CHAPTER 6

Norwegian Gas in Europe in the 2020's

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Introduction

The aim of this chapter is to contribute to a better understanding of the role of the Norwegian natural gas in the European market in the 2020's. This chapter is divided into four parts. In the first section, a brief history of Norway as a major energy producer and exporter is presented, outlining the main features of the Norwegian energy policy and its impact on energy situation in Norway's neighbourhood. Key data on Norway's energy production, consumption and exports are also examined presenting Norway as an energy actor. The second section narrows the scope of examination to the role of Norwegian gas in the broader European context in a historical perspective. Here we examine some historical data on Norway's role as a gas supplier to Europe and the broader international context of Norway's gas co-operation with the EU. The third section presents some assessments of how Norway's role in the European gas market may change in the 2020's. Here the focus is on the role of structural factors that may influence the future position of Norway as a gas supplier to the broadly understood Europe. The factors

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examined in this part include the role of the EU as an energy agenda setter, the role of other gas suppliers in this market, including the impact of LNG supplies, as well as the question of the resource base that could secure Norway's future position as an important actor in the European gas market. Finally, the fourth section sums up the main findings.

Norway as an Energy Actor in 2020

According to the most recent available data (IEA, 2020a), in 2018 Norway's total energy production reached 207 million tonnes of oil equivalent (mtoe), which gave Norway 15th place globally, behind Qatar, but before Kazakhstan. In the same year, Norway exported 177 mtoe more energy than it imported. Only five countries—Russia, Saudi Arabia, Australia, Canada and Indonesia—had a better energy import/export balance. Total domestic energy supply (TES) reached in the same year 28.3 mtoe. Norwegian primary energy consumption in 2019 was dominated by domestically available hydropower which made Norway unique among major global producers and consumers of energy as demonstrated in Table 6.1.

Table 6.1 Primary energy consumption by fuel

	Norway's energy consumption in 2019 (exajoules)	*Share in Norway in 2019 (%)*	*Share in the EU in 2018 (%)*	*Share in the world in 2019 (%)*
Oil	0.39	22.0	34.1	33.1
Natural gas	0.16	9.0	22.0	24.2
Coal	0.03	1.7	14.2	27.0
Nuclear energy	0.00	0.0	13.2	4.3
Hydroelectricity	1.12	63.3	2.0	6.4
Renewables	0.07	4.0	13.0	5.0
Total	1.77	100	98.5 (waste + others 1.5)	100

Exajoule = 1 quintillion joules (1×10^{18}). 1 Exajoule is equal to 278 terawatt hours
Sources The Author, based on BP (2020) and European Commission (2020b)

Norway's Petroleum Resources

After discovery of deposits of oil and gas in the North Sea Norway has entered European and global stage as a major producer and exporter of petroleum products, mainly crude oil and natural gas. By the end of 2019, total production of oil reached 4,431 Sm^3o.e. and for gas the figure was 2,571 Sm^3o.e. (Norskpetroleum.no, 2020c).[1] This means that oil represented 59% of the total production and gas 34%, the rest being condensate and natural gas liquids. Production and sales of petroleum commodities generated also huge revenues for the Norwegian state—by the end of 2019 the market value of the Government Pension Fund Global reached 10,088 million Norwegian Krones (NOK), or approximately 1,000 billion US dollars (USD), which was almost three times more than the country's gross domestic product (GDP) in the same year (Norskpetroleum.no, 2020a).

Figure 6.1 presents a synthetic picture of Norway's increasingly important role as a key European and global petroleum actor. History of Norway as a major producer and exporter of oil and gas can be divided into several sub-periods. Oil dominated the production mix until 2000 when oil production peak was reached with production of 181 Sm^3o.e. General peak production came four years later in 2004 when total production reached 264 Sm^3o.e. The share of gas in total production was increasing constantly and in 2010 was for the first time in history higher than the share of oil when it went up to 46.19% of the total production against 45.26% share of the latter (Norskpetroleum.no, 2020b).

By the end of 2019, basic estimate of total proven and unproven petroleum resources is about 15.7 billion Sm^3o.e. Of this, 7.6 billion Sm^3o.e., or 48%, has been sold and delivered. The estimate for undiscovered resources is 3.9 billion Sm^3o.e. The Norwegian Petroleum Directorate (NPD) estimates that 8.2 billion Sm^3o.e. are left to produce. Of this, 4.3 billion Sm^3o.e. are proven resources (Norskpetroleum.no, 2020c).

What is more important to understand when discussing the future of the Norwegian petroleum sector is the volume of recoverable petroleum reserves that are not yet produced, but for which a production decision

[1] Standard cubic metres of oil equivalents abbreviated as Sm^3o.e. is a standard volume unit of petroleum products—for oil, it equals 6.29 barrels of oil, or 0.858 metric tonnes. For gas, it equals 1,000 m^3 of natural gas.

