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**Article**

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## **LITHUANIAN CONSUMER'S WILLINGNESS TO PAY AND FEED-IN PRICES FOR RENEWABLE ELECTRICITY**

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### **Abstract**

The paper aims to assess the willingness to pay (WTP) for renewable electricity of Lithuanian households and to compare WTP of Lithuanian consumers with support provided for renewable by Lithuanian government in terms of Feed-in prices. The paper reviews the situation of renewable electricity generation and consumption in Lithuania and presents the results of empirical study aiming at assessment of Lithuanian household's willingness to pay for electricity produced from renewables. The results of study indicated that the WTP of Lithuanian households is significantly lower than subsidies for renewable electricity provided in the form of Feed-in prices in Lithuania. Therefore feed-in prices need to be revising taking into account WTP of Lithuanian consumers.

**Keywords:** renewable electricity, assessment of willingness to pay (WTP), feed-in tariffs.

**JEL Classification:** D1; D18; Q42; H31

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### **Introduction**

The increase in electricity prices because of support of renewable electricity reached new heights in Germany and other EU member states. In 2013 the German consumers will be forced to pay €20 billion (\$26 billion) for electricity from solar, wind and biogas plants - electricity with a market price of just over €3 billion (IER, 2012). Solar panels and wind turbines at times generate huge amounts of electricity, and sometimes none at all. Depending on the weather and the time of day, the country can face absurd states of energy surplus or deficit. In the near future it is expected that an average three-person household in Germany will spend about €90 a month for electricity (IER, 2012). That's about twice as much as in 2000. This problem is similar in Lithuania. Though renewable electricity should be supported in order to implement EU energy policy targets however consumers' willingness to pay for renewables need to be assessed and taken into account by developing support measures. In addition one of the basic rights of consumer is to have the right of choice and the right to be informed. Therefore the promotion of renewable energy should take into account the main principles of consumer's rights protection.

Though there is significant support measures for renewable energy in Lithuania all these measures are targeting supply sector. Lithuanian households since January 1 2013 can

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choose the electricity supplier and to support electricity from renewables by paying higher tariff for green electricity (National Control Commission for Prices and Energy, 2013) however Lithuanian households are reluctant to change their electricity supplier and it is important to assess the willingness to pay for green electricity of Lithuanian households. The households satisfaction with renewable electricity and WTP have significant impact on state policies aiming to promote renewable energy sources (Georgescu, Herman, 2014; Lungu et al, 2014). Besides that the electricity price is growing in Lithuania because of support to renewables and there is no clear message about Lithuanian consumers' willingness to pay high price for electricity to support renewables.

The aim of the paper: to compare willingness to pay for renewable electricity of Lithuanian households with feed-in prices for renewable electricity imposed by Lithuanian government. The main tasks to achieve this target: to review the situation of use of renewable energy sources in Lithuania; to analyse available measures to support renewables in Lithuania; to assess WTP for renewable electricity of Lithuanian households and compare with feed-in tariffs for renewable electricity.

### **1. Utilisation of renewable energy sources and support for renewable energy in Lithuania**

The Renewable Energy Directive adopted in 2009 sets binding targets for renewable energy in all EU member states (MS) (EC, 2009). The Directive focuses on achieving a 20% share of renewable energy in the EU overall energy mix by 2020. Every Member State (MS) has to reach individual targets for the overall share of renewable energy in energy consumption. In addition, in the transport sector, all MS have to reach the same target of a 10% share of renewable energy. All MS were obliged to prepare their National Renewable Energy Action Plans and submit them to the European Commission until June 30, 2010 (Streimikiene, Sarvutyte-Grigaliuniene, 2013).

While most Member States have already reached their 2011/2012 interim there is no room for complacency. The indicative trajectory contained in the Renewable Energy Directive is relatively flat early on in the period up to 2020, and rises more sharply towards the end. Nevertheless, three Member States have by now almost reached their 2020 target: Sweden, Romania and Estonia. On the other hand, in terms of progress towards interim targets, three Member States): Malta, the Netherlands and the UK still need to make particular efforts (based on 2010 data). Cyprus, Ireland, Latvia, Luxembourg and Lithuania have also not reached yet their interim target, but the gap is much smaller. In 2010 final renewable energy in Lithuania shared 19,7% of total final energy consumption. Countries target to make 23% of all energy from renewable resources until 2020 (Streimikiene et al, 2011).

