

Sourcing Natural Gas for the EU Market: Before and After 2022

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Abstract. Natural gas is a prevalent fossil fuel used in various economic sectors. Prior to 2022, many European Union (EU) nations depended largely on Russia as their primary source for this essential resource. However, the landscape shifted dramatically in February 2022 following Russia's invasion of Ukraine. This geopolitical turmoil led to a significant reduction in gas supplies from Russia, catapulting global natural gas prices to unprecedented levels and plunging the year into a deep energy crisis. This case presents the challenges EU countries faced regarding natural gas sourcing, underlining the complexities and risks associated with the global natural gas supply chain. The case was developed to provide a basis for discussing alternative global sourcing strategies in consideration of cost, supply resilience, and practical logistics constraints.

Key words: supply chain logistics, global sourcing, total cost of ownership, risk management, supply resilience.

1. Introduction

In this case study, we present the natural gas sourcing dilemmas EU nations faced before and after 2022. Natural gas is a common fossil fuel composed mainly of methane, along with small amounts of other hydrocarbons including ethane and propane. Natural gas is cleaner than coal or oil, producing less emission of greenhouse gases and other pollutants when burned.¹ Due to this benefit and its supply abundancy, natural gas is widely used to generate electricity, heat buildings, and power industrial processes across the globe. In this globalization era, the value of investigating natural gas sourcing decisions lies in the transferability of principles and strategies to diverse industries, including energy, manufacturing, food, retail, and healthcare. The overarching

1. <https://www.eia.gov/energyexplained/natural-gas/>, accessed on 08/25/2023.

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themes of cost optimization, risk management, regulatory compliance, and sustainability are applicable across a broad spectrum of supply chains, providing a valuable knowledge base for improving overall supply chain performance.

The supply chain for natural gas contains three main stages.¹ First, there is an upstream production stage of natural gas that supports operations like exploration and drilling. Originally, natural gas was formed from the remains of plants and animals that were buried under sedimentary rock layers millions of years ago. Often times, the natural gas extraction and production fields are located in remote areas and appropriate transportation means are needed to ship natural gas. The upstream stage can be normally characterized by a few large natural gas producers (often state-owned firms or large multinational energy companies) competing in this sector. Second, at the midstream level, natural gas is transported from the sources to the market storage facilities. Finally, at the downstream level, natural gas is distributed via the local gas network and consumed by the end users. Vertical integration has been common between the upstream, midstream, and downstream stages of the natural gas supply chain. For instance, many major gas producers have been vertically integrated into the extraction, production, transportation, and sale of natural gas.

Natural gas resources are found globally, but are mostly concentrated within a limited number of countries located in different continents. Despite the cleanness of natural gas, due to its relatively low energy density on a volumetric basis, natural gas is actually one of the most challenging and expensive primary fuels to transport over distance. The transportation system for natural gas typically involves pipelines, but it can also involve other modes of transportation such as ships and railcars. In reality, pipelines are often the primary mode of transporting natural gas over long distances. This is particularly the case for domestic gas supply chains inside of individual countries. These pipelines are typically made of steel and can range in diameter from a few inches to several feet. The natural gas is compressed and pumped through the pipelines at pressure. Although pipelines are expensive to build and operate, they are efficient in transporting natural gas. Large quantities of natural gas can often be shipped over long distances with minimal energy use and midway interruptions.

While pipeline transporting is usually considered reliable and consistent, there are some limitations to the method, including:

- Limited accessibility (outside of the network): Pipelines can only transport natural gas to/from areas where a pipeline network has been established. This means that for other areas far away from pipelines, such as remote or rural areas, their accessibility is limited.