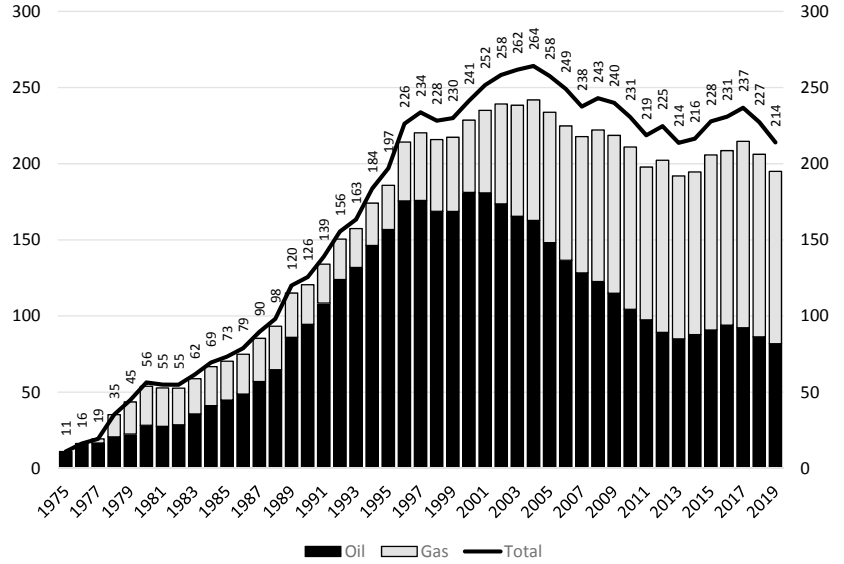

Fig. 6.1 Norwegian crude oil and natural gas production in 1975–2019 (Sm^3o.e.) (*Source* The Author, based on Norskpetroleum.no, 2020b)

had been made. By the end of 2019, these reserves totalled 2.9 billion Sm^3o.e. and 53% of these was natural gas (Norskpetroleum.no, 2020c).

Norway has 1,500 bcm in gas reserves, which represented 0.8% of global gas reserves. With these known reserves, gas production that reached 114 bcm in 2019 could be maintained at the same level for the next 13.4 years. Production of gas in 2019 was 5.7% lower than in 2018 and represented 92.8% of gas production in the top year 2017 when 123.2 bcm of natural gas was produced. Norway's gas output in 2019 represented 2.9% of the global gas production. Domestic consumption of natural gas in Norway was very low—4.5 bcm per year—and represented only 3.9% of production in 2019. This has made huge volumes of gas available for exports. Most of the Norwegian gas reached foreign markets through an extensive network of pipelines linking Norwegian production sites with national markets in Europe (BP, 2020).

Most of energy resources that have already been produced have been exported to European market and this market will also take a lion's share

of energy to be produced in Norway in the coming years. It is therefore important to understand how the developments in this market will influence Norwegian energy producers.

What Makes Norway Special as an Energy Exporter?

There are several factors that make Norway an important and special actor in the global and regional energy markets. First, Norway is better endowed with locally available energy resources that are used to cover the country's own energy needs than any other major exporter of energy as illustrated in Table 6.2. To cover its own energy needs expressed as TES Norway uses nearly 14% of energy produced within its borders which is

Table 6.2 Share of total domestic energy supply in national energy production and net exports of energy in 2019

Country	*Net energy exports (mtoe)*	*TES/Production (%)*
Russia	701.3	51.2
Saudi Arabia	449.1	32.1
Australia	279.5	31.1
Canada	227.6	56.2
Indonesia	220.6	51.3
Norway	177.0	13.7
Iraq	175.5	26.7
Qatar	172.5	19.8
United Arab Emirates	142.2	29.2
Iran	138.5	65.4
Kuwait	131.8	20.7
Kazakhstan	101.6	42.7
Nigeria	97.2	62.4
Algeria	93.7	39.3
Colombia	87.8	32.3
Venezuela	73.0	36.3
Angola	70.3	18.1
Oman	53.6	31.3
Libya	52.0	25.5
Turkmenistan	51.3	34.7
Azerbaijan	40.7	26.0

Note Countries are ranked in descending order starting with those with the highest net exports of energy
Source The Author, based on IEA (2020a)

the lowest share among the countries that according to IEA (2020a) had more than 40 mtoe in energy trade surplus.

Second, relatively small size of the Norwegian economy results in a relatively low domestic demand for energy that is covered by domestically available renewable energy sources, mainly hydropower, which helps Norway reduce its environmental footprint.

Third, relatively high per capita demand for energy—5.33 toe per capita (16th position globally)—is balanced by an even higher per capita production of energy—more than 39 toe per capita (Norway ranked 4th globally, with only Qatar, Brunei and Kuwait ranked higher) and by a relatively high energy efficiency of the Norwegian economy, especially compared with other major producers and exporters of energy (IEA, 2020a).

Fourth, Norway is the last Western European country to have substantial energy resources to be produced and exported to other European members of the Western community with which Norway shares liberal norms organising co-operation among like-minded states and economic interests strengthened by increasingly important mutual energy interdependence (Andersen & Sitter, 2019; Austvik, 2019). In other words, Norway is the only full-fledged European democracy with which other members of the European Western clubs—the EU and the NATO—can embark on fruitful energy co-operation without having any second thoughts or political concerns. In addition, Norway's energy co-operation with the EU is regulated, through membership in the European Economic Area (EEA), by the same set of regulations and norms as the ones other EU members must play by, which should make this co-operation even smoother and more predictable (Austvik & Claes, 2011; Ministry of Foreign Affairs Norway, 2012).

Gas Exports—Current Directions and Trends

The WTO estimated that in 2008 alone Norway had a 4% share in global exports of fuels, earning almost USD 114 billion from sales of fuels, or more than USD 23,000 per capita (World Trade Organization [WTO], 2010). In the same year, the share of gas production in petroleum production in Norway reached for the first time 41% and only two years later gas became the most important petroleum commodity produced in Norway. In the following years gas production represented more than 50% of the overall petroleum production in Norway, and even in years when oil

production slightly re-bumped, gas share went only slightly below that magic 50% (Norskpetroleum.no, 2020b).

In Norway, gas is produced and exported by various actors operating on the Norwegian continental shelf but it is the Norwegian state-owned company Gassco that is responsible for shipments of piped gas to Norway's gas customers in Europe. Gassco operates an 8,000-km-long network of gas pipelines connecting Norwegian gas production sites with buyers of Norwegian gas in the EU and in the UK. Construction of this extensive pipeline network came at ca USD 26 billion, but the network needs to be extended to connect new production fields to the existing infrastructure and increase transport capacity. The pipeline system was used to deliver 107 bcm of gas to receiving terminals in 2019 and 114 bcm in 2018 (Gassco, 2020).

