The use of renewable energy in Latvia's rural areas

Latvian Fund for Nature

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Author:
Andžela Pētersone, Ministry of Environment of Latvia

Editor:
Liene Auniņa, Latvian Fund for Nature

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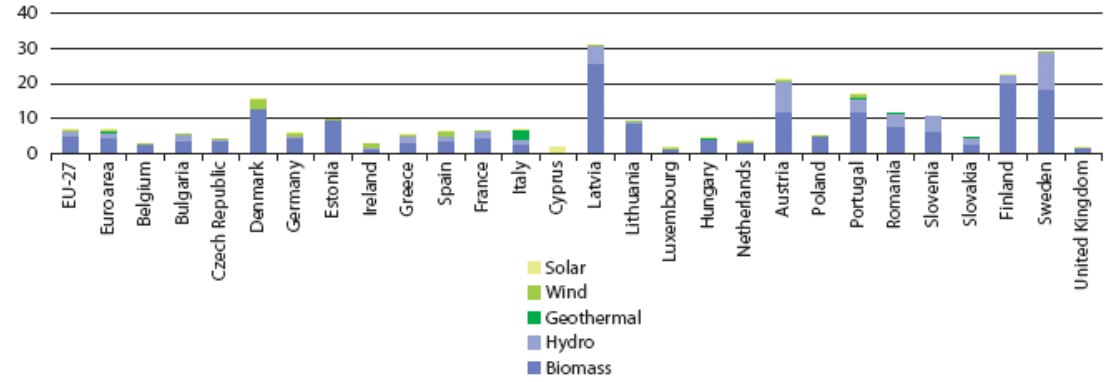
The use of renewable energy in Latvia's rural areas

1. The main guidelines for the use of renewable energy resources in Latvia (2006 – 2016)

In general, Latvia has the highest penetration of renewable energy among the EU member states

Share of renewables in gross inland energy consumption, 2006



(1) Malta, not available; EU-27, euro area and Slovenia, provisional.

Source: Eurostat (tsdcc110)

1.1. Objectives.

In general, the main goal of State Renewable Energy Policy is to promote its use, by respecting environment and achieving a reduction in greenhouse gas (GHG) emissions. The State Renewable Energy Resource Policy is defined in three basic policy documents: **Guidelines for Development of Energy Sector for 2007-2016, Strategy for use of renewable energy resources 2006 – 2013 and the Programme for the production and use of biogas from 2007 until 2011.** They outline the following objectives: increasing the proportion of energy generated from renewable energy sources (RES), reducing dependence on imported energy resources, and reducing greenhouse gas (GHG) emissions from energy sector.

1.2.Priorities.

The most important domestic renewable energy resource in Latvia is biomass, which has traditionally been used in heating, often using ineffective technologies. Distributed electric energy production from RESs is insignificant. Therefore, the following priorities have been set for the field of renewable resources in Latvia:

- the use of biomass,
- introducing technologies for effective use of biomass,
- increasing competitiveness of renewable energy resources,
- conducting research and pilot projects

1.3. Indicators of implementation.

Table 1. The defined quantitative indicators in Latvia's renewable resource politics and their implementation

Indicator	Objectives for 2010	Objectives for 2020	Implementation in 2007
Proportion in the gross electric energy consumption	49,3%	-	36,4%
Proportion in the total energy consumption	35-37%	40%	29%
Proportion of biofuel in transportation	5,75%	-	0,14%
Proportion of renewable energy resources (biofuel + "green" electric energy) in transportation	-	10%	no data available

Evidently, indicators defined in Latvia's renewable resource policy are general, they are few in number and their implementation is unsatisfactory. This situation can be explained by two main factors. First of all, an increase in the use of renewable energy resources in general has had a low priority until now. The main target in Latvia's power sector strategy has been diversification of energy resource types and ways of delivery, as well as the country's self-provision with electric energy. Secondly, until now the policy of renewable resources has been mainly initiated from the outside as EU requirements, in addition these objectives have been only of indicative character.

1.4. Future trends

In the EU Climate and Energy package approved in December 2008, Latvia has undertaken new obligations regarding the use of renewable energy resources. Latvia's targets are one of the highest ones among the EU member countries – to source 40 per cent of Latvia's overall energy consumption from the renewable energy sources by 2020.

