

Experience of the Krk LNG Terminal's Operation in Croatia Over the Past Year¹

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The PCI project in Krk was significant – since it was on a number of strategic priority lists for Croatia and the EU. The projections identified target markets for Croatian LNG in 8 countries, with an estimated combined annual gas demand of 37 billion cubic metres. The terminal on Krk was commissioned in January 2021 and has since been operating as a floating offshore storage and regasification facility. The gas taken up and regasified is fed into the Croatian national transmission network, which is interconnected with Hungary and other EU and non-EU member states. In the year of commissioning, a new complementary service was already added to the package of capabilities of the terminal, which allows for small-scale natural gas refuelling. The terminal has a number of positive benefits beyond the obvious improvement of the regional security of supply. These include the efficient integration of the North-South Gas Corridor into the regional gas market and the enhancement of market opportunities for Central and Southeast European operators and the competitiveness of the region. The aim of this presentation is to assess the one-year operation of the terminal in terms of gas supply and to present the energy future of the region.

Keywords: natural gas, LNG, Krk, energy import, PCI project

Introduction

Hungary and the whole European Union will face a challenging energy transition in the 2020 decade, based on the Green Deal package³ of measures published by the European Commission in December 2019. If the ambitious targets set out in the package are met, the European Union (hereafter: EU, Union, Community) could become the most progressive and environmentally friendly organisation in the world (the declared ultimate goal of the package is to make Europe the world's first climate-neutral continent by 2050). For this to happen, Member States will have to overcome a number of legal, infrastructural and political obstacles over the next 30 years, leading to decarbonisation and thus the desired

¹ The present publication was presented in an oral form on the *II South America, South Europe International Conference* at the Ludovika – University of Public Service, Budapest, Hungary, on 3–5 March 2022.

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³ European Commission: *The European Green Deal in a Nutshell*. 11 December 2019a.

climate neutrality. This process will, of course, involve the long-term displacement of conventional energy sources (imported and exported fossil fuels) used in the EU. Knowing the EU's energy and climate objectives, it is important to have an idea of the availability of the – temporary – options needed to achieve these objectives. Natural gas can be a good alternative to coal-fired power plants that are not generating electricity, provided that the EU can guarantee the security of supply, a properly diversified market and interoperable infrastructure needed to meet the increased demand. As the Community is highly exposed to the Russian Federation in terms of natural gas energy, it is important to support EU imports of Liquefied Natural Gas (LNG) for reasons of diversification. Although gas will continue to be transited through pipeline networks within the continent, due to import diversification, the EU's gas market diversification will be strengthened from an import perspective.

The aim of the analysis is to examine the operation of the Krk LNG terminal, which is directly relevant for our region within the European natural gas market, apropos of the terminal's operation for more than a year. The paper briefly describes the general LNG market conditions in the EU and the safety risks associated with the use of LNG technology. The main part of the thesis is the context of the implementation of the Krk Island LNG terminal, as indicated in the title, with particular reference to its position in the PCI lists, the main dates of the investment, the details of the financing and the technical data of the plant. In the end, the summary discusses the security of supply in the Balkans, the importance of small-scale capabilities and the future of LNG technology. Based on the author's preliminary perception, the operation of this terminal is useful, and its capacity should be expanded in the future. Considering the long-term operation of the terminal, it may be worthwhile to follow its position in the European gas market as the Russian–Ukrainian conflict escalates, especially with a particular focus on the imports from the Middle East and the U.S.

The LNG market of the European Union

Before getting to the specific subject of the analysis, it is worth mentioning the EU LNG market in general, with a special focus on the same periods in 2020 and 2021. This will make it possible to compare and measure the impact of the operation of the Krk terminal on the EU LNG market: the fourth quarter of 2020 was the last quarter to include data without Croatian imports – the last quarter of 2021 will be supplemented by periodic figures for almost a year of Croatian operations. I think it is particularly important to look at periods that measure the market during the heating season, when there is intensive demand.

The European Union's quarterly LNG import volume in Q4 2020 was 16.6 billion cubic metres.⁴ In 2020, the total volume of LNG imported into the EU was 84 billion cubic metres.⁵ In 2020 (considering the full year), the largest LNG importing countries were Spain (21.4 billion cubic metres), France (20 billion cubic metres), Italy (12 billion cubic

⁴ European Commission: *Report on European Gas Market 2020 Q4*. 2021a. 14.

