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**Economic Commission for Europe****Committee on Sustainable Energy****Group of Experts on Gas****Tenth session**

Geneva, 23-24 March 2023

Item 7 of the provisional agenda

**System resilience and security of supply****Energy system resilience and the future of gas supply in Europe****Note by the Secretariat****I. Introduction**

1. At its thirty-first session (Geneva, 21-23 September 2022), the Committee on Sustainable Energy (the Committee) called upon<sup>1</sup> its subsidiary bodies to formulate proposals that support efforts to build more resilient energy systems in the United Nations Economic Commission for Europe (ECE) region. The Committee concluded that a resilient energy system (RES) rests on three pillars:

- Energy security – to secure the energy needed for economic development
- Quality of life – to provide affordable energy to all at all times
- Environmental sustainability – to limit the impact of the energy system on climate, ecosystems, and health.

2. To further explore resilience, the Committee decided to set up an ECE Platform on Resilient Energy Systems (the Platform). Among other things, the Platform will host a series of dialogues on resilient energy systems that facilitate exchanges among member States, academia, technical experts, industry, and others on a range of topics, including the current challenges to resiliency, technical options, financing resilient energy systems and clean energy projects, lessons learned and best practices.

3. As an immediate response to the Committee's request, on 18 October 2022 the Group of Experts on Gas organized the first-in-a-series of dialogues titled "Energy system resilience: The future of gas supply in Europe".<sup>2</sup> The event explored four interlinked themes:

- Possible interruptions in the gas supply to Europe

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<sup>1</sup> <https://unece.org/sites/default/files/2023-01/Final%20Report%20-%202031st%20session%20of%20the%20Committee%20on%20Sustainable%20Energy%20ECE-ENERGY-143%20%282%29.pdf>, paragraph 19.

<sup>2</sup> <https://unece.org/info/Sustainable-Energy/events/370493>

- Rebalancing Europe’s energy gas supplies
  - Mapping alternative supplies for natural gas
  - Security of supply and climate agenda.
4. This document condenses the key messages and findings of the 18 October 2022 event, with the aim to facilitate discussions during agenda item 7 “System resilience and security of supply” of the tenth session of the Group of Experts on Gas (Geneva, 23-24 March 2023).
5. There are two important points to be noted upfront:
- First, the 18 October event, and this document as its summary, discussed system resilience in the context of gas supply to the subregion of Western and Central Europe, which was one of the pressing needs of late 2022. This document is not intended to cover the entire ECE region. In the coming months, other events under the Platform will address system resilience in other parts of our region, taking in account their specific contexts
  - Second, the document does not endorse in any way an increased reliance on fossil fuels. One of its central theses is that security of supply and the climate agenda align in the long run and that an increased integration of renewable energy and gas could enhance energy system resilience and, at the same time, accelerate decarbonization.

## **II. Background**

### **A. Crises in the region are multiplying**

6. The war in Ukraine is the gravest crisis in Europe since the end of the Second World War. It erupted at a time when the ECE region had already been coping with multiple and unresolved crises that exposed vulnerabilities of the energy system and put economic development and social cohesion to a test.

7. The first of these is the long-term climate crisis. As the 27<sup>th</sup> UN Climate Change Conference of the Parties (COP27) concluded, the climate crisis accelerated. For its part, the Committee on Sustainable Energy at its thirty-first session concluded that the climate crisis continued to be a significant threat multiplier to both economic and social development and to international peace and security.

8. The second crisis the ECE region faced is the COVID-19 pandemic. Due to geopolitical events in and around Ukraine, this health crisis lost the attention of the media but, in reality, it is far from over as it is still having global implications, including on energy markets and energy availability.

9. Combined with the war in Ukraine, these ongoing and intertwined crises are impeding energy flows across the ECE region and beyond. In some countries disruptions in energy supply and trade threatened economic growth, creating further pressure through elevated energy prices. Broken supply chains and an exponential increase in demand for critical raw materials are elevating the cost of components for manufacturing of renewable energy sources’ equipment, such as batteries, solar panels, wind turbines, electrolyzers, and energy storage systems.

### **B. Some consequences of the war in Ukraine**

10. The European Union, the United States and some other ECE member States responded to the 24 February 2022 events by imposing massive sanctions on the Russian Federation in multiple sectors. Due to the role gas has played in the European energy mix, the Russian gas sector has been impacted too, albeit arguably less than other sectors of the Russian economy – at least for the time being. The full impact on technical maintenance of gas infrastructure and future gas production potential is yet to be felt.

