

Experience the future now

We may have to go without some of life's luxuries in future, but not its little conveniences! That's because instead of just saving energy we should be thinking more in terms of 'using energy wisely' – and that means finding better, cheaper, more convenient and sustainable ways of doing so.



Sustainability as a strategy. A model for the rest of the world.

Since 1987 the idea that farmers can produce their own food for their own beasts of burden – i.e. tractors – has become reality.

Hatched by August Jost, Ferdinand Potzinger and Karl Totter over a few beers in the pub on 30 December 1985, this crackpot caper was at times called the biggest joke in the country over the following decade.

It called for a move away from the dark age of fossil fuels towards dazzlingly clean sources of energy by unleashing the impressive potential of natural sunlight, flourishing fields of rape and constantly regenerating biomass.

It called for a return to the proven cycles of traditional farming.

After undergoing trials at the agricultural college in Silberberg near Leibnitz from 1987 to 1989, this form of cyclical farming was finally launched in Mureck. Premiered on August 1987 at a ceremony held to mark the pilot phase in Silberberg, Fred Strohmaier's Oil Field Saga (see page 36) contains just what we people need in order to stop using fossil fuels and turn to renewable energy instead. After all, there is no alternative to taking this step.

We have always kept local people in the region and many other interested parties far and wide beyond the borders of Styria honestly and systematically informed about the production and necessary use of renewable forms of energy. More than this, we have asked them to join us in implementing the change.

As a result, Mureck saw the emergence of

SEEG Südsteirische Energie- und Eiweißherzeugung reg.Gen.m.b.H. (a cooperative producing energy and protein in southern Styria), Nahwärme Mureck GmbH (a provider of local heating to the Mureck area) and Ökostrom Mureck GmbH (an eco-friendly supplier of electricity) in the years between 1990 and 2004. The three service providers offer an integrated system for supplying bio-diesel, heating, bio-gas and eco-friendly electricity mainly from the raw materials of the region. Consequently, the region now uses these sustainable and clean sources of energy. As matters stand, the region is already set to be 100% self-sufficient in meeting its energy requirements by 2010 at the latest. It just goes to show that virtually everyone here in the Mureck region has come to accept the need for switching to renewable sources of energy even though fossil fuels actually cost less at times during this period.

An intact environment, security, added value and the resultant increase in local jobs represent values which are greatly appreciated by the people of our region. We owe the systematic launch and implementation of this project to the inspiring vision of former decision-makers in Styria and at national level, in particular of farming minister and Austrian vice-chancellor Josef Riegler, Styrian counsellor for farming Hermann Schaller, president of the Styrian chamber of agriculture Erich Pörtl, chamber supremo Dr. Heinz Kopetz and Dr. Gerhard Jägerhuber. The members, partners, officials and staff at Bioenergie

Mureck are highly dedicated in performing their work. The management board greatly appreciate the qualities of this conscientious team, which works enthusiastically each day to ensure the success of the utilities and create a quality environment for the people of the region.

17 years of SEEG, nine years of Nahwärme and the opening of the Ökostrom biogas unit are more than enough reason to celebrate with the general public at the 'First international climate-protecting-event' on September 01, 2007.

We will be introducing interested visitors to our exemplary model which can be replicated in many of the world's regions. Each inclusion of bio-diesel, heating, bio-gas and eco-friendly electricity into an integrated system is a vital contribution to the future.

We are extremely proud that of the 1,230 projects from 83 countries which were entered for the 2001 World Energy Globe Awards, Mureck Energiekreislauf was awarded first prize. The Climate Alliance municipality of Mureck was awarded the European Solar Prize in 2006. We are very proud to have received this award.

Let us now join together in taking this message out to the world and ensure we have many imitators, because after all, it is the only way to ensure we can look forward to a peaceful, sustainable future.

*Karl Totter, chairman of the SEEG management board
Karl Totter jun., SEEG management board
Josef Reiter-Haas,
chairman of the SEEG management board
Gernot Breitenhuber, SEEG management board*

Bringing self-sufficiency to the region with renewable sources of energy!

Experience the future now by discovering that a self-sufficient energy loop really can work quite separately from a conventional supply of energy. It all began at 30 December 1985, an idea someone came up with down the pub.

How to take personal charge of electricity, heating, fuel and fertilisers. How to become independent from the world market and all its risks by meeting your personal requirements with raw materials from the local region. That's what they were talking about down the pub. Just 15 years ago.

SEEG chairman Karl Totter and some of his friends wanted to take charge of the region's development and reduce its dependence on the vagaries of the world market. 'Let's keep our work and money in Europe!' they thought. And it turned out that many other people in the region increasingly thought it was actually a very feasible idea – not some half-baked



The executive board and governors of SEEG Mureck setting the cornerstone for a forward-looking project back in the founding year of 1989. That's what they were talking about down the pub. Just 15 years ago.

scheme hatched down the pub. If they hadn't, the idea would never have got off the ground. Today, the pioneers of self-sufficiency for the region through renewable sources of energy have provided local people with a feeling of security. That, too, we regard as a form of civil defence!



