ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ

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Review of BEMIP

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ABSTRACT

The European Union aims at creating an Energy Union, where all consumers have access to secure, sustainable, competitive and affordable energy. For the creation of the Energy Union and the completion of internal market, the European Union has adopted the Strategy for the Energy Union to deal with one of the most important obstacles in achieving this goal, which is the existence of isolated energy markets. The EU has recognized as its priority energy source the natural gas, which will be the focal point of this paper. In this context the European Union has been promoting the creation of the necessary natural gas interconnection infrastructure among EU member states.

This study focuses especially on the Baltic Sea region, that is considered as one of the most diversified and energy isolated areas in the EU. The characteristics of the energy sector of each of the countries of the region will be presented, with emphasis on natural gas. The existing infrastructure capabilities and weaknesses of each country and the region can be capitalized and addressed respectively with the implementation of several natural gas pipeline interconnection projects, as proposed and supported by the European Union within the Baltic energy market interconnection plan (BEMIP). These projects are the GIPL, the Baltic Pipe and the Balticconnector, since they constitute, as it will be presented, the backbone of an integrated, competitive regional natural gas market in the Baltic region.

ACRONYMS AND ABBREVIATIONS

ACER	Agency for the Cooperation of Energy Regulators
BEMIP	Baltic Energy Market Interconnection Plan
CEF	Connecting Europe Facility
EU	European Union
EUSBSR	EU Strategy for the Baltic Sea Region
IEA	International Energy Agency
LNG	Liquefied Natural Gas
OECD	Organization for Economic Co-operation and Development
PCIs	Projects of Common Interest
TPES	Total Primary Energy Supply
TSO	Transmission System Operator
TYNDP	Ten Year Network Development Plan

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INTRODUCTION

One of the visions that the European Union has expressed is the creation of the Energy Union, through establishing a fully integrated energy market that will provide all EU consumers secure, sustainable, competitive and affordable energy. The creation of the Energy Union is based on five principles: energy security, solidarity and trust, a fully integrated internal energy market, energy efficiency, decarbonizing the economy and lastly research, innovation and competitiveness.[1] Measures have been adopted since 1996, but further steps towards harmonizing and integrating the energy market are needed. With the First and Second Energy Package (1996, 2000 and 2009 respectively) the European Union concentrated on liberalizing the energy market, of electricity and gas, establishing the consumers' rights to freely choose the energy supplier. Within the framework of the Forth Energy Package (2019) and the "Clean for all Europeans" Package (2016), the EU aims at further completing the internal market by addressing the issues of energy security, energy efficiency, energy governance, renewable sources and climate change, creation of Energy Union within the European Union.

In the heart of the EU's Strategy for the Energy Union is closing the gaps in the interconnections between member states across the European Union. One of the challenges that the European Union is facing is the existence of fragmented markets. Isolated sub-regions of the European Union are usually dependent on imports from third countries and one source supply, and on existing indigenous production, making their and as a result the EU's energy security very vulnerable. Creating and connecting new and existing energy grids is of vital importance for security of supply, for protection against infrastructure failures, for greater variety of suppliers and routes.[2]

The region of the Baltic Sea is considered as one of the most diversified areas in the European Union, regarding the stage of development of energy infrastructure and the importance of energy sources in the energy mix of each country of the region. It consists of four different sub-regions: Finland, Estonia-Latvia-Lithuania, Poland, Denmark-Sweden.[3] In order to create the

[1] (Eurostaat, n.d.)
[2] (European Commission, 2019)
[3] (European network of transmission system operators for gas, 2011)

Energy Union, the Baltic states need to be synchronized and connected with other member states and regions of the European Union.

The purpose of this research is to explore and present the region of Baltic countries in the context of the Baltic Energy Market Interconnection Plan, and further to appraise the gas pipeline options that BEMIP introduces.

To be more specific, the first part of the study focuses on the Baltic countries-members of the European Union providing energy profiles of each one of them, in the context of the characteristics of those countries' energy mix, with emphasis on one energy source: gas. Natural gas plays a pivotal role in the energy transition of the European Union. The goal of the EU is to go carbon free by 2050, with energy produced from renewable sources to overtake the conventional energy sources. Due to the intermittency of renewable sources, the transformation of the energy system that the EU aims at, needs the support of another source, that will serve as back up. The European Union sees natural gas as the source with that role.

Furthermore, the existing gas infrastructure possibilities and gaps are identified, in order to understand how the Baltic region is structured and what are the existing vulnerabilities in each country's energy sector.

The second part provides an analysis of natural gas projects that are proposed or implemented with the purpose of creating multiple connections among the Baltic countries and the Baltic region with the rest of the European Union's regions. These projects bear the name BEMIP: Baltic Energy Market Interconnection Plan. A comparative analysis of three flagship gas pipeline projects of the BEMIP, based on qualitative and quantitative criteria, will be conducted. It is also important to point out the main barriers to the implementation of these projects and the potential impact that the completion of each of these projects has on the integration of the European market and the energy security.

The study concludes with several remarks on how the BEMIP project and the gas infrastructure developments form a single interconnected region within the European Union.

1. DESCRIPTION OF BEMIP

The Baltic Energy Market Interconnection Plan (BEMIP) is the major project that the European Union is implementing in the region of the Baltic Sea under the EU Strategy for the Baltic Sea Region (EUSBSR). It was initiated in 2009, with the signing of the Memorandum of Understanding[4], having as focus the establishment and safeguarding of competitive, secure, sustainable and integrated energy in the region of the Baltic Sea.[5]

The region of the Baltic Sea is characterized by the underdeveloped interconnection with the energy network of the Continental Europe, limited diversification of energy routes and supply sources. The latter constitutes a considerable risk for the energy security of the region and the EU in general.

The BEMIP project aims at addressing those deficiencies in the energy network of the European Union and the Region of the Baltic States.

The question is whether the BEMIP project is enough in ensuring the creation of an integrated, secure, sustainable energy market in this region of the European Union. The Plan involves proposals for creation of several interconnection links, recognized as PCIs, all of which aim at reducing energy isolation. In order to provide a greater insight to the matter, the most important of those projects regarding natural gas market will be presented in order to examine in what way each of the PCIs contributes to the integration of the EU energy market and with what cost.

Before we move on to the description of the interconnection plan in the region, first our attention should be directed towards explaining the characteristics of the Baltic countries and the region generally regarding the energy mix (specifically natural gas) and existing energy gas infrastructure. Such an approach will shed light on the weaknesses of the region in the context of energy sustainability, security, efficiency and integration.

[4] (European Commission, 2014)
[5] (EUSBSR, n.d.)

Countries that are participants in the above initiative are Denmark, Germany, Estonia, Latvia, Lithuania, Poland, Finland, Sweden, whereas Norway is an observer country.[6]

1.1 FINLAND

Finland has a diversified energy mix. The country's Total Primary Energy Supply (TPES) is dominated by oil, forest-based biofuels, and nuclear energy (Finland has four operational nuclear reactors[7]), with the shares of natural gas and coal to be less significant.[8] In 2017 the total energy supply amounted 33,277 Mtoe.

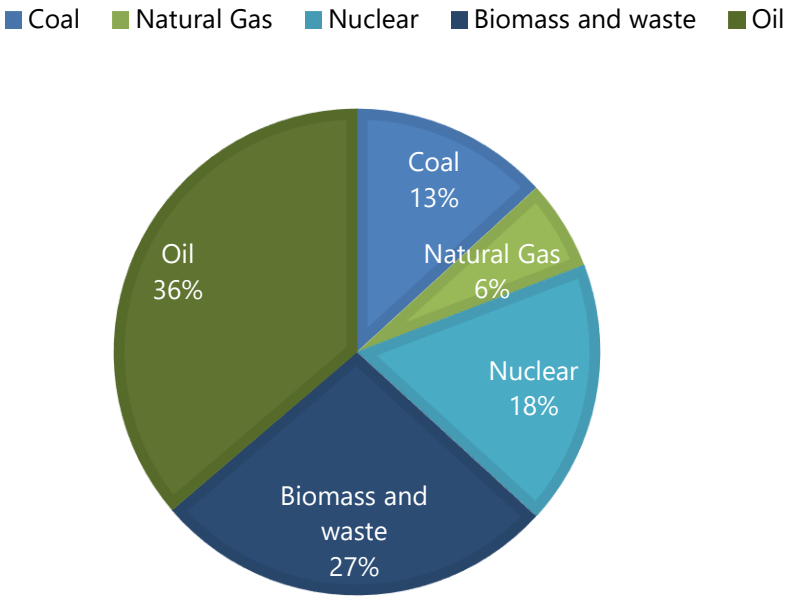

Figure 1.1.1 Energy sources in TPES (Finland) [9]

The country's domestic production in 2017 covered over 50% of the Finland's energy needs for that year. The production amounted 18,16 Mtoe, primarily from biofuels and waste, and nuclear fuel.

[6] (European Commission, 2014)
[7] (Ministry of Employment and the Economy: Energy Department, 2011)
[8] (International Energy Agency, n.d.)
[9] (International Energy Agency, n.d.)

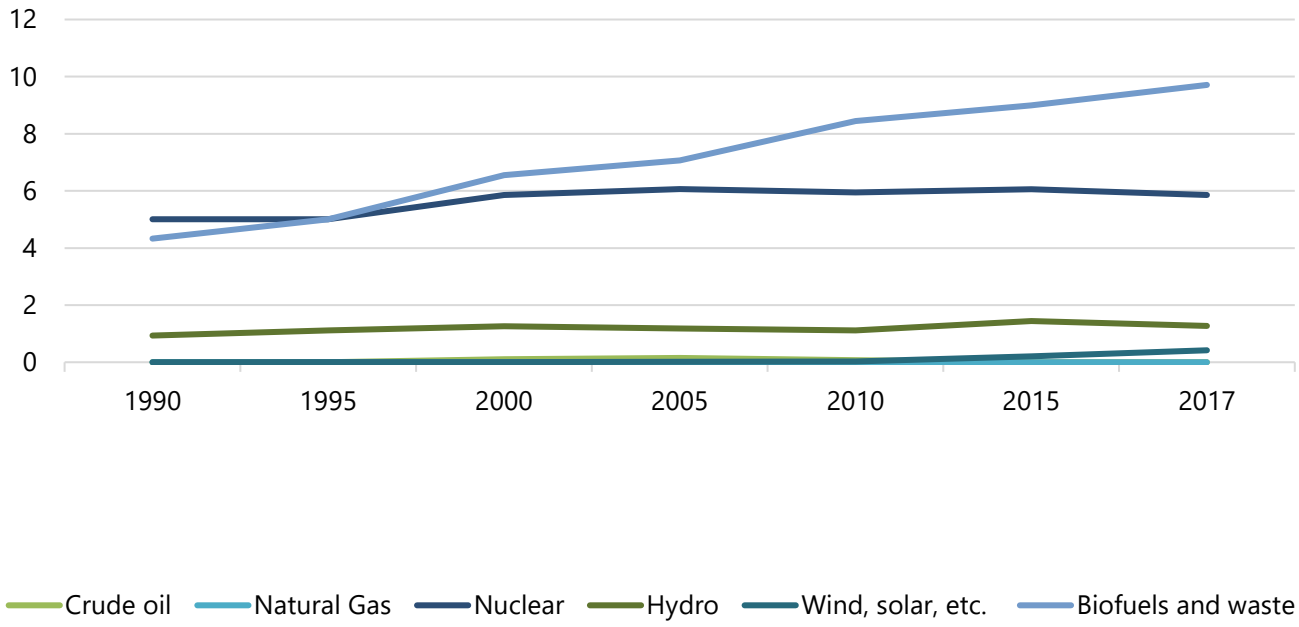

Figure 1.1.2 Energy production by source (ktoe) (Finland)[10]

The country in matter of years has grown to be one the leaders in using renewable energy sources. In fact, the country reached the EU's Renewable Energy Directive (increase of renewable energy to 38% by 2020) by 2014. According to data published by the International Energy Agency, for the year 2017, the share stands at 47%.[11]

Since the 90s the country doubled its energy production from renewable sources. In 1990 it amounted 5,262 Mtoe, while in 2017 the energy produced from hydro, solar, wind power, biofuels and waste reached 11,398 Mtoe, covering over 40% of Finland's energy consumption.[12]

The remaining share of energy supply is covered by imports. Russia is main importer of coal and oil. Over 50% of coal imports in the country come only from Russia.[13] Other minor suppliers are Australia, South Africa, Indonesia, China and Poland.[14]

[10] (International Energy Agency, n.d.)
[11] (U.S. Commercial Service of the U.S. Department of Commerce, 2019)
[12] (International Energy Agency, n.d.)
[13] (U.S. Commercial Service of the U.S. Department of Commerce, 2019)
[14] (U.S. Commercial Service of the U.S. Department of Commerce, 2019)

More importantly, the Russian Federation is the sole importer of natural gas to Finland since the country does not own any domestic natural gas reserves. The Russian natural gas is transmitted through a twin pipeline, with Imatra as the sole interconnection point, as depicted on the map below. Total capacity of the pipelines is 22 mcm/d (millions of cubic meters per day).[15]

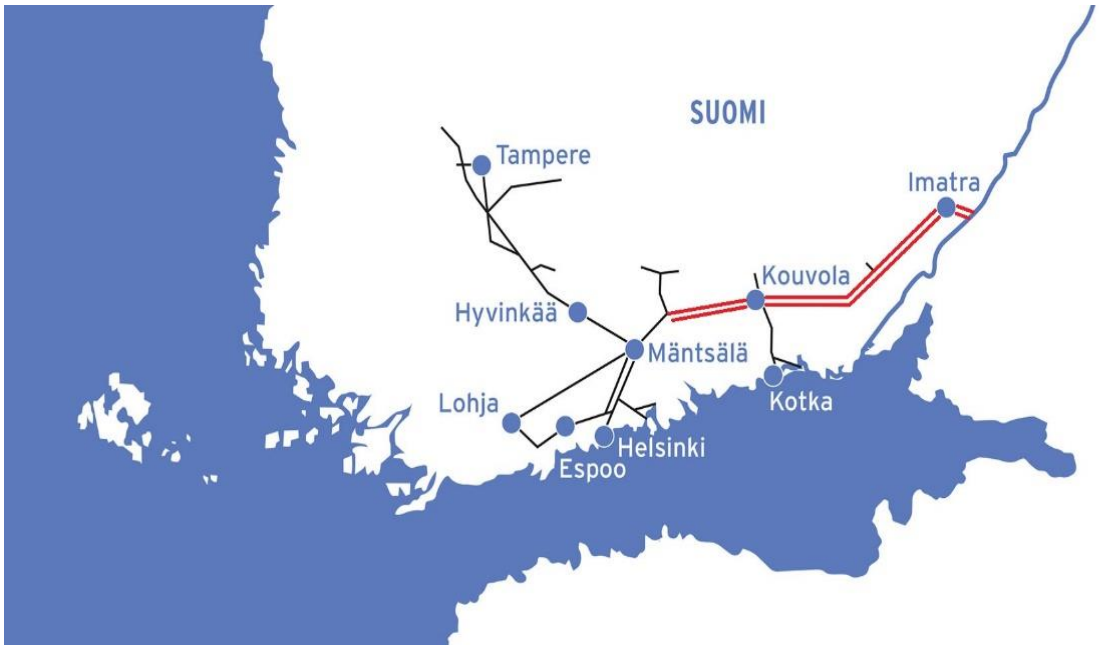

Figure 1.1.3 Natural gas interconnection between Finland and Russia[16]

Additional infrastructure are the two LNG terminals, one in Pori providing liquified natural gas to the south part of the country (storage capacity of 28,500 m^3), and one newly opened in 2019, the Tornio Manga LNG terminal. The new LNG terminal, which is the largest in the Nordic region, includes facilities for unloading and distribution of natural gas. It will also serve as a storage unit with 50.000 m^3 of storage capacity.[17] The construction of the new LNG terminal ensures LNG shipments to the northern part of the country as well.[18]

In this sense, the creation of ways for accessing alternative gas sources is of vital importance for the country since it will enhance the security of supply and competition.