SSB estimated that in 2019 Norway produced 119 bcm of natural gas, which made it the 8th largest global producer of that commodity (SSB, 2019). Norway was 'beaten' by the USA, Russia, Iran, China, Canada, Qatar and Australia, but produced more gas than Saudi Arabia and Algeria. Norway exported 95% of its gas production, most as piped gas to consumers in the European Union. In 2019, Norway was ranked the 3rd among global gas exporters, behind Russia, that exported 265 bcm of gas and Qatar (124 bcm), but ahead of Australia (95 bcm), the USA (54 bcm), Turkmenistan (52 bcm) and Canada (51 bcm) (IEA, 2020a) (Table 6.3).

BP (2020) figures show that after the Brexit the share of the EU in Norwegian gas exports will be substantially reduced, if we take 2019 figures as the basis for calculations. With the UK as the EU member the

Table 6.3 Importers of Norwegian gas in 2019 (bcm)

Country	*Piped gas*	*LNG*
Germany	27.8	0.0
UK	26.6	0.5
Netherlands	25.3	0.0
France	19.3	1.5
Belgium	5.1	0.0
Italy	2.7	0.2
Spain	1.8	0.7
Other EU	0.4	3.1

Source The Author, based on BP (2020)

share of the EU in gas export from Norway was 99%, after the UK withdrawal from the EU this will be reduced to 76%. However, the EU will continue to be the most important gas partner of Norway and Norway will retain its position as one of the two major suppliers of gas to the EU (Fig. 6.2).

The importance of the EU should be therefore factored in all examinations of the future of Norway as an energy producer and supplier of gas because for obvious structural reasons, such as the existence of the well-developed rigid pipeline infrastructure and the lack of substantial LNG capacity, Norway is somehow 'doomed' to supply its gas primarily to the European customers. From the point of view of a major gas exporter the question of security of demand in the main available market is therefore of the utmost importance.

The future demand for Norwegian gas in the EU will depend on several factors such as: domestic EU gas production, demand for gas as a source of energy and input to industry, price level on the European and global gas market, competition from other gas suppliers to the EU market, competition from other sources of energy, adaptation and implementation of various EU energy, climate and market regulations, national

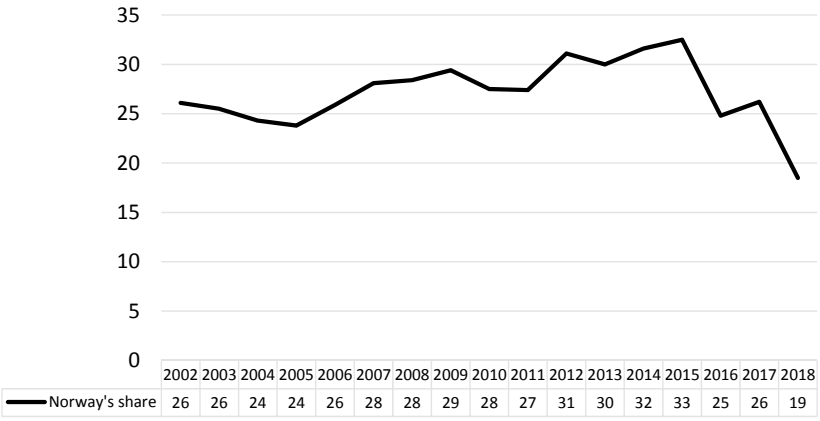

Fig. 6.2 Share of Norwegian gas in the EU's total gas imports in 2002–2018 (%) (*Sources* The Author, based on European Commission, 2020a and earlier editions)

energy policies and, finally, on the availability of the Norwegian gas to be supplied to the EU.

The Future of Norwegian Gas in Europe—Opportunities and Challenges

What are the prospects for Norwegian gas in Europe in the 2020's if all the above examined issues are factored in? This part is divided into two sub-sections. In the first sub-section the focus is on new opportunities that can help extend the lifespan of the Norwegian gas in the European market, while in the second section the emerging challenges are discussed. When conducting this examination special attention is paid to what policy instruments Norway has at its disposal and in what ways Norway can help buyers of Norwegian gas address some of their energy security concerns related to availability, affordability, acceptability and accessibility of energy resources.

Opportunities

The UK

The UK is already an important Norwegian gas customer and gas co-operation between Norway and the UK will continue in many years to come. The UK relies on supply of huge volumes of Norwegian gas which is also facilitated by construction and extension of necessary infrastructure connecting Norwegian gas production sites with the UK gas marked. Domestic production of natural gas has been dwindling in the UK and went down from 98 mtoe in 2000 to 35 mtoe in 2018. While in 2000 the UK was a net exporter of gas, in 2018 the UK's net imports of gas reached impressive 33 mtoe, making it one of the key gas importers in Europe. In 2000, the UK's exports of gas were almost 11% higher than its imports but by 2018 the UK had to import almost 50% of consumed gas. Gross inland consumption of gas in the UK went down from 87 mtoe in 2000 to 68 mtoe in 2018 and gas share in final energy consumption went from 37% in 2000 to 32% in 2018 (European Commission, 2020b). Norway has 'profited' from this situation and increased its gas exports to the UK from some one billion cubic metres in 2000 to almost 27 bcm in 2019 (BP, 2020). In 2019, Norwegian gas had 34% share in the UK gas consumption.

