

Local Sustainable Energy Planning on County Level

EC BREC, Poland

Summary

The project is an example of new approach to energy planning at the local level: active involvement of the local decision makers and stakeholders, local ownership of the investments planned and active co-operation with neighbouring municipalities. This is a pilot project, which results will be disseminated and used for the purpose of effective energy planning in other Polish municipalities. The most important barrier to addressing sustainability in local energy planning is lack of expertise at the local level, which is extremely difficult to develop and implement, owing to the lack of knowledge, data and skills there. However, capacity building at this level would not be cost effective due to the small scale. It would be much more effective if planning were delivered at the County level comprising of 5-10 municipalities. It would minimise, the requirement for specialist skills as well as the cost associated with individual identification of energy needs, assessment of renewable energy resources and optimisation of their rational use. Therefore, an appropriate and relevant methodology and useful planning tool is required for the development of sustainable energy plans. EC BREC together with ESD Ltd. UK has developed a project sponsored by the British Know-How Fund which aims at elaborating a methodology which could be then used widely in other municipalities in Poland. The project started in March 2001 it will be finished in July 2002.

Key words: sustainable, local energy planning, renewable energy in the rural areas, involvement of municipalities.

End-user area	Target Audience	Technical
<input type="checkbox"/> New buildings	<input type="checkbox"/> Citizens	<input type="checkbox"/> Energy efficiency
<input type="checkbox"/> Refurbishment of buildings	<input type="checkbox"/> Households	<input type="checkbox"/> Heating
<input type="checkbox"/> Transport and mobility	<input type="checkbox"/> Property owners	<input type="checkbox"/> Cooling
<input type="checkbox"/> Financial instruments	<input type="checkbox"/> Schools and universities	<input type="checkbox"/> Appliances
<input type="checkbox"/> Industry	<input type="checkbox"/> Decision makers	<input type="checkbox"/> Lighting
<input type="checkbox"/> Legal initiatives (municipal regulations, directives, etc)	<input checked="" type="checkbox"/> Local and regional authorities	<input type="checkbox"/> CHP
<input checked="" type="checkbox"/> Planning issues	<input type="checkbox"/> Transport companies	<input type="checkbox"/> District Heating
<input checked="" type="checkbox"/> Sustainable communities	<input type="checkbox"/> Utilities	<input type="checkbox"/> Solar energy
<input type="checkbox"/> User behaviour	<input type="checkbox"/> ESCOs	<input type="checkbox"/> Biomass
<input type="checkbox"/> Education	<input type="checkbox"/> Architects and engineers	<input type="checkbox"/> Wind
<input type="checkbox"/> Other	<input type="checkbox"/> Financial institutions	<input type="checkbox"/> Geothermal
	<input type="checkbox"/> Other	<input type="checkbox"/> Hydro power
		<input type="checkbox"/> Other

Context

National context. In September 2000 the Polish Council of Ministers endorsed the Renewable Energy Strategy, in August 2001 it was accepted by the Parliament. The Strategy, put forward by the Ministry of Environment, calls for 7.5% of primary energy to come from renewable sources by 2010. The RES It indicates that: “information flow and help to the local governments in the area of supply of energy and rational use of energy, including renewable energy sources should be granted, secured at minimal environmental costs”. Many official governmental documents encourage sustainable energy planning on the local level. It is justified by the statement in the Polish Energy Law (1997): “The local government is responsible for elaboration of heat supply plans, hereinafter called “assumption project” (...) The assumption project should contain possible ways of utilisation of surplus local energy sources (...)”.