[15] (International Energy Agency, 2018)
[16] (Gasum, n.d.)
[17] (Karagiannopoulos, 2019)
[18] (World Maritime News, 2019)

1.2 ESTONIA

Estonia's energy mix consists primarily of the domestically produced oil shale. It accounts around 73% of Total Primary Energy Supply of the country.[19]

Additionally, around 1/5 of the country's energy supply is made of biofuels and waste, as Estonia has large domestic biomass resources.

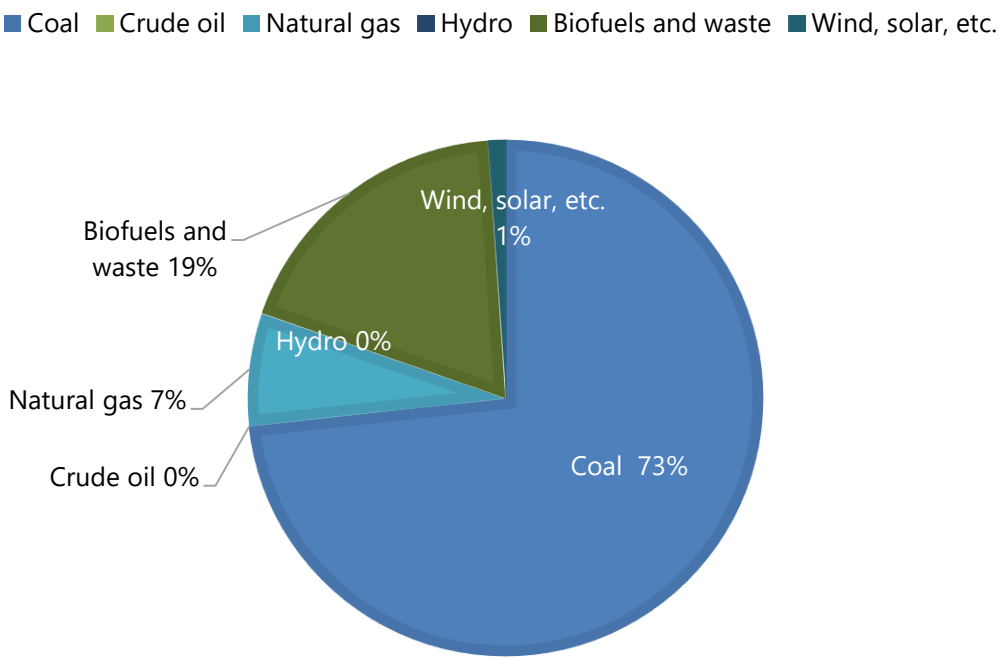

Figure 1.2.1 Energy sources in TPES (Estonia)[20]

The country is net exporter for example of solid biofuels and shale oil. There are no refineries for refined oil products, so Estonia exports all produced shale oil.[21]

In 2017, the TPES amounted 5,707 Mtoe[22], remaining pretty much steady comparing to the previous years.

[19] (International Energy Agency, 2019)
[20] (International Energy Agency, 2019)
[21] (International Energy Agency, 2019)
[22] (International Energy Agency, 2019)

Regarding energy production, it has shown steadiness for the last decade, accounting around 5,7 Mtoe in 2017. The largest energy sources, as mentioned above, are oil shale, and biofuels and waste. From renewable sources, energy from wind is getting a more and more increasing share.

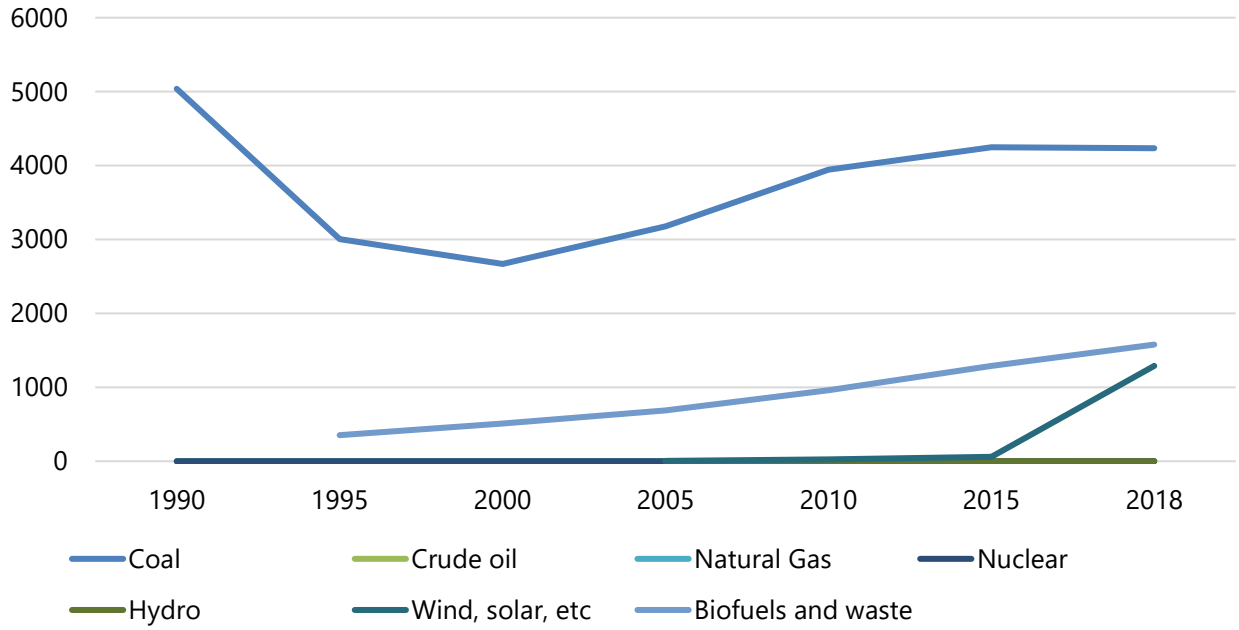

Figure 1.2.2 Energy production by source (ktoe) (Estonia)[23]

Total consumption, as well as energy production, has not shown significant fluctuations for the last decade, remained stable at around 3Mtoe.

The fact that the country has domestic energy resources is beneficial for the country's energy security.

The role of natural gas in Estonia is on one hand of declining importance. The domestic demand of the source has dropped by half in the last decade. This is explained, among other reasons, by the fact that renewable sources have been receiving the greatest attention in energy production over the last years.[24]

On the other hand, Estonia relies heavily on imports of natural gas, mainly from The Russian Federation. The imported natural gas comes via two main interconnection sites: one interconnection to the Russian gas network in Värska, and the other one in Karksiwith Latvia. The dependency from Russian gas has been reduced, due to the investment of the country in the connection

[23] (International Energy Agency, 2019)
[24] (International Energy Agency, 2019)

with the LNG terminal in Klaipedia, Lithuania. This way Estonia decreases the amount of imported Russian gas, to less than 90%.[25]

Nevertheless, the country invested in the connection with the LNG terminal in Klaipedia, Lithuania, thought which the country imports gas from the GET Baltic gas exchange in Lithuania.[26]

Figure 1.2.3 Estonia's natural gas infrastructure[27]

For Estonia, the creation of a gas interconnection with Finland will serve as an instrument of diversification of routes increasing the energy security of the country. In the past there were some discussions about creating LNG terminal as a part of the interconnector between the two countries, but no further dialogue has produced promising results.

[25] (International Energy Agency, 2019)
[26] (The Baltic Times, 2019)
[27] (European network of transmission system operators for gas, 2011)

1.3 LATVIA

The energy mix of Latvia is strongly dominated by oil products, most importantly by coal, natural gas and biofuels-waste. In 2017, the Total Primary Energy Supply amounted over 4Mtoe. The total supply in energy has shown variations during the last two decades. For example, in 1990 the TPES was over 7Mtoe, and in 2010 4,5Mtoe.

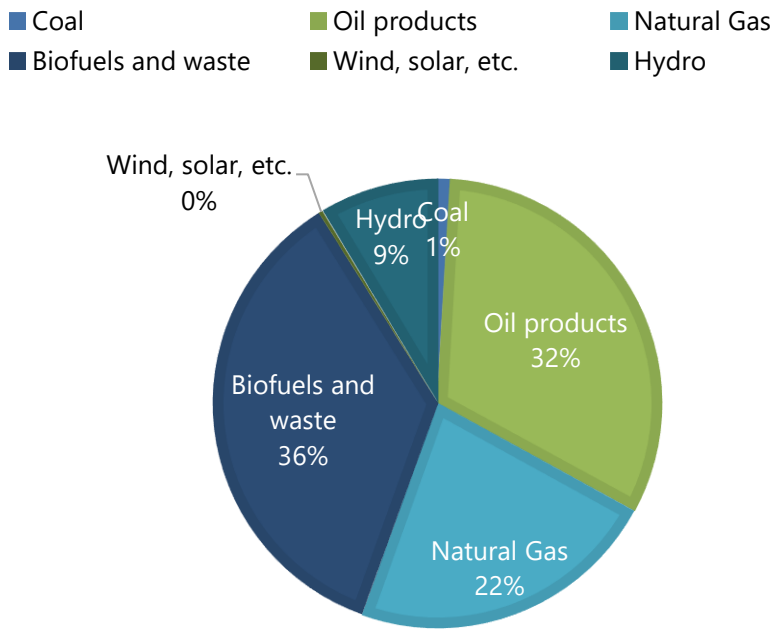

Figure 1.3.1 Energy sources in TPES (Latvia) [28]

The country has one of the highest shares of renewable sources (39%)[29] in its energy mix among the countries in the BEMIP region. The national target for renewables for 2020 is set on 40% and the country is close to achieve this target. Since the 1990s the supply of renewable sources almost doubled (in 1990 the supply was 1,081Mtoe, while in 2017 1,961Mtoe).

And in that specific category, biomass is the frontrunner. In less than three decades the supply of energy from biofuels and waste, increased by 42%.

[28] (International Energy Agency, n.d.)
[29] (European Commission, n.d.)

Domestic production of energy sources covers only partly the needs of the country. Latvia imports coal, petroleum products, small amounts of biofuels and waste, and all its natural gas, since the Latvia has no domestic natural gas resources.

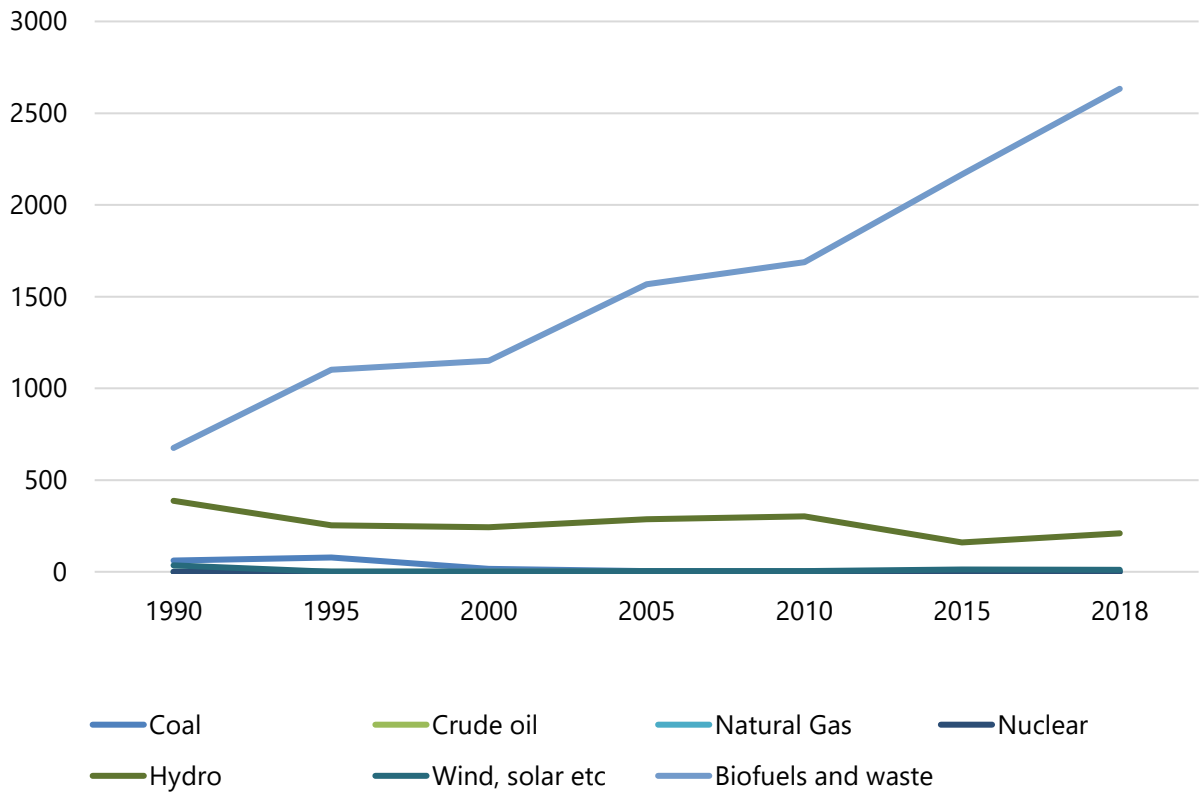

Figure 1.3.2 Energy production by source (ktoe) (Latvia)[30]

At the same time Latvia is a net exporter of biofuels and waste.

Regarding natural gas, Latvia was exclusively dependent on Russian natural gas. For the European Union, the country serves an important role for its natural gas imports from Russia since Latvia is a transit country. In addition to that, Latvia has, as the only Baltic country, an operational storage facility (the Inčukalns UGS)[31], ensuring natural gas supply stability in the region, especially during the cold season.[32]

[30] (International Energy Agency, n.d.)
[31] (Conexus Baltic Grid, n.d.)
[32] (World Energy Council, n.d.)

