Pilot Region 6 Güssing-ökoEnergieland

Status Quo Report and Masterplan

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Status Quo Reports are contributing to AlpStore WP4, Action 4.2
Masterplans are contributing to AlpStore WPS, Action 5.2

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AlpStore Status Quo- and Masterplans:

**Status Quo Reports:** All subconsortia describe the regional situation in their pilot region concerning the current impact and future trends of hybrid, electric and gas powered vehicles, energy storage systems, smart grids and renewable energy sources - taking planned demonstration sites as representative examples and considering transnational opportunities (e.g. roaming with electric cars, cross border aggregation of flexibility of mobile storages).

**Masterplans:** All subconsortia develop holistic masterplans for their respective regions with the specific emphases listed in Table 1. The masterplans build on the overarching STORM principle as developed in WP4 (see Appendix). With the masterplans developed in WP5 decision makers in the involved regions are to receive long-range concepts to enhance their regional and municipal development planning. With many different types of regions being involved many other decision making and planning processes in the Alpine Space can be informed by these masterplans as blueprints.

**Table 1: Overview of AlpStore Status Quo- and Masterplans:**

<table>
<thead>
<tr>
<th>No.</th>
<th>Region</th>
<th>Specific Emphasis of Masterplan according Application</th>
<th>Resp. PP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>West Milan</td>
<td>IT EV fleet management and VPS, involvement of ESCO and PAES for efficient energy management</td>
<td>EU-IMP</td>
</tr>
<tr>
<td>2</td>
<td>Aosta</td>
<td>IT “AOSTA Valley Regional Energy Plan 2011-2020”</td>
<td>AOSTA</td>
</tr>
<tr>
<td>3</td>
<td>Lombardy</td>
<td>IT electric public transport integration of VPS long term plan (gas, PV) with sustainable mobility needs and storage opportunities</td>
<td>AGIRE</td>
</tr>
<tr>
<td>4</td>
<td>Alsace</td>
<td>FR fleet management with EV and fuel cell vehicles in office buildings</td>
<td>FRESH UTBM</td>
</tr>
<tr>
<td>5</td>
<td>Vorarlberg</td>
<td>AT small hydro pump vs. mobile and stationary battery storage, mass roll-out of EV</td>
<td>VLOTTE</td>
</tr>
<tr>
<td>6</td>
<td>Güssing</td>
<td>AT mobile vs. stationary use of biogas</td>
<td>EEE</td>
</tr>
<tr>
<td>7</td>
<td>Haslital Brienz</td>
<td>CH controlled charging with 2nd life batteries in semi-public areas (supermarkets)</td>
<td>KWO</td>
</tr>
<tr>
<td>8</td>
<td>Gorenjska</td>
<td>SI off grid situations of small mountain villages</td>
<td>UL RDA JEZ</td>
</tr>
<tr>
<td>9</td>
<td>Allgäu</td>
<td>DE integrated storage and mobility for public transport, electric car and e-bike charging infrastructure fully integrated plus energy houses</td>
<td>BAUM EZA</td>
</tr>
<tr>
<td>10</td>
<td>Ebersberg</td>
<td>DE managing biogas and wind energy in Ebersberg</td>
<td>BAUM FFE</td>
</tr>
<tr>
<td>11</td>
<td>Berchtesgaden</td>
<td>DE small hydro pump, pressed air storage in salt mines in Berchtesgaden</td>
<td>BAUM FFE</td>
</tr>
<tr>
<td>12</td>
<td>Ticino</td>
<td>CH Ticino RE Platform</td>
<td>USI</td>
</tr>
<tr>
<td>13</td>
<td>Liechtenstein</td>
<td>LI FL potential for RES in various settlement forms (masterplan focused on potential for RES in various settlement forms)</td>
<td>LIECH</td>
</tr>
</tbody>
</table>
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1 Summary

- 2-3 pages
- What is the essence of our Status Quo and Masterplan?
- Please provide a brief and concise overview.

2 The Pilot Region

The “ökoEnergieland” is an association consisting of 14 municipalities in the Güssing region. The district of Güssing with approximately 27,000 inhabitants is known as a region with low economy and a low developed infrastructure. The population in the ökoEnergieland communities is approximately 10,000. Since 2010 the 14 communities of the ökoEnergieland are partnered for the project named ‘Climate&Energy Model-region’.

These communities are: Güttchenbach, St. Michael in Burgenland, Tobaj, Güssing, Strem, Moschendorf, Eberau, Bildein, Deutsch Schützen (district of Oberwart), Heiligenbrunn, Großmürbisch, Kleinmürbisch, Inzenhof and Neustift/Güssing. The total area of all 14 communities is 319.17km². Nearly 50% of the total area is covered with forest, which is the most important resource there, followed by agricultural resources (corn, cereals, rape and sunflowers). The landscape is undulating and the communities are mainly located along the two main watercourses Strem and Pinka (Stremtal and lower Pinkatal). With approximately 2,200

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Güssing</td>
<td>3,742</td>
<td>4,931</td>
<td>1,950</td>
<td>2,080</td>
<td>901</td>
</tr>
<tr>
<td>2 Tobaj</td>
<td>1,433</td>
<td>5,814</td>
<td>3,341</td>
<td>2,144</td>
<td>329</td>
</tr>
<tr>
<td>3 St. Michael</td>
<td>1,031</td>
<td>1,837</td>
<td>606</td>
<td>478</td>
<td>753</td>
</tr>
<tr>
<td>4 Eberau</td>
<td>1,018</td>
<td>3,075</td>
<td>1,114</td>
<td>984</td>
<td>977</td>
</tr>
<tr>
<td>5 Güttchenbach</td>
<td>961</td>
<td>1,590</td>
<td>613</td>
<td>790</td>
<td>187</td>
</tr>
<tr>
<td>6 Deutsch Schützen - Eisenberg</td>
<td>1,117</td>
<td>2,844</td>
<td>899</td>
<td>1,279</td>
<td>666</td>
</tr>
<tr>
<td>7 Strem</td>
<td>944</td>
<td>2,377</td>
<td>1,002</td>
<td>666</td>
<td>709</td>
</tr>
<tr>
<td>8 Moschendorf</td>
<td>423</td>
<td>1,318</td>
<td>404</td>
<td>826</td>
<td>88</td>
</tr>
<tr>
<td>9 Bildein</td>
<td>328</td>
<td>1,645</td>
<td>428</td>
<td>1,080</td>
<td>137</td>
</tr>
<tr>
<td>10 Heiligenbrunn</td>
<td>842</td>
<td>3,351</td>
<td>1,303</td>
<td>1,915</td>
<td>133</td>
</tr>
<tr>
<td>11 Großmürbisch</td>
<td>272</td>
<td>790</td>
<td>427</td>
<td>240</td>
<td>123</td>
</tr>
<tr>
<td>12 Kleinmürbisch</td>
<td>254</td>
<td>429</td>
<td>179</td>
<td>229</td>
<td>21</td>
</tr>
<tr>
<td>13 Inzenhof</td>
<td>337</td>
<td>597</td>
<td>242</td>
<td>203</td>
<td>152</td>
</tr>
<tr>
<td>14 Neustift bei Güssing</td>
<td>521</td>
<td>1,148</td>
<td>543</td>
<td>250</td>
<td>355</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13,281</strong></td>
<td><strong>31,747</strong></td>
<td><strong>13,051</strong></td>
<td><strong>13,164</strong></td>
<td><strong>5,532</strong></td>
</tr>
</tbody>
</table>

Table 1: Basic data of the 14 ökoEnergieland communities
hours offers the region a numerousness of sunshine hours per year.

The district of Güssing has no link to any railway or motorway, which indicates the region as peripherally located area. First countermeasures have been taken five years ago by implementing the „Red Bus“, a public transport project, which links the ecoEnergyland communities with the town of Güssing. At the end of 2010 the service had been stopped because of a lack of subsidies from the federal government and the province government.

The bad infrastructure is one of the main reasons of the structural weakness in the area. The region can score with high quality of life (pristine nature, calm location, less traffic, gentle climate, keyword gentle tourism), however large companies and attractive SMBs are missed. This is one of the reasons for a high commuter proportion and an emigration, which leads to a further weakening of the area.

Figure 1: The ökoEnergieland (green) in the Austrian province of Burgenland

Figure 2: map of ökoEnergieland
In addition to these problems, existing resources (as previously mentioned 41% forest) were hardly used, while a huge capital outflow from the region for energy purchase had existed (oil, electricity, fuels).

In 1990, experts developed a model, which provided for a complete abandonment of fossil energy. The objective was to supply, in a first step, the town of Güssing and subsequently the whole district with regionally available renewable energy sources thus providing the region with new forms of added value. The model comprises the aspects heat generation, fuels and electric power.

First steps toward implementation consisted in targeted energy saving measures in Güssing. As a result of the energetic optimization of all buildings in the town center, expenditure on energy was reduced by almost 50%. Then, the realization of numerous demonstration energy plants in the town and the region helped to promote the implementation of the model step by step. Examples include the successful installation of a bio-diesel plant using rape oil, the realization of two small-scale biomass district heating systems for some parts of Güssing, and, finally, a district heating system based on wood fuel supplying the town of Güssing. Energy self-sufficiency was finally realized in 2001 when the biomass plant Güssing was installed; it relies on a newly developed biomass-steam gasification technology. The current degree of energy self-sufficiency in the town of Güssing is 80% in respect of heat and electricity (regarding private households, public buildings and industries on annual basis), this benefited the region an added value of Euro 8 million (calculation based on 2010 figures) per year.

Thousands of ‘green energy-tourists’ are coming each year to study the model of Güssing, fascinated by the idea of a decentralized energy supply. In order to combine the visitation of the demonstration plants with the places of interest in the Güssing region “The ökoEnergiedland” was founded in 2005.

All these activities have been coordinated by the European Center of Renewable Energy (“EEE”, founded in 1996) located in Güssing. It was on the “EEE” to make the next logical step to expand the Güssing Model to the district of Güssing. With this intention 2 studies have been worked out (“Energy self-sufficient district” part 1 and 2).

Bad financial basic conditions, a lack of interest and a low will of assertive was the reason for a development with two rates. Efforts in renewable energy have not been so successfully in the Güssing region as it would be expected and as it has been in the town of Güssing.

The model works optimally at the local level of the town of Güssing and should act as best practice for the southern part of the Burgenland province. The utilization of regional energy sources like forest and biomass is in the main focus. Furthermore the focus should be more on mobility, photovoltaic, smart grid solutions and energy storage, ecological house building and energy efficiency. Tapping the already existing potential leads to more regional added value (job creation, settlement of companies etc.)
To mention all these circumstances is also essential in order to describe the discrepancy between the success story of Güssing transported in media on the one side and the lack of measurements regarding energy efficiency, energy accounting, photovoltaic and information and public relation with the resident people on the other side. And exactly on those last mentioned points much work has to be done to pursue those objectives. Since 2010 all these efforts are elaborated in the framework of a national policy called “Climate & Energy Model Regions”. Meanwhile the ökoEnergieland is one of 106 Model Regions all over Austria.

Figure 3: Geographical expansion Climate & Energy Model Regions

With this initiative, the Climate and Energy Fund (State Ministry of Environment) supports regions that have made “becoming independent of fossil fuels” their prime target. This target is fulfilled by drawing on the regions’ own resources and by meeting energy demand with a smart mix of renewable energy generation, enhanced energy efficiency and smart controls.

Climate and Energy Model Regions are key instruments to reach the Austrian Government's target of becoming energy self-sufficient by 2050. Over the course of a year, the amount of renewable energy produced shall equal the annual energy consumption. A large network of well-established, interlinked and coordinated model regions is a suitable approach for this target.
For many years Austria has been acting as precursor in the field of energy regions. One of the most prominent examples is Güssing. Together with local pioneers in this matter, the Climate and Energy Fund has developed its strategy in a stakeholder process.

In order to cover the regional energy demand with the regional available resources in ökoEnergieland an action plan had to be developed based on the analyses in respect of the current energy balance (ratio between energy production and energy demand) The assigned priorities in this action plan are energy efficiency, energy saving measurements (thermal insulation etc.), extension of the energy production (local biogas grid, photovoltaic) as well as the establishment of a regional feedstock association in order to improve the availability of feedstock for future additional energy plants (there is still a big potential of unused resources).

In order to achieve these objectives the integration of stakeholders and decision-makers (community, companies, population, associations) is strongly recommended. By the activities of the model region manager the implementation of the concept will be fixed. By the European center for renewable energy Güssing the integration of regional energy companies and regional or extern research institutes is guaranteed and with the members of the ökoEnergieland association 14 municipalities are integrated. The integration of the resident population should be reached by different info-campaigns, internet-performances("ökoEnergieland–forum"), info-pages in community papers, study visit packages in the context of the green energy tourism, open council, energy round table and events (e.g. Energy day).

