VisNova

SWOT Analysis

Strengths-Weaknesses-Opportunities-Threats-Analysis (SWOT analysis) concerning the regional energy potential of the Northern Saxony district and the Düben Heath region (parts of the Anhalt-Bitterfeld and Wittenberg districts) within the Central Europe Programme of the EU / project VIS NOVA

Client: **Wirtschaftsförderungsgesellschaft mbH of the Northern Saxony district**
Project VIS NOVA
Richard-Wagner-Straße 7a
04509 Delitzsch

Contractor: **Institut für Wirtschafts- und Regionalentwicklung**
Max-Liebermann-Straße 4a
04159 Leipzig

Leipzig, 02/15/2012

Prof. Dr. Ina- Beate Groß

Dr. Annedore Bergfeld

Table of contents

This project is implemented through the CENTRAL EUROPE Programme co-financed by the ERDF.

1. Introductory remarks

The project VIS NOVA pursues the objectives of promoting renewable energy sources and improving energy efficiency, especially in rural areas. For this purpose energy efficiency plans are developed for each of the European partner regions in Germany, Austria, Hungary and Poland. It is based on a comparative SWOT analysis using a methodology and structure compiled by all partners, for which a list of indicators is an important basis. During the process of SWOT analysis, the following elements to assess the regional potential for renewable energy and energy efficiency have been developed:

- Presentation of the initial situation in the administrative district and in the municipalities of Düben Heath (Dübener Heide) in Saxony-Anhalt
- Appraisal of the exploitable potential for using renewable energies as well as increasing energy efficiency
- Identification of best-practice solutions and action approaches for further work (15 case studies)
- Aggregate SWOT analysis

The short status analysis of essential benchmark data is based on the evaluation of development-related concepts, studies, programs, information platforms, and in particular on the results of the "Energy Plan for the Northern Saxony District as well as Wittenberg and Anhalt-Bitterfeld in the Düben Heath Region". A particular problem was the data collection for the presentation of the initial situation, as

- the data for the Northern Saxony district (Saxony) and the municipalities of Düben Heath (Saxony-Anhalt) are available in varying differentiation and quality (especially lack of data for specific questions on a community level),
- due to the regional reforms, the comparison can be realized at relatively great expense,
- there are no current information on housing stock and initial heating system available (as of 1995), data from the population, housing and building census VWGZ 2011 will not be available until the end of 2012,
- the detailed survey to determine the final energy consumption, which is part of the energy plan, could not be repeated for comparison purposes in 2000 (theoretical extrapolations would not have led to comparable results).

The presentation of local key actors provides the basis for the expansion of existing networking approaches. This was followed by the development of the aggregated SWOT analysis.

With the integration of selected representatives of the technical and planning authorities at a regional, district and municipal level as well as private partners (business and associations) it has been assured that the SWOT analysis forms a sound basis for further work. The draft of the SWOT analysis was coordinated with the Regional Steering Group in an open discussion process. Within this framework, the presented 15 case studies were defined and discussed. The cases include current best practice approaches on the one hand and fix new solutions such as "Virtual Power Plant" on the other.

2. Initial situation

Rural areas, comprising more than 50% of the population of the 25 EU member states and representing approx. 90% of the total territory of the EU, face an intense structural change. Regional disparities are increasing, whereas particularly peripheral rural areas are characterized by strong emigration processes, lack of economic strength and low potential for innovation. For this reason it is important to use the existing potential more effectively, to stabilize the areas with the help of regional economic cycles and thereby to ensure a long-term equivalent level of existence for a base population. For this purpose it is necessary to win the regional and local actors for new feasible and sustainable approaches that among other things attach special importance to energy efficiency and the use of renewable energies as well as environmentally friendly technologies and activities. This goal is addressed by the current INTERREG IVB project VIS NOVA.

In Saxony, the study area is the Northern Saxony district, Saxony-Anhalt is represented by the municipalities of Bad Schmiedeberg, Gräfenhainichen and Kemberg in the Wittenberg district as well as the municipality Muldestausee in the Anhalt-Bitterfeld district, whose initial situation is as follows.

2.1 Population

With a population of 205.163 (30.06.2011) Northern Saxony belongs to the sparsely populated districts in Saxony (102 inhabitants/km², including the central region Torgau 70 inhabitants/km²). The same applies to the municipalities of the Düben Heath in Saxony-Anhalt.

Table 1 **Development of population in the Northern Saxony district and the municipalities of the Düben Heath in Saxony-Anhalt in the period 1990-2010**

	1990	1995	2000	2005	2010
Northern Saxony district					
Population	236106	231165	230067	219415	206223
Development since 1990 (%)	=100	97,9	97,4	92,9	87,3
Municipalities in Düben Heath in S-A					
Population	54767	54275	52232	49059	45622
Development since 1990 (%)	=100	99,1	95,4	89,6	83,3

Source: Statistical Offices Saxony, Saxony-Anhalt

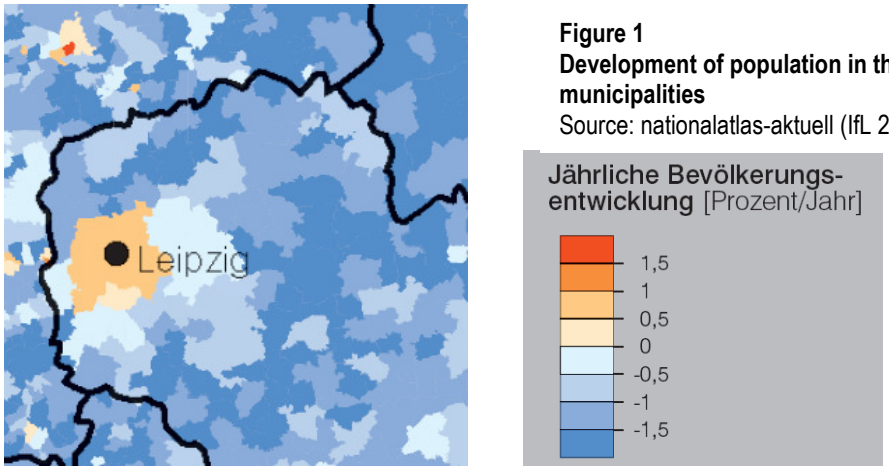


Figure 1
Development of population in the period 2004-2008 by municipalities
Source: nationalatlas-aktuell (IfL 2011)

Northern Saxony and the municipalities in Saxony-Anhalt are characterized by a sharply declining population. The development is regionally differentiated. Particularly affected are the areas Düben and Dahlen Heath (see Fig.1).

Accordingly, a further decline in population by 15.4% until 2025 is forecasted for the area of Northern Saxony district. For the municipalities of the Düben Heath in Saxony-Anhalt the projected decline is even higher (-21.0%). Particularly severe losses in Northern Saxony are expected for the area around Torgau and the former Oschatz district. Furthermore, due to the ongoing migration losses and the natural population development, distortions in the age, social and sexual structures are observed, which both impact the private energy demand but also the economic development (skills shortage) in the region.

Table 2 Development of age structure in the period 2000-2025 respectively 2010-2025

Northern Saxony district (%)						Municipalities of the Düben Heath in Saxony-Anhalt (%)		
Age group	2000	2009	2015	2020	2025	Age group	2010	2025
under 15	13,5	11,2	11,5	11,0	10,2	under 15	9,8	8,7
15 - 65	69,8	65,5	63,2	59,7	56,4	15 – 65	64,7	56,3
65 and older	16,7	23,3	25,3	29,2	33,4	65 and older	25,5	35

Source: Statistical offices Saxony, Saxony-Anhalt – 5. Regionalized population forecast

2.2 Economic strength

- **Employees**

In addition to the population, the development of economic strength is another factor that is essential for the development of energy consumption and future energy demand. This is presented by the development of employment, the number of companies as well as by the gross value added. It turns out that the number of employees in the Northern Saxony district has remained fairly constant, however, the structure has shifted towards the service sector. There are about 90.600 persons in employment of which 65.842 employees are subject to social insurance contribution.

Table 3 Development of employment figures and economic structure in the Northern Saxony district in the period 2000-2009

	Total	Agriculture and forestry	Manufacturing industry	Service
2010[1]	90,2	4,4	25,8	59,9
2005	87,3	4,5	24,5	58,3
2000	93,2	4,8	29,9	58,5

Source: Statistical office Saxony

With regard to employees subject to social insurance contribution, which represent approx. 65% of the workforce, however, there is a downward trend for the entire study area. The job density is at 313 p/th. Inh. Thus Northern Saxony is classified in the middle range of the districts in Saxony. This is also strongly influenced by the workplace concentration in the medium-sized centers and by the airport Leipzig/Halle. The workplace equipment is at 151 p/th. Inh. in the municipalities of the Düben Heath, and so significantly lower than in Northern Saxony.

[1] The data refer to 2008.

Table 4 Development of employees subject to social insurance contribution

	Number of employees (in 1000)							
	Northern Saxony				Municipalities in the Düben Heath			
	Total	Primary	Industrial	Service	Total	Primary	Industrial	Service
2000	71,073	3,160	24,293	43,620	11,199	n/a	n/a	n/a
2010	64,485	2,691	20,238	41,556	6,896	0,229	2,485	4,182
Development in %	-9,3	-14,8	-16,7	-4,7	-38,4	n/a	n/a	n/a

Both in Northern Saxony but especially in the municipalities of Düben Heath in Saxony-Anhalt a sharply declining employment trend is visible. Here, the negative trend is not equally distributed. The industrial sector (manufacturing and construction industry) shows the greatest losses. On the other hand the service sector becomes increasingly important.

With regard to unemployment a positive trend can be observed, i.e., the unemployment rate is declining in the Northern Saxony district as well as in the two neighbouring districts in Saxony-Anhalt. The decline was even more pronounced because of the relatively high levels in the last-mentioned districts.