⁵ European Commission (2021a): op. cit. 14.

metres), the Netherlands (7.8 billion cubic metres) and Belgium (7.4 billion cubic metres). The imports increased significantly in the fourth quarter of 2021⁶ (22.1 billion cubic metres), up by 33% compared to the same period in 2020. It is important to note that after 2021, EU LNG purchases more than doubled in the first months of 2022 year-on-year. In the period under review, a total of 302⁷ tankers arrived, which is also more than the 227⁸ deliveries in 2020 Q4. In total, during 2021, Member States imported approximately 80 billion cubic metres of LNG, which is lower than the amount imported in 2020.

Trends in Croatian LNG

Croatia's imports are already included in the reports of 2021: in the second quarter of 2021, the United States was Croatia's largest supplier of LNG (82% of its total LNG imports).⁹ Russia was the second largest importer of Croatian LNG with 18%. The filling up rate in the country was 29% at the end of the quarter.¹⁰ Considering the 2021 Q3 period, Croatia purchased 0.45 billion cubic metres of LNG.¹¹ In this quarter, the United States was again the largest supplier to Croatia (44%), but unlike before, Qatar became the second largest supplier with a share of 34%. In Q3 2021, Russia did not deliver significant volumes of natural gas to Croatia.¹² In terms of the level of filling of the storages, at the end of Q3 2021, the average EU filling rate was 75%, with the second highest rate in Croatia reaching 91%.¹³ In the fourth quarter, Croatian LNG imports amounted to 0.4 billion cubic metres, while the storage fill rate remained unchanged.¹⁴ Also in this period, the United States was the largest supplier of LNG to Croatia, with 53% of the imported volume.¹⁵

Operating LNG terminals

Among LNG plants, a distinction is made between large-scale and small-scale terminals. The geographic distribution of the terminals operating in the territory of the Community is clearly concentrated on the northwest and southwest coast of the continent. The plants in Europe are almost exclusively import facilities, the only exceptions those located outside the EU (Norway and Russia).

⁶ European Commission (2021a): op. cit. 15.

⁷ European Commission (2021a): op. cit. 15.

⁸ European Commission (2021a): op. cit. 14.

⁹ European Commission: *Report on European Gas Market 2021 Q2*. 2021c. 16.

¹⁰ European Commission (2021c): op. cit. 21.

¹¹ European Commission: *Report on European Gas Market 2021 Q3*. 2022a. 15.

¹² European Commission (2022a): op. cit. 16.

¹³ European Commission (2022a): op. cit. 22.

¹⁴ European Commission: *Report on European Gas Market 2021 Q4*. 2022b. 15.

¹⁵ European Commission (2022b): op. cit. 17.

In 2022, 29 large-scale LNG terminals operate in Europe. Of these, 21 are located in an EU Member State, three in the U.K. (not an EU Member State since 2020), four in Turkey and one in Russia.¹⁶ From 2021, Croatia could of course be added to the list.

With further infrastructure interconnections, a number of the terminals already operating could be capable of supplying natural gas to our narrower region, the Central and Eastern European area. One of these could be the Porto Levante terminal on the northern coast of Italy. This terminal has a direct connection to Austria, where the regional gas distribution centre is located.¹⁷ It is also important to mention the facilities from Poland, the terminal at the port of Swinoujscie. Although the terminal itself is not geographically remote from the region under study, a fundamental shortcoming in the EU gas network can be identified when we analyse the possibilities for transporting the imported natural gas inland. Unlike in the western part of the continent, the EU's overland pipeline system is not sufficiently well chiselled on the eastern side. This means that the pipeline network is mainly East-West direction defined, while North-South interoperability is not fully ensured. From an infrastructure point of view, our region is not entirely ready to receive imports from the Baltic Sea, and to ensure full interconnectivity, additional North-South interconnectors would need to be built and continuously operated.¹⁸ Especially since, in the context of the Russian–Ukrainian conflict that started in early 2022, the EU is increasingly referring to the introduction of a solidarity clause to cover the threatened gas supply of Member States.

