BALTIC PLUG INTO EUROPEAN ELECTRICITY NETWORK: PERSPECTIVES OF SUCCESS

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Abstract
Implementation of strategic energy projects, such as LNG terminal in Klaipeda, interstate natural gas and electricity interconnections, have terminated infrastructural isolation of the Baltic States and integrated them into a wider European energy market. Despite the aforementioned achievements, the Baltic States stand out as the only EU members, whose electricity systems are synchronised with the Integrated Power System/Unified Power System (IPS/UPS) of the CIS, de-facto maintained by Russia. As the systemic integration into the post-Soviet systems is considered to be a strategic vulnerability, the Baltic States decided to desynchronise from CIS’ power system and synchronise its electricity system with Europe. This became the most challenging strategic project given its length, complicated negotiation process and substantial costs. This article aims to introduce the scope of the synchronisation project and the challenges that Baltic States face. At the end, it is emphasised that synchronization with ECN is the most feasible option among others, but there are three main factors that prevent further progress. These are limited success convincing Poland, endless internal discussion regarding technical aspects and Russian opposition.

Keywords: Baltic States, Baltic Sea Region, European Union, Synchronization, IPS/UPS, ECN

Introduction
At the end of 2014 a new LNG terminal in Lithuania (Klaipeda) has been opened; in 2015 new power links from the Baltic States to Poland and Sweden were inaugurated, and gas interconnection between Lithuania and Latvia has been upgraded in 2016. These are real ‘game changers’ for energy pricing and security of supply purposes as they shifted the countries' understanding from energy as a permanent security challenge
to an energy as business opportunity.\textsuperscript{1} In other words, the completed infrastructure allowed the Baltic States to focus on the next tasks in the area of energy security, such as creation of regional electricity and gas markets, empowerment of the consumer, LNG bunkering and profiting on the related know-how.

Energy efficiency and mobilisation of the international community against the unsafe nuclear power plant in Ostravets are the challenges to overcome, but some results are already achieved even here. For instance, in Lithuania, electricity production from renewables exceeds production from fossil fuel, the state enterprises “Klaipedos nafta” and “Lietuvos energija” export not only natural gas, but also the “know how” of the LNG terminal construction and maintenance. Notable change from the times, then in 2014 Lithuania payed the highest price for natural gas in Europe and was constantly worried about a potential shortage of supply.

However, despite this bright picture, one strategic issue in the Baltic States remains unsolved. Despite membership in the EU, the region’s electricity system still operates synchronously with the Integrated Power System/Unified Power System (IPS/UPS), which is coordinated by the Electric Power Council of the Commonwealth of Independent States, having its seat in Moscow. In other words, the three Baltic States may buy and sell electricity in Nordic countries or Poland, but the daily management of their electricity systems is dependent from Moscow’s centralised control over frequency.\textsuperscript{2} Furthermore, provisions in the BRELL Agreement put the Baltic Transmission System Operators (TSO’s) under an obligation to coordinate the development of national electricity networks they are responsible for with Belarusian and Russian authorities.\textsuperscript{3} Dramatically worsening relations with Russia increase the Baltic States’ worries that such dependency may result in supply disruption well beyond technological reasons.

The Baltic States have attempted to lift the Soviet legacy since 2007, when their Prime Ministers declared changing the synchronous area, i.e. de-synchronising from IPS/UPS and synchronising with European


\textsuperscript{3} BRELL Agreement is signed by the transmission system operators (TSOs) of Belarus, Russia, Lithuania, Latvia and Estonia in 2001. Please see: http://www.so-ups.ru/index.php?id=brell
Continental Network (ECN), as a mutual strategic priority. They have made some progress in this regard: removed infrastructural isolation from the EU member states and obtained acknowledgment from the European Commission, as well as most countries in the Baltic Sea Region (including Germany, Sweden, Finland and Poland) that synchronisation contributes to achieving a functional internal energy market of the EU. The generic aim of synchronisation was included in the list of EU Projects of Common Interests (PCIs) and recognised as a feasible project from both the technical and legal point of view. However, since then Moscow has successfully prevented de-synchronisation of the Baltic States’ electricity systems. As a certain deadlock is reached, new tactical initiatives may lead to a split of unity and implementation of a national instead of regional strategy. As a consequence, a mismanaged synchronisation project could strengthen Russian influence in the region and negatively impact on its security. The prolonged uncertainty is playing on the hand of this most unfavourable scenario.

Given the relevance of the topic and limited academic attention towards it, this article aims to introduce the scope of the synchronisation project and the main challenges for the Baltic States while implementing it. In doing so, the concept of synchronous areas is introduced first of all. The article continues by comparing features of the Russian IPS/UPS with major synchronous areas in the EU. It is concluded by introducing the synchronisation project and the range of dilemmas that the Baltic States face. The research is based on an analysis of official documents and statements by important decision makers, with an emphasis on Russian and Baltic ones. The article has also overviewed major studies on the synchronization project that currently constitute approximately 3000 pages.