Table 5 Development of unemployment rates and commuting

Year	Unemployment rate	Number of commuters	
		Into district	Out of district
Northern Saxony district			
2000	17,8	19.093	30.399
2010	13,1	21.980	33.612
Municipalities in the Düben Heath in S-A			
2000	23,9/21,5	n/a	n/a
2010	11,5/10,6	3.473[2]	11.363[4]

The commuting is a further indicator for economic performance. It appears that both regions represent out-commuters areas (negative commuting balance). The Northern Saxony district is characterized by the proximity to Leipzig, the municipalities of the Düben Heath are more oriented towards the industrial sites of Bitterfeld-Wolfen and Wittenberg. Regarding the attraction of in-commuters the municipalities in Saxony-Anhalt lag behind the Northern Saxony district (Düben Heatth: 76 commuters/th.inh., Northern Saxony: 107 commuters/th. Inh.). Accordingly, the share of out-commuters is higher (Düben Heath: 249 commuter/th. Inh., Northern Saxony: 163 commuters/th. Inh.).

- **Gross Domestic Product (GDP)**

Concerning the gross domestic product a positive trend could be observes, whereas especially the secondary sector (industrial field) gains a higher importance. Although the number of service providers is grown, its contribution to GDP and also the proportion has declined significantly.

Table 6 Development of Gross Domestic Product

Year	GDP of region (thousand EUR)			
	Total	Primary	Industrial	Service
Northern Saxony district				
2000	3.366,0	121,1	986,1	2.827,7
2010	3.898,1	84,3	1.060,0	2.184,9

[2] In- and out-commuters refer to the municipalities

Data on gross domestic product are only available at a district level. In Northern Saxony and in the two neighbouring districts in Saxony-Anhalt a more positive trend in the overall GDP as well as in the industrial and service sector can be identified.

Table 7 Development of GDP per inhabitant in the study area

	GDP per inhabitant	
	2000	**2009**
Saxony-Anhalt	**16.437**	**21.300**
Anhalt-Bitterfeld	14.507	21.187
Wittenberg	14.751	18.771
Saxony	**17.031**	**22.212**
Northern Saxony	16.186	20.796

Source: Gross domestic product, gross value added in the autonomous cities and districts 1992-2009. In: Reihe 2, Kreisergebnisse Band 1, 2011

The comparative per capita analysis shows that the study area has a positive development, however it lags behind the national average. Also regional differences become clear. So the Wittenberg district is markedly below the national average, in contrast Anhalt-Bitterfeld district has developed its GDP above average. Such regional differences could also be seen in the data of the former districts of Northern Saxony in 2000 and 2006 respectively. Here the former Torgau-Oschatz district was significantly below the level of the former Delitzsch district.

- **Purchasing power**

Regarding the purchasing power the Northern Saxony district, like all districts in Eastern Germany, lags behind the German level with 83.1% and even behind the Saxon average of 83.6%. Both districts in Saxony-Anhalt Anhalt-Bitterfeld (80.0%) and Wittenberg (80.2) show an even lower purchasing power. This should be considered, for example, with reference to the potential of heating system modernization by private organisations.

- **Number and structure of enterprises**

For the year 2010, the Leipzig Chamber of Industry and Commerce for the Northern Saxony district reports 12.144 enterprises.

In addition there are approx. 3.056 craft enterprises, which correspond to 14,9 companies per th. Inhabitants and therefore it is slightly above the Saxon average of 14,4. A high proportion of the sites are located in the medium-sized centers, which means in the area of the cities. This is also reflected in the distribution of industrial and commercial areas in the district.

The Northern Saxony district is mainly characterized by small and medium-sized enterprises (SMEs). An exception is the airport Leipzig/Halle, which is located on the boundary of the district. Few companies have employment numbers over 500. In the manufacturing sector, 62 enterprises are to be categorized as >50 employees (of which >100 employees, e.g. 4 companies in the healthcare, 12 companies in the manufacturing sector, 2 companies of the primary production, 1 construction company, 2 trading companies, 2 service companies) and in the construction industry, there are 67 companies of more than 20 employees.

Within the business registrations and deregistrations in 2010 slightly more deregistrations can be observed. In Northern Saxony, a total of 6 companies are to be classified in the category energy-intensive (see

chapter 5.2). In addition, logistics and construction companies but also farms have generally a higher energy demand than the average.

Table 8 **Number and structure of enterprises including business premises in Northern Saxony**

Year	Number of enterprises[3]			
	Total	Primary	Industrial	Service
2000	9.760	179	1.086	8.495
2010	12.144	242	1.781	10.121

In the Northern Saxony district there are also 3.056 craft companies (2009), of which about 1/4 can be assigned to the service sector and 3/4 to the secondary sector. The considered municipalities in Saxony-Anhalt are characterized by small companies in the craft, trade and services sector. Thereby farms but also tourism and healthcare companies are dominating. Mainly small companies in the metal processing, steel and plant construction, printing and construction industry round off the picture. Large energy-intensive businesses are not recorded at all.

2.3 Living and heating systems

A further aspect is the housing stock, which is analyzed within the framework of the energy plan. The number of residential buildings in the Northern Saxony district is 50.314 and in the municipalities of the Düben Heath in Saxony-Anhalt it is 14.9504. In Northern Saxony single-family houses dominate with a number of 41.591 compared to 8.436 multiple dwellings (as of 2008). A similar situation prevails in Saxony-Anhalt, where the distribution was estimated from available data: 13.486 single-family houses and 1.498 multiple dwellings.

There are a total of 131.134 apartments in the region. This is equivalent to 510 apartments per 1.000 inhabitants in Northern Saxony and 322 in the municipalities in Saxony-Anhalt. The living space per inhabitant in Northern Saxony is at 38.6 m²/inhabitant and in the municipalities in Saxony-Anhalt at 43.0 m²/inhabitant. In consideration of the projected demographic change in the region a further increase of the population-related living space over the next few years is expected.

In terms of energy demand the age structure of residential buildings is also essential:

Table 9 **Age structure of the housing stock in the Northern Saxony district and the Düben Heath** (estimated -2011)

Age group	Northern Saxony		Municipalities in the Düben Heath	
	Residential buildings (number)	Share of age groups (%)	Residential buildings (number)	Share of age groups (%)
Before 1948	27.307	54,3	8.132	54,3
1948-1971	5.697	11,3	3.956	26,4
1972-1990	7.587	15,1		
1991-1994	2.172	4,3	2.896	19,3
Since 1995	7.551	15,0		
Total	**50.314**	**100,0**	**14.984**	**100,0**

Source: Statistical office Saxony, counting of residential buildings 1995, own calculations

[3] The latest business survey in 2008 - the source of the information is the CCI business statistics by industry. (http://www.leipzig.ihk.de/inhalt/geschaeftsfeld/Standortpolitik/Konjunktur-und-Wirtschaftsstatistik/Unternehmensstatistik/IHK-Unternehmensstatistik.aspx//branch-/). The establishments are included.

[4] More detailed information on the housing stock are only available as a result of the ongoing statistical survey (population and housing census).

The age structure of the municipalities in Saxony-Anhalt could only be estimated based on the information in Northern Saxony.

The structure of the heating systems is as follows:

Table 10 Structure of initial heating systems of the residential buildings in the study area 2010 – estimated[5]

	Heating oil	Solid fuels (such as wood, wood pellets, coal)	Electricity	Natural gas/ liquid gas	District heating	Heat pump	Solar heat
Northern Saxony							
abs.	16.318	1.124	1.291	29.379	1.697	383	92
rel.	32,5	2,2	2,6	58,4	3,4	0,8	0,1
Municipalities in the Düben Heath[6]							
abs.	4.863	335	385	8.755	506	114	27
rel.	32,5	2,2	2,6	58,4	3,4	0,8	0,2

Table 11 Structure of initial heating systems of the apartments in the study area 1990-2010[7]

Year	Total living units	Heating oil	Solid fuels (such as wood, wood pellets, coal)	Electri-city	Natural gas/ liquid gas	District heating	Heat pump[8]	Solar heat
1990[9]	97.555	0	73.947	2.244	5.170	2.488	0	0
1995	96.664	17.826	36.842	5.145	23.233	1.550	0	0
2010[10]	105.688	24.941	5.963	4.245	55.830	1.697	583	130

In terms of the development since 1990 similar trends are detectable in both areas:

- Replacement of the prevalent coal heating, and thus strong increase in heating oil and natural gas/ liquid gas
- Slight decline in district heating (due to dismantling programs in the cities)
- Increase in heat pumps and solar heat especially in single-family houses in the last year
- Slight decline in electricity
- Coal heating only partially present - increase in wood, but often not as initial heating system

Until 2020 the following trends can be identified based on similar analyzes:

Single-family houses:

- Coal is barely represented
- Further reduction in the share of oil
- Increase in natural gas heating
- Slight increase in district heating in the context of decentralized energy solutions such as biogas plants
- Further increase in the use of geothermal energy, strong growth of solar energy but also a certain increase in wood

5 Source: Leipzig Institut für Energie GmbH: Expertise in MORO project: Final energy consumption and approaches to reduce greenhouse gas emissions in the planning region of western Saxony. 2011, p. 11ff and assumptions of the energy plan northern Saxony, p. 29ff respectively the energy plan for the municipalities in the Düben Heath in SA

6 For the buildings in Düben heath the same proportions as in the northern Saxony district were assumed.

7 1995 – Details of the housing and building census. Statistical Office Saxony. Own calculation

8 Heat pumps in the district are a total of 547 (Source: www.erdwaermeliga.de) - Assumption thereof 70% in residential buildings, number of apartements estimated

9 1990 approx. 30.2% of the apartments were equipped with a modern heating system, of which 12.750 apartments had a district heating (16.6%) mainly in the medium-sized cities such as Delitzsch and Eilenburg

10 Source: Leipzig Institut für Energie GmbH: Expertise in MORO project: Final energy consumption and approaches to reduce greenhouse gas emissions in the planning region of western Saxony. 2011

- Electricity is becoming less important (night storage heating is to replace due to legal framework).

Multiple dwellings

- Further reduction in the share of coal
- Decline in oil use
- Increase in natural gas heating
- Slight decrease in district heating in connection with further dismantling
- Growth in the use of geothermal energy, solar energy but also a certain increase in wood
- Electricity is becoming less important (night storage heating is to replace due to legal framework).