Linking the power industry issues closely with fighting against climate changes, as well as setting ambitious binding targets means that in the nearest future significant changes in this direction have to take place in Latvia's renewable energy resource policy:

- higher priority for the use of renewable energy resources in the domestic power industry
- reorientation of state's support instruments from the "green" electric energy to promoting the use of renewables in the heat production sector, cogeneration and transportation.

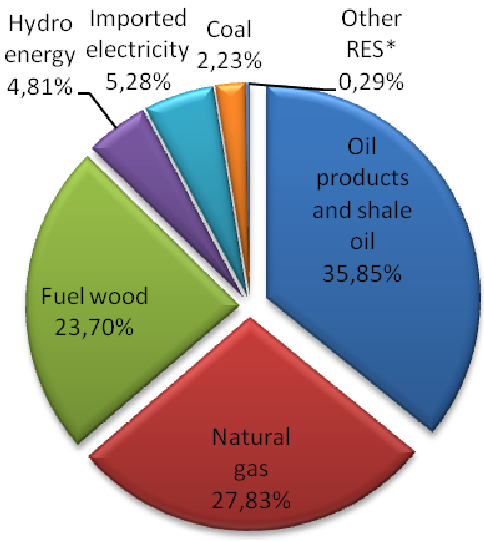
The strategy for the use of renewable energy resources is closely related to the implementation of energy efficiency measures that decrease the total energy consumption, thus increasing the total proportion of renewable energy resources.

1.5. The use of renewable energy resources in Latvia's rural areas: summary

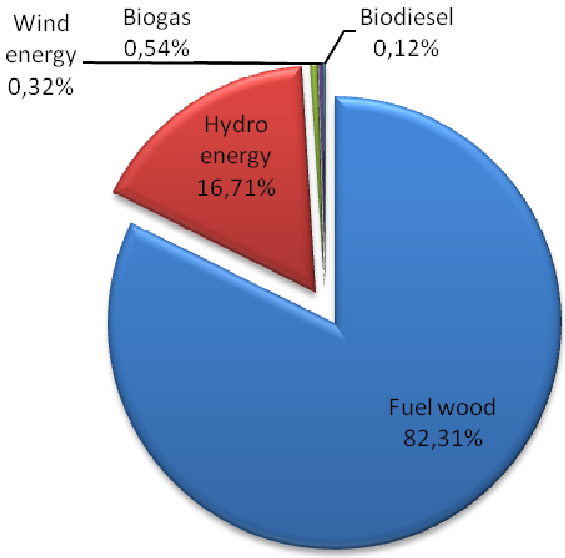
Wood is the major, most widely used renewable energy resource in Latvia – in 2007, the share of wood in the total amount of primary energy resources made up 29% of total energy consumption, the majority of it is used in household heating systems. Latvia's forest industry is a significant producer of wood fuel, in 2006 3,1 million tons of

energetic wood were exported from Latvia. Electric energy is produced in gas-operated cogeneration stations and hydroelectric power stations. 34% of all electric energy consumed in Latvia in 2007 was produced in hydroelectric power stations. Distributed production of energy – wind, small hydroelectric power stations, biogas and biomass cogeneration stations – produces about 2% of electricity.

The use of energy resources in Latvia – 2007
(*Other RES - Straw, biogas, bioethanol, biodiesel, wind)



The use of renewable energy resources in Latvia 2007



Source: Anon. 2009; `Enerģētika.` Available at http:// www.csp.gov.lv

In accordance to the Law "On Agriculture and Rural Development" rural territory is all the territory of Latvia, except cities of the republican importance and district centers. According to the OECD definition, local governments (municipalities) are classified as rural governments, if population density is less than 150 people per square kilometer. Since Latvia is characterized with very low population density, most of Latvia's territory can be considered to be a rural land, also in the sense of the OECD definition. In 2008 there were 2,27 million inhabitants in Latvia among which 68% lived in cities, while 32% lived in rural areas. The average population density in Latvia is 35,2 pers./km^2 – it varies from 2367,2 pers./km^2 in Riga to 5,6 pers./km^2 in Ventspils region. Rural regions are characterized by a lower education and income level, as well as a higher level of unemployment.