Supplies of Norwegian gas to the UK were facilitated greatly by several factors, such the falling domestic production in the UK and not least the construction of new elements of infrastructure, first and foremost the Langeled pipeline that is the main artery for transport of Norwegian gas to the UK.[2] Having in mind the high level of trust between the UK and Norway and mutual interest in continuing this mutually beneficial energy co-operation it can be expected that this co-operation will continue in the future and that the Brexit will not have any direct negative impact on this gas relationship.

Another factor that will secure Norway's dominant position on the UK gas market is the lack of a long-term alternative for supplies of piped gas from other sources. Although some UK-based actors have some time ago expressed interest in buying higher volumes of gas from Russia, this has become more controversial an option after the crisis in Ukraine that has demonstrated Russia's aggressive designs in Europe. Also other events, such as the poisoning of Alexander Litvinenko in 2006 and Sergei Skripal and his daughter in 2018 have most probably reduced 'appetite' for Russian gas in the UK. Although according to Gazprom its sales of gas in the UK soared from 34.2 bcm in 2018 to 59.0 bcm in 2019 (Gazprom, 2020), Gazprom Export reported that only 10.32 bcm of Russian gas reached the UK in 2019 (Gazprom Export, 2020).

Germany

Germany is another country that can provide some extended opportunities to Norwegian gas in the coming years. Germany must address several energy-related problems in the coming decades (Westphal, 2019) and Norwegian gas can be a part of the solution, at least in some years to come. The challenges faced by Germany are:

- the need to replace the highly polluting and less acceptable hard coal and lignite as the source of energy with some other sources especially after 2038 when all coal mines in Germany are going to be closed;
- the need to replace nuclear energy as a part of the energy mix after 2022 when the last nuclear power plants in Germany are going to be closed down; and

[2] Langeled is a 1,166-km-long pipeline constructed to carry gas from the Ormen Lange field in the Norwegian Sea to the UK with transport capacity of ca 72/75 mcm per day or ca 27 bcm per year.

– the need to add back up capacity to address the problem of intermittency of the German energy system that is increasingly relying on renewable energy sources.

Although there is a clear preference in Germany that has launched its Energiewende programme for renewable energy sources, natural gas, including gas from Norway, may play an important part in this transition towards a greener energy system in Germany. Seeking greater diversification of gas suppliers and facing dwindling production of gas in the Netherlands that has been traditionally an important gas partner, it can be expected that Germany will be interested in increased imports of gas from Norway, especially in the light of controversies caused by Germany's promotion of the Nord Stream 2 pipeline that is by many German partners perceived as highly controversial (Lang & Westphal, 2017; Westphal et al., 2017).

German domestic production of gas went down from 18 bcm in 2000 to some five billion cubic metres in 2019 while the domestic gross consumption of gas increased in the same period from 79 to 81 bcm. Imports of gas increased in this period from 63 to 78 bcm and net import dependence increased from 79 to 97% (European Commission, 2020b).

Norpipe, Europipe and Europipe II pipelines connect Norwegian production sites and gas infrastructure with market in Germany and facilitate trade in gas between Norway and Germany, making Germany the most important market for Norwegian gas. In 2019, Norway exported 27.8 bcm to Germany, covering 31% of the country's gas consumption and supplying 32% of its gas imports. Germany and Norway have also established close political co-operation and Germany is defined as one of Norway's strategic partners. Continued gas co-operation between Norway and Germany can therefore alleviate some problems in the period of German transition to a greener economy and help Germany diversify its gas supplies. This will also make Germany less exposed to over-reliance on gas coming from Russia (see Gustafson, 2020 for a historical overview, and Westphal, 2020 on the current state of Russian–German gas relations) with which relations have suffered several setbacks in the aftermath of the crisis in Ukraine in 2014 and in connection with poisoning of Alexei Navalny and Russian hacking of the German Bundestag that have resulted in imposition of sanctions against Russia and in the general worsening of bilateral relations (Fischer, 2020).

New Gas Relationships

Norwegian gas can be used not only to cement or extend old relationships, helping traditional partners to address various energy related challenges, but also to establish new energy relationships. There are at least three new emerging relationships in which Norwegian gas can play a positive role.

First, after the crisis in 2014, Ukraine expressed interest in replacing Russian gas supplies with supplies from other countries. Norway saw this new opening and was able to help Ukraine by supplying small but symbolically important volumes of gas—0.9 bcm in 2014 and two billion cubic metres in 2015 (Eurostat, 2020).

Second, Lithuania that wanted to reduce its gas dependence on Russia joined as a new gas customer when the floating LNG gas terminal in Klaipeda with a highly symbolic name FSRU Independence—owned by the Norwegian company Höegh, built in South Korea with support of the Norwegian State bank guarantees—made it possible to import gas in the LNG form from other suppliers. Norway was among the countries that used this opportunity exporting 0.1 bcm of gas in 2014, 0.5 bcm in 2015 and 1.4 bcm in 2016. Some affordability-related questions hampered this promising co-operation and imports of gas from Norway went slightly down to 0.9 bcm in 2017 and one billion cubic metres in 2018 (Eurostat, 2020). Supplies from Norway represented 4% of gas consumption in Lithuania in 2014, 21% in 2015, 66% in 2016, 41% in 2017 and 45% in 2018. These supplies have helped reduce the country's dependence and reliance on Gazprom and forced Gazprom to rethink its pricing policy on this small national market where it until 2014 had a monopolist position.

The third and most promising gas relationship that is about to be established is the one involving Poland, Denmark and Norway that work together to open a new transport route for Norwegian gas to reach new customers and help Norway diversify its markets. The Baltic Pipe project that is to allow for exports of up to ten billion cubic metres of Norwegian gas to Poland via Denmark is in fact no less than a third attempt to connect Norwegian production sites with a promising gas market in Poland, and more broadly in Central Europe. If implemented as planned by 2022 it will improve energy security in Poland in many ways. First, it will reduce dependence on imported energy from Russia which is perceived as an unreliable partner trying to use energy supplies as a political leverage (Gawlikowska-Fyk, 2019; Korteweg, 2018; Naimski, 2015). The Baltic Pipe project (BalticPipe, 2020) is the third of series

of gas-related measures taken by the Polish policymakers interested in diversifying supplies and reducing Poland's energy dependence on Russia.