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7 Gothia Power. Feasibility study on the interconnection variants for the integration of the Baltic States to the EU internal electricity market. 2013.
Synchronous areas in Europe

In its widest sense, a synchronised electricity area is a technological and regulatory bond linking countries or regions within countries. Various synchronised electricity systems distinguish themselves by specific technical parameters, such as installed generation capacity, fuel mix, peak load, number of consumers (people) and interconnected countries, size of the territory, etc. and it differs in ways of doing things, i.e. management of the system. Integrated Power System/Unified Power System, ECN and Nordic regional network are the largest synchronous areas within the geographical boundaries of Europe. This section will briefly overview their basic characteristics.

Concept of synchronous interstate electricity systems

As was already mentioned above, synchronous areas can differ in a number of ways. For example, they can integrate either territories within countries, such as Texas Interconnection in U.S. and National Electricity Market in Australia, or electricity grids of multiple countries, like ECN, IPS/UPS and Nordic synchronous area. If few national electricity networks are interconnected, but not synchronised with each other, they can exchange electricity for purely commercial or additional purposes. However, in case of major disturbances in one country, the others might not be legally obliged or reluctant to provide assistance as such disturbance will not impact their national system in a way it would influence it if the systems were synchronised together. A map of the synchronous systems in Europe is provided in Figure 1 below.

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Looking from a technological standpoint, synchronisation means that:

1. *all parts of the electricity system* (generators, transmission and distribution networks, etc. located in different countries) *operate as a single unit by maintaining the same system frequency* (50 Hz or 60 Hz). This is a complicated technological process as the synchronous electricity system that might link millions of private and industrial consumers with different demand for electricity and must ensure continuous balance between electricity consumption and generation.⁹

2. *disturbances in one part of the synchronous area*, for example, malfunction of a certain generator, *are felt throughout the system and has to be compensated by launching reserve capacities elsewhere*. Vice versa,

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improvements in one area, such as enhancement of transmission capacity by constructing a new interconnector linking bottlenecked regions, strengthens the interconnectivity of the system as a whole. Due to the nature of such interdependence, when well-being of one part impacts the others, a publication by United Nations Department of Economics and Social Affairs described a synchronised electricity system as a “technical marriage”\textsuperscript{10}; and

3. **members of interstate synchronous electricity systems create mutually beneficial exchanges between national electricity systems**\textsuperscript{11}. In other words, countries with limited generation capacity are enabled to choose between developing it or investing in electricity interconnections that would allow them to buy the electricity from other countries (neighbouring or not neighbouring ones) having excess generation. A similar principle can be applied in the development of renewable energy: one country, having good potential to produce renewable energy, can invest into renewable generation, while the other can invest into certain types of generation that can help to balance the renewable one.

Effectively synchronised electricity system benefits end consumers as interconnectivity of the system helps to equalise the electricity prices within different electricity systems.\textsuperscript{12} Therefore, an interstate synchronous electricity system helps to optimise the investments into the energy sector by creating beneficial synergies\textsuperscript{13}. But in order to manage technical interdependence of an interstate synchronised area, interconnected countries must:

1. **agree on common technical parameters**. For example, they need to decide how much frequency containment reserves\textsuperscript{14} each country must contribute to the synchronous area. They might also agree to coordinate the development of national electricity systems and


\textsuperscript{14} According to ENTSO-E glossary, frequency containment reserves are reserves launched automatically in order to maintain continuous balance between electricity generation and consumption.
maintenance schedule of certain infrastructure that is important to the system as a whole, to exchange sensitive information, etc.;

2. establish managerial principles by creating new institutions or delegating additional authority to transmission system operators; and

3. agree upon the ways of settling disputes. The general principle of legal agreement outlining the principles of interstate synchronous electricity system is that it takes away a part of national autonomy to manage the electricity sector as it becomes an integral part of a synchronised electricity network that needs commonly applicable rules.\textsuperscript{15}

Loss of national autonomy in exchange for greater security by technical integration of the electricity networks and commonly applicable rules for the members of synchronous area is what separates an interstate synchronous electricity system from national electricity networks interconnected with asynchronous power cables. As a consequence, interstate synchronous electricity systems increase the reliability and security of supply of the national electricity grids. The following sections will briefly outline the basic features of largest synchronous areas in Europe.

**Key features of the IPS/UPS synchronous area**

The origins of IPS/UPS lay in the MIR\textsuperscript{16} synchronous area that used to link former Soviet territories and Warsaw Pact members.\textsuperscript{17} MIR was established in 1962, when the Cold War was at its peak, and it ceased to exist after the collapse of Soviet Union.\textsuperscript{18} In order to fill the emerged regulatory vacuum, the newly formed Commonwealth of Independent States agreed\textsuperscript{19} on the establishment of IPS/UPS.\textsuperscript{20} As geopolitical realities changed, the IPS/UPS synchronous area gradually lost all ex-members of the Warsaw Pact. In the 1990s, Poland, Hungary, Czech Republic and Slovakia left the system to


\textsuperscript{16} English translation – peace.


