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CONTENT

INTRODUCTORY WORD

The recent decade can be called the Renaissance of the Lithuanian energy system. Liquefied natural gas terminal was solemn opened and additional gas pipelines linking Jurbarkas, Klaipėda and Kuršėnai were constructed. New power transmission links which join electricity systems of Lithuania, Sweden and Poland were introduced. Capacities of generating energy from renewal energy sources, wind and biomass in particular, have been expanded. The shares of strategic company "Lietuvos dujos" held by "Gazprom" hitherto were purchased, and other strategic Lithuanian energy enterprises were restructured according to the Third Energy Package of the European Union. The abovementioned events have brought international recognition to Lithuania and also changed the rules of the game in the energy sector by decreasing the degree of politics and increasing the degree of economics.

The implemented projects have initiated a discussion on the place of the energy system in the political agenda of Lithuania. Public opinions emerged that energy security should not be one of the prioritised policy areas. Although the growing energy security level tendency has been identified in Lithuania, and the energy island status has been discarded, it is necessary to remember that some of the essential tasks of energy policy have not been accomplished yet and some of the threats persist.

The construction of the Ostrovets Nuclear Power Plant in the vicinity of Vilnius calls for immediate actions. The committees for the implementation of the United Nations Espoo and Aarhus Conventions identified that a nuclear energy object violates international law. Furthermore, a negligent construction of the Ostrovets NPP has also posed a threat. In 2016, at least three significant incidents were reported from the construction site, the largest of them being the fall of a 330-ton reactor vessel from the height of 2-4 meters.

A doubtful nuclear safety of the Ostrovets NPP and Belarusians' plans to cool the reactors using the water of the river Neris demand for

focused opposition from the part of Lithuania. A resolution adopted in the Seimas and an agreement signed by political parties are important steps in this regard. Not only they send a clear signal of protest to Belarus, but they also warn that Lithuania will deny access of energy power produced by the Ostrovets NPP if it is constructed. On the other hand, if the boycott of Belorussian energy power will be performed by physically limiting energy flows between Lithuania and Belarus, consequently, additional capacities of energy power generation are to be considered.

It is also important to remember that Lithuanian energy power system functions in the synchronous IPS/UPS zone administered by the Commonwealth of Independent States. Energy system development scenarios studied by the scientists of Energy Security Research Center show that synchronisation with Continental European network will strengthen the Lithuanian energy security most in comparison to other projects; however, this task is also most difficult with regard to political and technical aspects.

Efficient implementation not only requires additional infrastructure for electric power generating and transmitting or complicated technical solutions, it also demands for common mutual agreement among the Baltic states, support by the European Union and Poland. Taking into account the resistance of Russia and importance of international support, implementation of synchronisation depends on the actions of high level politicians and diplomats rather than only the actions of energy system specialists.

It is evident that the current ruling majority will have to manage two particularly important processes, paying due regard to other processes as well, for instance, the vision of the Lithuanian energy sector which shall be laid down in the new energy strategy.

It is also important to remember the interstate pipeline "GIPL". Another significant issue is construction of waste incinerating plants in Kaunas and Vilnius. Their importance is undeniable; however, a balance must be found between the already equipped capacity and

demand for them, as the burden caused by redundant infrastructure will be shouldered by final consumers.

Finally, the exploration process of shale natural gas and oil should not be forgotten. The economic rationale of extracting unconventional hydrocarbons and its impact upon energy security is questionable; nevertheless, the state must know the resources that are at its disposition and how they can be utilised in case of need or under favourable economic circumstances.

A great number of the aforementioned aspects are analysed in the overview, which assesses the dynamics of Lithuanian energy security and compares it to the appropriate dynamics in Latvia and Estonia. The approach of the Lithuanian society towards energy security is presented, discussing the impact of information accessible to the society is also represented. Still the aim of the publication is not only to present the findings of research performed by scientists representing different disciplines; it is also an attempt to enhance societal interest in strategic energy sector and present objective information to Lithuanian decision makers.