The first of these measures was the plan to turn Poland into a European shale gas power, but after some overly optimistic prognosis it turned out that this was not to happen (Godzimirski, 2016). The second one was the construction of an LNG terminal in Świnoujście that enabled Poland to import LNG, including some small volumes from Norway (0.3 bcm in 2018 and 0.25 bcm in 2019). To increase gas import capacity Polish authorities have also given a green light to construction of a floating LNG terminal close to Gdańsk.

Baltic Pipe and the two LNG terminals will help Poland realise its plan to become a gas hub in Central Europe from which gas—including Norwegian gas—could be supplied to other regional customers, such as Lithuania, Slovakia or Ukraine. Increased imports of gas will also help Poland deal with another serious energy security-related problem—the question of the (in)acceptability of coal as a major energy source in Poland. Being a member of the EU and facing a huge air pollution problem in major urban areas Poland has joined the project of reducing the EU climate footprint. To achieve its goals it must phase out coal and lignite as the main energy sources. Natural gas, including gas from Norway, can help Poland deal with this challenge by making it possible to replace polluting coal with gas in the period of transition towards a greener energy system (Ministry of Energy Poland, 2019).

Two-Edged Technologies

An issue that deserves a closer scrutiny when discussing the future of Norwegian gas in Europe is the question of the technological change that can provide both some new opportunities and pose some challenges. From the point of view of a major producer and supplier of fossil fuels to the most attractive global energy market where a serious attempt is made to build a fossil free energy system as a way of dealing with the problem of climate change several technological transformations can be viewed as crucial. Two of these possible technological transformations can have direct and indirect impact on the situation of Norwegian gas in Europe in the short-term, mid-term and long-term perspective.

The first of these technological transformations has to do with the ability of the increasingly greener energy system to be coupled with new more effective energy storage technology that could help address the question of intermittency of renewable energy. A cost-effective solution

to this energy storage challenge can speed up energy transformation and reduce the need to have gas as a convenient transition fuel (O'Sullivan et al., 2017; Scholten & Bosman, 2016; Shivakumar et al., 2019).

But new cost-effective technological solutions can also help extend the lifespan of natural gas as an acceptable, affordable, accessible and available energy source. The most promising way of making gas—and some other fossil fuels—an acceptable energy solution with an extended lifespan is the success of large-scale CCS technology (Benson et al., 2012). This could give natural gas a new lease of life, for instance by making it a part of a new energy value chain in the form of green hydrogen that can replace other more polluting sources of energy in transport, heating or in other energy-related contexts. The fact that Norway has relatively voluminous gas reserves, well-developed energy infrastructure, access to renewable hydropower that can help it cover its own energy needs and have established many strong energy relationships with key European economic powers can make Norway a dream partner in a new era of green hydrogen (Mench, 2015; Overland, 2019). However, the success or failure of this possible reinvention of Norway will depend on the success or failure of the technological CCS revolution and as we in Norway have learnt it is much easier to proclaim CCS Moon landing than make it happen in reality. This makes it even more important to examine what real challenges Norwegian gas may face in the coming years.

Challenges

In this examination of challenges faced possibly by the Norwegian gas, we will focus on the developments in the 2020's and beyond 2030. We will also assess these challenges along two axes—the probability of them emerging, and how serious a challenge they can pose to the situation of the Norwegian gas on the European gas market.

The EU Focus on Climate Change and Decarbonisation

The success or failure of the EU launched policy of decarbonisation of the EU energy system should be viewed as the most important factor influencing the future of gas on the European market. This policy is to help the EU address the issue of climate change identified as an existential threat not only to the EU, but also in the global context (European Commission 2020c, 2020e; Goldstein, 2016; Luterbacher & Sprinz, 2018; Sartor et al., 2014; Skjærseth, 2015). The EU has at its disposal four types

of power and it is expected that all those types of power will be used in the EU's promotion of its approach to the climate change challenge (Goldthau & Sitter, 2019).

The core idea shaping the EU energy policy and thus its ability to project normative power is the idea of market and trade liberalisation as the best response to specific energy market-related challenges. Approaching the issue of gas market predominantly from a consumer perspective the EU aims to pursue a set of international rules that are somehow value-neutral but are shaped by the EU's overall approach to trade liberalisation. The EU seeks to shape international energy cooperation not by pursuing its own narrow economic interests but by building rules and regulations intended to be attractive to all market-oriented global players. This is also clearly visible in the EU's approach to how to mitigate climate change that could be understood as an effort to develop a regulatory regime that can serve as a model for global governance or a model for other national or regional regimes. Especially the introduction of the ETS can have direct bearing on fossil fuels, including Norwegian gas, in the European energy market. By 'imposing' an additional fee on consumption of fossil fuels the competitive edge of renewable fuels is strengthened which in turn may make them more attractive to energy consumers in the EU, and elsewhere.

To make both member states and external energy players play by the set of rules regulating the market the EU can in addition use its regulatory, market and economic power. Application of these three types of power by the EU has already had and is going to have a huge impact on the situation of fossil fuels, including natural gas, in the area where the EU is able to project its power. The EU's regulatory power shapes both the internal markets within the confines of the EU and exerts influence on external suppliers of energy to the EU.