\textsuperscript{20} Agreement concerning the coordination of the interstate activities in the field of electric power industry of the Commonwealth of Independent States 14 February 1992.
join ECN (UCTE at that time), while Romania and Bulgaria did the same in 2004. Even though the electricity systems of the Baltic States *de facto* operated synchronously with IPS/UPS system, the regulatory framework was established only in 2001 after the signing the BRELL Agreement.21

As of 2017, IPS/UPS is composed of 14 national electricity systems operating in synchronous mode. These are systems of Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan and Uzbekistan, Ukraine, Georgia and Mongolia, and also Lithuania, Latvia and Estonia. Even if it loses the three Baltic States to ECN, IPS/UPS remains the most geographically extended synchronous area that spans over eight time zones. It has 335 GW of installed generation capacity and annually supplies approximately 1200 TWh to 280 million consumers.22 Looking from a technological perspective, IPS/UPS is a vertically integrated synchronous area as Russia is responsible for maintaining the frequency for the whole system. The electricity systems of the Baltic States are tightly interconnected and integrated into the BRELL (Belarus, Russia, Estonia, Latvia, and Lithuania), that operates synchronously with the UPS/IPS zone23. Participation in this system contains several serious deficiencies for the Baltic States:

1. **Strategic paradox**: Russia is responsible for managing the frequency for IPS/UPS, it is a key player in drafting common technical standards for the entire synchronous area. There is little doubt, that vertical integration where Moscow is a power centre creates political and strategic vulnerabilities; and

2. **Technical vulnerabilities**. As it is highlighted by a number of scholars, Russia manages the system with limited success24:
   a. **Condition of the electricity grids in Russia and Belarus is unknown**. As it was stressed by the head of the Lithuanian transmission system operator (“Litgrid”), “there is no trusted, reliable information neither about the condition of the electricity grids in Russia and Belarus, nor about the future development

21 It is interesting to note that neither BRELL Agreement is intergovernmental nor it is signed between the Baltic States and Electrical Power Council of Commonwealth of Independent States. It is an agreement between Baltic TSOs and their Russian and Belarusian counterparts.


plans of those grids. Some major accidents in the past, convey the signs of a lack of security of the system, and obvious failures in maintenance; and

b. centralised control over frequency is not backed up by a strong regulatory framework. The governance within IPS/UPS is not legally binding, it lacks effective dispute settlement process and it is divided between two institutions corresponding to the lines of geopolitical alignment (CIS’ Electric Power Council and BRELL Committee).

Thus, the EU and NATO member states’ electricity systems are dependent, influenced and regulated by Russia which lacks a clear plan of modernisation of UPS/IPS system. Lack of regulatory control represents another alarming signal to the Baltic countries. In addition to that, interconnections built by the EU are being utilised by third countries (Russia and Belarus). Knowing all this it becomes clear, why the three Baltic States share a common position that their electricity systems must operate synchronously with European, but not the UPS/IPS system.

Decentralised systems of ECN and Nordel

The two largest synchronous areas in the EU emerged in a similar period as the IPS/UPS. Union for Coordination of Production and Transmission of Electricity (UCPTE), a predecessor of ECN, was established by Germany, France, Italy, Switzerland, Austria and Benelux countries in 1951 and began synchronous operation seven years later. Similarly, the Nordic synchronous area was established in 1963 and is composed of Norway, Sweden, Finland and a few Danish territories. Contrary to the Nordic synchronous area, ECN enlarged considerably. What started to be a synchronous area linking eight countries, evolved to a system composed of 24 national electricity grids. The first major enlargement occurred in 1987, when Greece, Spain, Portugal and the former Yugoslavia joined the synchronous area. The following two enlargements were largely driven by the collapse of Soviet Union and dissolution of the Warsaw Pact. In 1995, the system was enlarged by the Visegrad Four, in 2004 – by Romania and Bulgaria.

The process of enlargement is well reflected in Figure 2:

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26 Only eastern Danish territory operate synchronously in the Nordic system, the other parts of Denmark operate synchronously with ECN.

As the IPS/UPS is the largest synchronous area in terms of its territory’s size, ECN interconnects the largest number of countries and supplies electricity to the most people. It has an installed capacity of 631 GW and supplies electricity (approximately 2500 TWh annually) to 450 million consumers located in 24 countries.\textsuperscript{28} In comparison with ECN and IPS/UPS, the Nordic synchronous area is a rather small synchronous area. It has 90 GW of installed capacity and annually supplies approximately 400 TWh

\textsuperscript{28} UCTE. Feasibility Study: Synchronous Interconnection of the IPS/UPS with the UCTE. UCTE. Brussels. 2008.
for 25 million people. Prior to introducing Third Energy Package in 2009, each synchronous area operating within EU had a separate organisation for managing it. ECN was coordinated by UCTE (Union for the Coordination of Transmission of Electricity), while Nordic synchronous area was governed by Nordel (Organization of Nordic Transmission System Operators). The functions of the aforementioned organisation were transferred to ENTSOE (European Network of Transmission System Operators for Electricity). Despite regulatory integration, ECN and Nordic region remain separate synchronous areas in technological terms as they do not work in synchronism with each other.