Prof. Habil. Dr. Juozas Augutis

1. UNINFORMED RATIONAL AGENT AND TYPES OF ENERGY SECURITY PERCEPTION[1]

The contribution of the representatives of social sciences to the development of energy security concept has been considerable, expanding it from a narrow interest of each state to secure energy provision to the increasingly noticeable and differentiated societal energy security interest today[2]. It is obvious that public perception of energy security, threats and risk depend at large on such social factors as the type of society[3], socio-demographic groups, their interests, values, dispositions, history, and etc. In case of Lithuania, the issue is yet another one. It is not only the interface of the remaining energy sector infrastructure with Russia, not only the obvious interests of Russia in the Baltic region that are problematic, but also the societal approach to the policy pursued by Russia which is diverse: some inhabitants still maintain a positive regard to Russia, some do not but require cheap energy supply, yet others understand the importance of energy

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1 The data first appeard in the paper and reference should be made as follows: Leonavičius, V.; Genys, D.; Krikštolaitis, R. 2015. Public perception of energy security in Lithuania, *Journal of Security and Sustainability Issues* 4 (4): 311–322. DOI: http://dx.doi.org/10.9770/jssi.2015.4.4(1)

2 Winzer, C. (2012). Conceptualizing energy security. *Energy Policy* 46, 36–48; Cherp, A., Jewel, J. (2011). The three perspectives on energy security: intellectual history, disciplinary roots and the potential for integration, *Current Opinion in Environmental Sustainability* 3 (4), 202–212; Sovacool, B. K., Mukherjee, I. (2011). Conceptualizing and measuring energy security: A synthesized approach. *Energy* 36, 5343–5355; Sovacool, B. K., Valentine, S. V., Bambawale, M. J., Brown, A. M., de Fatima Cardoso, T., Nurbek, S., Suleimenova, G., Li, J., Xu, Y., Jain, A., Alhajji, A. F., Zubiri, A. (2012). Exploring propositions about perceptions of energy security: An international survey, *Environmental Science & Policy* 16 (0), 44–64; Sovacool, B. K. (2014). What are we doing here? Analyzing fifteen years energy scholarship and proposing a social science research agenda, *Energy research and social science* 1, 1–29.

3 Leonavičius, V., Genys, D., Krikštolaitis, R. (2015). Public perception of energy security in Lithuania, *Journal of Security and Sustainability Issues* 4 (4). DOI: dx.doi.org/10.9770/jssi.2015.4.4(1)

security but do not support this pursuit by their personal contribution, and only a small number of people understand, support and tend to contribute personally to ensuring energy security[4]. Various social groups have a different perception of and prioritize energy security risks differently due to pluralistic composition of the society.

The chapter discusses[5] how the priority to energy security factors given by the society and its social groups relates to the current energy security information they possess; the data analysis was performed applying the rational choice theory (RCT).

1.1 Energy security concept from the perspective of rational choice

The social world is full of infinite decision-making situations each of which requires certain formulations of choosing prospective actions and certain algorithms in order to choose among the alternatives. According to J. Elster[6], an individual's actions are most easily explained as a final result of two successive filtering operations. A rational agent starts from an unlimited set of virtual options which are limited by agent's opportunity constraints or personal material and social resources. Such first stage filtering leaves only possible options. The second filtering is related to agent's priorities and values which reject everything that is not important for the agent and leave only what he aims at or desires[7].

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4 Leonavičius, Genys, Krikštolaitis 2015

5 A representative survey of Lithuania's population was performed by an independent institution of public opinion and market research "Vilmorus" (May-June 2013). The number of the respondents: N = 2002; Lithuanian inhabitants 18+ of age. Survey method: face-to-face interview questioning respondents at their home using questionnaires prepared beforehand. Method of sampling: multi-stage probability sampling which allows each member of Lithuania's population to have an equal probability to be interviewed. The results show the opinion of Lithuania's population and distribution according to age, gender, education and purchasing power. 3 % sampling error (at 97 % confidence level).

6 Elster, J. (2000, EN. 1996). *Socialinių mokslų elementai*, Vilnius: Vaga. P. 17.

7 Elster 2000; Norkus, Z. (2005). Racionalaus pasirinkimo teorija. Iš Leonavičius, V., Norkus, Z., Tereškinas, A. (sud.), *Sociologijos teorijos*, Kaunas: Vytauto Didžiojo universitetas.

In a risk or uncertainty situation, a rational behaviour in its simplest form can be defined as a *subjective expected utility* theory[8]; therefore, in this case the agent's level of being informed is important. Such reasoning is useful only if an individual perceives risk as an issue of optimising the choice consequences, whereas the choice conditions are adequate to RCT assumptions.

Analysing various opinions on energy security from the RCT perspective, firstly, it is necessary to investigate energy system threats from the point of view of consumer expected benefit. For instance, what fuel-powered vehicle to buy to commute to work every day and pay less? Should I approve of the building renovation in order to pay less for heating, etc.? In this case we face the choice of maximising utility alternatives. On the other hand, as conceptualised by Yergin[9] in the energy security definition, acceptable pricing for energy power should not contradict the most important national values and goals[10].

