European Energy Prospect under the Russo-Ukrainian war

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Abstract. This paper studies the strategies of the European Union facing the Russo-Ukrainian war and discusses the possible outcomes of the Europe energy structure in the near future. It mainly analyzes the availability of the "Re-power EU" plan, using research from Nature, IEA, World bank and other reliable resources, to help readers understand how the Europe Union will deal with the energy crisis that exists for a long time and recently escalated in the light of the outbreak the Russo-Ukrainian war. The paper also provides suggestions for the EU to better implement the new energy plan, but also shows concerns and obstructions of the plan.

Keywords: Europe Energy Prospect, Russo-Ukrainian war, Europe LNG import, Europe renewable energy.

1. Introduction

The Russian and Ukrainian war began on February 24th, caused by a series of border crisis left by historically arguments since the time of Soviet Union and the NATO. The Russian government had been insisting that the outbreak of the war is attributed to the irresponsible actions of the Ukrainian leadership for refusing to implement Minsk agreements in the past 8 years, supporting nationalists and neo-Nazis, including terrorism and geocide activities in southeast of Ukraine like Donbass [1]. Despite the Russian Minister of Defense, General Sergei Shoigu, claimed "the Russian army does not threaten civilians, does not shoot at civilian facilities, and respect international humanitarian law" [2]. The European Union countries still describe Russian military attack as "an invasion to an independent and sovereign country", and is "a flagrant violation of international law and the basic principles underlying the rules-based international order." [3]. These irreconcilable conflicts make the crisis in Ukrainian almost be doomed to last long.

However, as Russia being one of the largest natural gas producer and exporter, this war has not only caused a large loss on lives, but also a huge shock towards to the global energy market, especially to the European Union. Before the war, 40% of European gas is provided by Russia, and as to gas, it is a quarter [4]. But after the war, the European Union has placed more and more sanctions towards Russia. For instance, the Nord Stream 2 gas pipeline, with a capacity of 55 billion cubic meter, is now completely suspended. It was expected to double the supply gas from Russia to Germany.

"The question now is how vulnerable is Russia, and how vulnerable is EU." said by Central European University professor Nick Sitter, "For Russia, it's vulnerable in the medium to long term, not so much in the short term." As the result of the high oil price over 100 dollars a barrel, Russia will strive to make the economy afloat under the gas cutoff in the short term. However, the overall export of gas from Russia to the EU has an amount of over 150 billion cubic meter (bcm) a year. And there is no equivalent alternative consumer for Russia. Maybe Russia could sell some natural gas to China, but it's very unlikely for China to increase its import gas from Russia over half of the amount of gas which the EU buys now in the next three or four years.

While the EU will suffer more the short term in terms of higher gas price, ebbs in industry and political protests. But for the EU, the import gas from Russia is replaceable by the liquified natural gas, and in the future, the EU can expand its capacity from other regions like north Africa to guarantee its natural gas supplement. "The EU's vulnerability is not in terms of people freezing to death", said by Professor Sitter, "it is in terms of higher bills, more need for investment, and probably speeding up the transition to renewables." [5].

2. RePowerEU

According to Europe Commission, there are three main aspects in RePowerEU, which the commission claimed as 'Diversifying', the action to find alternative energy supplies other than Russia; 'Saving', a series of policies to encourage citizens, enterprises, and organization to save energy; 'Accelerating', which means to accelerate the process of transition and mass investments on renewable energy [6].

3. Accelerating

The EU targets to increase the proportion of renewable energy from current 40% to 45% before 2030, and the renewable energy generation capacities to 1,236GW to 2030, which envisaged by "Fit for 55" as 1,067GW. As the IEA claims, attributed to the return of average weather, the additions of solar PV and wind power can improve EU's output over 100 TWh, which increases for 15% compared with 2021[7].

A study about the national growth dynamics of wind and solar power compared to the growth required for global climate targets states that in the future the growth of wind and solar power will be at a high level in areas with integrated feature like the European Union, because these places have stronger democratic institutions and faster demand growth [8]. It is also shown by nature index that the European Union countries have leading numbers of articles related with affordable and clean energy. Among these articles, over 80% were published by France, Australia, Spain, and the UK which have co-authors in other countries. This fact shows that the EU has adequate experience of clean energy cooperation.

