Smart City – Good Practice

Energy, Climate and air quality, Research and innovation

"Model Güssing": a vision of energy self-sufficiency

Güssing, Austria

The City of Güssing: an example for sustainable energy supply

In 1990 the City of Güssing decided to put the vision of becoming 100% fossil fuel free and energy self-sufficient into practice [1]. About 15 years later the City generates twice the electricity demand of the city's private households, public buildings and industries and also about 85% of the heating demand is covered. Both have been achieved via decentralized local energy production using renewable sources available in the region (especially wood, biomass and solar) [2]. The set-up of new renewable energy facilities (e.g. biomass plants, district heating infrastructure) in turn attracted many companies as well as national and international research initiatives working in the field of renewable energy. Thus by and by Güssing not only became an example of best practices for the sustainable energy supply of a city but also a network for research on renewable energy technologies and eco-energy tourism [1, 2]. Subsequently the model has also been expanded to surrounding municipalities of Güssing, the overall region called "öko-energieland" [1].

Country/ City Profile

Country		City	
Population (2014)	8.6 million [3]	Population (2011)	4,100 (city) [2] 26,507 (district) [2]
Land area (km²)	83.9 thousand	Land area (km²)	49.284 (city) 485 (district)
GDP per capita (2014, current international $, at purchasing power parity)	46,164 [4]	GDP per capita / GDP per capita at purchasing power parity	n/a
Region	Central Europe	Region	Inland (47°4'N, 16°19'E)

City's physical geography		
	Location	✓ Located in the southern part of Burgenland, Austria's most eastern federal state ✓ Situated in a hilly, agricultural landscape ✓ Relatively low altitude (229 meters above sea level)
	Climate	✓ "Illyric climate" = crossover between Mediterranean climate, pannnonic climate and climate of the Alps ✓ Southern part of Burgenland: 800-1,000mm annual rainfall

Initiating context

In the late 1980's the district Güssing, including the City of Güssing, faced a lot of problems such as a lack of industry, a high rate of unemployment, bad traffic infrasturcture, small structured agriculture, a high portion of commuters and a high rate of out-migration [2]. Based on these issues during this period the district Güssing was also idendified as the poorest district in Austria, with money only flowing out and not remaining in the region [2]. In order to solve these economical problems, to strengthen the regional added value and to stop depopulation, the City of Güssing started a strategy development process [2] resulting in the decision to become 100% fossil fuel free and energy self-suficient [1] and subsequently implemented the "Model Güssing".

Project description

In reaching the goal of becoming 100% fossil fuel free and energy self-sufficient the "Model Güssing" originally relied on two main pillars [5]:

1) realizing the city's energy saving potential; and
2) implementing and expanding renewable energy infrastructure facilities based on renewable sources available in the region.

The energy saving potential has been mainly realized via energetically optimizing all buildings of the municipality. The resulting energy savings led to about a 50% cut in energy costs thus making more funds available for the city to be spent in realizing its vision [5]. Subsequently many new pilot projects on renewable energy sources – e.g. an innovative dual fluid gasification technology for the production of nitrogen-free producer gas [7] – have been constructed. Based on wood, sufficiently available in the region, a biomass power plant and district heating infrastructure have been realized. Also, a biodiesel site based on rapeseed oil has been constructed and photovoltaic cells have been installed [2, 5]. Setting-up new renewable energy facilities allowed the city 100% energy autarky as today. Based on the annual balance, more energy in the areas of heat, fuel and electricity is generated as it is used within the city [1, 5].

Gradually the two main pillars (energy saving, construction of renewable energy facilities based on renewable sources available in the region) have been extended to research activities and eco-energy tourism. Both have been induced by the pioneering task of Güssing in realizing energy autarky, thus attracting many companies as well as national and international research initiatives working in the field of renewable energy [1]. The attraction of companies has also been supported by a special programm developed to settle companies working in the area of renewable energies (offer of cheap energy) [6]. As a result Güssing hosts the European Center for Renewable Energy (EEE), which is coordinating and inducing important research projects (e.g. production of synthetic natural gas, production of synthetic liquid fuels) accompanied by the coordination of educational programes based on renewable energies [2, 5]. Also a Technology Center focusing on environmental technologies has been established, operating as a crosspoint for research, technology development and energy/environmental services [6].