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8 In a risk situation the agent knows only comparative probabilities of conditions that determine the results of his choice, or is guided by his subjective opinions about them. The agent then chooses certain real probable situations each of which consists of the results of a certain choice. A risky agent can successively adapt to the changed situation if his priorities are comprehensive, transitive and strengthened with increasing probability and his probability expectations do not violate the axioms of mathematical probability theory, being a product of rational learning from experience. (Norkus 2005: 302-303)

9 Yergin, D. (1988). Energy Security in the 1990s, *Foreign Affairs* 67 (1), 111.

10 It is important to note that in the European Commission documents energy security implies neither maximisation of energy independence nor energy dependence minimisation, but suggest reducing the risks which are related to energy dependence. Generally speaking, the goal of energy security is firstly related to the balance and diversification of various energy supply and extraction sources, which can most realistically guarantee accessible energy pricing without abandoning the most important national values and goals (IEA (2007). *Energy security and climate policy: assessing interactions*, Paris: OECD/IEA p. 12; *In-depth study of European Energy Security Accompanying the document Communication from the Commission to the Council and the European Parliament: European energy security strategy*. This document corrects document SWD(2014)330 final/2 of 16.06.2014. Concerns technical and typographical corrections. Commission Staff Working Document, COM (2014)

Lithuanian energy security or insecurity of energy supply are inevitably related to politicisation of energy system risks, when the choice must be made between two alternatives – utility and national values. The agent chooses between what is directly useful for him and what is not useful but is within his value system. Which is a rational decision in this case – to approve of the lower pricing for energy power and show no concern with energy independence which requires investment and raises prices for energy consumption or be more concerned with energy independence? As energy independence is, first of all, related to monopolistic Russian energy supply and its political interests in this region, such a choice acquires additional motives, which are related to political identity, patriotism or loyalty.

1.2. Factors determining the choice of an uninformed rational agent

Analysing the approach of Lithuanian population to energy security[11], it is evident that inhabitants give priority to the importance of energy resource pricing. Having suggested choosing between cheap energy resource prices and Lithuanian energy independence, which requires higher investment and, consequently, increases the price for energy, we identified dispositions prioritised by the respondents.

First, we have found out how much information the respondents of various social categories (sex, age, education, income) have about energy system problems and various elements of the energy system policy, as the social agent's state of being informed

330 final, Brussels, 2.7.2014. Prieiga per internetą: <https://ec.europa.eu/energy/sites/ener/files/documents/20140528_energy_security_study.pdf>; EC (2000). *Towards a European strategy for the security of energy supply*, Brussels: European Commission, Green Paper).

[11] Leonavičius, V., Genys, D. (2016). Lietuvos visuomenės politiniai prioritetai ir energetinis saugumas. Iš Augutis, J., Krištolaitis, R., Leonavičius, V., Pečiulytė, S., Genys, D., Česnakas, G., Martišauskas, L., Juozaitis, J. (sud.) (2016). *Lietuvos energetinis saugumas. Metinė apžvalga. 2014–2015*, Kaunas: VDU, 12–18.

is directly related to optimising a rational choice. The data indicate that the respondents are not well informed about a great number of energy security factors – nuclear energy, shale gas, advantages and shortcomings of renewable energy, and etc. (see Table 1). Presumably, the inhabitants could be better informed if the state energy policy makers were more interested in engaging them. Only 18.5 % of the respondents *totally agree and agree* that they are very well informed about the issues of the energy system; the rest of the respondents disagree or are not aware (see Table 1). Besides, a great number of the respondents (57.7 %) *disagree and totally disagree* that mass media provide a comprehensive view of the energy system realities, though the survey data show that mass media remain to be the most important source of information about energy system issues (radio, television – 70.2 %; electronic and paper press – 58.5 %).

Table 1. Information held by Lithuanian inhabitants about energy security factors (%)

	Very well informed about energy system issues	Think mass media reflects energy realities comprehensively	Know about nuclear energy advantages and shortcomings	Know about advantages and shortcomings of renewable energy	Know about advantages and shortcomings of liquefied natural gas terminal	Know about advantages and shortcomings of shale gas extraction	Receive enough information on possible risks and benefits of NPP built in neighbouring countries	Know about advantages and shortcomings of block of flats renovation
T/disagree*	15.8	10.4	13.2	12.1	12.1	14.7	14.2	8.0
Disagree	52.9	47.3	40.9	41.5	43.9	45.0	44.5	27.3
Agree	17.1	24.5	26.9	26.6	23.7	20.7	23.3	42.5
T/agree	1.4	1.6	3.9	4.8	4.0	3.5	2.8	9.4
N/N	12.8	16.2	15.1	15.0	16.2	16.1	15.2	12.8

* T/disagree and T/agree – stand for *Totally disagree* and *Totally agree;* N/N – *Not aware* or *No response*.