2.4 Mobility

An essential share of energy consumption in rural areas is spent for mobility. It is necessary to differentiate between passenger and freight traffic.

In freight service, traffic is strongly determined by the industries. In the Northern Saxony district the airport Leipzig/Halle and companies of the logistics industry, which are located close to the traffic hub Schkeuditz, are dominant.

Passenger traffic in rural areas is strongly influenced by motorized individual traffic. On the one hand, a decreasing number of motor vehicles can be detected, but on the other hand, the distances traveled per diesel cars have increased[11]. The analysis of traffic behavior in the planning region western Saxony has also shown that the large-scale commuting decreases in areas with greater distance to the regional center (Torgau, Oschatz) and less traffic can be observed.

Table 12 Development of vehicle population in Northern Saxony district

	Total motor vehicles	Including cars	Including trucks
2001	142.547	119.170	11.988
2006	150.691	126.293	11.160
2011	135.567	111.539	10.406

Development since 1990

In the private sector, the increase in the fleet of vehicles and the driving performance results in an increase in energy consumption. In recent years, due to the declining population and the reduction of the fleet of vehicles the energy consumption has declined again. Gas and hybrid vehicles do not play any role, so far. In the commercial sector, after the decrease of energy consumption, as a result of losing companies, stabilization or further increase in energy consumption could be seen.

Forecast

In the future, a further decline in final energy consumption in private traffic is expected.

- The number of vehicles in the private sector continues to decrease slightly
- The number of solely petrol-driven vehicles continues to decline, the share of hybrid and diesel vehicles increases
- Growing demand of fuel-efficient vehicles results in an overall reduction of consumption and emissions.

11

		Average mileage per year (Source: destatis.de)	
		2010	2000
Cars	Petrol	11.500	12.500
Cars	Diesel	28.500	22.500

- In the period until 2020, electric vehicles do not play any role, (so far).

According to the commercial development, a stable development for the commercial traffic is to be expected.

Overall, the influence of the regions to reduce the energy consumption in the traffic is limited. Sustainable mobility plans also influenced by location decisions are relevant here. That means the focus in planning is on:

→ Creation of structures that prevent large distances for many inhabitants (e.g. local supply, combination of working and living),
→ Priority of energy-efficient modes of transport (cycling, rail),
→ Priority of investments in central locations.

3. Energy consumption

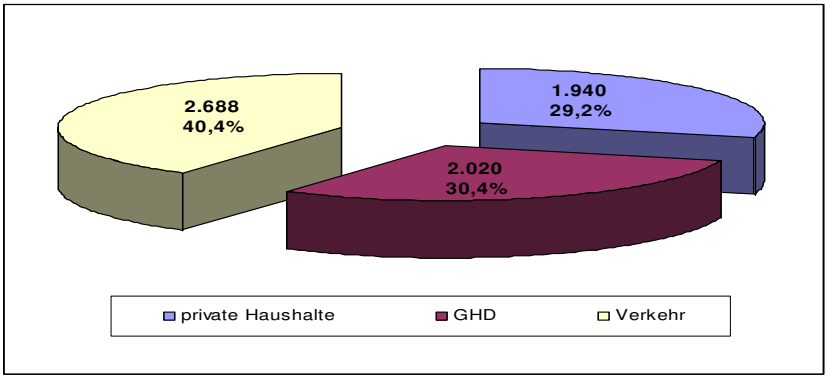
3.1 Overview of the final energy consumption

Taking into account the analysis of final energy consumption in the planning region western Saxony and the statements made in the energy plan of Northern Saxony as well as the energy plan for the municipalities of Düben Heath the following picture emerges:

Table 13 Deduction structure of final energy consumption in the Northern Saxony district

	Electricity and heat in GWh/a	**Traffic** in GWh/a
Private households	1.940	1.049
Commerce/trade/services/industry	2.020	1.639 (including air traffic 1106)
Total	**3.960**	**2.688**

Figure 2 Deduction structure of final energy consumption according to sector in Northern Saxony



According to the statements made on mobility, the structure of final energy consumption in Northern Saxony is characterized by the logistics industry including air traffic.

Table 14 Deduction structure of final energy consumption in the municipalities of Düben Heath

	Electricity and heat in GWh/a	**Traffic** in GWh/a
Private households	432,0	332,0
Commerce/trade/services/industry	109,1	52,7
Total	**541,1**	**384,7**

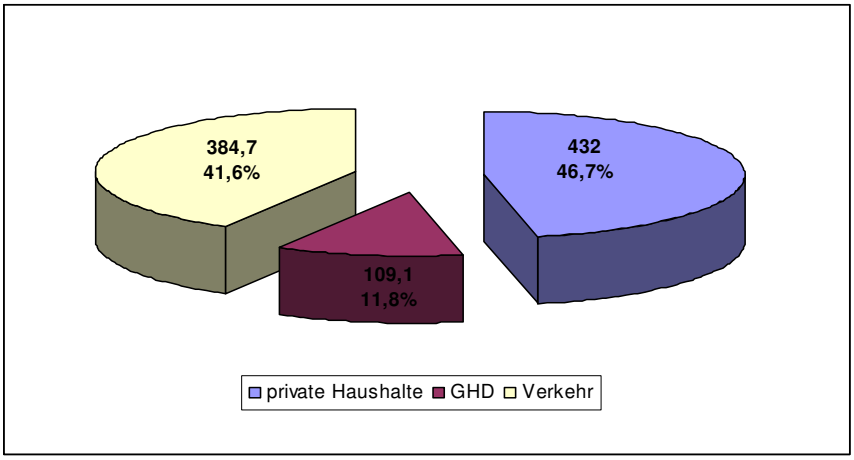


Figure 3
Deduction structure of final energy consumption by sector in the municipalities of Düben Heath

3.2 Final energy consumption in private households

In 2010, the energy consumption of private households has the following structure:

Table 15 Structure of final energy consumption in private households[12] in study area

	Private households – Consumption in GWh/a			
	Heat	**Electricity**	**Traffic[13]**	**Total**
Northern Saxony	1.664	276	1.049	2.989
Municipalities in Düben Heath	345	87	332	764
Total	**2.009**	**363**	**1.381**	**3.753**
Shares in %	53,5	9,7	36,8	**100**

The declining final energy consumption in the households since 1990 has several causes:

- Factors reducing consumption, e.g. reduction of energy-efficient living space, population decline, energy efficiency improvements in heating systems, rising energy prices, modernization of buildings.
- New installations and conversions primarily for the benefit of natural gas were usually combined with more efficient solutions.

Assuming that only a few additional constructions of living space are to be expected in the context of the population development and that also legal efficiency requirements (incl. EnEV, eco-design) result in further energy savings, a further decline in energy consumption for private households can be assumed. Overall, a further decline in electricity demand for private use, but especially a decline in heat demand (approx. 20-25%) is to be expected until 2025.

In addition, renewable energies to heat the buildings (according EEWärmeG) play a more important role.

3.3 Final energy consumption of industry/commerce/services and public sector

[12] The basis of the information on the final energy consumption in 2010 forms the analysis of the Leipzig Institut für Energie GmbH: **Final energy consumption approaches to reduce greenhouse gas emissions** in the planning region of western Saxony (Expertise in MORO-project „Spatial development strategies on climate change“ (2010) and the regional energy plan northern Saxony, Düben Heath 2011)

[13]

		Average mileage per year (Source:destatis.de)		Average fuel consumption per 100 km		Energy content kwh per litre
		2010	2000	2010	2000	
Cars	Petrol	11.500	12.500	8,0	8,6	8,6 kWh per litre
Cars	Diesel	28.500	22.500	6,8	7,0	9,9 kWh per litre

For the commercial sector the structure of final energy consumption is as follows (see Table 16). The final energy consumption has declined sharply since 1990, which had several causes:

- Industrial structural change from 1990 to the mid-90s, the decreasing economic performance led to a reduction in consumption,
- Continued decline in employment,
- Legal requirements and the need to reduce energy costs result in the use of more efficient technologies,
- In general, industry and commerce are sensitive to an increase in energy prices and develop efficiency and thus cost reduction potential,
- In the services sector efficiency and saving potential are often insufficiently used.

Table 16 Structure of final energy consumption of industry/commerce/services and public sector in the study are in 2010

	Businesses				Public			
	Heat	Electricity	Traffic[14]	Total	Heat	Electricity	Traffic	Total
Northern Saxony	1.167	737	1.570	3.474	72	45	69	186
Municipalities in the Düben Heath[15]	71	24,6	51,8	147,7	11,1	2,4	0,9	14,4
Total	**1.238**	**761,6**	**1.622**	**3.622**	**83,1**	**47,4**	**69,9**	**200,4**
Shares in %	34,2	21,0	44,8	100	41,6	23,7	35,0	100

Forecast

In the field of industry/commerce/services a further slight decline in consumption of electricity but also of heat can be expected until 2020. The development of saving potential will become increasingly important in enterprises, respectively, utilization of process heat and improved material flow management.

4. Status of the use of renewable energies

4.1 Overview

The energy plan for the Northern Saxony district notes that according to the composition of electricity generation in 2009 (concession levy in 2008), about 43% of the electricity consumption was covered by renewable energies.

So the district is well positioned compared with the other Saxon districts[16].