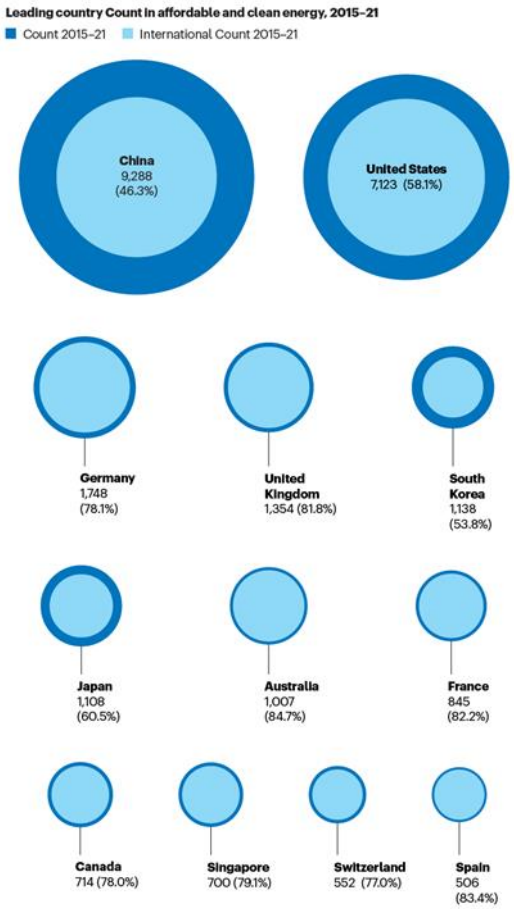

Fig. 1 Leading countries in affordable and clean energy, 2015-21 [9]

Solar photovoltaic power system, which so called solar PV is one of the most important renewable energy sources in RePowerEU plan. The European Commission describes its action of solar energy

construction as “boost the roll-out”. It is expected to bring over 320GW of solar pv before 2025, and then almost 600GW before 2030, the increment on solar pv can ideally replace the 9 bcm of natural gas consumption by 2027.

With effort of concerted policies, the renewable energy production can improve even more, which can be accomplished by tackling delays like setting up clear deadlines, enhancing management. As faster deployment can lead to lower the operation price, which will attract more investments. The IEA estimates that an additional 35 TWh of renewable energy generation can be made under ideal circumstances [7].

Another field of crucial clean energy is bioenergy and nuclear energy. Nuclear energy has long been the largest source of low greenhouse gas emission electricity in the EU. Especially in France, the nuclear energy provides 70% of total energy generation, which is on the top of the world [10]. It provides values over 3 billion euro every year for France in energy export. But there’s a recent problem on nuclear station that affecting the whole Europe. The sequential droughts have lowered the water level, resulting cooling problem for the reactors. For the sake of safety, it is suggested to shut the reactors for a period of time for maintenance and safety check. If one day they rerun in normal state, they should bring more natural gas saves for 1 billion cubic meter per month.

The European commission also planned to boost biomethane to 35 bcm by 2030. In order to achieve this goal, 37 billion investment needs eligible for co-financing. If succeeded, the IEA states that 50 TWh more electricity could be generated in 2022 [11].

4. Saving

Saving energy is an old topic, but it can be applied on many aspects. Most natural gas consumption is applied on heating. It is estimated that 42% of the total natural gas consumption is used for residential and household heating. Oil is the next largest portion which contributes to 14% of energy used for heating. Coal accounts for the smallest portion of the heating energy, which is approximately 3%.

The indoor average thermostat temperature in the EU is higher than 22 Celsius. It was claim by IEA that decrease 1 Celsius can reduce the gas demand by around 10 billion cubic meters of natural gas. The governments should encourage more public awareness campaigns as well as publish more laws to control heating usage in commercial areas, which is easier to deploy for it could be an attractive tool for election.

Saving energy can also be applied on transportation. Over 93% of the road transportation vehicles are powered by oil, which consumes 299 million ton of oil a year. For the rail transportation, this proportion is 23%. On transportation, saving energy can be applied through encouraging telecommuting, reduce speed limits, ban cars regionally, encouraging more cycling and replace short distance flights by trains. An interesting research result showed that during the covid pandemic, most people who were able to work home chose not to commute during work time. And this action causes the carbon emission from land-based transportation drop by 40% during that time [12]. According to a search, in unregulated Germany, setting speed limit on highways of 120km/h or 100km/h can decreases up to 13% greenhouse gases emission, which is equivalent to 0.4 million barrels of oil per day [13]. In some areas, traffic banes can be applied. For example, in downtown city, tracks or large-scale trailer could be prohibited to enter, this will not only help save energy, not also decrease traffic congestion. At last, cancel short distance flights is also a significant way to low-down the fossil-fuel consumption. It was briefly estimated by IEA that replacing short distance flights with trains can save nearly 0.3 mb of oil per day [7]. Though this action might cause a loss to airline companies, it will still be worthy considering this amount of save it can bring. Besides, it could create change for to re-enhance the railway system in Europe.