In order to promote the production and consumption of biofuel in Lithuania, on 18 July 2000 the Seimas of the Republic of Lithuania adopted the Law on Biofuel. On 5 February 2004 this law was amended according to the provisions of Directive 2003/20/EC of the European Parliament and the Council on Biofuel Utilisation in Transport and new edition was called the Law on Biofuel, Biofuels for Transport and Bio-Oils (Republic of Lithuania, 2009). The Government of the Republic of Lithuania undertaking the EU Directive 2001//77/EC on 5 December 2001 by the Resolution No. 1474 approved The Rules for the Promotion of Production and Purchase of Electricity Produced from Renewable (EC, 2001). and Waste Energy Resources. On 18 September 2006 by the Resolution No. 897 the

Rules were amended. According to this document is promoted the production of electricity produced by wind generators, biomass plants, solar power generators and hydro power plants with the capacity of up to 10 MW as well as the purchase of it (Streimikiene, Balezentiene, 2012).

The following promotion measures are applied: 1) Power plants are connected to the energetic grid according to the legislation with a discount of 40% of the interconnection fee for the producers. This discount is reckoned in public procurement of services and is compensated next year. 2) The electricity produced from renewable energy resources is purchased under the tariffs set by the National Control Commission for Prices and Energy. The purchase price of electricity produced from renewable energy resources until 2020 is higher than the market price. From 1 April 2002 until 1 January 2009 the price of the electricity produced consuming biofuel and by small scale hydro power plants was 0.20 LTL/kWh, and the price of the electricity generated by wind power generators was 0.22 LTL/kWh (average purchase price of electricity 0.09 LTL/kWh). Since 1 January 2009 these prices have changed: the price of the electricity produced consuming biofuel and by wind generators is 0.30 LTL/kWh, and that produced by hydro power plants is 0.26 LTL/kW (National Commission for Energy and Prices, 2014).

In Table no. 1 the feed-in prices for electricity produced from renewables in 2013 are presented.

**Table no. 1: Feed-in prices in Lithuania, LTL/ kWh**

<b>Technology</b>	<b>Installed capacity</b>	<b>Third quarter (1 July to 30 September 2013)</b>	<b>Second quarter (1 April to 30 June 2013)</b>
Solar power plant (not integrated into buildings)	< 10 kW	0.61	0.75
	10 kW - 100 kW	0.56	0.69
	100 kW - 350 kW	0.52	0.64
	> 350 kW	0.52	0.64
Solar power plant (integrated into buildings)	< 10 kW	0.79	0.97
	10 kW - 100 kW	0.71	0.87
	100 kW - 350 kW	0.66	0.81
	> 350 kW	0.66	0.81
Biomass power plants (newly built)	< 10 kW	0.40	0.49
	10 kW - 350 kW	0.34	0.45
	350 kW - 5000 kW	0.34	0.45
	> 5000 kW	0.31	0.38
Biomass power plants (reconstructed)	< 10 kW	0.37	0.49
	10 kW - 350 kW	0.32	0.45
	350 kW - 5000 kW	0.32	0.45
	> 5000 kW	0.29	0.38

*Source: National Commission for Energy and Prices, 2014.*

Renewable energy sources for heating and cooling purposes are exempt from environmental pollution tax and are eligible for grants. Transport sector is promoted through reimbursement of raw materials for biofuel production and an exemption from excise tax and environmental pollution tax. The operators of renewable energy plants are entitled to priority connection to the grid. The transmission of electricity from renewable energy sources shall be given the priority. Heating devices using renewable energy sources are connected according to non-discriminatory principles (Streimikiene et al, 2013).

Up to 2004 in Lithuania the main kinds of renewable energy resources were wood and hydro power while the utilization of other resources was just at the beginning (Energy Agency, 2011). In these latter years the generation of wind energy and production of biofuel have been rapidly developing. In Lithuania the utilization of biomass (wood, forest cutting residues, straw, energetic plants, etc.) as well as hydro power resources is being developed. There are constructed demonstrational geothermal and solar power plants, started the production of gas emitted from municipal waste dumps, expanded the amounts of biogas production (table no. 2) (Energy Agency, 2011).