The pursued objectives in the ökoEnergieland action plan can be summarized as follows: to become energy self-sufficient in the fields of heat, electricity and mobility until the year 2020. Of course this is a very ambitious goal.

The first step consists of energy efficiency measurements (public buildings and private households), the establishment of a regional feedstock management association as well as the establishment of a construction and operation company.

The next step comprises a complete changeover of municipal streetlights to LED-technology and the implementation of photovoltaic plants (with the help of crowd funding).

The last and biggest step is the implementation of a regional biogas grid in order to supply those private households with heat, which have no grid connectivity to a district heating scheme. The implementation of this regional biogas grid implies a construction of additional biogas plants, an established feedstock management and of course an appropriate biogas storage infrastructure. The establishing of the regional biogas grid comprises also the implementation of gas filling stations, which are feed by the biogas grid. The gas filling stations will be provided with an upgrading unit in order to upgrade biogas into bio-methane as a fuel for transport.
Region 6 Güssing-ökoEnergieland
Status Quo and Masterplan

3 Status quo of Energy System

- 10 - 20 pages
- What is the situation today concerning energy production, energy consumption, concerning energy transmission/distribution and energy storage

3.1 Energy Production

3.1.1 Conventional Power Plants

There are no conventional power plants in the pilot region at all.

3.1.2 Renewable Energies

- Water
- Wind
- Photovoltaic
- Combined heat and power generation
Figure 5: Energy plants in ökoEnergieland

<table>
<thead>
<tr>
<th>Power plants</th>
<th>Number of units</th>
<th>Installed capacity in MW</th>
<th>production in MWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHP wood</td>
<td>2</td>
<td>3.7</td>
<td>24,400</td>
</tr>
<tr>
<td>CHP biogas</td>
<td>5</td>
<td>1.75</td>
<td>15,225</td>
</tr>
<tr>
<td>Photovoltaic</td>
<td>65</td>
<td>0.357</td>
<td>357</td>
</tr>
<tr>
<td>Hydropower</td>
<td>3</td>
<td>0.240</td>
<td>975</td>
</tr>
<tr>
<td>Wind power</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>∑</td>
<td>6,047</td>
<td>∑ 40,957</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: electricity production in ökoEnergieland (2012)

Combined Heat and Power generation:

The main focus of electricity production in the pilot region is on biomass Combined Heat and Power generation (CHPs). There are 7 CHPs (5 biogas plants, 2 wood biomass power plants) with a capacity of 5.45MW.
**Photovoltaic:**

With more than 1,800 hours of sunshine per year and a global solar radiation of 1.170kWh per year photovoltaic becomes a more and more interesting opportunity for a decentralized production of electricity. Currently 65 photovoltaic plants with a capacity of 357kW are in operation producing 357MWh electricity.

**Hydropower:**

There is only one river in the pilot region which allows the utilization of run-of-river hydropower plants. There are 3 run-of-river hydropower plants with a total capacity of 240kw with an annual electricity production of 975MWh.

**Wind:**

Since the average wind speed is the main contributor for wind power potential in terms of electricity production (the energy content of wind is raised with the cube of its speed, that means the eightfold of energy content by doubling the wind speed), wind power plays a minor role in the ökoEnergieland region, because the average annual wind speed here is below 3,5m/s.

From a technical point of view the utilization of wind power is possible with an average annual wind speed of 4m/s. Economic feasibility starts also with 4-5m/s.

Regular anemometry (= wind force at hub height – usually at 100m – measured in m/sec) is the first precondition for a detection of wind power aptitude zones.

![Figure 6: map of wind power potential in Austria – dark blue = below 3,5m/sec and yellow = 5,5 - 6,5m/sec. Source: www.windatlas.at](image)
Special Case - the town of Güssing:

On closer examination of renewable energy in ökoEnergieland the town of Güssing is an eye-catching sample. The community of Güssing is supplied by a biomass district heating scheme (4 biomass district heating plants, 22MW capacity, district heating grid with 35km), 3 biomass CHPs as well as by several photovoltaic plants and solar-thermal units. By utilizing the sun, woodchips (regional forests), waste wood (parquet floor industry), sawdust (parquet floor industry) and renewable primary products (agriculture) coming from the region it is possible to cover the total demand of heat and electricity in the private and public sector.
With the building of the biomass power plant in Güssing in 2001, increased efficiency was achieved in every aspect. The heat and energy is produced by using special wood gasification technology developed by the Vienna University of Technology. The specific characteristics of the generated gas realize the production of synthetic natural gas (BioSNG) and synthetic liquid fuels such as gasoline or diesel (BTL – Biomass to Liquid) and to use high temperature fuel cells. Today Güssing is recognized as a leading research center in Europe in the field of wood gasification and the production of 2nd generation fuels. The production of synthetic natural gas as well as the production of synthetic liquid fuels is confined to research and has no relevance in the energy balance.

In total there are 12 biomass district heating plants and 7 CHP plants in ökoEnergieland, in which the focus of biomass district schemes is too important to be ignored.

3.2 Energy Consumption

The total energy consumption of ökoEnergieland consists of extrapolated demand of private households, the energy demand of buildings and infrastructure in the property of the communities and the partly evaluated and partly by means of survey collected demand of agriculture and industry. Table 3 gives an overview of the current total energy demand itemized by demand groups and energy source groups in MWh per year.

<table>
<thead>
<tr>
<th>Demand group</th>
<th>Heat</th>
<th>Power</th>
<th>Transport</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Households</td>
<td>102.374</td>
<td>23.173</td>
<td>60.545</td>
<td>186.092</td>
<td>52%</td>
</tr>
<tr>
<td>Public</td>
<td>3.282</td>
<td>724</td>
<td>279</td>
<td>4.284</td>
<td>1%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>7.493</td>
<td>4.245</td>
<td>9.056</td>
<td>20.794</td>
<td>6%</td>
</tr>
<tr>
<td>Industry</td>
<td>55.693</td>
<td>57.045</td>
<td>37.141</td>
<td>149.880</td>
<td>42%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>168.843</strong></td>
<td><strong>85.187</strong></td>
<td><strong>107.020</strong></td>
<td><strong>361.050</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: total energy consumption itemized by demand groups and energy source groups (2010)

The pro rata strongest demand group is the sector of private households with 52% of the total energy demand, followed by the industrial sector with a share of 42%. For a more detailed illustration the evaluation has been split to the single communities of ökoEnergieland.
### Table 4: annual Energy Consumption of ökoEnergieland communities in MWh for all demand sectors (private households, public building, industry and agriculture), 2010

<table>
<thead>
<tr>
<th>Community</th>
<th>Heat</th>
<th>Electricity</th>
<th>Fuel</th>
<th>total per community</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bildein</td>
<td>4.050</td>
<td>1.122</td>
<td>2.728</td>
<td>7.899</td>
<td>2%</td>
</tr>
<tr>
<td>Deutsch Schützen-Eisenberg</td>
<td>13.557</td>
<td>3.789</td>
<td>9.448</td>
<td>26.794</td>
<td>8%</td>
</tr>
<tr>
<td>Eberau</td>
<td>11.216</td>
<td>3.174</td>
<td>8.104</td>
<td>22.494</td>
<td>6%</td>
</tr>
<tr>
<td>Großmürbisch</td>
<td>3.126</td>
<td>883</td>
<td>2.056</td>
<td>6.064</td>
<td>2%</td>
</tr>
<tr>
<td>Güssing</td>
<td>59.876</td>
<td>48.835</td>
<td>28.615</td>
<td>137.326</td>
<td>39%</td>
</tr>
<tr>
<td>Gutenbach</td>
<td>11.208</td>
<td>3.131</td>
<td>8.143</td>
<td>22.482</td>
<td>6%</td>
</tr>
<tr>
<td>Heiligenbrunn</td>
<td>10.496</td>
<td>3.084</td>
<td>7.744</td>
<td>21.324</td>
<td>6%</td>
</tr>
<tr>
<td>Inzenhof</td>
<td>3.886</td>
<td>1.007</td>
<td>2.531</td>
<td>7.424</td>
<td>2%</td>
</tr>
<tr>
<td>Kleinmürbisch</td>
<td>2.545</td>
<td>686</td>
<td>1.821</td>
<td>5.052</td>
<td>1%</td>
</tr>
<tr>
<td>Moschendorf</td>
<td>4.860</td>
<td>1.430</td>
<td>3.551</td>
<td>9.841</td>
<td>3%</td>
</tr>
<tr>
<td>Neustift bei Güssing</td>
<td>4.535</td>
<td>1.749</td>
<td>4.464</td>
<td>10.748</td>
<td>3%</td>
</tr>
<tr>
<td>Sankt Michael im Burgenland</td>
<td>12.396</td>
<td>3.453</td>
<td>8.729</td>
<td>24.579</td>
<td>7%</td>
</tr>
<tr>
<td>Strem</td>
<td>10.558</td>
<td>3.137</td>
<td>7.375</td>
<td>21.070</td>
<td>6%</td>
</tr>
<tr>
<td>Tobaj</td>
<td>16.534</td>
<td>5.071</td>
<td>11.712</td>
<td>33.317</td>
<td>9%</td>
</tr>
<tr>
<td>Total</td>
<td>168.843</td>
<td>80.552</td>
<td>107.020</td>
<td>356.415</td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>47%</td>
<td>23%</td>
<td>30%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.2.1 Business clients

- **large-scale consumer, > 100,000 kWh/a**

Since about 20 years there is an increase of more than 50 additional enterprises in the pilot region of ökoEnergieland.

In order to make a conclusion about companies energy demand and hence about economic activity in ökoEnergieland in general, it was necessary to access to companies data by class of business and number of employees.

A further source represents the analysis of the net energy adopted by class of business. The surveyed number of enterprises and its employees are an important factor for conclusions in respect of company’s productivity. The generated data of this survey are illustrated in the following table 5 itemized by class of business in MWh.
As can be seen from table 5 the focus of energy consumption is on heat (66,5GWh) followed by electricity (62GWh) and fuels (46,5GWh). The most energy-intensive sector (in respect of heat and electricity) is the production of goods followed by public health and welfare and agriculture and forestry. In respect of fuels (for transport) the most energy intensive sector is agriculture and forestry.

<table>
<thead>
<tr>
<th>Community</th>
<th>Heat</th>
<th>Power</th>
<th>Fuel</th>
<th>Total per Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bildein</td>
<td>1.228</td>
<td>608</td>
<td>1.076</td>
<td>2.911</td>
</tr>
<tr>
<td>Deutsch Schützen-Eisenberg</td>
<td>4.445</td>
<td>2.143</td>
<td>4.130</td>
<td>10.718</td>
</tr>
<tr>
<td>Eberau</td>
<td>3.706</td>
<td>1.798</td>
<td>3.626</td>
<td>9.130</td>
</tr>
<tr>
<td>Großmürbisch</td>
<td>1.022</td>
<td>499</td>
<td>820</td>
<td>2.342</td>
</tr>
<tr>
<td>Güssing</td>
<td>30.424</td>
<td>43.573</td>
<td>11.379</td>
<td>85.376</td>
</tr>
<tr>
<td>Güttenbach</td>
<td>3.653</td>
<td>1.758</td>
<td>3.621</td>
<td>9.032</td>
</tr>
<tr>
<td>Heiligenbrunn</td>
<td>3.798</td>
<td>1.847</td>
<td>3.712</td>
<td>9.356</td>
</tr>
<tr>
<td>Inzenhof</td>
<td>1.075</td>
<td>515</td>
<td>936</td>
<td>2.526</td>
</tr>
<tr>
<td>Kleinmürbisch</td>
<td>758</td>
<td>354</td>
<td>747</td>
<td>1.859</td>
</tr>
<tr>
<td>Moschendorf</td>
<td>1.629</td>
<td>831</td>
<td>1.607</td>
<td>4.067</td>
</tr>
<tr>
<td>Neustift bei Güssing</td>
<td>154</td>
<td>961</td>
<td>1.886</td>
<td>3.002</td>
</tr>
<tr>
<td>Sankt Michael im Burgenland</td>
<td>4.007</td>
<td>1.939</td>
<td>3.796</td>
<td>9.743</td>
</tr>
</tbody>
</table>
As can be seen from table 6 Güssing is the community with the biggest energy consumption in respect of business activity.

3.2.2 Private consumers and small-scale business clients

- consumption < 100.000 kWh/a

Households are a considerable energy user in ökoEnergieland with a share of 52% (as illustrated in Table 3). Basis for further calculations was data of „Statistik Austria“. The source of energy for the heat supply of households is illustrated in table 5.