Implementation process

The "Model Güssing" has been implemented as in a series of steps toward energy autarky. The table below summarizes the projects most important implementation steps and features.

Projects implementation details

Process/ Leadership

The process of becoming 100% fossil fuel free and energy self-sufficient has been driven by the strong political will to completely convert the city´s energy system. Initially led by the municipality of Güssing, the process has later been assissted by the created Europea Center for Renewable Energy (EEE) as well as the management of various facilities newly located within the city [6].

Main phases of the project development [2, 6]:

Step 1: Realizing the city's energy saving potential

Step 2: Construction of new renewable energy facilities based on renwable sources available in the region

Step 3: Attraction of many companies as well as national and international research institutes, resulting in the development of various research projects around renewable energy technologies and the creation of a new category of tourism: eco-energy tourism

Financing

Financing of projects came from the EU, the state of Austria, the federal province of Burgenland, the municipality of Güssing itself as well as from several companies involved . The table below gives an overview of the amount of investment costs and corresponding financing methods of specific renewalbe energy facilities build in the context of the "Model Güssing" [2].

Investment	[€]	Investment	[€]
District Heating Plant	**8.0 Mio**	**Steam turbine**	**4.5 Mio**
Subsidies (33%)	2,640,000	Liability of the town	14,000
Connecting fees (33%)	2,640,000		
Bank loan (Liability of the town)	2,720,000		
Biomass power plant	**13.5 Mio**	**SNG plant**	**9.5 Mio**
(financed by EU, Austria, Burgenland)		(25% EU, 25% Austrian government and province of Burgenland, 50% AXPO – energy supply company)	
Liability of the town	0		

Involved stakeholders

- ✓ Municipality of Güssing
- ✓ EU, Austria, Burgenland
- ✓ Companies working in the field of renewable energy
- ✓ National and international research institutes working in the field of renewable energy
- ✓ Citizens of Güssing

Results

The table below shows latest estimates (2010) for the energy balance of Güssing:

Energy balance – City of Güssing (2010) [2]

Total annual demand (2010)		Annual production of energy (2010)	
Heat (30 GWh private households)	**60 GWh**	**Heat** (4 biomass-district heating plants & 3 CHPs)	**56 GWh**
Electricity (8 GWh private house holds, 36.4 GWh industry, 7.5 GWh others)	**50 GWh**	**Electricity** (3 CHP plants)	**100 GWh**
Fuels (17.5 GWh private)	**29 GWh**	Since 2009 **Methanisation** (prod. synth. natural gas) **projected**	**8.4 GWh/a**

In regard to the annual balance, today the City of Güssing has become 100% energy self-sufficient as in total more energy in the areas of heat, fuel and electricity is generated as is used within the city [1, 5]. In addition to energy autarky, the "Model Güssing" also had positive effects on the city's CO_2 emissions which decreased significantly especially in the first years of implementation. CO_2 emissions in 1996 have been estimated as about 37,000 t/a. They decreased to about 22,500 t/a in 2009 [2].

Further co-benefits for the City of Güssing which have been achieved via the implementation of the "Model Güssing" are [2]: the project attracted more than 50 new companies, created more than 1,000 new jobs (netting € 9 Mio. a year), produced a total sales volume of energy €13 Mio. a year (2005), and consumed 44,000 tonnes of wood a year, etc.

Lessons learned

The success of the "Model Güssing" was especially based on the fact that it was an early iniative with a stong political will to completely convert the energy system and to achieve 100% energy self sufficiency and fossil fuel independence. This has been strenghtened by strong support of citizens as they saw an oppurtunity for the added economic value to remain in the region as well as an increase of employment. In addition assistance by the European Center for Renewable Energies and high publicity as well as the settlement of new companies attracted by the municipality contributed a big part in the project's success. The strategy of the "Model Güssing" can easily be adapted to other cities where resources available. However, barriers for multiplying the model may be the necessity of high subsidies and the effect of the strategy becoming more unpopular and less innovative for people and companies as new initiatives are not longer a "showcase example" [6].

References

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(accessed: August, 2015)

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