

Short Company Profile

Business division

“CHP”

Combined Heat & Power Plants

Research institute for renewable energy

The Güssing Energy Technologies is a completely independent, private Non-Profit Austrian research institute that conducts basic and contract research in the field of renewable energy sources and the development of innovative mixed ware, as well as new processes and procedures.

Service in the energy sector

The Güssing Energy Technologies is your competent and loyal partner in the fields of energy and architectural engineering. Due to our years of experience we can offer our products and services at unbeatable price-performance ratios and determine the best economical and ecological solution for you.

Years of experience

The Güssing Energy Technologies has since its foundation developed a deeply ingrained network and is taking use of the generated knowledge in the form of simulation tools, databases and documentations. Countless selected reference projects show the desire of dissemination of the non-profit organization Güssing Energy Technologies.

Description:

The Güssing Energy Technologies GmbH (GET) has been re-named in 2009 and was funded as "Renet Güssing GmbH" in 2003 as a Spin-Off of the "Renet Austria Network". GET is based on two main pillars. One is R&D, mainly applied science, two is consultancy and engineering.

In the past GET carried out several feasibility studies for municipalities and companies to implement energy concepts and to provide energy from renewables.

The technological background is introduced by the experienced scientists, whose education is chemical engineering as well as architectural engineering on academic level.

The speciality of GET is to convert know-how, which has been generated by scientific work into usable products for industry, for example ToughGas, Winddiesel (production of diesel from surplus wind power) or mobile biogas (car fuel).

The GET is also implementing renewable energy facilities, e.g. CHP's, anaerobic digestion plants and purification. Therefore it holds 50% shares of a slovene company, which will erect and operate biomass based CHP's in Slovenia.

AREAS OF ACTIVITY

- Biomass
- Biofuels
- Biogas
- Synthetic gas
- Solar thermal heating/cooling
- Process engineering

Main Expertise: Biomass CHP's

Güssing Energy Technologies has been active under the name "Renet Güssing GmbH" since 2003. Previously ISG GmbH, resp. TB Koch carried out the design & engineering services necessary for the implementation and optimization, etc. of the technologies installed in Güssing. From 2003 to 2009 ISG, resp. TB Koch subcontracted the technical part of these projects to Güssing Energy Technologies. Renet Güssing GmbH changed its name in 2009 and merged with the staff of ISG GmbH and TB Koch. Thus, the Know How of the following areas are nowadays collected within Güssing Energy Technologies GmbH:

- Acting as "Owner's representative"
- Pre-feasibility & Detailed feasibility studies
- Basic Design
- Heat and material balances, detailed annual load computations, optimization components
- cost estimation
- Detailed economic assessments, dynamic economic simulation over the entire life cycle of a plant, sensitivity analysis, preparation business plan, identification investor
- Risk assessment
- Selection of Technologies (assessment of Rankine Cycle and available gasification plants and experiences from other CHP's worldwide)
- site identification
- route district heating grid, design of optimum DH grids, optimization temperature level
- Conceptual Design
- Detail Design, FEED, recommendation on site specific details (tie-in, etc.)
- P&ID diagrammes, instrumentation lists and details, ...
- application for permission (architectural, mechanical, structural, electrical design)
- Call for tender
- identification Turnkey Constructor
- Comissioning, detailed optimization
- implementation of detailed and overall control strategies
- implementation of fuel production into existing plants
- HSE, Risk assessment, operation aspects, etc.
- documentation As-Built Status
- setting up quality assurance biomass

- metering and fuel handling during operation
- Establishing R&D framework, definition R&D roadmap, establishing R&D cooperations
- organisation, participation & presentation on national and international conferences
- application for national and international calls (NER300, H2020, Interreg, SEE, Cornet,...)
- Know-How Transfer and consultancy with various international partners
- Project management, PR and presentations, as well as negotiations with the customers, clients and all other partners

During the past years Güssing Energy Technologies accompanied around 50 biomass CHP's and is aiming to install additional optimized CHP's around the world.

Besides these practical experiences Güssing Energy Technologies has been funded to further develop CHP technologies, Thus, a minimum of 60% of the annual turnover is dedicated to R&D projects.

