SWITCHING POLITICAL NUCLEAR ENERGY PREFERENCES, CHANGING PUBLIC ATTITUDE

Dainius Genys

Researcher; Ph.D.
Vytautas Magnus University, Energy Security Research Center (Lithuania)

Contact information
Address: Vileikos str. 8-227, 44404 Kaunas, Lithuania
Phone: +370 37 327822
E-mail address: dainius.genys@vdu.lt

Ričardas Krikštolaitis

Professor; Ph.D.
Vytautas Magnus University, Faculty of Informatics (Lithuania)

Contact information
Address: Vileikos str. 8-227, 44404 Kaunas, Lithuania
Phone: +370 37 327898
E-mail address: ricardas.krikstolaitis@if.vdu.lt

ABSTRACT

The aim of the paper is twofold - to cover the latest nuclear energy politics events and reveal the dynamics in public perception of nuclear energy by explaining the distribution of attitudes among two notable social groups in Lithuania. The paper is based on two empirical research studies (public polls) carried out in 2013 and 2017. The paper consists of four parts. It starts with brief review of main happenings in recent nuclear politics and general tendencies of public perception of nuclear energy. Then, it presents cluster analysis of both 2013 and 2017 polls, in which respondents were divided into two groups based on income, education

and occupation. Lastly, the paper presents findings and discusses the dynamics of public perception. Comparing the 2017 data with the results of 2013, three main tendencies can be distinguished. First, society became better informed and more critical. Second, the cluster analysis divided respondents in two almost identical groups as in 2013 (with minor peculiarities). Third, the general tendency presupposes the breaking of the irrelevance of nuclear energy as an important factor for energy security in public perception.

INTRODUCTION

Regardless of the advantages of nuclear energy (like carbon neutrality, low energy production costs) many countries (like Germany, Japan and Switzerland) have announced the decline of nuclear energy in their future energy development plans, whilst some other countries (like UK, France, China, USA, India, Belarus) continue to see nuclear energy playing important role in future. Having such schism, it is interesting to research public perception, which is peculiar in East Central Europe[1] and in Western Europe[2].

Lithuania is no longer a nuclear energy producing country, since Ignalina nuclear power plant (INPP) was shut down in 2009. However, the topic attracts notable attention in the public due to the decommissioning process, plans to construct new NPP and construction of Ostrovets NPP in neighbouring Belarus. The public attitudes towards nuclear energy in Lithuania throughout different periods have been discussed multiple times[3] and changes of perception were also reviewed[4]. The aim of this paper is to present the latest nuclear energy politics events and reveal the dynamics in public perception of nuclear energy between 2013 and 2017 by explaining the distribution of attitudes among two notable social groups in Lithuania.

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[1] Aliaksandr Novikau, "Nuclear power debate and public opinion in Belarus: From Chernobyl to Ostrovets," *Public Understanding of Science* Vol. 26, Issue 3 (May 2016) // DOI: 10.1177/0963662516647242; Aleksandra Wagner, Tiffany Grobelski, and Marcin Harembski, "Is energy policy a public issue? Nuclear power in Poland and implications for energy transitions in Central and East Europe," *Energy Research & Social Science* Vol. 13 (March 2016) // DOI: 10.1016/j.erss.2015.12.010; Wadim Strielkowski, Evgeny Lisin, and Manuela Tvaronavičienė, "Towards energy security: sustainable development of electrical energy storage," *Journal of Security and Sustainability Issues* Vol. 6, No. 2 (2016) // DOI: 10.9770/jssi.2016.6.2(4); Edvīns Šincāns and Jānis Ivančiks, "Evaluations of Energy Security Measures: Experience of Different Countries in Combating Unlawful Use of Electricity and Comparison with Latvia," *Journal of Security and Sustainability Issues* Vol. 6, No. 4 (2017) // DOI: 10.9770/jssi.2017.6.4(2).