[14] Including air traffic – 1106 GWh/a

[15] Estimated on the basis of the BMBF research report: "Energy consumption of the commerce, trade, services sector for 2004-2006" (Fraunhofer-Institut für System- und Innovationsforschung 2009)

[16] Comparison of the districts (Energy region) Vogtland and northern Saxony - plants and installed capacity

		District: Vogtland district	District: Northern Saxony
Hydroelectric power plant	Number electr. performance	14 1.687 kWel	2 112 kWel
Photovoltaic	Number electr. performance	43 9.958 kWel	36 29.959 kWel
Biomass plant	Number electr. performance therm. performance	31 9.575 kWel 10.282 kWth	45 59.599 kWel 7.905 kWth
Sewage and landfill gas	Number electr. performance therm. performance	Anzahl: 1 65 kWel 0 kWth	2 1.834 kWel 0 kWth
Wind energy plant	Number electr. performance	12 13.165 kWel	93 101.856 kWel

Source: www.energieportal-sachsen.de (as of 2009)

Table 17 Electricity consumption and generation in the Northern Saxony district in 2009/2010

	2009	2010
Electricity consumption	**1.058.555 MWh**	
Electricity generation/ energy source - feed		
Biomass	272.532 MWh	**287.892** MWh
Solar radiation energy	18.202 MWh	**35.737** MWh
Hydropower	608 MWh	**638** MWh
Wind energy	155.891 MWh	**147.451** MWh
	446.222 MWh	**471.718 MWh**

Source: ICL (2011): Energy plan for the Northern Saxony district

Production of electricity is dominated by the energy sources of biomass and wind. The solar radiation energy has increased in importance. The largest increases at a regional level in the short term can be seen in the wind energy. The mathematically high biomass potential competes with other energy sources (energy crops – nutrition – material use).

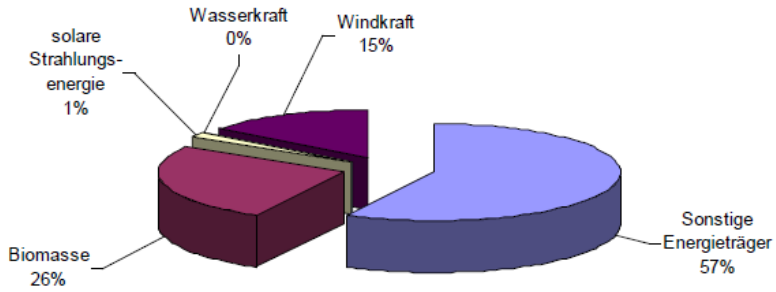


Figure 4
Share of energy sources that meet the electricity demand in the northern Saxony district

Source: ICL (2011): Energy plan for the northern Saxony district

According to the energy plan the following picture emerges for the municipalities of Düben Heath (see Table 5). Similar to the Northern Saxony district the demand for electric energy is already covered with about 48% from renewable energies. But here the wind energy is with a share of 83.7% dominant in power generation from renewable energy sources.

Table 18 Electricity consumption and generation in the municipalities of Düben Heath in 2009/ 2010

	2009	2010
Electricity consumption	**225.601 MWh**	
Electricity generation/ energy source - feed		
Biomass	16.854 MWh	16.687 MWh
Solar radiation energy	859 MWh	1.570 MWh
Hydro power	19 MWh	20 MWh
Wind energy	91.204 MWh	96.917 MWh
	108.936 MWh	**115.194 MWh**

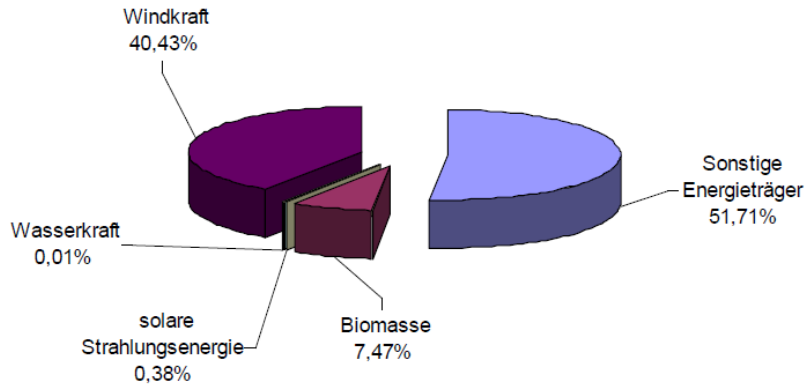


Figure 5
Share of energy sources that meet the electricity demand in the municipalities of Düben Heath

Source: ICL (2011): Energy plan for the region of Düben Heath in the Anhalt-Bitterfeld and Wittenberg district

For the energy sources of wind and biomass the regional distribution in the Northern Saxony district is exemplified.

4.2 Wind energy

Wind energy currently makes the greatest contribution to electricity generation from renewable energies. By 2021 about 16 percent of the electricity demand in Saxony will be covered using wind energy. (Source: Energy and climate programme of the Free State of Saxony, draft dated October 2011).

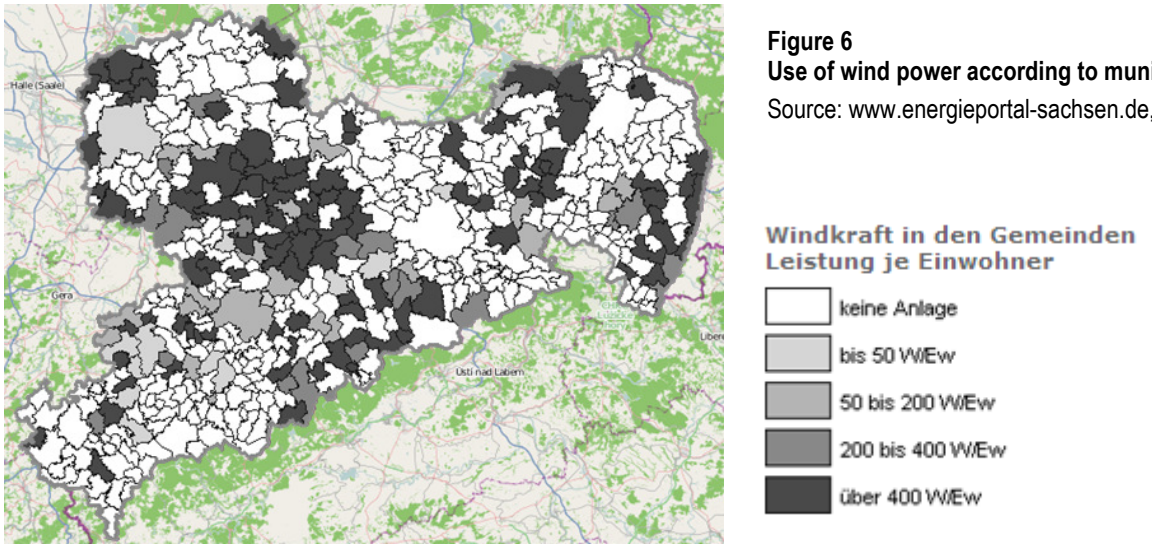


Figure 6
Use of wind power according to municipalities
Source: www.energieportal-sachsen.de, 2011

For the use of wind energy a conversion of existing sites within priority and suitable areas (so-called repowering) is to be assumed.

Currently plant types with an installed capacity of 150 kW and 2,0 MW, including about 50% <1 000 kW, are available in priority and suitable areas for use of wind energy.

Within the regional plan western Saxony four priority and suitable areas for wind energy are currently identified in the study area:

Zaasch	Naundorf
Rackwitz	Jesewitz/Ablaß (crossing district border)

Existing plants are subject to preservation of the status quo, that means a further development is not possible.

In connection with the ambitious goals of energy policy, an expulsion of other areas is expected. The district development plan 2012 (draft) provides that the region Leipzig-Western Saxony has to cover 21 percent of the wind energy production of the Free State Saxony corresponding to its area. Of the 3.500 gigawatt-hours per year that is to be achieved in Saxony in 2021, about 750 would be produced by Leipzig-Western Saxony. Under the new requirements in the planning region Leipzig-Western Saxony, which includes the district of Northern Saxony, the district of Leipzig and the Leipzig city, more than 50 percent of the space is needed (approx. 2.000 hectares). For this purpose, the regional planning will fix appropriate areas taking into account the municipalities.

4.3 Biomass

With the energetic use of biomass a significant contribution to energy supply is made in the district already. About 23% of the generation of electric energy from biomass takes place in agricultural biogas plants, the remaining 77% are generated in wood recycling units.

Renewable raw materials can form a new, economically attractive field of operation for agricultural businesses, but they are also of interest to energy companies such as public utilities and investors.

The approach differs between the actors. Farms focus on the use of their own emergences (manure, cornn ...) and the use of heat for their personal requirements (heating the stables) or for customers in the surrounding as well as for network supply. Investors/ energy utilities are more interested in larger plants with the appropriate supplier relationships that are focused primarily on power input according to EEG with heat utilization concepts.

In addition to the plants for power generation and network supply according to EEG, agricultural biogas plants for self-supply are present in the district, for example in Naundorf (OT Raitzen), Torgau (OT Pflückuff) and Mockrehna (OT Lang Reichenbach).

The potential of biomass use by agriculture and other operators in the context of the existing structure (livestock) and market development is already well developed and will be further expanded. Here, especially a more intense heat recovery is a priority. The development of further potential, such as green waste, straw and chicken manure is planned.

The wood is mainly used in the timber industry. A future potential to its use to produce energy consists especially in the use of wood residues and in the more effective cultivation of private forests. To what extent composted remnants, such as fir trees, shall be used as energy source has to be discussed from an economic point of view. The potential for further expansion in the cultivation of short rotation coppice (SRC) on agricultural land is limited due to the quality of the soils and the market situation. The development of this potential will depend on the extent to which alternative approaches for the SRC-cultivation can be exploited, for example as

- Erosion protective strips in the sense of agroforestry systems,
- In the context of flood protection or
- In connection with recultivation of open-cast mines in the region.