Due to the relatively small size of Güssing Energy Technologies these R&D projects are carried out mainly as consortium leader of cooperative research projects. These partners introduce innovative concepts as outcomes of their long term fundamental research. Güssing Energy Technologies is combining these results with practical experiences and is transferring this Know How via applied research into new technologies, like demonstration plants, which becomes suchlike state-of-the-art. During the past years dozens of R&D projects have been carried out in cooperation with AIT, bioenergy2020+, Vienna University of Vienna and Graz, ofi, ASiC, PSI, University Maribor, DBFZ to name a few of the renowned partners of Güssing Energy Technologies.

To prepare new concepts and verify innovative approaches the effect of new system combinations is evaluated as first step via Process Simulation Environments. The experienced personnel of Güssing Energy Technologies developed detailed models within the past 10 years mainly for the environments EES, Matlab-Simulink, IPSEpro, ChemSEP, ASPEN, HYSYS, FE-UX, TRNSYS, Fluent, e!Sankey DEMS, SINCAL and T-SOL.

Detailed models are available for CHP's based on:

- fixed bed gasification
- back pressure turbine
- bleeding condensing turbine
- ORC
- ORC (split)

Construction works is conducted in ACAD, Inventor and SolidWorks

Control algorithms are programmed by GET theirself for their PDU in LabView, S7, and Raspberry.

Object-oriented coding for additional tools is carried out in VB, TurboPascal, PHP and C++.

R&D Projects CHP, DH grids and Biomass-to-Liquid

References in the field of CHP are shown in the reference list. To denote how knowledge from R&D is used as basis for improved design & engineering services just three selected R&D projects are briefly presented, which are beyond the current state-of-the-art of CHP's and district heating grid.