[2] Wouter Poortinga, Nick Pidgeon, and Irene Lorenzoni, "Public perception of nuclear power, climate change and energy options in Britain: Summary Findings of a survey conducted during October and November 2005" (2006) // http://www.esds.ac.uk/doc/5357/mrdoc/pdf/5357userguide.pdf; Benjamin K. Sovacool, Scott Victor Valentine, Malavika Jain Bambawale, Marilyn A. Brown, Terezinha de Fatima Cardoso, Sayasat Nurbek, Gulimzhan Suleimenova, Jinke Li, Yang Xu, Anil Jain, A.F. Alhajji, and Andrew Zubiri, "Exploring propositions about perceptions of energy security: An international survey" *Environmental Science & Policy* Vol. 16 (February 2012) // DOI: 10.1016/j.envsci.2011.10.009; Karel Mulder, "The dynamics of public opinion on nuclear power. Interpreting the experiment in the Netherlands," *Technological Forecasting and Social Change* Vol. 79, Issue 8 (October 2012) // DOI: 10.1016/j.techfore.2012.04.018; Janelle Knox-Hayes, Marilyn A. Brown, Yu Wang, and Benjamin Sovacool. "Understanding attitudes toward energy security: Results of a cross-national survey," *Global Environmental Change* Vol. 23, No. 3 (2013) // DOI: 10.1016/j.gloenvcha.2013.02.003; Christina Demski, Wouter Poortinga, and Nick Pidgeon, "Exploring public perceptions of energy security risks in the UK," *Energy Policy* Vol. 66 (March 2014) // DOI: 10.1016/j.enpol.2013.10.079; Martin J. Goodfellow, Paul Dewick, Jonathan Wortley, and Adisa Azapagic, "Public perceptions of design options of new nuclear plants in the UK," *Process Safety and Environmental Protection* Vol. 94 (March 2015) // DOI 10.1016/j.psep.2014.12.008.

[3] Vladas Gaidys and Leonardas Rinkevičius, "Černobylio baimė, pigios energijos nauda ar kai kas daugiau? Dvidešimties metų visuomenės nuomonės apie Ignalinos AE sociologiniai tyrimai Lietuvoje" (The scares of Chernobyl, the favouring of cheap energy or something more? Twenty years of sociological public opinion polls in Lithuania on the Ignalina Nuclear Power Plant), *Filosofija. Sociologija* Vol. 19, No. 4 (2008); Dainius Genys and Ričardas Krikštolaitis, "The public perception of nuclear energy in Lithuania," *Journal of Security Sustainability Issues* Vol. 7, No. 1 (2017) // DOI: 10.9770/jssi.2017.7.1(2).

[4] Vylius Leonavičius, Dainius Genys, and Ričardas Krikštolaitis, "Public perception of energy security in Lithuania," *Journal of Security and Sustainability Issues* Vol. 4, No. 4 (2015) // DOI: 10.9770/jssi.2015.4.4(1); Vylius Leonavičius and Dainius Genys, *Energetinio saugumo sociologija (Energy Security Sociology)* (Kaunas: Vytautas Magnus University, 2017).

The first research was conducted one year after a public referendum regarding the construction of new NPP and elections to Lithuanian Parliament Seimas which meant a change in political power (Labor party and Socialdemoracts became ruling parties). The second study was also conducted one year after elections to Lithuanian Parliament Seimas, which also meant a change in political power (when Socialdemocrats were mainly replaced by Lithuanian Farmers and Green Union).

The paper is based on two empirical research studies (public polls) carried out in 2013 and 2017. A representative survey was conducted by public opinion research company "Vilmorus" in May and June 2013 and March 2017. Number of respondents: 2013 – N = 2002; 2017 – N = 1002; interviewed 18 years old and older residents of Lithuania. The method of survey: questioning respondents at home using pre-made questionnaires. Method of selection: multi-stage, probabilistic sampling. Selection of respondents was prepared so that each resident of Lithuania should have an equal chance of being questioned. The results reflect the opinion of the entire population of Lithuania and distribution by age, sex, place of residence, education, purchasing power. Error of survey results – 3% (probability – no less than 97%).

The paper consists of four parts. It starts with a brief review of the main occurances in recent nuclear energy politics. Then, it presents general tendencies of public perception of nuclear energy. Later, it presents a cluster analysis of both the 2013 and 2017 polls, in which respondents were divided into two groups based on income, education and occupation. Finally, the paper presents findings and discusses the dynamics of public perceptions.

1. CHANGING PREFERENCES OF NUCLEAR ENERGY POLITICS

Nuclear energy has always been one of the most important issues of energy security politics in Lithuania.[5] It was one of the key factors for energy security in official energy security politics.[6] Not only was Ignalina NPP the main electricity generator until its shutdown, but even afterwards for some time nuclear energy was treated as the main energy security pillar. Right after shutdown of the first unit of Ignalina NPP, some politicians put public pressure on former government to foster the construction of new NPP.