<table>
<thead>
<tr>
<th>Energy sources</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>district heating</td>
<td>9,5%</td>
</tr>
<tr>
<td>natural gas</td>
<td>2,3%</td>
</tr>
<tr>
<td>fuel oil</td>
<td>30,6%</td>
</tr>
<tr>
<td>woody biomass</td>
<td>45,5%</td>
</tr>
<tr>
<td>pellets</td>
<td>3,1%</td>
</tr>
<tr>
<td>electricity</td>
<td>2,8%</td>
</tr>
<tr>
<td>heat pump</td>
<td>5,5%</td>
</tr>
<tr>
<td>others</td>
<td>0,8%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100,0%</strong></td>
</tr>
</tbody>
</table>

The source of energy for heat supply of households in ökoEnergieland is graphically illustrated in figure 7.
Wood is the most important energy source with a percentage of 45.5%.

The total heat demand of all households in the pilot region ökoEnergieland is (calculated based on the data of „Statistik Austria”) 102,374 MWh per year, in which the production of domestic hot water represents 15,868 MWh per year. This is a share of about 9%.

Up to 69.4% of the required heat demand of households is already supplied by renewable energy (geothermal energy, wood, pellets, solar energy). The remaining 30.6% of the required heat demand is produced by fuel oil. The annual oil consumption in ökoEnergieland is about 31,000 MWh.

The following figure illustrates the utilization of energy in households of ökoEnergieland. The figure shows that 46% of energy utilization is needed for room heating and 33% of energy utilization is needed for transport. The utilization for electricity and domestic hot water represents a lower percentage.
This allocation of energy utilization (nearly 50% for heat) shows the priority of required measurements.

The medium demand of energy in respect of an average household in ökoEnergieland is 37.5 MWh /a.

The following table illustrates the energy demand of an average household.

<table>
<thead>
<tr>
<th>Energy demand [MWh/a]</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat</td>
<td>20.6</td>
</tr>
<tr>
<td>Power</td>
<td>4.7</td>
</tr>
<tr>
<td>Fuel Transport</td>
<td>12.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>37.5</strong></td>
</tr>
</tbody>
</table>

Table 8: Energy demand of an average household in ökoEnergieland

### 3.2.3 Trends

The current demographic development allows the following trend: natural population decrease and emigration of young people (to Vienna) will lead to a slight drop of the population in the ökoEnergieland communities. Anyway there is a trend to decreasing households, which means that the number of persons per household is getting less. But this trend implies not necessarily a decrease of energy consumption. Quite the contrary: it can be generally
observed that per capita energy consumption is increasing while households are getting smaller.

Of course there will be a trend of rising energy efficiency measurements (e.g. thermal insulation) especially in the field of private households (since there are strong incentives coming from the Federal Government). But it cannot be excluded that energy consumption of private households will rise slightly and hence efforts regarding energy efficiency are not reflected in the energy balance.

The focus of energy consumption will generally remain on heat, followed by fuels (mobility) and power. It can be assumed that there will be an increase of renewable energy in the field of heat, since we expect a long-term rise in price of oil, which makes it less attractive to use fuel oil for heating – in contrast there will be an increase in using pellets, wood, heat pumps, solar thermal etc.

Concerning energy consumption in industrial economy there is a close correlation to a general development of economy, which could be observed very clear in the year 2009/2010. Due to the economic crisis and the regression in economic development in those years and hence some related measurements (e.g. short time work), a reduced energy consumption could be detected short term.

But also in the field of industrial economy the focus of energy consumption will remain on heat. The impact of efficiency measurements in this field is not expected to be that relevant.

3.3 Energy Transmission and Distribution

3.3.1 Power grid

- High-voltage
- Medium-voltage
- Low-voltage

Grid operator and property owner of the Burgenland power grid (and hence for the major area of ökoEnergieland) is Netz Burgenland GmbH. The power grid in the ökoEnergieland-communities Güüssing and Strem is owned and operated by Energie Güüssing GmbH, but in a close cooperation with Netz Burgenland GmbH. The power grid consists of high voltage-, medium voltage - and low voltage - power lines, by overhead lines as well as by underground cable.

High Voltage Power Grid:

Netz Burgenland Strom is operating its own 110kV high voltage grid with a length of ca. 620km. This grid is connected with the power grid of Austrian Power Grid (APG) in Neusiedl am See and Rotenturm (220kV and 380kV) and also in Neudörfl (110kV). Load distribution with the interconnection grid of APG is carried out at those exchange points.

All 18 substations of Netz Burgenland GmbH and further the 20kV Medium Voltage grid are supplied by the 110kV High Voltage grid. This High Voltage grid is controlled by the network control station in Eisenstadt and is operated by overhead lines and underground cables.
Medium Voltage Power Grid:
The 20kV Medium Voltage Power Grid (3200km length) is operated as radial distribution system and as loop network starting from the substations as well as from the distribution stations in order to minimize the losses on the relatively long transmission lines. The Medium Voltage Power lines are realized as overhead lines (wooden pole, concrete pole and lattice tower) and in densely populated areas as underground cables.

Branch connections in substations and distribution stations as well as important nodes are controlled by remote control from the network control station in Eisenstadt in order to minimize times of trouble-shooting.

Low Voltage Power Grid:
More than 158,000 customer installations are supplied with power by the 5,500km long Low Voltage power grid. Low Voltage power lines are realized as underground cables or overhead lines by wooden poles or roof poles (with insulated or none insulated cables).
Figure 12: Network map Burgenland (Source: Netz Burgenland GmbH 2011)

<table>
<thead>
<tr>
<th>Power grid</th>
<th>Overhead lines</th>
<th>Underground cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Voltage (110kV)</td>
<td>618,7km</td>
<td>10,5km</td>
</tr>
<tr>
<td>Medium Voltage (1-20kV)</td>
<td>1.878km</td>
<td>1.354,2km</td>
</tr>
<tr>
<td>Low Voltage(400V)</td>
<td>1.213,6km</td>
<td>4.300km</td>
</tr>
<tr>
<td>Total</td>
<td>3.710,3km</td>
<td>5.664,7km</td>
</tr>
</tbody>
</table>

Table 9: rounded length of the power grid (Source: Netz Burgenland GmbH 2011)

Facilities: (as at 30.09.2011)
- Substations (High Voltage/Medium Voltage): 18
- Distribution stations (High Voltage/Medium Voltage): 43
- Transformer stations (Medium Voltage/Low Voltage): 2.638
3.3.2 Metering points

In order to achieve energy and climate policy objectives the EU aims to modernize the current power grids into intelligent grids, so called Smart Grids, which are able to handle future requirements especially when it comes to decentralized injection of power. The implementation of Smart Meters is a first important step towards those goals. The required legal framework is regulated by the 3rd EU Single Market Package, which defines the goal to provide at least 80% of all customer installations with Smart Meter until 2020.

The legal framework in Austria is the Elektrizitätswirtschafts- und Organisationsgesetz (EWOG) and Gaswirtschaftsgesetz (GWG) and all corresponding regulations.

In Burgenland there are 190,000 metering points (Source: Netz Burgenland GmbH). 2012/2013 the Netz Burgenland GmbH is starting a pilot project in the communities Neufeld an der Leitha and Steinbrunn with the goal to implement ca. 200 Smart Power Meters and 20 Smart Gas Meter. Until the end of 2019 all private households should be provided with Smart Meters according to the law. The next milestone of Netz Burgenland GmbH is to change 10% of all meters to Smart Meters until 2015.

Until now (2012) there are 11 Smart Meters installed in the ökoEnergieland communities. These Smart Meters have been installed routinely in the course of new photovoltaic installations especially in the grid area of ökoEnergieland because there is no gas grid to consider in respect of metering. This procedure has been stopped so far for technical reasons (in order to wait for an updated version of Smart Meters).

3.3.3 (Smart) grid issues and development status

The last 5-10 years have been affected by enormous changes and challenges in respect of energy production as well as energy transmission. The 2 most relevant drivers in this development is the Energie Burgenland AG on the production and energy providing side and the Netz Burgenland GmbH on the transmission side.

The declared aim of Burgenland’s climate and energy policy is energy self-sufficiency in the field of power until 2013. This goal has been achieved this spring 2013 (112,6% of Burgenland’s electricity demand was produced in March 2013) thanks to the enormous extension of wind power in the last years.

But the Burgenland power grid is also one of Austria’s most reliable power grids. The average interruption duration in Austria is about 27,5 minutes, in Burgenland the average interruption duration is just 18 minutes.

To guarantee this high quality of supply large future investments in the Burgenland power grid are necessary especially in relation to a further extension of wind power. Currently wind turbines with a capacity of more than 250MW are under construction. Until 2015 there will be an installed wind power capacity of ca. 1000MW.

Burgenland’s power grid operator Netz Burgenland GmbH is investing annually 31 Million Euros for grid modernization and grid maintenance. In addition to these running expenses Netz Burgenland GmbH will invest another 84 Million Euros for grid infrastructure until 2015. Currently 11,3 Million Euros are being invested in the construction of the substation in An-
Netz Burgenland GmbH is coordinating and adopting its grid extension projects since 2008 with Austrian Power Grid (APG). APG is investing 1 Billion Euros until 2020 for the modernization of the Austrian interconnection grid. This is necessary for enabling the grid in respect of all renewable energy requirements. Core piece of this effort is the big Austrian 380kV loop, which still has to be finished in the area of Salzburg. This loop will enable grid operators to transport unused wind power from the eastern part of Austria (e.g. Burgenland) to western part of Austria, where the big hydro pump storage plants are in the Alps.

A safe and efficient transmission grid is the backbone of the Austrian business location and a fundamental requirement for the further expansion of renewable energies and the achievement of the Austrian and European climate protection goals.

The Master Plan Grid 2009–2020 was prepared by Austrian Power Grid AG as the basis for medium- and long-term grid planning. The foreseeable developments in the energy market in the period 2009 to 2020 were analysed in detail and the necessary expansion steps in the APG transmission grid were defined.

The results of all of the relevant calculations point at massive increases in grid loads up to 2020 and a pressing need for the further expansion of the APG transmission grid. This applies not only to the transmission lines in Austria but also to the cross-border lines.
The master plan projects, based on the grid load calculations, which need to be implemented by 2020 are:

- 380-kV Salzburg-line, project part 1 (St. Peter - Salzburg)
- 380-kV Salzburg-line, project part 2 (Salzburg - Tauern)
- Integration of wind energy in Burgenland
- Reinforcement of the grid to facilitate the integration of wind energy in the Vienna district and to cover consumption increases in Lower Austria
- Reinforcement of the grid in the Carinthia region
- Reinforcement of the grid connection to Germany
- Changeover of the Danube line to 380 kV
- Reinforcement between West Tyrol – Zell/Ziller

The necessary grid expansion measures require investments in the amount of approx. € 1 billion. The domestic value added created through these projects lies at approx. 80% - a contribution to the national economy that will secure more than 1,000 jobs per year up to 2020.

(Source: http://www.apg.at/en/grid/grid%20expansion/masterplan Austrian Power Grid website)

Figure 14: General Map of Austria’s High Voltage Grid operated by Austria Power Grid (Source: APG)
3.4 Energy Storage

- Units in operation and planned, market availability

- Biogas digesters and storage tanks
- Power-to-Gas (methane in gas grid)
- Power-to-Gas (hydrogen in gas grid)
- Power-to-Gas (hydrogen local)
- Chemical storage (zeolite etc.)
- Compressed air storage
- Pump storage (regional in Alpine Space)
- Pump storage (Scandinavia etc.)
- Thermal energy storage systems – High temperature
- Thermal energy storage systems – Low temperature
- Thermal energy storage system - Water
- Thermal energy storage system - Salt
- Thermal energy storage system – Materials like concrete, stones or sand
- Flywheels (small-sized)
- Flywheels (large-sized)
- Mobile batteries (electric vehicles)
- Stationary batteries

Biogas plants (anaerobic digestion plants):

Currently there are 3 anaerobic digestion plants in the pilot region ökoEnergieland (and 1 anaerobic digestion plant in the neighbor community Heiligenkreuz, which is not a member of ökoEnergieland)

Anaerobic digestion plant in Strem:

The plant is owned and operated by the „Biogas Strem Errichtungs- und Betriebs GmbH & Co KG“ and was put into operation in the year 2004. Aim of the project is the production of electric and thermal energy from renewable resources available in the region (energy crops such as grass, clover, corn, sunflowers). The thermal energy shall be fed into the local district heating network, the electric power - according to the feed-in tariffs of the green electricity law shall be supplied to the local power grid. The green electricity law supports and guarantees special feed-in tariffs for electricity produced from renewable energy sources. For a biogas plant of 500 kWel, the feed-in tariff (Austria) of 14,5 €Cent/kWh is guaranteed for 13 years.