Since the launch of the LNG station in Klaipėda Seaport in Lithuania, the country ensured an alternative source and route of natural gas, increasing its energy security. There is a project for creation of an LNG station near Riga, the Skulte LNG Terminal project, which is under consideration.[33] The creation of the BEMIP Interconnection is considered as an additional step towards security of supply and alternative routes.

Existing natural gas infrastructure in the country include two pipelines, through which the Russian gas is imported to the country, and an emergency pipeline connection with Lithuania.

Figure 1.3.3 Gas infrastructure in Latvia[34]

[33] (Budapest LNG Summit, 2019)
[34] (European Commission, 2016)

1.4 LITHUANIA

The level of TPES of Lithuania, is one the of the lowest in the last 30 years. In 2017 it rose to 7,5 Mtoe.

Regarding energy sources, crude oil and natural gas have the highest shares in total supply of the country, 73% and 14% respectively. Important role plays energy produced from biofuels and waste.

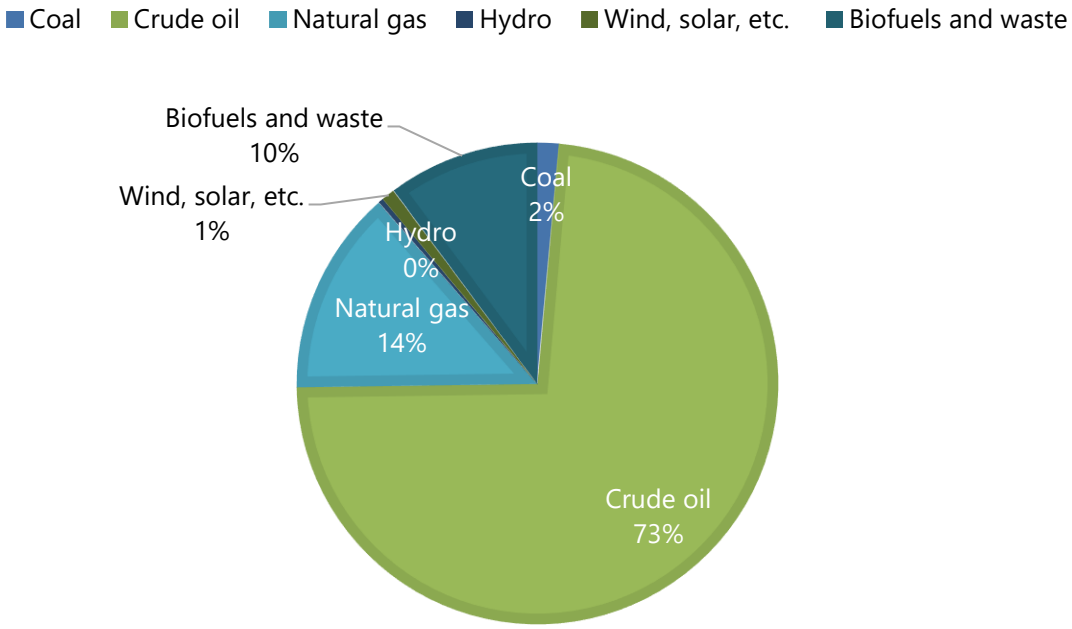

Figure 1.4.1 Energy sources in TPES (Lithuania)[35]

The country in the past used to produce nuclear energy. During the accession talks with the European Union, the country agreed with the assistance of the European Commission to shut down two existing nuclear reactors. In 2004 and in 2009 the Ignalina Nuclear Power Plant was decommissioned.

Energy production from nuclear powerplants was replaced by increased production of energy from renewable sources, most notably from biofuels and waste. Lithuania is one of few countries-members of the European Union that

[35] (International Energy Agency, n.d.)

has accomplished the 2020 Renewable Energy Target (20% share of renewable sources in the overall energy share).

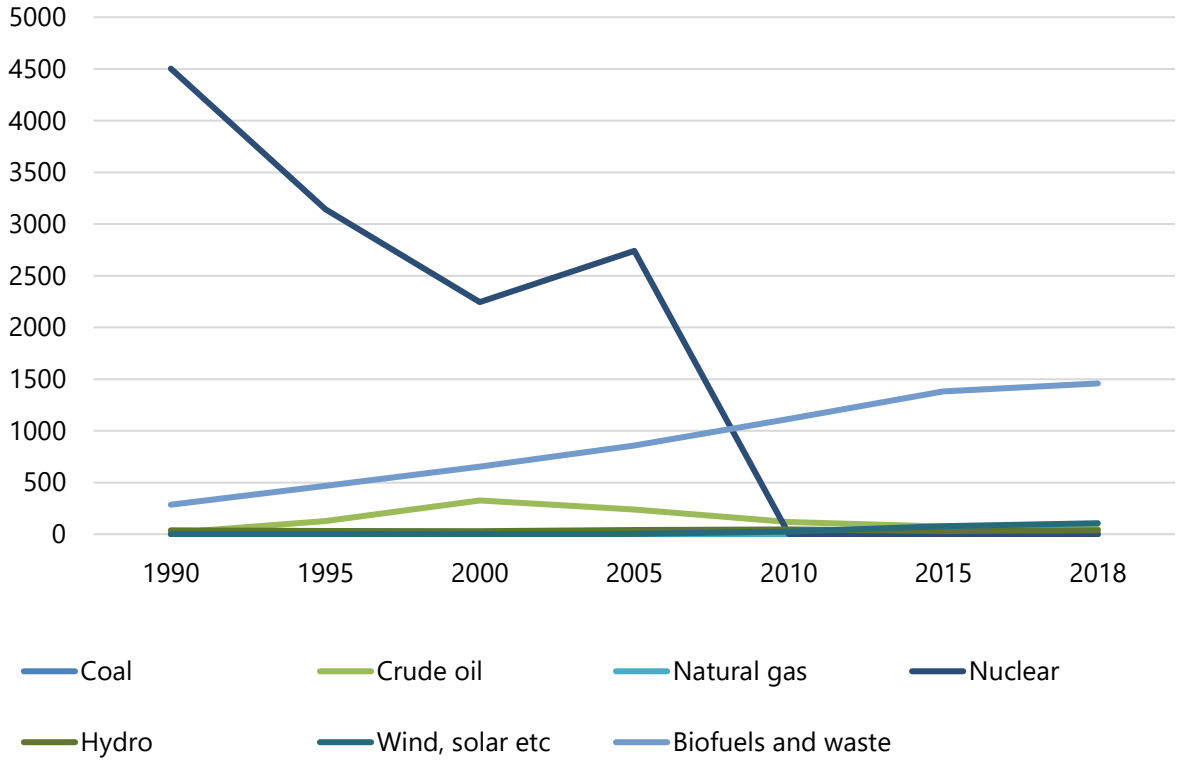

Figure 1.4.2 Energy production by source (ktoe) (Lithuania)[36]

Domestic production of energy sources is not enough for the country's energy needs. Lithuania imports natural gas exclusively from the Russian Federation. There are three main routes: interconnection with Belarus, a bi-directional interconnection with Latvia, and, for gas transit only, and one interconnection with the Kaliningrad region.

As stated above, Lithuania has access to gas from Latvia's storage facility (Inčukalns UGS), which serves beneficially to the country's energy security.

[36] (International Energy Agency, n.d.)

Most importantly, the LNG station in Klaipėda Seaport contributed into breaking Russia's monopoly over natural gas supplies not only to Lithuania, but also to the neighboring countries (Latvia and Estonia). The natural gas that is stored in Klaipėda LNG Station comes mainly from Norway and since 2017, from the U.S.[37]

Figure 1.4.3 Infrastructure of natural gas in Lithuania[38]

[37] (Sytas, 2019)
[38] (European network of transmission system operators for gas, 2011)

1.5 POLAND

The largest share in TPES of Poland has undeniably coal. In fact, Poland has one of the largest shares of coal in its energy mix among all OECD countries, accounting almost half of the energy mix. Second comes crude oil, which mostly imported, showing high rate of dependency.

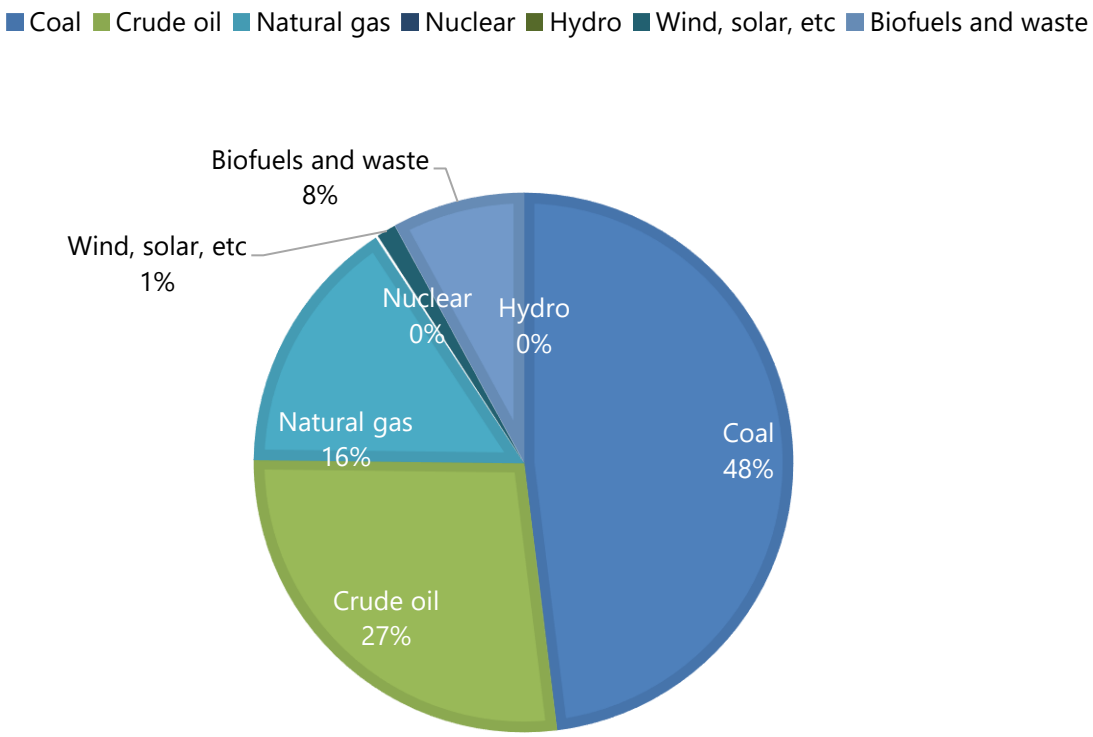

Figure 1.5.1 Energy sources in TPES (Poland)[39]

Regarding domestic production, the main source of energy, coal, has been in decline since the 90s, as a consequence of lower level of existing coal reserves in mines and of the non-profitability of coal extraction.[40]

Additionally, indigenous production of energy from crude oil is located in several areas of the country.

[39] (International Energy Agency, n.d.)
[40] (Giantas, 2019)

At the same time, a small increase in production of energy from renewable sources has been observed, but the shift is rather slow and cannot gradually replace coal or oil.

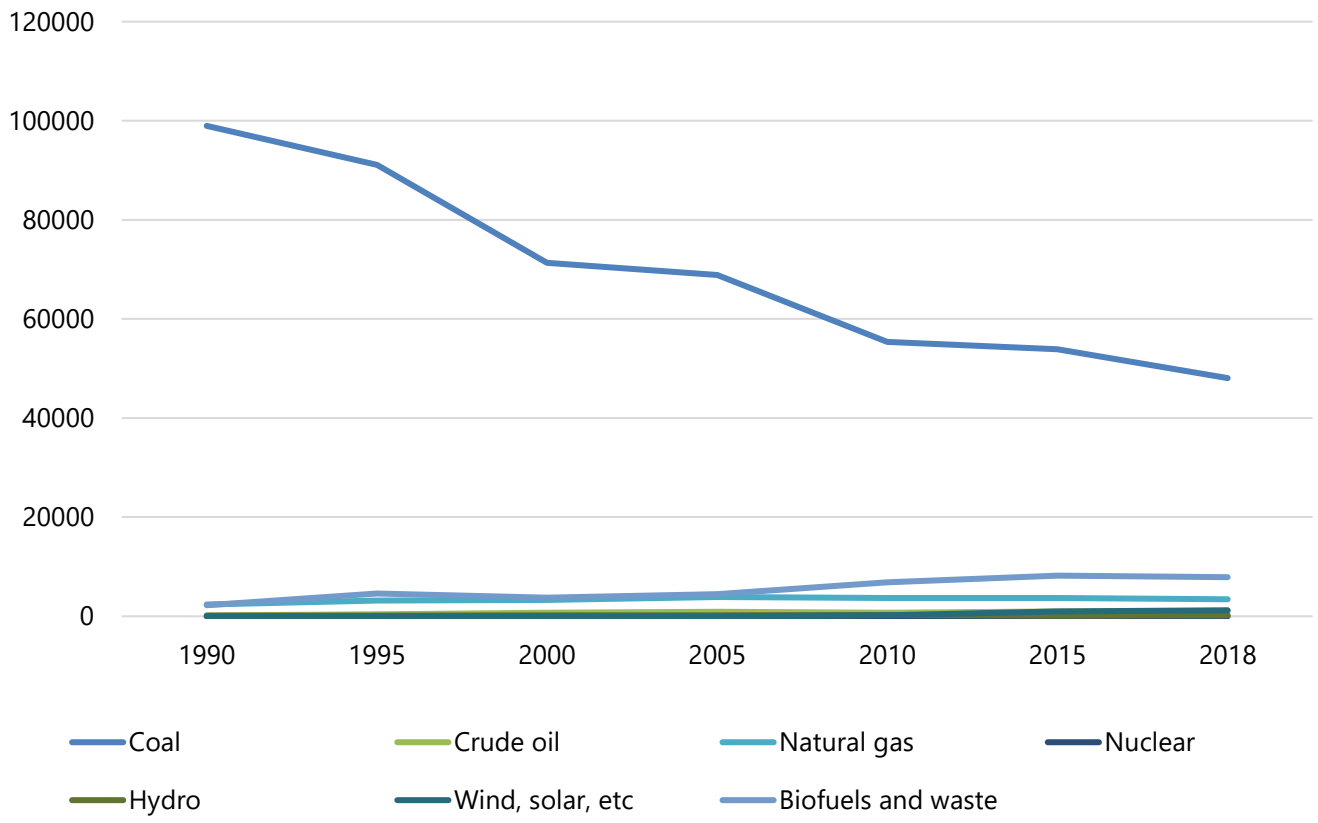

Figure 1.5.2 Energy production by source (ktoe) (Poland)[41]

Despite the existence of domestic production, Poland's energy needs cannot be fully covered by it, which means that the country relies on imports.