OPT-Polygrid

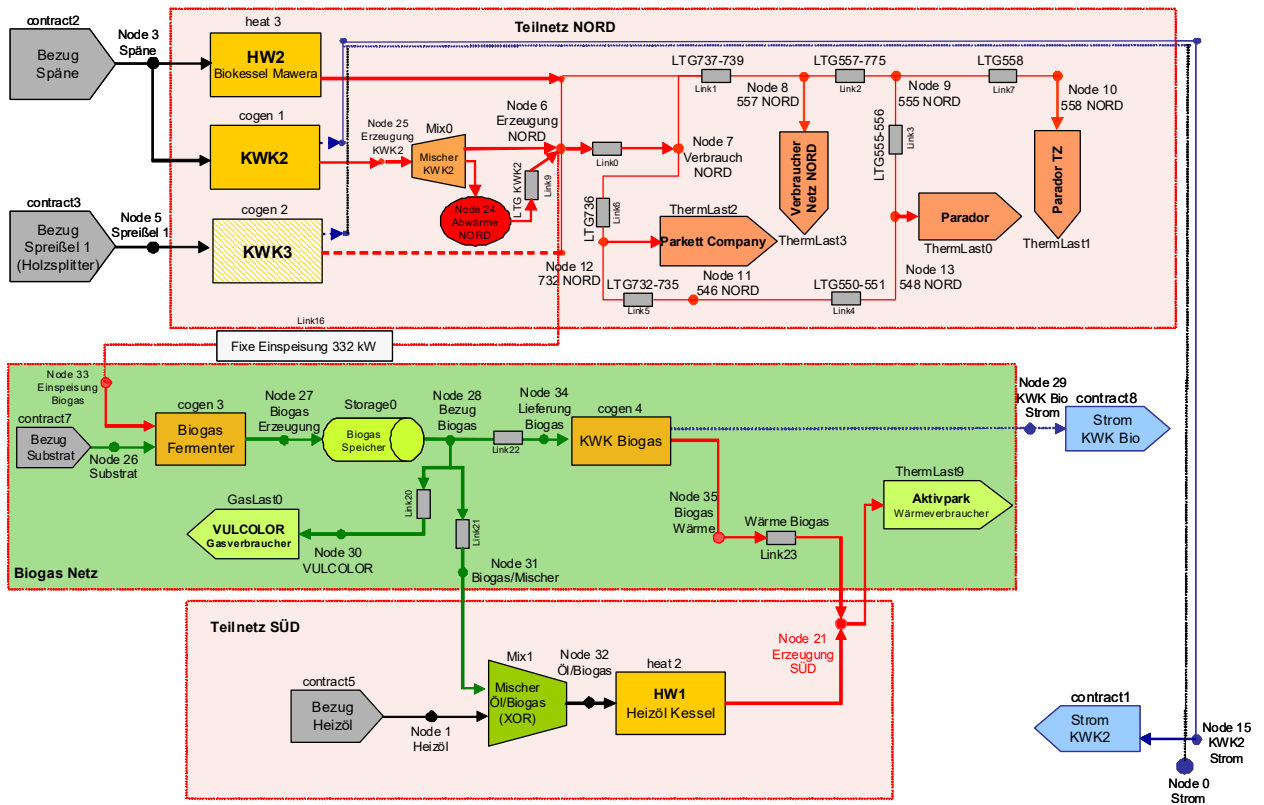


Figure 1: Güssing System with extension Biogas projected in DEMS/SINCAL

Figure 1 shows the final model of the combined technologies in Güssing, which have been the basis for optimization of the overall system. GET as lead partner developed this method in order to improve the efficiency taking into account 15-min intervals for real current load of the entire systems. After 5 years Siemens is now implementing this control strategy on a large scale in Germany.

NextGenerationHeat

This 3 years project is about 1 Mio. EUR and will be finished in 2015. Project dynamic network simulation is currently applied to develop, evaluate and test concepts for the economically and ecologically optimized supply of space heating and warm water, by means of district heating, to passive and low energy buildings at the example of four case studies. These concepts are based on low supply temperatures thus allowing to exploit currently unused (renewable) energy sources and to reduce heat losses and investment costs. GET is further developing existing standards in DH networks and attached consumers and producers.



Ref 1	Project Title		CHP-I Güssing					
Name of legal entity	Country	Overall project value (EUR)	Proportion carried out by legal entity (%)	No of staff provided	Name of client	Origin of funding	Dates (start/end)	Name of partners if any
GET	AUT	€ 20.000.000,00	8	6	BKG Güssing GmbH & Co KG	private & various national and international research programmes	2001 - 2013	Vienna University of Technology, PSI (Swiss), etc.
Detailed description of project						Type of services provided		
<p>The Güssing Gasification plant is the first gasification plant worldwide, which is reliable in operation. Currently more than 80.000 hours of operation on gas engines can be proven. The project started in 1999, when Renet Austria was funded to demonstrate the knowledge developed by fundamental research of Vienna University of Technology. Austrian Energy & Environment erected the plant in 18 months (6 months Design & Engineering, 6 months erection and 6 months of start-up and optimization). 2003 the operation was that stable, that various national and international research carried out (more than 30 until 2013).</p> <p>The main focus was on further development of synthesis gas applications. In 2009 the Technikum near the Biomass gasification plant has been erected. This is the only location worldwide, where real synthesis gas is available for experiments. The gas is extracted at the biomass gasification plant and conveyed to the Technikum, where the headquarters of Güssing Energy Technologies is located.</p> <p>Up to now various products have been generated from synthesis gas. Natural Gas is produced via the methanation plant. This demonstration plant have been the basis for the commercial plant in Göteborg, which is generating Natural Gas from Biomass.</p> <p>The next technology transferred to the state-of-the-art is Diesel and Kerosene production via Fischer Tropsch synthesis. Other approaches aim to produce Dimethylether, Hydrogen, Mixed Alcohols and other products from synthesis gas.</p>						<p>Pre Feasibility Feasibility Study Selection of Technology (assessment of Rankine Cycle and available gasification plants and experiences from other CHP's worldwide) Conceptual Design Detail Design Call for tender Comissioning Optimization Establishing R&D framework local part of Methanation project (total Budget 8 Mio. EUR) Winddiesel (current project 1 Mio. EUR) detailed optimization setting up quality assurance biomass metering and fuel handling during operation (2002 - 2013) establishing R&D cooperations (California, China, Cook Islands, etc.) organisation, participation & presentation on national and international conferences application for national and international calls support R&D roadmap Know-How Transfer and consultancy with various international partners</p>		