The key positive differences of ECN or Nordic synchronous areas from IPS/UPS could be summed as following:

1. **Decentralization of the system.** Each TSO operating in the ECN or Nordic synchronous area is responsible for frequency management in its area of control and is obliged to contribute frequency containment reserves for the entire network. Hence, coordination between TSOs, especially between the ones located in close proximity with each other, is crucial in order to prevent or mitigate the consequences of disturbances.

2. **Each TSO has clear obligations.** The Operational Handbook is the main reference document underlying obligations for TSOs, such as frequency control, scheduling and accounting, operational security, emergency procedures, etc. and principles of cooperation among them. For example, when, how and which data TSOs must exchange, how they need to plan and coordinate their operations, etc. Hence, TSOs are important players in keeping the system stable and they act on the basis of provisions in the Operational Handbook; and

3. **Regulatory, arbitration and planning tools are present and effective.** In order to prevent defection from Operational Handbook, certain institutions and regulatory tools are established within the EU:
   a. **ENTSO-E** has a pan-European perspective as it unifies 41 TSOs across 34 European counties and oversees the developments in

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31 Even though the quantity of FCRs each country must share differs considerably in ECN and Nordic synchronous area, the principle is the same.


synchronous areas within the limits of EU’s *acquis communautaire*. Among other duties, for example, ensuring technical cooperation between TSOs, coordinating network development plans and research activities. ENTSO-E’s main task is to draft *network codes* (common rules applicable for TSOs) and other policy proposals.\(^{34}\)

Once network codes are confirmed, they become legally binding regulations\(^{35}\). 

b. TSOs operating within EU’s synchronous areas are signatories of the *Multilateral Agreement* that “introduces a binding contractual relation between all ENTSO-E TSOs.”\(^{36}\) Multilateral Agreement outlines the principles of dispute settlement process in case of disagreements among TSOs and procedures for monitoring their compliance to commonly agreed rules. In case of failure to reach an agreement, TSOs can ask for guidance from ENTSO-E’s System Operations Committee.

c. If TSOs disagree with the guidance, they can settle the dispute by *arbitration in accordance with Rules of Arbitration of the International Chamber of Commerce.*\(^{37}\) The purpose of the process is to ensure that TSOs comply to common rules by determining non-compliance and providing TSOs with steps it needs to take in order to achieve compliance.\(^{38}\) In sum, Multilateral Agreements not only delegates central authority to ENTSO-E, but also it empowers TSOs to raise questions regarding the compliance of their counterparts; and

d. *Ten Year Network Development Plan (TYNDP)* is a biannual document serving as a platform for information exchange among TSOs and an instrument of declaring their intentions. TYNDP provides information about important infrastructure projects in the electricity sector within the reach of ENTSO-E by outlining their location, rationale, costs, impact, and status.

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\(^{35}\) For a quick overview regarding legally binding network codes and current proposals, please see: https://www.entsoe.eu/major-projects/network-code-development/updates-milestones/Pages/default.aspx and https://www.entsoe.eu/major-projects/network-code-development/Pages/default.aspx


\(^{37}\) Multilateral Agreement on Participation in Regional Security Coordination Initiatives.

date of commissioning and other relevant data. Such a platform promotes transparency not only among TSOs, but also between ENTSO-E’s member countries. By having official and credible briefings on the long-term developments of electricity network in the region, TSOs are empowered to plan the development of national electricity grids more effectively, while member states are better informed in making policy choices.\(^{39}\)

In sum, there is a glaring discrepancy between ENTSO-E’s synchronous areas and IPS/UPS. Centralised frequency control and weak regulatory framework are the features of CIS’ system,\(^{40}\) while decentralised frequency management and strong legal framework are the attributes of the EU’s networks. ENTSO-E drafts policy proposals on common rules in the synchronous area (Network Codes) and from the moment they are approved by the EU’s member states, the rules become legally binding, while Electric Power Council of Commonwealth of Independent States issues only recommendations. Multilateral Agreement establishes contractual relations between ENTSO-E TSOs and authorises System Operation Committee to supervise their compliance with Operational Handbook. Moreover, it establishes procedures for dispute settlement, while IPS/UPS lacks such instruments. Finally, TYNDP contains credible and official information, thus serving as a platform for information exchange and as a tool for promoting transparency. Yet again, IPS/UPS does not have such equivalent.