**Table no. 2: Development of renewable capacities in Lithuania 2000-2010**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total solar capacity, kW	0.1	0.1	0.2	0.4	2	2.7	9	10	30	50	60
Total biogas capacity, MW	1.25	1.21	1.21	2.14	1.955	2.71	2.71	3.04	4.24	4.5	4.7
Total wind capacity, MW	-	-	0.16	0.16	0.85	1.1	48.1	52.3	54.4	62.8	92
Total small Hydro power plants capacity, MW	13.1	13.4	16.5	18.3	19.6	23.5	24.4	24.7	25.0	26	27

*Source: Energy Agency, 2011.*

The Renewable energy in Lithuania accounts for approximately 9.3% of the primary energy production. The total installed capacity of wood based boiler plants (straw, biogas, and biofuels) amounts to some 125 MW, making it the dominant renewable energy in Lithuania. Biodegradable waste from the industrial and residential sectors being able to provide 87.4 million m<sup>3</sup> of biogas annually, for an electricity production of 524.4 GWh. 10-12% of the straw stock of Lithuania is estimated to be available for use as fuel (Streimikiene et al, 2011).

Up to now, hydropower has been the main renewable energy source for power production. Due to the topographical conditions, the potential for hydropower is rather low. The economically feasible potential for hydro resources is estimated at 2.2 billion kWh/year. Approximately 14% of this resource is currently being exploited. Legislation protecting many of Lithuania's rivers from development for ecological and cultural reasons hampers further exploitation of hydropower. Since 2007, the use of wind energy has dramatically increased in Lithuania. In 2008, the installed capacity amounted to 52 MW and in 2011 reached 161 MW. Table no. 3 presents the development of electricity produced from renewable energy sources (Energy Agency, 2011).

**Table no. 3: Electricity production from renewable energy sources (in ktoe)**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Hydro energy	29.2	28.0	30.4	28.3	36.2	38.8	34.2	36.2	34.6	36.5	46.4
Wind energy	–	–	–	–	0.1	0.2	1.2	9.1	11.3	13.5	19.3

*Source: Energy Agency, 2011.*

The share of renewables in electricity generation in Lithuania made 29% in 2012 and it is necessary to increase the share of green electricity further. The National Energy Strategy and the National Energy Efficiency Program foresee the development of geothermal energy. Barriers towards development of this energy source include little technological experience, and currently low heat prices. Lithuania has some geothermal resources, and a demonstration plant of 41 MW. Electricity generation potential from geothermal resources exists mostly in Western Lithuania, and the potential for heat pump use in private housing has also been examined. Solar energy does not contribute a significant amount to power production at the moment. The use of solar energy for hot water, heating, and agricultural use has risen in recent years. The total annual potential of solar energy in Lithuania is approximately 1,000 kWh/m<sup>2</sup> (Energy Agency, 2011).

Since 2012, buildings that are owned by state and municipal institutions, agencies and enterprises and are either new or subject to major renovation have been required to meet the renewable energy requirements for buildings. These requirements as well as a defined implementation process shall be met by the government and its authorised institutions. Measures for the increased use of renewable energy in buildings shall be included in municipal action plans for renewable energy sources according the Law on Energy from Renewable Sources (Republic of Lithuania, 2011).

**2. Review results of studies on WTP for renewables**

The results of studies indicated that consumers support various types of renewable electricity; they would not be willing to actually pay more for it. The results of a poll released by Harris Interactive in 2008 showed that many in the five largest countries in Europe and in the United States like the idea of renewable energy, but are not willing to pay any more than their current rates for renewable energy sources (Renewable Energy.world.com, 2014). The poll was conducted among a total of 6,448 adults aged 16 to 64 within France, Germany, Great Britain, Spain and the United States, and adults aged 18 to 64 in Italy, between January 30 and February 8, 2008. According to analysis conducted until people are forced to do so, or the price for renewable energy comes down considerably, people will not make the choice to go with renewables. In table no. 4 the results of study on WTP to increase the payment for energy if it were from renewables is presented for some EU member states (Renewable Energy.world.com, 2014).

