Among the Styrian technology offers one may find:

- *turnkey-ready biogas plants*
- *ATEX fans*
- *catalyst mineral compounds*
- *membranes*
- *planning and engineering*
- *consultancy*
- *R&D (e.g. gas yield, crop rotation, digester technologies)*
- *monitoring*
- *analysing labs*
- *control and automation*

The Styrian biogas companies are ready to export their know-how and products to other regions! You are invited to contact us for more information on Styrian biogas technology, other biogas related activities or if you want to visit a biogas plant in Styria.

DESCRIPTIONS OF STYRIAN BIOGAS PLANTS

The production of biogas as a source of renewable energy is an industry with a promising future. Furthermore, biogas is of considerable importance, from an economic perspective and in terms of energy policy. 42 biogas plants are already in operation in Styria. The authors selected 8 plants in order to give an overview over the wide spectrum.



Biogas Plant Hainersdorf

KURT TAUSCHMANN BIOGASANLAGEN GMBH

The Tauschmann family runs an enterprise with about 1,100 fattened pigs. The idea of constructing a biogas plant was born in 2004. The plant was ultimately constructed in just one year and successfully put into operation in July 2005.

The biogas plant is operated by means of the liquid pig manure from the business and silo maize using the storage vessel throughflow method. The raw materials are fed into the biogas plant by means of a charger feeding them into the first digester which is equipped with a horizontal agitator, while the second one is equipped with a vertical agitator in order to avoid possible floating or sink layers. Underground floor outlets have been constructed for the liquid manure (2 manure pits, approx. 1,700 m³ in total) in order to avoid possible odour nuisances.

Subsequent to the fermentation time of about 40 days at a temperature of 39.5°C the substrate is pumped into the final depository, which is equipped with a tractor stirrer. The biogas produced is stored in a gas dome. About 150 m³ of biogas is produced per hour and converted into electricity and heat in a combined heat and power station.

Facts

Start of Operation/Extension	*12005/2007*
Substrates	*liquid pig manure, maize silage*
Rated electrical power	*500 kW*
Amount of biogas produced	*8400 m³ per day*
Heat utilization	*pigsty, residential building, neighbouring houses*
Plant costs	*2,200,000 €*

Contact

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Kurt Tauschmann, Plant Operator

"We decided to operate a biogas plant for two reasons: our access to renewable resources and our desire to become autonomous. The goal was to achieve a 100% energy autarchy for the business."

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Biogas Plant Hartberg

BIOKRAFT HARTBERG – ENERGIEPRODUKTIONS GMBH

The plant was put into operation in March 2005 and represents a combined project with the biogas plant in Habersdorf. The input material is prepared by a special conditioning facility within the sewage treatment plant in Habersdorf and transported to the pre-pit by means of an underground pumping station where it remains for 20 days under continuous agitation.
Thereafter the material is fermented for a further 120 days in the 2 secondary digesters. The emerging biogas is directed into the 330 m³ gas sack and stored there. The biogas is utilized in the 2 combined heat and power stations at the Ecopark. The fermented substrate is returned to the sewage treatment plant by means of tankers. The thermal energy produced is fed into the district heating network of the Ecopark and during summer used, via the absorber of the cooling facility, to cool the operating facilities at the Ecopark. The generated electricity is fed into the local grid and also covers the internal consumption of the plant.

Facts

Start of Operation	*2005*
Substrates	*fat separator contents, dairy sludge, sewage sludge*
Rated electrical power	*1x100, 1x180kW*
Amount of biogas produced	*approx. 2,900m³ per day*
Heat utilization	*fed into the district heating network at the Ecopark*
Plant costs	*1,800,000 €*

Contact

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Hannes Köck, Plant Operator
"Due to the large number of legal outline conditions and the need to comply with the quality regulations, the concept of the biogas plant at the Hartberg Ecopark was realized in combination with the sewage treatment plant in Habersdorf. The idea for this project has been touted for more than 10 years by the waste management centre in Hartberg. In realizing the project, we were particularly keen to safeguard the utilization of the incidental raw materials. We generate green electricity using existing residuals and therefore deliver a valuable contribution to climate protection."

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Sewage treatment and biogas plant Knittelfeld

WASTE ASSOCIATION OF KNITTELFELD

The plant was put into operation in 1983 with the goal of treating the important resource water and returning it to the natural cycle in the best possible condition. The plant was extensively modernized in 2008 and expanded by a biogas co-fermenter.
Solid substances such as food leftovers or biogenous waste, used cooking oil and liquid substances from a dairy are digested together with previously thickened sewage sludge in the existing digestion towers, which leads to a significant increase in the biogas yield. The biogas gained from this process is then converted into heat and electricity in a cogeneration plant. The entire heat and electricity needs of the sewage treatment plant are covered this way. The digested sludge and suitable extraneous substances are dried in a solar drying plant (mass reduction by more than 75%) and used as a fuel for the cement industry. The application of persistent substances and heavy metals on agricultural areas is avoided this way. Another innovation is the reduction of the strain on the sewage system by the directly adding liquids with a high organic content to the digestion. The co-fermentation makes the fermentation of the biogenous residues economically viable. The concept received the environmental protection award of the province of Styria in 2006.