**The scope and costs of the synchronisation project**

The main objective of the synchronisation project is to desynchronise Baltic electricity systems from the Russian controlled IPS/UPS network and to synchronise them with electricity grids regulated by the European Union. Lithuania, Latvia and Estonia are in agreement regarding the need to desynchronise from IPS/UPS, but discussions are not completely finished yet regarding the direction of synchronisation. There are several possible options, if not counting the establishment of the separate synchronous area, which is unacceptable from a system reliability and security point of view. First, they might choose one of several options how to synchronise

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\(^{39}\) For example, TYNDP is one of the sources that inform the decision of Baltic States to synchronise their electricity systems with either ECN or Nordic synchronous area. By having TYNDPs at hand, the Baltic States can examine likely development patterns in Polish, Swedish and Finish electricity grids.

\(^{40}\) Philibert et. al. Europe / Russia electricity market. About the opportunity of fully integrated power market over geographical Europe. ESCP Europe. 2014.
system with the ECN. Second, they might opt to synchronise with the Nordic grid via underwater cable\textsuperscript{41} (see Figure 3).

Six studies were carried out in the period of 1998-2015 with more than 3000 pages of research: starting from general market based insights and ending up with an analysis of scenarios, technical requirements and financial investigations. What is interesting that none of the studies of that period have analysed Baltic States' synchronous operation with Nordic countries. For instance the Gothia Power (2013) study rejected further analysis of Nordic scenario due to its complex technical character and high costs. On the contrary, synchronization with Continental Europe was continuously defined as being feasible without major obstacles from a legal or any other point of view.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure3.png}
\caption{Options for the synchronisation of the Baltic States' networks}
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Adapted from ENTSO-E

\textsuperscript{41} Ten Year Development Plan, P. 235.
What must be done?

The synchronisation project is extremely complex as it includes issues of technical infrastructure development and international agreements with regional partners (The EU, Poland or Nordic countries, Russia and Belarus). From a technical point of view it addresses the following aspects: 1) infrastructure preparation, 2) ensuring power reserves, 3) system reorganisation, 4) de-synchronisation from Russia and Belarus, and 5) tests of isolated work.

In relation to infrastructure preparation, concrete projects are being aimed at achieving full integration into the European electricity market and ensuring a reliable work within ECN: these include interconnections with Sweden and Poland, development of internal transmission system inside Poland and the Baltic States, disconnection from IPS/UPS and back-to-back converters on the Eastern borders. Power Reserve Assurance is important in a sense that the Baltic electricity system must ensure a power reserve in case of disconnection of the most important electricity provider source (power plant or interconnection, in the Baltic States' case – NordBalt electricity link). This problem would be first of all solved by maintaining in reserve local electricity generation power plants, but also through interconnections with Finland, Russia, Belarus and Poland. Adequate system management covers the issue of being able to create only minimal impact on existing systems connected into synchronous zone. This means that the various possible disturbances by the newly acceding systems should be minimal, without prejudice to the set of stable and safe area synchronous system’s requirements. In order to adapt the Baltic system for synchronous operation with ECN, the Baltic States are implementing system management tools: creating a market of the system services, negotiating an agreement among the Baltic TSOs on common management of the power reserves, reaching an agreement with Sweden, Finland, Russia and Belarus on usage of the power reserves, etc. De-synchronisation from Russia and Belarus includes construction of DC converters with Russia and Belarus, disconnection of the unused power transmission lines and construction of the necessary internal part of the network. According to the ENTSO-E procedure, before synchronous operation with ECN, the Baltic States must make a test of isolated work and demonstrate a willingness to self-manage the isolated Baltic electricity grid system. This experiment must last for a few weeks in winter and summer seasons.

Assessing the project from a political perspective, there are several factors to be mentioned. From the positive side, there is internal agreement between the regional partners (Baltic, Nordic countries, Poland) in place already. For instance, on 11 June 2007 the Prime Ministers of the Baltic States signed a Communiqué which expressed their “understanding
that full and smooth integration of the Baltic electricity market into EU market would be possible only with the synchronisation of the Baltic electricity transmission system with UCTE synchronous area”. They also called on TSOs from Estonia, Latvia and Lithuania to start overall studies on synchronisation. The importance to synchronise the Baltic networks with the network of Continental Europe has been once again recognised by the Prime Ministers’Council of the Baltic Council of Ministers in 2014. Ministers of Lithuania, Latvia and Estonia confirmed this determination in numerous decisions (for instance, in 2015 signing a joint declaration) and even joint letters to Polish colleagues through the year 2015-2016.

What is politically even more important, the EU Commission also noted the importance of the synchronisation of the Baltic States: in 2009 the Baltic States and the European Commission, Denmark, Germany, Poland, Finland, Sweden established and in 2015 reinforced the Baltic Energy Market Interconnection Plan “BEMIP”, which called for “synchronisation of the Baltic States with the ECN”. Finally, in 2014 transmission system operators proposed a roadmap for desynchronization from IPS/UPS and synchronisation with ECN stressing the success of TSO’s while agreeing on the action plan towards synchronous operation with ECN, with the target of establishing synchronous operation by 2025. In this way the implementers of the project recognised the project as being of strategic importance and therefore to be implemented without delay. Nevertheless, some political disagreements remained and will be discussed in one of the next sections.