Security risks of LNG terminals

Special rules apply to the transport and storage of LNG. The substance itself, the liquefied natural gas, can basically maintain its liquid state when it is held at an extra-low temperature. LNG is stored at normal pressure. This change of state allows much larger quantities of natural gas to be stored in containers of a given capacity (1 cubic metre of LNG is equivalent to 625 cubic metres of gaseous natural gas).¹⁹

Since gaseous natural gas is processed by removing the pollutants from the mixture, “pure LNG contains no flammable source and therefore does not burn on its own. A fire or an explosion requires a combination of three factors: flammable material, oxygen and a heat source. LNG can therefore only catch fire if it is in contact with air in a closed environment producing an exactly 5–15 percent mixture and if there is a source of ignition close-by”.²⁰ If it still happens, LNG becomes an explosive substance that spreads rapidly. It burns at about twice the speed of regular petrol, with a combustion temperature of

¹⁶ Danielle Murphy–Cannella – Magnus Eikens: Jettyless Terminals: Accelerating Alternative LNG Import to Europe. *Econnectenergy*, 08 March 2022.

¹⁷ Diána Blanka Blum: *Az LNG szerepe a közép- és kelet-európai gázdiverzifikációban. A régióknak ellátásbiztonságának fokozása*. Budapest, GlobeEdit, 2020. 52.

¹⁸ At the Polish–Slovak and Slovak–Hungarian border crossing points.

¹⁹ Jianhua Li – Zhenghua Huang: Fire and Explosion Risk Analysis and Evaluation for LNG Ships. *Procedia Engineering*, 45 (2012). 70–76.

²⁰ Zsuzsanna Réka Kecse: A cseppfolyós földgáz, azaz az LNG szerepe Európában. *International Relations Quarterly*, 1, no. 4 (2010). 2.

650 degrees Celsius. Another characteristic is that it is difficult to smother and there is a high risk of re-ignition.²¹ Obviously, this involves safety risks, and to minimise these, a number of rules have been put in place for the construction of LNG ships and plants.²²

Relevant PCI projects

The projects on the PCI list, as it is known in EU terminology, are a collective name for energy investments that will bring positive benefits to multiple members of the Community and help the EU achieve its energy and climate policy goals by connecting national energy systems. These investments are ranked by the EU on the basis of a common trans-European infrastructure development plan, and the projects on this list are prioritised at Community level.²³ Initiatives to extend the onshore pipeline network are the most likely to be included, as strengthening transit systems interoperability, through the construction of interconnectors and making them bidirectional, will generate added value for the Community energy sector in a more resource and time efficient way. The first PCI list was created in 2013 and the current list was published in 2021. The projects on this list have received a total EU contribution of €30 billion in the previous budget cycle, from 2014 to 2020, through the Connecting Europe Facility (CEF) programme.²⁴

Four of the initiatives on the previous list published in 2019 (Shannon, Krk, Gdansk, Alexandroupolis) were aimed to support the deployment of new LNG terminals on the continent.²⁵ In addition to what has been previously described, these types of investments will in the long term, both strengthen competition in the gas market and contribute to securing the EU's energy supply.²⁶

2021 PCI list

The fifth PCI list, currently in force, reflects the infrastructure priorities in line with the EU's climate policy objectives as set out in the Green Deal package, as it does not include any new fossil fuel infrastructure projects and focuses on supporting the implementation of decarbonisation ambitions. The number of PCIs supporting the Union's gas network was reduced from the 32 projects in 2019 to 20 projects in 2021.²⁷ With the 20 projects in

²¹ Li-Huang (2012): op. cit. 71.

²² Vlado Frančić et al.: *Maritime Study LNG FSRU Krk*. University of Rijeka, 2017. 53.

²³ Takácsné Tóth Borbála: Közös érdekű energetikai infrastruktúra-fejlesztési projektek az Energia Közösségben. *Jelentés az energiapiacokról*, 13, 3 (2013). 9.

²⁴ INEA: Third State of the Energy Union: EU Is on Track to Implement the Energy Union and Deliver Jobs, Growth and Investments. *INEA*, 24 November 2017.

²⁵ Commission Delegated Regulation (EU) 2020/389 of 31 October 2019 amending Regulation (EU) No 347/2013 of the European Parliament and of the Council as regards the Union list of projects of common interest.

²⁶ European Commission: *Key Cross Border Infrastructure Projects*. 2020.