Poland imports coal in smaller amounts for diversification reasons, but mostly the country depends on imports of natural gas and crude oil. Poland imports the largest share of crude oil from the Russian Federation thought the Druzhba pipeline.

As for natural gas, Poland is a net importer of that source, having as main importer Russia.

[41] (International Energy Agency, n.d.) An in depth analysis of the energy sector of Poland is provided: http://energypolicy.unipi.gr/wp-content/uploads/2019/02/Unipi_WP14_GiantasKamila201902.pdf

One key existing infrastructure, that provides opportunities for diversification of routes and suppliers is the LNG terminal in Świnoujście, operating since 2015.

1.6 DENMARK

In 2017, the Total Primary Energy Supply was slightly higher than the domestic consumption, reaching 17Mtoe, the lowest in the last three decades. Total energy supply is dominated, as showed on the above graph, by crude oil, coal and natural gas.

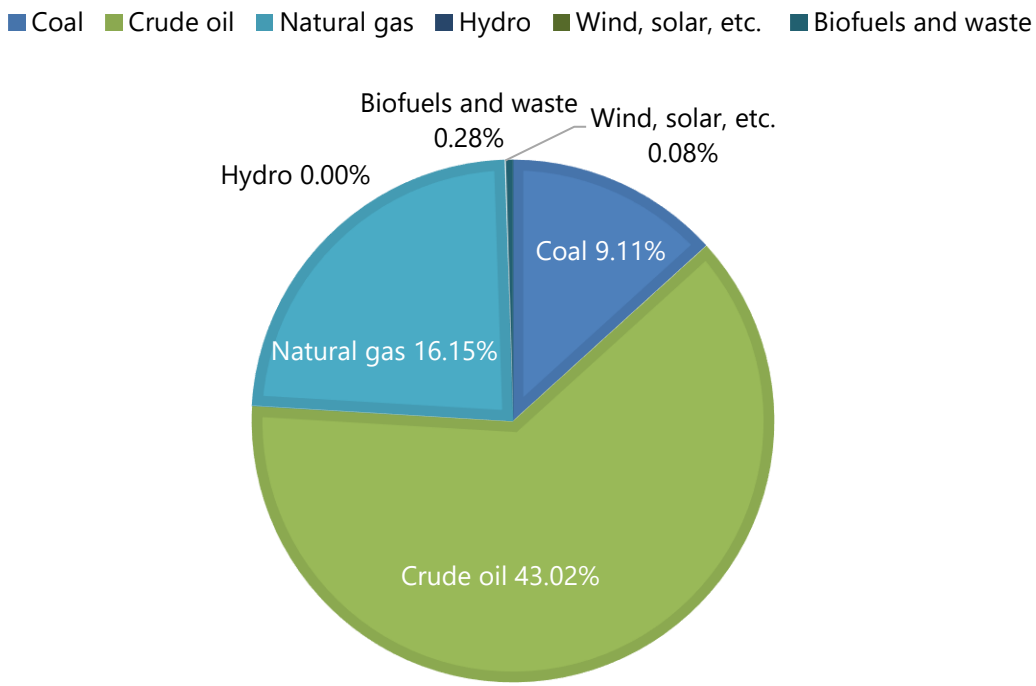

Figure 1.6.1 Energy sources in TPES (Denmark)[42]

The dependency on each of this source is different regarding the country's TPES. Concerning natural gas, which constitutes over 16,5% of TPES, Denmark is self-sufficient in natural gas, which means that the country is a producer and a net exporter of natural gas. Around 1/3 of the domestically produced natural gas was exported in 2017. In fact, the country has been exporting natural gas since the 80s and is expected to remain net exporter of this source for the next years. Countries that receive Danish natural gas are Germany, Sweden, the Netherlands and Norway.[43]

The country is mostly dependent from coal in its energy supply. For Denmark, the total of coal supply comes from imports, creating worries over the

[42] (International Energy Agency, n.d.)
[43] (International Energy Agency, n.d.)

country's energy security. The Russian Federation is the largest source of coal for Denmark, followed by Columbia, South Africa, Norway, Poland and United States.[44] It needs to be pointed out that the Danish governments are focusing on taking steps towards replacing coal with energy from renewable sources.

When it comes to crude oil, Denmark has its own domestic production. The produced oil in 2017 reached almost 7Mtoe, bus was lower for 12% from the 2015 production. The decreasing oil production comes along with lower domestic demand and lower exports of this source (the exports are directed towards Sweden, the Netherlands and United Kingdom[45]).

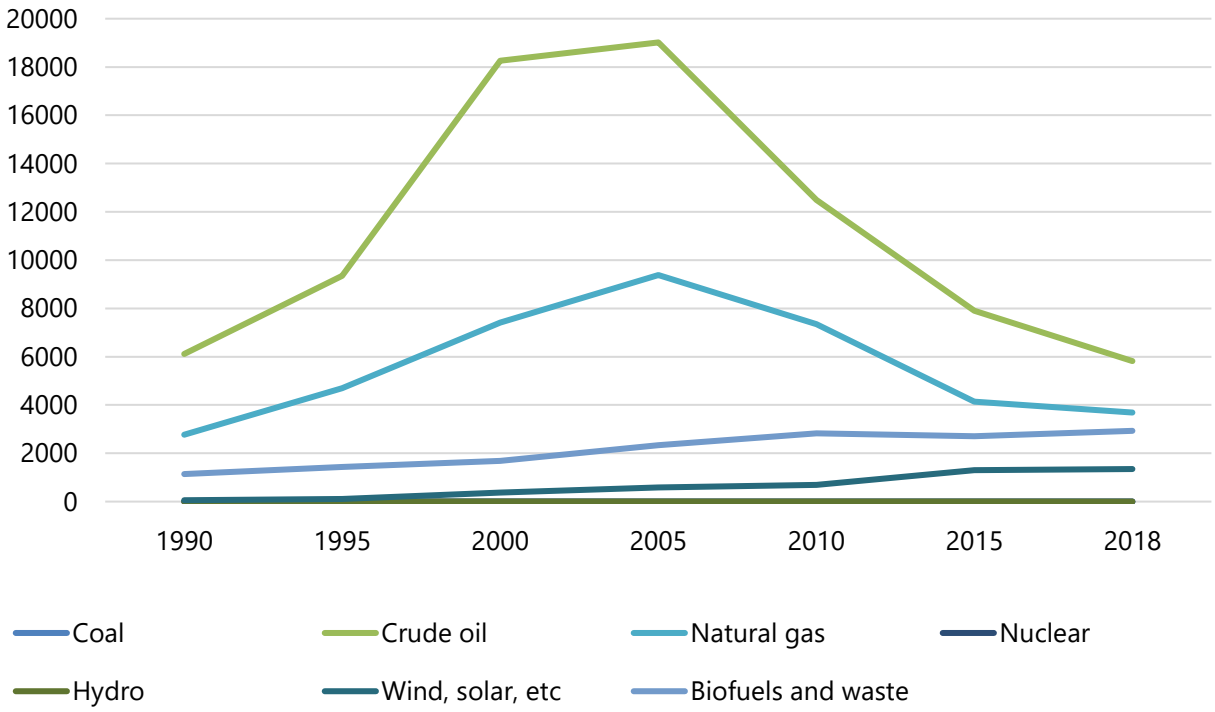

Figure 1.6.2 Energy production by source (ktoe) (Denmark)[46]

[44] (International Energy Agency, n.d.)
[45] (International Energy Agency, n.d.)
[46] (International Energy Agency, n.d.)

Existing gas transmission system includes interconnections in Nybro (for offshore production that is transmitted through two pipelines), Ellund (entry and exit route from and to Germany) and one exit route to Sweden (Dragør). In addition to that, Denmark has two operating gas storage facilities for security of supply during seasonal fluctuations.[47] With the BEMIP project, a perspective for the transportation of Norwegian gas via a new route to Denmark is opening.

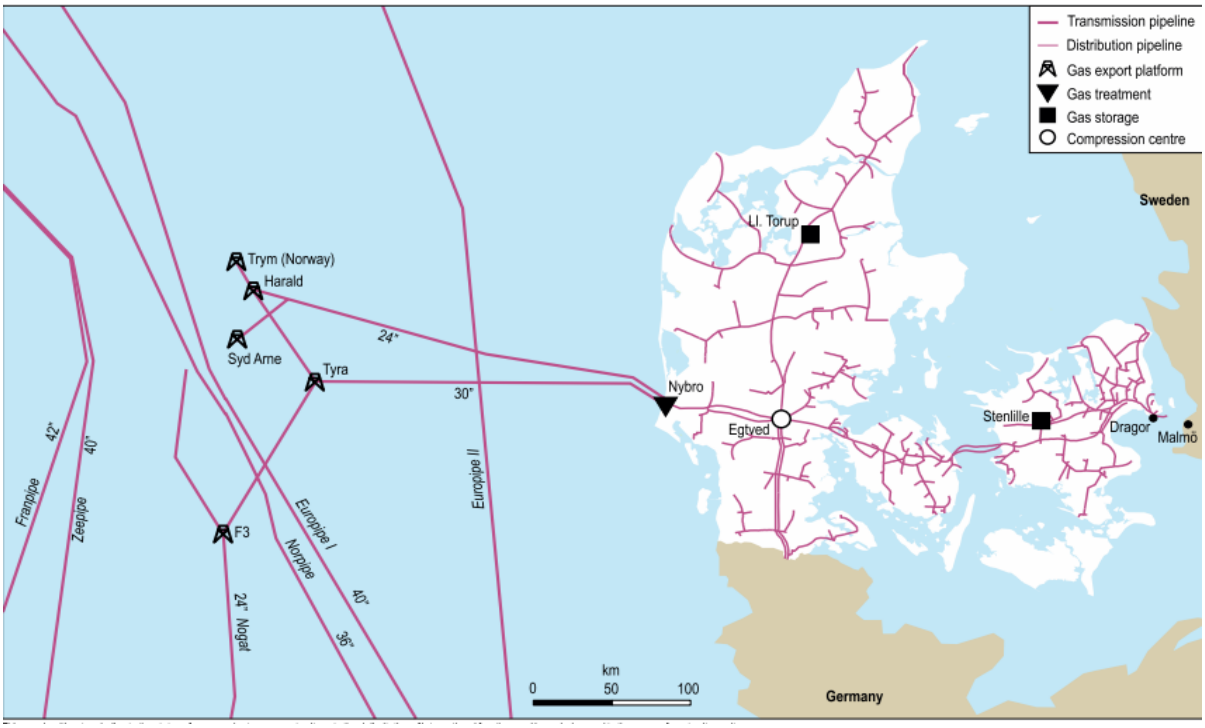

Figure 1.6.3 Natural gas infrastructure in Denmark[48]

[47] (International Energy Agency, n.d.)
[48] (International Energy Agency, n.d.)

1.7 SWEDEN

The Total Energy consumption of Sweden constitutes mostly from energy produced from crude oil, nuclear energy and biofuels and waste. The mentioned energy sources are around 80% of the country's TPES. The last decade the country has made a significant shift towards a more emissions-free energy sector, giving priority to nuclear energy and biofuels and waste.

In overall, a downward trend in total energy consumption has been observed since 2018, reaching 0.47Mtoe.[49]

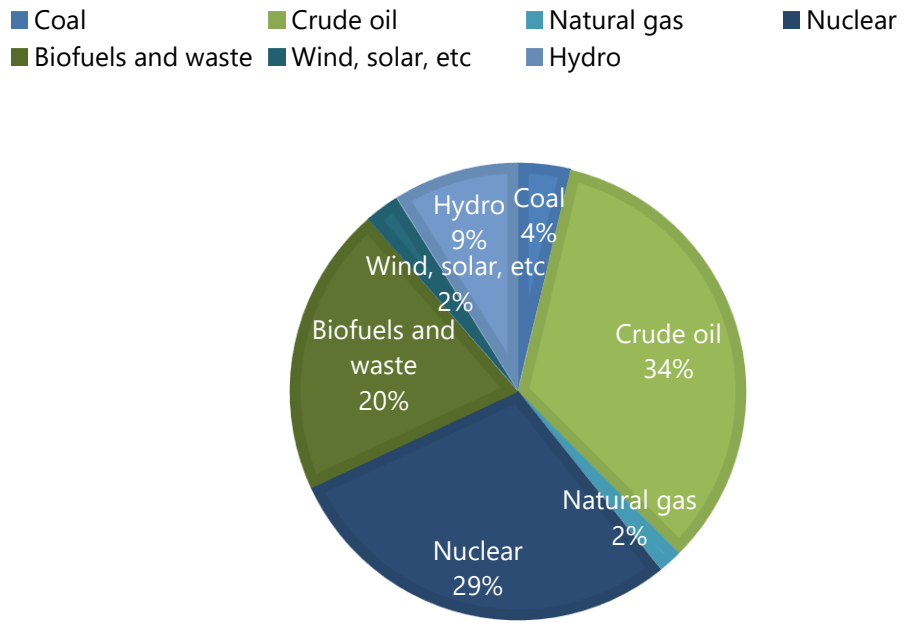

Figure 1.7.1 Energy sources in TPES (Sweden) [50]

When it comes to domestic production of energy sources, hydro, nuclear, biofuels and waste, and wind power are all domestically produced energy sources, ensuring around 70% of the country's energy efficiency.[51]

[49] (International Energy Agency, n.d.)
[50] (International Energy Agency, n.d.)
[51] (International Energy Agency, n.d.)