Thought up once, ...
... thought out again, ...

World supplies of crude oil will peak before 2010 before falling off by 2-3% each year thereafter. That means a fundamental break with the developments of the past 150 years, because up to now the world supply of crude oil has increased in line with growing demand. Yet while supplies of crude oil will become scarcer, world demand for the commodity is surging. In Austria alone the consumption of crude oil went up by 10% from

2000 to 2002. These developments will lead to a destabilisation of oil prices and national economies which will have the most severe impacts on countries with the greatest exposure to crude oil and natural gas as a result of their liberal energy policy. A liberal energy policy has no place in responsible measures to safeguard our future, because the market only signals future energy shortages when it is far too late for a counter-strategy to prove effective.

The most important counter-strategy is to drive forward the development of renewable sources of energy together with flanking measures to boost energy efficiency and energy-saving.

Heinz Kopet
President of the European Biomass Association

... in fact, thought right through!

An all-round business

The Mureck energy cycle boosts the regional economy!



Rapeseed

Used cooking oil

Bioheating

Bioenergie Mureck
End user

Electricity

Biogas

Benefits and sustainability:

- Environmental dividend:
- Security:
- Convenience:
- Added value:
- Operating performance
- Quality of life:
- Jobs:

- 45,000 to of CO₂ saved each year
- secure provision of energy even during times of crisis
- fully automatic, no dust, odour or noise
- biodiesel: 10m litres
- local heating : 8,500 MWh.
- eco-electricity : 8,400 MWh.
- lasting production for soil, water and air
- 20 permanent local jobs
- 25 permanent jobs with contractual partners
- plus permanent jobs at surrounding farms through production and supply of raw materials

Building up powerful shared values

The path to the joint development of the former border region of Mureck was clear right from the start and systematic progress has been made over the years.

From the very start progress was made down the path to the joint development of the former border region. The basic idea was to open up new, promising sources of added value with united forces from the region itself. That could only work by placing the entire region in the centre of attention right from the start. And this is also why SEEG possesses a very special structure with its 580 owners.

The resolute determination to act on a joint basis is not only revealed in the ownership structure, or in dealings with customers and regional suppliers. The goal continues to be the optimum inclusion of existing structures for the mutual benefit of all.

After SEEG won the 2001 World Energy Globe Award and proved that the sustainable energy supply of a region is already possible now and not tomorrow, Mureck again pointed the way forward with its bio-energy beacon, a sign that peace is safeguarded in the region.



Chamber of industry president Gady, president Pörtl, regional counsellor Schaller, farmer's federation director Molterer, MP Kowald breaking ground at the 'house' where the bio-diesel production was born in Mureck.

This project was completed by Styria's vocational school in Mureck, with the bio-diesel fuelled fire provided by a different local company each year. It is very much a community-driven project. The outer part of the beacon features four notions of nature, energy, region and peace. These four words reveal the core values behind the vision and implementation of Bioenergie Mureck.



An exemplary eco-social model

'Are we just going to make it or are we heading for certain disaster?' – Germany's former minister of employment Norbert Blüm asked this question about the current prospects for mankind. Indeed, the 'civilisation of despoliation' we now see practised across the world on man, nature and limited natural resources has no future. And an increasingly propagated and practised 'civilisation of egoism' – 'meanness is magic' – holds out

little prospect of lasting peace. There is an alternative: the 'real utopia' of the 'global Marshall Plan for a worldwide eco-social market economy' as a European initiative is currently gaining enormous ground. Its goal is to pursue a twofold strategy. First, fair development chances for all through the efficient funding of UN development goals (e.g. through minimum levies payable on global transfers of capital).

Second, a fair market economy for all through a worldwide eco-social market economy (i.e. the implementation of binding ecological and social standards throughout the world in all global institutions – WTO, UNO, World Bank, etc.)

Dr. Josef Riegler

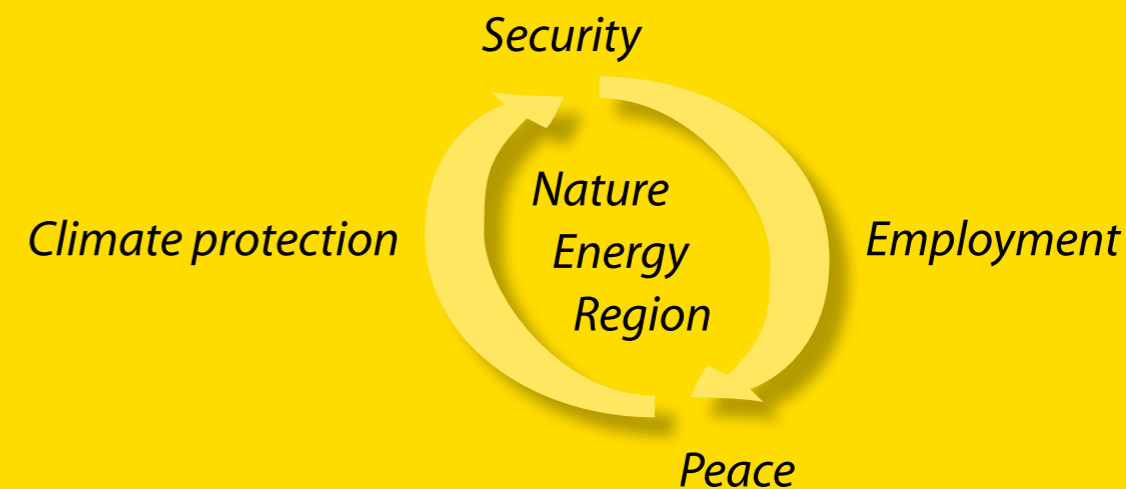
A secure and sustainable energy supply ensures social stability