²⁷ European Commission: *Questions and Answers on the Fifth List of Energy Projects of Common Interest (PCIs)*. 19 November 2021d.

progress now running out, this type of investment is unlikely to be launched again – in line with the EU's decision to phase out support for fossil fuel infrastructure. Currently, only 1 LNG terminal²⁸ remains on the list, the rest of the LNG projects have already been completed in the previous cycle. The remaining subtasks in the 2021 list related to the Krk plant are summarised in the 6.26.1 Croatia–Slovenia cluster²⁹ as follows: construction of the Croatia–Slovenia connection, the 2nd phase of the modernisation of the Kidričevo compressor station and the modernisation of the Rogatec connection. As the European Commission is committed to aligning the EU energy regulation with the Green Deal, a review of the TEN-E³⁰ Regulation was also initiated at the end of 2020, resulting in an interim political agreement³¹ between the Commission and Parliament in December 2021. In this way, the regulatory environment would not allow the construction of a fossil fuel transport network to become a project of common interest in the future. In addition, all future projects on the following PCI lists will be required to fulfil sustainability criteria.³²

Krk

Funding

The CEF for 2014–2020 has allocated a total budget of €5.35 billion to the energy sector,³³ which has been useful for achieving the Europe 2020 energy and climate change objectives. During this period, the construction of the Krk LNG terminal was also financed from the same budget.

In the period of 2014–2020, the following titles have been called for the implementation of the Croatian LNG plant:³⁴

- Studies for the LNG terminal in Krk: legal and financial advice, FEED, master plan, EPC tender documentation, energy supply system documentation
- Preparation of field and laboratory studies and reports
- Construction of Krk LNG terminal
- Construction works for the Omišalj-Zlobin LNG pipeline section
- Studies on the long-term operation of the Krk FSRU LNG terminal

²⁸ 6.27 LNG Gdansk (PL).

²⁹ European Commission: Annex to Commission Delegated Regulation (EU) .../... Amending Regulation (EU) No 347/2013 of the European Parliament and of the Council as Regards the Union List of Projects of Common Interest. 19 November 2021e. 7.

³⁰ Trans European Network – Energy.

³¹ Council of the European Union: Proposal for a Regulation of the European Parliament and of the Council on Guidelines for Trans-European Energy Infrastructure and Repealing Regulation (EU) No 347/2013 – Analysis of the Final Compromise Text with a View to Agreement. 17 December 2021.

³² European Commission: *Commission Proposes New List of Projects of Common Interest for a More Integrated and Resilient Energy Market*. 19 November 2021f.

³³ Davide Pernice – Frédéric Gouardères: Financing the Trans-European Networks. *European Parliament*, December 2021.

³⁴ European Commission: *Connecting Europe Facility (CEF) – Energy Grants. Croatia. Key Facts and Figures*. June 2019c.

The total implementation cost was approximately €233.6 million, with the following breaking down:³⁵

- €101.4 million contribution from the Connecting Europe Facility
- €100 million direct financial contribution from the Croatian State budget
- €32.2 million direct capital contribution from HEP Plc and Plinacro Ltd.

Preliminary perceptions

The Croatian initiative offers a number of advantages for all countries in the region, as the level of the diversification of the natural gas market in the Carpathian Basin is much lower than in the Western regions – therefore any new energy investment will significantly improve the overall security of supply in the region. The strategic location of the Krk Island terminal allows it to supply gas to the landlocked Eastern Europe, which is largely dependent on the Russian piped natural gas.³⁶

The project was a significant Europe-wide construction project – beyond the PCI list, the project was included in several lists of strategic importance for Croatia and for the EU, for example in the list of *Declared Project of Strategic Importance for the Republic of Croatia*, in the CESEC³⁷ Action Plan and in the European Energy Security Strategy.³⁸ It is important to point out that, unlike other planned terminals, this project had a two-phase construction plan, the first phase of which, the construction of the terminal, has already been completed. (The second phase of the investment is included in the 2021 PCI list under point 6.26.1.)³⁹ The first phase involved expanding the capacity of the terminal and connecting it to the overland pipeline system, resulting in an annual increase of 2.6 billion cubic metres of resources and a direct connection of the source to Hungary.⁴⁰

Potential target markets for the Croatian LNG have been identified in 8 countries with a combined annual gas demand of 37 billion cubic metres. Of these, Croatia (2.7 cubic metre) and Hungary (9.5 cubic metre) were the primary markets, with an overall annual demand of 12 cubic metre. In the context of immediate neighbourhood and the common gas infrastructure project,⁴¹ Slovenia's gas demand is also worth mentioning, at 0.7 billion cubic metres per year.⁴²

Although originally an overland plant was planned, in the end a floating facility was added to the project list. This could be constructed more cost-effectively by converting an LNG carrier and by building only the onshore infrastructure. The resulted FRSU has

³⁵ European Commission: *State Aid: Commission Approves Public Support for Croatian LNG Terminal at Krk Island*. 31 July 2019b.