Sweden imports all its crude oil and natural gas. Specifically, in the case of natural gas, the single country-source of natural gas is Denmark. In the case of Sweden, natural gas does play a minor role as an energy source. In fact, the country has one of the lowest shares of natural gas in energy mix among all IEA member countries.[52]

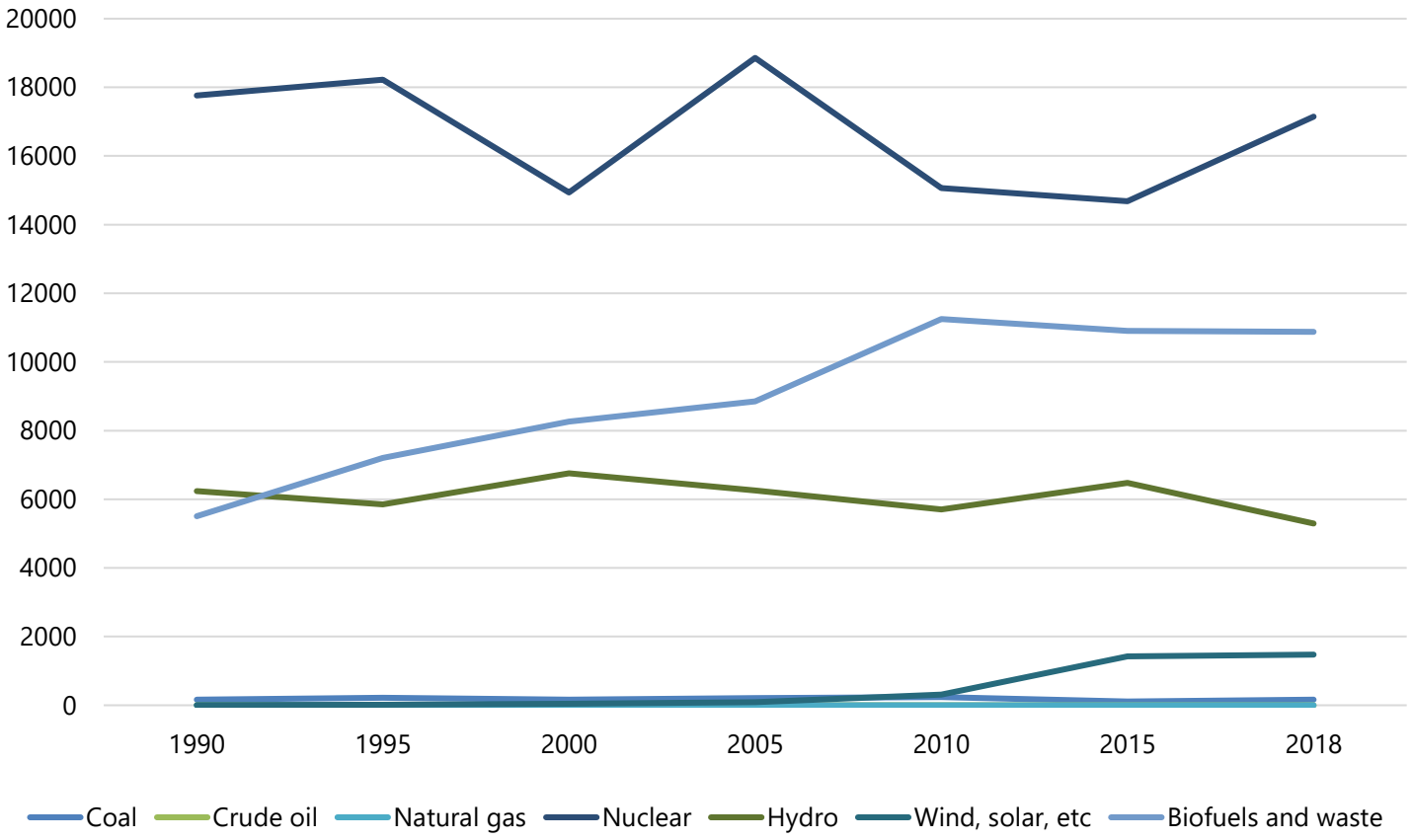

Figure 1.7.2 Energy production by source (ktoe) (Sweden)

The existing gas network is not highly developed. Besides the gas pipeline that connects the country to Denmark, there are two LNG terminals (in Lysekil with storage capacity of 30.000 m3 and in Nynäshamn with 20.000m3 capacity).[53]

[52] (International Energy Agency, n.d.)
[53] (Gasum, n.d.) and (Nauticor, n.d.)

Figure 1.7.3 Gas infrastructure in Sweden[54]

[54] (International Energy Agency, n.d.)

Having finished the overview of the countries that have the most interests in the development of the BEMIP initiative, on individual level, we can move on to a short presentation of the characteristics that the Baltic region countries face.

One common issue that features in all the countries of the Baltic region (except from Denmark) is the high dependency ratio from imports of natural gas from one single supplier (the Russian Federation), an issue that constitutes a threat for the energy security of the above countries.

COUNTRIES	CHARACTERISTICS
FINLAND	× Leader in using renewable sources × High dependency ratio from imports of coal and natural gas × Russia: sole importer of natural gas
ESTONIA	× Large domestic biomass and oil shale resources × Main importer of natural gas: Russia
LATVIA	× High share of renewable sources × Imports of natural gas: mostly from Russia, and Lithuania
LITHUANIA	× Natural gas: 2nd share in the energy mix × Imports of natural gas: mostly from Russia
POLAND	× Energy mix based on natural gas and coal × Russia: main importer of natural gas
DENMARK	× Producer and net exporter of natural gas
SWEDEN	× High dependency on imports of natural gas (and crude oil) from Denmark

2. PROJECTS OF BEMIP

The Baltic Energy Market Interconnection Plan (BEMIP), having as the main objective the open and integrated natural gas (and electricity) market in the region of the Baltic member states, creates possibilities in order to address the issue of energy security. It constitutes from several major gas interconnection projects.

PROJECTS OF BEMIP	OBJECTIVE
Gas Interconnection Poland-Lithuania (GIPL)	× The objective of the project is to create a connection between the transmission systems of Poland and Lithuania, by constructing a pipeline connecting those two countries and its supporting infrastructure. × Furthermore, the construction of GIPL is seen as an important step towards connecting the Baltic states with the EU natural gas market, and opening alternative sources and routes of gas supplies, with positive effects for the market liberalization and competitiveness.[55]
Poland Denmark Interconnection (Baltic Pipe)	× The project includes the creation of a bidirectional offshore pipeline connection between Poland and Denmark, which will provide energy to both countries and the region of the Baltic and Eastern and Central European countries.[56]
Finland Estonia Interconnector (Balticconnector)	× The aim of the project is to integrate the gas markets of Finland and the countries in Baltic region into the EU gas market, through a bidirectional pipeline connection between Finland and Estonia, which opens new supply sources (e.g. Latvia's underground storage) and increases the energy security in the region.[57]

[55] (European Commission, 2016)
[56] (Baltic Pipe Project, n.d.)
[57] (Baltic Connector, n.d.)

Each of the above projects will be evaluated based on four main criteria. The criteria are non-monetary and/or qualitative, as well as monetary.

First, the overall cost and the source of founding of the project will be examined. It is also essential to identify existing gaps and need for additional infrastructure that is considered necessary for the optimal operation of the new natural gas connections. In case of need for supportive infrastructure, the estimated cost of the implementation of the project is increasing and the construction time is extended, which makes the project more vulnerable to disruptions and complications.

The second criteria are competition and security of supply. With this criterion, it is evaluated whether the natural gas project serves the diversification of suppliers and/or routes in a certain region and in general in the European Union, thus if it promotes competition within the market of the EU and contributes to the reduction of countries and EU's dependency on imports from one supplier.

The ability to connect and integrate isolated energy markets to the rest of the markets in the European Union, and to contribute to the creation of a single European energy market is the following evaluation criterion.

Lastly, the benefits regarding fuel switching and substitution of higher carbon energy sources by natural gas is taken into consideration.

2.1 GAS INTERCONNECTION POLAND-LITHUANIA (GIPL)

The first gas project, that is under consideration, is the Gas Interconnection between Poland and Lithuania, also called GIPL. The beginning of the interconnector is placed at the Hołowczyce GCS in Poland and will run all the way to the Jauniūnai Gas Compressor Station (GCS) in Širvintos district in Lithuania[58], with the natural gas being transmitted in both directions. The project is carried out by the countries' transmission operators: Operator Gazociągów Przesyłowych GAZ-SYSTEM S.A. (Poland) and AB Amber Grid (Lithuania), with the cooperation of national regulatory authorities (Polish Urząd Regulacji Energetyki, Lithuanian Valstybinė kainų ir energetikos kontrolės komisija, Latvian Public Utilities Commission and Estonian Competition Authority).[59]

The map that follows presents the route of the Gas Interconnection Poland-Lithuania Project.

Besides the construction of the gas interconnector, the project includes the addition of supporting infrastructure: new compressor station in Gustorzyn in Poland, the modernization and extension of the pipeline to the Hołowczyce node, the extension of the Hołowczyce compressor station, and on the Lithuanian side, the creation of a gas pressure reduction and metering station.[60]

[58] (Amber Grid, n.d.)
[59] (GAZ-SYSTEM S.A., n.d.)
[60] (European Commission, 2016)

Figure 2.1.1 Route of GIPL[61]

The GIPL project benefits of the status of Project of Common Interest. It has been recognized as PCI by the European Union since it embodies the key feature of PCIs: the cross border linking of energy systems of the EU. This natural gas infrastructure will constitute, when constructed, the first connection between the transmission systems of Poland and Lithuania, and the first connection of the Eastern Baltic Sea region with the Continental Europe.[62] Besides connecting the countries mentioned above, the GIPL project will also provide additional transmission possibilities along with another PCI project, the Balticonnector (between Finland and Estonia).

[61] (Amber Grid, n.d.)
[62] (European Commission, 2015)

2.2 ASSESMENT OF GIPL

As presented at the beginning of this chapter, each of the possible projects in the BEMIP region, will be evaluated based on four criteria.

1. Cost and supportive infrastructure

The first criterion is the cost of the investment and the source of the founding, in relation with execution time and the existence of supporting infrastructure.

The estimated total cost of the project is € 558 million and is projected to be finished in 2021. The source of founding is collective, coming from the Baltic states and the European Commission's granting with the Connecting Europe Facility (CEF).[63]

The Agency of Cooperation of Energy Regulators (ACER) stated that the project will provide significant net positive benefits to Latvia, Estonia[64] and Finland. The agency is responsible for the so-called CBCA decisions (decisions for cross border cost allocation). In the agency's first opinion on the GIPL project, it was stated that Poland is a net bearer of the cost of the implementation of the project, while Latvia, Lithuania and Estonia, net benefiting countries. That is why it was decided that Poland would be compensated by an amount money paid by the net beneficiaries (€54.9 million by Lithuania, €29.4 million by Latvia and €1.5 million by Estonia). Overall, the ACER estimated that the economic benefits from the construction of the GIPL are twice as the costs.[65]

In addition, the countries of the Baltic region have another weakness, related to their existing gas transport and delivery infrastructure. Gas infrastructure in several countries, such as in Latvia, Lithuania and Estonia has been inherited from the Soviet Union. This means that the region was only connected to the Soviet Union (later to Russia) in terms of natural gas supply and was isolated from the rest of Europe. Besides the supply routes, in these countries,

[63] (European Commission, 2015)
[64] (ACER, 2014)
[65] (ACER, n.d.)

Gazprom for many years maintained stakes in natural gas companies in Estonia (37% of Eesti Gaas), Latvia (34% of Latvias Gāze) and Lithuania (37% of Lietuvos Dujo), until 2014/2015, when new european regulatory framework forced Gazprom to sell its shares.[66] Within the Third Energy Package (2009), members states were committed to unbundle their natural gas markets: the control of energy generation, transmission system and sale.[67] This way, Gazprom's influence over Baltic states was reduced.

Lithuania took action to deal with the high dependency from gas imports from Russia, creating LNG terminal in Klaipėda. The terminal is used to import and store Liquified Natural Gas (LNG) delivered from Norway and the U.S. The construction of the terminal benefited the whole region of the Baltic Sea, especially Latvia and Estonia. Latvia is connected to Lithuania via Lithuania–Latvia Interconnector, and this interconnection is linked to Estonia-Latvia Interconnection (Vireši–Tallinn pipeline).

Figure 2.2.1 Latvia - Lithuania natural gas interconnection[68]

[66] (Hoellerbauer, 2017)
[67] (European Commission, 2019)
[68] (LITHUANIA LATVIA INTERCONNECTOR, 2015)

Figure 2.2.2 Latvia – Estonia has interconnection[69]

The construction of gas interconnection between Poland and Lithuania, brings additional benefit though capitalization of existing infrastructure in the region.

Nevertheless, for the maximization of the benefits of the construction of the GIPL in the area, there is need for additional supportive infrastructure (new compressor station in Gustorzyn, the modernization and extension of the pipeline to the Hołowczyce node, the extension of the Hołowczyce compressor station[70]) that increases the cost and the execution time of the project in its entirety. It has been decided that the project will be implemented in several stages-sections, that will be carried out simultaneously or sequentially depending on the project. Any complications regarding the

[69] (INNOVATION AND NETWORKS EXECUTIVE AGENCY, n.d.)
[70] (European Commission, 2016)

implementation of all individual sections, that present additional cost and time delay is considered "local, temporary and reversible".[71]

The additional projects are considered necessary for the optimal operation of the Gas Interconnector between Poland and Lithuania since they increase the flexibility of gas flow and transmission in the region of the Baltic. The new facilities will enable increased gas supply flow and distribution (for example from Norway, towards the compressor station with Lithuania or other connected countries as the destination country).[72]

2. Competition – Security of Supply

The second feature that will be evaluated refers to the competition and security of supply.

The question is whether the GIPL project promotes the competition in the market of the European Union, by providing alternative sources and routes of supply of natural gas in the region of the Baltic countries and the European Union in general.

The countries that are mostly interested in this project, thus have the strongest incentive for the implementation of the GIPL project are directly Poland and Lithuania.

The GIPL is the first gas pipeline that will be connecting Poland and Lithuania, and the first gas interconnector between the Eastern Baltic Sea region and the Continental Europe, creating an alternative route of supply to the existing options and ending the isolation of the Baltic region from the rest of the Europe. According to Amber Grid, the GIPL will be able to satisfy around 40% of needs in natural gas in the Baltic region and Finland.[73] This is of increased importance for Poland, Latvia and Estonia, that have no other alternative source of natural gas supply.

[71] (Inwestycja Gazowa Gazociąg Polska-Litwa , n.d.)
[72] (GAZ-SYSTEM S.A., 2015)
[73] (Amber Grid, 2019)

The existing routes of natural gas supply, are natural gas transmission pipelines from Russia, and the LNG terminal located in Lithuania.[74] Most of the countries mentioned above have strong dependency from imports of natural gas from one single supplier, the Russian Federation, creating worries over the energy security of the region.

The construction of GIPL expands the possibilities to use the LNG terminal in Klaipeda, creates new routes of supply and diversifies the gas supply, since the region will be interconnected to the European gas transmission network, thus increases the energy security of Baltic countries.

3. Market integration

The EU aims to fully integrate all national energy markets into one single European energy market, that will enable the diversification of energy supply routes, will increase the union's energy security and improve competitiveness and expanding the options for consumers.[75]

Despite the progress that has been made on national and European level, the European Union still faces a significant problem: the existence of "energy islands". This concept signifies that there are regions in the European Union that are in majority lack of interconnecting infrastructure, rely on one single source of supply, thus are isolated and excluded from the natural gas supply network and energy market.[76]

On the map that follows, the existing natural gas network and interconnections in Europe are depicted. The region of the Baltic countries is considered as one of the "energy islands" of the European Union: isolated from the EU's natural gas supply network and energy market.

[74] (Jakstas, 2019)
[75] (ACER, n.d.)
[76] (Jakstas, 2019)

The implementation of GIPL project, will finally connect the market of the Baltic countries to the rest of the European Union, taking another step further towards the creation of EU's internal market in natural gas. The market in the region will become an open and competitive market, where more suppliers from the rest of the EU will have the opportunity to participate, with the customers being benefited from lower prices and plenty of options.