Ref 2	Project Title		Optimized CHP systems					
Name of legal entity	Country	Overall project value (EUR)	Proportion carried out by legal entity (%)	No of staff provided	Name of client	Origin of funding	Dates (start/end)	Name of partners if any
GET	AUT	€ 140.000,00	97	4	Austrian Research Promotion Agency	National Austrian fund	2006 - 2008	Prof. Hofbauer (VUT)
Detailed description of project						Type of services provided		
<p>Analysis and presentation of representative biomass CHP systems with an electric power output of less than 2 MW limited to Rankine Cycle technology. Variation of parameters and identification of optimized interactions between specific units. Identification of the economically and thermodynamically most optimized interconnection based on state-of-the-art technologies.</p> <p>The unit operations of these processes are representing the state-of-the-art, which doesn't unconditionally implement, that the entire plant represents the state-of-the-art. For example the experience in operation with steam turbines is little, or opportunities to optimize the process are missed in some cases. Representative facilities have been identified and presented, to provide a basis for the examinations. The focus of this study is on the optimization of existing processes with regard to thermodynamic issues and to point out the required border conditions for an economical operation as well as to identify alternative unit operations to increase the efficiency of these power plants.</p> <p>40 power plants in Austria have been examined to identify 4 key technologies, which have been compared and optimized via a detailed technical and economical assessment. The representative processes have been split into single units, whereas each of them have been examined detailed in order to improve the single efficiency of each unit. The so optimized single units have been combined again to create an optimized simulation model. This led to a comparable scenarios for each of this technology. During an extensive parameter variation under the current border conditions in Austria the feasibility to install further CHP's in Austria have been displayed clearly.</p>						<p>Basis of the investigations are annual load lines of the district heating systems and detailed process models, which are built within the Process Simulation Environment IPSEpro, resp. the equation solver EES. Input data for the simulation are detailed operation data, which are gathered during the project, for example the isentropic efficiency of steam turbines in the observed power range.</p> <p>The Basic Design of 40 Austrian CHP'S have been observed to identify 4 key technologies:</p> <ul style="list-style-type: none"> -) back pressure turbine -) bleeding condensing turbine -) ORC -) ORC (split) <p>The detailed design for these plants have been drafted to design comparable power plants. The single units have been iteratively assembled again and an extensive parameter Variation revealed the optimization potential of CHP's. Different design tools, like pinch point analysis for heat exchangers have been used.</p> <p>As main outcome the detailed economic assessment made these different technologies comparable to each other. Effects on thermal load, power or heat driven are getting more clear with the outcomes of this study.</p> <p>At an international conference the outcomes have been presented to the respective stakeholders in this field.</p>		



Ref 3	Project Title		CHP-II Güssing					
Name of legal entity	Country	Overall project value (EUR)	Proportion carried out by legal entity (%)	No of staff provided	Name of client	Origin of funding	Dates (start/end)	Name of partners if any
GET	AUT	€ 9.000.000,00	7	5	Biostrom Güssing GmbH	private	2005 - 2009	GWT
Detailed description of project						Type of services provided		
<p>Another, not very popular plant in Güssing has been erected in 2005 to utilize sawdust for energy production.</p> <p>The idea is, to use the waste from parquette companies in Güssing to provide thermal and electrical energy.</p> <p>The thermal power of the CHP-II is 5 MW, the electrical power is 1.5 MW. An upside down burner is used to drive a steam boiler, which provides 10 t/h steam at 450°C, 27 bar.</p> <p>A bleeding condensing turbine is converting this power to combined heat and power or solely thermal power, according to the requirements of the district heating grid.</p> <p>A series of troubles ocured during design, erection and operation. In 2008 the steam turbine broke down, the manufacturer of this steam turbine went bankrupt and a replacment was hard to find.</p> <p>Another challenge concerned the integration into the district heating grid due to flexible requirements of the consumers.</p> <p>The integration in the grid, the optimization, repairs and the implementation of an overall control strategy for the entire combination of DH grid and connected power plants have been carried out by Güssing Energy Technologies.</p>						<p>Pre Feasibility Feasibility Study Selection of Technology Conceptual Design Detail Design Call for tender Comissioning Optimization detailed optimization setting up quality assurance biomass implementation of an overall control strategy documentation As-Built Status</p>		