³⁶ Ronen Lazarovitch – Adam Quigley: LNG: Regions on the Rise. *Bracewell*, 03 February 2022.

³⁷ Central and South Eastern Europe Energy Connectivity.

³⁸ European Commission: *European Energy Security Strategy*. 28 April 2014.

³⁹ Sebastijan R. Maček: Slovenia and Croatia Plan Closer Nuclear, Gas Ties. *Euractive*, 30 March 2022.

⁴⁰ Serbia Energy: Hungary and LNG Terminal in Croatia. *Serbia Energy News*, 12 June 2020.

⁴¹ Portfolio: Szijjártó elárulta, Magyarország és Szlovénia összekötné gázvezeték-hálózatát. *MTI*, 02 February 2019.

⁴² LNG Croatia Llc: LNG Terminal Krk in Croatia. *LNG Croatia Llc*, June 2021.

a smaller reception and regasification capacity than before but has the advantage of being able to be moved if necessary.⁴³

The physical implementation of the terminal has been a long process, dates back to 2014 with the planning phase: the first feasibility studies were published in 2016. At the beginning of 2017, the decision of the Connecting Europe Facility to participate in the project was taken and the contract was signed at the end of 2017 (worth €101.4 million). In the first quarter of 2019, the final investment decision was made public, marking the actual start of the implementation of the project. A year later, by January 2020, the cross-border compressor station was completed, enabling reverse transports between Hungary and Croatia. The onshore works were completed by the end of the first quarter of 2020, and the floating part of the terminal was completed by the end of 2020. The facility was commissioned on 29 January 2021⁴⁴ and the first cargo ship arrived this month.⁴⁵

Technical specifications

The terminal, which has been operational since 2021, does not have outstanding regional capacity, but it is undoubtedly the largest entry point to the national gas infrastructure in Croatia, with the capacity to supply 40% of the Croatian market with its import volumes alone.⁴⁶ The capacity of LNG carriers (LNGCs) being able to put in at the terminal ranges from 3,500 to 265,000 cubic metres. The maximum transfer capacity from the ship to the terminal is 8,000 cubic metres per hour. The nominal back-filling capacity from the LNG terminal to the cargo ship: 1,500 cubic metres per hour. The plant has a total LNG storage capacity of 140,206 cubic metres and a maximum regasification capacity of 300,000 cubic metres per hour, which equates to 2.6 billion cubic metres in a year.⁴⁷

The year 2021

As previously described, the terminal on the island of Krk has been operating as a floating offshore storage and regasification unit (FSRU) since January 2021. This makes Croatia the 13th EU Member State to be able to import LNG directly through the Krk Island terminal.⁴⁸ In May of the year of commissioning, a new additional service was added to the terminal's package of capabilities, which – uniquely in the Mediterranean – now offers the possibility of small-scale natural gas refilling at the plant.⁴⁹ The total storage

⁴³ Orsolya Somogyi: Csúcsra jár a Krk terminál. *Magyar Nemzet*, 01 October 2021.

⁴⁴ European Commission: *First Croatian LNG Terminal Officially Inaugurated in Krk Island*. 29 January 2021g.

⁴⁵ Claudia Patricolo: First LNG Carrier Arrives at Krk. *Ceenergy News*, 01 January 2021.

⁴⁶ Evelin Szőke: Rewriting the Regional Gas Market: The Future of the Krk Terminal. *Ceenergy News*, 18 June 2021.

⁴⁷ Barbara Doric: LNG Terminal on the Island of Krk. Status and Project Update. *Budapest LNG Summit*, December 2019.

⁴⁸ European Commission: *Report on European Gas Market 2021 Q1*. 2021b. 13.