How much will it cost?

Exhaustive technical and economic analysis conducted by the Joint Research Centre demonstrated that interconnection with ECN via Poland
is: “<…> the most technically-feasible cost-effective solution.” If the Baltic States will rely on the existing Lithuanian – Polish interconnection, they will need to invest in additional electricity generation capacities. If they will opt for the construction of a second interconnector, the costs of the latter would replace costs of additional power plants. In both cases, maintaining synchronisation with ECN via one or two interconnections with Poland is better due to the fact that two electricity interconnectors would provide more security of supply and most probably would be cheaper to maintain in the long run. Synchronisation with the Nordic countries emerges as the most cost ineffective option: comparative costs for the period 2025-2065 are the highest and security the lowest.

One should recognise, that the accuracy of financial estimations is debatable, especially the calculation of initial investments. As for instance, the Lithuanian TSO ‘Litgrid’ assumes that synchronisation of Baltic States will cost 435-1071 million Euros, while ENTSO-E estimates that synchronisation will cost approximately 1069 million Euros. One of the reasons for such stark differences in estimations is that different calculations include or do not include different infrastructure: international interconnections and internal lines, as well as needed upgrades or construction of generation power plants. Finally, some studies (e.g. ‘Gothia Power’) assumes that the Baltic States will need to invest in building a few back-to-back converters with the Russian and Belarusian border, while the Joint Research Centre considers them as unnecessary from a technical point of view and does not include their cost in the final estimate. All in all, though estimates are not final, studies by ‘Gothia Power’ and the Joint Research Centre indicate that synchronisation with ECN via Poland is the most cost-effective and technologically sound option looking from the perspective of the Baltic States.

Another limitation of contemporary studies on the synchronisation of the Baltic States is that they differ in providing concrete estimates of costs not only for the Baltic States, but also for other countries in the Baltic Sea.

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48 Synchronization. Litgrid, Please see: http://www.litgrid.eu/index.php?act=js/synchroni-

49 Ten Year Development Plan 2016.

50 Gothia Power. Feasibility study on the interconnection variants for the integration of the Baltic States to the EU internal electricity market. 2013.

region, namely Poland, Sweden, Finland and Russia. Likely investments in the electricity grids of the Nordic countries and Poland are unknown, but in the case of synchronisation with ECN investments in Poland it could reach hundreds of million euro: as it was once mentioned in an interview with the representative of the Polish ministry of energy, “there may be problems with electricity production. On the one hand, all power plants will have to prepare for operation in a different mode and, on the other hand, Poland will have to ensure power reserves for Lithuania“\(^{52}\). As for Russia, there is only limited data as well. The cheapest option for Russia is to synchronise the electricity system of Kaliningrad together with the Baltic States which will require no additional investment. ‘Gothia Power’ claims that de-synchronisation of Baltic States from the IPS/UPS system could cost Russia an additional 62 million Euros as it will need to upgrade its national grid.\(^{53}\)

However, if Kaliningrad will be developed as an autonomous region (asynchronous with Lithuania and Russia), it will require investments into a new converter on the Lithuanian-Kaliningrad border for frequency containment reserves or a new 450 MW power reserve capacity. In this case the investments would be several times higher than in the case of Kaliningrad’s synchronisation with ECN. Another option for Kaliningrad is to remain in IPS/UPS system by establishing a direct connection between Kaliningrad and Belarus (a new 140 km line Marijampolė – Vilnius would be needed in this case). Russian companies have different calculations of the whole project’s costs, (“Inter RAO” argues that it would have to invest 1,582 billion EUR into additional generation capacity in the Kaliningrad region,\(^{54}\) while the Russian Energy Minister claims that an additional 174 million Euros will be invested into the power grid of Kaliningrad\(^{55}\)), but it is also evident that opposition to the project will cost Russia a significant sum as well.

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\(^{52}\) Polish EnMin: Baltic synchronization with Poland would be technically difficult. Please see: http://www.baltic-course.com/eng/energy/?doc=121595

\(^{53}\) Gothia Power. Feasibility study on the interconnection variants for the integration of the Baltic States to the EU internal electricity market. 2013.

\(^{54}\) New power plants in Kaliningrad region to cost 100 bln rubles– Inter RAO. Interfax, 2016.

\(^{55}\) Kaliningrad grid modernization to cost 15 bln rubles, Russian Grids to issue 11 bln rubles in new stock. Interfax, 2016.
Key challenges regarding synchronisation of the Baltic States’ electricity systems

Key challenges to the synchronisation project first of all are of a political nature, although financially it is also a burden for each involved state. The worst thing is that the third states are surely contributing to the division of interests with a hope to misuse the situation by prolonging or cancelling the synchronisation of one or two Baltic States with ECN. It seems that issues that have no direct link to synchronisation (such as the future of the Kaliningrad region’s electricity system, but not only this) factually determine this even more than the practical challenges of the synchronisation itself.