11. Reducing reliance on Russian gas has become the prevalent narrative in Europe since 24 February 2022. In the Versailles Declaration,<sup>3</sup> adopted at the 10-11 March 2022 meeting of the heads of state or government of the European Union, the EU agreed to phase out dependency on Russian gas, oil, and coal imports as soon as possible. In particular, the EU called its Member States to:

- Accelerate the reduction of its overall reliance on fossil fuels
- Diversify supplies and routes, including LNG and the development of biogas
- Further develop a hydrogen market for Europe
- Speed up the development of renewables and the production of their key components
- Complete and improve the interconnection of European gas and electricity networks and fully synchronise power grids throughout the EU
- Reinforce EU contingency planning for security of supply
- Improve energy efficiency and the management of energy consumption
- Promote a more circular approach to manufacturing and consumption patterns.

12. In May 2022, the above action items were further elaborated through the REPowerEU Plan,<sup>4</sup> devised as the EU response to the global energy market disruption caused by the conflict in Ukraine. The Plan has two key components: ending the EU's dependence on Russian fossil fuels and tackling the climate crisis. REPowerEU called for additional new LNG terminals (in particular in the form of Floating Storage and Regasification Units (FSRUs) due to their speed of deployment) and import pipelines from other suppliers (for example, from North Africa or the Middle East) and intra-EU gas interconnections enabling eastward flows. The cost of these investments is estimated at €10 billion by 2030.

### III. Key messages

13. The 18 October 2022 dialogue “Energy system resilience: The future of gas supply in Europe” produced a wealth of data, information, and opinions expressed by the participants. The paragraphs below summarize some of these points. They do not reflect the official opinion of the Committee, nor of the Group of Experts on Gas, nor of the secretariat.

#### A. Possible interruptions in the gas supply to Europe

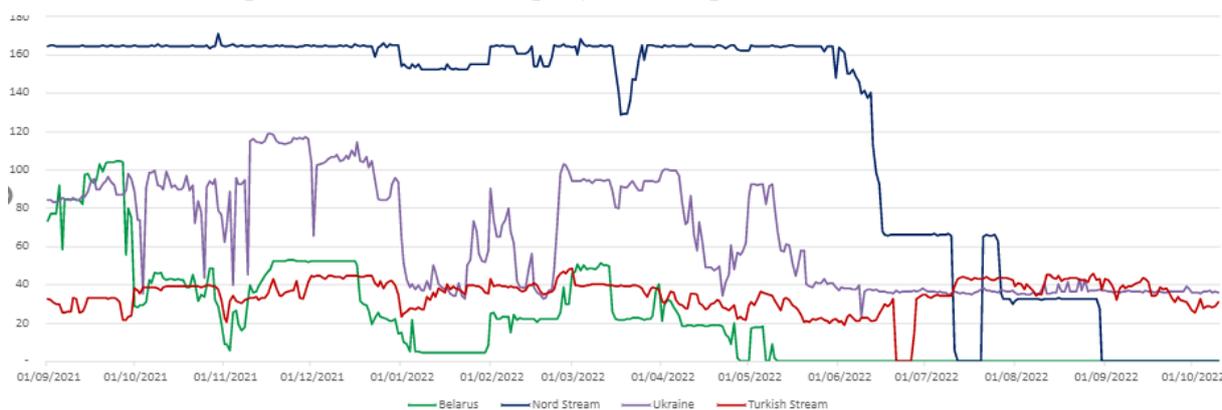
14. Continued interruptions in the gas supply to Europe from the Russian Federation are very likely. As predicted, during the first half of 2022 the delivery of Russian gas to Europe fell dramatically. As Figure I shows, supplies through Belarus (through the Yamal-Europe natural gas pipeline) quietly discontinued in May for mostly political reasons, while supplies via Nord Stream 1 almost completely stopped in June 2022 according to Gazprom for technical reasons related to turbine maintenance.

15. Nord Stream supply interruptions continued through the summer. Then, on 26 and 27 August 2022, both Nord Stream 1 and Nord Stream 2 were damaged by explosions that rendered them unusable for the foreseeable future.

<sup>3</sup> <https://www.consilium.europa.eu/media/54773/20220311-versailles-declaration-en.pdf>

<sup>4</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A230%3AFIN&qid=1653033742483>

Figure I  
Russian Pipeline Gas Flows to Europe by Route, September 2021 - October 2022



Source: Data from ENTSOG Transparency Platform, and graphic by Sharples/Oxford Institute for Energy Studies.