Due to the reorganization of many farms from full-time farming to part-time farming, animal husbandry was reduced to a minimum extent. When finally animal husbandry was abandoned, grassland was no longer used and so arable farmland is lying idle now. Hence in the
surroundings close to the biogas plant there is enough farmland available to cultivate energy crops in a sustainable way while avoiding long transport distances.

The plant:

Bunker silo:
The bunker silo is filled with the according input material (grass and corn silage etc.) which is then packed and finally covered. So energy losses and emissions are reduced to a minimum.

- Total surface: 4,350 m²
- Storage volume/capacity: 15,000 m³
- Lane L/W/A in m: 75 x 14.5 x 3.5
- 4 Lanes: acid-resistant concrete asphalt

Feeding device for solids:
The feeding device for solids consists of a container unit and an automatic screw conveying system. From there the grass and corn silage is continuously fed into the main fermenter. The filling of the feeding device is carried out once a day by means of a wheel loader.
Storage capacity: 50m³
Alimentation: fully automated continuous alimentation via plug screw convey-
or with integrated weighing unit.
Input: 30 tons/day grass silage and corn silage
Annual input: ca. 11,000 tons/year

Main fermenter and second fermenter with integrated gasholder:
The fermentation takes place in round vessels made of reinforced concrete (main fermenter, second fermenter with gasholder for gas storage). The volumetric capacity of both ferment-
ers amounts to 1.500 m³ each. The fermenter is equipped with a heating system which guar-
antees the constant temperature that is necessary for an optimum fermentation process. The
heat is delivered by the CHP power station. Two horizontally lying paddle agitators inside the
main fermenter prevent the formation of sediment deposits and floating layers, at the same
time they help the biogas to escape. The biogas then is collected and transported via a pipe-
line to the gas storage system of the second fermenter.
Main fermenter: 1.500m³
Paddle agitator horizontal paddle agitator for efficient stirring of the input material engine
speed adjustable via frequency changer 5.5 kW operation fixed cycle-operation and slow-
running: automatic central lubrication
Second fermenter (1.500m³) with gasholder
Gasholder on top of the second fermenter, 2 layers membrane with storage capacity of 300
m³
230 m³/h Gas production
2,000,000 m³/a
55 % methane

Biological gas desulphurisation
After a certain retention time the substrate is pumped into the second fermenter. The residual
activity dissipates and the biogas is collected in the gasholder where it is biologically cleaned
(injection of oxygen) and subsequently conducted to the CHP power plant via an under-
ground gas pipeline.

Separation:
After an appropriate retention time in the second fermenter the fermentation residue (dige-
sate) is separated into a solid and a liquid phase by means of a separator. The remaining
solids (DS= dry substance of approx. 30%) are almost odorless, have very good fertilizing
properties, and can be directly spread on the fields. A small part of the liquid phase is re-
turned to the main fermenter in order to dilute the substrate, the rest is transferred into two
lagoons.
Final storage (lagoons 1 and 2):
The liquid fermentation residue is stored in two lagoons with a volumetric capacity of 2,000
m³ each (4-6 months). An integrated mixer homogenizes the input and prevents the for-
mation of floating layers. Finally this substrate is used as valuable fertilizer.
Gas utilization:
From the gasholder (on top of the second fermenter) the cleaned biogas is fed into the gas engine by buried pipelines and converted into electric and thermal energy in two Jenbacher JMC 312 GS-B.LC CHP power plants with an electric output of 500 kW and a thermal output of 535 kW.
One CHP power plant is in continuous operation, whereas the second engine is in stand-by mode. In case of breakdowns or maintenance works the processing of the biogas is effected by the second CHP power plant. Thus, the biogas plant can be operated throughout the whole year without any losses. A small part of the produced electric and thermal energy is needed for the operation of the plant, whereas the surplus power is fed into the public network. The surplus heat is fed into the existing district heating network of the Ökoenergie Strom GesmbH.

Anaerobic digestion plant in Güssing/Company Nudel Wolf:
The biogas plant of the Franz Wolf Ltd is a 500kW plant, in which organic substrates are being used to produce electricity and fertilizer by anaerobic digestion. At the same time, heat is being continuously accrued, which will be utilized appropriately. The agricultural fertilizer for the basic supply for the gas-production of the plant, is available by the liquid manure and solid waste of the agricultural poultry-keeping of the 40.000 laying hens and 13.000 breeding hens of the Franz Wolf Ltd. The agricultural enterprise Wolf commands about 160 ha agricultural production land for cultivated farmland. On average, 60 t of crops are being yielded, which is equivalent to 9,600 t/a.
The operation of the Biogas plant with the necessary input materials is fully guaranteed long-term by the agricultural enterprise Wolf.
Input material | Amount in t/a
--- | ---
Poultry manure(solid) | 1.216
Poultry manure(liquid) | 234
grass silage | 3.000
Maize silage | 4.150
Total: | 8.600

Utilization of the fermentation products as fertilizer:
The fermentation products of the gas-production plant are being added to the nutrient balance for the available farmland of the agricultural enterprise Wolf under good practical experience. Currently there are about 160 ha agricultural farmland secured and available, for the utilization of the fermentation products as high-quality fertilizer substitutes. These lands are available for the nutrient balance requirements for the gas-production plant without constraints. If needed, further contingents of land with nutrient balance requirements can become available by agreements with cooperating enterprises. Cooperating enterprises receive the products by their fertilizing and plant adequacy as well as availability of the nutrients, or cover their entire nutrient requirements with fermentation products of the biogas plant.

Concept of power and heat usage:
The produced biogas (approx. 270m³/h) is fed into 2 gas engines (MAN) with a capacity of 600kW. 500kW are injected into the public electricity grid by a fixed feed in tariff of 18.5cent/kWh for 13 years. The rest is used for the own electricity demand of the noodle factory. In order to guarantee a smoothly biogas supply of the 2 gas engines there is a biogas storage of 400m³. By conversion of biogas into electricity, heat is being decoupled from the exhaust gas and the cooling of the combustion engine and then fed into the hot water tank with hot water circulation distribution.
The heat gathered from the exhaust gas and cooling system (~ 95C) is being used in the digester of the temperature and process conduction of the gas-production plant, for the preparation of the service water for cleaning purposes and for heating the company building and the gas-production plant. Furthermore, the heat is being utilized for the noodle-production and to heat the chicken stables. The Franz Wolf Ltd. consumes more than 75% of the produced heat for its own production plant.
Anaerobic digestion plant in Tobaj (Martin Jautz Farming):

The biogas plant located in the community of Tobaj (5km from Güssing) was put in operation in summer 2012 by the farmer Martin Jautz. He is operating a cattle breeding with more than 200 cattle. Martin Jautz is cultivating its own arable land of more than 250ha. With the produced biogas (from grass and corn silage) he is supplying 3 CHPs with a total capacity of 750kW electrical output. Two of them are so called satellite CHPs located in two neighbor villages and supplied with biogas over a several kilometers long buried gas pipeline. The electricity of all 3 CHPs is injected in the public grid for feed in tariff. The heat is used for the particular district heating grids. In order to guarantee a smoothly biogas supply of all 3 gas engines there is a biogas storage of 800m³ nearby the plant in Tobaj.

Anaerobic digestion plant in Heiligenkreuz:

This plant is in the neighbour community Heiligenkreuz (10km from Güssing), which is no member of the ökoEnergieland association, but the plant plays an important part as a future provider of biogas for the projected biogas grid in the pilot region. The plant has a biogas storage with a volume of 2 x 1.500m³.

Overview:

<table>
<thead>
<tr>
<th>Biogas Storage</th>
<th>Volume in m³</th>
<th>Storage capacity in kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant in Strem</td>
<td>400m³</td>
<td>2000kWh</td>
</tr>
<tr>
<td>Plant in Güssing/Wolf</td>
<td>400m³</td>
<td>2000kWh</td>
</tr>
<tr>
<td>Plant in Tobaj/Jautz</td>
<td>800m³</td>
<td>4000kWh</td>
</tr>
<tr>
<td>Total</td>
<td>1.600m³</td>
<td>8000kWh</td>
</tr>
</tbody>
</table>

Table 10: Overview of biogas storage in ökoEnergieland

Thermal energy storage system – Water

As described in chapter 3.2.2 the focus of energy consumption (and hence also of energy production) in the pilot region ökoEnergieland is on heat. 12 biomass district heating plants are supplying privat households, public buildings and companies in 9 communities with heat.

In the last years it could be generally observed that more and more social housing buildings are supplied with heat by so called biomass micro grid installations. This system consists of a storage bin for woodchips, a small biomass boiler (normally approx. 300-600kW) and a thermal store unit in order to supply 4 – 8 apartments.
Currently 4 biomass district heating plants are provided with a thermal storage system. 3 of them are also provided with a solar thermal plant on the roof in order to produce hot water for grid. Especially for such plants thermal storage system is absolutely necessary. But also district heating plants without solar thermal plant are starting now to upgrade their plants with a thermal storage system in order to provide capacity during periods of peak demand (especially in the morning) and during off-peak times (especially in summertime it is very difficult to operate the biomass boiler).

**Biomass district heating plants with a thermal storage system:**

- **District heating plant Urbersdorf:**
  - Biomass boiler capacity 650kW
  - Grid: 2.7km
  - Connected households: 47
  - Solar thermal plant 340m²
  - Thermal storage system: 2 x 30m³

- **District heating plant Deutsch Tschantschendorf:**
  - Biomass boiler capacity 600kW
  - Grid: 1.1km
  - Connected households: 45
  - Solar thermal plant 350m³
  - Thermal storage system: 34m³

- **District heating plant Bildein:**
  - Biomass boiler capacity 1300kW
  - Grid: 5.2km
  - Connected households 90
  - Solar thermal plant: 450m²
  - Thermal Storage system: 38m³
District heating plant Strem:
Biomass boiler capacity 1000kW
Grid: 5km
Connected households: 100
Thermal Storage system: 50m³
(2/3 of the annual supplied heat are coming from the biogas plant in Strem with a thermal capacity of 550kW)

Biomass micro grid installations for Social housing:

The registered cooperative with limited liability “Kaiserwald” (chairman Johann Pammer) is currently operating 15 micro grid installations for social housing buildings with a total capacity of 1300kW in order to supply 162 households (apartments with 65 -100m² living space) with heat. Each micro grid system is provided with a thermal storage system with a capacity of 1.5m³ up to 3m³.
It can be assumed that several hundred thermal storage systems (0.5m³ - 1.5m³) are installed in private households of the pilot region ökoEnergieland in combination with biomass boilers or solar thermal panels.

**E-Mobility:**

As far as it was possible to find out the current status of E-mobility vehicles in the pilot-region ökoEnergieland here some numbers of e-bikes and e-vehicles:
- E-Bikes or pedelecs: 124
- Single track E-Vehicles (electric motorcycle and scooter): 9
- Electric vehicles (electric automobiles): 5
- Electric vehicles (two track e-mobiles like Scooter for elderly or disabled persons): 3

**Stationary batteries:**

Generally it is very difficult to obtain useful information in respect of stationary batteries. Due to the fact that there are no incentives (funding etc.) for a distribution of such systems and hence registered numbers of stationary batteries in operation it was necessary to make use of information which was provided by a local trader who is dealing with stationary battery systems in combination with photovoltaic.

Currently 15 units are in operation
- The storage capacity per unit is 9.6 or 19.2 kWh (average 14.4 kWh), so the total storage capacity is about 216 kWh (15 x 14.4 kWh)

4 Future Energy System

- 10 - 20 pages
- What will be the situation in the future concerning energy production, energy consumption and energy transmission and distribution

4.1 Regional Energy Production

4.1.1 Conventional Power Plants

No relevance for pilot region.
4.1.2 Renewable Energies

- **Water**
  The potential for hydro power plants is already exhausted and was very small anyway in the pilot region.

- **Wind**
  Due to the local wind conditions (see 3.1.2) no relevance in the pilot region.

- **Photovoltaic**
  It can be generally assumed that the number of installed photovoltaic units will rise in the next years also in the pilot region ökoEnergieland. This trend can be observed by the grid operator (responsible for allocation of metering points) as well as by the province government administration (responsible for notification of recognition).

![Development of installed PV units in Burgenland from January 2009 until May 2012 (Source: Netz Burgenland GmbH)](image-url)
Regional Energy Consumption

The 2010 National Renewable Energy Action Plan for Austria presents measures to achieve an increase to 34 percent, by 2020, of renewables as a share of gross energy consumption (in line with EU Directive 2009/28/EC). Compared to a reference scenario based on the data on energy consumption available up to 2009, final energy consumption is to be cut by 13 percent by 2020 in order to achieve the target. Sectors will contribute different shares to this goal. The largest contribution is expected from transport (−22 percent), followed by heating and cooling (−12 percent) and electricity (−5 percent). The directive’s implementation is a dynamic process, to a large extent controlled by the envisaged energy strategy of the Austrian Federal Government.