Saving energy can also be reflected in a way of developing the flexibility for power system, especially the flexibility in the way of adjusting energy demand in peak periods, including the seasonal demands and hourly demands. Currently, because natural gas is the main source for

electricity powering, the elasticity between power system and natural gas supply is very low. Therefore, the EU will have to enhance grids, energy efficiency, large-scale and long-term energy storage batteries, in this way, markets can have more buffer time to adapt the status quo when natural gas supply crisis happens. All these efforts need more investments. And that is what the EU countries should support, creating more market signals to help business on these fields. In the future, the some low-carbon gases like biomethane can also be applied to alleviate the pressure from natural gas supply, though it will certainly take more preparations of deployments.

The European Commission collects estimates from different factors that may contribute to the energy saving plan in the short term. It should be noted that this list is not exhaustive, and the effects of some measures could be overlapped. This list provides an overall understanding of the possible magnitude of these measures at EU level, as shown in Table 1.

Table 1. Non-exhaustive list of targeted measures able to generate significant energy savings in the short term [14]

Possible Measures	Specific actions	Estimated energy saving in a year (Mtoe)
Information campaign on life energy wastes or business energy wastes	Use targeted information to incite citizens to turn down heating and boiler temperature, turn off lights, heaters in unuse rooms, shut windows and doors in AC rooms. This applies to commercial and public spaces too.	11
Certification and maintenance	Use inspections, audits, performance certifications, and spot checks to create awareness for individuals and enterprises to save energy.	3.5
Smarter control practices in public spaces	Introduce smart monitors to ensure control and eliminate temperature fluctuation in centralized heating districts	2.5
Energy audits	Create heat loss audits on industry to avoid heat loss from high temperature processes.	2.5
Financial supports on replacement process of fossil fuel system to renewable energy systems	Especially for buildings with boilers over 12 years old, apply incentives like taxes or subsidies to accelerate the renew or maintenance.	5

5. Diversifying

In brief, for Europe, the first step of diversifying is to cut-off energy cooperation with Russia. The overall energy import (crude oil and natural gas) contract with Gazprom will end by the end of 2030. EU will not renew the contract; this will cause a loss of 40 billion cubic meter per year of gas until 2023. Addition to that, as the EU decided to put sanctions on Russian coal, starting for April 2022. There are roughly 44 to 56 million tons of coal per year need to be replaced by import [7].

The EU commission is also looking for new international partners, the plan is focused on boosting renewable energy and increasing energy efficiency. The EU commission claims that 85% of Europeans support the EU to reduce dependency on Russian gas and oil as an action to support Ukraine. The scheduled actions involve increasing Liquified natural gas from the US and Canada as well as pipeline and LNG from Norway, Coordination with gas buyers such as Japan, China, and Korea [15].

In the south, the EU also aims to find trilateral agreement with Egypt and Isrel for supplying natural gas, as well as with both Algeria and Azerbaijan.

The LNG market is rapidly increasing since the application of secondary fracture technique. From 2017 to 2023, the global LNG trade is expected to increase for 391 bcm to 505 bcm. Among all LNG markets, the US, as the biggest gas producer in the world, is significantly increasing its gas export. It is shown in the figure, that in the first month of 2022, 37% of total US LNG exports has been traded to the EU.

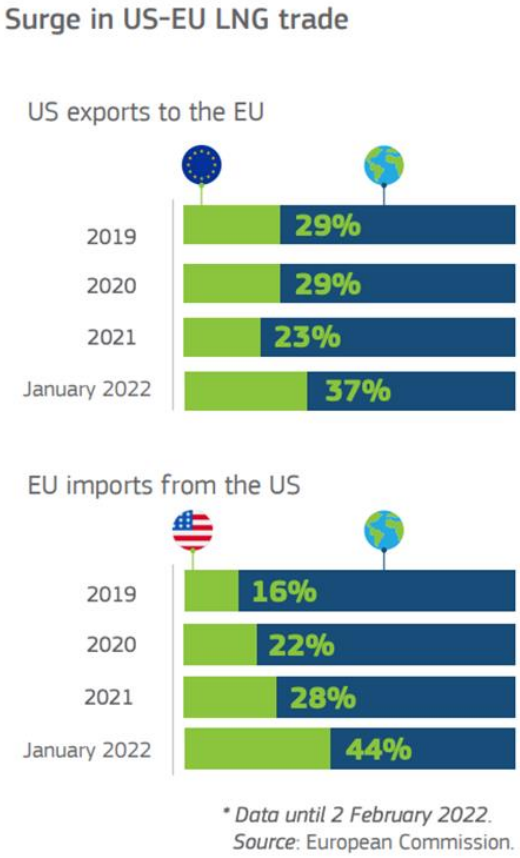

Fig. 2 Surge in US-EU LNG trade [16]

6. Challenges

Despite EU leaders made various solutions for coming energy crisis, the reality still seems challenging. Protests have started in some European countries, especially landlocked countries which are particularly reliant on Russian gas pipelines. In September, Czech Republic happened a series of protests spurred by the skyrocketing gas and oil price. Smaller but similar protests happened in Germany too. Thousands of people gathered to demand the government to open Nord Stream 2, the gas pipeline from Russia. “It has been a wake-up call, and I hope it has been a wake-up call for others across Europe,” said Tomas Pojar, an adviser to the Czech prime minister, Petr Fiala [17].