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[5] Agnia Grigas, "Energy Policy: The Achilles Heel of Baltic States"; in: Agnia Grigas, Andres Kasekamp, Kristina Maslauskaite, and Liva Zorgenfreija. *The Baltic States in the EU: Yesterday, Today and Tomorrow* (Paris: Notre Europe – Jacques Delors Institute, 2011); Arūnas Molis and Justina Gliebutė, "Prospects for the Development of Nuclear Energy in the Baltic Region," *Annual Strategic Review* Vol. 10 (2012) // DOI: 10.1515/lfpr-2016-0003; Margarita M. Balmaceda, *Politics of Energy Dependency: Ukraine, Belarus, and Lithuania between Domestic Oligarchs and Russian Pressure* (Toronto: University of Toronto Press, 2013).
[6] *National Energy (Energy Independence) Strategy*, Government of the Republic of Lithuania endorsement of the National Energy (Energy Independence) Strategy by Resolution No. 1426 on October 6, 2010; *National Energy Independence Strategy of the Republic of Lithuania Approved by Resolution No XI-2133 of the Seimas of the Republic of Lithuania of 26 June 2012*, Ministry of Energy of Republic of Lithuania, 2012.

By reviewing a chain of nuclear events from 2005 till 2012 we see consistent politics:

- March 2006: Baltic States' energy companies agree to conduct a feasibility study regarding a new regional NPP;
- December 2006: Initial conceptual work begins;
- January 2007: New NPP is included in Lithuania's National Energy Strategy;
- July 2007: Lithuanian Nuclear Power Plant Law is adopted;
- August 2008: Environmental impact assessment for construction site near Visaginas is prepared;
- May 2010: Detailed plan for construction site near Visaginas is approved;
- July 2011: Hitachi, Ltd. is selected as the strategic investor for the Visaginas NPP (VNPP);
- December 2011: Polish energy company PGE withdraws from the Visaginas NPP project;
- October 2012: Advisory referendum in Lithuania regarding construction of the Visaginas NPP is held.[7]

Despite various scandals and setbacks due to the political cycle, the direction is quite clear – to build a new NPP. But after the referendum, when the majority of participants expressed negative will towards construction of a new NPP, nuclear politics were put on pause. There were no official decisions regarding the construction of a new NPP (except some quite ambivalent proclamations regarding the future of nuclear energy in Lithuania which weren't supported by any legislative acts or political decisions). The fact that the role of nuclear energy in upcoming energy security strategy is strongly reduced probably serves as an important argument that its perspectives in the country are at least cloudy.

The situation drastically changed in 2016. This was when nuclear energy was the forgotten and ambivalent issue became a new source of anxiety and even a threat to national security. Thus it is neither related with VNPP nor a nuclear future in Lithuania. It is related to our neighbour Belarus and their Ostrovets NPP (ONPP).

The origin of Ostrovets NPP construction might be traced back to 2006-2007 when Belarusians decided to include nuclear energy in their future energy balance and confirmed this decision in Belarusian energy security concept. But only ten years later in 2016 did it land on the Lithuanian political radar and become issue of national security. It was then when Ostrovets NPP was declared unsafe due to its failure to comply with international safety standards, namely Espoo and Aarhus, and few major incidents such as the fall of one building, the drop of the reactor pressure vessel, and

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[7] Timeline created by G. Česnakas and J. Juozaitis 2017; *see*:
http://www.atlanticcouncil.org/publications/issue-briefs/nuclear-geopolitics-in-the-baltic-sea-region.

the collision of the damaged reactor vessel replacement with a railway power line pillar while being transported. With such incidents 20 km away from the border and 50 km from capital Vilnius, it did not go unnoticed in Lithuania.

A series of events happened in Lithuanian in 2016-2017 indicating the change of political preferences regarding nuclear energy from internal problem (regarding construction of own NPP) to external problem (regarding neighbour Belarus construction of their NPP).

If some concerns regarding the safety of Ostrovets NPP were expressed in 2012 (energy independence is identified as the biggest and the development of unsafe NPP in neighbor country as the second biggest threat in National Energy Security Independence Strategy - 2012), in 2016 Lithuanian politics (both at internal and foreign levels) became more targeted and consistently expressed.[8] This was the year when the Lithuanian Seimas declared a resolution regarding Ostrovets NPP, and the government initiated a consistent program of actions to stop the construction of ONPP. In 2017 Parliamentary political parties declared the agreement regarding „On common actions regarding unsafe Ostrovets NPP", and later the Lithuanian Seimas declared that ONPP is a direct threat to Lithuanian national security as well as environmental and public health. Finally it is worth mentioning that there have been many various TV shows and discussions considering the safety of ONPP and what could be done in order to stop its construction close to Lithuanian border.