Pointing the way forward

A regional supply of energy offers security and quality of life



The Bioenergie Mureck beacon as a clearly visible symbol of peace through the safeguarding of local energy supplies.



21st century man must be prepared to learn once more from nature, to live with nature and to use natural resources with great care. In the long term, the sun is our only risk-free provider of energy and nature our energy reservoir. We must use her carefully if our energy cycle is to work. Our region is where we live and work,

and our priority concern must be to push for the further development of joint, regional cycles of added value. A region must be able to finance itself before it finances other regions. A secure, stable and sustainable energy supply in the region is a guarantor for peace!

Producing sustainability in the cycle of nature by using renewable sources of energy

Clear structures

Thanks to clear structuring in its ownership and management fields, Bioenergie Mureck can operate as an efficient, cost-saving energy provider. And it can do so whatever the form of energy!

Ownership structure

Seeg

reg.Gen.m.b.H.

Approx. 580 farmers
Local authorities
Manufacturing companies
Waste disposal federations

Nahwärme

Ges.m.b.H.

SEEG
2 farmers

Ökostrom

Ges.m.b.H.

Nahwärme Mureck
7 farmers

Management structure

Seeg

reg.Gen.m.b.H. 1989

Chairman:
Karl Totter
Executive manager:
Gernot Breitenhuber
Production manager:
Heinrich Rossmann

Nahwärme

Ges.m.b.H. 1998

Executive managers:
Gernot Breitenhuber,
Karl Totter jun.
Production manager:
Herbert Leitgeb

Ökostrom

Ges.m.b.H. 2003

Executive managers:
Gernot Breitenhuber,
Karl Totter jun.
Production manager:
Wolfgang Sommer

Finance:
Waltraud Lederhaas
Controlling: Mag. Manfred Niederl
Senior Manager: ÖKR. Karl Totter

Clear areas of responsibility

A meticulously organised constellation of companies

Seeg

reg.Gen.m.b.H. 1989

- 570 members
- 10% bio-diesel from rapeseed
- 90% bio-diesel from used cooking oil
- 10m litres bio-diesel/year

Customers:

Farmers
Local authorities
Public and private transport companies
Freight forwarders and hauliers
Petrol stations

Nahwärme

Ges.m.b.H. 1998

- 3 partners (SEEG + 2 farmers)
- 7.5 MW rated output
- 250 customers
- 85% of total heating requirements in Mureck
- Costs per household:
1,000 kWh EUR 90 incl. VAT
15,000 kWh annual consumption
= EUR 1,350
- Connection costs for 10 kW
= EUR 5,000–6,000
- No financial grants currently available for connections

Ökostrom

Ges.m.b.H. 2003

- 8 partners (Nahwärme + 7 farmers)
- 1,000 kW rated output
- Use of waste heat from local heating (no heat loss)
- Power also fed into public grid
- Use of liquid manure, raw plant materials, maize, silage and glycerine phase of bio-diesel production
- 300 ha area for raw materials, 500 ha area for substrates used for spreading
- Start-up: February 2005
uar 2005

The company

The oldest of the three companies – SEEG – is a co-operative which constantly works to promote the interests of its members. Important business information (such as total sales, harvest yields, production volumes, but also visions for

the future, etc.) is communicated at the specially appointed general meetings. Held at least twice a year, they also act as a forum for formulating and discussing proposals and ideas.

The impact on the local economy

By meeting the energy requirements of the local population, the Mureck 'energy cycle' helps to tie down locally generated revenue to the region, thereby strengthening and boosting the local economy.

If over 85% of people in the Mureck region had continued to use heating oil as a fuel instead of opting to switch to renewable energy sources in the form of bioheating, they would have had to pay EUR 325,000 more in 2006 than they currently spend on the new local heating system. Unlike other regions, the Mureck population now has this additional money at its disposal. Imagine that the people spend this same amount of money on shopping in the region: it all helps to provide greater job security and closed added value cycles. Thus local heating plays an active role in regenerating the local economy. Furthermore, as a result of the high price of crude oil, the difference in price between biodiesel and fossil diesel also amounted to EUR 1.000,000. Altogether in 2006 a EUR 1.325,000 increase in purchasing power was obtained simply as a result of the savings gained from the decision to opt for sustainable products.