The above-mentioned circumstances, to a great extent, determine the power supply solutions in rural areas, with the following main characteristics:

- the heat supply is dominated by individual or local solutions;
- the use of local resources – mainly wood – in heat supply;
- traditional heat supply technologies are being used, whose efficiency is often low;
- development of the distributed electricity production depends on the availability

of investments and the support policy determined by the state.

The use of renewable energy resources, especially in rural areas, where individual solutions dominate, largely depends on the level of information / awareness in society. According to the results of a sociological research conducted in 2008, rural population in general is not very interested in issues of energetics, only 10% show any interest in them. More than 70% of population acknowledges that they are not informed enough to enable them to choose the best energy supply solution. The most important factors in the choice of energy supply is price, impact on people's health and nature, while the impact of landscape is considered to be irrelevant. The attitude of Latvia's population towards the use of renewable energy resources (wind, sun, biomass, hydroelectricity) is very positive (76-86%), only about 45% of population acknowledges natural gas and coal as a good solution, but the attitude towards the use of nuclear energy is mainly negative. Rural population, to a larger extent than city dwellers, think that electric energy has to be produced locally in Latvia, and the price of energy is considered to be the main reason.

In order to promote the development of cogeneration stations, the production and use of renewable energy, **the following support instruments have been created in Latvia:**

- *obligatory purchase of electric energy* for a fixed price (feed-in tariffs), in a form of payment of all Latvia's electric energy consumers in proportion to their total electricity consumption;
- *earmarked investment subsidies* from EU funds for construction of biomass and biogas-based cogeneration power plants;
- *support payment for the installed capacity* – such a regulation was included in the law on Electric Energy Market in 2008, and the applicable regulations were passed in 2009;
- *financing research of renewable energy resources and innovative projects* from the State research programme and various other sources (the financial instrument of the European Economic Zone, the Environmental Protection Fund etc.)
- In the law on Latvia's participation in the flexible Kyoto mechanisms it is stipulated *to create a financial instrument designed for combating climate change in order to finance projects and measures* to reduce greenhouse gas emissions, including RES projects.
- *subsidies for producers of biofuel.*

Although during the last two years Latvia has implemented an entire chain of promotion instruments that have been tested in other countries, **there are several obstacles for the implementation of successful renewable energy resource policy. Here are the main ones:**

- Building of biomass and biogas cogeneration stations entails huge initial investments, and even in the case of subsidies, cofinancing creates problems for the developer;
- Unclear conditions and difficult procedures for connecting the small power plants to the network;
- Inadequate development of electricity transmission and distribution network in some cases preventing the connection of distributed energy producers.
- It is more economically feasible to sell biofuel outside of Latvia; therefore, in spite of significant subsidies, the use of biofuel in transportation is insignificant.
- The carbon dioxide (CO2) tax is too small to encourage the use of renewable energy resources.

1.6. Solar energy

Solar radiation has a relatively low intensity in the territory of Latvia. The total amount of solar energy in Latvia is 1109 kWh/m^2 a year, which is a little more than in the Scandinavian countries. In Latvia solar thermal energy can be used from the last ten days of April when the intensity of sun rays is 120 kWh/m^2 to the first ten days of September. During this period (approximately 1800 hours) it is possible to use solar energy by installing solar collectors. A precise amount of the installed solar collectors is not exactly known. The total installed capacity of the solar photoelectric cells is 5-8 kWp.

1.7. Wind energy

At present Latvia has wind generators having the total capacity of 27,2 MW, they are installed mainly in the coastal area of the Baltic Sea. At the same time small wind generators are being installed, they produce electric energy for local use - guest houses, farmsteads, small municipalities. Since the quantity of wind energy produced by these plants is small, it is not entered into the electricity supply grid and sold, no exact data is available about the capacity and quantity produced. An interesting example is the combining of the local use of wind power and solar energy at the seashore – in Salacgriva municipality. The potential of wind energy in Latvia coastal areas is assumed 500-600 MW.