Political peculiarities

The political support of the European Commission was received by including synchronisation as a generic project into the list of PCI (same has been done in 2013), meaning that the project is recognised as of European importance and may expect financial support from the Connecting Europe facility fund (CEF). EC support has been repeated in 2015 when the Baltic States’ ministers met with the European Commission’s representatives, including the Vice-President of the European Commission Mr. Maroš Šefčovič. In addition to that, the EU Energy Security Strategy of 28 May 2014 and various conclusions of the European Council in 2014 and 2015 also highlighted the importance of the Baltic States’ integration into the ECN. Additional institutional structures have been created in order to promote the target at the working level: synchronisation with the ECN was included into the reinforced BEMIP and it was agreed in the MoU that a BEMIP working group will be established in order to discuss various aspects of integration.

On the other hand, not everything went smoothly in this regard. First of all, discussions with the key country Poland did not result into sound political agreement as yet. The Baltic States’ calls to the highest officials in Poland to support the synchronisation target were received with proposals to consider another options (like a second underwater interconnection) which could mean a willingness to continue the stage of feasibility studies and clarification of all possible consequences, sharing the financial burden instead of making decisions towards concrete actions. As evidence, no positive results have been announced recently, for instance, after the visit

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of the European Affairs Committee of Lithuanian Parliament to the Polish Senate in September 2016 or the visit of Lithuanian head of the Parliament to Poland in March 2017. On another hand, understanding on the technical issues of the Baltic States integration into ECN exists between Lithuanian and Polish transmission system operators (companies that will implement concrete projects) and this sets positive environment for further political talks.

The reason for certain Polish coolness may be part of “packing” tactics when synchronisation is put into one basket with other issues of bilateral relations: national minority rights, requirements of the “Orlen Lietuva” refinery, and disputes over rail tariffs, etc. Or Poland may simply not be seeing the economic rationale to contribute to a project that requires investments, but provides minor value to Poland’s energy security. Environmental concerns of the second LitPol Link interconnection (which would be running through the Natura 2000 region) and wish to protect the domestic coal based generation market could be mentioned among the reasons for Polish scepticism. No matter what the real reason is, Polish formal and final approval is missing. Without it, as for example, a first very concrete and compulsory step of ENTSO-E performing a study that would analyse the measures to be taken in order to overcome possible technical, organisational and legal obstacles for Baltic States'synchronisation with ECN isn’t possible57.

However, although Poland isn’t keen to take on the additional obligations necessary to support the systems of the Baltic States, synchronisation of the Baltic States could help Poland solve local electricity generation challenges in the long run, as well as limiting the flow of electricity from the unsafe Ostravets NPP in the short term. The prevention of the export of Ostravets’ electricity to Poland was mentioned among Poland’s’ priorities just recently58. Therefore, all in all the Baltic States should remain patient and engage into constructive dialogue with Poland, contribute to a solution, which would diminish the costs of synchronisation for Poland and lead to de-synchronisation negotiations between the EU and Russia/Belarus. In this context the new approach of Estonia in the second half of 2015 by requiring synchronisation with the Nordic countries instead of the ECN is potentially dangerous – the next paragraph will explain why.

57 Although such studies ENTSO-E carried out for Ukraine and Moldova, Poland has no interest to provide so necessary agreement to accomplish the study for the Baltic States.
Tallinn’s new approach could be explained in the light of Estonia losing hope to agree with Poland and Russia. There is no big surprise in this, as up until 2016 it remained unclear, how the concrete projects will be financed and what will be the solution regarding the Kaliningrad region’s electricity system. Wishing progress on synchronisation and even higher integration with Finland, Estonia started to drift towards plan B: synchronisation with the Nordic countries. The real danger here is the disappearing unity of the Baltic States’ — hesitation to reach a final agreement prevents technical infrastructure development (presented above), postpones negotiations on EU financial support and puts the whole process at risk. As a consequence, the dynamics of the project may be lost and Russian doubts about no need of the synchronisation with European network would prevail. Or it may also happen that the theoretical possibility of synchronising Estonia via underwater cables with the Nordic countries will enter the stage of active planning. Leaving only Lithuania with maybe Latvia to negotiate synchronisation with ECN is much more possible if in the short run involvement in constructive cooperation with Poland is hindered.