Regional economic growth through energy-saving measures



Forward-looking ideas bear fruit

Bioenergie Mureck has played a key role in the overall transformation of what was once a highly underdeveloped region. What makes its contribution so special is the fact that this development was instigated by the players themselves, without the aid of a major investor from outside the region or a powerful local energy utility. At Bioenergie Mureck, sustainability was characterised by the self-initiative, individual responsibility and personal commitment of the players right from the start.

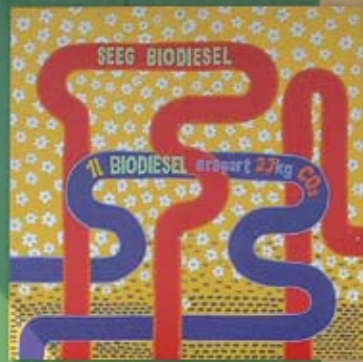
The company's activities have enabled capital flows from exports to circulate once more in the region and triggered a considerable programme of investments in the local economy. Until now, 20 permanent jobs have been created at the company. And as if that wasn't enough, jobs have also been created or at least maintained at local suppliers' – craftsmen, farmers and caterers, etc. A region has come to life again.

Only 4% of the population is made up of farmers, so it was clear that the specific form and usefulness of Bioenergie Mureck had to be conceived to include a far greater number of groups. After all, an idea can only begin to take shape if it has a groundswell of support in the region.

Sustainable development is particularly evident in the deliberate creation of structures and different ways people work with each other to achieve a common goal. Bioenergie Mureck shows a clear example of this in its organisational structure. SEEG has incorporated its 570 members from quite different fields into a cooperative. At Nahwärme Mureck, SEEG has teamed up with two farmers to run the company, and a further seven farmers enjoy co-ownership of Ökostrom Mureck.

Sustainable development can also be seen in the receptive and inclusive approach the project adopts to people. Nahwärme Mureck was jointly prepared and planned with local residents and the local authority. Even though the initial phase incurred extra costs for the population, 50% signed up to the scheme right from the start – today, that figure is fast approaching 87%. After viewing the facts and perspectives related to this development, local residents in Mureck have opted to go down the joint regional path to self-sufficiency in energy with Bioenergie Mureck. Their decision is now starting to reap dividends. Both biodiesel and local heating from cuttings are now far cheaper than fossil fuels such as heating oil or diesel.

Biodiesel



Mobil 2010

Reinforcing the idea of regional value

The building of the biogas system provides a good example of how sustainability is experienced in everyday life. Many operators of biogas units struggle to deal with objections of local residents at the planning permission stage or with complaints when the system goes online. But not at Bioenergie Mureck. In fact, the local authority in charge of negotiations was more than surprised when no-one turned up to take part in the public hearing. That was only possible because the Bioenergie management had systematically integrated local residents and the Mureck local authority into the planning process from the very start. As a result, the site of the biogas plant was changed at a very early stage of joint decision-making.

Bioenergie Mureck also assumes responsibility for tourism in the region. Each year some 6,000 visitors come to see not just the energy plants, but the region itself. And it was only thanks to the efforts of Bioenergie Mureck that one of the energy sites on eastern Styria's Energy Display Road was sited in Mureck, thereby attracting more visitors to the area. In both cases Bioenergie Mureck has helped to strengthen regional tourism. Its energy concept has been linked deliberately to the region's restaurants and local providers of specialities, with joint activities and campaigns being staged on a regular basis. A further project should see a sales outlet for special regional products being set up at Bioenergie Mureck. By doing

so, the company will be able to offer a source of information for other regional attractions and support local tourist establishments and restaurants. So another cycle is already starting to close.

What's more, the building of the biogas unit has been a major boon to the tourism industry, since it cuts down extensively on the unpleasant smell caused from spreading liquid manure in the fields.

The incorporation of the Mureck energy cycle into Styria's Energy Display Road has particularly opened up opportunities for regional tourism

Built in 2001, the Mureck energy venue provides visitors with an explanation of the Mureck energy cycle and is the region's energy filling station.



Systematic compliance with strict guidelines

Social guidelines:

- Enhanced quality of life. People can stay in the region they are proud of!
- Extensive information to enable local population to gain awareness of sustainable cycles in the region.
- Activities to be set and implemented on a joint basis (580 members of SEEG, Nahwärme and Ökostrom).
- Creation and safeguarding of jobs to give people another chance to stay in the region.
- Establishment and development of a theme in the region to provide orientation and renewed strength.
- Closer cooperation and networking of associations and companies (cooperation with schools and associations, e.g. fire brigade exercise at district level, bioenergy festival, biodiesel day, bioenergy beacon).
- Contribution to regional tourism (6,000 visitors to Bioenergie region Mureck each year).

