Building methodology, assessing the risks: the case of energy security in the Baltic States

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Abstract

The purpose of this article is not confined to analysis of risks to the Baltic States' energy security. The research aimed to develop methods for risk intensity assessment in the area of energy security in the Baltic States, based on scenario-building and risk assessment tools as well empirical examples. It encompasses an effort to tailor a system of damage and probability (i.e. risk intensity) assessment used by other authors to risk analysis. The analysis performed by using this methodology shows the existence of at least two major energy security risks of intolerable intensity for the Baltic States: dependency on a single energy resources supplier and a wrong (in the terms of transparency, competence and knowledge) decision making process. Neutralization of these two risks or mitigation of the negative consequences caused by these should become the energy security priorities for Lithuania, Latvia and Estonia.

Keywords: Baltic States, energy risks, assessment methodology
JEL classification: P48, E17

1. Introduction

Planning systems may go wrong even if based on the most modern principles and foresights of the most prominent people: despite continuously improving tools for collection, processing and analysis of information, conclusions are usually based on the then relevant and most widely known information. As a result, threats identified as the most urgent may turn to be artificial, overemphasised or, in the best case, short-term and easy to neutralise. On the other hand, the unpredictability of the future and continuous dynamics in the area of international relations do not imply the senselessness of analysis of the security environment and development of response instruments. The disposition of some states towards using energy resources for the strengthening and spread of their powers within the international environment as well as increasing competition over limited resources suggest that these threats are not going to disappear in the nearest future. This does not mean that threats that are currently most obvious will retain primary importance in the future. Nevertheless, the assessment of current challenges and attempts to forecast future challenges as well as trying to rate them and direct

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limited resources towards neutralising the most urgent risks are efforts that do make sense despite uncertainty and likely mistakes[3].

The International Energy Agency (IEA) describes energy security as "uninterrupted physical availability at a price which is affordable, while respecting environment concerns". In this context, long-term energy security is linked to investment in energy supply in line with economic developments and environmental needs. Risks to long-term energy security are posed by geopolitical events and difficult-to-predict partners' actions, while effects are usually impossible to eliminate within a short time (they require e.g. long-term strategic solutions concerning infrastructure developments, energy consumption and saving programmes, positive relations with suppliers of energy resources). On the other hand, short-term energy security is the capability of the energy system to react promptly to sudden changes in supply and demand, disagreements about prices, technological disruptions in supply, and the like.

It is no coincidence that the Baltic States have been chosen for this research. After reinstatement of independence 20 years ago, integration in Euro-Atlantic structures and initiation of a common European Union energy policy, the Baltic States still remain the most vulnerable members of the EU and NATO in the energy field. The objectives of this article include a review of the most relevant energy security risks in the Baltic States (as of today and in a 10 year perspective), identification of the most urgent short-term and long-term risks to energy security in the Baltic States and proposing indicators for assessment of damage and the probability of its occurrence. Achieving these objectives would enable creation of a risk map so that it can be judged whether energy security risks should be considered tolerable or not. Assessment and rating of potential risks give grounds for addressing risk management mechanisms. But this is a topic for other research.

It is worth noting in this light that risk intensity assessment methodology (used in this article) is not a novelty in general or in the energy sector. Such organisations as the International Country Risk Guide (ICRG) have been assessing risks to international trade relating to political, economic and financial factors for more than 30 years[4]. In the area of assessing public-life risks related to natural cataclysms, fundamental research has been carried out by Ferrier and Haque (2003), who recommended paying greatest attention to factors conditioning the greatest damage. Governmental organisations (for example, the US Congress) also do not underemphasise risk analyses and risk management. A quite extensive congressional report "Risk Management and Critical Infrastructure Protection: Assessing, Integrating, and Managing Threats, Vulnerabilities and Consequences" was published in 2005. Likewise, there have been multiple attempts to quantify even hazards of a social nature – a traffic-light method (assigning colours to risks of different intensity) has been used by the University of Kent (UK)

[3] Currently scenario construction methodology is applied even by the Organization for Economic Co-operation and Development. See more at the OECD Future Trends database, 2001.

[4] Today ICRG publications monitor 150 countries.

in analysis of risks for development of the university[5]. In this context, due mention should be given to analogous studies by the International Risk Governance Council (IRGC) and World Economic Forum in the area of developing risk assessment methods.

Methodology for risk intensity assessment has not yet been used for assessing energy safety in the Baltic States. Therefore, this article is an early attempt to fill that gap. Being only a part of wider energy security assessment methodology setting and applying research, this article does not have the ambition to provide and explain all methodological aspects of energy security evaluation. It includes neither econometric modelling nor precise calculations or a detailed description and evaluation of the main factors influencing energy security in the region. On the other hand, conclusions on the relevant risks, their weights, probability that risks may realize and cause certain damage are based on "brainstorming" events held at the Energy Security Research Center (ESRC) under Vytautas Magnus University[6]. Besides, working on the conceptual and deeper energy security assessment methodology, experts from this Center contributed to the article by providing their insights expressed during structured interviews. Therefore, although some detailed explanations may seem to be lacking due to constraints of space, the conclusions in this article should be treated as undoubtedly having a certain degree of reliability.

The first part of the article discusses risk assessment methodology in detail, including a few examples of its practical application. The second part of the article deals with risk sources and a review of risks to energy security in the Baltic States. The third part contains an assessment of risk intensity in respect of energy security in the Baltic States, as based on the above-described risk assessment method.

2. Risk assessment methodology

In this article, risks and hazards bear meanings similar to those described in the IRGC paper "Risk Governance. Towards an Integrative Approach", published in 2006.[7] In other words, risk is understood as an uncertain consequence of an event, process or tendency with respect to something that humans value (Kates 1985). The IRGC study separately explains the meaning of "hazards" (described as the potential for harm) but in this article risks and hazards are understood synonymously. Thus, risks refer to a combination of two components: the likelihood of potential consequences and the severity of the damage caused by human activities, natural events or a combination of both. In this article not all risk areas are covered: efforts are confined to risks that lead to negative consequences in terms of energy resources supply and

[5] A quantitative risk assessment methodology similar to that of the traffic-light method has also been used by the International Energy Agency (e.g., see study on Risk Quantification and Risk Management in Renewable Energy Projects).

[6] Academics from the Lithuanian energy institute, as well as professors from Vytautas Magnus University Faculties of Informatics/ Economics and management/ Political science and diplomacy/ Social sciences took part in these "brainstorming" events as they all contribute to a larger study on energy security assessment methodology designed by ESRC.