⁴⁹ Adnan Bajic: LNG Croatia Completes First Small-Scale Reload at Krk. *Offshore Energy*, 24 May 2021.

capacity of the FRSU is already booked up for the next three years, and only 26% of it is still available until 2027 (84% booked).⁵⁰

During 2021, Krk hosted a total of 16 cargo ships, of which 8 were from the USA, 2 from Nigeria and Qatar, and 1 from Belgium (Zeebrugge), France (Dunkirk), Trinidad and Tobago and Egypt.⁵¹ The total volume of deliveries up to November 2021 is estimated at around 1.4 billion cubic metres of gas. The proportions of countries exporting LNG in 2021 to the EU for the Community as a whole were as follows: the largest supplier of LNG to the EU was the United States (22.3 billion cubic metres), followed by Qatar (16.3 billion cubic metres), Russia in third place (16 billion cubic metres), Nigeria (11.2 billion cubic metres), Algeria (8.5 billion cubic metres) and Trinidad and Tobago (2 billion cubic metres). Total imports from other, smaller suppliers amounted to 3.7 billion cubic metres.⁵² It can be seen that Croatian proportions are in line with the EU trends.

The Hungarian import

The Magyar Földgázkereskedő Zrt. (a subsidiary of state-owned MVM Magyar Villamos Művek Zrt.) has successfully booked LNG capacity at the Krk LNG terminal in Croatia. Under the agreement signed in summer 2020, MFGK Croatia d. o.o. (of which Magyar Földgázkereskedő Zrt. is the parent company) will be allowed to use up to 1 billion cubic metres of capacity per year from the Krk terminal for a seven-year cycle starting in 2021.⁵³ In terms of the exact figures, the MVM Group has booked the following volumes for the following years: 1.409 billion cubic metres for 2020–2021, 2.072 billion cubic metres for 2021–2022 and 2022–2023, 1.534 billion cubic metres for 2023–2024 and 1.532 billion cubic metres for each of the next three gas seasons.⁵⁴ With the booking of another Hungarian-owned company, MET (a total of 1.3 billion cubic metres over the next three years), Hungary has become a major user of LNG capacity in Krk. The Hungarian contracts also ensure the long-term economic viability of the Krk LNG terminal, which has become the first operational LNG terminal in Central and Southeastern Europe. Here it is worth mentioning the declarations that concretise the sources of Hungarian supply. For instance, the announcement that Hungary will purchase 250 million cubic metres of LNG per year for six years from the Royal Dutch Shell through the Krk LNG port. The long-term contract with Shell is the first long-term deal with a Western player in Hungary's history.⁵⁵

⁵⁰ Sanja Pekic: Croatia's LNG Terminal Receives Its 10th Cargo. *Offshore Energy*, 27 July 2021.

⁵¹ Sanja Pekic: FSRU LNG Croatia Receives 16th Cargo and 1st One from Egypt. *Offshore Energy*, 12 November 2021.

⁵² European Commission (2022b): op. cit. 14.

⁵³ Világgazdaság: Történelmi jelentőségű a szerepvállalásunk a Krk LNG terminálban. *Világgazdaság*, 09 June 2020.

⁵⁴ Iskra Pavlova: MFGK Croatia Books 6.8 bcm Capacities at Krk LNG Terminal until 2027. *SeeNews*, 08 June 2020.

⁵⁵ Evelin Szőke: Hungary's FM: Krk LNG Terminal Creates a New Situation for Energy Security in CEE. *Ceenergy News*, 29 January 2021.

Hungary has purchased natural gas from a dedicated LNG source for the first time, using this new transport route and ensuring its own long-term source diversification. The Croatian contracts cover about one fifth of Hungary's yearly gas import demand.⁵⁶

Conclusion

There is no doubt that the LNG segment of the European Union's natural gas market, and the current situation of the market expansion, is constantly changing and offers many opportunities. The liquefied natural gas market is growing dramatically and is expected to increasingly allow room for U.S. export gas, in contrast to the previous dependency on Russian pipeline imports.

So, at the beginning of last year Croatia joined the list of EU LNG importing countries, too. According to the previous description, the plant, which has the capacity to regasify 2.6 billion cubic metres of natural gas per year, becomes the third terminal after Revithoussa in Greece and Marmara Ereğlisi in Turkey.⁵⁷

Looking around our southern neighbourhood, we can see that two more countries (Albania and Bulgaria) are also planning to introduce the technology of LNG. In case of Albania,⁵⁸ this type of diversification would mitigate the exposure to hydropower yields, while the indirect LNG access for Bulgaria,⁵⁹ (via a Greek terminal) would both reduce the country's dependence on Russian gas and contribute to optimising energy use by encouraging a shift from coal to natural gas.