Table no. 4: Willingness to pay for renewables in some EU member states

The increase in payment for energy if it were from renewables	Great Britain	France	Italy	Spain	Germany	U.S.
	%	%	%	%	%	%
Unweighted Base	884	934	807	848	968	787
Nothing more	54	42	44	35	50	40
5% more	18	25	25	25	22	17
10% more	12	16	15	14	14	17
15% more	2	4	7	4	4	7
20% more	2	2	4	3	2	4
30% more	1	*	*	1	1	2
40% more	1	*	*	1	1	1
Not sure	10	10	5	17	5	11
AVERAGE	3.9%	4.7%	5.1%	5.3%	4.4%	6.1%

Source: Renewable Energy.world.com, 2014.

As one can see from results presented in table no. 4 most of consumers do want to pay nothing more for renewable energy sources. This is mainly related with high renewable electricity prices. While existing research has identified a positive WTP for green energy in general, there is a disconnection between the stated WTP reported in these studies and the actual participation in green electricity programmes (Akcura, 2013; Scarpa, Willis, 2010; Wisser, 2007; Longo et al, 2006; Ek, 2005).

WTP surveys were compared with market simulations or real tariff schemes and found that only between 12% and 15% of those who state a positive willingness to pay actually pay the premium when given the opportunity (Akcura, 2013).

Borchersa et al. (2007) explore an alternative explanation by investigating whether consumers have preferences for specific renewable energy sources compared to “generic” green electricity. They find that respondents have positive WTP for “green” electricity but also WTP differs by green energy source. For example, respondents had a higher preference for solar energy compared to other renewable energy sources.

Samela and Varho (2006) interviewed consumers aiming to look at the barriers that contribute to the discrepancy between stated and actual uptake in Finland. Although the number of interviews conducted by the authors is relatively few, the emerging theme is that consumers lack trust in green electricity products and electricity companies.

Several authors found that the consumers suffer from information gaps due to poor marketing of green electricity products from suppliers (Zografakis et al, 2010; Zoric, Hrovatin, 2012). Therefore as most consumers in EU are unfamiliar with green electricity, they require a lot of external information and incentive in order to become active participants (Hansla et al, 2008).

**3. Assessment WTP for renewable electricity in Lithuanian households**

Between March 23 and June 23, 2013, the focus group was formed and the two surveys of the same group were conducted for the project funded by a grant (No. MIP-004/2012) from the Research Council of Lithuania. To recruit participants of focus groups, the e-mails (3000) were sent for individuals at random by a project team. The individuals were asked to participate in survey and promise to present useful information for participants was made. The focus group was formed from 100 individuals willing to participate in 2 surveys: before and after information provision on renewables. The global benefits of renewable electricity were stressed and state policies promoting use of renewables were described. The possibilities to use renewables electricity and to select supplier of renewable electricity were provided for the participants of focus groups. Information on price on electricity prices from renewable and non-renewable energy sources was also provided.

The questionnaire surveys were conducted before and after the information campaign on the renewable energy. Participants of the information campaign were asked about their willingness to pay (WTP) for 10% of their electricity consumption being from renewable sources. The similar question was presented before and after the campaign. The above question was asked at the beginning and the end of the survey, to try to assess the way that information received, and interactions with group members, affected basic WTP for green energy. The responses were unguided and open-ended. The questions of survey are presented in Table 5. Demographic information was also collected. Participant demographics were well balanced, consisting of individuals from a wide variety of social backgrounds, education levels, income and age. The questions about awareness on renewables and on responsibility for global warming were included in questionnaire to have understanding about focus group participant's awareness and opinion on state policies.

Participants of the information campaign were asked about their willingness to pay (WTP) for 10% of their electricity consumption being from renewable sources. The same question was presented before and after the campaign. Results of survey are generalized in table no. 5.