[7] IRGC White Paper No 1, 'Risk governance: Towards an integrative approach' (2005, available at www.irgc.org/irgc/knowledge_centre/irgcpublications/)

stable (predictable) price. It should also be recognised that risks in any case are "mental constructions" (OECD 2003) – they originate in the human mind and may be perceived as risks, act of God or opportunity, depending on the groups (be it consumer, supplier, etc.) making the assessment. Besides, in this article risks are "framed" from the perspective of the energy consumers, i.e. the Baltic States.

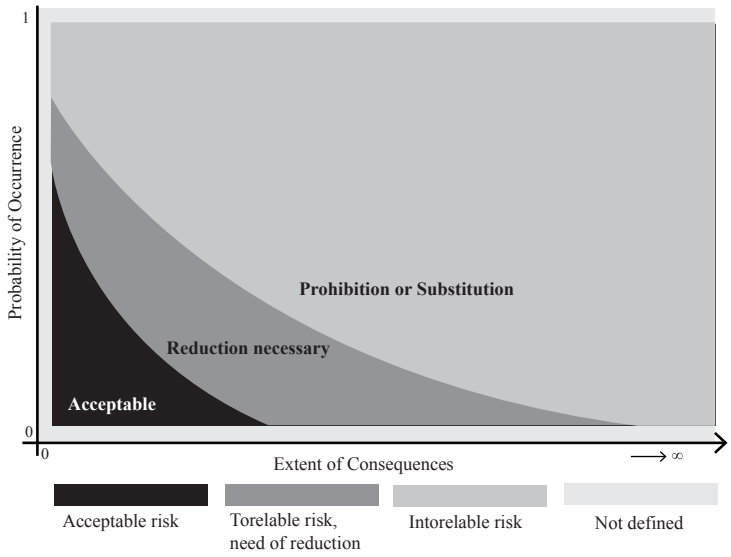
Agreement exists in the literature on three core components of risk assessment: 1) identification and, if possible, estimation of hazard; 2) assessment of exposure and/or vulnerability; 3) estimation of risk, combining the likelihood and the severity of the targeted consequences (IRGC, 2005). Identification establishes a cause-effect link and estimation determines the strength of the cause-effect link. Exposure refers to contact of the hazardous agent (government, interest groups) with the target (individuals, energy infrastructure, etc.). Vulnerability describes the various degrees of the target to experience harm or damage as a result of exposure (for example: ability to replace one energy resource with another). The basis of such assessment is use of analytical – largely probability-based – methods (e.g. scenario techniques, distribution models based on Geographic Information Systems (GIS), empirically driven simulations, etc (IAEA 1995; Stricoff 1995).

In short, risk assessments specify what is at stake, calculate the probabilities for (un)wanted consequences, and aggregate both components into a single dimension (Kolluru 1995). Collection of statistical data relating to performance of a risk source as well as to components of a hazardous agent or technology are crucial for risk assessment. However, probabilities themselves are in any case estimated by experts or decision makers. They usually rely on a set of criteria developed by the German Council for Global Environmental Change (WBGU) in the late 1990s[8]. The most relevant of these are: extent of damage, probability of occurrence, geographical dispersion of damage, persistence (how long will the damage last?), reversibility (can the damage be reversed?), delay effects (latency between initial event and actual damage), potential for mobilisation (will the risk generate social conflict or outrage etc.?). After the WBGU proposal had been reviewed and discussed by many experts and risk managers, the suggestion was made to unfold the compact 'mobilisation index' and divide it into several elements. The most important of these for our analysis are: psychological stress and discomfort associated with the risk or the risk source; potential for social conflict and mobilisation (degree of political or public pressure on risk regulatory agencies) and spill-over effects that are likely to be expected when highly symbolic losses have repercussions on other fields such as financial markets or loss of credibility in management institutions.

[8] The WBGU was set up by the German federal government as an independent scientific advisory body in 1992. Among the Council's principal tasks are to provide early warning of new issue areas, identify gaps in research and to initiate new research, etc. The WBGU takes a transdisciplinary approach, enabling it to provide guidance for political decision makers. Despite the existing uncertainties, it assesses hazards and identifies 'guard rails' that should not be crossed. The WBGU flagship report "World in Transition: Strategies for Managing Global Environmental Risks" (used in this article) is available at: http://www.wbgu.de/en/flagship-reports/fr-1998-global-risks/

Depending on the risk under investigation, additional criteria can of course be included. However, the suggestions listed above in general terms provide a solid background for judgement about the tolerability of a given risk. In this regard, the term "tolerable", according to IRGC, refers to an activity that is seen as worth pursuing yet requiring additional efforts for risk reduction within reasonable limits. The term "acceptable" refers to an activity where the remaining risks are so low that additional efforts for risk reduction are not seen as necessary (IRGC, 2005). If tolerability and acceptability are located in a risk diagram (with probabilities on the y-axis and extent of consequences on the x-axis), the well known traffic light model emerges (Figure 1). In this variant of the model the red zone signifies intolerable risk, the yellow zone indicates tolerable risk in need of further management actions (in accordance with the 'as low as reasonably possible' – ALARP – principle) and the green zone shows acceptable or even negligible risk (IRGC, 2005).

Figure 1. Acceptable, Tolerable and Intolerable Risks (Traffic Light Model)



Source: IRGC White Paper No 1, 'Risk governance: Towards an integrative approach' (2005, available at www.irgc.org/irgc/knowledge_centre/irgcpublications/)

To draw the line between 'intolerable' and 'tolerable' as well as 'tolerable' and 'acceptable' is probably the most difficult task of risk assessment. The UK Health and Safety Executive has developed a procedure based on risk-risk comparisons (Löfstedt 1997); Swiss cantons experimented with Round Tables as a means to reach consensus. Irrespective of the selected means, the judgement on acceptability or tolerability is contingent on making use of a variety of different knowledge sources. Besides that, as is stressed by the IRGC report, judgements on acceptability rely on two major inputs: values and evidence. What society is supposed to tolerate or accept can never be derived from looking at the evidence alone. Likewise, evidence is essential if we are to know whether a value has been violated or not (or to what

degree). In this article some of the conclusions are drawn relying on the respective experts' opinion. However, the main attention was put on collecting and analyzing evidence.