For instance, publication and implementation of EU directives on gas market liberalisation is the best example of how this regulatory power is 'translated' into market rules and practices that have a huge impact on the functioning of the gas market in the EU and elsewhere. The most visible change in the gas market over the past decades is the departure from long-term contracts with many rigid options and provisions to daily market-based spot prices as basis for trade decisions. All actors wanting to have access to the EU gas market have been forced to accept this change of the rules of the gas game, not least because the EU regulatory power

is meant to build and manage markets in ways that favour EU itself by putting in place regulatory regimes that generate consumer benefit.

Having in mind increased EU focus on mitigation of climate change and EU priorities in development of energy market that are to reduce its environmental footprint we should expect that various types of climate, competition and trade related regulations will have a direct and indirect impact on gas producers' and exporters' access to the EU internal gas market also in the coming decades. In addition, the EU can also use its market and economic power to make actors play by the normative and regulatory rules set by the EU—or to eliminate them as suppliers of energy to the EU, if they refuse to comply with EU energy market rules and regulations. The EU's market and economic power is targeted at selected actors to get them to pursue or not pursue a given course of action (Goldthau & Sitter, 2019). In the area of gas '*the market power strategy is based on the idea that gas is a strategic good and that security of supply must be a paramount concern for a specific group of states that rely on a neighbouring empire for almost 40 percent of their gas imports*' (Goldthau & Sitter, 2019, 34). Finally, the economic power of the EU can be used as a tool in foreign policy to support selected industries or policies for political or economic reasons.

In this situation, Norwegian gas can have a limited role as a part of the solution in a short-term and mid-term perspective, but can face some problems in the long-term perspective. Being the second largest external supplier of gas to the EU, Norway can alleviate some risks related to the EU's in general and some EU countries more specific, overdependence on gas supplies coming from Russia. This is already the case when Norway decided to supply gas to Ukraine, Lithuania or Poland and has plans about increasing these supplies to represent almost 10% of its total export of gas when the Baltic Pipe project becomes operational by 2022. In a similar way, Norwegian gas can help countries, such as Poland or Germany, to achieve climate and emissions goals outlined in national documents and agreed at the EU level by replacing coal in national energy mixes.

However, realisation of climate and emission goals may also force phasing out of fossil fuels, including Norwegian gas, from energy mixes. For instance, according to prognoses presented in the last edition of the IEA World Energy Outlook (IEA, 2020b) some scenarios see demand for gas both globally and in the EU fall due to more focus on combatting climate change and phasing in new renewable energy resources replacing fossil fuels. According to Stated Policies Scenario, gas demand in the

EU is to be reduced by 30 bcm in 2030 compared with 2019 (IEA, 2020b). However, it may turn out that for various political and market-related reasons Norwegian gas will suffer lesser losses on this shrinking EU energy market in transition towards a greener energy system than gas coming from other suppliers with a more complicated relationship with the EU than Norway.

When dealing with the EU and trying to influence its energy policy and priorities to promote its energy interests Norway that is in many respects a de facto member of the Union (Austvik & Claes, 2011), has a limited arsenal of instruments at its disposal (Godzimirski, 2019). Energy relationship between Norway and the EU can be best described as an asymmetric interdependence, with the EU having the upper hand in most of the areas and Norway forced to adapt to changing political, market, economic and normative framework conditions (Andersen & Sitter, 2019; Gawlikowska-Fyk et al., 2015; Godzimirski & Nowak, 2018). This asymmetry is even more clear in a situation when the EU aims at removing all fossil fuels, including gas, from its energy mix while Norway, as a major gas supplier is interested in having access to the EU gas market. When commenting on strategic choices made by the EU in 2018 Norwegian media painted therefore a rather bleak picture for the future of Norwegian gas in Europe. One of the leading Norwegian newspapers argued for instance that although according to some EU estimates demand for gas in the EU will be reduced only by ca 15% by 2030 and Norwegian gas will have an important role in the EU in the coming decade, the situation will change dramatically in the following decades. According to two EU scenarios, the EU that plans to become climate neutral by 2050 will reduce its consumption of gas by 85% by 2050 and Norwegian and other gas suppliers will therefore face hard time in this key energy market (Dagbladet, 2018).

Especially after 2025 the prospects for gas will start to deteriorate in established markets as a result of environmental considerations, increasing competition from renewables, efficiency gains, growing electrification of end-use demand and improving prospects for alternative low-carbon gases, including hydrogen (IEA, 2020b). A possible way of extending the lifespan of natural gas is the implementation of effective CCS technology that will help turn natural gas into green hydrogen, a prospective fuel with almost no direct negative environmental footprint.

Changing Competition Landscape

Another challenge Norwegian gas can face in Europe is the coming of new gas suppliers who can offer more affordable, and thus more acceptable gas supplies. Although today some of the gas supplied to the EU from further away comes already as LNG, it is believed that LNG will see its share increased in the EU market. The future role of the USA as the emerging gas supplier to the EU draws a lot of attention. Some EU members, such as Poland, are enthusiastic about these prospects and have already signed contracts for LNG supplies from the USA, while others, such as Germany, are more reluctant, but it is expected that the ongoing LNG revolution that is about to change the global gas market will also have huge impact on gas trade in Europe and indirectly on Norway's position in this market. It is expected that huge volumes of the US produced LNG will press gas prices in Europe down and this will also have consequences for other gas producers and suppliers (Barstad, 2016).