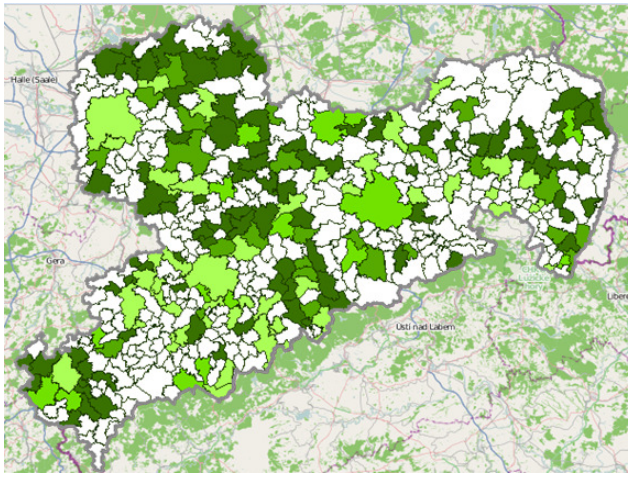


Figure 7
Biomass plant according to municipalities
Source: www. energieportal-sachsen.de, 2011

4.4 Other

In recent years, the use of geothermal energy becomes increasingly important. In particular Delitzsch but also Torgau possess a pioneering role. There is a total of 547 sites (2010) in the district. Additionally, the energy generation based on sewage sludge and landfill gases are available in the study area:

Sewage/landfill gas: 2 plants, 1834 kWh/a

4.5 Forecast of the structure of consumption according to energy sources

Overall, a further decline in private consumption but also in energy consumption for the transport sector can be expected. In a stable economic development, assuming the access to saving potential in the field of commerce/industry/services, a slight decrease in consumption can also be predicted.

Based on the state of 2010, a decline in energy consumption and a slight change in the pattern of use can be assumed. Renewable energies gaining in importance, its share is rising. In contrast, the consumption of oil and petrol is decreasing slightly. The consumption could show the following structure in 2020:

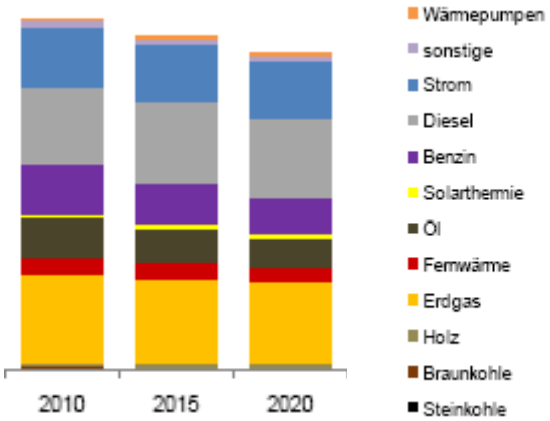


Figure 8
Forecast energy consumption until 2020

Source: Working material of the Leipzig Instituts für Energie GmbH (IE)

5. Overview of important regional stakeholder groups in the study area

5.1 Municipalities

In the study area municipalities are exemplary in the use of renewable energies as well as opening up potential to increase energy efficiency. These include:

Northern Saxony

Bad Düben	Eea-certified municipality, environmental advisory board
Delitzsch	Successful participation in the eea Partner in a national competition for energy efficiency, Municipal energy management system
Schkeuditz	Preparation of the certification process

Municipalities of the Düben Heath

Gräfenhainichen	Energy-efficient urban development policy

5.2 Enterprises

From the perspective of energy demand both energy-intensive companies (6 companies in the district - Table 19) and transport-intensive sectors such as transport services, logistics companies and agricultural enterprises have to be observed. Various companies are working on the development of efficiency potential. Hydro Aluminium Deutschland GmbH, Werk Rackwitz or Profilstahl Delitzsch GmbH are using, for example, process heat as an energy source. The latter company also operates exemplary with the Energy Performance Certificate for the development of potential for energy saving.
The focus of the business sites is located in the cities. In the context of regional energy development potential three groups of companies are of interest:

- Companies with high potential for increasing energy efficiency (see Appendix 2)
  These are companies with high energy demand and large businesses but also housing companies in the study area with its partly great housing stock
- Companies with potential for use of renewable energies
  These include the regional energy provider and energy companies (see Table 19) but also farms with animal production (see Appendix 2)
- Technology companies (see Table 19)

Table 19 Important companies with relevance to the access of regional energy development potential

Public utilities/ district utilities/ energy provider	
enviaM	
Stadtwerke Torgau GmbH	Torgau
Stadtwerke Schkeuditz GmbH	Schkeuditz
Stadtwerke Eilenburg GmbH	Eilenburg
Technische Werke Delitzsch GmbH	Delitzsch
Kreiswerke Delitzsch GmbH	Delitzsch
Energy companies	
Danpower Energie Service GmbH	Delitzsch
Good Energy Biomassekraftwerk GmbH & Co. KG	Delitzsch
Gehrlicher GmbH & Co. Solarpark Sprotta-Paschwitz KG Haar	Haar
ENERGIEPARK SÜPTITZ GmbH	Dreiheide, OT Süptitz
juwi Solar GmbH	Doberschütz

Technology companies	
Streicher Anlagenbau GmbH & Co KG	Delitzsch
CBK Intelligente Licht- und Profilsysteme GmbH	Delitzsch
MEREG GmbH	Delitzsch
Reliable Plant Solutions GmbH	Schkeuditz
David Solar Deutschland GmbH	Cavertitz
Mobil-Strom GmbH	Rackwitz
EPC GmbH European Pellet Company	Torgau
Caralux LED u. Neonlichttechnik GmbH	Rackwitz, OT Lemsel
AVANCIS GmbH & Co KG (> 500 Beschäftigte)	Torgau
Elektrobau Oschatz GmbH & Co. KG	Oschatz
KET Energietechnik-Anlagenbau Wermsdorf	Wermsdorf
Adelwitzer Technologiezentrum GmbH	Arzberg

For a comprehensive presentation of the actors in the development of the energy sector an analysis of existing research and development potential, respectively, innovative companies and their degree of networking is of particular interest. The study[17] of the potential expansion of the cluster energy and environmental technology of the city of Leipzig to the region of western Saxony and in particular to the Northern Saxony and Leipzig district, which was developed on behalf of the regional management Leipzig-Western Saxony, dealt with this focus. It concludes that the number of active and research-oriented companies in the Northern Saxony district itself is relatively low, but that there is potential for expansion and especially the networking and marketing in the region is to improve significantly.

Of the 23 enterprises linked with the energy sector, the majority can be assigned to energy providers, plant operators, engineering offices or energy consultants. Only two companies in the study area meet the following requirements:

- Producers of marketable and promising products
- Fully developed products that can be brought to market immediately
- R&D potential

However, the development potential can be assessed as positive due to the proximity to the cluster initiative energy and environmental technology of the city of Leipzig (embedded research potential of universities like HTWK Leipzig, University of Leipzig and research institutions such as German Biomass Research Centre). Also of interest was the finding that the majority of innovative enterprises is anchored only slightly in the region and that especially supply and productive relations exist outside the region or partially with other countries.

6. Aggregated SWOT analysis

Within the framework of a SWOT analysis the strengths and weaknesses as well as the opportunities and threats have been identified with regard to the use of renewable energies and improving energy efficiency. The analysis was focused on the following fields of investigation:

- General (including location, infrastructure and settlement structure; population; economy and labour market; tourism, education, knowledge transfer, environment)

[17] Source: Feasibility study on energy and environmental technology - The extension of the cluster energy and environmental technology of the city of Leipzig to the western Saxony region. DIMACON on behalf of the RM of western Saxony in 2011

- Renewable energies and energy efficiency

The results of the SWOT analysis are presented below:

LIVING SPACE	
Strengths	**Weaknesses**
Diverse features of the natural environment (such as natural river sections, heath areas) - Development of the post-mine landscape as part of the "Leipzig Neuseenland"	Population decline and structural change (age, social, sexual structure) leads to developmental problems in the long term, especially in peripheral rural municipalities (region of Torgau, Düben Heath)
Good living environment (renovated village and city centers, good developed road network, good technical infrastructure and possibilities for recreation/leisure activities)	Vacancies in the urban areas and increasingly in rural areas. Also important buildings,forming the image of a village (such as old farm buildings) are empty
Successful regional development in the context of existing network structures (ILE / Leader areas across borders)	Deterioration of basic services in rural areas (especially local supply everyday consumer goods, partially GP care)
Cultivation of tradition and strong civic commitment	Accessibility in rural areas requires a car (public transport not flexible enough, decreasing capacity and thinning of the network offer)
Proximity to the major regional center of Leipzig (in particular for use of services such as culture, shopping)	Loss of structural elements in landscapes through vast fields/agricultural landscapes; regionally differentiated sparsely wooded - with 20.5% wooded land Northern Saxony is below the Saxon average (28%)
Opportunities	**Threats**
Demographic change as opportunity	Migration, ageing, social segregation lead to declining attractiveness and loss of image and as a consequence also to a loss of identity
People aware of appreciation of nature and sustainable use of resources	Change of municipal finances: lack of investment funds to maintain the infrastructure
Rising energy costs are accelerating the implementation of new solutions	Declining attractiveness of rural areas (deteriorated level of supply) and rising costs of mobility promote migration of young and older people in the centers
ECONOMIC AREA	
Strengths	**Weaknesses**
Cities are important workplaces for rural population	Ageing of qualified employees; increasing lack of young specialists; low attractiveness of rural areas for highly qualified employees
Energy tradition in the region (brown coal) and a stock of companies in the field of environmental technology/remediation	Little manufacturing and industry cause a lack of economic strength in the region, particularly in rural areas
Preservation of traditional industrial cores (Rackwitz, Krostitz, Delitzsch, diving, Torgau, Oschatz) and alternative ue of old industrial sites	Potential of the proximity to the metropolitan area of Leipzig/Halle and to the traffic hub are not yet completely exploited
Establishing of logistics and automotive suppliers	Low purchasing power and social destabilization, high unemployment, first of all long time unemployment
Efficient transport infrastructure in parts of the district (highway, airport, rail)	Established small and medium-sized companies usually have only limited financial resources and thus often a lack of potential to support regional development (e.g. through sponsoring)
Proximity to the major regional center of Leipzig as part of the European metropolitan region of Central Germany	In parts of the study area positional disadvantage because of inadequate road infrastructure