Economic principles:

- 20 permanent jobs created within the company.
- 20-25 permanent jobs created for the collection of used cooking oil.
- 12 permanent jobs* created in farming for the supply of rapeseed 600 ha, raw materials for biogas (grass, maize) 300 ha and wood chips 730 ha forest for 11,000 srm (15 srm/ha/yr).
- EUR 22-26m investment programme (direct investments at Bioenergie Mureck: EUR 9.4m for SEEG, EUR 7.2m for Nahwärme, EUR 5.6m for Ökostrom, of which up to EUR 1.4m for all suppliers from Austria and EUR 5-8m of investments in the supply chain.**
- Maintenance work farmed out to local contractors (electricians, machine fitters, joiners).
- About 6,000 visitors go on a tour of Bioenergie Mureck each year, thereby helping the region to become better known and contributing to direct expenditure in the region (restaurants).

* According to the local chamber of agriculture's Grüne Berichte, procurement of raw materials requires 15 hours of work per ha and year and sustainable forestry 10 hours of work per ha and year.
** Assessment based on 0.3 to 0.5% added value, staff, type of utility (heating, diesel), indirect jobs (possible earnings in the rural sector), waste and energy costs avoided, investment volumes, life environment, contribution to tourism, stimulation of associations.

Impact on the regional environment

Bioenergie Mureck can make an important contribution to the environment due to the extensive implementation of its energy cycle in all key areas ranging from reduced volumes of waste and the prevention of local emissions to biodiversity.

Apart from the mandatory requirements to separate waste and use a mineral oil separator, Bioenergie Mureck has also adopted its own measures to enhance the environment:

- Incorporation of a bio filter to reduce unpleasant smells from the biogas unit
- Dust filter unit for reducing dust emissions from the biomass cauldrons

Environmental protection as the basis for a high quality of life



Integrative interplay of the cycles of nature

Products from Bioenergie Mureck actually enhance the environment

Air:

The priority aim of Nahwärme was to reduce emissions from domestic heating by introducing a wood chips-fired system with a textile filter unit. The decision was taken right at the start to opt for this more effective (though more expensive) variant for dust removal because of Bioenergie Mureck's resolute commitment to a sustainable energy cycle. The new system provides optimum relief to this problem. Use of bio-diesel also lowers emissions caused by motor vehicles, not to mention hazards such as major oil tanker accidents and emissions in the oil-producing countries. Furthermore, the creation of local jobs helps to reduce the volume of local traffic.

Climate:

On the basis of calculations, the region will be able to avoid completely the output of greenhouse gas relevant amounts of CO₂ with the switch to biodiesel and bioheating (and eco-electricity from 2005). Since there are a wide range of conflicting opinions and studies on auditing RME and its indirect CO₂ emissions, we have only indicated fossil CO₂ emissions which have been directly avoided. (These values must be lowered if indirect emissions for fossil and renewable sources of energy are factored in and the different efficiency of each system also included.)

Energy sources used by customers

	Vol. 2006	Energy content [kWh]	[kg CO ₂ /a]
Wood chips	11,085 srm	8.868,000	2.660,400
Biodiesel	8,739 t	97.320,650	29.196,212
Glycerine	3,874 t	23.244,000	6.973,200
Biomethane	2.100,000 Nm ³	21.000,000	6.300,000
Total		150.432,650	45.129,812





A pioneer on the road to zero emissions

Thanks to its collection system, SEEG ensured that 9000 t less of used cooking oil entered the local sewerage system each year.

Waste / wastewater:

The SEEG collection system has not only prevented the sewerage system and wastewater treatment plants from damage and therefore greater expenditure: it has also helped people to realise that important raw materials can be reused for a useful purpose instead of being thrown away. SEEG has adopted an operational waste management scheme that enables it to process the highest possible amount of reusable waste. Its own production activities do not generate direct waste since the ash from local heating is used as a fertiliser, residue from filtering used cooking oil for composting and rapeseed cake for animal feed. In future, all biogenic waste will also be used to provide energy directly in the bio-gas unit. Hence Bioenergie Mureck is well on the way to becoming a zero-emissions plant. Paper, plastics and metals are properly captured so that only a small amount of residual waste is incurred.

Soil / area requirements:

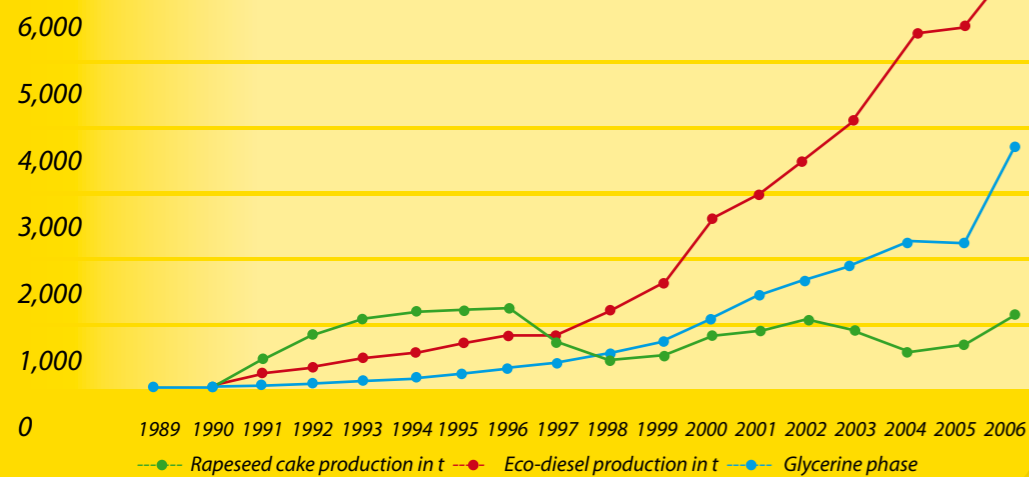
The cultivation of rapeseed has improved the quality and compactness of the soil, leading to improved crop rotation. By moving away from single-crop farming, Bioenergie Mureck has managed to allay a frequently raised concern of the local population. This new approach will be reinforced by the planting of new crops (such as Sudan grass) for the biogas unit. Up to 890 ha of fields have been used to grow rapeseed. The production of biodiesel has clearly helped to reduce the level of environmental risk. The raw material requirements of Nahwärme Mureck have helped to ensure that 750 ha of forest are managed on a sustainable basis and kept in good health. Improvements in crop rotation have also been achieved thanks to the recently built biogas unit, which obviates the need for extra fertilisation with liquid manure. What's more, bio-gas manure is kinder to crops and will eventually completely replace the use of mineral-based fertilisers. Apart from the liquid manure obtained from livestock farming, maize and green fodder are also used in the bio-gas unit.

Ecological benefits:

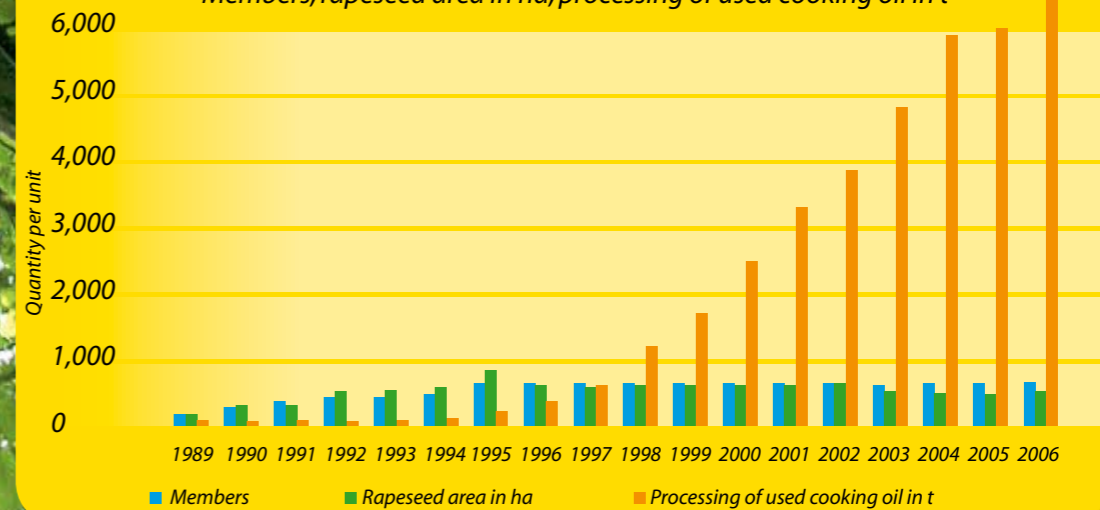
- Reduction of emissions through more convenient local heating instead of domestic fires – now even with reduced costs.
- Less traffic because more people can live and work in the region.
- Lower emissions from biodiesel compared with fossil diesel (soot, SO₂, fine particles).
- Reduction of environmental hazards (diesel 70% degradable, bio-diesel 99.6%).
- Reduction of climatically relevant greenhouse gases (only 15% indirect CO₂ emissions).
- Utilisation of forestry residues and waste wood from the sawmills.
- Less used cooking oil as problem waste in sewerage system and wastewater treatment plant.
- Biogas unit is set to bring more crop friendly fertilisation and improved crop rotation.