The respondents are relatively more informed only about the advantages and shortcomings of the block of flats renovation – 51.6 %; although even one third (35.3 %) admitted being not aware of block of flats renovation advantages and shortcomings (see Table 1).

The data yielded statistically significant differences between genders – male respondents admitted being more informed than females about energy security issues. They also more frequently state (the difference is statistically significant) that they know about the advantages and shortcomings of nuclear energy sector and renewable energy, although the relationship between the variables is not high (see Table 2).

Table 2. Information held by Lithuanian inhabitants about energy security factors (according to gender, %)

	Very well informed about energy system issues		Know about nuclear energy advantages and shortcomings		Know about advantages and shortcomings of renewable energy	
	Female	Male	Female	Male	Female	Male
T/disagree	57.6	42.4	59.8	40.2	59.5	40.5
Disagree	54.5	45.5	55.3	44.7	55.9	44.1
Agree	40.9	59.1	45.4	**54.6**	44.5	55.5
T/agree	28.6	71.4	25.6	74.4	30.2	69.8

Cramer's V=0.147; P=0.000

No statistically significant differences were found comparing the research results according to age groups. Both younger and older respondents admit being informed in a very similar way, although a slightly higher number of middle aged Lithuanian population (younger maturity age group 27–35 in particular) admit being very well informed about the issues of energy security (see Table 3).

Table 3. Very well informed about energy issues (according to age, %)

	From 18 to 26	From 27 to 35	From 36 to 45	From 46 to 65	66 and more
T/disagree	18.9	11.4	17.3	14.8	16.5
Disagree	50.5	59.3	55.4	53.5	48.8
Agree	16.7	18.2	16.1	17.3	17.1
T/agree	2.9	0.8	0.9	1.5	1.0
N/N	10.9	10.2	10.2	13.0	16.5

Education has a statistically significant impact upon being informed. The less educated the inhabitants were, the more often they admitted disagreeing that they have information about energy issues. The number of not aware responses was four times higher among less educated respondents (see Table 4).

Table 4. Very well informed about energy issues (according to education, %)

	Primary / incomplete secondary	Secondary	Vocational	Upper vocational	Incomplete higher education	Higher education
T/disagree	20.9	17.0	16.9	18.5	13.3	9.7
Disagree	41.8	51.5	60.0	54.6	54.1	54.1
Agree	8.0	16.1	11.8	14.9	22.4	25.7
T/agree	1.3	1.4	.5	.4	3.1	2.6
N/N	**28.0**	14.1	10.8	11.6	7.1	**7.9**

The data about inhabitants' income groups also indicate statistically significant differences – the higher the inhabitant's income, the more often they admit being well informed about energy issues (see Table 5).

Table 5. Very well informed about energy issues (according to income Eur, %)

	Under 86	87–147	148–260	261–347	348–434	435–521	522–608	609– 695	696≤
T/disagree	21.7	13.9	19.0	14.1	14.4	10.5	9.8	12.5	6.1
Disagree	59.8	53.9	50.4	55.9	52.0	52.6	43.1	12.5	42.4
Agree	12.0	12.1	15.7	20.0	22.4	21.1	**37.3**	**62.5**	**30.3**
T/agree	.0	1.8	.5	1.6	4.0	.0	2.0	.0	6.1
N/N	6.5	18.2	14.4	8.4	7.2	15.8	7.8	12.5	15.2

The place of residence has equally significant impact upon inhabitants' state of being informed about energy issues. Inhabitants from larger towns more often admit being well informed about energy issues and less seldom mark the option not aware (see Table 6).

Table 6. Very well informed about energy issues (according to place of residence, %)

	Large towns	Regional centres	Small towns	Rural settlements and farmsteads
T/disagree	12.2	22.3	15.6	14.2
Disagree	55.4	51.1	51.6	51.5
Agree	**19.6**	**19.0**	**15.6**	**11.7**
T/agree	2.6	.3	1.6	.7
N/N	10.1	7.3	15.6	21.8

Summarizing, it is possible to affirm that modelling the choice of a rational agent between the utility and energy independence, which is related to Lithuania's political independence, or, in other words, between the supply of energy sources at accessible prices to

consumers and the basic national values and goals the inhabitants identify themselves with, leads us to conclusion that having insufficient amount of information the agent is in the state of uncertainty. In such a case the rational behavior is based on subjectively expected utility. Acting under the conditions of uncertainty or risk, the agent cannot choose between the actions according to clearly calculated benefit as it happens when decisions are made in the situation of certainty. On the other hand, what we refer to here is not the optimal benefit alternatives but the choice between utility and important national values that the energy security threats are related to. What will the expected choice of an uninformed agent, being in the state of uncertainty, be in case of energy security threats? What will his priorities be?