**Russian factor**

There is little doubt, that regional disagreements are determined by the Russian factor: security of supply in the Kaliningrad electricity system is heavily dependent on the Baltic States electricity system. Its fate must be discussed and decided at a political level between the Baltic States, European Union and Russia (the so called EURUBY process is established for this purpose). From an objective point of view, the security of supply in Kaliningrad and Belarus can be ensured by simply strengthening internal grids – the EU could assist in doing this. But from the political side, internal disagreements in the region are being exploited by the Kremlin in a way to demonstrate “the unbearable political and security damage” that Baltics’ synchronisation would bring for Russia. For instance, the Russian National Security Concept implicitly refers to Baltic plans to de-synchronise from IPS/UPS system by actualising the importance of: “<…>the safeguarding of the country’s technological sovereignty in the world energy market”\(^{59}\) and warning about: “Attempts by individual states to utilise <…> technological policy to resolve their own geopolitical tasks.”\(^{60}\) Vladimir Putin himself spoke against de-synchronisation from IPS/UPS on a number of occasions\(^ {61}\). During an interview with an Italian newspaper, he specified

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60 Ibid.

61 In the context of 70th UN General Assembly, he told CBS journalist: “we will have to reform the system, spending billions of dollars, as well as our European partners
that de-synchronisation of Baltic States’ electricity grid would cost Russia from 2 to 2.5 billion Euros – much more than the figures presented by the Russian Energy Minister and Inter RAO “Gothia Power” study.\footnote{Baltics Threaten to Unplug Russian Region. Politico, 2015. Please see: http://www.politico.eu/article/baltics-threaten-to-unplug-russian-region-power-kaliningrad-electricity-interconnectors-lithuania-poland-sweden/}

Worse is that Russian foreign policy is not exclusively targeted against the Baltic States – Moscow creates a pressure on the EU, Poland and the Nordic countries. The factor of a potential Kaliningrad nuclear power plant, that could be constructed in the neighbourhood of the mentioned countries is important and deters them from sharper actions. The paradox here is that if the Kaliningrad NPP will be constructed, the Baltic States could be linked to the IPS/UPS even tighter, synchronisation postponed and the electricity from this NPP would easily reach the EU: barriers for that without synchronisation are hardly possible to establish. Nevertheless, the region seems not willing to enter tough discussions with Russia: the impact for Kaliningrad that might be detached from the mainland Russia, analysis of alternatives and technical parameters of de-synchronisation, as well as calculation of the related financial and political costs for them place the discussion of the geopolitical consequences if the Baltic States stay dependent on Russia and its IPS/UPS system. In other words, while in accordance with ENTSOE rules the Baltic States are trying to secure a political agreement between the European Commission, Belarus and Russia regarding de-synchronisation from IPS/UPS, Moscow’s policy to involve the counter-partners in viscous and endless negotiations provides tangible results.

Conclusions

An interstate synchronous area can be defined as the legal and technological bond that keeps different electricity systems operating as a single unit. The more reliable is this synchronous area, the more secure is electricity supply in a country. In case of the Baltic States, a dispatcher in Moscow is responsible for providing frequency containment reserves and controlling the load frequency of their electricity systems. The fact, that they mitigate grid deficiencies by launching reserve capacities in the former Soviet Union network only, represents serious technical and geopolitical

who will also have to spend billions of dollars to integrate the Baltic countries into their power grid. \(<\ldots\>)\ What for?" Please see: https://sputniknews.com/politics/201509291027695060-putin-interview-charlie-rose-transcript/
vulnerability for them. The following factors are crucial while considering change of the synchronous area in which the Baltic States operate:

1. *Synchronous work with the European system is more reliable in comparison to the IPS/UPS system*. Key features of the latter are centralised frequency control, weak regulatory framework and technologically outdated infrastructure causing supply problems. In case of a legal dispute with the system manager or non-compliance with the provisions of BRELL system, the Baltic States don’t possess effective legal instruments to appeal. In contrast, the ECN and Nordel are prominent due to their decentralised frequency management and strong legal framework. TYNDP contains credible and official information, thus serving as a platform for information exchange and as a tool for promoting transparency. In addition to that, ENTSOE drafts Network Codes which from the moment of approval become legally binding for all EU member states: European law provides an effective framework to defend their rights and therefore serves as a guarantee of security and reliability of the system.

2. *There is wide political agreement on the need of synchronisation: it was numerously confirmed on national, regional and European levels*. However, first Poland and then Estonia required additional studies on the direction and reasoning of the synchronisation: these are taking time and create doubts about the unity of project parties. Security of electricity supply to Kaliningrad region serves as an instrument that allows Russia to block the project. The Kaliningrad nuclear power plant, that could be constructed in the neighbourhood of Lithuania is another of Moscow’s foreign policy tools that encumber the project;

3. *Probable alternatives include synchronisation with ECN or Nordic synchronous area*. In any case it is widely agreed, that the project must be accomplished by 2025. Current financial estimates regarding the price for synchronisation of Baltic States’ electricity system cannot be considered as final, but they indicate that synchronisation with ECN via Poland is the most cost-effective and technologically sound option looking from the perspective of Baltic States. As synchronisation is considered a Project of Common Interest, at least partially the costs will likely be reimbursed by EU’s financial instruments. However, it is reasonable to assume that the magnitude of national investments will be an important question.
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