Most often the process of judging the tolerability and acceptability of a risk is structured into two distinct components: risk characterisation and risk evaluation. The first step, 'risk characterisation', determines the evidence-based component for making the necessary judgement on the tolerability and/or acceptability of a risk. The 'risk evaluation' step is in essence subjective as it determines the value-based component for making the judgement (IRGC, 2005). Risk characterisation includes tasks such as point estimates of risks, descriptions of remaining uncertainties and potential outcome scenarios including social and economic implications, suggestions for safety factors, risk-risk comparisons, risk-risk trade-offs, identification of discrepancies between risk assessment and risk perceptions, etc (Stern and Fineberg 1996). In the course of characterising the energy security risks of the Baltic States, evidence on materialisation of risks into concrete damage were collected and analysed; experts were asked to give their evaluation on these issues. The second step, risk evaluation, broadens the picture by including important pre-risk aspects. In the case of energy security, those pre-risk aspects worth paying attention to are the possibility to diversify the supply, reliability of infrastructure, political priorities, potential for conflict resolution, and social mobilisation potential. The main objective here is to arrive at a judgement on tolerability and acceptability based on balancing pros and cons, testing potential impacts on reliable supply of a sufficient amount of energy resources at an affordable price and weighing the competing arguments and evidence claims in a balanced manner. It should be noted that despite some subjectivity, this risk evaluation step is crucial (and most probably the only way) for risk assessment if tolerability and/or acceptability is disputed.

Likely disruption in energy supplies and unstable price of energy resources are referred to in this article as the main challenges to Baltic States' energy security. Therefore, in assessing the energy security risks each potential risk is evaluated on a scale of 100 points: 50 points for the likelihood of supply disruption or sharply increasing price and 50 points for severity of damage caused to the energy sector (i.e. provision for society and industry with energy resources). Judging the intolerable, tolerable and acceptable situations, conclusions are drawn using an equally distributed scale: 0-16 points the situation is considered acceptable (materialisation of risk is unlikely or damage negligible), 17-33 points as tolerable (materialisation of risk is likely and investment in reducing potentially considerable damage pays off) and 34-50 points as intolerable (probability of materialisation of risk is very likely, damage would be severe).

3. Main risks to Baltic States' energy security

Until the end of 2009, the three Baltic States had quite a diverse energy mix. In Estonia, the energy sector was dominated by the use of oil shale, in Latvia by the use of hydro resources and in Lithuania by the use of nuclear energy. In addition, all three states complemented these energy sources with biofuel, wind energy and, of course, with imports of natural gas and oil products (Rudzikas 2006). Therefore, despite significant import dependencies in both the oil and gas sectors, the Baltic States were not treated as purely energy importing and consuming

countries. The presence of an oil refinery in Mazeikiai, import/export terminals for oil and oil products in Butinge and Klaipeda (Lithuania), Ventspils, Riga and Liepaja (Latvia), and Tallinn and Sillamae (Estonia), as well as a gas transit pipeline through Lithuania to Kaliningrad, resulted in a quite successful risk management strategy and at least partially neutralised the above mentioned risk sources.

However, in 2002 the Lithuanian government and the European Commission (EC) reached an agreement regarding decommissioning of the Ignalina Nuclear Power Plant by the end of 2009[9]. In addition, over a five year period starting in 2016, Estonia will have to comply with EU emissions regulations on large combustion power plants, meaning that the country will practically have to cease production of electricity in oil shale-fired power plants. As a consequence, the Baltic States will have to replace both their nuclear and oil shale energy with imported electricity or gas, which will be required for generation of electricity. Besides that, in the electricity sector the Baltic States have to rely on Russian 'back-up' capacities. A huge share of internally consumed or refined oil is imported from either Russia or Belarus in the case of oil products (Janeliunas, 2009).

In the gas sector, the Baltic States are dependent on Russia for 100% of their gas supplies. Despite that, Lithuania decided to follow the unbundling option according to the 3rd EU energy package without exemption (Latvia and Estonia asked for it and received 15 percent discount from Gazprom). The Baltic States possess only one relatively small underground gas storage (in Latvia), but do not have either a LNG import terminal, or interconnection with the western European gas system. Subsequently, this all resulted in extremely high natural gas prices, especially for Lithuania. In this context analysts from the *European Centre for International Political Economy* (ECIPE) conclude that the Baltic States are least able to respond to gas supply cuts. In other words, the Baltic States are extremely vulnerable to Gazprom's price and supply policies (Dreyer 2010).

In this context, the main risks for the Baltic States' energy security may be characterised as follows:

Imperfection of energy infrastructure. The US and Japanese have experienced evidence that natural phenomena capable of destroying the energy infrastructure can have tragic consequences despite all human efforts. An explosion in a gas pipeline in Belgium in 2004 reminded us that gas pipelines represent infrastructure that can be quickly damaged and that requires special care. On the other hand, quite many disruptions in supplies of energy resources of technological origin (particularly in the Baltic States) could be prevented (or, at least, damage and probability of supply disruptions occurring could be reduced) if energy infrastructure is properly maintained and managed. The areas of electric power supply and distribution demonstrate the greatest need for modernisation of energy infrastructure. On the other hand, this risk also appears to be obvious in the oil sector – the oil refinery in Mazeikiai

[9] At the time, Ignalina not only provided ~80% of Lithuania's domestic electricity requirements but also exported electricity to the other Baltic States.

has been designed to process Urals crude oil transported by pipeline. Oil transportation in oil tankers or by railway from Russia and other regions involves additional transportation and technology adaptation costs.

Dependence on a single supplier may become a crucial factor for energy supply disruption in time of serious international military, political or economic crises. Besides, dependence in the energy sector might be used as an instrument of pressure by foreign governmental structures or monopolistic companies. This scenario is possible in the Baltic States as alternative (to those from Russia) supply routes are practically impossible due to the absence of energy interconnections with the energy systems of Northern and Western Europe. In the electricity sector, the Baltic States are integrated only into the 'United Energy System of Russia' network (the interconnection between Finland and Estonia is of weak capacity, the Lithuanian-Swedish interconnection is still under construction). This means that in the case of a short term electricity deficit they possess only one option – to rely on a system dominated by Russian electricity providers (Aalto 2008). In the oil sector, dependency risks are also relevant, due to the fact that the Baltic States possess only very limited local oil resources.

Central government and local municipalities threaten secure energy supply at a stable price due to lack of practical experience, specific competence and western transparency in decision making. The Baltic States lack professionals skilled in political and technical energy security aspects. Likewise, there is a shortage of objective and unbiased research in the area. This has to do with sceptical attitudes of governmental and research organisations towards training of professionals, support to research centres, etc. As a result, projects supposed to ensure energy security are carried out without assessment of costs of several possible alternatives and long-term benefits (it is not clear what strategies to ensure energy security should be prioritised in the light of limited resources). On the other hand, decisions (even the right ones) made by people with poor authority in a society are easy to revise by making the society doubt the decisions.