The survey covered 100 respondents. 86% of the respondents were at least 35 years old. Most of the respondents (72%) had graduated from the tertiary education institutions. As regards the employment status, the sample split evenly in terms of the private- and public-sector employees (33% and 34% respectively), whereas some 16% were engaged in their own businesses with the remaining 16% being out of labour force. Some 10% of the respondents featured monthly income higher than 3000 Lt (ca. 870 EUR). In addition, some 10% of the respondents lived in household comprising at least 5 members.

**Table no. 5: Survey results (N=100)**

<b>Variable</b>	<b>Levels</b>	<b>Percentage</b>
Q1 – Have you ever heard of the renewable electricity?	0 – No	19.2
	1 – Yes	80.8
Q2 – Do you believe in global warming?	0 – No	45.5
	1 – Yes	54.5
Q3 – Who is responsible for mitigating climate change?	1 – Each and everyone	5.1
	2 – Government	13.1
	3 – Individuals using energy	36.4
	4 – Power companies	26.3
	0 – N/A	19.2



Variable	Levels	Percentage
Q4 - Would you agree to pay an additional fee of 12 Litas (3.5 EUR) per electric bill per month to have about 5% of your electricity coming from renewables? ( <i>pre-campaign</i> )	0 – No	29.3
	1 – Yes	49.5
	No answer	21.2
Q1 – Would you agree to pay an additional fee of 12 Litas (3.5 EUR) per electric bill per month to have about 5% of your electricity coming from renewables? ( <i>post-campaign</i> )	0 – No	33.3
	1 – Yes	66.7
Q5 – How much should it cost per month to have 10% of your electricity coming from renewables? ( <i>pre-campaign</i> )	<i>Mean (SD)</i>	5.2 (5.2)
Q2 – How much should it cost per month to have 10% of your electricity coming from renewables? ( <i>post-campaign</i> )	<i>Mean (SD)</i>	6.5 (5.5)
Q3 – The costs related to the renewable electricity should be covered by:	1 – Everyone	15.2
	2 – Government	15.2
	3 – Individual energy users	33.3
	4 – Power companies	25.3
	0 – N/A	11.1
Q4 – What is the main reason encouraging you to pay for renewable electricity?	1 – It helps economy	11.1
	2 – Reduced dependence on the imported energy	14.1
	3 – Reduced GHG emission	16.2
	4 – Environmental issues	27.3
	0 – N/A	31.3
Q5 - What is the main reason discouraging you to pay for renewable electricity?	1 – It restricts economy	21.2
	2 – It is a responsibility of government	7.1
	3 – It is too expensive	31.3
	4 – It is waste of resources	11.1
	0 – N/A	29.3
Q6 – Have you gained any new knowledge during the workshop?	1 – No	12.1
	2 – A little	33.3
	3 – A lot	20.2
	0 – N/A	34.3
Q7 – Will you discuss renewable electricity with your friends?	0 – No	54.5
	1 – Yes	45.5
<i>EML</i> is employment	1 – Self-employed	16.2
	2 – Public sector	34.3
	3 – Private sector	33.3
	4 – Student	6.1
	5 – Retired	10.1
<i>EDU</i> is education	1 – Secondary	9.1
	2 – College	19.2
	3 – Higher education	71.7
<i>INC</i> is monthly income	1 – Up to 1000 Lt	21.2
	2 – 1001-2000 Lt	32.3
	3 – 2001-3000 Lt	36.4
	4 – 3001-4000 Lt	5.1
	5 – Above 4000 Lt	5.1

Variable	Levels	Percentage
<i>AGE</i> – age	1 – up to 23	4.0
	2 – 23-34	10.1
	3 – 35-44	37.4
	4 – 45-65	29.3
	5 – above 65	19.2
<i>SIZE</i> – household size	1 – 1	22.2
	2 – 2	37.4
	3 – 3-4	30.3
	4 – 5	8.1
	5 – more than 5	2.0
<i>SEX</i> – gender	0 – Male	68.7
	1 – Female	31.3

**4. Results and Discussion**

The results of the study indicated that the vast majority of the participants (81%) had heard of the renewable electricity. Meanwhile, 46% stated that they did not consider the global warming as a convincing phenomenon. Individuals using energy were most frequently (36%) assumed to be responsible for the climate change mitigation. Power companies were the second most frequent choice (26%). Accordingly the same actors were treated as being responsible for covering the costs of renewable electricity. It was the environmental issues (including greenhouse gas emissions) that encouraged paying for renewable electricity (44% in total). On the other hand, it was the economic reasons that made respondents reluctant to paying for renewable electricity.