1.3. Energy security perception rationality types

Analysing the perception of energy security from RCT perspective we based our considerations on the assumption that a rational social agent considers material benefit to be the most important factor. Therefore, a number of contradictory statements were included in the questionnaire, two of them being most important aiming at identifying the respondents' priorities – "State should care more about cheap energy source pricing rather than energy system independence" and "State should care more about energy independence regardless of higher financial investment". Energy system independence requires additional (in many cases) investment, which should be shouldered by consumers; therefore, the second statement is in contrast with the consumer intention to have cheap energy resources.

As expected, the summarised responses show that 68.7 % of the respondents as rational agents give priority to cheap prices for energy resources rather than energy independence; whereas 30.8 % of the respondents give priority to the country's energy independence notwithstanding the necessary higher financial investment and increasing financial burden shouldered upon consumers. From the

utility optimisation perspective, these respondents could be regarded as irrational or agents of a different rationality. As almost 1/3 of the respondents gave priority to state energy independence, it is worth specifying the social characteristics of these social agents.

Analysing the given priorities according to various socio-demographic parameters, certain differences are obvious. The data indicated that younger (up to 35) and older (66 and over) respondents more often (more than 1/3) give priority to the statement "State should care more about energy independence irrespective of the necessary higher financial investment", and this difference is statistically significant. Meanwhile the middle-aged respondents (from 35 to 65) more often (more than ¾) give priority to the statement "State should care more about cheap energy source pricing rather than energy system independence" (see Table 8), the difference is statistically significant. It is worth noting that both these generations were socialised in the times of independent Lithuania: the generation up to 35 was socialised in the current independent Lithuania, whereas the most of respondents over 66 were socialised in independent Lithuania during the interwar period. It is possible to assume that the choice of priorities made by the elderly and young generations in particular was influenced by certain values not related benefits. Whereas the average maturity generation (it is representatives of this generation who most often hold most important positions in the state management and hundreds of whom were socialised in the soviet Lithuania) is more pragmatic. Though the relationship between the age groups and dichotomous variables is not strong (see Table 7).

Table 7. Which statement do you agree with (according to age groups) (%)?

	From 18 to 26	From 27 to 35	From 36 to 45	From 46 to 65	66 and over
State should care more about cheap energy source pricing rather than energy system independence"	62.2	62.3	**73.4**	**72.8**	66.5
State should care more about energy independence irrespective of the necessary higher financial investment	**37.5**	**37.7**	25.7	27.0	**32.4**
Not aware/ Not responded	0.4	0	0.9	0.1	1.0

Analysing the aforementioned statements in the same vein with regard to income groups, a rather logical conclusion is evident: respondents with higher income more often than those with lower income give priority to the statement "State should care more about energy independence irrespective of the necessary higher financial investment"; the difference is statistically significant. Conversely, groups with lower income more often give priority to the statement "State should care more about cheap energy source pricing rather than energy system independence". It is possible to state that dependence between the obtained higher income and approval of energy independence is statistically significant and rather logical. However, the same as in case of age groups, the relationship between income and dichotomous variables is not strong (see Table 8).

Table 8. Which statement do you agree with (according to income groups, Eur %)?

	Under 86	87–147	148–260	261–347	348–434	435–521	522–608	609– 695	696≤
State should care more about cheap energy source pricing rather than energy system independence"	76.1	73.5	72.3	68.1	59.2	57.9	49.0	50.0	45.5
State should care more about energy independence irrespective of the necessary higher financial investment	23.9	26.1	27.4	31.4	40.8	42.1	49.0	50.0	54.5
Not aware/ Not responded	0	0.4	0.3	0.5	0	0	2.0	0	0%

Cramer's V=0.106; p=0.001

It is most probably logical that respondents from the larger towns (37.4 %) statistically significantly (the relationship between the variables is weak) more often than those from regional centres (28.5 %) and small towns (29.7 %) give priority to the statement "State should care more about energy independence irrespective of the necessary higher financial investment". The reason most probably lies in the fact that large town inhabitants are more well-off than the inhabitants of other locations in Lithuania (see Table 9).

Table 9. Which statement do you agree with (according to place of residence %)?

