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*Sustainable Energy Management In Industry Of Republic Of Serbia. Biogas Power Plants Advantages **

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Summary:
This paper reviews the specifics of energy policy in Serbia on the example of designing a biogas power plant. The biogas power plant is designed in accordance with the existing energy policy that recognizes producers of energy from renewable sources as This paper reviews the previously performed analysis in the sphere of energy consumption, which served as the basis for creating a new corporate energy policy. The paper presents an analysis of biogas power plant output (electrical and thermal energy), potential prices on the market, that are consistent with the incentives of energy policy of Serbia. In addition, special emphasis is given to the revenues that a biogas power plant realizes by using mechanism of energy policy, which promotes gaining revenues by reducing pollution of the atmosphere. The authors also show the procedure, costs and expected effects for the qualification of this power plant project (CDM project categories).

Key words:
energy policy, sustainable energy, renevable sources, biogas power plant, Republic of Serbia

Rezime:
Ovaj rad razmatra specifičnosti energetske politike u Srbiji na primeru analize projekta elektrane na biogas. Elektrana na biogas projektovana je u skladu s postojećom energetskom politikom koja obezbeđuje privilegovan status proizvođačima energije iz obnovljivih izvora i garantuje im kupovinu proizvedene energije po subvencionisanim cenama. U ovom radu je izložena analiza potrošnje energije, koja je poslužila kao osnova za kreiranje nove korporativne energetske politike. U radu su predstavljene analize output-a (električne i toplotne energije) energetskog postrojenja na biogas i analize potencijalnih cena na tržištu, u skladu s podsticajima energetske politike Srbije. Osim toga, poseban akcenat je stavljen na prihode koje ostvaruje elektrana na biogas pomoću mehanizma energetske politike, koji obezbeđuje prihode na račun smanjenja zagađenja atmosfere. Takođe su prikazane procedure, troškovi i očekivani efekti za kvalifikaciju ovog projekta (CDM kategorije).

Ključne reči:
energetska politika, održiva energija,obnovljivi izvori, elektrana na biogas, Republika Srbija

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1. INTRODUCTION

Energy Policy of the Republic of Serbia

Replacing fossil fuels with renewable sources has a major impact on the successful resolution of global environmental problems.

Biomass and its products (biofuels and biogas) are fuels from renewable resourses like plants and animals sources.Biofuels have chemical and physical properties that are close to fuels from fossile fuels.Biofuels, which are most widely used are biodiesel and bioalcohols with ethanol accounting for more than 90% of global production of biofuels [3,6,7,9].

With the ratification of the Treaty on establishing the Energy Community of countries from Southeast Europe (14^{th} July 2006) Republic of Serbia, among other things, accepted the obligation to adopt and implement a plan of applying the Directive 2001/77/EC about promoting the production of electrical energy from renewable energy resources [1,5,8,10].

Directive 2001/77/EC defines renewable energy resources, provides for the establishment of national indicative targets for consumption of electricity produced from renewable energy resources and definition of measures to achieve them [4]. Programs are reviewed every five years and the member countries are obliged to report to the European Commission on their realization. The Directive also introduces a duty of countries to analyse and improve existing legal frameworks and administrative procedures necessary for the construction and exploitation of plants that generate electricity from renewable energy resources [2,4,11,14].

In September 2008, the European Parliament adopted a package of legislation on climate change which aims to provide a reduction in emissions of greenhouse gases by 20%, improving energy efficiency by 20% and share of renewable energy from 20% in total energy consumption in the EU - till 2020, in comparison with 1990.

The new Directive 2009/28/EC on renewable energy sets binding national targets which the members of the European Union need to achieve through the promotion of renewable energy in the sectors of electrical energy, heating and cooling and in the transport sector, to ensure that by 2020 the renewable energy is at least 20% of total energy consumption in the European Union. Member countries are obliged adopt, publish and inform the European Commission about the National Action Plans for the accomplishment of the instructed goals and to ensure that procedures for approval, certificates and permits are simplified in order to clear obstacles for developing a market for renewable energy.