Having such shifting political preferences and a vivid debate surrounding it, we presume that not only nuclear energy will remain visible issue in public perception of energy security in general, but its interpretation will be different comparing the importance of nuclear energy in Lithuania and in neighbour countries.

2. BREAKING THE IRRELEVANCE OF NUCLEAR ENERGY IN PUBLIC PERCEPTION

As in 2013, the 2017 research showed that a variety of different aspects are taken into account in public perception on energy security. Three of the most important aspects are the "prices of energy resources" – 93.4% important, "reliability of energy supply services" – 91.9% important and "reliability of energy infrastructure (pipelines, electric transmission networks, power plants and so on)" – 90.5% important. The three less important are the "development of nuclear energy" - 42.9% not important; "the development of shale gas" – 37% not important; and "the development of oil extraction" – 30.1% not important.

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[8] Justinas Juozaitis, "Lithuanian foreign policy vis-à-vis Belarusian nuclear power plant in Ostrovets," *Lithuanian Foreign Policy Review* Vol. 35 (2016) // DOI: 10.1515/lfpr-2016-0003.

The research shows the continuing ambiguous evaluation of nuclear energy. Only a bit more than one-third of society (36.9%) mentioned nuclear energy as important, while 42.9% answered that "the development of nuclear energy" was absolutely unimportant or unimportant for Lithuanian energy security, and one-fifth of respondents (20.2%) were undecided on this issue.

As other research has demonstrated[9] there are large sections of the public with no firm views for or against nuclear energy in many countries. Nuclear energy has been controversial and susceptible to instinctive public reaction. The data clearly shows that countries already include nuclear power in the energy mix have publics that are more knowledgeable on the issues and are more supportive. Which comes first is unclear.[10]

To better understand the Lithuanian public's attitude on nuclear energy and its associational aspects, respondents were asked to evaluate statements regarding personal knowledge of nuclear advantages and disadvantages, information regarding risks and benefits, and support to construction of new NPP (Table 1).

Table 1. Evaluation of the statements (%)

	I know the advantages and disadvantages of nuclear energy	I have enough information regarding risks and benefits of the development of nuclear energy in neighbour countries	I am well informed regarding energy problems	Do you support the constrution of Visaginas NPP?
Totally disagree	8.7	10.1	13.2	22.7
Disagree	39.2	42.0	57.4	33.6
Agree	36.2	32.0	18.1	16.7
Totally agree	4.7	4.9	1.8	3.0
Don't know/undecided	11.2	11.0	9.5	24.0

From the table above we can see several tendencies. First, three opinion groups can be distinguished regarding first two questions. In both "I know the advantages and disadvantages of nuclear energy" and "I have enough information regarding risks and benefits of the development of nuclear energy in neighbour countries", we see the biggest group of those who disagree (47.9% totally disagree/disagree; 52.1% totally disagree/disagree), a large similar-sized group regarding both questions who

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[9] NEA, OECD, "Public Attitudes to Nuclear Power. Report (NEA No. 6859)" (2010) // https://www.oecd-nea.org/ndd/reports/2010/nea6859-public-attitudes.pdf.
[10] *Ibid*.

agree (40.9% totally agree/agree; 36.9% totally agree/agree) and almost equal numbers of those who do not know or are undecided (11.2%; 11%).

Second, there is quite a different picture regarding two other questions. In the case of "I am well informed regarding energy problems" we see the dominant group (70.6% totally disagree/disagree), a much smaller group who agree (19.9% totally agree/agree) and the smallest among all questions group of those who do not know or are undecided (9.5%). In the case of „Do you support the construction of Visaginas NPP?" we also see a large but smaller-than–the-previous-group of those who disagree (56.3% totally disagree/disagree), a very similar group of those who agree (19.7% totally agree/agree), and the largest group of them all (24%) who do not know or are undecided.

Third, it seems that respondents have more information or at least better evaluate it regarding nuclear energy as compared to information regarding energy problems in general. And finally even though almost half of the respondents stated they do not know the advantages and disadvantages (47.9%) only 24% were undecided regarding the support of the construction of a new NPP in Lithuania, which means that one quarter of the total respondents came to a decision without having enough information. This corresponds with the notion that there are large sections of the public with no firm views for or against nuclear energy.