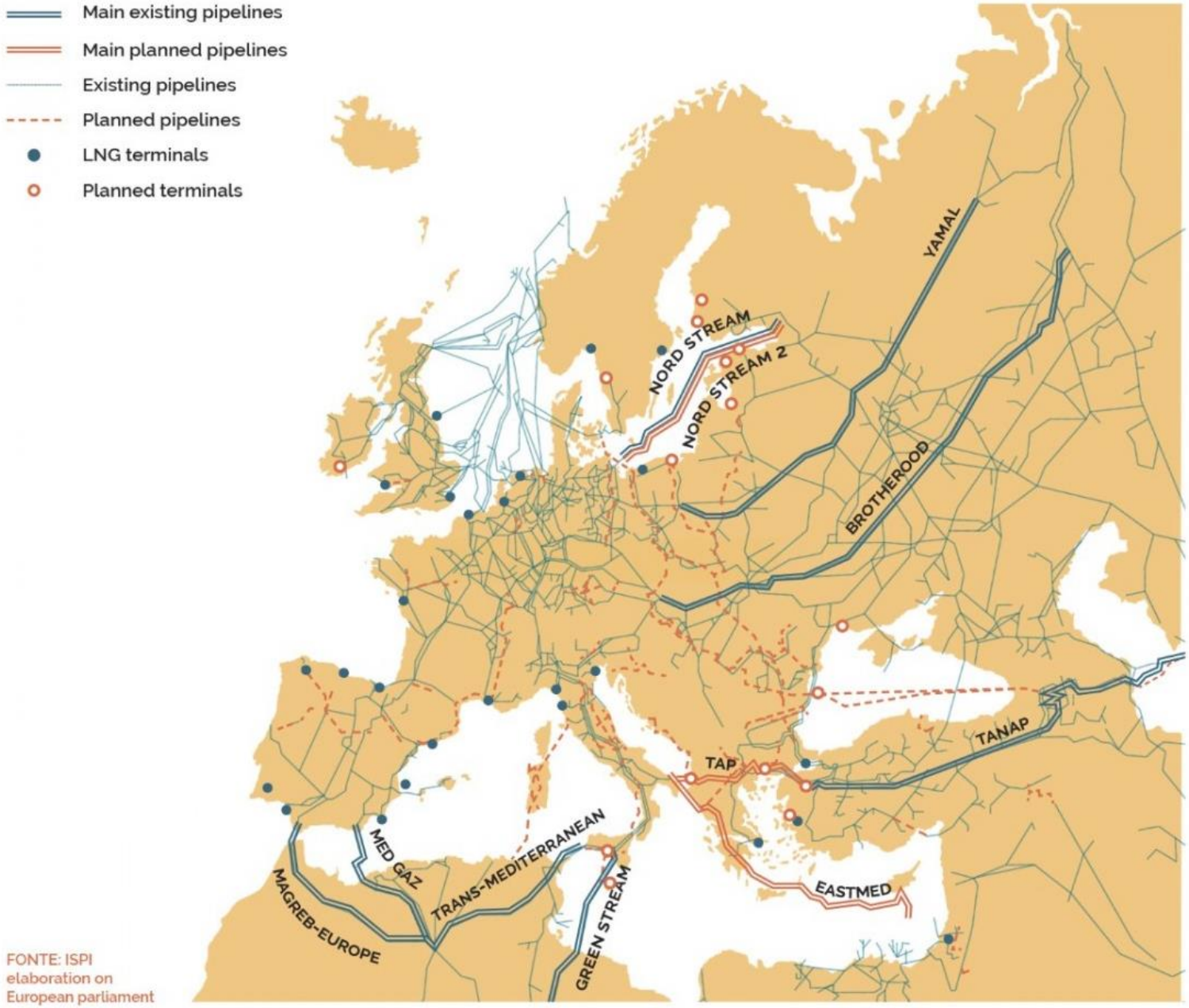

Figure 2.2.3 The gas supply routes in Europe[77]

[77] (Belladonna & Gili, 2020)

4. Fuel switch benefits

The implementation of GIPL project brings benefits due to promoting of fuel switch. Because the supply of natural gas will be facilitated and become a more safe and affordable option, countries of the Baltic region that rely on fossil fuels in their TPES, will have the opportunity to replace coal or crude oil with a more environmentally friendly source of energy.

First, Poland's share of fossil fuels in TPES is around 75% of TPES, the highest among the countries in the region. Poland not only will be able to replace most of the fossil fuels through increasing the alternative to fossil fuels natural gas, but also will benefit from reducing imports from Russia.

Latvia, Lithuania and Estonia as well would decrease dependency on fossil fuels, in favor of natural gas, reducing this way the negative environmental externalities, the CO_2 emissions.

2.3 POLAND-DENMARK INTERCONNECTION (BALTIC PIPE)

In the chapter that follows, another natural gas infrastructure project in the region of the Baltic countries will be presented. Poland-Denmark Interconnection, known also as the Baltic Pipe, is the proposed project to create a new supply corridor in the gas market of the EU. With the implementation of this gas project, it will be possible to transport natural gas from Norway (from Norwegian gas fields in the North Sea) to Denmark and Poland (to Niechorze-Pogorzelica on the North polish coast)[78], and the neighboring interconnected countries in the Baltic region and Central and Eastern Europe. The project also provides the opportunity for bidirectional flow of natural gas, from Poland to Denmark and even Sweden, giving access to the LNG from the polish LNG terminal at Świnoujście.[79]

The project is being developed and implemented in collaboration between the danish gas and electricity TSO, Energinet, and polish gas TSO GAZ-SYSTEM S.A.[80]

Figure 2.3.1 The Baltic Pipe and its sections[81]

[78] (Holroyd, 2020)
[79] (N.a., 2017)
[80] (Baltic Pipe Project, n.d.)
[81] (Viohanco, 2019)

The project presents higher level of complexity since it constitutes of five components, as shown on the map above.

1. The North Sea offshore pipeline: will connect the gas system of Norway and the Danish gas transmission system on the land.[82]

2. Onshore Denmark: will expand the existing danish transmission system from West to East. It is essential for the optimal operation of the transmission system in Denmark and the management of increased gas flows to create additional supportive infrastructure. These include:

    - ✓ construction of new pipelines from the beach near Blåbjerg to Nybro, from Egtved to the Little Belt and across the Little Belt, over Fyn from the Little Belt to Nyborg, and a new pipeline on Zealand from Kongsmark to the Baltic Sea offshore landfall

    - ✓ construction of new receiving terminal at Nybro.[83]

3. Compressor station on Zealand, Denmark: The construction of new compressor station will make possible the increase of pressure of natural gas, thus the transportation of the source between the countries through the offshore pipeline.[84]

4. The Baltic Sea offshore pipeline: This is the key project, that will connect Denmark and Poland across the Baltic. The transmission of gas will be bidirectional.

[82] (Baltic Pipe Project, n.d.)
[83] (Baltic Pipe Project, n.d.)
[84] (Baltic Pipe Project, n.d.)

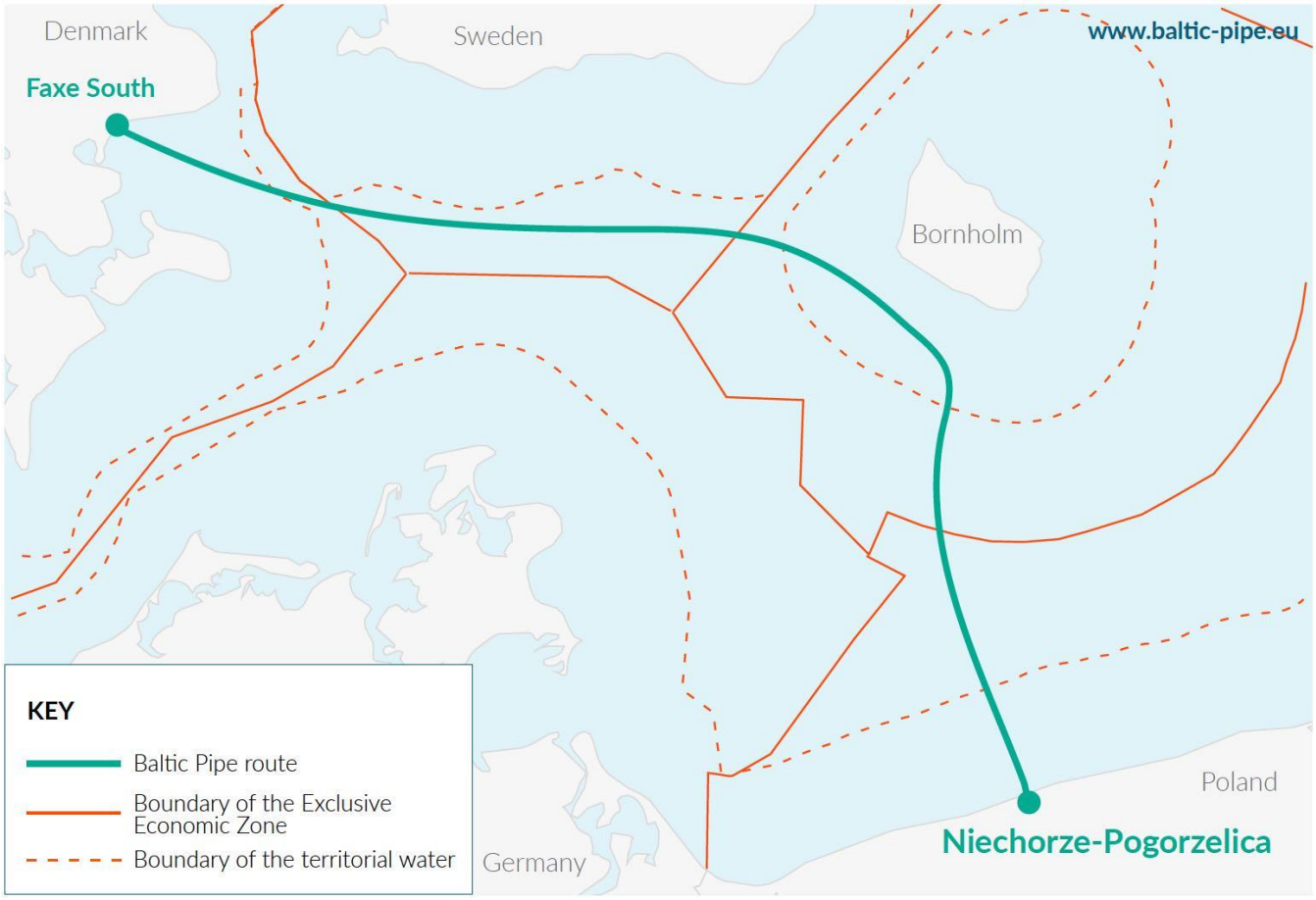

Figure 2.3.2 The Baltic Sea offshore pipeline[85]

5. Onshore Poland: The transmission system of the country needs to be modernized and expanded in order to support not only the transmission needs of Denmark, Sweden, but also the needs in neighboring countries.

   Extension projects include:

   - ✓ construction of the Goleniów-Lwówek pipeline
   - ✓ construction of Gustorzyn gas compressor station
   - ✓ extention of gas compressor stations at Goleniów and at Odolanów
   - ✓ construction of gas compressor station at Gustorzyn
   - ✓ construction of the onshore natural gas pipeline, that will connect the offshore pipeline with the transmission system of the country.

[85] (Baltic Pipe Project, n.d.)

Figure 2.3.3 Extension projects in Poland[86]

The European Union considers the Baltic Pipe project as a Project of Common Interest, due to the benefits that it provides for the EU: strengthening of the internal energy market of the EU and providing affordable, sustainable and secure energy for the consumers in the European Union.[87] Furthermore, the EU has integrated this project into its Ten Year Network Development Plan (TYNDP).[88]

[86] (Baltic Pipe Project, n.d.)
[87] (Baltic Pipe Project, n.d.)
[88] (Ramboll, 2017)

2.4 ASSESMENT OF BALTIC PIPE

1. Cost and supportive infrastructure

In the first place, the financial criteria will be evaluated.

The total estimated cost for the entirety of the project is around EUR 1,6 bn[89], split equally between the danish Energinet and the polish GAS-SYSTEM. The projected date for the beginning of gas transmission is October 2022.[90]

In addition, the project is benefited from EU's financial assistance, under the Connecting Europe Facility Program (CEF).

It is worth mentioning that the member states of the EU decided three times to grant financial support to this project (in 2017, 2018 and 2019), which indicates the importance of this project for the EU and its energy strategy. The total amount is almost EUR 215 million, which will be used for the construction of the offshore gas pipeline that will connect Poland and Denmark's national transmission systems, and for the expansion and modernization of polish transmission system.[91]

As presented above, the Poland-Denmark Interconnection consists of five correlating smaller projects, that are essential and necessary parts of the final project. That is why the total cost of the project is high, and becomes even more complex, since it requires permits of countries and different stakeholders. For example, the route of the Baltic Pipe goes through the Exclusive Economic Zone of Sweden. In May of 2020, Sweden granted the permit for the construction of the pipeline in the Swedish Exclusive Economic Zone.[92]

The additional benefits of this project multiply when one considers the fact that other already existing infrastructure such as the LNG terminal in Poland, or other natural gas interconnection e.g. between Sweden and Denmark, can be utilized in order to supply even further natural gas from Norway.

[89] (Shotter, 2020)
[90] (Energinet, n.d)
[91] (Baltic Pipe Project, n.d.)
[92] (Baltic Pipe Project, n.d.)

Lastly, it is important to point out that the total cost of the project should be balanced in a way that the utilization of the Baltic Pipe is not more expensive than other alternative sources and routes of natural gas.[93]

2. Competition - Security of supply

The Baltic Pipe is considered as a project with benefits for the competition in the market of the Baltic states and the EU in general, and increases the energy security of the countries, the region and the European Union.

The construction of all the parts of the Baltic Pipe project will expand the opportunities for alternative routes and suppliers for several countries in the region. Higher level of supply diversification means increased energy security. With the creation of the Baltic Pipe, the European Union will be able to directly import natural gas from Norway. Markets in the countries of eastern Europe will be able to purchase natural gas coming from a new source, diversifying the energy mix.

Not only the Baltic Pipe means the entrance of new supply source for countries such as Poland, Sweden and Denmark, but also constitutes a new route of supply, that will make use of the Nybro point, the LNG terminal in Poland, and even further the interconnection between Denmark and Sweden.

It must be noted that the creation of the Baltic Pipe, that will bring diversification benefits to many countries in the EU, increases the negotiation power towards Russia. It creates safe alternatives of source and routes, making the natural gas more accessible, and reducing the possibility and the impact of supply disruption.