Facts

Start of Operation	*2008*
Substrates	*organic food wastes, kitchen waste, old cooking oil, dairy effluents, sewage sludge*
Rated electrical power	*330 kW*
Amount of biogas produced	*approx. 3600 m³ per day*
Heat utilization	*pigsty, residential building, neighbouring houses*
Plant costs	*1,400,000 €*

Contact

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Bernhard Mayr, Planer
„The generation of energy through the fermentation of biogenous waste has only been implemented to a neglectable degree in the province of Styria due to the high investment costs for new plants, among other reasons, even though high potential energy yields are hidden in these biogenous wastes. Furthermore, a range of communal sewage treatment plants including the AWV Knittelfeld are equipped with over dimensioned digestion towers. This means that their capacity utilization can be considerably increased through an adequate process engineering and control.“

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Biogas upgrading and grid-injection Leoben

STEIRISCHE GAS&WÄRME

The „Reinhalteverband Leoben“ has been operating a sewage treatment plant (catchment area around 100,000 inhabitants) with two fermentation towers (2,500 m³ each) for the production of biogas since 1983. The sewage treatment plant was expanded by a biogas process in order to achieve the goal of an increased energy generation from regional biogenous resources.
In 2009 - after several years of preparation - the sewage plant operator and the Steirische Gas&Wärme realized an innovative pilot project, which operates in parallel to the electricity and heat generation, in order to upgrade and inject the biogas into the regional natural gas grid.
The biogas upgrading plant operates based on the amine wash process and consists of an absorber column, a desorber column, a gas condenser and an active carbon filter. The undesirable impurities (carbon dioxide, hydrogen sulphide and ammoniac) are washed out in the absorber. The purified biogas (natural gas quality) is cooled and fed into the natural gas network through an active carbon filter. The washing liquid is cleaned (desorber) and remains in the closed loop system.
A comprehensive energy and waste disposal centre, which uses the biogenous waste from industries and businesses, produces bio energy and utilizes the residual substances, has been created this way. The biogas grid injection is planned to cover 10% of the total gas needs of the gas distribution system in Leoben.

Facts of the upgrading and grid injection plant

-	*amine wash process*
Start of Operation	*2009*
Max. crude gas processing capacity	*250 Nm3 per hour*
Required heat power	*264 kW*
Required cooling power	*205 kW*

Contact

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Biogas Plant Mureck

ÖKOSTROM MURECK GMBH

In 2001 the idea came about of adding a biogas plant to the existing biomass heating plant and the biodiesel fuel plant in Mureck. The plant is made up of a mixing vessel, a hydrolysis vessel, 4 ligivators, 4 digesters, the digester discharge vessel and 2 depositories.
The liquid manure, silo and grain maize are mixed in the mixing vessel and fed directly into the hydrolysis vessel. The fermentation substrate is pumped into the 4 digesters and gasified. The aim is to separate the solid components from the digester vessel via a separator and sell them as a valuable fertilizer. The glycerine phase by-product from the production of biodiesel is fed into the digesters directly. Liquid pig and cattle manure, maize silage, CCM and draff are also added.
By connecting the green electricity plants in Mureck, the energy can be utilized efficiently since the biogas plant's combined heat and power station is located next to the biomass heating plant so that the thermal energy can be utilized in the most efficient way.

Facts

Start of Operation	*2005*
Substrates	*liquid manure, maize silage, glycerine phase, draff, milled corn cobs*
Rated electrical power	*999 kW*
Amount of biogas produced	*approx. 10,000 m³ per day*
Heat utilization	*fed into Mureck district heating system, self-supply*
Plant costs	*5,400,000 €*

Contact

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Gernot Breitenhuber and Karl Totter Jun., Plant Operators
"The motivation to construct a biogas plant was the goal to make Mureck an energy self-sufficient region solely using renewable resources in order to ensure a sustainable and livable future. The farmers of the region take up a role as energy brokers giving them an additional income source next to agriculture. The location of Mureck combines different types of bio energy systems allowing for the energy to be used efficiently."