Foreign and local companies (i.e. Gazprom, its partners and subsidiaries) enjoying a monopolistic position on the Baltic States market, use their dominant position for further strengthening vertical integration (a situation where energy import and distribution are controlled by the same player) in the energy market. In many cases, governments and municipalities (for the reasons mentioned in the paragraph above) even support them in this regard. As a consequence, the Baltic States actually have no levers to influence the conditions of gas supply from Gazprom (purchase quotas, unilaterally fixed prices), and if Gazprom shuts down gas supplies for whatever reason, the Baltic States would not be able to import natural gas from other sources. In addition, vertical integration of energy companies hinders the Baltic States from pursuing another policy which does not suit the interests of Gazprom in the gas field, i.e. to increase transit charges, use gas transit to the Kaliningrad Region as a tool, implement the European Union's Third Energy Package, etc.

Profiting business structures as well as interested external governmental institutions and incompetent, poor or sometimes even corrupt internal governmental bodies determine **low application of technological innovations in the energy sector** which serves as the main reason for slow growth of renewable energy consumption and low energy efficiency. It is officially expected that by 2020 the share of renewable energy resources to final energy consumption will be 23% in Lithuania, 25% in Estonia and 42% in Latvia (Europe's energy portal 2009). However, the high costs of renewable technologies, the lack of stable financial support systems, little technological experience and an unsettled legal base may prevent setting higher - or even achieving - the above mentioned ambitions. In other words, a further increase in renewable resource consumption requires further research and high up-front investment. However, even economically viable projects face administrative hurdles, as those to be involved with planning, developing, operating or promoting renewable energy projects lack the required levels of education and training. At the same time the energy intensity of industry in the Baltic States is one of the highest in the EU. Energy efficiency in buildings, the transport sector and district heating systems is extremely low. This stems from use of out-dated Soviet technologies, insufficient investment and a weak savings culture. The biggest challenges towards improving the Baltic States' energy efficiency are related to lack of knowledge and experience in common property management, low incomes and the fear of taking out loans. The inability of residents to agree and make common decisions, the lack of trust and knowledge in realising successful projects and unattractive financing conditions for energy efficiency investment also play a significant role in this regard (Janeliunas 2009).

Political organisations, which are supported by external forces and only formally "protect" the rights of the Russian and Polish minorities, induce dissatisfaction of national minorities with their social and cultural situation in the Baltic States. Continuous talks about discrimination against the Polish and Russian minorities (on the grounds, for example, of non-granting of citizenship, not allowing use of native-language forms of personal names, not printing ballots in Russian, neglecting the social problems of Visaginas residents after decommissioning the Ignalina NPP, etc.) not only escalate social conflicts, but also attract the attention of Poles in Poland and Russians in Russia. The worst thing here is that reinforced anti-Baltic attitudes both in the Baltic States and in Poland and Russia may legitimise responses by the Polish and Russian authorities. In other words, allegedly unresolved and overstated in public, problems about national minorities can be used as an energy blackmail tool, i.e. this may lead to suspension of cooperation projects in the energy sector (building of power links, nuclear power plant), demands for additional obligations from the Baltic States to resume negotiations, rising prices for resources, etc.

4. Risk intensity assessment: methodology and results

4.1. Methodological framework

In order to assess the intensity of the above-described risks to Baltic States' energy security, the aforementioned models for assessing the extent of damage and probability of negative consequences occurring can be used if modified, at least to a certain extent, due to the speci-

ficity of the energy sector and the strategic importance for the entire national economy and even sovereignty of the state. For example, with regard to damage, in Global Risks 2011, as published by World Economic Forum, this is measured in likely economic losses (expressed in quantitative parameters, i.e., US dollars)[10]. It is obvious that in case of disrupted supplies of key energy resources, the Baltic States would suffer not only financial losses caused by industry shutdowns or use of expensive alternative resources; there is also a likelihood of a threat to the political and social stability of the state. In this context, the extent of damage would also depend on the speed of damage manifestation (how much time, if any, is left to mitigate negative consequences), its duration, etc. In other words, assessment of the extent of potential damage (from the original state till complete destruction) requires invocation of other quantitative and qualitative criteria, each with an assigned numeric expression (as in most analogous studies by PRS Group, in this study risk components have different weights). Probability assessment is usually based on expert analysis, taking into account such criteria as intention of risk sources, cause-effect links, and precedents.

In this article, the category of risks of the highest intensity, i.e. intolerable risks, includes such risks where the total extent of damage and probability ranges between 68 and 100 points, tolerable risk ranges from 34 and 67 points and acceptable risk is deemed to refer to risks where the total extent of damage and probability does not exceed 33 points. Damage and probability of occurrence have been estimated on a scale from 0 to 50 points. Damage is considered low if the sum of estimates of its criteria is between 0 and 16 points; the sum of criteria estimates between 17 and 34 represents average damage and 35-50 points shows severe damage. The same method is applied to evaluate the probability of damage occurring: 0-16 points – low probability, 17-34 points – average probability, 35-50 points – high probability. Each of the criteria for evaluating the extent of damage or probability of its manifestation may acquire one of the three numeric expressions (low, average or severe/high). Thus, having assessed the importance of the criteria on the basis of expert survey, the risk characterisation criteria developed by the WBGU and discussed in the first section of the article may be extended to the Baltic States' energy sector and summarised as follows:

Table 1. Risk intensity assessment criteria and their weight

Criteria for assessment of the extent of damage		Criteria for assessment of probability of occurrence	
Duration of damage manifestation	– 11 points	Intentions of risk sources	– 17 points
Financial expression of damage	– 11 points		
Effects on social (in)stability	– 8 points	Precedents	– 17 points
Likelihood of dissemination to other sectors	– 8 points		
Latency of damage manifestation	– 5 points	Cause-effect links	– 11 points
Geographical spread of damage	– 5 points		
Specific risk criterion	- 2 points	Specific risk criterion	– 5 points

Source: Composed by the author following ESRC experts' advice

[10] World Economic Forum (2011). Global Risks 2011, Sixth Edition. An initiative of the Risk Response Network (available at http://riskreport.weforum.org/global-risks-2011.pdf).