The aim of the Republic of Serbia, by the end of 2012, is to increase the participation of energy produced from renewable resources by 2.2%, compared to the total national consumption of electrical energy in 2007 [5]. Planned capacities include the construction of at least 5 MW plants which use biogas in the period till 2012.

The basic legal guidelines for energy production from biogas

Since the production of electricity from renewable resources in most cases is more expensive than energy production from fossil fuels, the so-called support systems has been introduced, i.e. financial and nonfinancial measures of incentives to invest in facilities that use renewable energy [1,2,6,11,14].

The support system for producers of electricity from renewable resources in the Republic of Serbia has been established by the following legislative acts Energy Law

- Decree on conditions for obtaining the status of privileged power producers and criteria for evaluating compliance with these conditions (3rd September 2009)
- Decree on measures of incentives for the production of electricity using renewable energy resources and combined production of electrical and thermal energy (Official Gazette of RS from 01/12/2009 No. 99/2009 year)

According to the aforementioned acts, biogas (gas created from biomass in anaerobic processes) is defined as a renewable energy resource.

Biogas power plants are defined as plants that use gas emerged from the remains of agriculture: manure from livestock and poultry farms, from biomass, from residual biomass produced from the primary processing of agricultural products, which do not contain hazardous materials, debris and animals parts. Manufacturers who in the process of electricity production use renewable energy resources can achieve the status of a privileged producer, among other things, "for a power plant which produces electricity using renewable energy resources (excluding biomass), if in the production process the energy value of used renewable energy resources annually makes at least 90% of total primary energy" [14].

Privileged producer is entitled to measures of incentives which are valid at the time of the request for acquisition or restoration of the status of a privileged producer.

Incentive measures include the purchase price determined by the type of power plant that produces electricity using renewable energy resources and the installed capacity (P) expressed in MW. Types of power plants and installed capacity are determined by the act of acquiring the status of privileged power producers.

Power plant capacity and standards of material inputs consumption

According to the technical and technological solutions, maximal power of a biogas power plant is 250 kWh, which corresponds to the annual electricity production of 2000 MWh and 2857 MWh of heat. The limiting factor in defining the capacity of existing power plants are the dimensions of the digester, i.e. the stability of the process of anaerobic fermentation measured by daily intake of organic dry matter per cubic meter of digester volume.

Maximum capacity of processing category 3 slaughterhouse wastes is 490 tons per year. Processing of waste from slaughterhouses in the biogas power plant is limited by the regulations on acquiring the status of privileged producers of electricity, i.e. the energy balance of the power plant. For privileged power producers, the maximum allowed share of energy produced from this waste in the total primary energy production plant is 10%.

Maximum emission reduction for the planned solution is 9175 CERs. Biogas power plant achieves its emission reduction by reducing emissions from swine manure lagoons and by cogeneration. Taking into account the availability of a gas engine with 90% (7900 hours per year), a standard raw material consumptions for 1 MWh of electricity are shown in Table 1.

Table 1. Consumptions of raw materials for production of 1 MWh of electricity from biogas

Material inputs	Final product (MWh)	Raw material consumption (t)
Manure from the farm Vizelj	1	23.8
IMES slaughterhouse soft waste	1	5.6
Pigs digestive tract content	1	10.4
Cattle digestive tract content	1	9.7
Source: Project of construction and operation of biogas power plant Vizelj, Serbia, 2010		

The consumptions of raw materials for obtaining one unit of electricity from biogas can be considered acceptable for all other similar facilities.

Terms of placements energy from biogas

For producers who submit an application for acquisition or restoration of the status of privileged producer from 1st January 2010 to 31st December 2012 (application period of the Decree on the incentive measures), the purchase price, denominated in euro cents per kilowatt-hour (c€/kWh) are given in Table 2:

Table 2. Purchase prices of energy obtained from biogas in Serbia

Type of power plant	Installed power (MW)	Incentive measure - Purchase price (c€/kWh)
Biogas power plants	to 0.2 MW from 0.2 MW to 2 MW over 2 MW	16.0 16.444 – 2.222xP 12.0
Source: Project of construction and operation of biogas power plant Vizelj, Serbia, 2010		

Calculated by these parameters, the purchase price for electricity generated by the biogas power plant on Vizelj farm is 15.82 c€/kWh for a period from 2011 to 2023.