With the introduction of the new decentralised administrative system in Poland, regional and local authorities will take on an increasingly active approach to the development of renewable and sustainable energy strategies. There are three levels of regional governments in Poland. These are, in order of decreasing size: 16 regional governments, 373 County municipalities and almost 2500 local municipalities. Under the new Energy Law local authorities are required to develop local energy plans taking into account locally available renewable sources of energy. These plans have to be approved by the regional government. The plans should be coherent with the regional energy strategies and national energy policies. Referring to the comprehensive energy plans and sustainable energy strategies, regional and local governments can apply for investment support offered by various public funds including national and local environmental funds as well as EU pre-accession funds. The most important barrier to addressing sustainability in local energy planning is lack of expertise at the local level, which is extremely difficult to develop and implement, owing to the lack of knowledge, data and skills there. However, capacity building at this level would not be cost effective due to the small scale. It would be much more effective if planning were delivered at the County level comprising of 5-10 municipalities. It would minimise, the requirement for specialist skills as well as the cost associated with individual identification of energy needs, assessment of renewable energy resources and optimisation of their rational use. It would also help in the development of consistent local plans and enable larger joint investment initiatives at the County or clusters of municipalities level to be planned. Therefore, an appropriate and relevant methodology and useful planning tool is required for the development of sustainable energy plans. EC BREC together with ESD Ltd. UK has developed a project sponsored by the British Know-How Fund which aims at elaborating a methodology which could be then used widely in other municipalities in Poland for the purpose of local sustainable energy planning.

Regional context The Lidzbark Warmiński County, which used to be the capital of the Warmia and Mazury Region, chosen for the purpose of the project, is located in the north-east of Poland. The unique orography, picturesque landscape, numerous post-glacial lakes, huge forest complexes, diversified flora and fauna of the region make it being called “the Green Lungs of Poland”. The protected areas (8 nature parks and 96 reserves) cover 53% of the region, which accounts for 20% of total Poland’s landscape parks and reserves. Additionally the lake district and areas bordering Zalew Wislany lagoon were announced the crucial areas of the European Ecology Network (EECONET) system. This proves that the natural resources are polluted in slight degree and relatively well-preserved. With the population density at 60 per/sq km it is the least populated area in Poland. Additionally, as a result of low industrialisation (2,3% share in Poland’s total industrial output) and high unemployment rate (23,7%), there is a negative migration balance. The County of Lidzbark Warmiński comprises of five municipalities: Lidzbark Warmiński township, three – Lubomino, Kiwity and Lidzbark Warmiński are rural ones, Orneta is a mixed township surrounded by rural areas. The County has about 45 000 inhabitants. 40% or the population live in the rural area. The society of the County consists of repatriates who came here from Vilnius district after II world war in 1945. There are also Ukrainians removed from Podkarpacie, German minority and the previous inhabitants of central Poland.

Objectives

The project is aimed at elaboration of a methodology, which could be used for sustainable energy planning purposes first in the pilot region i.e. Lidzbark Warmiński County and then repeatedly used in other areas of Poland.

The general benefits from the realization of the project:

- elaboration of a methodology which could be used by other self-governments,
- elaboration of the Safire computer program in the Polish version (a software for balancing energy demands and local energy sources) and making it available to other municipalities,
- elaboration of a good-practice manual where energy planning issues are explained in detail on a step-by step basis,
- identification of the role of the County in the energy planning process and suggestion of changes to the existing legislation,
- promotion of the effective energy planning issues in other areas of Poland.

The benefits associated with authorities designing and implementing local sustainable energy plans are:

- elaboration of the County energy strategy,
- preparation of the framework for the local RES center,
- identification of short, mid and long term investments in the public buildings,
- promotion of the County in Poland,
- attracting new investments.

The benefits associated with local population designing and implementing local sustainable energy plans are:

- Financial savings. Industry, households and local authorities themselves are wasting their finances through inefficient energy use. This waste is set to increase as energy prices rise. The outputs will have a direct effect on rural poverty, where energy is taking up an increasing proportion of income.
- Environmental improvements will result from more sustainable use of fossil fuel resources and increased use of renewables. Energy use in Poland is dominated by coal one of the most polluting energy forms, both locally in terms of pollutants and globally as a producer of greenhouse gases. In addition there is often widespread environmental damage from waste materials from the agricultural and wood industries, these can be turned to economic benefit and reduce environmental damage.
- Economic benefits will result from the development of local resources and the marketing of heat and power from sustainable sources, there will be local job creation during the project development stage and a lower but more long term employment effect from operation and maintenance particularly for biomass energy projects. The production of a harmonised system for Poland will have major “economy of scale” benefits across the country, and will also benefit the national government towards achieving its national sustainable energy aims and targets.