On September 26, it was reported by Denmark energy commission that Nord Stream 1 and 2 were both ruptured in the region close to Denmark and Sweden, it was later being suspected as a result of deliberate attacks. Though whoever cause this destruction is remain unknown, it shows that there does exist factitious obstruction for Europe to fix its energy dilemma.

With the adoption of the EU embargo on Russian coal, prices in the EU increased around 15% to EUR 325 per ton. In fact, despite natural gas has been long considered as a clean, environment friendly energy source, however, there are still concerns that natural gas would still cause negative influence on the climate. Natural gas is mainly consisted by methane, and fossil fuel in general accounts for 15-22% of total methane emission [18]. But latest research concerns that natural gas has in fact caused higher methane emission due to leakage. In Canada and the US, the actual methane emission could have been 50%-60% higher than the estimates [19, 20]. Though there is no detail

figure or value for the leakage, some believe that it is because the leakage varies according to the local gas-process system [21].

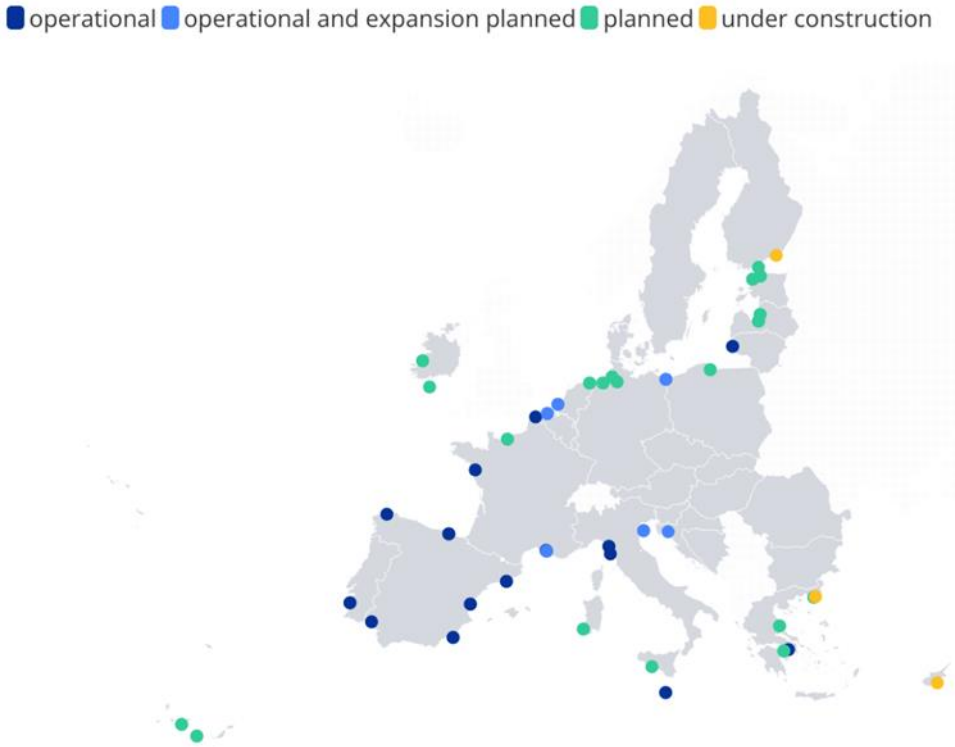

Fig. 3 Surge in US-EU LNG trade [22]

7. Conclusion

The future of Europe energy is based upon the overall reaction of the several factors. It primarily depends on how the European member will implement the EU's strategy, and if the citizens of the EU member will accept the decisions of EU. It is obvious that the war will not end in any time soon. However, if the European Union and its allies keep adding militaries supplies to Ukraine, it might continuously increase the time length of the war, of course, escalating the conflict at the same time. If that happens, not only it will worsen the gas supplies from Russia, but it could also lead to even server and more dangerous situations. At this point, there's no absolute safe approach to overcome the energy crisis, but nevertheless, as global climate aggravating, it is always a smart decision to invest more on renewable energy sources and posts more actions to help save fossil fuel energy. The fact that most of the EU proposals need financial supports, along with the protests happened recently, together indicate that the EU should cooperate to enhance economic before set about fixing energy issues.

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