Austria ranks high in renewable energy consumption, mainly due to its high share in hydropower and biomass. It was among the four EU countries with the highest share of energy from renewable sources in gross final energy consumption in 2005 and amongst the Member States committing to the most ambitious national targets for 2020 (in Austria: 34%) under the EU Directive 2009/28/EC on the promotion of the use of energy from renewable sources. Since 2005 the share of renewable energy in Austria had grown continuously, reaching nearly 29% in 2008. The main driver for the growing contribution of renewable energy is the enhanced use of biomass due to strong incentives such as targets set by regulations, a long-term focus on research and development policies as well as subsidies.

Outlook

The objective of the (recently elaborated) energy strategy is the development of an energy system providing energy services to private consumers and businesses in the future while complying with EU climate and energy requirements (34% renewables, 16% reduction of GHG in the non-ETS sector). Achieving stabilization of final energy consumption (considered to be indispensable) is a major challenge for Austria.
According to recent national research papers, main challenges in the energy sector are achieving a higher rate of thermal refurbishment of existing buildings, a new approach to transport and mobility services and a higher rate of cogeneration and renewables in the production sector as well as future decision-making on energy supply and transformation technologies and increased public research funds for clean energies.

These measurements are also foreseen in the regional energy strategy planning for the pilot region ökoEnergieland. In addition to them the replacement of all conventional municipal street lighting systems by modern LED street lighting systems is a main goal in the regions efficiency projects.

The calculations in respect of energy savings are made in respect of energy sources and not in respect of demand groups.

The foreseen savings for 2020 in the pilot region ökoEnergieland (cumulated by all demand sectors as private households, public and industry):

- 10% reduction of power consumption
- 8% reduction of heat consumption
- 14% reduction of fuels (transport)

4.3 Transmission and Distribution Grids

4.3.1 Stressors for the Regional Power Grid

- High-voltage
- Medium-voltage
- Low-voltage

Please see 23 in chapter 3.3.3

4.3.2 (Smart) Grid Solutions

- Grid Operation and Automation
- Balancing Energy and Flexibility Management

In coming up autumn 2013 a research project named “Micro Grid Güssing” is starting. The project “Micro Grid Güssing” is funded by Austrian Climate and Energy fund (program: Smart Cities – FIT for SET)

Objective: The future energy industry needs solutions, which do justice to the challenges and possibilities of the increasing decentralized, urban renewable production. Micro-grids are self-contained regional energy systems, in which both the decentralized urban producer of
energy and consumers and lofts are connected. This innovative approach is complex and requires a comprehensive consideration and an interdisciplinary optimization. The complex presentation of problems should be treated in this smart city starting project. In the town of Güssing the requirements and the function of the Microgrid should be investigated via connection of producer, consumer, grid and storage facilities.

Project Partner: GE Austria, Telekom Austria, Energie Güssing GmbH, …

**Austria's contribution to the European Smart Grids initiative (EEGI):**
The implementation of smart grids is a complex long-term project that – given the extent to which the power supply system is interlinked across borders – can be developed and implemented only internationally. In the “European Strategic Energy Technology Plan” (SET Plan) integration of renewables into tomorrow’s power grids is a central issue that is being tackled at the international level in the “European Electricity Grid Initiative” (EEGI).

**DG Demonet – technical development chain for active distribution networks**
As part of the “DG DemoNet” – project chain, experts at AIT (Austrian Institute of Technology, Energy Department) and its partner institutions at Austrian universities have been working for several years on developing and implementing smart control strategies for tailor made voltage management. In collaboration with Austrian distribution network operators they are continuously developing, validating and demonstrating innovative technical solutions. Some of these approaches are currently very successfully under test in practice in the smart grid model regions (Salzburg, Upper Austria, Vorarlberg), in order to solve problems specific for the individual regions. The work receives financial support from the Federal ministry for Transport, Innovation and Technology (BMVIT) and from the Austrian Climate and Energy fund.

5 **Future Energy Storage**

- 10 - 20 pages
- What will be the situation in the future concerning our AlpStore key issue energy storage?

The focus of present and also future energy consumption and hence also energy production in the pilot region ökoEnergieland is definitely on heat, especially heat for private households.

Therefore it can be assumed that there will be an extension of further thermal storage systems at the existing biomass district heating grid systems in the pilot region. (The last bigger extension in this regard is the construction of a 50,000 liter storage tank as a thermal storage system at the district heating plant in the community of Strem.). Another development in respect of a further construction of thermal storage systems will be in combination of social housing projects and micro grids, which are supplying the social housing apartments with heat. In order to provide capacity during periods of peak demand (especially in the morning) and during off-peak times (especially in summertime it is very difficult to operate the biomass boiler) there will be an increasing demand of thermal storage capacity.
An increasing number of private households are changing their heat production scheme from oil boiler systems to wood boiler systems (also in combination with solar thermal systems). A thermal storage unit is absolute necessary for an optimized use of such systems.

The construction of two biogas plants (in the ökoEnergieland-communities Güttenbach and Bildein) is projected for the next years, each with an intended electrical capacity of 500kW. Also a biogas-storage of respectively 1500m³ is planned for these two projected plants.

Further the stepwise implementation of a local biogas grid is planned for the next years. In this regard it will be necessary to have biogas-storage installations at strategic points of the grid to compensate grid fluctuations (storage for 1 or 2 days). The planned capacity of the storage unit will be from 10.000m³ up to 40.000m³ according to requirements. And the requirements again depend on the development of the biogas grid in general.

**Framework and Trend:**
As long as feed in tariffs are the main revenue for biogas plants (at which the feedstock prices play an important role) the current storage infrastructure is sufficient. More and more biogas plants in Austria and in Germany are working with biogas-preparation plants to upgrade biogas into bio-methane and to inject it into the gas grid. Also peak load power production is becoming more interesting for biogas plants. Some plants start cooperation and join together in order to build so called virtual plants. For all those mentioned points in this development biogas storage will be essential. But at the moment it is very difficult to make forecasts in respect of further development in the pilot region ökoEnergieland.

5.1 Storage Requirements

5.1.1 Short Term Storage

Hot water storage tank - thermal storage systems in district heating grids, in micro grids and in combination with wood boiler in private households. It is very difficult to estimate exact figures in respect of the required storage capacities.

Biogas storage systems for additional biogas plants and for a future local biogas grid to compensate grid fluctuations.

5.1.2 Long Term Storage

No need for long term storage

**Key Question:**

- What are the relevant results and conclusions from the status quo and future energy system assessment?
5.2 Potentials for Regional Storage

- description of technical and spatial potentials, limitations etc.

  - Biogas digesters and storage tanks
    High potential, implementation already in planning stage
  - Power-to-Gas (methane in gas grid)
    Low potential, no gas grid in ökoEnergieland, only some pilot projects in Austria
  - Power-to-Gas (hydrogen in gas grid)
    Low potential because of a lack of regulation
  - Power-to-Gas (hydrogen local)
    Low potential because of a lack of regulation
  - Chemical storage (zeolite etc.)
    No potential
  - Compressed air storage
    No potential
  - Pump storage (regional in Alpine Space)
    No potential
  - Pump storage (Scandinavia etc.)
    No potential
  - Thermal energy storage systems – High temperature
    No potential, only interesting for (metal) industry and even there no economic efficiency
  - Thermal energy storage systems – Low temperature
    No potential, no units in operation in Austria
  - Thermal energy storage system – Water
    High potential in combination with solar thermal plants, biomass boiler and district heating plants
  - Thermal energy storage system – Salt
    No potential, still R&D
  - Thermal energy storage system – Materials like concrete, stones or sand
    No potential
  - Flywheels (small-sized)
    No potential
  - Flywheels (large-sized)
    No potential
  - Mobile batteries (electric vehicles)
    Potential on the long run, depending on technological and price development in the E-mobility sector.
  - Stationary batteries
Potential on the long run, depending on technological and price development of batteries.

5.3 Benefits of Regional Energy Storage

economy – ecology - society

Optimized and more efficient heat supply in district heating grid schemes and private households and consequently an increasing life time of technical equipment such as boiler etc. A further development of battery systems (in respect of price and life time) will lead to more photovoltaic systems in general.

6 Framework for future Storage Systems

- 5 -10 pages
- What will be the influences on the situation in the future?

Austria in general is characterized by the production of energy from hydro power. A large part of the total energy production is provided by hydro storage power plants. Nearly a fifth (19 %) of the total production of electricity is produced by hydro storage power plants. In Austria are 111 hydro storage power plants installed. The installed capacity thereof is 7,800 MW. In this case storage hydro power plants play by far the most important role in the field of energy storage in Austria. Especially the west of Austria, where the Alps are located, is characterized by storage hydro power plants. The next important “storage system” in Austria is the field of thermal storages with water. There are a huge number of units regarding storage systems for water for domestic use. There are also a big number of units regarding storage systems for heating-circuit water. Currently 270,000 units of solar panels with a thermal capacity of 3,334 MW are installed in Austria. Beside the storage of electricity (pump storage) and heat (thermal storages with water) biogas is another issue concerning storage in Austria. In Austria are currently 300 operating anaerobic digestion plants with a total capacity of approximately 80 MWel installed. The average capacity of all anaerobic digestion plants is at 250 kWel. For an average biogas plant approx. 100 m³ volume of biogas storage are to be assumed, which means that the overall biogas storage in Austria amounts to approx. 30,000m³. The feed in of methane from biogas power plants to the gas grid is another important topic of different operators.

Other storage systems are available in the market, but play a minor role in Austria. That is the reason why private and public institutions concentrate on R&D projects to make other storage systems ready for the market. The Austrian government implemented therefore several institutions which handle the funding with different calls of proposals. The Climate and Energy Fund, which was founded in 2007 by the Austrian government, has a leading role in Austria. The main goal of the Climate and Energy Fund is the reduction of greenhouse gas emissions in Austria by setting targeted pulses and initiating funding for projects. The Climate
and Energy Fund is therefore a key instrument of the Austrian government for the achievement of climate protection (20-20-20-targets, Energy Strategy, Kyoto Protocol), higher energy efficiency and the development of innovative renewable energies.

The legislation plays also an important role. In Austria exist several laws and regulations which deal with the topic of energy, but in Austria there is no law, which handles with the topic of energy storage in particular.

The market in Austria is characterized on the one hand by global players, which build the hydro power plants, and on the other hand by national players (private and public institutions, companies, R&D departments, regulators,...). A strong focus of these participants lies in the field of R&D. Austria has a leading role in the R&D activities. In 2012 institutions and firms, which concentrates on R&D activities spent € 8,610 Mio for different projects. Compared to 2011 the expenses for R&D increased about 4.2 %. The total expenditures for R&D run up to 2.8 % of the GDP. The average in the EU is at 2.0 %. Austria, together with Finland, Sweden, Denmark and Germany are those countries that have a higher R&D ratio as 2.7 %. In 2009 approximately 56,000 people have been employed in the sector of R&D. About two third (67.9 %) of them work in the industry sector and 26.7 % are employed in the higher education sector (e.g. universities, R&D institutes,...). Another 4.7 % fiddle with R&D activities at public institutions. About 19.1 % of the total expenditures for R&D activities refer to basic research. Another 35.4 % of the total expenditures are required for applied research projects. 47.1 per cent of expenditure is spent on experimental development. Several institutions focused on different R&D projects concerning storages.

The long term goal in Austria is to become energy self-sufficient until 2050 by using 100% renewable energy and an increasing energy efficiency. This ambitious goal will lead to a rising storage demand in the Austrian energy system. Within this context the storage demand for electricity and heat have to be emphasized. Depending on the conditions the storage demand for electricity rises up to 18-20 PJ/year and the energy storage demand for heat rises up to 20-26 PJ/year. In the near future further studies concerning storages shall be developed to reach the different energy goals which Austria has set.

6.1 Governance

- Summary and Reference to the documents about National and EU-frameworks
- Regional specifics
- Regional binding plans (spatial planning)
- Political aspects

20 – 20 – 20 Targets Link
In January 2008, the European Commission presented a legal package on climate protection which is often referred to as the 20-20-20 targets. The proposals focus on a restrictive climate and energy policy and set new goals. By 2020, Europe shall thus:

- cut greenhouse gas emissions by 20%,
- increase the share of energy from renewable sources by 20%,
- increase energy efficiency by 20%.