Ref 4	Project Title		CHP Kocevje					
Name of legal entity	Country	Overall project value (EUR)	Proportion carried out by legal entity (%)	No of staff provided	Name of client	Origin of funding	Dates (start/end)	Name of partners if any
GET	SLO	€ 30.000.000,00	1	3	MELAMIN d.d. KOČEVJE	private	2011 - ongoing	Pomurske elektrarne d.o.o.
Detailed description of project						Type of services provided		
<p>The municipality of Kocevje (Slovenia) owns 1.500ha forestry area to be utilized for energy production.</p> <p>Due to the close location to Ljubljana the mayor of Kocevje aimed to establish a similar R&D project as in Güssing.</p> <p>The first step should be to replace existing fossil boilers with renewable energy.</p> <p>The largest consumer is the industry Melamin, which requires thermal energy at a temperature level of 160°C.</p> <p>Thus, CHP technologies based on Rankine Cycle are not feasible. Within the first step the integration in the existing system has been investigated.</p> <p>Secondly the basic design has been carried out to check, if fuel production can be combined with this system.</p> <p>Finally, a detailed design has been carried out to apply for NER-300.</p>						<p>Pre Feasibility Feasibility Study heat and material balances Selection of Technology Implementation of fuel production into the gasification plant Conceptual Design Detail Design Preparation NER300 application (HSE, Risk assessment, operation aspects, etc.)</p>		



Ref 5	Project Title		CHP ToughGas					
Name of legal entity	Country	Overall project value (EUR)	Proportion carried out by legal entity (%)	No of staff provided	Name of client	Origin of funding	Dates (start/end)	Name of partners if any
GET	AUT	€ 13.000.000,00	2	7	Austrian Reserach Promotion Agency	Public - climate and energy saving programme	2012-2014	Vienna University of Technology Reinhard Koch
Detailed description of project						Type of services provided		
<p>Economical and technological feasibility study of a reliable, tough and competitive air blown fluidized bed gasification CHP plant with minimum emissions. Based on the long term experience of the project partner the current state of the art is extended by the following innovative units and methods:</p> <ul style="list-style-type: none"> • novel bed material with low attrition and catalytic activity for low emissions • Development of a reliable feeding system, with a minimum of leakage with respect to low investment and running costst • optimization of the reactor design in order to minimize the investment costs • reliable gas cleaning system • Optimization to biological residues in order to reduce Austria’s CO2-emissions • cascadic utilization of RES, development of business model <p>The target is to utilize biomass residues, like straw, or municipal waste to produce a gas, which can substitute natural gas.</p> <p>A roadmap for implementation have been drawn up, as well as the outcomes of the detailed market study have been implemented in the detailed businessplan and R&D roadmap.</p>						<p>Pre Feasibility Feasibility Study heat and material balances P&ID diagrammes, instrumentation lists and details development of control system Selection of Technology Conceptual Design Detail Design of key components, like reactor, feeding system, gas cleaning cost estimation economic analysis R&D roadmap project schedule R&D and implkementation demonstration plant</p>		



Ref 6	Project Title		CHP Puconci					
Name of legal entity	Country	Overall project value (EUR)	Proportion carried out by legal entity (%)	No of staff provided	Name of client	Origin of funding	Dates (start/end)	Name of partners if any
GET	SLO	€ 7.000.000,00	3	5	internal project	Own funds	2010 - ongoing	Pomurske elektrarne d.o.o.
Detailed description of project						Type of services provided		
<p>Puconci is located close to Güssing and has been identified as first project for Pomurske elektrarne d.o.o. in 2010 in order to install a CHP.</p> <p>The public buildings are a rather large energy consumer and the connection dense of a prospective district heating grid in Puconci allow to install a DH systems for domestic heating purposes.</p> <p>The largest industrial consumer is KEMA d.o.o. producing materials for the construction industry.</p> <p>The project is fully developed, but since 2010 there was no progress due to the specific regulations in Slovenia. Utility companies, like Pomurske elektrarne d.o.o., which have been funded to install and operate such systems, require a license for the energy supply of the municipality.</p> <p>This needs a decree from the municipality council, but the decision has not been taken so far.</p> <p>The technical concepts includes the installation of a district heating grid, the replacment of an existing dryer at KEMA and the installation of an ORC CHP.</p>						<p>Pre feasibility Feasibility PR and presentations, as well as negotiations with the municipality Basic Design Detail Design Replacement dryer site identification heat and material balances different technologies detailed economic assessment preparation business plan identification investor selection of technology detail design preparation application for permission (architectural, mechanical, structural, electrical design) call for tender identification Turnkey Constructor</p>		