The buyer of power is "Elektroprivreda Srbije". The buyer redeems the power from the privileged power producers at set prices in RSD counter value at the average exchange rate of the National Bank of Serbia on the day of issuing the invoice.

The rights and obligations of the buyer and the privileged producer are regulated by contract, concluded in written form, for a period of 12 years. The privileged producer along with the request for signing a contract delivers the decision on acquiring the status of privileged producer to the buyer. Buyer is obliged, to conclude a contract with the privileged producer within 30 days of filing a written request. This contract for the purchase of electricity generated using renewable resources is a standard, published on 22nd April 2010.

Under the terms of the contract, the privileged producer turns out to the buyer an invoice for the downloaded electricity till 10th of the month for the previous month. The deadline for paying the bill is 23rd in the current month for the previous month, and if the invoice is submitted later, the deadline for paying the bill is 15 days from receipt.

2. BIOGAS POWER PLANT – VIZELJ, SERBIA

Brief preview of investor company for the power plant on biogas

The meat industry PKB IMES Ltd is a company for the production of meat and meat products. The head office is in Padinska Skela, 15 km from Belgrade.

The basic concept of IMES business is a strictly controlled cycle "from farm to fork". The company is vertically integrated and includes its own livestock production, primary meat processing and retail. It operates in accordance

with ISO9001 and HACCP standards. Several farms operate within the plant, of which the most important farm is Vizelj for fattening pigs.

On the IMES farm Vizelj, 15 km from Belgrade, there is a plant for wastewater treatment by anaerobic fermentation (biogas) which was built in 1986-87. The main motives for investment, which at the time of construction was 1.2 million USD, were: covering the cost of heating in winter, the cost of electricity in summer and the positive effects on the environment. This biogas plant on the farm Vizelj successfully worked until 1994.

Although the complete infrastructure for handling manure, digesters and some other parts of the plants can be restored and put into operation, still the issue was a great investment that could not be justified by savings in electricity and gas on the farm, so in the past there was no economic justification for putting the plant into operation. Venture capital funds are potential investors willing to take risk by investing in the developing companies [13].

3. BIOGAS POWER PLANT PRODUCT PLACEMENT

Biogas power plant products

In addition to the business which is in accordance with the concept of sustainable development and with the Law on Energy of the Republic of Serbia, and therefore consistent with the Kyoto Protocol, the biogas power plant has to operate as a market-oriented unit, which includes development of basic economic indicators. First of all, it is necessary to analyse the products of the plant. The products of biogas plants are diversified from the standpoint of their characteristics, target markets and conditions of placement.

- Electricity is the main product of the biogas power plant. It occurs as a product of combustion of biogas in gas engines of the power plants and by transformer stations is handed over to the electrical network. Since the biogas power plants, in accordance with the legislation of the Republic of Serbia, have the status of privileged power producers, which carry the right of priority in the regulated electricity market and incentive measures by the purchase price, this is a production for a known customer and pre-fixed prices.
- Thermal energy also occurs as a product of biogas combustion. Since it cannot be transmitted over long distances, its marketability and financial effects depend on the possibilities of using it by on-site facilities.
- The third product of a biogas power plant is the reduced emission of greenhouse gases that are, within the projects of Clean

Development Mechanism of the Kyoto Protocol, certified and sold as CERs (Certified Emission Reductions).

Thanks to the Kyoto Protocol of the Framework Convention on Climate Change of the United Nations (UNFCCC) the industrialized countries and EU companies have an obligation to reduce emissions of greenhouse gases and defined targets for reduction.

For the period from 2008 to 2012, Member States of Annex-I (industrialized countries) committed themselves to a total reduction of greenhouse gas emissions by 5.2% compared to the reference year of 1990. EU countries have committed themselves to achieve a reduction in emissions of greenhouse gases by 20% by 2020 (compared to 1990).

To achieve this set of targets, the developed countries and EU companies must invest in projects that decrease emissions or buy already implemented reductions [12]. The emission reduction is calculated in tones of CO_2 emitted.