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Biogas Plant Saaz

RWP BIOENERGY LTD. COMPANY

The "Saaz" biogas plant is a typical 500 kW_{el} NAWARO (energy crop) plant, which is owned and operated by four farmers of Eastern Styria. They are specialized in pig and poultry farming and the cultivation of corn.
The biogas plant has one main digester and one secondary digester which are built of reinforced concrete and have a volumetric capacity of 1,800 m^3 each. Both digesters have two hydraulic agitating devices with propeller drive. Both, the main and the secondary digesters, additionally have a paddle agitator. The gas storage tank is integrated into the second digester.

Only liquid pig manure is used for controlling the dry matter. The daily load of 20 tons of energy crop feedstock requires an additional 15 tons of liquid manure in order to achieve the required dry matter content of 7%.
A 500 kW_{el} combined heat and power unit converts the biogas into electricity and heat. The electricity is fed into the regional grid. The power requirement of the plant (328,000 kWh per year) is bought back from the grid company. At present two blocks of flats and the stables of a local farmer are supplied with heat.

Facts

Start of Operation/Extension	*2004*
Substrates	*liquid pig manure, grass silage, maize silage, CCM, green pruning rye*
Rated electrical power	*500 kW*
Amount of biogas produced	*approx. 6100 m^3 per day*
Heat utilization	*stables, block of flats*
Plant costs	*1,850,000 €*

Contact

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Christian Walch, Plant Operator:
"With starting the biogas production, three pig breeding farmers could add a second string to their bows. The sustainable regional energy production also secures our jobs as full-time farmers."

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Biogas Plant St. Stefan i. R.

ROSENTALER BIO KRAFTWERK GMBH & KEG

The "Rosentaler" biogas plant in St. Stefan (Eastern Styria) was built in the year 2003 with the latest technology and was at that time one of the biggest biogas plants in Styria. This plant for the first time realized a combination of organic waste, animal by-products, liquid manure and renewable primary products (energy crops) by installing an innovative hygienisation unit (1 hour at 70°C). Thus, the plant fully operates in compliance with the EU-hygiene regulations. The corporate partnership includes 10 farmers (owning 80 %), who have pig breeding and pig fattening farms, the municipality St. Stefan (10 %) and a waste management company (10 %). Special emphasis was put on using only regional feedstock. About 5,500 tons of liquid manure (pig), 1,800 tons of silage maize, 950 tons of silage grain maize, 200 tons of green cut, about 240 tons apples/pomace (residuals from juice squeezing), 130 tons vegetable matter and 1,900 tons organic leftovers make the annual feedstock of this biogas plant.

The plant produces about 750 kW of electricity per hour, which is supplied to the public grid. The produced thermal energy is fed into a district heating system and used for heating the neighbouring stables, two blocks of flats and for drying fruit in a neighbouring plant.

Facts

Start of Operation/Extension	*2003/2007*
Substrates	*liquid manure, maize silage, food leftovers, green cut, apples/pomace, vegetable matter, organic leftovers*
Rated electric power	*2 x 500 kW*
Amount of biogas produced	*approx. 6,800 m³ per day*
Heat utilization	*supplying heat to stables and a fruit drying plant*
Plant costs	*3,000,000 €*

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Johann Luttenberger, Plant Operator

"A closed regional economic cycle is achieved through the use of biogenous residues from the region and agricultural resources like liquid manure and maize silage. Unfortunately, due to legal restrictions, we are not able to also use the sewage sludge from the communal sewage plant in our biogas digester. The operators are nonetheless proud to have set up a truly exemplary biogas plant."

Intelligent Energy Europe
BIOGAS REGIONS

Biogas Plant Zeltweg

THÖNI INDUSTRIAL FIRMS LIMITED LIABILITY COMPANY

This biogas plant was built for the military airfield of the federal armed forces in Zeltweg. The federal armed forces make the necessary feedstock (grass) available to the operator of the biogas plant. The digestate is used as a fertilizer on the green space of the military field. The green electricity generated by the plant is fed into the local power grid.

The biogas plant works with a two-stage process with one main digester and a secondary digester, both of which are made of concrete. The main digester has a concrete ceiling and the second one has a plastic membrane as a gasholder. Inside the main digester are two paddle agitators and one submersible agitator. The secondary digester contains one paddle and one submersible agitator.

Corn, grass silage and whey are the substrates for the biogas plant Zeltweg. The infeed of the solids is done over a separated hydraulic shear cotter floor, which transports the feedstock from the storage to a conveyor duct. The installed weighing machine allows for the feed rate to be adjusted accurately. The whey is pumped through a slurry store with a special coating. The plant also has an external biofilter to avoid odours nuisance.

Facts

Start of Operation/Extension	*2005*
Substrates	*grass silage, corn, whey*
Rated electrical power	*500 kW*
Amount of biogas produced	*approx. 6000 m³ per day*
Heat utilization	*federal armed forces*
Plant costs	*2,300,000 €*

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