3. THE CLASH IN OPINION BETWEEN TWO GROUPS

To better understand the distribution of attitudes to nuclear energy between different social groups, it was decided to perform cluster analysis. The clusters were formed accordingly to the concept of socio-economic status deriving from the basis of the American social stratification research tradition.[11] The concept of socio-economic status is based on three variables: education, income and occupation. Therefore, there are three corresponding empirical questions: What is your educational background? What are your main activities? What is your income? These serve as independent variables for the creation of the two clusters.

Hierarchical cluster analysis was performed to identify the number of clusters. Between groups linkage method with Chi-square measure as linkage measures was used. 2 different clusters were distinguished. Subsequently a K-means cluster analysis was performed using 2 as the pre-defined number of clusters. The descriptive statistics for each cluster are displayed in table below (Table 2).

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[11] Harry B.G. Ganzeboom, Paul M. De Graaf, and Donald J. Treiman, "A Standard International Socio-economic Index of Occupational Status," *Social Science Research* Vol. 21, No. 1 (1992) // DOI: 10.1016/0049-089X(92)90017-B.

Table 2. Final Cluster Centers

2013	Cluster center		2017	Cluster center	
Question	1	2	Question	1	2
What is your educational background? 1. Primary education 2. Secondary education 3. Vocational training 4. Further education 5. Unfinished higher education 6. Higher education 7. Other	4	3	*What is your educational background?* 1. Primary education 2. Secondary education 3. Vocational training 4. Further education 5. Unfinished higher education 6. Higher education 7. Other	4	3
What is your occupation? 1. State enterprises employee 2. Private business owner 3. Private company employee 4. Student / Pupil 5. Unemployed 6. Retired 7. Other activities	2	6	*What is your occupation?* 1. State enterprises employee 2. Private business owner 3. Private company employee 4. Student / Pupil 5. Unemployed 6. Retired 7. Other activities	2	6
What is your family income (per person after taxes)?[12] 1. Under 86,89 Eur 2. 87.18 - 173.77 Eur 3. 174.06 - 260.66 Eur 4. 260.95 - 347.54 Eur 5. 347.83 - 434.43 Eur 6. 434.72 - 521.32 Eur 7. 521.61 - 608.20 Eur 8. 608.49 Eur and more	4	3	*What is your family income (per person after taxes)?* 1. Under 100 Eur 2. 101 – 200 Eur 3. 201 – 300 Eur 4. 301 – 400 Eur 5. 401 – 500 Eur 6. 501 – 600 Eur 7. 601 – 700 Eur 8. 701 Eur and more	4	3

From Table 2 we see the identical situation in both 2013 and 2017 polls. The 1st cluster consists of people with higher education, who are wealthier and own private companies (or are working in them). Meanwhile, the 2nd cluster is dominated

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[12] The public poll was carried out in 2013 when national currency Litas was still in use, therefore in further analysis in this article income in Litas is used as a category. The analogue amount in Euros is provided in the brackets.

by people with lower education (mainly vocational training) and with lower income who are retired, unemployed or students. Through cluster analysis the respondents were divided in two distinct parts, in which the 1st cluster represents that part of the public which is well educated, actively working and actively contributing to the state economy; meanwhile the 2nd is less educated, less active economically and more dependent on social security programs part of the public. The size of the 1st cluster is 853 individuals or 42.61% of the surveyed population, the 2nd is 916 individuals or 45.75% and 233 – missing (11.64%). In 2017 total amount of respondents were 1002, therefore size of the 1st cluster is 398 individuals or 39.72% of the surveyed population, 2nd – 476 individuals or 47.51% and 128 – missing (12.77%). Thus, we see throughout five years the only notable change between these two clusters is the increasing gap.

To crystalize the differences and have a broader understanding of each of them we decided to analyze additional correlations regarding living area and age.