Especially in the case of Poland and Denmark, the role and importance of those two countries is increasing. Denmark has interconnections with Sweden, and Germany, and can play the role of a transit country, managing most of the natural gas flows in the Eastern Europe once the Baltic Pipeline is created.

In addition, Poland can aim at becoming a natural gas hub in the eastern part of Europe.[94]

[93] (Ramboll, 2017)

3. Market integration

The creation of the Baltic Pipe makes possible the integration of the energy markets of the countries in the Eastern Europe and the Baltic region to the markets of the rest Europe. Countries that have a single supplier will get access to new markets and supply sources and routes. This way steadily isolated energy markets will connect with infrastructure to the rest of more developed markets of the EU.

4. Fuel switch benefits

The implementation of the project also contributes to the reduction of fossil fuels production and use in covering energy needs, thus promotes the environmental and climate change goals that the EU has established. This argument is especially important for Poland, a country that is highly dependent from coal in its Total Energy Supply. With the creation of new routes and sources for natural gas, the country will be able to gradually switch from fossil fuels to the more environmentally friendly natural gas.

[94] (Emerging Europe, 2020)

2.5 FINLAND-ESTONIA INTERCONNECTOR (BALTICCONNECTOR)

The last project that will be discussed and assessed is the Interconnector between Finland and Estonia, also known as the Balticconnector.

The Balticconnector started operation in January 2020. The discussion over this project that has been implemented will assist in the better understanding of the importance and the magnitude of the further interconnection in the BEMIP region.

The bidirectional natural gas pipeline is connection between the Finish and Estonian natural gas networks, starting from Inkoo in Finland, ending in Paldiski, Estonia. The aim of the project is to create a connection and end energy isolation of Finland, and even further connect the area to the rest of EU's natural gas network.

The project is comprised from three sections: Siunto-Inkoo onshore pipeline in Finland, the Inkoo-Paldiski offshore pipeline, and on the Estonian side the Paldiski-Kiili onshore pipeline. Additionally, the project requires the creation of compressor and metering stations in Inkoo, Finland, and in Paldiski, Estonia.[95]

Transmission System Operators from both countries were responsible for the implementation of all the parts of the project (Elering AS in Finland and Baltic Connector Oy in Estonia).[96]

Because of the importance of the project in connecting Finland with the national natural gas transmission system of other country, integrating energy isolated countries and areas and diversifying gas sources and routes, the EU added the Balticconnector to the list of Projects of Common Interest and provided a remarkable share of found necessary for the construction of the project as a whole.

[95] (Baltic Connector, n.d.)
[96] (Elering AS, n.d.)

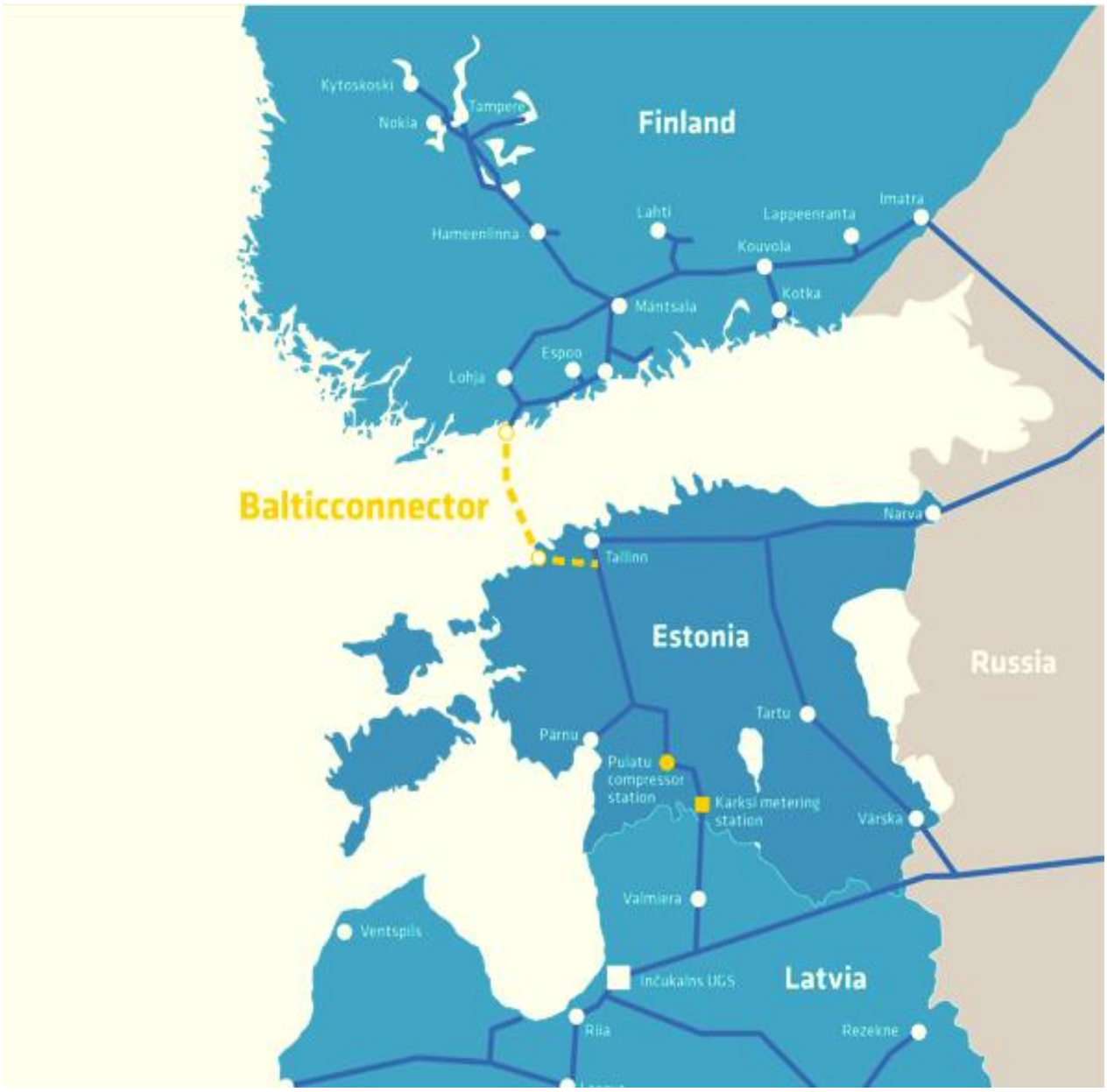

Figure 2.5.1 The Balticconnector[97]

[97] (Baltic Connector, n.d.)

2.6 ASSESMENT OF BALTICCONNECTOR

1. Cost and supportive infrastructure

First, the financial figures of the project will be presented. The total cost of the project amounted for €300 million. As a Project of Common Interest, and under the Connecting Europe Facility (CEF), a co-financing grant of €187,5 million was awarded in favor of the construction of Balticconnector, the maximum amount that was allowed.[98] In total the contribution of EU funds covered 75% of the total cost of the project.

The rest of the costs of the construction of Balticconnector were undertaken by Elering AS and Baltic Connector Oy.

It must be noted that the European Union even funded surveys for constructing the interconnection, in the amount of € 5,4 million.[99]

In addition to the main project, which is the construction of the Balticconnector, the project supports the enhancement of the interconnection between Estonia and Latvia. The aim of the project is to ensure "more coherent and diverse natural gas transmission network in the Baltic Sea region and further enable the Balticconnector project". The estimated cost is €37,3 million, and again the project will be co-funded by the European Union as it has been included in the PCIs.[100]

The overall construction and completion of the project happened uninterruptedly, and each stage was executed on time, leading to successful implementation and trial runs, and eventually to a punctual commercial functioning of the project.[101]

[98] (European Commission, 2020)
[99] (Elering AS, n.d.)
[100] (European Commission, 2016)
[101] (Baltic Connector, 2019)

2. Competition - Security of supply

Secondly, the promotion of competition and ensuring of security of supply will be discussed. The importance of the Balticconnector is that it has created an alternative route of supply of natural gas and has connected the isolated Finland form the rest of Europe.

Natural gas represents around 2% of Finland's TPES, meaning that it is not the most important energy source for the country's energy security, but it plays an important role in the heating and power generation sectors. Nevertheless, Finland depends on a single source for natural gas imports, Russia. The construction of the Balticconnector delivers certain benefits to Finland: it makes possible the transport of LNG from Lithuania and access to the Latvian Underground Storage Facility in Inčukalns.[102] In other words, for the first time Finland has been connected to the rest of Europe. Additional benefits arise when the GIPL will be constructed, since the country will get access to the market and supplies of Central Europe. Especially in the case of Finland, natural gas does not play as an important role as other energy sources currently, but the new interconnection opens the possibility for equal competition with other energy sources in the country.

For Estonia, the supporting infrastructure of the strengthening of the interconnection with Latvia, improves the country's energy security. All in all, the region gains new supply routes and sources in present and future time.

3. Market integration

The implementation of the Balticconnector promotes the liberalization of the Finnish market and its connection to the EU's energy market, with the support of the construction of the GIPL project.

Balticconnector is the missing infrastructure link that makes for Finland possible to get indirect connection to other markets of the EU, and the natural gas supply network. This means, that since January 2020 Finland is no more an

[102] (Jakstas, 2019)

isolated market, and can benefit from other future interconnection plans in the region regarding energy supply sources, routes and prices of natural gas.

Figure 2.6.1 The Balticconnector and the GIPL[103]

On the map above, the connections in the region are depicted. With the creation of GIPL and the Balticconnector the whole region, starting from

[103] (Henderson, 2015)

Finland ending at Poland, is getting interconnected via direct pipeline infrastructure connections or indirectly.

4. Fuel switch benefits

Last but not least, despite the fact that Finland doesn't rely much on natural gas regarding its energy mix and supply, the creation of a new natural gas interconnection adds opportunities to use alternative sources such as Liquified Natural Gas, and even biogas.[104]

[104] (Baltic Connector, n.d.)

3. CONCLUSION

The European Union, within its Energy Union Strategy, has expressed its goal to construct the missing links and infrastructure in the natural gas sector, in order to create, along with electricity, an energy union of EU's members states. Among the pillars of the energy union is the integration of all energy markets, including the natural gas market that will make possible the free flow of energy with the creation of essential infrastructure and connections.

The region of the BEMIP is one of the areas in Europe that constitutes an "energy island", lacking infrastructure and natural gas interconnections, and being isolated from the rest of natural gas network. Several countries in the region depend on a single importer of the source and the existing infrastructure is a connection to their single supply source.

The question that was posed in the beginning of this paper, was whether the Baltic energy market interconnection plan (BEMIP), and the projects it constitutes, is enough in order to create and improve natural gas interconnections in the countries in the area of the Baltic Sea making a step further towards the energy union.

The Baltic region constitutes of four subregions: Poland, Finland, Denmark-Sweden, and Estonia-Latvia-Lithuania. With this division in mind, each of the projects is meant to connect these subregions into one area. In particular, starting from the GIPL project, it is essential for connecting Poland with any other country member of the EU, in this case with Lithuania with the aim of ending its dependency from Russia in natural gas imports. It is important to note that the implementation of the GIPL project gives additional benefits, not only to Poland or Lithuania, but also to Latvia and Estonia because of the existing natural gas interconnections, and even further to Finland because of the Balticconnector, that links Estonia and Finland.

In addition, the Baltic Pipe will connect Poland and Denmark, making possible the supply from Norway, to Poland, Denmark, Sweden via the country's connection to Denmark, and even further (Latvia, Lithuania and Estonia). With the two above projects, Poland can become an energy hub and make further use of its LNG station.

Figure 3.1 BEMIP projects [105]

With the three pipeline connections created, the area of the Baltic Sea, is in fact getting fully interconnected when it comes to natural gas, as presented on the map above:

- ✓ With the GIPL **Poland, Latvia, Lithuania** and **Estonia** are interconnected.
- ✓ **Finland** gets connection to the EU's natural gas network with the Balticconnector and the existing interconnection between Estonia and Lithuania.
- ✓ **Denmark** and **Poland,** as well as **Sweden** via its pipeline connection with Denmark get connection through the Baltic Pipe.

With the BEMIP as a set of independent but interconnected projects, the four unconnected with each other subregions are linked, dealing with the fragmentation and the isolation of the region's countries members.

For the European Union, it is essential to gradually ensure the creation of an integrated, competitive regional market in the Baltic region. The presented PCI projects are interlinked and serve altogether the above purpose.

[105] (Gumbau, 2020)

REFERENCES

[1] Eurostaat. (n.d.). *WHAT IS THE ENERGY UNION ABOUT?*. Retrieved from: https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-1.html

[2] European Commission. (2019, March). *Clean Energy for all Europeans*. Publications Office of the European Union, pp. 8. Retrieved from: https://op.europa.eu/en/publication-detail/-/publication/b4e46873-7528-11e9-9f05-01aa75ed71a1

[3] European network of transmission system operators for gas. (2011, February 17). *BEMIP Gas Regional Investment Plan 2012 – 2021*, pp.7. Retrieved from: https://entsog.eu/sites/default/files/files-old-website/publications/GRIPs/2012/GRIP_BEMIP_MAIN.pdf

[4], [6] European Commission. (2014, July 31). *Baltic energy market interconnection plan.* Retrieved from: https://ec.europa.eu/energy/topics/infrastructure/high-level-groups/baltic-energy-market-interconnection-plan_en?redir=1

[5] EUSBSR. (n.d.). *PA Energy.* Retrieved from: https://www.balticsea-region-strategy.eu/connect-the-region/pa-energy

[7] Ministry of Employment and the Economy: Energy Department. (2011). *Nuclear Energy in Finland*., pp.7-8. Retrieved from: https://tem.fi/documents/1410877/2937056/Nuclear+Energy+in+Finland

[8], [9], [10], [12] International Energy Agency. (n.d.). *Finland: Balances for 1990-2018.* Retrieved from: https://www.iea.org/data-and-statistics/data-tables?country=FINLAND

[11], [13], [14] U.S. Commercial Service of the U.S. Department of Commerce. (2019, May 29). *Finland – Energy.* Retrieved from: https://www.export.gov/apex/article2?id=Finland-Energy

[15] International Energy Agency. (2018). *ENERGY POLICIES OF IEA COUNTRIES – Finland Overview 2018,* pp. 150. Retrieved from: https://www.connaissancedesenergies.org/sites/default/files/pdf-actualites/situation_energetique_de_la_finlande.pdf

[16] Gasum. (n.d.). *Natural gas is the cleanest fossil energy source*. Retrieved from: https://www.gasum.com/en/About-gas/natural-gas-and-lng/natural-gas-as-an-energy-source/

[17] Karagiannopoulos, L. (2019, June 11). Finland opens largest Nordic LNG terminal after delay. *Reuters*. Retrieved from: https://www.reuters.com/article/finland-lng/finland-opens-largest-nordic-lng-terminal-after-delay-idUSL8N23I2UC