From the standpoint of the producer/owner of the power plant, the CER is a marketable certificate that has "produced" reduced emissions of greenhouse gases in the amount of 1 t of CO_2 equivalent. For the buyer it represents the right to emit 1 t of CO_2.

Accounting procedures, registrations, measurements and verified emission reductions that will be realized in the developing countries are defined in the Clean Development Mechanism (CDM) of the Kyoto Protocol. Sale of CERs is possible directly or through a stock exchange that was established under the EU Emissions Trading System (Emission Trading Scheme 2005-2007, 2008-2012).

Removal of animal waste is a service which slaughter industries pay to specialized companies. Certain categories of this waste can be processed in a biogas power plant and the costs of such processing are lower compared to other technologies. From this point, the power plant can offer these services on the market at very competitive terms.

In order to fit well into the energy policy of Serbia, the biogas power plant must offer a certain acceptable range of products. This assortment of the biogas power plant is shown in Table 3.

Table 3. Assortment of the biogas power plant Vizelj, Serbia.

Product name	Target market	Product/service buyers
Electrical energy	Republic of Serbia, Purchase of electricity from renewable sources at favourable terms	Known buyer – Elektroprivreda Srbije
Thermal energy	The use of thermal energy on site of the power plant for heating the farm	Known buyer – IMES
CERs	International trade in emission reductions, either directly or through stock exchange	EBRD Carbon Fund
Removal of slaughterhouse waste	IMES, potentially other meat industries	Known buyer – IMES
Source: Project of construction and operation of biogas power plant Vizelj, Serbia, 2010		

Projected sales and prices of the biogas power plant – annual amounts are given in Tables 4 and 5:

Table 4. Projected sales of the biogas power plant Vizelj – Serbia

Product	2011	2012	2013	2014-2020
Electrical energy (MWh)	271.83	1,359	1,365	1,369
Thermal energy (Sm^3)	26,961	61,657	61,943	62,424
CERs (piece)	2,149	8,818	8,823	8,827
Removal of slaughterhouse waste (t)	90.00	450	472	486
Source: Project of construction and operation of biogas power plant Vizelj, Serbia, 2010				

Table 5. Projected prices of the biogas power plant Vizelj – Serbia

Product	Unit of measure	Price
Electrical energy	MWh	158.20 €
Thermal energy	per Sm^3	0.30 €
CERs	piece	11.00 €
Removal of slaughterhouse waste	t	47 €
Source: Project of construction and operation of biogas power plant Vizelj, Serbia, 2010		

Given the characteristics of the presented products of a biogas power plant, it is necessary to examine aspects of the market for each product.

Electrical energy from the biogas power plant

The overall sale of electricity from the biogas power plant will be provided based on the sale of the Public Enterprise "Elektroprivreda Srbije", at prices guaranteed for a period of 12 years. The overview of projected amount of electrical energy is given in Table 4.

Thermal energy from the biogas power plant

The project envisages that the thermal energy obtained from biogas power plant (after deducing the consumption of the plant) is used for heating the farm. According to the technological solution described in the operating plan, within the power plant 51.88% of total produced heat is consumed. The remaining 48.12% or 1,037.6 MWh per year is available for delivery to other consumers. Since the farm is heated only in winter (October-April), the possibilities for the use of thermal energy are limited. Table 6 gives a detailed breakdown of heat production, by month:

Table 6. Heat Production in the biogas power plant Vizelj, Serbia

Month	Available heat from the biogas power plant	Total thermal energy consumption for heating the farm	Heating the farm with biogas	Unused heat
January	65.120 kWh	100.293 kWh	65.120 kWh	
February	75.536 kWh	104.929 kWh	75.536 kWh	
March	82.232 kWh	175.907 kWh	82.232 kWh	
April	88.256 kWh	21.909 kWh	21.909 kWh	66.347 kWh
May	94.136 kWh	0 kWh		94.136 kWh
June	99.056 kWh	0 kWh		99.056 kWh
July	106.784 kWh	0 kWh		106.784 kWh
August	106.784 kWh	0 kWh		106.784 kWh
September	99.056 kWh	0 kWh		99.056 kWh
October	86.696 kWh	56.317 kWh	56.317 kWh	30.379 kWh
November	69.536 kWh	154.072 kWh	69.536 kWh	
December	64.376 kWh	78.011 kWh	64.376 kWh	
Total	1.037.567 kWh	691.440 kWh	435.026 kWh	602.541 kWh