Ref 7	Project Title		CHP Ljutomer					
Name of legal entity	Country	Overall project value (EUR)	Proportion carried out by legal entity (%)	No of staff provided	Name of client	Origin of funding	Dates (start/end)	Name of partners if any
GET	SLO	€ 9.500.000,00	4	6	internal project	Own funds	2011 - ongoing	Pomurske elektrarne d.o.o.
Detailed description of project						Type of services provided		
<p>More effort than in Puconci have been introduced into the project Ljutomer. The target is similar, but the details have been prepared more extensive, as well as the largest potential consumers have been investigated much more detailed.</p> <p>This led to a very detailed simulation of the annual load line, which takes also into account daily load as well as the installation of buffer storage tank.</p> <p>There are 4 major industrial consumers located in the industrial area, whereas the existing boiler of a wood furniture procedure is scheduled to be implemented as backup / peak load boiler into the system.</p> <p>The largest consumer is Krka d.o.o, a pharmaceutical company, which is obliged to provide the thermal energy as steam at a pressure of 6 bar. A detail design has been prepared to tie-in the thermal energy of the ORC at a lower temperature level. Redundancies have been designed to assure a reliable operation during implementation of the ORC CHP.</p> <p>The logistics are designed very detailed and the negotiations about the plots of land are already finished.</p> <p>Losses and overall annual efficiencies have been computed rather detailed to prepare an optimum economic assessment.</p> <p>The investors are waiting to inject their money and the negotiations with the General Contractor are finished.</p>						<p>Pre feasibility Feasibility PR and presentations, as well as negotiations with the municipality Basic Design Detail Design Replacement dryer site identification heat and material balances different technologies detailed annual load lines meterings of consumers detailed economic assessment preparation business plan identification investor selection of technology detail design route district heating grid preparation application for permission (architectural, mechanical, structural, electrical design) call for tender identification Turnkey Constructor</p>		



Ref 8	Project Title		CHP Burgenland					
Name of legal entity	Country	Overall project value (EUR)	Proportion carried out by legal entity (%)	No of staff provided	Name of client	Origin of funding	Dates (start/end)	Name of partners if any
GET	AUT	€ 47.000.000,00	1	7	BEGAS	private	2003 - 2007	all renowned plant manufacturers at this point time
Detailed description of project						Type of services provided		
<p>In 2003 the Austrian Utility company BEWAG and BEGAS decided to benefit from the lucky border conditions about biomass at this point in time in Austria, which means low prices for biomass as well as rather high feed-in tariffs for electrical power.</p> <p>Similar to the CHP's in Güssing they aimed to install several plants all over the county. In the first step the biomass logistics and availability have been checked, as well as larger consumer of thermal consumers have been identified.</p> <p>The Güssing Energy Technologies supported the owner during the important project phases, until the tender have been selected and the following plants have been realized:</p> <p>CHP Eisenstadt (Kirchäcker) CHP Oberpullendorf CHP Oberwart CHP Siegendorf CHP Rechnitz</p> <p>All of them are still in operation, 4 of them have been realized as ORC CHP, the biomass power plant in Oberwart has been realized as gasification plant. It is based on the experiences from the Güssing gasification plant, but is improved in many aspects. For instance, an additional ORC is integrated in order to increase the electrical efficiency up to 28%.</p>						<p>"Owners representative"</p> <p>Pre feasibility Feasibility Basic Design heat and material balances selection of technology recommendation on site specific details (tie-in, etc.) Detail Design support Conceptual Design (Mechanical, Structural, electrical, architectural) call for tender bid comparison selection turnkey constructor</p>		