4.2. Estimation of risk intensity

4.2.1. Imperfect energy infrastructure

With regard to imperfection of energy infrastructure, it is worth mentioning that natural phenomena are increasingly often conditioning disruptions in power supply in the Baltic States. For example, in February 2011 storm and hurricane winds disrupted power supplies for more than 45 thousand electricity consumers in Lithuania (in Klaipeda, Panevezys, Vilnius and Kaunas regions). In the same year, in July, a windstorm tore down high-tension power cables in the city and region of Siauliai, disrupting power supply to some 26 thousand consumers. So far, natural cataclysms of such a scale have happened just a few times a year in the Baltic States. But they are going to increase according to forecasts. Ensuing disruption in supplies is usually short-term (lasting for several hours or several days at a maximum), but the number of natural calamities caused by climate change and ensuing damage are forecast to increase. This means that disruptions in power supply may increase both in frequency and length. So far, natural calamities have caused damage almost exclusively to the power supply system with quite a small proportion of electricity consumers being exposed to negative consequences (usually not exceeding 1% of total consumers)[11]. However, natural calamities can pose a risk to newly built or planned infrastructure in future; power transmission lines will suffer increasing damage unless renovated. In Lithuania, insurers pay out 1-2 million euros a year for damage caused by natural calamities. This is not a big amount, but it is significant enough for loss-making state-owned power supply entities. Accordingly, damage to the energy sector posed by poor infrastructure and the probability of damage occurring could be estimated as follows:

Table 2. Assessment of energy risk intensity: case of poor infrastructure

Damage		Probability	
Duration of damage manifestation	– 3 points	Intentions of risk sources	– 5 points
Financial expression of damage	– 3 points		
Effects on social (in)stability	– 0 points	Precedents	– 5 points
Likelihood of dissemination to other sectors	– 2 points		
Latency of damage manifestation	– 5 points	Cause-effect links	– 3 points
Geographical spread of damage	– 1 point		
Future perspectives	– 1 point	Future tendencies	– 3 points
Total: 15 points – low damage		Total: 16 points – low probability	
Risk intensity: 31 point - acceptable			

Source: Composed by the author following ESRC experts' advice

4.2.2. Dependence on single supplier

Dependence on a single supplier and shortage of links with alternative suppliers constitutes a somewhat different risk – in this case we can also speak about the intentions of the predominant supplier, i.e., the human factor and the importance of the current political situation. As for the Baltic States, it should be noticed in this regard that physically there is no gas pipeline

[11] Natural disasters will cost more?, IQ.lt, 2011 02 09 (available at http://iq.lt/titulinis/gamtos-smugiai-atsieis-vis-brangiau/)

uniting them with Western or Northern Europe. In other words, Gazprom, for instance, enjoys a supply monopoly on the Baltic States' gas market. As a consequence, the supply of natural gas may be limited or stopped or its price may be lifted at any time without any real negotiations. These are not only theoretical assumptions: it is calculated that since 1991 Moscow has suspended the gas supply to Eastern European countries for political reasons 40 (!) times (Kolesinskas 2008). But it is true to say that disruptions, if any, in supply to consumers would be of a short-term nature due to the possibility of importing gas from Latvia. After Latvia refused to sell its oil transit company "Ventspils Nafta" to the Russian oil company Transneft in 2003, oil deliveries to the Latvian port of Ventspils were suspended. Between 1998 and 2000, Transneft cut off oil supplies no less than nine times in order to stop the Lithuanians from selling their port, pipeline and refinery to the American company Williams International (Hamilton 2008). In July 2006, deliveries of crude oil through the Druzhba pipeline to the "Mazeikiu Nafta" refinery were also stopped (and so far not renewed despite all Lithuanian efforts) after Russia failed to gain control over this energy infrastructure asset (Whist 2008). Assessment of precedents leads to the conclusion that quite a high probability exists of short-term (up to two weeks) supply disruptions, but these cause minor damage, if any. Supply disruptions resulting from an intended boycott of the Baltic States (or any of the transit countries) pose a considerably greater danger but they are less probable. The latter disruptions may last for up to several months and result in price increases not only for heating but for other products, too. The effect of this kind of disruption may be at least partially postponed by replacing traditional resources (or supply means, routes) with alternative or temporary ones. The likelihood of a boycott lasting for a period exceeding three months is extremely low – it may be caused only by a serious cooling in relations with Russia. On the other hand, this would lead to extremely severe damage, involving possible disruption in supplies of certain services and goods as well as threats to the social and political stability of the Baltic States.

As for price, due to the absence of a free gas market in the region and Gazprom's dominance on the management boards of national gas companies (importers and distributors), the Baltic States practically have no possibility to negotiate the price of natural gas with their single provider (the only possibility to influence the gas price for final consumers is an obligation for certain state institutions to set the margin of profit for gas import companies). Therefore, for instance in January 2010 the gas price in Lithuania was $US 310 for 1000 cubic meters, while Western consumers were purchasing natural gas on the so called 'spot' market for a mere $US 200 for 1000 cubic meters. At the end of 2010, Gazprom decided to reduce gas supply prices to Latvia and Estonia by 15% with effect from 2011, but to leave the 2010 price for gas supply to Lithuania. The Lithuanian side perceived this decision as a response to the country's decision to promptly and unconditionally implement the requirements of the EU's Third Energy Package[12].

The situation might change if planned additional energy infrastructure objects (LNG terminal, underground gas storage, interconnections, new NPP) are built and gas from alternative

[12] An interesting assessment on that issue is provided by the Lithuanian National Control Commission for Prices and Energy in its "Annual Report on Electricity and Natural Gas Markets of the Republic of Lithuania to the European Commission".

suppliers, unconventional gas, electricity from Central Asia, the South Caucasus, the Nordic countries, the US or Poland reaches the Baltic States. However, at least until 2014-2016 (by then the LNG terminal in Klaipeda and the electricity cable between Lithuania and Sweden will become operational) these dependency-related risks will remain[13]. Even after that period, due to complicated political relations, Moscow will hardly refuse to use its natural resources as a means of economic pressure, sanctioning, interference in the Baltic States' domestic affairs or forcing them to make foreign policy concessions (Mae 2009). The overall damage posed to the energy sector by dependence on a single supplier and shortage of links with alternative suppliers and the probability of damage occurring could be estimated as follows:

Table 3. Assessment of energy risk intensity: case of dependency on a single supplier

Damage		Probability	
Duration of damage manifestation	– 11 points	Intentions of risk sources	– 11 points
Financial expression of damage	– 7 points		
Effects on social (in)stability	– 5 points	Precedents	– 11 points
Likelihood of dissemination to other sectors	– 8 points		
Latency of damage manifestation	– 1 points	Cause-effect links	– 11 points
Geographical spread of damage	– 5 points		
Future perspectives	– 1 point	Future tendencies	– 1 point
Total: 38 points – severe damage		Total: 34 points – high probability	
Risk intensity: 72 points - intolerable			

Source: Composed by the author following ESRC experts' advice

4.2.3. Imperfect decision making process

Lack of transparency, lack of experience and lack of competence in the decision making process is often mentioned among the most important reasons why government fails to ensure implementation of projects contributing to the proper maintenance of functioning infrastructure, construction of new energy infrastructure installations, development of alternative resources or energy efficiency projects. The same reasons often condition competition with neighbouring countries for EU financial aid, over-intimacy with business groups supporting or promising their support during elections, etc. With regard to the transparency of decision making, we can mention the Transparency International 2010 Corruption Perceptions Index (2011), where Estonia is given a score of 6.5, Lithuania – 5 and Latvia – 4.3 (on a scale from 0 (highly corrupt) to 10 (very clean))14. These scores are not tragic, but only Estonia and Lithuania, for the first time, have been identified as capable of curtailing corruption. Maps of corruption constructed in Lithuania on a per-year basis demonstrate public procurement to

[13] It is worth noting that the Baltic States are required to create gas supply alternatives according to Regulation No 994/2010 of the European Parliament and of the Council of 20 October 2010, which provides that the Competent Authority of a Member State shall ensure that the necessary measures are taken so that by 3 December 2014 at the latest, in the event of a disruption of the single largest gas infrastructure, the capacity of the remaining infrastructure is able to satisfy total gas demand during a day of exceptionally high gas demand.