Also an important aspect of the operation of the Krk terminal is that, in addition to the large-scale capability, a small-scale filling capability has been developed, i.e. the possibility to backfill LNG from the FSRU LNG Croatia to a smaller tanker (e.g. Avenir Accolade with a capacity of 7,000 cubic metres).⁶⁰ This service is the first in the Mediterranean basin and has made Croatia a market leader in small-scale refilling. The additional capacity established will allow the Croatian market to participate in the maritime trade of LNG. In conclusion, with the introduction of this new, additional service, the Krk Island LNG terminal has further increased its importance on the energy map of Europe.

Finally, let us mention the perspectives of environmentally friendly LNG technology in general. These efforts in the EU are clearly connected with the relevant objectives of the Green Deal package, in which the reduction of carbon dioxide emissions is a priority. Overall, even in the medium term, the use of natural gas and regasified LNG can be a more environmentally friendly solution than the combustion of heavier fossil fuels. In order to further increase the competitiveness of this energy source compared to renewables,

⁵⁶ Embassy of Hungary Washington: Another Energy Diversification Milestone Reached by Hungary. *Embassy of Hungary Washington*, 16 June 2021.

⁵⁷ Gas Strategies: Balkan Focus: Croatia, Bulgaria and Albania Bank on LNG Import Solutions. *Gas Strategies*, 14 October 2021.

⁵⁸ Excelerate Energy: LNG Would Bring Reliability and Diversity to Albania's Power Supply Portfolio and the Balkans. *Excelerate Energy*, 12 March 2021.

⁵⁹ Svetoslav Todorov: Bulgaria Buys Share of Greek Gas Terminal. *BalkanInshight*, 10 January 2020.

⁶⁰ Avenir LNG. 24 May 2021.

the LNG industry has come up with a number of creative solutions. One of these is the introduction of a green LNG service. The purchase of the product is guaranteed to offset the carbon dioxide emissions of the tanker ships carrying natural gas, by buying emission quotas/certificates or by participating in other environmental supporting measures outside the sector (e.g. afforestation projects).⁶¹ As green LNG is not yet widely traded, the question of who will pay the extra cost of carbon neutrality and how it will be charged to end-users is not fully resolved. The EU, among others, has also expressed doubts about the compensation strategy detailed above, which is rooted in fragmented certification processes and missing monitoring mechanisms.

According to forecasts, if gas prices are once normalised, the additional costs built in this way will not be so significant as to have a decisive impact on trade preferences. Here we need to mention the Russian–Ukrainian conflict that erupted in February 2022 and has had a significant impact on European gas trade ever since. In summary, Russian gas imports remain a key factor for (Eastern) Member States' imports in the 2020s, which means that in the current situation they are highly exposed to the Russian gas industry's revisionist actions in the aftermath of the EU sanctions policy, which, together with the high volatility after the outbreak of the war, have dramatically increased the average prices over the last three months. In terms of domestic gas prices, "the day before the war, gas prices were €80 per megawatt-hour, rising to €88 by 10 June, representing a 10 percent increase. However, the average price during this period was €111, almost 40 percent higher than the day before the war".⁶²

All in all, the Krk Island LNG terminal has proven to be a good and timely decision in the short and medium term, as one of the last completed gas projects in the transition from fossil fuels. It remains to be seen to how far increasingly expensive imported gas will be a sustainable resolution. It is worth pointing out that the first measures taken by Member States to replace gas as a primary energy source may reach back to the reopening of coal and lignite mines, which were previously considered environmentally harmful. Hungary has secured access to Croatian imports until the 2030s, which has clearly made our national security of supply more stable and diversified (due to the not exclusively Russian LNG product).

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⁶¹ The National Law Review: LNG in Europe 2021: Current Trends, the European LNG Landscape and Country Focus. *The National Law Review*, 12, no. 152 (2021).

⁶² Világgazdaság: Egyre nagyobb a háború okozta árnyomás a gáz és az áram piacán. *Világgazdaság*, 12 June 2022.

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