Norway itself has experienced how gas from the USA can change gas trade in Europe. Already in March 2016, a giant gas vessel fully loaded with ethane extracted from American shale gas arrived in Norway to deliver gas to the Ineos facility in Rafnes (Sørheim & NTB, 2016). This gas was meant to be used in production of plastic but this shipment was also viewed as a highly symbolic sign of the new gas era emerging in Europe where traditional gas producers and suppliers were challenged by newcomers who intended to change the rules of the gas game not only in Europe but globally. The emergence of new LNG suppliers, first and foremost the USA, Qatar and Australia is often interpreted as a new step in creation of a truly global single gas market where piped gas will be facing increased competition from LNG. Since more than 95% of gas produced and exported from Norway has the EU countries as the main customers the emergence of LNG competition poses a challenge to Norway's position as the second most important gas supplier to the EU. The volume of LNG supplies to Europe is not for the time being huge, and demand for gas saw a slump in the aftermath of the COVID-19 pandemic, but in the short-term, medium-term and long-term LNG can compete with Norwegian gas on many markets in Europe. However, for the time being this competition is limited to the UK where LNG has been arriving in increased volumes and to some other national markets where the Norwegian gas is one of available options.

In 2019, the last pre-COVID year, the EU imported the highest volume of LNG in its history—108 bcm that represented 27% of total

gas imports and 22% of gas consumption (European Commission, 2020f) which was purely by chance almost the same volume of gas Norway exported to the EU in the same year. Qatar supplied 30 bcm of LNG to the EU in 2019, and was followed by Russia with 21 bcm and the USA with 17 bcm.

Situation changed in 2020 as EU LNG imports kept on increasing, up by 26% year-on-year in the 1st quarter of 2020. The USA remained the most important LNG supplier to Europe, ensuring 30% of the EU's total LNG imports in the 1st quarter of 2020, ahead of Russia (22%) and Qatar (15%). In the 1st quarter of 2020, the EU imported 25 bcm of LNG, and the three largest importer countries were: Spain (6 bcm), France (5 bcm) and Belgium (4 bcm) (European Commission, 2020f).

This list of major LNG suppliers reveals some interesting developments—Qatar has been the major global LNG player for some time and has supplied LNG to Europe in many years, but the emergence of Russia on this list is a relatively new phenomenon caused by opening of the Yamal LNG in the Russian Arctic run by main Gazprom's Russian gas competitor Novatek that has managed to break Gazprom's monopoly for gas exports from Russia, while the US supplies are a result of the ongoing shale gas revolution turning USA into a major global LNG player and the number one global producer of oil and gas combined.

Although this LNG 'expansion' was slowed down by the COVID-19 related developments that have reduced demand for energy in Europe, it is expected that LNG will continue to play an increasingly important role both on the European and on the global market, posing in that way a challenge to suppliers of piped gas (Analiticheskii tsentr pri pravitelstve Rossiyskoy Federatsii, 2020a).

Price Volatility

The volatility of gas price in Europe is one of the key structural factors all gas suppliers must factor in their plans. In December 2019, the price of natural gas at Europe's largest terminal—the Title Transfer Facility (TTF) in the Netherlands—fell by 10.3% to USD 4.62 per MBtu. In the 3rd quarter of 2019, the average sale price of thousand cubic metres (tcm) of gas to the EU was USD 170 which was 32% lower than in the 3rd quarter of 2018. In the 3rd quarter of 2019, natural gas prices in Europe fell to the level not seen since 2004 when the average price amounted to USD 138 per tcm (Volovik, 2020). This trend continued in the 1st half of 2020, when the COVID-19 pandemic resulted in massive lockdowns and

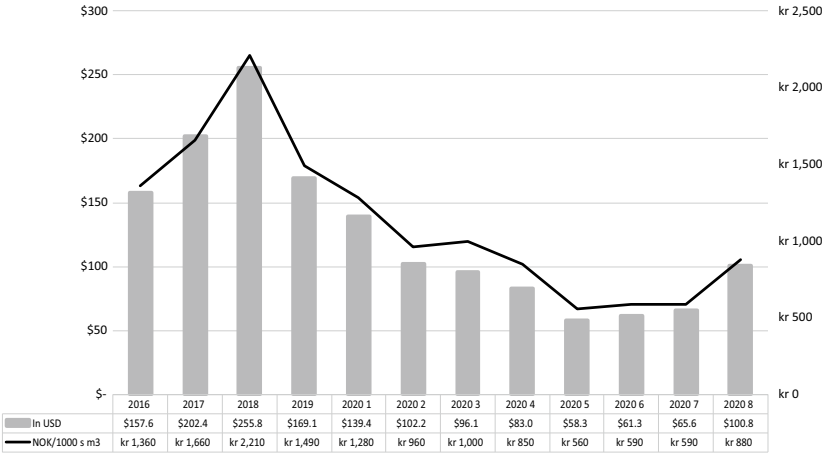

Fig. 6.3 Price of Norwegian gas on the European market 2016–2020 (NOK and USD/1000 Sm^3o.e.) (*Note* kr = Norwegian Krone (NOK). *Source* The Author, based on Brenna, 2020b)

a far lower demand for energy. Both global and regional European gas markets were hard hit and the gas price collapsed. In May 2020, gas was traded for USD 37 per tcm in Europe and for USD 66 per tcm in Asia (Analiticheskii tsentr pri pravitelstve Rossiyskoy Federatsii, 2020b). After the end of the first phase of the COVID-19 pandemic, gas price in Europe went up by nearly 60% from July to August 2020, but was still below USD 100 per tcm, both in Europe and the USA (Analiticheskii tsentr pri pravitelstve Rossiyskoy Federatsii, 2020c). However, cold weather in the first weeks of January 2021 contributed to skyrocketing of gas price in Europe where it reached USD 252 per tcm at TTF, but this seems to be a short-lived price spike and not a long-term trend (Lenta.ru, 2021) (Fig. 6.3).

Will Norway Be Able to Maintain the Current Level of Gas Production in the Future?