Rapeseed cake, eco-diesel and glycerine phase (GLP) production



Members, rapeseed area in ha, processing of used cooking oil in t



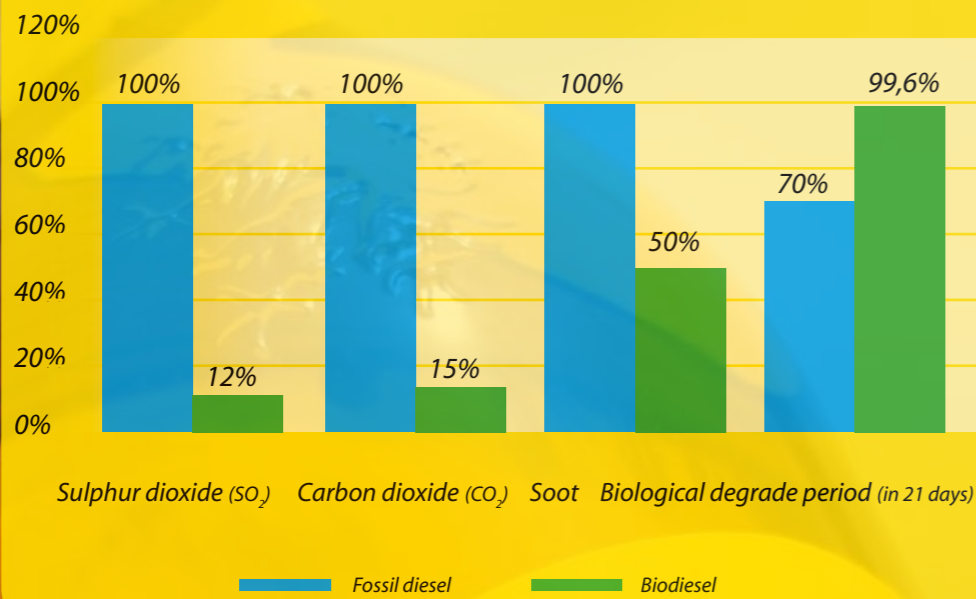
1991 witnessed the production of a modest 150 t of biodiesel – today, output has grown to the highly respectable figure of over 6,000 tonnes / year



From the field to the tank

Integrative interplay of the cycles of nature

Environmental benefits of bio-diesel



Plant-based energy for a clean future

The biggest challenge currently lies in the field of transport. Well over 90% of private motor vehicle owners are dependent on oil imports.

Particularly in rural areas, biodiesel offers a genuine alternative to fossil fuels – even though it is clear that biofuels alone cannot solve the question of a sustainable transport system. The central aim here is for the farmer to be able to open up a new area of business as a regional supplier of fuel. By doing so, he and the region become less dependent on the oil-producing countries and their instable prices.

While it is true that biodiesel alone is not the solution, it has become increasingly important for the region to strengthen its cycles and structures in order to reduce the volume of road traffic. One way to achieve this is to create jobs in the region, which is what Bioenergie Mureck has done. The Mureck bio-energy cycle has adopted a critical stance to large RME plants since they are unable to offer the benefits described here and because of the emergence of new dependencies through the necessary import of rapeseed oil, which stands in the way of a sustainable energy policy.

The EU biofuel directive (Directive 2003/30/EC) for the promotion of biogenic fuels aims to encourage the greater addition of biodiesel to conventional fossil fuel. In Austria, the directive came into effect in November 2004 together with the amended fuel directive. The goal of achieving a minimum admixture of 2.5% by October 1, 2005 and at least 5.75% by 2008 is an important incentive for using farm-made biogenic fuels.

Rapeseed improves crop rotation. The aim, therefore, is to enhance crop

rotation for biogas as well as for (green) fodder and food. Due to the nine months it spends in the soil and its system of deep roots, rapeseed is actually ideal for this overall system of crop rotation, since it helps to relieve the strain on underground water. Rapeseed is used completely in Bioenergie Mureck's energy cycle: the oil is turned into fuel, glycerine energy is harnessed for local heating (soon it will also be used in the production of biogas) and as a complete fertiliser for improving the substrate, while rapeseed cake is a quality source of high protein fodder. Thus sustainability is experienced here in the form of cyclical farming. A biodiesel generator also provides emergency power to SEEG, Nahwärme and Ökostrom, thereby ensuring that the energy can indeed be supplied on a sustainable basis.

Up to 1,350 litres of biodiesel can be obtained from one hectare of rapeseed. About 800 ha of land is currently being used by SEEG's suppliers to grow rapeseed, leading to a production volume of some 1.08m litres of bio-diesel. In addition, some 140 litres of fuel are required to cultivate the rapeseed fields, meaning that 7,710 ha of fields can be cultivated from the current 800 ha. Put in another way and assuming an average consumption rate of 5 l / 100 km, this is the same fuel needed to travel 21.6m km, enough to meet the complete fuel requirements of 1,550 Austrian drivers or to drive around the world 491 times every year. In 2001, each car in Austria covered an average 13,900 km of road a year. (Source: ASFINAG)

Balance of energy in biodiesel production for the Biowärme Mureck system:

Energy deployed	
Total oil consumption for planting, harvesting, drying and transport	2,050 kWh
Processing of biodiesel (electricity, methanol, KOH)	2,450 kWh
Transport of finished products (biodiesel, rapeseed cake, glycerine phase)	350 kWh
Straw harvest	400 kWh
Total energy deployed	5,250 kWh
Energy yield	
Total energy generated (biodiesel, rapeseed cake, glycerine phase, others)	23,300 kWh
Resultant positive balance of energy	1 : 4,44