	Large towns	Regional centres	Small towns	Rural settlements and farmsteads
State should care more about cheap energy source pricing rather than energy system independence"	61.8	71.3	70.3	75.7
State should care more about energy independence irrespective of the necessary higher financial investment	37.4	28.5	29.7	24.0
Not aware/ Not responded	0.9	0.2	0.0	0.4

Cramer's V=0.093; P=0.000

Finally, analysing priorities with regard to enhancing cheaper energy resource pricing and energy independence according to education groups, it is evident that the respondents with higher education give more priority to the statement *"State should care more about energy independence irrespective of the necessary higher financial investment"*; the difference is statistically significant. The responses of research participants with incomplete higher education single out in particular (see Table 10).

Table 10. Which statement do you agree with (according to the type of education) (%)?

	Primary / incomplete secondary	Secondary	Vocational	Upper-vocational	Incomplete higher education	Higher education
State should care more about cheap energy source pricing rather than energy system independence	71.1	70.5	77.4	73.8	52.0	60.6
State should care more about energy independence irrespective of the necessary higher financial investment	28.0	28.8	22.1	**25.6**	**48.0**	**39.2**
Not aware/ Not responded	0.9	0.7	0.5	0.6	0	0.2

Cramer's V=0.116; p=0.000

1.4. Summary

The research data suggest that with regard to two dichotomous statements – energy resource pricing and energy independence – two possible rationality types of Lithuanian population energy security perception can be distinguished. About 1/3 respondents give priority to the enhancing Lithuanian energy independence and about 2/3 the respondents more often give priority to cheap pricing of energy resources. The first type of rationality relates energy security with energy independence and is more often peculiar to the respondents with higher education, higher income, living in larger Lithuanian towns and being slightly younger (up to 35) or considerably older (over 66).

Without broader considerations it is worth noticing that both these age groups share one common characteristic: their socialisation processes proceeded in their young years in Independent Lithuania; for the first group in re-established Independent Lithuania, for the elderly people's group mostly – in Independent Lithuania between the wars.

It is possible to assert that respondents with higher education, higher income, living in largest Lithuanian towns feel more secure; therefore, when they have to choose between one of the aforementioned options, it is not only benefits that are important to them but other values related to identity (associated to independent and safe state) and self-expression (associated to previous activity aiming at energy security). The second rationality type of energy security perception is more related to the pricing of energy resources. Such rationality is more common to a utility optimising agent and is more peculiar to respondents with lower education, lower income, living in smaller towns and rural settlements. Besides, it is more common among the representatives of average maturity age group (aged 36-65), who constitute the most highly active age group today, and who in their youth and at the age of maturity underwent the processes of socialisation during the soviet times.

It can be assumed that states of uncertainty with regard to energy security arise due to lack of information; a utility optimising rationality type agent perceives a lower threat of energy security. Material security for this type agent is more important than energy independence or higher political independence of the country. This leads to an assumption that with regard to value based priorities the latter type is less likely to identify himself with political and cultural values in contrast to the rationality type who gives priority to energy independence and perceives a higher threat or risk to energy security and, consequently, to the country's political independence. Therefore, he will more likely support higher investment to energy independence.

2. THE LITHUANIAN ENERGY SECURITY LEVEL IN 2007–2015

The integral security level of the country can only be assessed with regard to all factors influencing energy security. There are more than 60 factors (indicators). All of them are divided into three blocks – technical, economic and socio-political. Each block and each indicator have their value in the overall estimate that integrates the influence of all factors for energy security. This estimate is called the energy security level (measured in the scale from 0 (the worst case) to 100 % (the best case).

2.1. The overall Lithuanian energy security level

The assessment of Lithuanian energy security level has started since 2007, when the energy security level had reached 55.5 % in comparison to the maximum – 100 %. Over the past years, the highest security level was achieved in 2015 – 62.6 %, and the lowest was noted in 2012 – 52.5 %. Starting from 2013, an increase of the energy security level is observable, which in 2015 reached 62.6 %. The biggest impact on the increase of the energy security level was the decrease of natural gas and increase of biofuel components weight in the country's fuel and energy balance, decrease of energy intensity, as well as new LNG terminal. The dynamics of energy security level is illustrated in figure 1.

Figure 1. The dynamics of energy security level in 2007–2015.

In 2010, the situation in the energy sector changed due to the shutdown of Ignalina NPP and the resulted change of the prevailing resource of electricity energy production – basic production of electricity energy was ensured by power plants fueled with natural gas. Natural gas supply is the most sensitive to economic and geopolitical factors; therefore, the domination of this kind of fuel in the energy production process reduces energy security.

When assessing the overall energy security level, all indicator results are added up; therefore, the worse situation in one energy sector is partially compensated by better results from another sector. Still, indicators signifying a critical state show that there are essential issues in the energy sector that need to be solved. Starting from 2010, indicators of economic and technical blocks, related to nuclear power production and fuel supply, are not counted, because at the end of 2009, Ignalina NPP was shutdown.