Table 3. Distribution of living are among each cluster (crosstab). 2013

2013	Living area								Total
	Big cities		Centre of region		Small cities		Rural areas and Countryside		
	2013	2017	2013	2017	2013	2017	2013	2017	
1	43.4%	43.7%	29.9%	19.9%	2.8%	4.5%	23.9%	31.9%	100.0%
2	33.3%	33.8%	29.5%	22.5%	2.6%	4.6%	34.6%	39.1%	100.0%
Total	38.2%	38.3%	29.7%	21.3%	2.7%	4.6%	29.5%	35.8%	100.0%

Chi-Square Tests

2013	Value	df	Asymp. Sig. (2-sided)	2017	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	28.990	3	.000	Pearson Chi-Square	9.354	3	.025
Likelihood Ratio	29.158	3	.000	Likelihood Ratio	9.354	3	.025
Linear-by-Linear Association	28.178	1	.000	Linear-by-Linear Association	7.457	1	.006
N of Valid Cases	1769			N of Valid Cases	874		

As we can see from Table 3 there are almost no differences between the distribution of respondents in 2013 and 2017. In both cases the part of those living in big cities is almost identical in both clusters between the two polls. Small differences are noted regarding living in the center of the region. The latest poll has a smaller population. In the case of the first cluster the drop is 10% (from 29.9% to 19.9%, while in the

second it is 7% (from 29.5% to 22.5%) and 8.4% total. In the case of the small cities the difference is less great – the increase is noted from 2.7% to 4.6% in total. Finally, an increase is noted in the rural area and countryside when the total population increased from 29.5% to 35.8%. It is especially worth paying attention to the increase of the 2nd cluster from 34.6% to 39.1%, which overall means the growing distinction between the clusters, when the 1st tends to concentrate in big cities while the 2nd is in rural areas.

By comparing the clusters of both polls, we see that representatives of the 1st cluster (in both cases) more frequently live in bigger cities and more seldom in rural areas, while of the 2nd we see the contrary – i.e. that most of them live in rural areas and in district centers. And also, a notable part live in cities as well (Table 3).

Table 4. Age distribution within each cluster (crosstab) 2013.

		Age groups											Total
		18 - 25		26 - 35		36 - 45		46 - 55		56 - 65		66 and more	
		2013	2017	2013	2017	2013	2017	2013	2017	2013	2017	2013	2017	
1		12.2%	8.5%	20.5%	21.1%	24.6%	21.1%	27.0%	28.9%	13.4%	19.4%	2.3%	1.0%	100.0%
2		9.2%	8.6%	5.3%	7.2%	8.2%	9.0%	10.6%	9.0%	20.9%	18.5%	45.9%	47.7%	100.0%
Total		10.6%	8.6%	12.7%	13.5%	16.1%	14.5%	18.5%	18.1%	17.2%	18.9%	24.9%	26.4%	100.0%

Chi-Square Tests

2013	Value	df	Asymp. Sig. (2-sided)	2017	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	572.603	5	.000	Pearson Chi-Square	279.159	5	.000
Likelihood Ratio	664.254	5	.000	Likelihood Ratio	343.672	5	.000
Linear-by-Linear Association	357.905	1	.000	Linear-by-Linear Association	140.258	1	.000
N of Valid Cases	1769			N of Valid Cases	874		

The representatives of the 1st cluster are relatively young and mature, the three largest groups are of 26-35, 36-45 and 46-55 years old. Meanwhile the two largest groups of the 2nd cluster are elders, 56-66 years old and the oldest (66 and more) group.

The same tendency remained in 2017 with small exceptions. The three largest groups of the 1st cluster are 26-35, 36-45 and 46-55 years old; thus the percentage

varies merely. The bigger difference is seen in the 56-65 years old group. In the previous poll it was dominated by the members of the 2nd cluster; this time the division is very similar with small advancement of the 1st cluster. Finally, in the last category members of the 2nd cluster is dominating similarly as before.

The only reasonable conclusion to be drawn from the cluster analysis is the emerging or increasing schism between the clusters. It might be presumed it is related with global emergence of the precariat (when middle class keeps losing its peculiarity and evolving towards the precariat[13]) and division of the public between those who have and those who do not (Table 2). Complementary research needs to be carried for validating the progress of this trend. Nevertheless, cluster analysis within our research reveals the existence of such difference between two polls: if four years ago the gap between the clusters were 3.14%, now it has increased to 7.43% (in overall respondent's division between clusters).

4. CHANGES IN PUBLIC VIEW THROUGHOUT 2013 AND 2017 YEARS

Having these two different clusters it is interesting to explore what kind of difference it will reveal regarding their attitude towards nuclear energy and VNPP (Table 5).