[14] Transparency International (2010) Corruption Perceptions Index 2010: Sources of information. Transparency International. (Report). Retrieved 24 Aug 2011.

be one of the domains with the highest corruption. Corruption in the energy sector is below levels in health care or systems of the interior, but non-transparent lobbyism in law drafting (e.g., regarding development of renewable energy resources (RER)), shady decisions made in respect of privatisation of energy infrastructure installations, funding of closure-related operations in the Ignalina NPP, building of new dependency-increasing cogeneration plants, winning continuous heating price increases by national regulators, pursuing shady staff policy in state-owned energy companies, etc. show a lack of transparency in this area too.

A shortage of competencies and skilled professionals constitutes an even bigger problem in taking decisions with long-term effects on state energy security than insufficient transparency. The Baltic States have no strategy for training energy professionals, and universities thus train very few of them. The latter do not take leading positions in critical situations; instead, individuals supported by different stakeholder groups, political parties or business structures are appointed to these posts.

Recommendations and foresights of energy professionals, scientists, researchers and analysts are usually "recalled" only if they are in conformity with decisions actually taken by politicians or business groups. In other words, the Baltic States still often apply a practice, which is difficult to understand for Western Europe, when not a single representative of a think tank, academic or research institution, able to assess threats/risks to energy security formulated by politicians and solutions offered by them from the expert point of view, is included in task forces drafting national energy security strategies and other documents with long-term effects.

Table 4. Assessment of energy risk intensity: case of imperfect decision making

Damage		Probability	
Duration of damage manifestation	– 11 points	Intentions of risk sources	– 11 points
Financial expression of damage	– 11 points		
Effects on social (in)stability	– 2 points	Precedents	– 11 points
Likelihood of dissemination to other sectors	– 5 points		
Latency of damage manifestation	– 1 point	Cause-effect links	– 11 points
Geographical spread of damage	– 5 points		
Future perspectives	– 1 point	Future tendencies	– 3 points
Total: 36 points – severe damage		Total: 36 points – high probability	
Risk intensity: 72 points - intolerable			

Source: Composed by the author following ESRC experts' advice

Scientifically unsubstantiated and unreasonable decisions, which mainly depend on the prevailing political situation, surprise and give grounds for reasonable dissatisfaction of energy experts. At the same time, citizens suffer losses from possibly corrupt relations between decision makers and entities interested in such decisions: this leads to a situation when people can not pay for objective reasons or avoid paying for their energy bills. In turn, this harms energy company themselves (first of all, heat and power suppliers) and increases mistrust in the authorities. In lack of expertise and society's mistrust in the competence of the authorities to manage crises and threats, the situation is made use of by entities seeking commercial

interests and enjoying the best access to decision makers (for example, campaigning for the lowest possible final energy price to consumers in the short term, without taking into account long-term effects, etc.). The overall damage posed to the energy sector by lack of transparency, experience and competence in decision-making and the probability of damage occurring could be estimated as follows:

4.2.4. Problem of vertical integration of energy companies

In the Baltic States, few energy companies enjoy exclusive rights to import resources, control the distribution networks (electricity grids, gas pipeline system) and supply consumers with electricity, natural gas or oil products. For instance, in the gas sector Gazprom is a shareholder in one of the biggest gas distribution operators, Lietuvos Dujos: in 2010, Gazprom controlled 37.1% of the shares of Lietuvos Dujos while its partner in Europe - E.ON Ruhrgas International – owned 38.9% of the shares. Two out of five board members of Lietuvos Dujos were representatives of Gazprom (including the chairman of the board) and two more were representatives of E.ON Ruhrgas International. This means that Lietuvos Dujos (along with other smaller companies) is a company importing the biggest quantity of gas from Gazprom and holding control over the entire Lithuanian gas infrastructure[15]. In each Baltic State one national company exercises monopoly control over power transmission networks and the largest power generation capacities. Such a situation in the natural gas and energy sectors is called vertical integration of energy companies[16].

Negative consequences of vertical integration of energy companies could be prevented or considerably mitigated if the shares in these companies are controlled by the Governments of the Baltic States, local or Western companies. Unfortunately, Gazprom is a company from a country that is difficult to predict but with clear political and geopolitical interests in the region. On the other hand, negative effects of vertical integration of such a type should be mitigated by the EU decision to exert stricter regulation over monopolistic companies maintaining power transmission networks (cross-border high-voltage lines, high-pressure pipelines) and large natural gas transportation pipelines. Looking to the future, an obligation is foreseen for EU Member States to segregate the management of transmission networks from companies managing energy sales, generation and supply, so that a network operator would not impede use of networks by other power sellers, generators or suppliers. In other words, if the Third Energy Package (TEP) is implemented, risks relating to vertical integration of energy companies should be eliminated.

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[15] The situation in Latvia and Estonia is similar: in Latvia, Gazprom owns 34% of shares in the single gas importer and distributor Latvijas Gaze (E.ON Ruhrgas International owns 47%). In Estonia, Gazprom owns 34% of shares in the main gas importer and distributor Eesti Gaze (E.ON Ruhrgas International owns 33%).

[16] The Lithuanian legal basis is unfavourable for the import of oil products from third countries (i.e. not from PKN Orlen's refinery operating in Mazeikiai). Oil for export and re-export is mostly imported to the Baltic States from Russia. However, problems in trading oil products are in many cases caused by cartel agreements.