Till 2010 a major part of indicators fall into normal state, and starting 2010 a major part of indicators – into pre-critical state. Such distribution of indicators shows a significant negative influence on the overall energy security level. And only in 2015 when the LNG terminal began to operate the indicators in the normal and pre-critical state started to dominate.

Table 11. Distribution of indicators according to conditions

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Critical state	22	21	22	17	16	18	17	17	12
Pre-critical state	20	21	19	23	25	24	24	22	24
Normal state	26	26	27	20	19	18	19	21	24

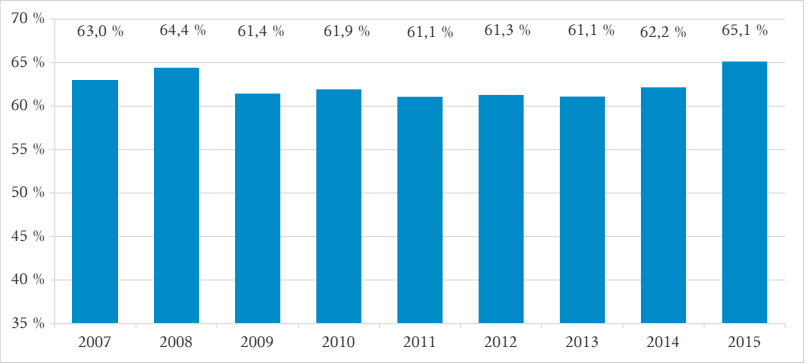
Most of the indicators falling under the category of critical state are related with the natural gas system: the ratio of natural gas buying price with the average purchase price in the EU countries, the amount of natural gas bought from the biggest supplier, high electricity and heat energy production dependency from natural gas. A number of indicators get into the critical zone due to the lack of market conditions, especially in the heat production sector. The socio-political block of indicators shows that the greatest negative influence on energy security is caused by Lithuania's high dependency on import from one country and disproportionally high expenses of inhabitants for energy services in comparison to average income, as well as the negative attitude of population to new energy projects and low political rating of the analyzed countries.

2.2. The energy security level of the technical block

The energy security level in the technical block in 2007–2015 varies from 61.1 % (in 2011 and 2013) to 65.1 % (in 2015). Technical area is the strongest part of Lithuanian energy sector. High and often surplus energy production capacities, well developed network for energy transmission and distribution, an opportunity to use alternative fuel for production equipment allow maintaining the technical aspect of Lithuanian energy sector that satisfies the country's energy security needs. The situation is worsened by the age of energy production

equipment and concentration of energy production in natural gas fueled power plants using a small number of technologies. Due to natural aging of equipment for a while, some indicators of the technical block were decreasing, but with the introduction of new facilities and technologies, the energy security level in the technical block in the last few years has stabilized.

Figure 2. Dynamics of energy security level in the technical block in 2007–2015



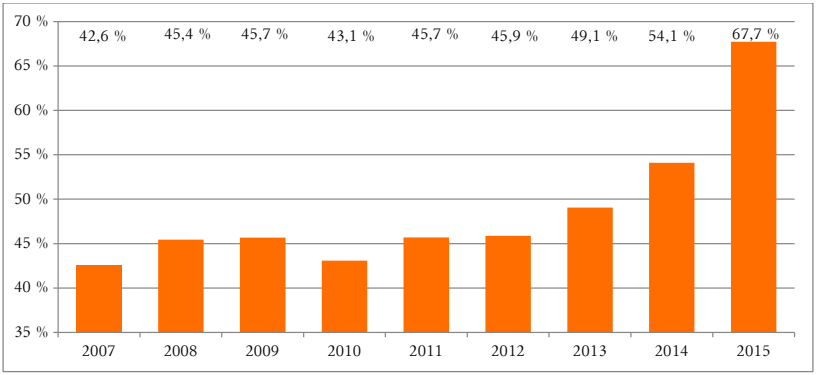
2.3. The energy security level of the economic block

In the analyzed period, the economic block energy security level increased by more than 25 percentage points, and in 2015, it reached 67.7 %. The improved situation in district heating, new LNG terminal had the greatest impact. The main indicators of the economic block signifying the critical state are connected with the natural gas sector, the forming concentration of biofuel suppliers and with imported energy resources. The dynamics of the energy security level of the block is demonstrated in figure 3.