Supraregional important water resources in the Elbe floodplain	
Productive soils and favorable conditions for an efficient and environmentally friendly agriculture (in parts)	
Traditional areas of recreation and day-trip tourism (like Dübener and Dahlen Heath), day-trip tourism in the context of the "Neuseenland" as a newly emerging economic factor	
Opportunities	**Threats**
Efficient business development and existing network structures	Further deterioration in the attractiveness of peripheral areas due to emigration and loss of infrastructure
Collaboration with universities and research institutions	No improvement of urban-rural relations – persistently low level of networking and transfer of the major regional center of Leipzig to the district
Development of additional alternative income through alternative energies	
Establishment of regional circulations in the use of biomass (from the landscape conservation of municipal and conservation areas) and in the use of heat (horticulture and fish farming)	
Education and public relations on the importance and function of the generation and use of alternative energies in the region	
Continuation of initiatives to improve the internal and external marketing	
USE OF RENEWABLE ENERGIES AND ENERGY EFFICIENCY	
Strengths	**Weaknesses**
Wide use of renewable energies in the district and the municipalities of the Düben Heath - investments of agricultural enterprises, municipalities and companies in bioenergy plants	Complex and sometimes highly differentiated natural conditions of production (such as low amounts of precipitation per year, early summer drought, partly unfavorable soil conditions)
Agriculture, forestry and fish farming can provide biogenic resources in an economically viable range	Use of biogenic residues expandable (e.g. from the meat processing, sewage sludge, straw, wood residues, green waste)
Delitzsch and Bad Düben are recognized eea-municipalities (Schkeuditz preparation of certification)	Private forest owners are often not able to manage their wooded land
Higher education institutions with an energy-related environment (HTWK, University of Leipzig, energy cluster) and innovative companies in the field of environmental technology	Potential for exchange of experience among regional actors, such as municipalities, enterprises still expandable
Educational and research institutions in the field of agriculture (Saxon State Office for the Environment, Agriculture and Geology and Lehr- und Versuchsgut Köllitsch)	Potential for development of environmental awareness by local municipalities and schools is only beginning to be used
International awareness of the youth projects of the Ecological Project Center Rabutz (municipalitiy Wiedemar)	Heat recovery from biogas plants and biomass power plants, in parts, insufficient due to the location
Development of the energy path (consistent marketing through a joint logo) as an important part of public relations for the use of renewable energies	
Opportunities	**Threats**
Use of existing endogenous potential in agriculture, forestry and fish farming: Creating value and additional revenue	Negative development of regional economic strength, budget situation of municipalities and private purchasing power
Environmentally friendly regional energy products as a (side) line of business can be established at all stages of the value chain	Competitive pressure of material recycling due to market situation

Linking the potential of agriculture, forestry, fish farming and tourist offers: Nature trails, information points for material cycles	Forecasts of climate change expect an impact particularly for agricultural and forestry production (water shortage)
Further development of projects in the field of bio-energy and energy efficiency (EE-district heating networks, eea-municipalities, Energy Efficiency Management Delitzsch, Energy Performance Certificate etc.)	Change of societal framework (EEG) with the result of insolvencies of plant manufacturers, operators, etc.
Development of regional value chains along the lines of energy crops, wood and biogenic residues	Skills shortage (also in the fields of agriculture, forestry and fish farming)
	Declining acceptance of animal production and alternative energy systems like wind energy and biogas plants

7. Estimation of potential

The opening of development potential for sustainable energy supply and use as well as to reduce CO_2 emissions can be pursued through three main fields of action:

→ Development of the potential for energy savings and efficiency (e.g. increasing insulation standards, modernization rates),

→ Change in the energy supply (e.g. energy source substitution) and

→ Adaptation of generation (e.g. decentralized CHP, expansion of renewable energies).

When analyzing the potential and discussing the strategic orientation of the regional energy supply and use the following premises should be considered:

Premises for the potential analysis

1 The following ranking of measures should be noted

(1) Efficient use of energy	Electricity savings
	Heat savings
(2) Efficient supply engeneering	Combined heat and power
	Waste heat recovery
	Heat pumps
(3) Renewable energies	Wind energy
	Biomass
	Solar heat
	Photovoltaic

2 Searching for economic solutions

3 Passiv-house standard as basis for new buildings

4 Support of companies in the energy sector in particular innovative manufacturing companies

5 Extensive PR activities

Approaches to increase energy efficiency and expand renewable energies in the region are diverse and are supported in particular by

- Municipality (eea-process, energy efficient street lighting, energy certificate, energy representative, municipal property/facility management),
- Industry and business enterprises,
- Service provider especially housing associations,
- Citizens (incentives by energy consulting, initiatives of the craft).

Table 20 Groups of measures differentiated by actors

	Municipalitiy	Industry/ Commerce/ Services	Private
General Approaches	Participation in the European Energy Award (EEA)	Qualification, e.g. further education for craftsmen	Regionalized energy consulting - Heating engineering - Energy-related renovation
	Exchange of experiences		
	Self-commitment energy-efficient building standards		
Building and facilities stock	Cost/consumption documentation of local properties	Energy Performance Certificate - energy controlling (first step)	Actions with thermal imaging cameras
	Economic efficiency analysis of measures	Low-loss heat supply	Increasing the thermal insulation
	Real estate and energy management	Use of process heat - heat recovery combined heat and power	Replacing heating, development of potential for the use of renewable energies
	Improving the efficiency of street lighting	Efficient lighting	Procurement of energy efficient equipment
	Procurement of energy efficient equipment	Procurement of energy efficient equipment and facilities	Efficient lighting
	Visualization of energy consumption in schools, daycare centers and larger buildings - energy saving competitions (participation in saving effects)	Housing associations: Low-loss heat supply, insulation standards, economic modernization solution	
	Energy contracting	Implementation of eco profit	
		Energy contracting – A form of organization/financing	
New buildings	Aiming for the passive-house standard		
	Obligation to use renewable energies in new buildings (known as the obligation to use pursuant to Section 3 (2) EEWärmeG) - based on Erneuerbarbe-Energien-Wärmegesetz (EEWärmeG)		
	According to the EU Directive of 23/04/09 an amendment to the EEWärmeG can be expected - Introduction of an obligation to use renewable energies for old buildings under certain conditions until 31/12/14		
Use of renewable energies	Provision of municipal rooftops for photovoltaic systems	Energy consulting	Regional network of energy consulting
	Testing and securing locations for combined heat and power (CHP)	Energy plan - own energy supply approaches such as photovoltaic	Developing the potential for retrofitting (solar thermal energy, heat pump with restrictions etc.)
	Conversion areas as potential locations for photovoltaic ground-based systems	Public utilities in cooperation with enterprises as multipliers in public relations of innovative solutions	
	Installation of photovoltaic systems on their own property		
	Establishing of an connection obligation for local and district heating networks		
	Participation in the Solarbundesliga		
	Optimal use of designated priority and suitable areas for the use of wind energy		

	Municipality	Industry/ Commerce/ Services	Private
Traffic	Establishment of commuter parking	Optimization of traffic routes	Carpool
	Attractive public transport services	Choice of site supplier	Use of public transport
	Increasing the use of electric vehicles in regional transport	Network of electric energy station and converting vehicles to an electric drive	Increasing the use of electric vehicles in regional transport
	Attractive network of cycle paths		Carsharing
			Use of bicycle

The final overview will show the potential for renewable energies and existing barriers

Table 21 Potential for renewable energies

	Development potential	Comments/ barriers
Biogas	Potential for expansion given in animal production facilities Larger plants by farms, regional energy provider, investors	Further expansion of the acceptance through the population Securing the supply Increasing transportation costs because of expanding catchment area
Dendromass	Residual wood in relation to the forest limited Development of street side wood, green waste Short rotation coppices (SRC) in the context of flood protection, agroforestry systems expandable	Acquisition and processing effort Interest of farms in SRC limited so far
Wind energy	Priority and suitable areas – Zaasch Naundorf Rackwitz Jesewitz/Ablaß Repowering in priority and suitable areas Identifying further priority areas in the process of coordination between regional planning association and municipalities	Further expansion of the acceptance through the population
Solar energy **Photovoltaics**	Potential for expansion Conversion areas Building-integrated solutions	
Solar thermal energy	Use of roof and building surfaces, especially in single-family houses for water heating and partly for heat requirements	
Hydropower	No potential for expansion due to the current legislation Considering the alternative possibility of use (heat pump)	
Ambient heat	Development of potential further expandable	
Geothermal energy	Potential well used – Development of potential further expandable	Efficient solutions for building renovation are missing

In terms of power input, consequences for the network operator result from the development of solutions for the use of renewable energies (small-scale, peripheral locations), which have to be taken into account.

In the sparsely populated rural areas solutions have to be found that include a personal use of the generated heat and electricity.

8. Best practice and focus of further work

8.1 Best practice

Finally, best practices were determined through a survey of regional actors in the Northern Saxony district and the municipalities of Düben Heath. The presented case studies are innovative projects / plans on

Use of renewable energies
Increase of energy efficiency
Public relations

It was focused on projects/ plans, which are realized in the sense of best practice/ are in the process of implementation and which can serve as an example for other regions. Similarly, new innovative approaches were needed, which are to be prepared and implemented in the next 2 years.

For the involvement of the projects comparable figures were compiled (see Appendix 2). The following table provides an overview of the projects included (see Appendix 3).