Source: Project of construction and operation of biogas power plant Vizelj, Serbia, 2010

The estimated net production of thermal energy is 1,037.57 MWh per year. In contrast to the net production of electrical energy that is fully marketable since it is handed over the distribution network, the financial effects of thermal energy production depends on the ability to harness it on the location of the plant.

On the basis of currently available resources, the estimated production of thermal energy in the biogas power plant is 2,156.35 MWh per year. The heat needed to maintain optimum temperature of the mass in the digesters (37^{o}C) is 1,118.78 MWh per year, or 51.88% of the total amount of heat produced. Implementation of the project will enable that one part of energy for heating the farm, in the amount of 435 MWh annually, be provided from biogas. For heating the farm 20.17% of the total heat produced in the plant will be used. Total balance of the plant is presented in Figure 1.

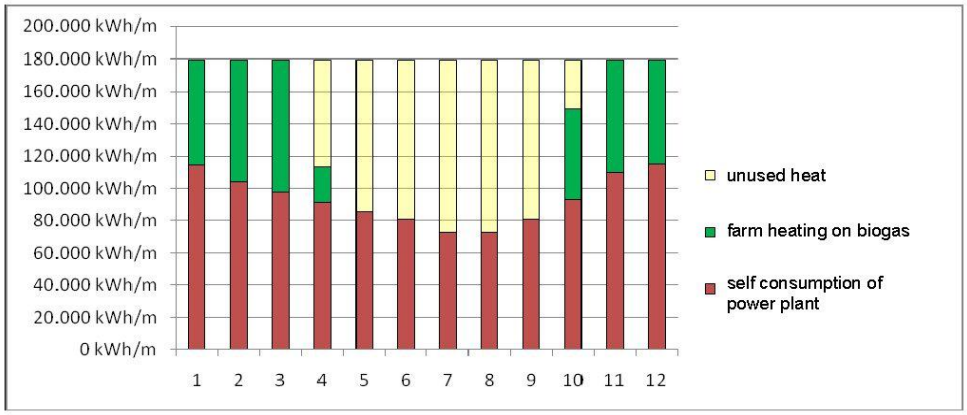

Figure 1. The balance of thermal energy produced in the biogas power plant Vizelj, Serbia

(Source: Project of construction and operation of biogas power plant Vizelj, Serbia, 2010)

The average consumption of natural gas for heating the farm is 98.000 Sm3. Based on currently available inputs, the biogas power plant saves up in consumption of natural gas for heating the farm Vizelj in the amount of 62.92%, which is illustrated in Figure 2.

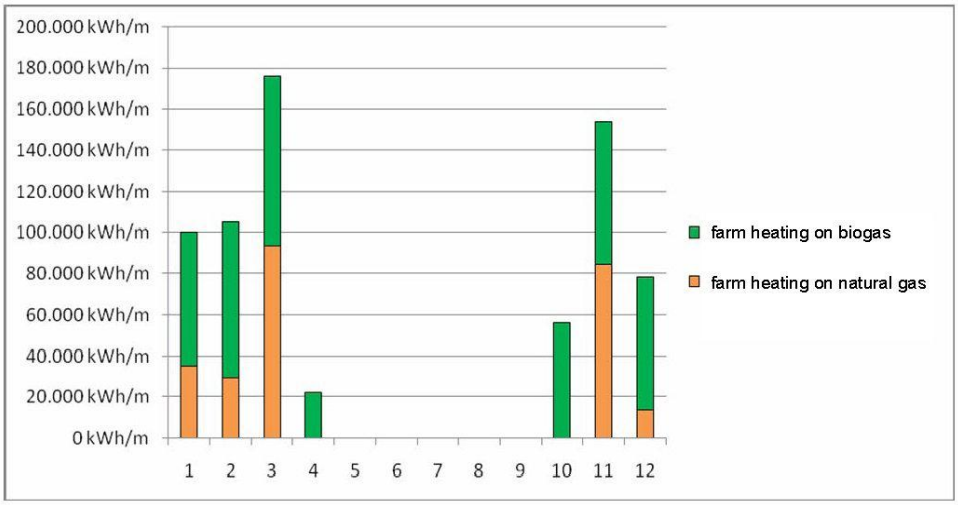

Figure 2. Projection of the replacement of natural gas with thermal energy from biogas Vizelj, Serbia