The overall growth of the security level of the block is related to the development of free markets in the energy sector, first of all in the electricity system. A very large part of electricity import has reduced the overall level of the block since 2010, but after Lithuania's

joining 'Balt Pool' energy exchange, the growing use of biofuel and the formation of the biofuel market compensate the decrease and create the potential for the rise of the overall block security level. The biggest increase was from 2014 to 2015 and it consists of more than 13 percentage points. As it was mentioned the LNG terminal was one of the main reason of such increase of energy security level.

Figure 3. The dynamics of energy security level in the economic block in 2007–2015



2.4. The energy security level of the sociopolitical block

Lithuanian energy security level in this block in the period of 2007–2015 was characterized by obvious decrease tendencies. The overall security level of the block in 2007 and 2008 was 60.9 %, and in 2012 – only 50.3 %; the security level decreased by 10.6 percentage points. However, in the last three years, the situation has improved. This occurred due to the improved Lithuanian political risk factor (International Country Risk Guide), published by the agency PRS Group. Still, in a longer period of time, the energy security level of the block should acquire the tendencies of growth in relation to the implementation of energy projects. The dynamics of the block energy security level is illustrated in figure 4.

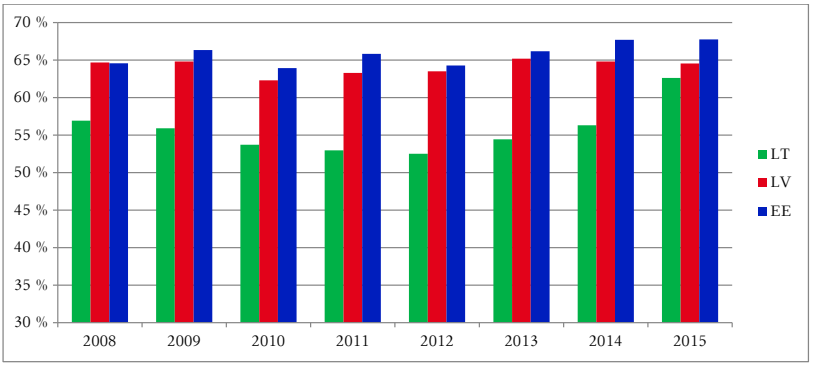
The overall decrease of the energy security level of this block is related to the growing import of energy resources, import dependence on one state and the increasing part of the population income devoted to covering heating and electricity. The overall security level of the block slightly increased due to the obligations for energy saving.

Figure 4. The dynamics of energy security level in the sociopolitical block in 2007–2015

3. THE COMPARISON OF THE LITHUANIAN ENERGY SECURITY LEVEL WITH THE LATVIAN AND ESTONIAN ENERGY SECURITY LEVEL

To compare Lithuanian energy security level with other countries in this survey, the energy security level of Latvia and Estonia was assessed using the same methodology. The data are presented in figure 5. These results show that energy security levels in Latvia and Estonia are higher than those in Lithuania. The energy security level of Estonia falls under the normal state, and in Latvia, it is close to the normal state. Only in 2015 the energy security level of Lithuania becomes closer to normal state.

Figure 5. The dynamics of energy security level in Baltic States



All three countries are in the similar environment of threats and risks. Significant differences in energy security level are decided by technical and economic blocks. As has been mentioned, the indicators denoting a critical state in the economic block are mostly those related to the natural gas sector. A similar situation exists in Latvia and Estonia. Still, during the assessment of the energy security level of the three Baltic States, differences emerge mostly related to the part of the gas sector in the energy balance of the countries. In the energy security level of Lithuania, the natural gas sector takes

up about 29 %, in Latvia it amounts to 15 %, in Estonia – about 7 %. The biofuel sector receives the best assessment in all three states. In Lithuania and Estonia, it makes up about 22 %, and in Latvia – more than 39 %, depending on the energy security level (table 12).

Table 12. Average group values in the technical and economic blocks of the Baltic States[12]

	Lithuania	Latvia	Estonia
Electricity	19.99 %	22.11 %	33.94 %
Gas	28.95 %	15.01 %	7.18 %
Oil	3.58 %	0.13 %	0.57 %
Coal	3.66 %	2.74 %	4.26 %
Biofuel	22.78 %	39.31 %	22.15 %
Heating	21.04 %	20.69 %	31.90 %

The energy security level in Latvia increases due to two reconstructed blocks of Combined Heat and Power Plants in Riga and gas depository in the country. Estonia is the exporter of electricity, and electricity is produced by using country's own resources. These factors are exceptionally favorable for the Estonian energy security.

[12] The groups of technical and economic indicator blocks were divided according to the type of fuel used in the energy system: gas, oil, coal, nuclear and biofuel. In addition, electricity and heat were included in the composition of these indicator blocks as separate groups of indicators, because they are ones of the essential elements of the energy system.

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