Table 22 Structure of the included best practice in the Northern Saxony district and for the area of Düben Heath

	Northern Saxony	Municipalities in the Düben Heath
Energy efficiency		
	1. City of Delitzsch: Energy efficiency consultant	5. Eisenmoorbad Bad Schmiedeberg: Energetic optimization of the heating system in the rehabilitation clinic
	2. Torgau: Passive-house school	
	3. Public utilities Delitzsch: Electromobility	
	4. City of Oschatz: Efficient street lighting	
Renewable Energies		
Biomass/network	6. Löbnitz: CHP and district heating network	
Complex energetic solutions – combination of EE/RE/PR		
Complex energetic solutions	7. Agricultural cooperative Jesewitz: Biogas plant and catfish production, including district heating network	11. Bitterfeld OT Thalheim: Decentralised combined cycle power plant (Photovoltaic, wind; biomass – Energy management system)
	8. Energy park Süptitz	12. Gräfenhainichen: Energetic urban renewal
	9. Bad Düben: Ecological advisory board (Subprojects - heating system nature reserve building Bad Düben, sewage treatment plant)	
	10. Police academy Dommitzsch: Use of photovoltaics and wood chips	
Public Relations/ Research/ Education	13. Lehr- und Versuchsgut Köllitsch: Energy concept with biogas and short rotation coppice as well as public relations	15. TGZ Bitterfeld-Wolfen: Consulting and competence center for PV-applications (consulting, educational offers and research)
	14. Rabutz: Use of RE – Youth employment	
Development	16. Virtual power plant Technische Werke Delitzsch, enviaM (part of the VisNova-project in preparation)	

8.2 Focus of further work

For developing the energy potential in the Northern Saxony district and the municipalities of Düben Heath the following important fields of actions are identified:

Field of action energy efficiency

Expansion of approaches in the municipalities in terms of a pioneering role (energy efficiency competitions, caretaker training, exchange of experience in energy management)

Municipal housing companies and associations as actors in the housing stock – Moderation of developmental processes/ exchange of experiences on best practice

Field of action renewable energies

- Participation in the updating of the regional plan for locations wind energy, repowering
- Analysis of conversion areas as location for photovoltaics
- Offer land register roof surface on municipal property
- Continue and enhance the networking of actors such as public utilities, biogas plant operators, enterprises, municipalities and housing companies

Field of action economy

- Information on new business models (e.g. farmers on potential and financing/ business models for the cultivation of short rotation plantations on marginal land, with the combination of biogas and diversified agriculture)
- Support in the development of cooperations with the energy cluster Leipzig - Integration of innovative regional companies in the energy sector
- Exploring the requirements and potential of housing companies in the stock modernization (EE, RE)

Field of action public relations

- Information on the results of best practice from the perspective of saving potential and climate impact
- Presentation of potential of so-called people's power plants, cooperative models
- Development of arguments for acceptance discussions

Field of action data basis

- Incorporating the results from the population, housing and building census VWGZ 2011

List of tables

List of figures

Appendix 1: Survey of used data bases for the analysis of the initial situation

Statistical Office Saxony (StaLA)
Population development and structure
School leavers
5th regionalized population forecast for the Free State of Saxony until 2025 (Version 1 and Version 2)
Labour force by districts
Employees subject to social security contribution (AO) by district and cities
Gross value added by districts 2000, 2009 (WZ 03)
Energy consumption of enterprises in mining and manufacturing industry

Statistical Office Saxony-Anhalt
Population development and structure
Population forecast
Total housing stock
Gross value added by districts

Entreprises
Statistics of the Leipzig Chamber of Commerce, Leipzig Chamber of Trade
Gross value added by districts

Municipal and subregional activities and plans
Energy plan for the Northern Saxony district
Energy plan for the region of Düben Heath in the districts Anhalt-Bitterfeld and Wittenberg
Energy and climate protections plans
Integrated rural development strategies
Concepts in the context of integrated rural development (ILE and LEADER areas)
Participation in European statistics of the CCI Leipzig, Leipzig Chamber of Trade
Energy Award (EEA ®)

Housing stock
"Construction activity and housing" from "Statistical yearbooks Saxony" 1992-2010
Apartments in residential and non-residential buildings according to spatial structure and districts (excluding residential homes, all figures include vacant dwellings)
Updating the GWZ 1995 for Saxony (StaLa) – Construction year categories, heating systems

Generation of electricity and heat
Publications on the internet: www. energieportal-sachsen.de
www.50Hertz.com
www.solaratlas.de,
www.biomasse.de
www.erdwaermeliga.de

Sales of electricity gas and heat
ICL (2011): Energy plan for the region of Düben Heath in the districts of Anhalt-Bitterfeld and Wittenberg
Leipzig Institut für Energie GmbH: Expertise in MORO project: Final energy consumption and approaches to reduce greenhouse gas emissions in the planning region of western Saxony.

Traffic
Fleet StaLa
Leipzig Institut für Energie GmbH: Expertise in MORO project: Final energy consumption and approaches to reduce greenhouse gas emissions in the planning region of western Saxony

Appendix 2 Companies with particular relevance for the development of renewable energies and energy efficiency

Companies with relevance to the development of renewable energies

Farms with animal production (to be clarified)	
Agrargenossenschaft eG Jesewitz	Jesewitz
Agrargenossenschaft Naundorf-Niedergoseln e.G.	Jesewitz OT Naundorf
Agrargenossenschaft Beerendorf eG	Delitzsch
Agrargenossenschaft Hohenroda e.G.	Schönwölkau
Leinemilch GmbH Badrina	Schönwölkau
Argrar- und Umwelt AG	Rackwitz, OT Zschortau
Agrargesellschaft mbH & Co KG „Leinetal“ Sausedlitz	Löbnitz - Sausedlitz
Agrargenossenschaft Laas e.G.	Liebschützberg
Mensdorfer Agrargenossenschaft e.G.	Doberschütz, OT Mörtitz
Agrargenossenschaft „Heideglück“ e.G.	Doberschütz, OT Sprotta
Agrargut Wöllnau GmbH	Doberschütz, OT Sprotta
Presseler Landwirtschaftsgesellschaft mbH	Laußig, OT *Pressel*
Heideland Agrar AG Bad Düben	Laußig
Agrargenossenschaft Krippehna eG	Zschepplin
Agrargesellschaft Langenreichenbach e.G.	Mockrehna
Agrargesellschaft „Heideland“ Beckwitz mbH	Torgau, OT Beckwitz
Agrargenossenschaft Arzberg eG	Arzberg
Bioenergie Oberhoff GmbH	Beilrode, OT Zwethau
Heidegut Dahlen GbR	Dahlen
Döllnitztal Agrar eG Liptitz	Wermsdorf,
Agrargut Malkwitz GbR Kunze & Paulsen	Wermsdorf
Erzeugergemeinschaft Agrarprodukte Wildenhain	Mockrehna, OT Wildenhain
Agrargenossenschaft Meuro e.G.	Bad Schmiedeberg
Agrarland Söllichau GmbH	Bad Schmiedeberg
Agrarbetrieb Milch u. Fleisch e.G. (Kleingorgau)	Bad Schmiedeberg
Agrargenossenschaft Trebnitz e.G.	Bad Schmiedeberg
Agravis Fläming Mittelelbe GmbH	Kemberg
Milchagrargenossenschaft Heideland e.G.	Kemberg
Landwirtschaftliche Produktionsgenossenschaft e.G.	Kemberg
Agrarprodukte Pansfelde Verwaltungsgesellschaft	Gräfenhainichen
Kälberaufzucht GmbH	Gräfenhainichen
Landwirtschaftliche Produktionsgenossenschaft e.G.	Gräfenhainichen
Milchagrargenossenschaft Heideland e.G.	Gräfenhainichen
Landwirtschaftsgesellschaft Schmerz GmbH	Muldestausee
Schlaitzer Landwirtschaftlicher Tierzuchtbetrieb GmbH	Muldestausee
Weißwange Werner Bauernhof Krina	Muldestausee

Companies with relevance to the increase in energy efficiency

Companies with high energy demand – partly also waste heat users	
AGR - Aluminiumgießerei Rackwitz GmbH	Rackwitz
Ursa Dämmstoffwerk Delitzsch	Delitzsch
Hydro Aluminium Extrusion Deutschland GmbH	Rackwitz
Hydro Aluminium Deutschland GmbH	Rackwitz
Profiroll Technologies GmbH	Bad Düben
Flughafen Leipzig/Halle	Schkeuditz
Smurfit Kappa GmbH	Delitzsch
StoraEnso-Papierfabrik Eilenburg	Eilenburg
Flachglas Torgau GmbH - SAINT-GOBAIN GLASS	Torgau
P-D-Glasseiden GmbH Oschatz	Oschatz
Large enterprises	
EuroMaint Rail GmbH Werk Leipzig	Delitzsch
Bau- und Haustechnik Bad Düben GmbH	Bad Düben
Delitzscher Schokoladenfabrik GmbH	Delitzsch
Harry Brot GmbH	Wiedemar
DHL HUB Schkeuditz	Schkeuditz
Bitzer Kühlmaschinenbau Schkeuditz GmbH	Schkeuditz
Flughafen Leipzig/Halle	Schkeuditz
Housing companies and housing associations (to be supplemented)	
Wohnungsbaugesellschaft der Stadt Delitzsch mbH	Delitzsch
Wohnungsbaugenossenschaft „Aufbau“ eG	Delitzsch
Wohnungsgenossenschaft Unitas e.G	Delitzsch
EUKIA Vermietungs- und Verwaltungs GMBH, NL Leipzig	Leipzig
Eilenburger Wohnungsbau und Verwaltungsgesellschaft mbH	Eilenburg
IBV Immobilienbetreuungs- und Verwaltungsgesellschaft Taucha mbH	Taucha
Vereinigte Leipziger Wohnungsgenossenschaft Leipzig e.G	Taucha
Schkeuditzer Wohnungsbau- und Verwaltungsgesellschaft mbH	Schkeuditz
Laußiger Wohnstätten GmbH der Wohnungsbaugesellschaft mbH Bad Düben	Bad Düben
Wohnungsgenossenschaft „Heideland“ Bad Düben e.G	Bad Düben
Wohnungsbaugesellschaft Bad Düben mbH	Bad Düben
Wohnungsbaugenossenschaft Torgau e. G.	Torgau
Wohnungsgenossenschaft Gräfenhainichen e.G.	Gräfenhainichen
Gräfenhainicher Wohnungsgesellschaft m.b.H	Gräfenhainichen
Wohnungsgenossenschaft Holzweißig e.G.	Holzweißig
Wohnungsgesellschaft Wolfen	Wolfen

Appendix 3 Summary of case studies - abstract of important projects

1. ENERGY EFFICIENCY

Name of the activity/ of the project	**Delitzsch - Implementation of energy efficiency concept (Delitzsch as a winning city in BMBF's competition "Energy-Efficient City")**		
Category	x	Use of renewable energies	
	x	Increase of energy efficiency	
	x	Public relations	
Location	Delitzsch, Municipal buildings and facilities		
Responsible institution (address)	City council of Delitzsch		
Cooperating partner	Institute for Infrastructure and Resources Management, University of Leipzig – Municipal Energy Research Centre, University of Leipzig Helmholtz Centre for Environmental Research (UFZ) – Leipzig Institute for Energy (IE Leipzig) - KEM Kommunalentwicklung Mitteldeutschland GmbH Technische Werke Delitzsch		
Background	▪ Introduction of an energy management system beginning in 2005 (for approx. 129 buildings) ▪ Successful participation in the "eea" ▪ Preparation of the master plan "Energy-Efficient Delitzsch", which acts neighborhood-based and mostly down to the nearest building and actively considers the prevailing lifestyles of the residents (Sinus-Milieus) ▪ Developing strategies for efficient energy use in residential areas as a partner in the national competition "Energy-Efficient City"		
Development status	Project idea	Planning	Operating
			since November 2011
Abstract of action/ project	The aim is to develop the capability to increase the energy efficiency (especially heating and electricity) in private households, but also in municipal buildings, in the industry and in the mobility sector (e.g. by car sharing). Thus, active local value added and economic promotion will be achieved. The findings will then be transmitted to comparable cities in Central Germany and possibly throughout Germany. Possible activities: conducting target group specific information sessions, forming of a network with regional industry partners (energy efficiency service), advancing energetic construction projects at public and private buildings as well as controlling heating system replacements in an ecologically and economically sensible manner.		
Technical Data			
Steps from planning to implementation	The city is working according to their 'Vision of the City of Delitzsch 2015' and the objective enshrined therein to stand up for the economical use of resources and an effective climate protection.		