16. The troubles with Nord Stream and related developments brought once again to the fore the concept of system resilience, in this case the resilience of gas infrastructure.<sup>5</sup>

17. There remains a fundamental uncertainty concerning the future of Russian gas supplies to Europe that already decreased by 65 per cent in 2022. On one hand, the supplies could continue until existing long-term supply contracts expire in the early 2030s. On the other hand, Russian gas supplies to Europe could stop completely during the winter of 2022/2023 or beyond due to either Russian or European political decisions.

## B. Rebalancing Europe's energy gas supplies

18. Short-term, it will not be possible to substitute Russian imports (155 billion cubic metres per annum (bcm/a) in 2021) with alternative supplies. This shortage could be progressively reduced if new supplies are procured.<sup>6</sup> Half of the missing 150 bcm/a have been compensated for by a decrease in demand. The decrease, however, was primarily driven by high prices that lower demand for gas and its use as a feedstock in the European chemical industry.

19. Although liquefied natural gas (LNG) has become increasingly important as an energy carrier, it alone cannot compensate for the lost Russian supplies at this time. European LNG imports fluctuated around 12 bcm/a. As Figure II shows, the United States emerges as the key LNG supplier to Europe, responsible for the lion's share of additional supplies (Figure III). As things stand now, Russian gas will not return to the European market in the foreseeable future, so LNG supplies from the United States, Qatar and other producers will remain critical for years to come.

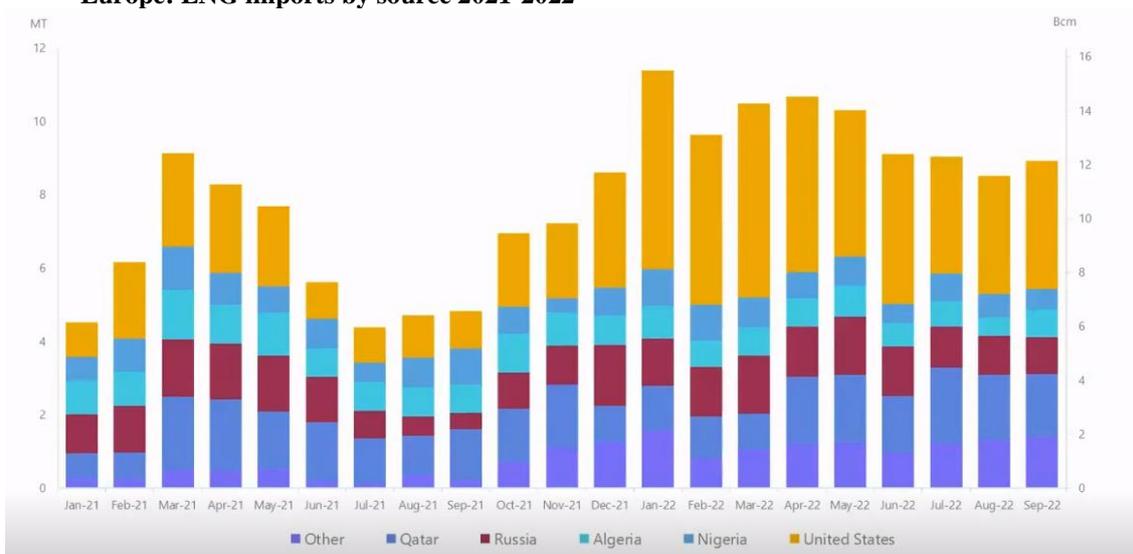
20. Global LNG market conditions are driven primarily by the events in Ukraine. The impact of these events is global as Europe is competing with other markets for the same LNG cargoes. In 2022, Europe evolved from being the market of last resort to being the market of greatest need. LNG is expected to continue to provide long-term diversification of natural gas supplies.

21. Longer term, it would be possible to substitute Russian gas imports, using several old and new supply sources and supply routes, both pipeline and LNG.

<sup>5</sup> Massive targeting of energy infrastructure in Ukraine by the Russian Federation that started in October 2022 and left millions without water, electricity and heat was another major escalation that further stressed the importance of system resilience.

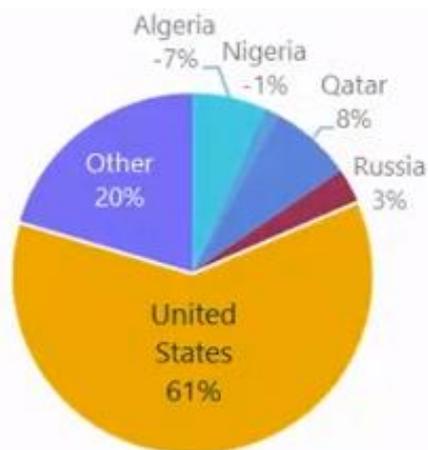
<sup>6</sup> <https://iogeuropa.org/wp-content/uploads/2022/09/Report-Rebalancing-Europes-gas-supply.pdf>

Figure II  
Europe: LNG imports by source 2021-2022



Source: Cheniere.