Production of raw materials
Farms

Biodiesel and rapeseed cake for farms

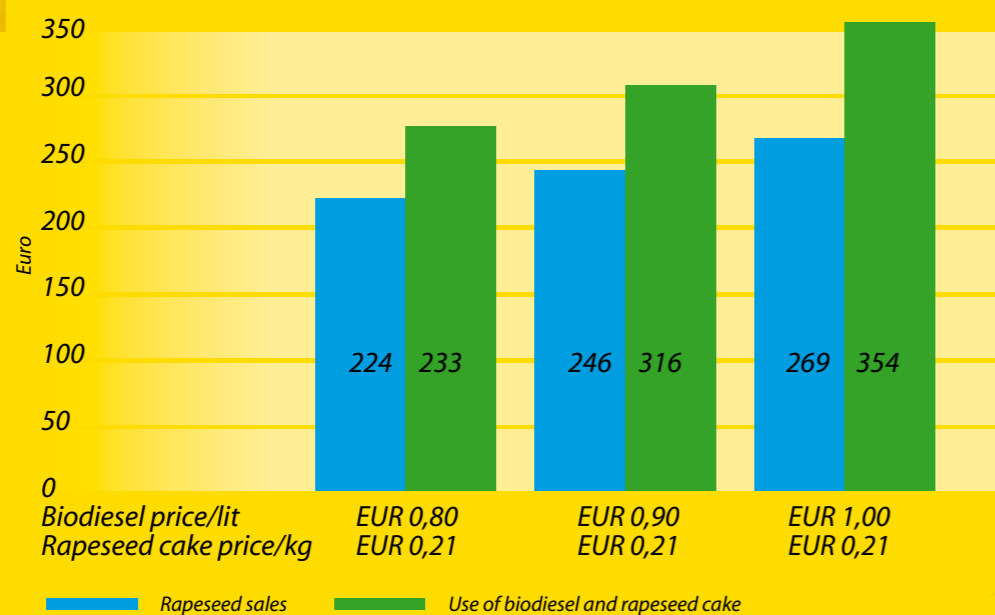


Drying and storing in the region's depots

The biodiesel system at SEEG Mureck

A regional cycle replaces raw material sales

Revenue from rapeseed sales and the use of biodiesel and rapeseed cake (per tonne of rapeseed)



Growing rapeseed and processing it into fuel has opened up completely new perspectives and sources of income for rural farmers.



Natural power for the horses of the 21st century

A critical observation

Converting rapeseed oil into biodiesel requires both methanol and energy. Converted engines can also run directly on rapeseed oil. While both statements are completely true, we also see a number of other RME benefits from using regional systems: biodiesel can be used in all standard diesel engines with relatively small conversion costs, but conversion for pure vegetable oil use is more expensive (EUR 3,000 – 4,000). Hence there are cost benefits at the moment from using RME. Initially, SEEG also intended that the farmers only use vegetable oil but given the third-party drying costs and high expenditure on storage and handling the farmers eventually decided to opt for a regional biodiesel system. In SEEG's overall concept, the by-product of transesterification – the glycerine phase – is used as a form of energy in the local heating and biogas unit. In future the system should be able to meet its own requirements for methanol. This means that the fossil methanol which is currently used will eventually be replaced by methanol made from sustainable sources.

Aspects of sustainability

Biodiesel can be said to make an indirect contribution to securing peace because it offers independence from the vagaries of the world market and the insecurity of the oil-producing countries. The use of biodiesel in motor vehicles leads to a reduction in the amount of most pollutant emissions (especially CO, HC, particles, and 50% less soot emissions). Furthermore, this fuel does not contain sulphur. However, the use of bio-diesel can also lead to slightly higher NO_x emissions, especially when engines are driven to their performance limits. The amount of fine particles in biodiesel is somewhat less than in fossil diesel, a point which is of particular relevance to the current debate.

Since biodiesel is rapidly biodegradable, it reduces the level of environmental risk particularly in sensitive areas such as water reserves, gravel ditches, ski slopes, etc. Avoidance of climatically relevant CO₂ emissions: biodiesel combustion leads to reduced direct greenhouse gas emissions caused by motor vehicles. There is considerable potential for achieving savings if the whole of the fuel manufacturing process is taken into account because the growing plant bonds with the same amount of CO₂

as is emitted during fuel combustion. To achieve the optimum reduction of the potential greenhouse gas effect when rape is grown, an environmentally friendly, fertiliser-intensive approach to crop cultivation must be adopted, with the by-products from the manufacture of biofuels (e.g. glycerine, animal feed) eventually being utilised for a sensible purpose. At Bioenergie Mureck almost all of the farmers run their tractors on bio diesel. If in future fully fermented bio gas manure is used for fertilisation and methanol is produced from the biogas, SEEG bio-diesel will then be obtained completely on the basis of renewable energy sources in the first balance cycle.