Results	Delitzsch is financially energy self-sufficient since 2010 and already a model city for energy efficiency. Ambitious redevelopment projects with emission reductions have been implemented since 2007 (e.g. cost savings of about 300.000 € based on the introduction of the energy management system for municipal buildings) In 2012, the day care center "Zauberhaus" was built as an energetic model project. Since 2011, the City of Delitzsch together with the Technische Werke Delitzsch are in possession of an e-vehicle.
Financing	Pro rata financing through the „Competition Energy-Efficient city“ by the Federal Ministry of Education and Research
Further links	www.delitzsch.de – city portrait – energy-efficient city www.facebook.com/energieeffizientesDelitzsch http://uni-leipzig.de/~effstadt/cms/index.php?id=5

2 COMPLEX APPROACHES

2.1 COMPLEX ENERGETIC SOLUTION

Name of the action/ of the project	**Waste heat utilisation of a 500 KW biogas plant Ochelmitz**		
Category	x	Use of renewable energies	
	o	Increase of energy efficiency	
	o	Public relations	
Location	04838 Ochelmitz Liehmenaer Str. 1a		
Responsible institution (Address)	Agrargenossenschaft eG Jesewitz, Bergstr. 8 04838 Jesewitz		
Cooperating partner	PAL Anlagenbau GmbH, Amtsweg 6, 18510 Abtshagen – Dr. Scheibe Eutec Ingenieure GbR, Wehlener Str. 46, 01279 Dresden - Mr. Warecka Fischgut Nord eG Fischgut Mitte eG		
Background	Better use of waste heat from the biogas plant and recycling of the water used		
Development status	Project idea	Planning	Operating
			Since 2011
Abstract of the action/ project	<u>Goal</u> Greater use of waste heat from the biogas plant, reuse of service water of about 10 m³ per day due to the used input materials <u>Innovation</u> Solution: Combination of aquaculture recirculation system and district heating concept		
Technical Data (input materials, power supply/ capacity, land use, energy efficiency, etc.)	• Parameters of the biogas plant: - Volume of liquid manure ~ 900 m³/a (4% TS) - Fermentation of 550 to/a wilted silage and 550 to/a alfalfa - Fermentation of 1.100 to/a corn silage und 550 to/a maize meal - Fermentation of 1.650 to/a corn meal - Max. 280 m^3 biogas/h; digester temperature 45°C; methane approx. 52% - Fermenter with 2.800 m³ digester (2 x 1.400 m³) - 2x CHP with a capacity of 500 kW and thermal output of 530 kW at 100% utilised capacity - Generation of electricity of 3.942.000 kWhel per year (90% utilised capacity) - Generation of heat of 4.178.500 kWhth per year (90% utilised capacity) • Heat use: Increase of about 1 million kWh for 19 service connections and recirculation system (heat losses in district heating network below 20%) • Well water for the biogas plant is first used in the fish facility • Fish manure is used exclusively in the biogas plant to keep the "fermenter pulp" pumpable • Approx. 1.430 m long district heating network route		
Stages from planning to implementation			

Results	Production of 85 tons of African catfish Heat demand of the aquaculture facility: about 700.000 kWh Supply for town of Ochelmitz with local heating: approx. 470.000 kWh
Financing	District heating network (net 389 T€): ILE-promotion (40%) – thereof 80% EU-funding/ 20% Free State of Saxony Bank credit and self-funding Aquaculture recirculation system (net 600 T€): 50%-promotion by SMUL as part of EEF – thereof 75% EU-funding/25% Free State of Saxony Bank credit and self-funding
Upcoming development	Search for further heat utilisation in summer – e.g. ORC-plant
Further links	www.agrar-jesewitz.de

Name of the action/ of the project	Energy park Süptitz		
Category	x	Use of renewable energies	
	x	Increase of energy efficiency	
	o	Public relations	
Location	04860 Süptitz 048880 Elsnig/ OT Neiden		
Responsible institution (Address)	Energiepark Süptitz GmbH Am Gewerbepark 6 04860 Süptitz		
Cooperating partner	Ölmühlen in Kaschwitz (next to Bautzen) Bilsdring (next to Magdeburg)		
Background	Corporate philosophy: Development of closed value chains		
Development status	Project idea	Planning	Operating
			Since 2003
Abstract of the action/ project	Goal Entire value chain: operation and management of own agricultural land for rape cultivation; own transport fleet; own storage and production including cleaning and drying; environmental friendly production of high-grade vegetable oil (rape oil and rape expeller), Resource-efficient energy and heat generation using photovoltaic (roof, facade, open space) and combined heat and power units as well as sustainable timber production and trade of agricultural raw materials of highest quality. Innovation CHP based on sustainably produced vegetable oil for the energy supply of productions for e.g. drying of firewood Rape oil as fuel for the transportation fleet Complete usage of all byproducts emerging during the energy production from renewable resources		
Technical Data (Data input materials, power supply/ capacity, land use, energy efficiency, etc.)	Location Süptitz 1,2 MW electricity 1,4 MW heat 500 kWp solar Location Neiden CHP (Rape oil) 7 MW electricity, 8 MW heat 6 MWp photovoltaic system Total 10 MW thermal 15 MW electricity		
Stages from planning to implementation			
Results	Creation of 60 jobs		
Financing	SAB-promotion Self-funding and bank credit		
Upcoming development			
Further links	www.energiepark-süptitz.de		

2.2 ENERGY GENERATION/ PUBLIC RELATIONS/ RESEARCH

Name of the action/ of the project	**Demonstration of a sustainable energy concept based on renewable energies - Subproject: The use of short rotation coppices in the Lehr- und Versuchsgut Köllitsch**		
Category	x	Use of renewable energies	
	o	Increase of energy efficiency	
	x	Public relations	
Location	Lehr- und Versuchsgut Köllitsch/ Saxon State Office for the Environment, Agriculture and Geology		
Responsible institution (Address)	Lehr- und Versuchsgut Köllitsch Am Park Köllitsch		
Cooperating partner	Research support: KUP - State Office for the Environment, Agriculture and Geology Division 7 Crop Production, Leipzig-Möckern Biogas - State Office for the Environment, Agriculture and Geology Division 9 Animal Production, Köllitsch (Am Park)		
Background	The Lehr- und Versuchsgut Köllitsch has developed an energy plan for the use of renewable energies. This includes the provision of the site of Köllitsch predominantly based on renewable energies. Due to the spatial division of the location the animal husbandry sector is supplied with heat by the waste heat from the biogas plant and a pellet heating system. The heat demand of the interior (administration, boarding school, training workshops, cultivation) is covered by a wood chip heating and a solar thermal energy (hot water in the boarding school) respectively. In both areas, a gas boiler is available as a redundancy. To complete the energy plan a 10 ha short-rotation plantations of poplars and willows was planted in 2007. Besides the accompanying research of biomass utilization, especially the application in terms of teaching, basic and advanced training as well as permanent education are focal points within the energy plan.		
Development status	Project idea	Planning	Operating
			KUP since 2007/2008
Abstract of the action/ project	<u>Goal</u> Demonstration of a sustainable and ecological energy wood production (wood chips) from cultivation to harvesting and drying up to energy recovery. In detail: • Practical demonstration of the cultivation of fast growing tree species in short rotation on a 10 ha area under the conditions of low annual precipitation, • In addition, cultivation of fast growing tree species from field strips for energy production and as landscaping elements • Getting a deeper understanding of optimal methods of cultivation of poplars and willows, • Testing of harvest and drying processes of wood chips in the own company,		

Technical Data (Data input materials, power supply/ capacity, land use, energy efficiency, etc.)	Amongst others wood chip furnace (280 KW) CHP with biogas fuel (140 KW $_{ther}$ and 104 KW $_{el}$) Pellet heating 90 KW
Stages from planning to implementation	Wood chip heating: - Establishment of the plantation in 2007 - Construction of wood chip heating (2009/2010) with purchase of wood chips - 2011 and 2012, first crop of KUP plantation after 4 or 5 years growth period Biogas plant: - Commissioning in December 2009 - Construction and building 2009/2010 Pellet heating: Construction in 2009
Results	Part of the implementation of an alternative energy plan of the Lehr- und Versuchsgut Köllitsch Evidence of sustainable use of KUP for energy generation also under specific site conditions
Financing	Free State of Saxony
Upcoming development	Further establishment of the KUP plantation in terms of operation and optimization of the drying process (Dom-drying method). Demonstration of the whole chain (wood chip production to energetic use)
Further links	http://www.landwirtschaft.sachsen.de/landwirtschaft/22866.htm http://www.smul.sachsen.de/lvg