In this context problems first appear due to Russia's (and, first of all, its Prime Minister Putin's) attitude towards TEP implementation as "confiscation of property"17. Clearly, Moscow will try to make use of crises in conventional regions of supplies to Europe (North Africa, the Middle East) in order to avoid transfer of part of the market to competitors (Averre, 2010). Russia increases pressure by negotiating the conditions of supplies and TEP implementation with individual EU member states, threatening diversification of export markets and cooperation partners (Bozhilova/Hashimoto, 2010). It is alleged that forced vertical unbundling of gas companies can make it impossible to supply natural gas in the quantities foreseen in long-term contracts due to likely differences in the provisions (regarding quantities and time limits) of import contracts and contracts for use of gas pipelines (transit contracts, which may expire without being renewed, etc.). Therefore, today it is too early to say that risks relating to vertical integration of energy companies will pose no threat to Baltic States' energy security several years later. Accordingly, the relevant damage and probability of occurrence can be estimated as follows:

Table 5. Assessment of energy risk intensity: case of vertical integration of energy companies

Damage		Probability	
Duration of damage manifestation	– 7 points	Intentions of risk sources	– 11 points
Financial expression of damage	– 7 points		
Effects on social (in)stability	– 2 points	Precedents	– 11 points
Likelihood of dissemination to other sectors	– 2 points		
Latency of damage manifestation	– 1 point	Cause-effect links	– 11 points
Geographical spread of damage	– 3 points		
Future perspectives	– 1 point	Future tendencies	– 1 point
Total: 23 points – average damage		Total: 34 points – high probability	
Risk intensity: 57 points - tolerable			

Source: Composed by the author following ESRC experts' advice

4.2.5. Low consumption of renewables and high energy intensity

The next risk whose importance should be carefully examined is high energy intensity. On the one hand, since 1995, the Baltic States have reached nearly a double improvement in energy intensity indicators. However, they are still among EU outsiders in this area. Moreover that progress has been achieved not as much as a result of application of the newest energy-efficient technologies, but rather as a result of the bankruptcy of some industries. Energy efficiency in buildings, the transport sector and district heating systems remains extremely low. This stems from use of out-dated Soviet technologies, insufficient investment and a weak savings culture.

The biggest challenges towards improving the Baltic States' energy efficiency are related to lack of knowledge and experience in common property management, low incomes and the fear of taking out loans. The inability of residents to agree and make common decisions, lack

[17] Speaking at a news Conference in Brussels on 23 February 2011, Russian prime minister V. Putin expressed himself very clearly: "We are talking in practice about the confiscation of property. The third energy package, it is quite clear, will harm the activities of our energy companies."

of trust in and knowledge of the realisation of successful projects and unattractive financing conditions for energy efficiency investment also play a significant role in this regard (Janeliunas 2009).

Another problem which the Baltic States are facing in regard to insufficient application of energy innovations concerns the low increase of renewables in their energy consumption balance. As mentioned, officially it is expected that by 2020 the share of renewable energy resources to final energy consumption will be 23% in Lithuania, 25% in Estonia and 42% in Latvia (Europe's energy portal 2009). However, in 2011 the Baltic States were behind the planned schedule for reaching these goals. The main reasons for this are lack of stable financial support systems, little technological experience and an unsettled legal base (Piebalgs 2007). In other words, a further increase in renewable resource consumption requires further research and high up-front investment. However, even economically viable projects face administrative hurdles, as those to be involved with planning, developing, operating or promoting renewable energy projects lack the required levels of education and training.

Table 6. Assessment of energy risk intensity: case of lukewarm attitude towards latest energy innovations

Damage		Probability	
Duration of damage manifestation	– 7 points	Intentions of risk sources	– 5 points
Financial expression of damage	– 3 points		
Effects on social (in)stability	– 2 points	Precedents	– 5 points
Likelihood of dissemination to other sectors	– 2 points		
Latency of damage manifestation	– 1 point	Cause-effect links	– 11 points
Geographical spread of damage	– 3 points		
Future perspectives	– 1 point	Future tendencies	– 1 point
Total: 18 points – average damage		Total: 22 points – average probability	
Risk intensity: 40 points - tolerable			

Source: Composed by the author following ESRC experts' advice

As a matter of fact, re-orientation towards RER and energy-efficient technologies is an expensive process. In the short term, this may determine increased costs for industry, households and heating rather than a decrease in these costs. However, some municipalities in the Baltic States have nonetheless switched over to use of alternative fuels for boilers, when almost the total energy required is generated from RER. It could be forecast that EU requirements, financial and political support, growing prices for conventional resources as well as global developments towards energy saving and RER development will also have a positive influence on the culture of energy consumption in the Baltic States and cause their governments to adopt more legislation encouraging energy saving and RER development. Purchase of RER-produced energy at a fixed rate, a system of additional payments and quotas, investment grants, tax privileges and other financial initiatives – all these instruments are foreseen in the Baltic States' plans aimed at promoting innovative attitudes towards energy consumption. In this context, the damage posed by low application of the latest technologies in the area of energy saving and use of renewable energy resources, as well as the probability of damage occurring, can be estimated as follows:

4.2.6. National minorities as a tool to challenge regional energy security

In the Baltic States, the Polish and Russian national minorities[18] have their representatives in local municipal councils (in some municipalities, members of the parties representing the interests of national minorities have even been elected mayor), parliaments and the European Parliament. About 20 periodicals are published in Polish (more than 15 newspapers and 3 magazines) and 120 Polish schools, kindergartens and higher schools are functioning in Lithuania. An absolute majority of Poles are citizens of the Republic of Lithuania (Skaistys, 2011)[19]. The Russian national minority enjoys similar safeguards of their rights in all three Baltic States (except for certain derogations in respect of the somewhat more complicated issue of citizenship in Latvia and Estonia). Nonetheless, the Lithuanian Poles' Electoral Action, which formally protects the rights of the Polish national minority, and the Russian Alliance, which represents the interests of Russians in Lithuania, the same as pro-Russian parties and formations in Latvia (For Human Rights in a United Latvia, Harmony Centre) and Estonia (Team Russia, Estonian United Left Party) keep expressing their criticism of national governments. What may have even worse consequences is their practice of initiating proceedings against the three Baltic States on a European level and collaborating with radical politicians, parties and formations in Poland and Russia.

With energy control retained in the region and in pursuit of regaining political control over the region, Russia's ideologists have openly expressed that the main objective of Moscow in the short term is first to stage an incident between Lithuania and Poland and then making use of the discord. Probably the easiest way to do so is to escalate allegedly pending issues of bilateral relationship. This goal is sought through artificial stimulation of the problem about use of Polish-language forms of personal names in Lithuanian documents, provoking disputes over the occupation of Vilnius during the interwar period, bluffing over allegedly unresolved issues of granting citizenship to Russian-speaking residents, etc. The fact of Moscow's actively playing the card of national minorities in order to strengthen its influence in the region (Conley/Gerber, 2010) should not be doubted having in mind events in Georgia (the intervention in 2008 was allegedly justified by efforts to protect Russians living in Abkhazia and South Ossetia) and Estonia (provocation of an ethnic conflict in 2008 about the Bronze Soldier statue was not without Russia's support). Even more alarming in this context are open mentions by LLRA representatives, who repeatedly extend these "problems" to international space, that they coordinate their activities with the Embassy of the Russian Federation in Vilnius and nonetheless receive support from Poland's politicians too.