Process

The project had several steps:

- identification of a suitable County (Lidzbark Warmiński has been chosen during a contest),
- organisation of human resources for the project i.e. Advisory Group, local project managers, identification of the regional priorities and needs,

- identification of the key renewable resources in the selected region and definition of regional energy demands,
- training of local authorities on the use of the SAFIRE (this computer model, which was developed for the European Commission by ESD Ltd., uses a desegregated bottom-up approach to assess the potential for sustainable energy supply, it has been used in many projects at a local, regional and national level. A Polish version of SAFIRE has been created training for the participants of the project provided), identification of the key investments, identification of the sources of funding for the chosen investments,
- elaboration of the local energy strategy.

Organisation of human resources for the project The co-ordination of different tasks performed in the project was the responsibility of EC BREC and ESD Ltd. UK, however the County is in the focal point, therefore it requires active involvement of local participants. Wide participation not only of the representatives of the local government but also of other stakeholders have been assumed. This is a new approach to energy planning issues. Active involvement of many local groups guarantees elaboration of a “living” document from which the findings will be implemented in the reality.

On the County level a working group has been founded, which consists of representatives of different Municipalities as well as employees of the County. The members of the working group are employees of the building or environmental protection departments in their municipalities. The meetings of the group take place every 2 weeks, when they realise different assignments ascribed to them, such as:

- collection of data on renewable energy resources in the region,
- collection of data on the local energy and fuel market (existing plants, fuels used, fuel shares etc.),
- identification of renewable energy and energy efficiency investments,
- active promotion of the project.

The other important body is the Advisory Group which consists of prominent people from the region such as: the director of a regional energy utility, director of a rural property agency, directors of local schools, manufacturer of wood boilers, dean of the regional university, director of a regional forest corporation, representatives of financing institutions. Involvement of such prominent people helps the progress of the project as well as dissemination of its results.

Financial resources and partners

The project is sponsored by the British Know-How Fund.

Results

The project finishes in June 2002 and by then the results will be ready for dissemination. From the work undertaken so far some preliminary conclusions can be drawn:

1. Sustainable energy planning should not be carried out without active participation of all interested stakeholders from the region, including local governments, public utilities and NGOs. Only such active involvement can awake public interest in the new investments and as a consequence lead to increased use of renewable energy sources on a given territory.
2. Sustainable energy planning is much easier at the County level (which is the natural cluster of municipalities) rather than at the municipality level. Municipalities which have big renewable energy potential are usually rural areas where energy demand is not too high. On the other hand municipalities with bigger energy demands are usually townships with well developed industry such municipalities however have very abridged RES potential. Therefore co-operation between municipalities and exchange of resources and demands is needed. A natural administrative unit for such purposes in Poland is the County or association of municipalities.

3. While preparing energy plans municipalities are fulfilling their legal obligations such as supply of energy to local population and creation of new job places. For the local government investment from the heating sector are much more interesting and important than investment from the electricity sector, therefore following investments in local government infrastructure should be realised in the first place: retrofits of the boiler houses belonging to schools, administration buildings, hospitals as well as energy efficiency measures in such buildings.
4. Increased use of RES on a given territory should be based on a well planned and thought out action plan. The areas with the biggest energy demands should be linked to biggest RES resources. In the rural, non industrial areas the biggest potential is in the private housing sector whereas the largest RES resource is provided by means of biomass (straw, energy crops, forest residues). In the rural areas the target should be therefore to use biomass in the household heating sector. In order to achieve this goal detailed action plan should be elaborated. Such plan should include issues as: demonstration projects, information campaigns, technical assistance, organisation of technology fairs and funding of a local energy unit responsible for realisation of the local strategy. For the purpose of defining schedule of the above mentioned tasks and their priorities elaboration of local Energy Strategy, acceptable to local governments is necessary.
5. Renewable energy sources have a dispersed character therefore management of investments in this area is much more difficult than in case of centralised installations. Utilisation of RES should be stimulated by local governments, who should elaborate sustainable energy plans as well as carry out pilot investments in the municipal infrastructure such as schools, administration, hospitals. Realisation of RES investments in the public sector will serve as an example and incentive for individual.
6. In the rural areas where RES are easily available the biggest potential group of users are individual households. Only utilisation of RES in this sector can contribute significantly to increased participation of renewables in the final energy balance. It is extremely difficult to new technologies among large group of consumers. Things such as fuel supply system, technical assistance, mediating between financing institutions must be provided for them. The realisation of the above mentioned tasks is the key to increased number of investments and thus to increased utilisation of RES. These tasks are however not in the scope of competence of the local government. Such actions would require additional financial resources, know-how and technical assistance.