1.8. Hydroenergy

The use of hydroelectric power plants (HPP) and watermills has longstanding traditions in Latvia which go back to the first half of the 20th century. Hydroelectricity accounts for 98% of all of Latvia's "green" electricity. The capacity of the 3 major hydroelectric power plants on the Daugava cascade (Kegums HPP, Plavinas HPP and Riga HPP) is 1550 MW, however about 150 small hydroelectric power plants have been built on small rivers with the total output of 26 MW. Theoretically, it would be possible to build new hydroelectric power plants whose capacities could possibly be 100-150 MW, however it is practically impossible due to the rigid environment and fish resource protection laws and regulations.

1.9. Biomass

The potential of utilizable fuelwood in Latvia is estimated to be around 6-11 mil. m^3 a year (44-82 PJ), biomass is Latvia's main energy resource. When evaluating the flow of fuelwood in rural regions, one has to take into account the particularities of the wood supply in Latvia. Part of the fuelwood that is used in individual (households) and local heating systems (villages, production units) is obtained in private forests and is utilized for self-consumption or is sold and bought privately, outside the official market. According to an evaluation conducted by the power industry and forestry expert group, the amount of fuelwood in Latvia in 2007 was 9,24 mil.m^3:

- forest output – 3.5 mil. m^3,
- wood resources from areas outside forests – 0.1 mil. m^3;
- woodprocessing by-products – 5.54 mil. m^3;
- used wood – 0.1 mil. m^3.

Fireplaces and stoves, as well as wood boilers are being used for individual heating of family homes. In the 90's of the last century, a transition from centralized district heating

with fossil resources to local wood heating took place in apartment houses in rural villages. A quite common heat supply solution in rural regions is installation of wood boiler houses for one or several apartment homes (in total 20-100 privately owned apartments). The energetic and economical efficiency of such a heating system is largely dependant on the technical solution (capacity conformity, operating mode), firewood quality (each household supplies their own portion of firewood, usually 10-15 m3, with very different moisture parameters etc.), as well as on the condition of heating network. Wide-ranging fuelwood burning installations are used in the centralized district heating of provincial towns with the coefficient of efficiency of 50-80%. Among the great number of wood boiler houses there are those that run on woodchip or sawdust, some that still run on firewood and a small part of those boiler houses that run on wood pellets.
The potential of straw is measured to be 157 000 t per year (0,75 PJ). In 2007 1000 t of straw were utilized in Latvia. There are only two boiler houses using straw as fuel in Latvia. Already since 1999 straw is used in Saulaine – in a boiler house with a 1,2 MW thermal capacity. In Kurzeme, Dubeni village, Grobinas parish straw has been used since 2008, three central heating boilers have been set up with the total capacity of 1 MW. Wood is seldomly used in Latvia for production of electric energy. At present the wood co-generation installations that are in use in Latvia have the total electric energy capacity of about 3 MW. However, progress in this area can be expected in the nearest years, because since 2009 biomass co-generation investment support programme has been started, as well as an increased electrical energy purchase tariff has been implemented.

The use of biogas obtained from agricultural produce and waste is one of Latvia's priorities in the use of renewable energy resource. Support programme for setting up biogas installations in rural farmsteads was started in 2009, a support tariff has been set for electric energy produced from biogas. At present the joint electric capacity of biogas installations that are set up in rural regions is approximately 2 MW (waste site in Grobina, farm in Vecauce), but about 30 new projects are in planning stage.

1.10. Geothermal energy

It has been found in Latvia, but it hasn't been widely utilized until now, because simpler and cheaper solutions have been available. The temperature of thermal underground waters in the territory of Latvia is 25-35^{o}C at a depth of 1300 – 1800 m. It is theoretically possible to generate heat levels of around 70 MW with the help of heat pump technologies. However, heat pumps, which use the heat accumulated by ground, water and air, are being more and more widely used since year 2006-2007. Heat pumps are being installed mainly on new or capitally renovated buildings. Those are newly built residential villages (e.g. in Saulkrasti), as well as guest houses, camping sites, summer cottages, as well as other objects, where a special heating supply regime is needed. 2008 was the start of statistical calculation of energy produced by heat pumps, results are not available yet. The amount of the installed heat pumps is estimated to be around 4000 (half of them are of the ground source type), the total generated heat capacity is around 30 MW (not including the consumed electric energy).

In this publication, we describe three types of renewables in Latvia: the most common - firewood, the most promising – biogas and the most recent pilot project – use of solar and wind energy for lighting of lanterns.