It's hardly probable that these national minorities' political movements supported by metropolitan countries could provoke armed conflict in NATO countries. Yet, playing the card of

[18] The Lithuanian population includes about 7% of Poles and about 6% of Russians (in Vilnius, the Polish population accounts for 19% and the Russian population for 15%; in Klaipeda, 28% of residents identify themselves as ethnic Russians). In Estonia, Russians account for 23% (37% in Tallinn) of the local population; in Latvia, this number totals 28% (local Russians account for nearly a half of the population in Riga and 56% in Daugavpils).

[19] A. Skaistys. Poles in Lithuania – privileged national minority. 2011 03 02, alkas.lt (available at http://alkas.lt/2011/03/02/a-skaistys-lenkai-lietuvoje-%E2%80%93-privilegijuotoji-tautine-mazuma/)

national minorities makes it very convenient to impede implementation of joint Baltic-Polish energy projects (such as gas and power interconnections, new nuclear power plant), to justify delays in repairing the Druzhba oil pipeline which is a corridor to the only oil refinery in the Baltic States, etc. If non-fulfilment of alleged requirements and discrimination against national minorities result in disruption of energy supplies and abandonment of other cooperation projects in the energy sector, the damage sustained would be quite severe and long lasting, as the conditions raised by the Baltic States for fulfilment of these requirements are unacceptable to Russia and Poland (for example, a requirement to ensure the same conditions for citizens of the Baltic States in Russia and Poland, respectively). Russian (and Polish as well) elites continue to use the status of the Russian and Polish speaking minorities as a justification for their approach toward other foreign policy issues, including energy policy (Schulze, 2010), thus creating a situation where further rises in energy prices, unilateral decisions to cancel participation in common projects, or selling energy infrastructure objects to companies of shady repute may again and again be justified by the worsening situation of national minority rights in the Baltic States. Thus, risks relating to these aspects can be summarised as follows:

Table 7. Assessment of energy risk intensity: case of misused national minorities

Damage		Probability	
Duration of damage manifestation	– 7 points	Intentions of risk sources	– 11 points
Financial expression of damage	– 7 points		
Effects on social (in)stability	– 5 points	Precedents	– 5 points
Likelihood of dissemination to other sectors	– 5 points		
Latency of damage manifestation	– 1 points	Cause-effect links	– 3 points
Geographical spread of damage	– 3 points		
Future perspectives	– 1 point	Future tendencies	– 1 point
Total: 29 points – average damage		Total: 20 points – average probability	
Risk intensity: 49 points - tolerable			

Source: Composed by the author following ESRC experts' advice

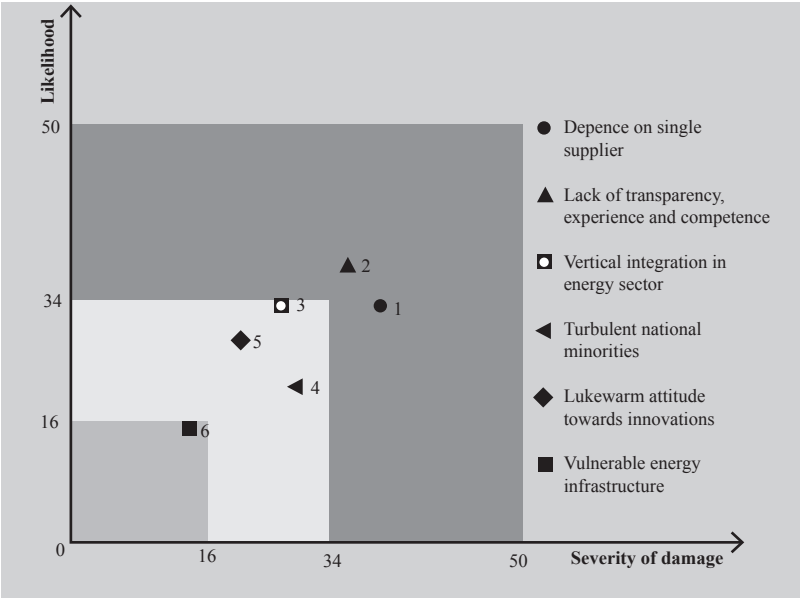
5. Conclusions

In order to assess the intensity (importance) of the most relevant risks to the Baltic States' energy security, methodological instruments of the IRGC and some other competent authorities have been used in this research. According to the energy experts' survey, the intensity of risks to Baltic States' energy security can be established on the basis of seven damage assessment criteria (duration of manifestation, financial expression, effects on social (in)stability, likelihood of dissemination to other sectors, latency of manifestation, geographical spread and future perspectives) and four probability of occurrence criteria (intention of risk sources, precedents, cause-effect links and future trends). The map of risks demonstrates that the Baltic States should focus their attention on neutralising two risks with intolerable intensity. In other words, increase of investment in diversification of energy resource supply plus improvements in the quality (transparency, competence and knowledge of decision makers) of long-term decisions in the energy sector should become the energy security priorities in the Baltic States. Damage potentially sustained due to these risks is not yet critical (not close

to 50 points), but this damage plus the probability of a considerable increase in energy prices, disruption or loss of energy supplies as a result of these two factors are already alarming.

Assessment of the intensity of key risks to Baltic States' energy security (see tables 2-7) serves for construction of a risk map that would graphically reflect acceptable, tolerable and intolerable risks. In a risk diagram prepared using the traffic light model the intensity of each analysed risk to the Baltic States' energy security might be presented as follows:

Figure 2: Intensity of risks to the Baltic States' energy security



Source: Composed by the author following ESRC experts' advice

As may be seen from the risk map, vertical integration of energy companies also poses a considerable probability of an increase in resource prices or use of supplies as a blackmail tool. It is true to say that the governments of the Baltic States are still in the position of exerting a certain influence, at least formal, on the energy companies (e.g. through application of legal instruments) and damage should not last long. Yet, implementation of the EU TEP is of no less importance than diversification of supplies, i.e. acceleration of integration to a single EU electricity and gas market, unbundling activities of importers and distributors of resources and companies controlling infrastructure are of no less importance. Likewise, it becomes ever more obvious today that the Baltic States could soon face one more factor implying occurrence of damage to their energy security by not taking the activities of political movements instigating national discord in all seriousness and by leaving unresolved realistic problems of national minorities that are sometimes in fact vulnerable, and by not investing in use of RER and efficiency-promoting innovations. Issues of updating the existing energy infrastructure will undoubtedly become important if not now, then in 10-15 years.

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