Table 5. Evaluation of the statements, both clusters (%) 2013

Question	Chi-Square	Asymp. Sig. (2-tailed)		1st %	2nd %
9.3. I know the advantages and disadvantages of nuclear energy	25.183	.000	Absolutely / disagree[14]	51.8	56.1
			Don't know/ not responded	12.6	18.2
			Absolutely / agree	35.6	25.7
20.1. I think that Visaginas NPP project will be safe	18.799	.000	Absolutely / disagree	43.1	39.2
			Don't know/ not responded	30.0	39.5
			Absolutely / agree	26.9	21.3
20.2. I think that Visaginas nuclear power plant will be	15.566	.000	Absolutely / disagree	38.6	36.7

economical beneficial for Lithuania			Don't know/ not responded	30.7	39.0
			Absolutely / agree	30.7	24.3
20.3. I think that Visaginas NPP project will cause additional problems in the country (eg., oligarchy widespread).	22.445	.000	Absolutely / disagree	18.8	17.2
			Don't know/ not responded	28.0	38.5
			Absolutely / agree	53.2	44.3
1.7. The importance of the development of nuclear energy for energy security in Lithuania?	26.488	.000	Absolutely / disagree	25.4	22.5
			Don't know/ not responded	21.5	32.3
			Absolutely / agree	53.1	45.2

First, the analysis shows that every question was evaluated somehow differently between the clusters. A chi-square test for homogeneity was run to determine whether the 1st clusters members' opinions differed significantly from the 2nd clusters members' opinion. From Table 5 we can see that for all 5 questions we are observing statistically significant differences between clusters members' opinions. Second, as it was possible to predict, the respondents of the 2nd cluster are much more indecisive and frequently do not have an opinion (see Table 5). Most of the time it exceeds 30% (with exception of the first statement – "I know the advantages and disadvantages of nuclear energy", 18.2%). Third, the respondents of the 1st cluster are more positive towards every statement (including "I think that Visaginas NPP project will cause additional problems in the country (e.g., oligarchy widespread"). However, this does not mean that the respondents of the 2nd cluster are more sceptical regarding every statement. Even though the 1st cluster has a more positive attitude at the same time it is more sceptical. It seems that the 1st cluster, whether the answers are positive or critical, is more decisive than the 2nd.

To sum up main differences between at least two groups of respondents, we can say that representatives of the 1st cluster (who are better educated, richer, frequently working in private sector, frequently living in big cities and are in the age range from 26 to 55) are more positive as well as more critical about every statement. They tend to agree with the advantages (safety, economic benefit) as well as disadvantages (VNPP contribution to oligarchy widespread). Finally, this cluster has fewer doubts regarding the development on nuclear energy and tends to support it.

The representatives of the 2nd cluster (who are somehow less educated, have lower income, mainly retired, unemployed or studying, frequently living in rural areas and are older (56 and more)) have less information and frequently are unaware of

nuclear energy issues. The respondents of this cluster are less critical to every statement (with the exception of "I know the advantages and disadvantages of nuclear energy"). Finally, this cluster has more doubts regarding the development of nuclear energy.

Due to the changing circumstances in the country,[15] a few questions were reformulated, withdrawn, or replaced by some others. Thus in 2017 respondents were asked to answer slightly different questions (Table 6). Thus, the direct comparison remained possible only regarding two questions; however, it is nevertheless possible to grasp the general tendency of public nuclear energy perception from the questions provided.

Table 6. Evaluation of the statements, both clusters (%) 2017

Question	Chi-Square	Asymp. Sig. (2-tailed)		1st %	2nd %
81. I am well informed regarding energy problems	17.823	.000	Absolutely / disagree	67.9	73.7
			Don't know/ not responded	7.0	11.6
			Absolutely / agree	25.1	14.7
83. I know the advantages and disadvantages of nuclear energy	12.945	.002	Absolutely / disagree	47.5	50.0
			Don't know/ not responded	6.5	12.8
			Absolutely / agree	46.0	37.2
87. I have enough information regarding risks and benefits of the development of nuclear energy in neighbour countries	5.941	.051*	Absolutely / disagree	54.0	52.3
			Don't know/ not responded	7.3	12.2
			Absolutely / agree	38.7	35.5
96. Do you support the constrution of Visaginas NPP?	7.873	.020	Absolutely / disagree	60.3	54.2
			Don't know/ not responded	18.8	26.9
			Absolutely / agree	20.9	18.9
	4.070	.131	Absolutely / disagree	46.2	42.6

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[15] Juozas Augutis, Ričardas Krikštolaitis, Vylius Leonavičius, Sigita Pečiulytė, Dainius Genys, Giedrius Česnakas, Linas Martišauskas, and Justinas Juozaitis, *Lietuvos energetinis saugumas. Metinė apžvalga. 2015–2016 (Lithuania's energy security. Annual review. 2015–2016)* (Kaunas: VDU, 2017); Dainius Genys and Ričardas Krikštolaitis, *supra* note 3.