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2. Typical solution for the use of wood for heating purposes - Dundaga Health and Social Assistance Centre

Location: Dundaga village, Kurzeme region - northern part of Latvia
Type of RES: biomass (firewood)
Type of property: municipality
Costs of establishment: 2300 LVL (3272EUR)
Annual maintenance costs: 9000 LVL (12802 EUR)
Annual costs of other type of energy: electricity – 28 LVL (40 EUR), auxiliaries service
Energy created per year: 100 - 150 MWh th

2.1.Basic information

The region of Kurzeme (Courland) is located in the western part of Latvia. Kurzeme has an extremely high quality habitat. Being encompassed by the Gulf of Riga and the Baltic Sea, the coastline of Kurzeme, stretching 300 km long, offers many sandy beaches and rocky shorelines. Most of the coastal area is sparsely inhabited. Also the majority of wind power plants installed in Latvia are located here.

Wood is the most traditional type of fuel in Latvia, particularly in rural areas. More than 50% of the total energy consumed by households in Latvia is obtained from wood. In Kurzeme this proportion is even higher. There are two main reasons for this: first, there is no developed natural gas network, and secondly, there are especially large forest resources in the territory of Kurzeme. In 1980s in many rural villages of Kurzeme, which were collective farm centres, there was a well developed district heating, which was mainly run on heavy fuel oil or coal which was readily available back then. After Latvia regained its independence in 1990, fossil fuel became expensive, and there was a spontaneous collapse of district heating systems. As a result, a transition to wood based local heating solutions took place.

Dundaga village with its approximately 1800 inhabitants is the centre of Dundaga parish, which is the biggest parish in Latvia. 72% of the territory of this parish is covered with forests. Key areas of work of the local people are logging, dairy processing, fish processing and tourism. There are eight specially protected natural reserve areas in Dundaga parish (Natura 2000). The biggest of these is Slitere National Park. There are many children and elderly people in the village.

2.2. Situation outline

Dundaga Health and Social Assistance Centre is the main provider of medical services in Dundaga. The centre is a local government institution. It was created by

closing a local hospital in accordance with the Latvian national health system reform. The centre provides outpatient services, as well as home care nursing.

The Health centre is located in a building built in 1932, and which was renovated and insulated in 2007. Before renovation, several wood stoves were used for heating of this building. This option was not economically feasible, besides the stoves were outdated. After renovation, it was decided to introduce a local heating boiler, which was considered the most convenient and economically attractive solution. The purchased ATMOS 50kW boiler was placed in the building extension. Split firewood is used as fuel, which is the most accessible domestic fuel in Dundaga.

Dundaga Health and Social Assistance Centre building

Photo: ©Elmārs Pēterhofs

2.3. Technical specifications of the heating solution

Boiler: ATMOS DC 50S, power: 50kW.
Heatable area: 908 m^2.
According to the manufacturer's technical specifications the recommended heatable area is 380 m2. However, since the building is insulated, the boiler can provide a good comfort level.
Electricity usage for operating the heating system - 50kW per month.

Boiler and fuel

Photo: ©Elmārs Pēterhofs

Building extension

Photo: ©Elmārs Pēterhofs

2.4. Economic indicators

The building is heated 7-8 months a year. The main items of expenditure for heating are fuel costs and labour costs. Two employees are hired in the production of firewood and heating.

- 7600 LVL (10811 EUR) a year are spent on salaries of firemen/boiler operators
- 1400 LVL (19915 LVL) are spent on purchasing and preparation of fuel (firewood)
- The average costs per $1m^2$ of heatable area during the heating season (2008) - 1.25 LVL (1.78 EUR) $/m^2$

In general, such costs cannot be regarded as very low compared, for example, with individual firewood heating in apartments. However, they are also not excessive, given that a salaried workforce is involved.

For comparison - the city of Riga has one of the lowest heating rates in Latvia. In Riga district heating system, which is run mainly on heat produced in natural gas

cogeneration stations, heating and hot water costs are about 1LVL (1.42 EUR)/m^2. At the same time when using individual gas boilers the cost is 0.5 LVL (0.71 EUR)/m^2 or even lower. This situation is not obvious, since it would be logical to assume that the cost of a centralized district heating system with many consumers must be lower.