The carried out information campaign was effective in terms of the WTP: The share of respondents who agreed to pay an additional sum of 12 Lt (3.5 EUR) per month to have the share of renewable electricity increased by some 5% rose from 50% before the campaign up to 67% after the campaign. The respondents were also asked about the sum they were ready to pay for 10% of the electricity consumed coming from renewables. In this instance, the mean WTP increased from 5.2 Lt (1.5 EUR) up to 6.5 Lt (1.9 EUR). Note that the variance remained virtually constant and the coefficient of variation thus dropped from 100% down to 85%. Thus, the respondents become less heterogeneous in terms of WTP. Some 45% of the participants stated that they have gained some knowledge during the campaign. In addition, a similar share (46%) was ready to discuss the issues with their friends.

After information campaign the average WTP for 10% of electricity produced from renewables makes 6.5 Lt (1.88 EUR) or 0.85 Lt/kWh (0.25 EUR/kWh). However the feed-in prices for renewable electricity in Lithuania are significantly higher (table no. 1). The average Feed-in price for electricity produced from renewables makes about 1.63 Lt/kWh and Lithuanian households are willing to pay just 0.85 Lt/kWh (0.25 EUR/kWh). Therefore the revise of feed-in tariffs is necessary seeking to protect Lithuanian consumer rights and to address their perceptions.

The achieved results were expected as in major other studies (Renewable Energy.world.com, 2014; Akcura, 2013; Scarpa, Willis, 2010; Wiser, 2007; Longo et al, 2006; Ek, 2005) the WTP for renewable energy sources of households are significantly lower than Feed-in prices and the state supports renewable energy sources without taking

into account consumers preferences and WTP. The results also indicated that in Lithuania like in other countries information and awareness rising are important measures to increase public acceptance of renewable energy sources and to increase WTP for renewable energy sources.

### **Conclusions**

1. The information campaign increased the mean WTP for renewable electricity in Lithuanian households. In addition the individual respondents were likely to increase their WTP as an outcome of the campaign. Therefore, the information campaign can be considered as an effective measure for promotion of the use of renewable electricity in Lithuanian households.
2. Participants of surveys who gained no additional knowledge during the information campaign have convinced themselves that government is responsible for covering the costs associated with the use of the renewable energy and stated it as a main reason for not supporting additional payments for the renewable energy. Accordingly, these respondents were less likely to discuss the topic with their friends.
3. The results provided that the consumers with higher WTP acknowledge differences in the environmental impact of conventional and renewable energy sources and suggest that the burden of promotion of renewable electricity should be imposed on as wide as possible base. However, they are concerned with the impact on economic activities. The latter issue is related to the practice of regulation which needs to be improved in order to develop a reasonable energy pricing and incentive system.
4. The study indicated that the average WTP of Lithuanian households for 10% of electricity produced from renewables makes 6.5 Lt (1.88 EUR) or 0.85 Lt/kWh (0.25 EUR/kWh). However the average Feed-in price for electricity produced from renewables makes about 1.63 Lt/kWh (0.47 EUR/kWh) and is significantly higher comparing with WTP for renewables of Lithuanian households.
5. The Government of Lithuania should review policies to promote renewables on supply side. The Feed-in tariffs should be also reviewed as their current levels are almost twice higher than willingness of Lithuanian households to pay for them.
6. The Government of Lithuania should more focus on developing policies promoting use of renewable energy sources on demand side. Information campaigns and other soft policy measures would be useful to stimulate Lithuanian households to switch to renewable energy suppliers and to increase demand for renewable electricity in Lithuania.
7. Further research is necessary to explore WTP of Lithuanian households by increasing the sample and coverage of respondents as IT (Information Technologies) are mostly being applied by young people and this study is limited by e-mail communication and dissemination of information on benefits of renewable energy sources.

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