1.7. The importance of the nuclear energy development for energy security in Lithuania?			Don't know/ not responded	16.8	22.3
			Absolutely / agree	37.0	35.1
16. The importance of nuclear energy development in neighbour countries (Ostrovets in Belarus and Baltic in Kaliningrad) in Lithuania?	11.473	.003	Absolutely / disagree	33.4	26.3
			Don't know/ not responded	18.9	27.9
			Absolutely / agree	47.7	45.8

If in 2013 the significant difference regarding every question appeared in all cases, in 2017 a significant difference was noted in four cases out of six (see Table 6). Even though we see an opinion discrepancy regarding "I have enough information regarding risks and benefits of the development of nuclear energy in neighbour countries" and „The importance of the nuclear energy development for energy security in Lithuania?", the differences are not statistically significant.

The 1st cluster remained more critical to every question. Even though notable part of its members claim they do not have enough information regarding advantages and disadvantages of nuclear energy (67.9%) or energy problems in general (47.5%), it still estimates possessed information much better than the 2nd cluster (46% vs. 37.2%; and 25.1% vs. 14.7%) (see Table 6).

The 2nd cluster of respondents have significantly less information regarding various aspects of nuclear energy and is both more concern and sceptical regarding the development of nuclear energy and its role in Lithuanian energy security (35.1% - Agree / totally agree).

Both clusters lack information regarding the risk and benefit of the NPP's in neighbour countries (18.9% vs. 27.9% - Don't know/ not responded). Both are quite critical regarding the construction of Visaginas NPP (60.3% vs. 54.2%) and nuclear energy in general (46.2% vs. 42.6%) (see Table 6).

Lastly, by comparing "The importance of the nuclear energy development for energy security in Lithuania?" and "The importance of nuclear energy development in neighbour countries (Ostrovets in Belarus and Baltic in Kaliningrad) in Lithuania?" we see that many fewer respondents agree with the importance of nuclear energy future in Lithuania (37% - 35.1% - absolutely / agree) but still a large part of respondents think that the development of nuclear energy in neighbour countries is a problem for Lithuanian energy security (47.7% - 45.8% - absolutely / agree).

CONCLUSIONS

Comparing 2017 data with results of 2013 years, four main tendencies can be distinguished.

First, society became better informed and more critical. This tendency is common for both clusters: "I know the advantages and disadvantages of nuclear energy" 2013: 12.6% and 18.2% vs 2017: 6.5% and 12.8% - Don't know/ not responded; "The importance of the development of nuclear energy for energy security" 2013: 21.5% and 32.3% vs. 2017: 16.8% and 22.3% - Don't know/ not responded.

Second, the cluster analysis divided respondents into two almost identical groups as in 2013 (with minor peculiarities). The most notable difference in this division is the increased gap between clusters. If in 2013 the proportions between clusters were similar (1st - 42,61%; 2nd - 45,75%) in 2017 they became more vivid (1st 39,72%; 2nd - 47,51%). Accordingly, the 1st cluster remained more critical and better informed, while the 2nd was less informed and less decisive.

Third, the general tendency shows the breaking of the irrelevance of nuclear energy as an important factor for energy security in public perception. In the case of "The importance of the development of nuclear energy for energy security in Lithuania?" was fixated growing irrelevance: 2013: 1st - 25.4% and 2nd - 22.5% vs. 2017: 1st - 46.2% and 2nd - 42.6% - Absolutely / disagree.

Fourth, statistical analysis confirmed the theoretical presupposition that switching political preferences - from constructing own NPP within Lithuania to the attempts to stop the construction of unsafe ONPP in neighbour country - impacted public perception. The greater part of respondents – 46.2% and 42.6% - absolutely / disagree with importance of the importance of the nuclear energy development for energy security in Lithuania. But a very similar part of the respondents – 47.7% and 45.8% - absolutely / agree with the importance of nuclear energy development in neighbour countries (Ostrovets in Belarus and Baltic in Kaliningrad) for Lithuanian energy security.

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