(Source: Project of construction and operation of biogas power plant Vizelj, Serbia, 2010)

For the purposes of defining a sales plan and financial plan, the thermal energy of the biogas power plant, which will be used for heating the farm, is converted into an equivalent amount of natural gas, shown in Table 7.

Table 7. Projection of biogas energy production expressed in equivalents of natural gas

Thermal energy	2009	2011	2012	2013	2014-2020
Production (MWh /year)		431.27	2,156.35	2,166.35	2,183.16
Used thermal energy from biogas (MWh /year)		190.23	435.03	437.04	440.43
Total consumption of thermal energy on the farm (MWh/year)		691.44	691.44	691.44	691.44
The share of thermal energy from the biogas power plants in the total consumption of the farm		27.51%	62.92%	63.21%	63.70%
Consumption of natural gas for heating the farm (Sm^3)	98,000				
Used thermal energy from biogas (Sm^3 of natural gas)		**26,961.80**	**61,657.70**	**61,943.73**	**62,424.25**

Source: Project of construction and operation of biogas power plant Vizelj, Serbia, 2010

The price which IMES pays for natural gas is 33 RSD or 31 c€ (official middle exchange rate of NBS for 3rd August 2010:106.64). During the project, the anticipated selling price of heat was 30 c€/Sm^3.

Emissions market

One source of revenue on which the biogas power plant can count on is the revenue generated by trading certified emission reduction, achieved by the exploitation of biogas power plant. On the emissions market (so-called carbon markets), the following things are traded:

- Assigned Amount Units – AAU
- Emission Reduction Units – ERU
- Certified Emission Reductions – CER

These instruments are very different in their origin, but their fundamental purpose is the same – fulfilling commitments under the Kyoto Protocol. This protocol defined 2 periods of obligations: from 2008-2012 and from 2012-2020. Principles of the fulfilment of obligations under the Kyoto Protocol that can be achieved at different levels are given in Figure 3.

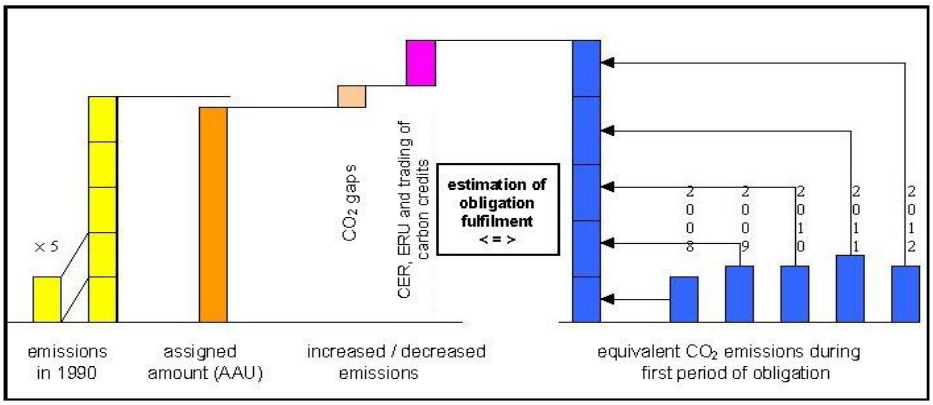

Figure 3. Overview of the obligations for reducing emissions as the basis for trading of carbon credits

(Source: Project of construction and operation of biogas power plant Vizelj, Serbia, 2010)

At the end of the first period of obligations the assessment of the fulfilment of obligations to reduce emissions of greenhouse gases for all Member States of the Annex-I which have target emissions under the Kyoto Protocol will be carried out.