The environmental, social and economic results are that rather than focus on renewable energy and the demand side separately, an integrated approach which combines both the energy demand and energy supply at local level is more appropriate. This includes activities to increase the use of renewable energy sources and to improve energy efficiency and to encourage other rational energy use.

Energy demands The use of oil is now very expensive, only 30% of infrastructure is connected to the gas network. In all municipalities the biggest use of energy is on the site of household sector, it varies depending on the character of the municipality from 90% in Lubomino to 60% in Lidzbark Warmiński township, where industry is more developed.

Table 1 Summary of energy demands in the LW County

Municipalities	Energy demands by sectors				Total
	Households	Commercial I/ Institutions	Industry	Agriculture	
	GWh/a				
Lubomio	18,59	1,43	1,5	12,51	34,4
Lidzbark Warmiński township	73,05	38,20	38,20	0	126,0
Lidzbark Warmiński- rural areas	34,16	1,59	1,59	36,87	76,3
Kiwity	16,89	1,85	0,9	14,50	34,1
Orneta	78,54	9,96	9,96	15,02	112,6
Total for Lidzbark Warmiński County	221,23	53,03	52,15	78,9	383,4

The estimation of final energy demand was a very arduous task. It included detailed information from all units using energy. The data was collected by the members of the working group, it was then gathered by EC BREC and entered into the computer SAFIRE model. In all municipalities the biggest use of energy is on the site of household sector. The participation of household sector in the total energy demand varies depending on the character of the municipality from 90% in Lubomino to 60% in Lidzbark Warmiński township, where industry is more developed than in other municipalities.

Local energy resources Renewable sources of energy are still unknown in this part of Poland even though a lot of effort has been made to popularise them, e.g. the first wood chip fired plant (1,8MW) was launched in 2001. It heats five school buildings and replaced five small coal fired plants. The area of 25 ha has been planted with willow. Biomass plantations seem to be one of the solutions to social problems particularly in the rural areas where unemployment is now reaching 30%. In the early 90s, 22 000 hectares of plough land belonged to the state. Some of this area has been sold, some has been leased, but there are still 9000 ha of barren land, a large part of this is being afforested. The rest may be assigned for biomass plantation purpose e.g. willow. Altogether the total potential land which could be used for energy crops in the County has been estimated at 2700 ha. At present forests cover 23 523 ha, 25,5% of the area of the County. Altogether the potential for forest residues for the whole County has been estimated at some 7500 tonnes per annum. 55 000 tonnes of straw has been identified as waste material.

The problem of waste remains so far unresolved. Two functioning local landfills are not coherent with the present environmental requirements. It seems reasonable that the future landfill could not only provide for the needs of 5 municipalities but also produce energy for heating purpose e.g. landfill gas. The total waste from all 5 municipalities is too small to have a landfill installation but there is an idea to have a modern landfill for municipalities also from outside of the County. The predicted input would be 4500 t/a. Building of a biogas plant is profitable if the amount of input material is sufficient. In the case of agricultural biogas no big farms which would be interested in building a biogas plant exist in the region. The farms are numerous but all of them are pretty small. The cities of Lidzbark Warmiński and Orneta have their modern wastewater plants, they were constructed in the second half of the 90s, there are also 14 smaller ones in the rural area. As far as municipal biogas is concerned the existing waste water treatment plants are too small to be considered for potential biogas investment.

The wind conditions are average as per Polish circumstances and they are described in wind speed levels at 30 meters. The figures are the result of wind measurements run by EC BREC in neighbouring regions of Poland and evaluations of wind energy specialists. Solar energy has been estimated based on the solar radiation measurements in the region in three places close to the County.