The burden of reducing greenhouse gas emissions will be shared by the Member States on the basis of their wealth. Austria is committed to reducing emissions by 16% by 2020 as compared to 2005. This target applies to all emitters not subject to the emissions trading scheme set out in the European directive 2003/87/EC. However, this emissions trading scheme should also be further developed and more restrictively applied. Apart from the fact that, as of 2010, certificates will no longer be distributed free of charge, the sectors subject to the emissions trading scheme will be assigned a reduction target of 21%. The new directive on carbon capture and storage is another important component of the efforts in climate protection. This directive promotes relevant technologies and the practice of geological storage of CO₂ emissions. Finally, the third pillar of the 20-20-20 targets is raising the share of energy from renewable sources. By 2020, the share of energy from renewable sources shall be increased to 20% of total energy consumption, i.e. not only regarding electricity, but also heating, transport, etc. The contribution set for Austria is an increase in this share from 23.3% in 2005 to 34% in 2020.

The Kyoto Protocol

At a supranational level the Kyoto Protocol has been the central instrument of climate policy. All EU member states have agreed to share the climate burden and have committed to individual climate protection targets.

The Austrian target is a reduction of greenhouse gas emissions by 13% as compared to the base year 1990 by the end of the so-called Kyoto period. An Austrian climate strategy for target attainment defined a series of instruments and measures, which cover all important areas, from the renovation of residential buildings, traffic regulations, the optimization of processes for the generation of electricity and heat to the promotion of renewable energy technologies. So far, these efforts have not produced the expected results. Current values of greenhouse gas emissions in Austria significantly exceed the original Kyoto targets - i.e. 15% above the base value of 1990.

- The energy end-use directive

Another central point of European energy policy is the energy end-use directive. It stipulates an increase in energy end-use efficiency by 9% by 2016 as compared to 2006. This target does not require a "real" reduction in energy consumption in absolute numbers but a more efficient use of energy, i.e. driving more kilometers with the same amount of gasoline. Last but not least the common energy policy strives for a
significant increase of the share of energy generated from renewable energy sources in Europe. This applies to both the energy end-use (i.e. heating, bio-fuels for vehicles) and transformation processes in the generation of electricity and heat.

- **Energy Strategy Austria** [Link]

The aim of the "Energy Strategy Austria" is the development of a sustainable energy system, energy services for private consumption as well as for companies. The defined goals should provide the EU targets on climate and energy (20-20-20, Kyoto Protocol). Security of supply, environmental impact, cost, energy efficiency, social equity and competitiveness were fixed as frameworks in the Austrian energy strategy. In working groups concrete measures should be defined. Concerning storages and e-mobility two working groups; “storage and grid” and “mobility”; have been implemented.

**Storages**

Concerning storages further studies shall be conducted. Important topics in this case are CCS, gas storages and “environmental friendly storages”. Different market players (e.g. energy suppliers) will get an order to create helpful studies.

**EVs and PHEVs**

In 2020, in total 250,000 electric vehicles (proposed all-electric vehicles and plug-in hybrid vehicles) should be on the road in Austria. This represents a ratio of not quite 5 percent of the forecast of the total number of passenger cars in 2020.

**National Renewable Energy Action Plan for Austria** [Link]

The 2010 National Renewable Energy Action Plan for Austria presents measures to achieve an increase to 34 percent, by 2020, of renewables as a share of gross energy consumption (in line with EU Directive 2009/28/EC). Compared to a reference scenario based on the data on energy consumption available up to 2009, final energy consumption is to be cut by 13 percent by 2020 in order to achieve the target. Sectors will contribute different shares to this goal. The largest contribution is expected from transport (−22 percent), followed by heating and cooling (−12 percent) and electricity (−5 percent). The directive’s implementation is a dynamic process, to a large extent controlled by the envisaged energy strategy of the Austrian Federal Government.

**Klima- und Energiefonds (Climate and Energy Fund)** [Link]

The climate and energy fund is an institution of the Austrian government. It was founded in 2007 and has the goal to reduce greenhouse gas emissions in Austria by setting targeted
pulses and initiating funding for projects. The Climate and Energy Fund is therefore a key instrument of the Austrian government for the achievement of climate protection (20-20-20 targets, Kyoto Protocol), higher energy efficiency (the energy end-use directive) and the development of innovative renewable energies. Since 2007 in total 35,000 energy and climate projects have been implemented with a total budget of €600 Mio by the Climate and Energy Fund. The Climate and Energy Fund is responsible to keep the European targets (20-20-20) in mind and promote a “zero emission Austria”.

For the efficient operational implementation of the funding allocation the Climate and Energy Fund is supported by management agencies. These are currently the “Österreichischen Forschungs-förderungsgesellschaft mbh” (FFG), „Kommunalkredit Public Consulting GmbH” (KPC) and the „Schieneninfrastruktur-Dienstleistungsgesellschaft mbh” (SCHIG mbH).

Projects concerning energy storages and also smart grids, which also include the topic of storage, are big issues in the different programs. The following programs of the Climate and Energy Fund, which have a close link to energy storages, are registered in the following list.

- **Smart Cities – FIT for SET**
  This program attends to the topics renewable energies, energy efficiency, mobility, e-mobility and model regions. The vision of the Climate and Energy Fund for the program "Smart Cities - FIT for SET" is the first implementation of a "smart city" or a "smart urban region" and also includes neighborhoods, communities or other urban regions in Austria. The main task lies on the implementation of intelligent green technologies to build up a "zero emission city" or "zero emission urban regions" with a high quality of life. The program focuses on the areas of buildings, energy networks, supply and waste management, mobility, communication and information. The storage of energy is therefore an essential way to achieve the objectives, which are defined in the “Smart Cities – FIT for SET” program.

- **Smart Energy Demo – FIT for SET**
  The central objective is the implementation of the visible "Smart City" pilot and demonstration projects in which existing and already largely mature technologies, systems and processes are integrated to interacting global systems. The key strategic objectives of the program are aimed at improving energy efficiency, increasing the share of renewable energy sources and the reduction of greenhouse gas emissions.

- **Neue Energien 2020**
  This program attends to the topics renewable energies, energy efficiency, smart energy and awareness. In the program, ideas and concepts with long-term prospects have been realized by basic research and technological research and development work and implemented
through pilot and demonstration plants. In addition to these primarily technology-related issues, the program has to work out the task to address social issues and knowledge for long-term planning processes. The program closed in 2011. The objectives of the program will be continued in the new program “e!Missi0n+.at – Energy Mission Austria”, which started in 2012.

- e!Missi0n+.at – Energy Mission Austria

This program attends to the topics renewable energies, energy efficiency and R&D. This program pursues the Climate and Energy Fund aims to reduce the cost of high-efficiency and low emission energy technologies and help ensure that Austrian companies play in this rapidly growing sector a leading role. The focus lies on collaborative projects between industry and science. The program is designed to convert scientific breakthroughs into innovative and sustainable products and services that provide business opportunities and make a contribution to reduce greenhouse gas emissions significantly.

Regional Specifics:

Federalism is very strong in Austria and hence every province does have energy strategies as well as the national government has its own energy policy, which has not really a binding character. The Federal Ministry of Environment is supporting a nationwide project named “Climate and Energy Model Regions” with regional focus in order to encourage more and more regions to do efforts in the field of renewable energy and energy efficiency. The subjects of smart grid, e-mobility and energy storage can be a part of these regional strategies but are not necessarily in the focus of every region. Since this framework there are regions in Austria with strong focus of e-mobility (8 model regions in Austria) and smart grids (Model regions in Vorarlberg, Salzburg and Upper Austria). There is no particular plan in the subject of energy stationary storage.

Regional binding plans:

The Austrian Institute for Regional Studies and Spatial Planning (ÖIR) developed several regional studies as well as cross boarder studies by order of the Federal Government and also by order of some provincial governments. Focus of these studies is spatial planning guidelines in respect of renewable energy strategy planning. The use of renewable energy and its potential impacts in the sustainable development of regions is an area of special interest.

Here some examples of ÖIR studies:

Cross boarder evaluation report for the implementation of wind parks

http://www.oir.at/de/node/594
REGIO Energy – Potentials of regional renewable energy
http://www.oir.at/de/node/397

Conceptual framework guideline for wind power plants in Burgenland
http://www.oir.at/de/node/591

Framework guidelines for the implementation of open field photovoltaic plants in Burgenland

6.2 Technology Trends

- e-mobility, plus-energy-house,…
- market development

Although there are incentives by the provincial government for purchasing electric vehicles the general interest in e-mobility in Burgenland and in the pilot region ökoEnergieland is not that big. Also it is very difficult to receive exact figures about market development of e-mobility. It can be discovered that more and more private households are implementing stationary battery systems in combination with photovoltaic plants, even though there is no financial incentive for storage and even though the costs for such systems are still very high.

6.3 R&D activities

Austria has a strong focus on R&D and on different type of projects, which link to different sectors in the market. In the R&D projects a focus concerning storage systems is recognizable. The Technical University of Vienna (Link - R&D activities) implemented different R&D projects about storages.

In coming up autumn 2013 a research project named “Micro Grid Güssing” is starting. The project “Micro Grid Güssing” is funded by Austrian Climate and Energy fund (program: Smart Cities – FIT for SET)

Objective: The future energy industry needs solutions, which do justice to the challenges and possibilities of the increasing decentralized, urban renewable production. Micro-grids are self-contained regional energy systems, in which both the decentralized urban producer of energy and consumers and lofts are connected. This innovative approach is complex and requires a comprehensive consideration and an interdisciplinary optimization. The complex presentation of problems should be treated in this smart city starting project. In the town of Güssing the requirements and the function of the Microgrid should be investigated via connection of producer, consumer, grid and storage facilities.

Project Partner: GE Austria, Telekom Austria, Energie Güssing GmbH, …
6.4 Stakeholders

- enterprises
- energy groups

- European Center for Renewable Energy (EEE Ltd. Güssing)
The ‘European Centre for Renewable Energy’ (German abbreviation EEE) was founded as an association in Güssing in 1996 to professionally coordinate and implement all projects related to renewable energy. The same year, the district heating plant Güssing - the biggest biomass district heating plant of Austria - started operating. In 2002, the EEE Ltd. was founded as a 100% subsidiary of the association. The EEE Ltd. is based at the Güssing Centre for Technology which the State of Burgenland established in 2002. Meanwhile, the EEE Ltd. has become a Europe-wide recognized institution for the development of sustainable regional and local concepts for energy saving and the use and production of renewable energy. As a reliable partner in various networks on the national and European level, the EEE has gained an excellent reputation. In the fields of research, development and project management, it has long since been a much sought-after coordination office. The EEE is also a co-founder of the ‘Eco Energy Land’ (‘ökoEnergieland’) and acts as an umbrella organisation for all energy relevant activities in the region of Güssing. It organises lectures and trainings in the field of renewable energy and arranges guided tours through the ‘Eco Energy Land’. Link: www.eee-info.net

- ökoEnergieland
The “ökoEnergieland” is an association consisting of 14 municipalities (constantly new communities are joining) in the Güssing region. The district of Güssing with approximately 27,000 inhabitants is known as a region with low economy and a low developed infrastructure. The population in the ökoEnergieland communities is approximately 10,000. Since 2010 the 14 communities of the ökoEnergieland are partnered for the project named ‘Climate&Energy Model-region’. With this initiative, the Climate and Energy Fund (State Ministry of Environment) supports regions that have made “becoming independent of fossil fuels” their prime target. This target is fulfilled by drawing on the regions’ own resources and by meeting energy demand with a smart mix of renewable energy generation, enhanced energy efficiency and smart controls. Link: www.oekoenergieland.at

- Energie Güssing GmbH
Grid operator (in a close cooperation with Netz Burgenland) of the power grid in the communities Güssing and Strem. Energie Güssing GmbH will be a project partner in the research project “Micro Grid Güssing”. Link: http://www.e-guessing.at/

- Klima- und Energiefonds (Climate and Energy Fund)
The climate and energy fund is an institution of the Austrian government. It was founded in 2007 and has the goal to reduce greenhouse gas emissions in Austria by setting targeted pulses and initiating funding for projects. Link: http://www.klimafonds.gv.at/
• Kommunalkredit Public Consulting
Kommunalkredit Public Consulting has set itself the goal of making a sustainable contribution to environmental, economic and social developments through the management of support programs and targeted consulting activities.
Link: http://www.publicconsulting.at/kpc/de/home/

• Energie Burgenland
The Energie Burgenland is the most important and most relevant energy supplier in the province of Burgenland and hence in the pilot region ökoEnergieland. With its subsidiary Austrian Wind Power the Energie Burgenland is the biggest producer of wind power in Austria (capacity 384MW)

• Netz Burgenland GmbH
The Netz Burgenland is a subsidiary of Energie Burgenland and the power grid operator in the province of Burgenland. Link: http://www.netzburgenland.at/index.php

• Bioenergy 2020+
The purpose of the Competence Centre is the research, development and demonstration in the “Energetic use of Biomass” sector. The research performance and services thereby cover the entire value-added chain, meaning that Bioenergy 2020 is a specialist of solid Biomass per se, specialist of the improvement of solid biomass, specialist of the forming processes, specialist of the ecological correlations and specialist of the collective (also economic) views on the topic. The biomass wood gasification plant with its R&D department is one of 5 locations of this R&D competence center. Link: http://www.bioenergy2020.eu/

• WIBAG
WiBAG was established in 1994 and is 100% owned by Burgenländische Landesholding. Core business areas: Site marketing and company relocation, grants advice and the development of grants, equity participation and venture capital, services and management optimization. Link: http://www.wibag.at/index.php?id=wibag0

• University of applied sciences – Fachhochschule Pinkafeld
The University of applied sciences is providing Bachelor and Master Studies with focus on Renewable Energy, sustainable energy systems, energy and environmental management and building technology. Link: http://www.fh-burgenland.at/
7 Master Plan

- 20 - 30 pages
- What is our plan for the region?