For the period 2012-2020, it is certain that the market will continue to exist, but many questions are open. For example, the targets are defined by EU

countries, but not the other parties, joining of the U.S. and China as major polluters is unknown, it is possible to restrict CDM projects only to the LDCs and the like. For projects to be registered by 2012 the risk is minimal.

A current price for certified CERs is 12.62 Euro (Euro Bluenext spot price). Prices of CERs have varied considerably in the past. The maximum price was 23.88 Euro (June 2008), the minimum 7.39 Euro (May 2009). It is also possible to sell emission reductions in advance (before certification) for the entire period until 2020. The prices are:

- 10-11.5 Euro for registered projects,
- 9-10 Euro for low-risk forwards,
- 7-7.5 for high quality post-2012 vintages.

The project envisages the sale of CERs after certification at a price of 11 Euro. Sale of emission reductions during the project is provided through GFA ENVEST, with an agreed commission of 3%. CERs buyers are multilateral and government funds for reduced emissions of CO_2, private funds, multilateral and private funders. In preparing the project a contact with the KfW Carbon Fund and the EBRD Carbon Fund was made.

Removal of animal waste from the slaughterhouse

The treatment of animal waste from abattoir industry is regulated and strictly controlled by the Veterinary Administration of the RS Ministry of Agriculture and veterinary inspectors. From the standpoint of health risks for humans and animals, the whole animal waste is divided into 3 categories:

- Category 1 – high-risk material that could cause MCD - mad cow disease;
- Category 2 – waste that is a certain risk from the standpoint of other diseases of animals or people. These include the remains of diseased and dead animals, the remains in which permitted doses of drugs are exceeded, as well as manure and the contents of the digestive tract of animals;
- Category 3 – waste that poses no threat to human and animal health. This category includes parts of the body of healthy animals that are useful for the human diet but do not have a commercial placement and parts not usable for the human diet but come from healthy animals.

Processing of this waste in biogas plants is allowed only for categories 2 and 3. Since the plant is designed only for the treatment of soft waste, obtaining these raw materials from local industries that process cattle and beef is risky from the standpoint of the presence of large bones that would

damage the equipment. Processing of waste from poultry slaughterhouses is possible without boning.

Processing of waste of animal origin from the slaughterhouse IMES completely fills the capacity of the biogas power plant.

The current market price of slaughter house waste removal service for category 3 is 5.5 to 6 RSD/kg. In the lifespan of the project, the projected price of removing category 3 waste from the slaughterhouse IMES is 5 RSD per kilogram, or 47 €/t.

Capacity utilization of biogas power plant

The volume of production is planned starting from the raw materials which are available on the location of the power plant within the company IMES. Based on the planned volume of production, capacity utilization for the main products of the power plant is planned in the next level and given in Table 8:

Table 8. Capacity utilization of biogas power plant Vizelj, Serbia

Year	2011	2012	2013	2014-2020
Production of electricity from manure (MWh)	273	1.369	1.369	1.369
Production of electricity from animal waste (MWh)	28	140	147	151
Total electricity produced (MWh)	301	1.509	1.516	1.520
Capacity utilization	**15.09%**	**75.47%**	**75.82%**	**76.03%**
CERs farm (t CO_2 e)	1,930	7,722	7,722	7,722
CERs cogeneration (t CO_2 e)	219	1,096	1,101	1,105
CERs total (t CO_2 e)	2,149	8,818	8,823	8,827
Capacity utilization	**23.43%**	**96.12%**	**96.17%**	**96.21%**
Source: Project of construction and operation of biogas power plant Vizelj, Serbia, 2010				

Given that the heat is practically a by-product of electricity production, capacity utilization is essentially depends on the capabilities of its consumption. Animal waste processing capacity will be used at 90-100%.

4. PROJECT OF CLEAN DEVELOPMENT MECHANISM (CDM project)

The main parameters of CDM projects

Vizelj biogas power plant in Serbia will join the development of CDM project and validation of reduced emissions. Development of a CDM project adds another component to the normal cycle of preparing investment. The development process of a CDM project requires:

- the preparation of special documentation;
- specific procedures for the registration of the project to the Executive Board for CDM projects in the UN Secretariat for Climate Change (Secretariat headquarters is in Bonn, Germany).