This can be explained by two reasons: first of all, heat provider's monopoly, secondly, the property management company's low interest in energy efficiency and reduction of heating costs.

Pros and cons:

+	-
• Uses wood, which is the most affordable fuel in the given region • Economical solution, relatively low heating costs • Convenient and easy maintenance	• Only dry firewood can be used • People need to be hired for heating and fuel preparation

3. Biogas co-generation plant in Vecauce

Location: Southern part of Latvia, Zemgale region
Type of RES: biogas from agricultural feedstock (dairy manure, corn silage)
Type of property: owned by state university
Costs of establishment: 800 000 LVL (1137980 EUR)
Annual maintenance costs: 120 000 LVL (170697 EUR)
Annual costs of other type of energy: Not applicable
Energy created per year: 1800 MWel, 2400 MWth

3.1. Basic information

Biogas is one of Latvia's most promising renewable energy resources. The total biogas production potential is estimated at 120 million m3 per year, from that around 100 million m3 of agricultural raw materials. Biogas can be produced by anaerobic fermentation of wood or agricultural waste, on landfills or sewage plants. First two ways are of the most interest for rural areas.

Vecauce village is located near the small town of Auce, in Zemgale region. The region of Zemgale, stretching from south of Riga, occupies the central part of Latvia and in south borders with Lithuania. This region has the most fertile agricultural land in Latvia, therefore agriculture is especially developed. Latvian University of Agriculture (LLU) is situated in Jelgava, which is the largest city in Zemgale region.

3.2. Situation outline

LLU research farm "Vecauce" is the only farm in Latvia, where both production and field practice of agriculture students takes place at the same time. About 1000 university and technical school students participate in the training every year and have the opportunity to get acquainted with modern agricultural production technologies. In addition, master's and doctoral students develop their own research work on the farm, including the technical and economic aspects of biogas production in Latvia's conditions. Research in the field of biogas production in Vecauce has been conducted already in the 70's of the 20th century, therefore a high level of competence and elaboration forerun of research is still preserved, as well as the teaching staff who have experience and knowledge in the field of biogas. Farmland area is 1800 ha, the sphere of activity - crop farming and cattle-breeding. The farm owns 800 cattle, of which 350 are dairy cows.

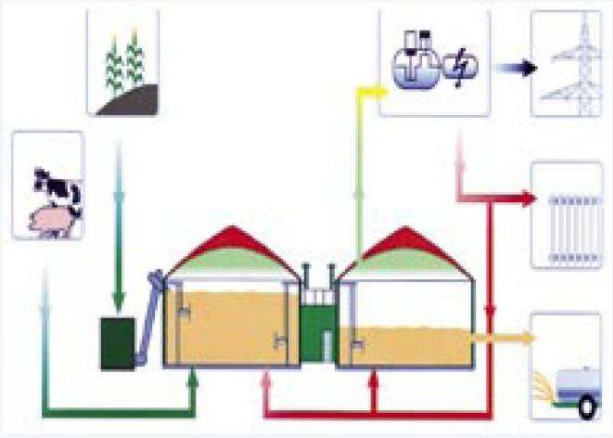
A biogas production plant has been operating on the farm since 2008. This solution was chosen by analyzing the practice of manure management in Latvia and comparing it with the experience of other countries. A traditional manure management solution in Latvia is a construction of special manure storage facilities. Such storage facilities require relatively large investments, therefore European Union funds are granted for their construction in Latvia. The solution of biogas production for manure management has not been used in Latvia until now.

The biogas production project in the research farm "Vecauce" is based on economic calculations and began with the construction of a modern farm in 2006. The farm was built for 500 cows, and according to regulations two slurry reservoirs of 4000 m3 volume are required to maintain them, each of which costs at least 100 000 lats. Since manure storage tanks would only cause expenditure to the farm, it was decided to replace one of

them with a biogas plant. This represents an additional energy production phase, which would pay for construction costs. After having explored experience of the old EU countries, especially Germany, farm experts decided to construct a manure processing biogas plant. It is anticipated to earn extra income for the farm from the sale of electric energy and heat produced as a result of biogas cogeneration.

The biogas plant is comprised of a raw material tank, bioreactor fermentation tank, gas holder, digestate tanks and cogeneration facilities.