Figure III  
Incremental European LNG imports in 2022



Source: Cheniere.

22. Between 2022 and 2040, European LNG regasification import capacity can grow by 120 bcm/a from 210 bcm/a to 330 bcm/a. Because of these developments, LNG will become increasingly traded internationally as global liquid markets start appearing. New LNG infrastructure is clearly needed, including floating small-scale regasification units. For all that to happen, investments in new LNG regasification trains need to be underpinned by long-term contracts.

23. In general, there seems to be a shift in the political arena – long-term gas contracts are clearly coming back. This, in turn, can affect the achievement of the climate agenda by investing in new infrastructure linked to fossil fuels with a long economic life. This problem is underappreciated by many market players as the current economics are attracting capital inflows destined to financing these new long-term investments.

24. The tight supply situation stressed the importance of building sufficient storage capacity needed to buffer any future supply disruptions that remain very likely.

### **C. Mapping alternative supplies for natural gas**

25. In the absence of supplies from the Russian Federation, the gas quantities that Europe needs could come from EU internal sources, Norway, United States, Algeria, the Gulf, the Caspian, or the Eastern Mediterranean.

26. Historically, Norway provided around 25 per cent of the European Union's gas needs. Due to the decreased supplies from the Russian Federation, Norway, with its 113 bcm/a has become the most important European supplier. The current maximum output is expected to continue until at least 2030. Boosting Norwegian exports by an additional 10 bcm/a could be achieved by maximizing the Troll field and by increasing the calorific value of gas (through a reduction in gas liquid production).

27. Other European onshore and offshore production of 130 bcm/a – mainly in Ukraine, the United Kingdom and Romania – is declining, but the trend is reversible if the political environment changes. Similar political support is needed to increase, potentially by 10 bcm/a, the supply capacity from the Groningen gas field in the Netherlands. Shale gas, which also would require a change in political support, could add up to 30 bcm/a by 2027.

28. Gas discoveries in two Southern-most ECE member States – Israel and Cyprus – have become an important driver for regional cooperation. Cyprus has the potential to supply Egypt (pipeline gas) or Europe (LNG). Israeli gas exports to neighbours had a tremendous positive impact on building regional markets and through them, stability, prosperity and peace in an otherwise historically volatile region. The technical barriers to transport this gas to Europe are however important.

29. Algeria's exports to Italy and Spain could add up to 50 bcm/a, if marketable gas rates are increased by reducing reinjection (incentivized by high gas prices relative to oil).

30. Supplies from Azerbaijan through the Trans-Anatolian Natural Gas Pipeline (TANAP) could increase from 10 to 16 bcm/a if Turkey back-fills the missing quantities (e.g., from Iran or via LNG). Expansion of TANAP could add 15 bcm/a by end of the decade. The Trans Adriatic Pipeline (TAP) brings gas from Azerbaijan to Italy. Its 2022 capacity of 10 bcm/a could be potentially doubled relatively quickly. (TurkStream, a natural gas pipeline from Russia to Turkey with a total capacity of 31.5 bcm/a, is not considered an alternative in the context of the current sanctions regime).

### **D. Security of supply and climate agenda**

31. In the long run, energy security and climate goals do align. For example, an increased integration of renewable energy and gas could enhance energy system resilience and accelerate decarbonization. Electrical variable renewable energy (VRE) is expected to grow substantially in the following decades, increasing its share in the future energy mix of the ECE region. A higher penetration of VRE into ECE energy systems brings an associated challenge: how to manage, on a cost-efficient manner, the strong fluctuations and intermittency associated with VRE, while ensuring a reliable and robust energy system at all times. Gas could provide affordability and the required flexibility for integration of higher shares of VRE in the energy mix.

32. In achieving the competing goals of security of supply and climate impact mitigation, biogas could contribute too, although at a limited level at this time. In the future, a hybrid energy system concept could envisage an increased reliance on decarbonized gases.

33. Natural gas, if carbon dioxide from its combustion is captured, could continue to play the key role in providing the security of supply to Europe – while meeting climate objectives.

34. Large-scale carbon capture and storage (CCS) projects that utilize abandoned gas fields in the North Sea could help strike a balance between climate and supply priorities. Likewise, the European initiative for hydrogen transmission that explores hydrogen production in Norway combined with midstream and downstream solutions could mitigate both the climate and security of supply challenges.