Registration is the formal acceptance of the project activity that is certified as a CDM project and it is a prerequisite for the issuance and sale of certificates of emission reductions (CERs). After the registration of CDM project, the activities of the project are monitored in accordance with the approved monitoring plan and verification of achieved emission reduction is periodically performed.

Emissions from the given project are the sum of emissions resulting from implementation of the project and usually refer to an annual basis. CDM project activity can generate CERs certificates for a period to 10 years. Emissions from the project are estimated in the Project Design Document (PDD) before the realization of the given project, i.e. construction of the plant. During the operation of the plant, actual emission reductions are monitored.

The plan about how will the monitoring be carried out should be included in the Project Design Document (PDD) for the proposed CDM project. The monitoring plan should specify the methods that will be used to verify emission reductions after the implementation of the given project. The plan should describe the procedures that will be used to collect data needed for setting the annual baseline emissions, emissions from the project and the leakage (i.e. specific measurements, calculations, using the emission coefficients, etc.) and how will they be stored.

Verification and certification of emission reductions

The assessment of reductions that are expected during the operation of the power plant, as well as the real reductions that will be achieved must be confirmed-verified by an independent verification body (TuV, Bureua

Veritas, DNV). After a successful validation/confirmation of correctness, the company that is engaged for the certification sends a request for registration to the Executive Board of CDM. The request is submitted in the form of a report confirming the correctness, together with a written confirmation of the hosting country. After checking, the indicated amount of CER certificates is recorded to the current account of the Executive Board of the CDM registry.

Each CER certificate must have a special identification number. Possession, transfer and purchase of CER certificates is always monitored and registered in several electronic registers:

- The national registry maintained by each country in Annex-I;
- CDM registry maintained by the CDM Executive Board;
- Book of international transactions (ITL) led by UNFCCC Secretariat to verify all the transactions of Kyoto units, including CER certificates.

For the preparation of the CDM project in IMES 30,000 Euro is needed. Costs of validation and certification are 15,000 Euro per year.

5. CONCLUSION

The presented work represents a specific part of the new energy development strategy of Serbia. The starting point for a significant strategic shift was represented by the new solution of the Energy Law of the Republic of Serbia, which highlighted the production of energy from renewable resources as one of its priorities.

Thus defined energy policy of the Republic of Serbia has imposed the need to review the existing and creating a new energy policy. The analysis of the current situation, defining the real target state, and the discussion of affordable credit solutions for inciting an environmentally responsible business, led to the decision of the company to invest in a biogas power plant .

For this purpose, extensive preliminary analysis were conducted, whose aim was to define the economic, technological and ecological indicators of impending investment. The most important part of the analysis is set forth in this paper, and a summary of the production potential of biogas power plant is shown, i.e. the income that the company can expect with its exploitation. All of the above analysis supports the initial assumption that investing in a biogas power plant is several times and long-term profitable. In addition, a positive contribution of the planned biogas power plant on the farm and biogas power plant in general, is reflected in the reduced emission of carbon dioxide and methane, prevention of harmful effects of non-degraded

slurry to the surrounding soil, and reduced propagation of unpleasant smells. Positive economic effects, energy stability, positive impact on the environment and socially responsible business are just some of the goals that the company accomplishes by realizing the investment into the biogas power plant. This proves that even a potentially very impure industry, which includes animal husbandry and abattoir, by implementing appropriate measures and proper management, could grow into a company that can fit into the principles of sustainable development and become an integral part of the future economy of its country and region.

Special contribution to the exposed work can be found in the practical usefulness of all aforementioned parameters that are specified in real terms of the environment, and the projections till 2020 are given based on an accepted trend interpolation methodology. Therefore, the above analysis and the creation of a new energy policy of this company can serve as an example, a landmark and a guide for companies wishing to implement similar change in their business.

In order to achieve better results in the implementation of renewable energy sources it would be important to find models for off-budget financing: grants, bank loans, international funds etc.

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