Biogas production from agricultural raw materials - the fundamental framework



Author: Anon. 2007.

Raw materials are supplied into the raw material tank, from there into the bioreactor where microorganisms produce biogas by decomposing organic matter. Bioreactor is maintained at a constant temperature and anaerobic conditions. The processed substrate is fed to the digestate tank. Gas is purified from unwanted contaminants (such as hydrogen sulfide) and is supplied to the cogeneration plant, which produces electricity and heat. The processed substrate is used as an agricultural fertilizer.

3.3. Technical characteristics of the Vecauce biogas plant

Raw materials: cattle slurry and corn silage
Bioreactor volume: 2000 m^3
The temperature in the reactor: 38°C
Methane content of biogas: 50-60%
Electricity generation capacity: currently 280 kW, it is possible to increase to 400 kW
Heat output: 356 kW

The heat produced at the cogeneration plan is used for farm purposes, including about 20% of heat – for maintenance of biogas production process. The generated electricity is fed into the common network. The gas engine that generates electricity is hired from the facility production company "UPB".

3.4. Economic indicators

The total investment costs of the biogas plant are 800 000 LVL (1137 980 EUR) state subsidy, equity funds, bank loan). Considering that this amount does not include the

cogeneration facility itself (it is leased), the investments could be regarded as relatively high. This can be explained mainly by the lack of experience in financing and technical implementation of such objects - this is the first agricultural biogas plant in the countryside of Latvia. Electric energy is sold for the support tariff (feed-in tariff) ~17 sant/kWh. Revenues from electricity sales are around 30 000 LVL per month, it varies depending on the mode of production of electric energy. The costs of running the biogas plant are around 10 000 LVL (14 225 EUR)/month (raw materials - corn, equipment maintenance, labour etc.). Part of the proceeds goes to loan interest payments.

3.5. Future Prospects

The size of the farm allows for a doubling of the biogas yield in the future. Since quotas exist in Latvia for the mandatory procurement of power generated from RES, it is contemplated to use biogas for district heating of the nearest populated area (~ 1.5 km). Another alternative is to use biogas as a fuel for farm transport. Support for these types of projects that reduce emissions from transport is planned in Latvia starting with 2010.

Pros and cons:

+	-
• The demonstration potential of RES use, training, experience and research base; • Electric energy production diversifies production, reduces economic risks, creates extra income; • Environmentally friendly manure management, reduces odors and nitrate pollution • The use of biogas is in line with strategic state priorities - to produce energy from RES in a distributed way • Reduces greenhouse gas GHG emissions from livestock farming	• Cost too high for this type of facility • Cannot serve as a model for green business projects • Technological challenges in ensuring the maximum gas output

Vecauce biogas plant

Photo: ©Zane Līde

Vecauce biogas with digestate tank

Photo: ©Zane Līde

Biogas combustion flare

Photo: ©Zane Līde

Generator box

Photo: ©Zane Līde

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Anon. 2007. ”Enerģētisko augu audzēšana un izmantošana”, SIA „Vides projekti”, Rīga. MPS „Vecauce”. Available at http://vecauce.llu.lv/

4. Autonomous outdoor lighting in Salacgriva

Location: northern part of Latvia, Vidzeme region
Type of RES: solar PV and small wind
Type of property: municipality
Costs of establishment: 4295 LVL (6109 EUR)
Annual maintenance costs: Na
Annual costs of other type of energy: Na
Energy created per year: 300-400 MWh

4.1. Basic information

The overall strength of wind in Latvia is mediocre - ~ 4-6 m/s. Wind is stronger in Kurzeme and Vidzeme region of the Baltic Sea coast - Ainazi or Salacgriva (more than 7.5 m/s). Therefore, it is possible to develop wind parks with large (0.8-1.5 MW) wind generators. At present 2 wind generators are set up in Ainazi with 0.6 MW each.

4.2. Wind Map

Salacgriva is located in the Vidzeme region, in the northern part of Latvia. Salacgriva city is situated in the coastal area of the Gulf of Riga, close to the Salaca river’s estuary into the sea, in both of its shores. The territory of the municipality is crossed by the international highway "Via Baltica". The total number of population of Salacgriva city including rural population is 6000, there is a large proportion of children and pensioners among the population. Salacgriva city with the surrounding rural areas is located in the territory of the Northern Vidzeme Biosphere Reserve. The key economic sectors are wood and fish processing.