7.1 Objectives

7.1.1 Vision

The region of Güssing has made a fundamentally decision for its future – to take the energy supply stepwise into one’s own hands in order to use the own regional resources. This includes the creation of added value, jobs and more independence from energy imports.

Around the core idea of a renewable energy supply an overall philosophy was developed, which converted the region in a sustainable and positive way.

In parallel with the start to utilize regional available feedstock as well as development, implementation and operation of energy plants and finally energy supply of citizens, a network of infrastructure was built in various ways. In accordance to the creation of jobs and the gains of renewable energy production it was important to force topics like education, recreation, health, sport and tourism in order to offer especially young people a future in the region.

The energy revolution in Güssing was a process of many and – at the very beginning – also of small steps. There were several "partly-revolutions", which has to be adapted and modified according to national and international basic conditions.

The first Energy Revolution

Due to the fact that wood is a local resource with a sufficient availability the first logical step was the heat supply for private households by biomass, as it has been in former times. For reasons of comfort the majority of home owners modified their heating system from wood to oil and hence forests has lost its function as energy source. To retain comfort as well as heating costs it was necessary to transfer the heating center from households to a district heating plant in order to provide an all year round heat supply for the households with the help of a district heating grid. These systems have been implemented region-wide in the town centers of Güssing and its neighbor-communities, partly also in combination with large scale solar thermal systems (for operation in the warm season). All these plants are in operation until today, most of them operated by cooperatives, nowadays people would say public participation models.
The second Energy Revolution

Apart from forestry and solar energy big amounts of agricultural resources are available, therefore the second logical step to utilize them for energy generation. A plant was built for the generation of biodiesel out of rapeseed. For more than 15 years the region of Güssing was supplied with biofuel by a farmer cooperative. Various basic conditions influenced local stakeholders to change policies and to force new technologies, key word “2nd generation fuels”.

The third Energy Revolution

After starting a successful regional production of heat and biofuels it was obvious to start with regional power generation as well. For an efficient power generation out of local resources it was necessary to attract R&D to Güssing. With scientific support from Austrian universities, above all the Technical University of Vienna with Prof. Hermann Hofbauer a new era was starting for Güssing with international reputation. By implementing the developed technologies in pilot plants the region of Güssing definitely reached the status of a Model Region. The transformation from biomass into a product gas with the help of the so called FIFCB-Technology (fast internally fluidized bed gasification) plays key role in this development. Currently this product gas is used in a CHP plant for the energy supply of Güssing. This technology which was demonstrated in Güssing for the first time is now in demand worldwide.

But also in respect of power generation the focus was not only on woody biomass. The utilization of agricultural residues for power generation became an interesting subject for R&D. In this regard another demonstration project – a special type of biogas plant - has been implemented in Strem. Residual products like grass are transformed in heat and electricity. Currently there are 4 operating biogas plants in the region of Güssing and others will follow.

The fourth Energy Revolution

As recent past has pointed out many Austrian regions are following the example of the Model Region Güssing. It should be noted that resources are sought-after more than ever, not only in the field of energy production. Price fluctuations of feedstock which never had been before result in enormous economic problems. In Güssing these problems had been identified at an early stage in order to find appropriate solutions. Various task forces worked out project ideas in cooperation with local business partners in order to meet the coming challenges in respect of energy supply.

With this process possibly the most important Energy Revolution was initiated. Logically the focus is on the subject of carbon containing resources. Of course this is still biomass but also other residues of daily life are possible to utilize in order to cover our energy demand. This requires an extension of the technologies developed in Güssing as well as new approaches in respect of supply chain strategies.
What all energy revolutions have in common is a close cooperation with citizens, because they are the customers of today and tomorrow as well. And they will make their choice of what kind of energy they will use tomorrow and which utility. After all everyone is paying its energy bill.

The following projects are going to be implemented within the next years in the Güssing Model Region:

- Biogas for heating purposes: The region of Güssing is characterized by scattered settlements and that’s the reason for the circumstance that only houses in communities town centres were able to be connected to the biomass district heating grids. Now the plan is to construct an area-wide biogas grid in order to supply all settlements. The houses are then going to be heated by gas central heating with the help of special biogas heaters. The regional biogas plants (anaerobic digestion plants) will be connected by main pipelines and in the communities itself local networks will be constructed. Decentralized biogas storage units will provide uninterrupted service.

- Biogas for refueling purposes: Bio-methane will be produced by decentralized upgrading plants located at some communities in the Model Region. These upgrading plants are coupled with the biogas grid. Gas filling stations in some bigger communities of the Model Region are providing bio-methane for citizens, enterprises and regional public transport. The company “Gussing Renewable Energy” wants to distribute plants and biofuels under the label „Care Fuel“.

- Since the thermal gasification technology in Güssing has been further developed, a new plant – the so called MULTIFUEL Project – is going to be implemented soon. Different types of feedstock will be utilized there in order to produce a product gas (synthesis gas) as a basis product for a further generation of heat, electricity, synthetic natural gas, hydrogen or synthetic liquid fuels (2nd generation bio fuels).

- So called „Home Power Stations“ are being developed. They are generating power from photovoltaic-systems, small wind turbines or fuel-cells also equipped with stationary storage systems in order to consume the produced power or to sell it to the grid.

To guarantee a sustainable supply of feedstock in an available diversity a communal feedstock association is required. On the basis of the already existing communal drinking water association, which is operating very efficient and successful for years, the unused potential of forestal, agricultural, private, communal and industrial residues should be collected and utilized. The association’s staff members are in charge for management, temporary storage and supply of energy plants. The financing of the association is covered by the sale of feedstock.

The modern concept of Energy Revolution has turned to everyday occurrence in the Model Region of Güssing and is no longer just an empty phrase. Safe jobs for many people in the region have been created. Young people are confident for their future, after studies they re-
turn from the city to their familiar environment in order to start a family in this worth living ökoEnergieland.

7.1.2 Goals

- Milestones towards meeting the goals

Initial Situation

Several communities in the ökoEnergieland region are already supplied with heat by biomass district heating grid. Major parts of the region are characterized by scattered settlements and that’s the reason for the circumstance that only compact settlements and houses in community's town centres were able to be connected to the biomass district heating grids. In order to tackle this problem and to provide a low priced, convenient an environmental-friendly heat supply also for those settlements an area-wide biogas grid with a total length of more than
300km should be constructed gradually in the next years.

A local biogas grid – the future solution for a regional heat supply

The biogas coming from the regional biogas plants (anaerobic digestion plants) has to be dehumidified and desulfurized. The biogas plants (currently 4 plants) will be connected by main pipelines. In the communities, settlements local networks will be constructed. The households are then going to be heated by gas central heating with the help of special biogas heaters. Decentralized biogas storage units will provide uninterrupted service.

Economic efficient grid operation

The heat price will be significant lower than the production costs of an oil based heat supply. Taking into account the calculated biogas grid parameters, a connection density of 350kWh per meter and per year has to be assumed. And this is the typical connection density of rural scattered area like the Güssing region. Nowadays modern biomass district heating grids have to achieve a grid connection density of more than 900kWh/m²a. So for a region like Güssing not a district heating grid, but a biogas grid would be the right solution in order to provide a heat supply. Calculations showed that an economical efficient operation of a biogas grid could be possible without any problems under the parameters of a connection density down to 300kWh/m²a.

For the customers of this new biogas grid there will be no difference to the framework of the already existing district heating schemes. The grid infrastructure and the biogas boilers in the houses will be in the property of the grid operator. An association to be founded will be in charge for this and the association will sell the heat (on basis kWh) to the customers and take care for all the maintenance. The customer has to pay a one-time connection fee and a yearly basic charge and a kilowatt hour rate. The price of heat will be at the same price level than district heating prices.

Association will operate the grid

Ideally the association will consist of all 18 ökoEnergieland communities and will also acquire shares of the existing biogas plants and will be the investor of future required biogas plants.
The storage demand for peak shaving requirements and compensation of grid fluctuations will depend on the status of grid extension.

Table 11: Milestones of grid implementation
7.2 Regional Storage Park

- Description of future storage elements to be implemented in the region, their potentials etc.

**Biogas storage compensates fluctuations in the production and consumption of biogas as well as temperature-related changes in volume.**

The correct selection and dimensioning of the biogas storage system make a substantial contribution to the efficiency and safety of the biogas plant. Suitable biogas storage assures the supply with gas, reduces gas losses while contributing to the plant's safety and reliability.

**Internal biogas storage tanks** are integrated into the fermenters. In most cases they also assume the function as tank covering. – Relevant for projected additional biogas plants

**External biogas storage tanks** are separated from the fermenter forming autonomous components of a biogas plant. – Relevant for the projected biogas grid nearby settlements

In the case of biogas plants with several tanks, optimal result is often obtained through a combination of coverings with integrated biogas storage and one-layer, gas-proof coverings without gas storage.

**Decisive criteria for the selection and dimensioning of the biogas storage systems are the following:**

- Working pressure
- Storage volume
- External loads
- Number of tanks and tank size


In order to provide suitable storage solution for the projected biogas grid tenders of double membrane-gas storage systems have been obtained.

**Double membrane-gas storage:**

*Outer shell providing protection against climatic conditions*

As in the case of an air hall, air is blown under the outer membrane of the gas storage by a support air blower. Thus, an overpressure is created within the support air space, Figure 29: Double membrane-gas storage. Source: Sattler AG
keeping the form of the outer membrane stable. The ¾ spherical shape allows for high pressures and large volumes on restricted areas.

The outer membrane represents the building. It absorbs all external loads such as wind, snow and climatic conditions.

The actual gas storage is located inside and is thus protected against atmospheric conditions.

*Inner shell for the storage of gas*

Together with the floor membrane, the inner membrane forms the actual gas storage. They encase the gas chamber. The pressure in the support air space spreads to the biogas via the inner membrane. The inner membrane floats between the floor and the external membrane in different heights depending on the filling level. The pressure inside the gas chamber is limited by the overpressure valve.

*Measuring the filling level*

The position of the inner membrane is measured by ultrasonic sensors or rope length measuring systems. These measured values can be transformed into filling level values and serve for the plant control.

*Storage volume*

Most producers of double membrane gas storage tanks are providing them in standard sizes of 50m³ up to 5,360m³ but dimensions are not limited to that range.

Storage concepts for substantially larger storage volumes work according to the same principles, but use different geometries.

*Working pressure*

The spherical diameter has the greatest influence on the maximum working pressure of the storage. The smaller the diameter, the higher the max. permissible working pressure may be. A common value of the working pressure is approx. 20 mbar.

*Membrane material*

Membranes are made of polyester fabrics which are PVC-coated on both sides. Different membrane types are used depending on static requirements, statutory provisions and customer requirements.

The biogas grid will be constructed gradually in 4 stages of expansion. The most developed grid section in terms of calculations, technical planning, number of pre-contracts etc. is the grid section “South”.

Figure 30: Scheme of a double membrane-gas storage (Source: TECON textile constructions GmbH)

Figure 31: Overview biogas grid stages of expansion
The storage demand of grid section “South” will depend on the finally implemented version of this particular section.

**Version 1** comprises the supply of the ökoEnergieland communities Strem, Heiligenbrunn, Großmürbisch, Kleinmürbisch, Inzenhof und Neustift b. Güssing and the biogas is provided by the biogas plant Strem.

**Version 2** comprises all these mentioned communities and the community Heiligenkreuz in addition. This community is not a member of the ökoEnergieland association, but would be very interesting to include, since there is a 1MW el biogas plant there (which could also supply the grid with biogas) and Heiligenkreuz is also connected to the supra-regional natural gas grid of the provincial utility “Energie Burgenland”.

If Version 2 is going to be implemented no additional biogas storage will be necessary, since the biogas grid could be connected and hence supplied by the supra-regional natural gas grid in case of a blackout of both biogas plants in Strem and Heiligenkreuz.