Solar radiation for various places in Poland has been provided in the Polish norm PN-B-02025:1999. The radiation is not very high and solar installations have low potential for market penetration in the region. There are four main rivers: Lyna, Symsarna, Pasłęka and Drwęca Warmińska. Currently, 12 small-scale hydro plants work on them but the possibility to construct 3 more is being considered. With regard to geothermal waters, resources were discovered in the early 90-s by the researchers of University of Warmia and Mazury, with 35 to 54 0C temperature at the depth from 1800 to 2200 m.

Correlation between energy demands and availability of renewable energy sources Once all the information had been gathered it was entered into the computer which is used to run Safire. SAFIRE (Strategic Assessment Framework for the Implementation of Rational Energy) is a tool tested in the European Union. SAFIRE was designed to provide decision makers from the world of business and politics with a tool enabling them to investigate and assess development opportunities for renewable technologies with the help of various political and economic instruments in competition with conventional energy technologies. SAFIRE permits the balancing of the supply of energy from various sources with the energy demand requirements in the various sectors of the economy. On that basis, energy supply and demand may be analysed at a local (a company, village, town), regional (city, local authority) and national levels.

SAFIRE performs calculations on the following three levels:

- Technical potential - starting with the resource SAFIRE looks at what can realistically be used technically and physically, without taking into account economic factors. Planning restrictions would apply here.
- Market potential - this takes account of the economics of using this resource compared with other energy sources.
- Market penetration - this allows for the degree of choice and preference users have in selecting their energy sources and the time it takes for new energy sources to enter the market place.

The calculation algorithm shows how the calculation procedure in SAFIRE allows, via the use of input data, the calculation of final results:

- production of renewable energy, GWh/year,
- additional installed power, MW/year,
- employment effects of additional installed power of renewable technologies,
- carbon dioxide emission reductions due to additional installed power of renewable technologies,
- total capital investment in order to attain the goals set forth in the scenario.

The results of the simulations are presented below:

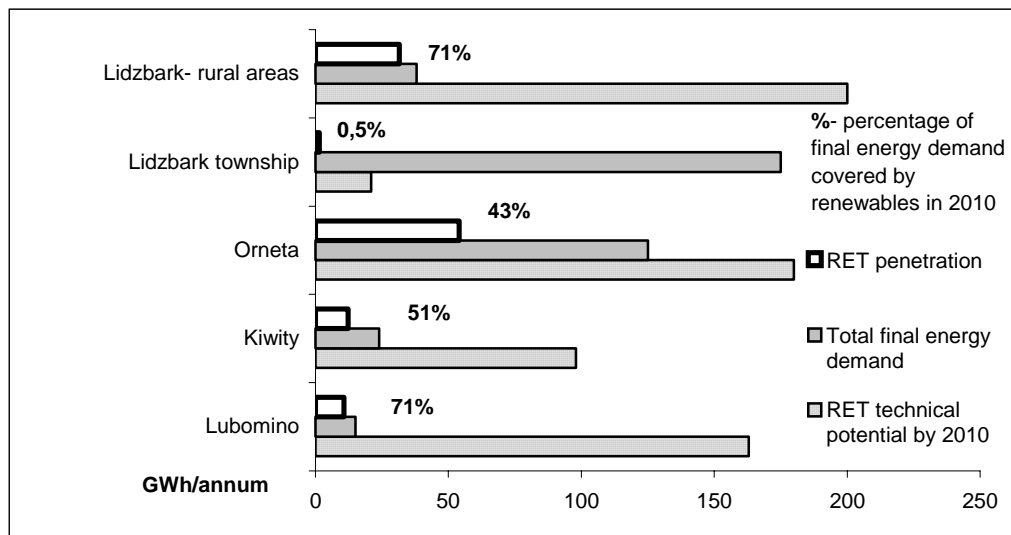


Figure 1 Energy demands and RES potential as per computer simulations

From the above diagram it becomes clear that in 4 municipalities the potential of renewable energy sources is bigger than their energy demand. The exception is in this case Lidzbark Warmiński township which has no potential for development of biomass on its territory. Municipalities which have big renewable energy potential are usually rural areas where the energy demand is not too big and they can use only a fraction of its potential for own needs. On the other hand municipalities with bigger energy demands are usually townships with well developed industry- such municipalities however have very abridged RES potential. Therefore co-operation between municipalities and exchange of resources and demands is needed. All 4 municipalities can cover by 2010 half of their heat and electricity demand from renewables. Most of the technical potential will be used by means of utilisation of biomass: forest residues, straw and energy crops. The other RETs have very insignificant penetration, for different reasons: wind conditions are average in this region, solar radiation is one of the lowest in Poland and geothermal waters are located very deep underground and have low temperatures

Identification of the key investments

The energy market has been divided into 3 basic sectors:

- production of electricity
- production of heat
- energy efficiency measures.

The simulations run with the help of the Safire have shown that renewable energy sources can be utilised both in the electricity as well as in the heating sector. However, these two sectors have completely different priorities as far as their importance for the local governments and the local people are concerned. The realisation of “electricity” investments such as wind farms, small hydro aims mainly at attracting new investors and capital to the region as well as generation of new income like local tax, terrain acquisition and land lease fees, increased electricity buyback rates. Because these are centralised installations connected to the national grid their importance is bigger for the whole region but less significant for the County or the Municipality.

The analysis has shown that electricity contributes 15% to final energy demands. The rest of final energy is used for covering heat demands. Therefore the investments based on heat obtained from RES are of bigger importance to the local population as far as: creation of new jobs, , increasing local incomes and decreasing heat prices. The analysis of the heat demand has shown that some 60-80% (depending on the municipality) is used in the household sector. Therefore the identified investments should to large

extent cover this sector both as far as district heating but also as individual houses are concerned. However, the pilot demonstration phase of the RES Strategy should not be omitted: such preliminary projects serve as introduction to the new technology for the local population, help to overcome stereotypes, barriers and doubts. During this phase mainly investments in the local governmental infrastructure should be realised. For it is the local governments who should serve their local population as an example. These priorities helped to identify short term, mid-term and long term projects.

The final aim of all actions is to increase the market penetration of biomass in the household sector, because biomass has the biggest market potential among RES and final energy demand is the biggest in the local household sector. This is not an easy task to convince many people to switch to biomass fuel. Following actions must be undertaken to achieve this goal:

- pilot and demonstration project as means of practical education to local population,
- technical assistance to people who would like to switch to biomass,
- biomass supply system must be present (special points where producers deliver produced biomass and users can buy the product),
- information campaigns for local inhabitants with technology fairs etc. must be launched.

In order to achieve the above mentioned goals a well thought out strategy is needed so that the actions are carried out in a logical consequence. The County Energy Strategy is the basic document on which all future actions will be based. The Energy Strategy for the County is currently under the process of elaboration. The aims of this document are as follows:

- increase RES use
- increase energy efficiency measures
- elaborate energy plans
- reduce air pollution
- reduce energy fees
- attract new investors
- decrease unemployment rate
- establish a detailed action plans
- elaborate short, mid and long measures and investments
- defining responsibility of different decision making bodies
- prepare a marketing strategy for increased utilisation of RES among individual users.

Lessons learned and repeatability

The idea of establishment of the RES energy centre in the County should be developed from the very beginning and financial sources for its functioning should have been identified. There is a danger that the things planned during the realisation of the project will be postponed or even not realised if there is no clear assignment of institutional responsibilities. The first year of functioning of the RES centre, would enable to gain institutional experience in this scope as well as to prepare for continuation of the work in the coming years. Actions such as informational campaigns, advisory services would be directed mainly to the local population in order to supply them with information about possible RES utilisation, i.e. accessible local energy resources, equipment suppliers, servicing companies well as advantages from the use of such technology (new job places, preserving local capital spent for energy e.g. coal). Within the framework of the project active co-operation with the local unemployment office, local governments (as far as courses for qualified unemployed are concerned) as well as with local NGOs and decision makers. The main tasks identified for this project are following: informational campaigns and consultancy services for local population, organising of RES fairs and special courses (for installers of new technologies such as solar or biomass and farmers interested in short rotation coppice).

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