4.3. Situation outline

When developing the spatial planning of Salacgriva municipality, tourism development, port development and timber industry were named as strategic development areas. Since this is a special territory of Latvia with significant wind energy resources, electricity production is a viable business line.

Also several problems with the public image of Salacgriva city were identified, including an outdated infrastructure and a lack of playgrounds. The inspection showed that its street lighting network is incompletely utilized, because it has no real owner. There are many cables, whose role is not clearly known, many of the cables used are outdated and often perishable. Street lighting has been described as poor and uninteresting. To address these and other issues, the municipality identified a creation of an attractive living environment as its top priority, hoping that it would attract both the local people and tourists to the site. The municipality is aware that it is definitely

necessary to utilize this type of energy production in the coastal region where the wind blows all the time. Therefore, at the beginning of 2009, three autonomous lighting lanterns that run on solar and wind energy were installed in the children's playground in Salacgriva.

Although the contribution is not large, it has already brought good results. Several articles have been published in the press. Positive feedback can be found on the Internet from travelers who have noticed both the large wind masts in Ainazi and the solar - wind lanterns in Salacgriva which can be rarely encountered in Latvia. Representatives of the Salacgriva municipality have been invited to talk about their experience, for example, in the large-scale exhibition of "Environment and energy" held in Latvia, October 2009.

Autonomous lighting lanterns in the children's playground

Photo: Downloaded from the website http://arnis.ucoz.lv/photo/

4.4.Technical solution

Each autonomous lighting lantern consists of a mast, solar photo voltaic (PV) panel, wind generator, battery and lighting fixtures with LED lamps. The power of each LED lamp is 50W, which corresponds to an analogue 250 W sodium lamp. The wind and solar energy produced during the day builds up in the battery, which powers lamps at night. This technology of combining two types of energy resources ensures illumination, regardless of weather conditions.

The battery turns on as soon as the wind speed exceeds 3 m / s. The energy that is produced during the daytime is accumulated in the battery, and as soon as darkness sets in, the photocell turns on the lights automatically and turns them off in the morning.

Light emitting diodes are one of the newest lighting technologies, their potential lies in their small size and insignificant energy consumption. Unlike incandescent light bulbs, where light is emitted by a heated incandescent filament, LED diode is a crystal, which glows when connected to a current. Light emitting diodes consume about 10 times less energy than an incandescent light bulb and will last for at least 10 years.

Photo: Downloaded from the website http://arnis.ucoz.lv/photo/

4.5. Economic indicators

A price survey was conducted, and "AET Ltd." was chosen as the preferred supplier for Latvia. One lantern, together with installation expenses, costs around 1430 LVL (2034 EUR). In Salacgriva city council this is considered to be a good future prospect. Such an autonomous use of renewable resources is convenient because it is not necessary to install lighting poles and dig cables in the ground. It makes it possible to save financial means in the places where retraction of electrical cables would be a more expensive option. City council has estimated that an acquisition of these three lamps could pay off in three to four years.

4.6. Future Prospects

If these installations will function well for a year, it is planned to install such wind and solar lanterns also in other municipalities, in areas where there are no cables and where it is unfeasibly expensive to retract them.

The municipality can continue creating their "green" image. The Northern Vidzeme Biosphere Reserve education centre is located here, which was equipped with solar

energy devices in 2009 and utilizes the energy stored in the earth to provide heating. Salacgriva therefore has a good chance of attracting public attention by its interesting and non-traditional example of the use of renewable energy.

Salacgriva municipality has enough wind resources to develop commercial large-scale wind power plants.

Pros and cons:

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• The first time a combined solar and wind powered public lighting was installed in Latvia • It constitutes an image of a "green-conscious" municipality. Attracts positive attention of local people and visitors; • Represents the practical possibility of the use of solar energy in Latvia • Independence from electricity supplier, energy for free • A high level of safety in case of damage • Easy Installation • Cost savings at the expense of designing, site restoration and installation	• Its costs are higher than those of traditional lampposts • In the second half of night lighting is sometimes inadequate