If Version 1 is going to be implemented a biogas storage with the capacity of 30,000m³ (equal to 150MWh) will be necessary. The plan is to implement this 30,000m³ biogas-holder (double membrane-gas storage) nearby the biogas plant of Strem in order to guarantee an uninterrupted supply of biogas in this grid section.

From the present point of view it is difficult to estimate the storage requirements of all other projected grid sections, but it will certainly depend on the status of grid extension and on the number of connected households per grid section. Furthermore the implementation of 2 or 3 gas filling stations is projected in the grid area, which requires gas processing installations and further storage installations to supply the gas fillings stations with purified biogas (= biomethane).

*Figure 32: Biogas plant in Heiligenkreuz with 2x1500m³ biogas holders on the tanks*
7.3 Storage Roadmap

7.3.1 Measures and Projects

- descriptions of key development and deployment projects to build the storage park
  (typically one of these projects being the one to be implemented in AlpStore)

As already mentioned the plan is to construct the biogas grid gradually within the next years according to the number of connected households per community and according to the number of communities which will be a member of the biogas grid association. Ideally all 18 ökoEnergieland communities will join to the biogas grid association. The non-participation of one (or more) community has to be compensated by all other member communities. The association will be in charge to implement the interconnection pipelines between the already existing biogas plants and membered communities as well as the implementation of biogas storages. The membered communities of the biogas grid association will be in charge to acquire as many potential customers as possible and will be in charge to implement the local grid in the respective community.

The course of the regional and local water pipes will be used as a basis for the biogas grid implementation, since the regional and local water pipes (and also the sewers) are situated on the public domain, which facilitates planning and implementation.

Figure 33: map of projected biogas grid with 4 grid sections to implemented gradually
The biogas grid will be constructed gradually in 4 stages of expansion. The most developed grid section in terms of calculations, technical planning, number of pre-contracts etc. is the grid section “South”. Therefore it can be assumed that biogas grid implementation will start with this section.

In Version 1 the grid section “South” (indicated on map as Project “Süd”) consists of the communities Strem, Heiligenbrunn, Großmürbisch, Kleinmürbisch, Inzenhof and Neustift.

In Version 2 also the community of Heiligenkreuz, which is no member of the ökoEnergieland association will be considered in the biogas grid project since a 1MW el biogas plant is located there and due to the fact that Heiligenkreuz is connected to the supra-regional natural gas grid. This circumstance is very important when it comes to guarantee an uninterrupted supply of biogas in this grid section in case of a blackout of both biogas plants in Strem and Heiligenkreuz.

Figure 34: map of grid section „South“
Figure 34 shows the projected grid section “South” in Version 2, which includes the community Heiligenkreuz. The main line is indicated in black, the bypass lines are in red.

### Table 12: Cost summary using the example of Neustift, community in the grid section „South“

<table>
<thead>
<tr>
<th></th>
<th>Version 1</th>
<th>Version 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connections total</td>
<td>108</td>
<td>108</td>
</tr>
<tr>
<td>Connections main pipeline</td>
<td>56</td>
<td>68</td>
</tr>
<tr>
<td>Connections bypass</td>
<td>52</td>
<td>40</td>
</tr>
<tr>
<td>Biogas consumption</td>
<td>409.262.76 m³</td>
<td>409.262.76 m³</td>
</tr>
<tr>
<td>% share main pipeline</td>
<td>18.65%</td>
<td>18.03%</td>
</tr>
<tr>
<td>costs proportionally main line á 60€/m</td>
<td>145.622.60 €</td>
<td>193.926.04 €</td>
</tr>
<tr>
<td>costs proportionally bypass á 60€/m</td>
<td>62.824.02 €</td>
<td>56.021.23 €</td>
</tr>
<tr>
<td>overall costs pipeline á 60€/m</td>
<td>208.446.62 €</td>
<td>249.947.32 €</td>
</tr>
<tr>
<td>costs proportionally main line á 55€/m</td>
<td>133.487.38 €</td>
<td>177.765.54 €</td>
</tr>
<tr>
<td>Costs proportionally bypass á 55€/m</td>
<td>57.588.69 €</td>
<td>51.352.84 €</td>
</tr>
<tr>
<td>overall costs pipeline á 55€/m</td>
<td>191.076.07 €</td>
<td>229.118.38 €</td>
</tr>
<tr>
<td>costs proportionally main line á 50€/m</td>
<td>121.352.17 €</td>
<td>161.605.03 €</td>
</tr>
<tr>
<td>costs proportionally bypass á 50€/m</td>
<td>52.353.35 €</td>
<td>46.648.40 €</td>
</tr>
<tr>
<td>overall costs pipeline á 50€/m</td>
<td>173.705.52 €</td>
<td>208.253.43 €</td>
</tr>
</tbody>
</table>

Revenues connection fees
(linked biogas heater and house connection):

- 100% 486.000.00 € | 486.000.00 €
- 90% 437.400.00 € | 437.400.00 €
- 80% 388.800.00 € | 388.800.00 €
- 70% 340.200.00 € | 340.200.00 €
- 60% 291.600.00 € | 291.600.00 €
- 50% 243.000.00 € | 243.000.00 €
- 40% 194.400.00 € | 194.400.00 €
- 30% 145.800.00 € | 145.800.00 €
- 20% 97.200.00 € | 97.200.00 €
Table 11 shows the cost calculation of a possible member community of the biogas association using the example of Neustift. The result of this calculation shows that there are **108 households along the projected route** of the grid (main pipeline and bypass line) on the municipality grounds of Neustift. So a share of 100% means that all of the 108 households along the route are connected to the grid. Small variations of the bypass route are possible depending on the interest of the respective households, therefore different figures of households along the bypass line. Also 2 versions are considered (with Heiligenkreuz and without) which also means that there are different figures of connected households along the main pipeline according to the 2 versions.

The estimated biogas consumption will be around **409,000 m³**.

18,65% of the projected main pipeline route are passing the municipality grounds of Neustift. Each member community of the future biogas grid association is responsible for the costs according to its respective share of the main pipeline route on the municipality’s grounds.

Then the **construction costs per meter** grid are listed in 3 alternative versions depending on the route conditions, so for example the route of the pipe line has to pass an asphalted road the average construction costs are calculated with 60€/meter, in case of the route has to pass only soil the average construction costs are calculated with 50€/meter.

The last part of the table indicates the expected **revenues coming from the connection fees** (excluding the costs of biogas heaters and house connection) depending on the respective rate of connection. Assuming the overall costs for the route of pipeline (main line and bypass lines) in Neustift will be around 250,000€ (means Version 2 and 60€/meter), which is the most realistic scenario, **the rate of connection has to be at least around 50% to cover the construction** costs with the revenues of the connection fees. Finally it’s in the decision of the community to which rate of connection the implementation of the grid will be started.

This cost calculation is available for all communities in the grid section “South”. Assuming all communities in this section intend to become a member of the biogas grid association and assuming the necessary rate of connection will be reached in all this communities this project could step into tendering procedures and furthermore in a concrete implementation phase.

Due to the fact that the biogas plant in Strem is able to supply biogas also for parts of the grid section “East” this respective section could be the next step in the gradually implementation of the biogas grid.

Also the grid section “West” where two biogas plants are located is to be expected for the second or third stage in the overall implementation development.

In order to supply the projected grid section “North” with biogas one or two additional biogas plants (Güttenbach and Höll) are necessary. Of course the construction of a biogas plant with a capacity of 500kW el will result in additional costs of at least 2 Million Euros per plant. At the present stage of the project it is difficult to assume if the investment of one or even
two biogas plants will be possible, therefore it can be assumed that grid section “North” will be the last step in the grid’s development.

Figure 35: Grid section „East“
Figure 36: Grid section „West“
Figure 37: Grid section „North“
7.3.2 Timelines, milestones and Controlling
7.4 Implementation Structure

**Key Questions:**

- What are the relevant structures for the process at the moment?
- What are the needed structures for a successful implementation process?
- How can this ideal structure be accomplished?

All project relevant work, calculations, technical planning, pilot tests, PR work, contact to municipalities and other stakeholders, tender obtaining etc. is currently done by the European Center for Renewable Energy (EEE) in cooperation with the ökoEnergieland association and the private research institute GET (Guessing Energy Technologies).

In order to implement the biogas grid infrastructure (pipelines from the biogas plants to the villages, biogas storages, local network in the settlements, biogas heaters) and in order to operate the grid the already existing and well operating regional water boards serve as a model for a new operating structure of the future biogas grid.

It’s not only the structural organization of a regional water board but also the course of the regional and local water pipes can be used as a basis for the biogas grid implementation, since the regional and local water pipes (and also the sewers) are situated on the public domain.

*Figure 38: Implementation structure of the biogas grid in ökoEnergieland*
So the implementation structure and also the institutional structure of a new biogas grid association will be very close to the structure of the regional water board, where the communities of the Güssing region are already membered. The new biogas association will be formed by the member communities of the ökoEnergieland association (18 communities belonging to the political districts of Güssing and Oberwart). Ideally all 18 ökoEnergieland communities will join to the biogas grid association. The non-participation of one (or more) community has to be compensated by all other member communities.

In the initial phase of the grid implementation each member community has to announce – as practiced in the water board - its anticipated required amount of biogas, according to the number of households going to be connected in the respective community and in consideration of possible business locations and further expansion plans.

Every member community is responsible for the costs of the respective local grid and proportionally for the costs of the biogas storages and connection pipelines between the communities and the plants/storages. The local grid and the biogas heaters in the households as well are in the property of the respective community. The interconnection grid and the biogas storages are in the property of the biogas association.

Furthermore the biogas association plans to purchase shares of the already existing biogas plants, which are in the hands of local private limited companies. Future biogas plants will be implemented and operated by the biogas association.

If final customers will be pay their one-time connection fee, the yearly basic charge and the kilowatt hour rate to the respective community or to the biogas association will be still subject of negotiations.

The grid maintenance, maintenance of the biogas heaters and emergency service is in the responsibility of the association.

It remains to be seen how much communities will join the biogas association. The scope and the further stages of grid expansion will depend on this, as well as the storage requirement and the further construction of additional biogas plants and gas filling stations.

It’s up to the communities to acquire as many potential customers as possible.
Kundeninformation
Im gesamten ökoEnergieland soll Schritt für Schritt ein Biogasnetz installiert werden, um den Bürgern eine günstige und vor allem umweltfreundliche Wärmeverteilung zu ermöglichen, von der die ganze Region profitiert.

Anschlussgebühr: 8.500 – 9.000 Euro
Förderung Anschlussgebühr: pro Haus max 30% möglich
(Üblicherweise 2.100.- €)
(Anschlussgebühr auch in Raten abzahlbar)
Inklusive:
- Biogasleitung ins Haus (max. 20 Meter)
- Biogastherme
- Wärmezähler
- Wartung und Instandhaltung

Grundgebühr: ca. 200 – 300 Euro pro Jahr
Wärmepreis: ca. 10 Cent pro kWh
(bei durchschnittlich 18.000 kWh -> € 1.800.- Euro pro Jahr Wärmepreis)

Alle Preise inkl. MwSt.

Zeitplan:
- Fertigstellung des Gasnetzes: August 2013

Figure 39: Customer information letter
Feedstock Association

Parallel to the development of the biogas grid association the European Center for Renewable Energy and the ökoEnergieland-association are working on the development of a future Feedstock association.

The increasing production of biogas and additional biogas plants on the one side as well as price fluctuations on the feedstock market require the development of a regional feedstock association, which works in a close cooperation with the biogas grid association, the regional biogas plants, communities and citizens.

The idea is to utilize regional available resources which are not utilized yet (see also figure 35) and to have a well operating logistic system operated by the feedstock association for harvesting, transport, storage and delivering.

Feedstock in Communities

Forest resources
- Forest in public property
- Common private forest area
- Wood along rivers
- Pruning of trees, shrubs, pruning of vines
- Waste wood
- Short rotation

Agricultural resources
- Grass strips along municipal roads
- Grass strips along rivers
- Etc.

Figure 40: Overview of potential unused resources in ökoEnergieland
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10 Review of existing sources and literature

Basic data ökoEnergieland, energy production and consumption:

Wind map:

**Project Regioenergy:**
http://www.regioenergy.at/windkraft - study report potential renewable energy in the scope of Austrian regions - project “regioenergy” (ÖIR powered by Klimafonds)

**Netz Burgenland GmbH – Operator of the power grid in Burgenland**
http://www.netzburgenland.at/

**Austrian Power Grid APG:**
Description of masterplan for grid extension
http://www.apg.at/en/grid/grid%20expansion/masterplan

**Biogas storage:**


TECON textile constructions GmbH http://www.tecon.biz/standardspeicher_en.html