[18] World Maritime News. (2019, June 11). *Finland Inaugurates Biggest LNG Terminal in the Nordics*. Offshore Energy. Retrieved from: https://www.offshore-energy.biz/finland-inaugurates-biggest-lng-terminal-in-the-nordics/

[19], [21], [24], [25] International Energy Agency. (2019). *Energy Policies of IEA countries: Estonia 2018 Review*, p12,82. Retrieved from: https://webstore.iea.org/login?ReturnUrl=%2fdownload%2fdirect%2f2869%3ffileName%3dEstonia_2019_Review.pdf&fileName=Estonia_2019_Review.pdf

[20], [22], [23] International Energy Agency (n.d.). *Estonia: Balances for 1990-2019*. Retrieved from: https://www.iea.org/data-and-statistics/data-tables?country=ESTONIA

[26] The Baltic Times. (2019, June 13). *GET Baltic is expanding regional gas exchange operations to Finland from 2020*. The Baltic Times. Retrieved from: https://www.baltictimes.com/get_baltic_is_expanding_regional_gas_exchange_operations_to_finland_from_2020/

[27] European network of transmission system operators for gas. (2011, February 17). *BEMIP Gas Regional Investment Plan 2012 – 2021*, pp.20. Retrieved from: https://entsog.eu/sites/default/files/files-old-website/publications/GRIPs/2012/GRIP_BEMIP_MAIN.pdf

[28], [30] International Energy Agency. (n.d.). *Latvia: Energy Balances for 1990-2018*. Retrieved from: https://www.iea.org/data-and-statistics/data-tables?country=LATVIA&energy=Balances&year=2017

[29] European Commission. (n.d.). *Europe 2020 targets: statistics and indicators for Latvia*. Retrieved from: https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-

monitoring-prevention-correction/european-semester/european-semester-your-country/latvia/europe-2020-targets-statistics-and-indicators-latvia_en

[31] Conexus Baltic Grid. (n.d.). *Inčukalns UGS*. Retrieved from: https://www.conexus.lv//incukalns-ugs-459

[32] World Energy Council (n.d.). *Natural Gas Supply in Latvia*. Retrieved from: http://weclmc.lza.lv/images/stories/energetika/GAZe.pdf

[33] Budapest LNG Summit. (2019, October 11). *Latvia to consider South Korean Kogas as main partner for the Skulte LNG Terminal project*. Retrieved from: https://budapestlngsummit.hu/news/latvia-to-consider-south-korean-kogas-as-main-partner-fEnhancement of Estonia-Latvia interconnectionor-the-skulte-lng-terminal-project/

[34], [100] European Commission. (2016, May 30). *Enhancement of Estonia-Latvia interconnection*. Retrieved from: https://ec.europa.eu/eipp/desktop/en/projects/project-24.html

[35], [36] International Energy Agency. (n.d.). *Lithuania: Energy Balances for 1990-2018*. Retrieved from: https://www.iea.org/data-and-statistics/data-tables?country=LITHUANIA

[37] Sytas, A. (2019, January 21). *Lithuania LNG port aims to be Baltic hub, double flows*. Retrieved from: https://www.reuters.com/article/lithuania-lng/lithuania-lng-port-aims-to-be-baltic-hub-double-flows-idUSL8N1ZL2C9

[38] European network of transmission system operators for gas. (2011, February 17). *BEMIP Gas Regional Investment Plan 2012 – 2021*, pp.34. Retrieved from: https://entsog.eu/sites/default/files/files-old-website/publications/GRIPs/2012/GRIP_BEMIP_MAIN.pdf

[39], [41] International Energy Agency. (n.d.). *Poland: Balances for 1990-2018*. Retrieved from: https://www.iea.org/data-and-statistics/data-tables?country=POLAND&energy=Balances&year=2017

[40] Giantas, K. A. (2019, February). *Overview of the energy sector and the energy policy of Poland*, p. 12. Energy and Environmental Policy Laboratory, University of Piraeus. Retrieved from: http://energypolicy.unipi.gr/wp-content/uploads/2019/02/Unipi_WP14_GiantasKamila201902.pdf

[42], [46] International Energy Agency. (n.d.). *Denmark: Energy Balances for 1990-2018*. Retrieved from: https://www.iea.org/data-and-statistics/data-tables?country=DENMARK

[43], [44], [45], [47], [48] International Energy Agency. (n.d.). *Energy Policies of IEA countries: Denmark 2017 Review*, p. 44, 55, 59, 60, 70,. Retrieved from: https://www.scribd.com/document/439123118/EnergyPoliciesofIEACountriesDenmark2017Review-pdf

[49], [50] International Energy Agency. (n.d.). *Sweden: Energy Balances for 1990-2018*. Retrieved from: https://www.iea.org/data-and-statistics/data-tables?country=SWEDEN&energy=Balances&year=2017

[51], [52], [54] International Energy Agency. (n.d.). *Energy Policies of IEA countries: Sweden 2019 Review*, p.21, 141, 145. Retrieved from: https://webstore.iea.org/download/direct/2495

[53] Gasum. (n.d.). *Gasum LNG terminal in Lysekil*. Retrieved from: https://www.gasum.com/en/About-gas/natural-gas-and-lng/lng-supply-chain/terminals--liquefaction-plants/gasum-terminal-lysekil/

and

Nauticor. (n.d.). *LNG TERMINAL NYNÄSHAMN*. Retrieved from: https://nauticor.de/lng-terminal-nynaeshamn

[55] European Commission. (n.d.). *Construction of the Gas Interconnection Poland-Lithuania (GIPL) including supporting infrastructure*. Retrieved from: https://ec.europa.eu/inea/en/connecting-europe-facility/cef-energy/8.5-0046-pllt-p-m-14

[56] Baltic Pipe Project. (n.d.). *Baltic Pipe project benefits*. Retrieved from: https://www.baltic-pipe.eu/about/the-project-about-benefits/

[57] Baltic Connector. (n.d.). *The company*. Retrieved from: http://balticconnector.fi/en/company/

[58], [61] Amber Grid (n.d.). *GAS INTERCONNECTION POLAND–LITHUANIA (GIPL)*. Retrieved from: https://www.ambergrid.lt/en/projects/gas-interconnection-poland-lithuania-gipl

[59] GAZ-SYSTEM S.A. (n.d.). *Gas Interconnection Poland – Lithuania (GIPL) Backbone of Regional Market Development*, p. 9. Retrieved from:

https://www.lsta.lt/files/seminarai/140226_Lenkijos%20ambasada/Pranesimai/04_sek_-_gipl.pdf

[60], [70] European Commission. (2016). *Construction of the Gas Interconnection Poland-Lithuania [GIPL] including supporting infrastructure.* Retrieved from: https://ec.europa.eu/inea/sites/inea/files/fiche_8_5-0046-pllt-p-m-2014_final_1.pdf

[62], [63] European Commission. (2015, October 15). *End of energy isolation in the Baltics: how the Gas Interconnector Poland-Lithuania (GIPL) works*. Retrieved from: https://ec.europa.eu/commission/presscorner/detail/en/MEMO_15_5845

[64] ACER. (2014, August 11). *DECISION OF THE AGENCY FOR THE COOPERATION OF ENERGY REGULATORS No 01/2014 of 11 August 2014,* p 3. Retrieved from: https://acer.europa.eu/Official_documents/Acts_of_the_Agency/Individual%20decisions/ACER%20Individual%20Decision%2001-2014%20on%20GIPL.pdf

[65] ACER. (n.d.). *Citizens' summary Energy infrastructure projects in the EU: How to ensure they benefit all Member States*, p.2. Retrieved from: https://acer.europa.eu/Media/Citizens%20summaries/ACER-CS-02-15.pdf

[66] Hoellerbauer, S. (2017, June 14). Baltic Energy Sources: Diversifying Away from Russia. *Baltic Bulletin*. Retrieved from: https://www.fpri.org/article/2017/06/baltic-energy-sources-diversifying-away-russia/

[67] European Commission. (2019, May 21). *Third energy package.* Retrieved from: https://ec.europa.eu/energy/topics/markets-and-consumers/market-legislation/third-energy-package_en

[68] *LITHUANIA LATVIA INTERCONNECTOR*. (2015, April 23). Wikipedia

[69] Innovation and Networks Executive Agency. (n.d.). *Construction works for the Enhancement of Latvia-Lithuania interconnection*. Retrieved from: https://ec.europa.eu/inea/en/connecting-europe-facility/cef-energy/8.2.1-0001-lvlt-w-m-19

[71] Inwestycja Gazowa Gazociąg Polska-Litwa (n.d.). *Pytania i odpowiedzi*. Retrieved from: http://gazociagpolskalitwa.pl/pytania-i-odpowiedzi/

[72] GAZ-SYSTEM S.A. (2019, October 25). *GAZ-SYSTEM LAUNCHES TENDER PROCEEDINGS FOR EXTENSION OF GOLENIÓW AND ODOLANÓW GAS COMPRESSOR STATIONS AND CONSTRUCTION OF A NEW GAS COMPRESSOR STATION IN GUSTORZYN*. Retrieved from: https://en.gaz-system.pl/press-centre/news/information-for-the-media/artykul/203045/

[73] Amber Grid. (2019, April 2). *Amber Grid GIPL*. [Video file]. Retrieved from: https://www.youtube.com/watch?v=GeShF97AXYE&ab_channel=AmberGrid

[74], [76], [102] Jakstas, T. (2019, August). Creation of regional gas market in the Baltic States and Finland: Challenges and opportunities, p. 4, 7, 8. *BSR Policy Briefing series*. Centrum Balticum.

[75] ACER. (n.d.). *The EU Energy Market*. Retrieved from: https://www.acer.europa.eu/en/the_eu_energy_market/Pages/default.aspx

[77] Belladonna, A. & Gili, A. (2020, February 21). *The Geopolitics of Gas in the European Union*. Italian Institute for International Political Studies. Retrieved from: https://www.ispionline.it/en/pubblicazione/geopolitics-gas-european-union-25103

[78] Holroyd, M. (2020, May 5). Baltic Pipe Project: Deal agreed to build gas pipeline under sea between Denmark and Poland. *Euronews*. Retrieved from: https://www.euronews.com/2020/05/05/baltic-pipe-project-deal-agreed-to-build-gas-pipeline-under-sea-between-denmark-and-poland

[79] N.a. (2017, July 27). *The Baltic Pipe Project moves to the next level*. Central Europe Energy Partners. Retrieved from: https://www.ceep.be/baltic-pipe-project-moves-next-level/

[80] Baltic Pipe Project. (n.d.). *Crossing borders for secure, affordable and sustainable energy*. Retrieved from: https://www.baltic-pipe.eu/

[81] Viohalco. (2019, August 27). *Energinet announces award of Baltic Pipe offshore to Corinth Pipeworks*. Retrieved from: https://www.viohalco.com/Article/68/

[82] Baltic Pipe Project. (n.d.). *The project: Project Map*. Retrieved from: https://www.baltic-pipe.eu/the-project/

[83] Baltic Pipe Project. (n.d.). *The project: Onshore Denmark*. Retrieved from: https://www.baltic-pipe.eu/the-project/denmark-onshore/

[84] Baltic Pipe Project. (n.d.). *The project: Compressor station in Denmark*. Retrieved from: https://www.baltic-pipe.eu/the-project/compressor-station-denmark/

[85] Baltic Pipe Project. (n.d.). *The project: The Baltic Sea offshore pipeline*. Retrieved from: https://www.baltic-pipe.eu/the-project/compressor-station-denmark/

[86] Baltic Pipe Project. (n.d.). *The project: Gas pipeline connecting the Baltic Pipe with the National Transmission System*. Retrieved from: https://www.baltic-pipe.eu/the-project/poland-onshore/gas-pipeline-connecting-baltic-pipe-national-transmission-system/

[87] Baltic Pipe Project. (n.d.). *The project: Project of Common Interest (PCI)*. Retrieved from: https://www.baltic-pipe.eu/about/project-of-common-interest/

[88], [93] Rambol. (2017, April). *ABSTRACT OF FEASIBILITY STUDY BALTIC PIPE PROJECT*, p.9. Retrieved from: https://www.ceep.be/www/wp-content/uploads/2017/07/Abstract-of-Feasibility-Study_Final.pdf

[89] Shotter, J. (2020, June 8). Polish gas network close to fully financing Baltic Pipe to Norway. *The Financial Times*. Retrieved from: https://www.ft.com/content/e3a8266d-3cc4-4c0e-93d0-3fd469553704

[90] Energinet. (n.d.). *Baltic Pipe*. Retrieved from: https://en.energinet.dk/Infrastructure-Projects/Projektliste/BalticPipe

[91] Baltic Pipe Project. (n.d). *Financial support from the EU*. Retrieved from: https://www.baltic-pipe.eu/about/financial-support-eu/

[92] Baltic Pipe Project (2020, May 15). *GAZ-SYSTEM holds all construction permits for Baltic Pipe project*. Retrieved from: https://www.baltic-pipe.eu/gaz-system-holds-all-construction-permits-for-baltic-pipe-project/

[94] Emerging Europe. (2020, May 5). *Work set to start on Baltic Pipe gas conductor*. Retrieved from: https://emerging-europe.com/business/work-set-to-start-on-baltic-pipe-gas-conductor/

[95] Baltic Connector. (n.d.). *BALTICCONNECTOR natural gas pipeline worksites*, p. 2. Retrieved from: http://balticconnector.fi/wp-content/uploads/2019/01/Balticconnector_project-worksites.pdf

[96], [99] Elering AS. (n.d.). *Balticconnector*. Retrieved from: https://elering.ee/en/balticconnector

[97], [104] Baltic Connector (n.d.). *The project*. Retrieved from: http://balticconnector.fi/en/the-project/

[98] European Commission. (2020, January 8). *Balticconnector gas pipeline up and running since 1 January 2020*. Retrieved from: https://ec.europa.eu/info/news/balticconnector-gas-pipeline-ready-use-1-january-2020-2020-jan-08_en

[101] Baltic Connector. (2019, November 5). *Balticconnector pipeline will be ready for use on schedule*. Retrieved from: http://balticconnector.fi/en/balticconnector-pipeline-will-be-ready-for-use-on-schedule/

[103] Henderson, H. (2019, April 25). MAN Compressors For Balticconnector Project. *Gas Compression Magazine*. Retrieved from: *https://gascompressionmagazine.com/2019/04/25/man-compressors-for-balticconnector-project/*

[105] Gumbau, A. [@AnnaGumbau]. (2020, January 16). *With the launch of the #Balticconnector, start-up of construction of #GIPL and progress on #BalticPipe, 2020 will be an important year for #BEMIP & the Baltic gas markets integration.* [Tweet; attached picture]. Retrieved from: https://twitter.com/AnnaGumbau/status/1217748811092762624