To remain an important energy producer and exporter, Norway needs to have enough energy resources to cover its own energy needs and to send the surplus of energy to other actors. A recently published examination of the resource situation paints a rather disturbing picture of that future,

describing the Norwegian continental shelf where most of the discovered and undiscovered resources are located as a squeezed lemon. According to the recent estimate, the production of petroleum is to increase until 2024 and to decrease in the following years. It is also estimated that approximately 50% of all discovered and not yet discovered resources are still to be produced and that most of these resources are in the Barents Sea. What is however more problematic is that most of these resources are in natural gas in the fields that are located far away from the existing infrastructure. This means that only the largest fields to be discovered in this promising region will be considered as marketable, but so far the discoveries in the region have been disappointing. The main conclusion from this rather realistic study was that the deposits that are discovered today are far smaller than before and the prospects for new major discoveries are becoming increasingly uncertain (SSB, 2019). This can in the longer perspective put an end to Norway's role as a major gas producer and exporter.

With the current level of production—ca 120 bcm of natural gas per year—that is not expected to grow substantially in the coming years this would secure the same level of supplies in the coming thirteen years. The situation could change into a more positive direction if the levels of contingent and undiscovered gas resources were to increase. Contingent resources of gas are proven resources for which a production decisions have not yet been made. Undiscovered gas resources are those resources that will most likely be discovered and can be produced, but which have not yet been proven through drilling. At the end of 2019, contingent resources totalled 1,378 million Sm^3o.e. while the undiscovered resources were at that moment estimated at 3,910 million Sm^3o.e. According to official NPD data, there are additional 310 million Sm^3o.e. of gas in contingent resources in fields, similar volume of gas—310 million Sm^3o.e.—in contingent resources in discoveries, and 1,805 million Sm^3o.e. in undiscovered resources. If all the estimated volumes of gas in all categories are added they total 3,955 million Sm^3o.e. This in theory could secure production of gas from Norwegian fields at the current level in the coming 33 years—in other words, until the year 2053.[3]

[3] The author's calculations based on data from Norskpetroleum.no (2020c).

Acceptability and Affordability Question

The future of the Norwegian resource base will depend not only on development of known and yet undiscovered fields, but also on the outcome of the political discussion on how Norway could and should reduce its environmental footprint to help mitigate problems caused by the climate change not only in Norway but globally. There are strong voices both in Norway and elsewhere, calling for putting an end to production from some existing or newly discovered fields, for stopping development of new fields as well as exploration in some areas deemed too vulnerable environmentally.

A good example of how difficult decisions on petroleum activity in Norway could be was provided recently when the debate on the so-called marginal ice zone in the Barents Sea was concluded, leading to a lot of controversy. The so-called constitutional climate controversy—Klimasøksmålet—taken by Norwegian environmental NGOs to the Supreme Court of Norway that wanted to stop exploration and production of fossil fuels in the Arctic part of Norway is another good example of how the issue of acceptability can influence the future of the gas industry in Norway (Klimasøksmal, 2020). Yet another good example with direct bearing on possible access to some important but yet undiscovered petroleum resources is the ongoing discussion on exploration and possible petroleum activity in the marine areas of Lofoten, Vesterålen and Senja located in the northern part of the country far away from the EU market (Åslie & Mansouri, 2020).

The future of Norwegian gas production will therefore depend not only on the availability of resources, but also on whether exploration and development of these resources will be acceptable and affordable, not only in purely economic but also in political and environmental terms. Depending on what choices in this area will be taken by Norwegian policymakers, and how strong such decisions will be pushed on Norway by the EU that is seriously concerned with the negative impact fossil fuels have on climate, we cannot completely rule out the possibility of some known and undiscovered gas assets ending as stranded assets.

Also quickly falling costs of renewable energy, increasing costs of CO_2 emissions and availability of cheaper gas with lower break even costs can undermine the economic viability of some of the projects located in those vulnerable areas. The fate of the huge Russian Shtokman gas field—the second largest offshore gas field in the world—located in the same area where many yet undiscovered Norwegian fields are expected to be found

is a good example illustrating technological, economic, market and even political challenges to be faced by Norwegian gas producers in years to come.

Norwegian Hydropower Versus Norwegian Gas?

The role of hydropower in Norway needs to be examined for at least two reasons in the context of discussion on the current and future role of Norway as a gas supplier to Europe. First, the availability of hydropower and its central role in the Norwegian energy consumption contribute to limited demand for gas in the domestic market, which makes huge volumes of gas of Norwegian provenience available to other consumers in the neighbourhood. Second, there is a growing interest in both Norway and in the EU in strengthening the connection between Norwegian power grid and production facilities and the European electricity consumers. The idea is to turn Norway into an important element of the European power generation system to help it cope with the challenge of intermittency caused by the more prominent role of renewable energy resources in the European energy mix. The idea of turning Norway into a green battery of Europe is being translated into policy of building interconnectors linking Norwegian power grid with several national grids. This means that Norwegian supplies of electricity can in fact compete with Norwegian gas on some national energy markets. This trend may become even more important in the future when new grid interconnectors between Norway and Europe will be added to the existing ones and gas will no longer be treated as a convenient transition fuel but as a less harmful but still a fossil fuel to be removed from the European energy mix.[4]

In 2019, Norway produced 125 TWh of hydroelectricity (3% of the global hydropower) and had 33 GW of installed capacity which helped generate 95% of all electricity produced in Norway. However, even if the production of electricity in Norway were to increase substantially in the coming years it would be impossible to replace gas with electricity as the main Norwegian contribution to energy security of Europe. According to realistic calculations, energy value of the Norwegian gas exported to Europe—1,200 TWh—was almost ten times higher than the total production of electricity in Norway—125 TWh in 2019 (Brenna, 2020a). The

[4] See IEA (2019) on the role of gas in energy transition.

main conclusion here should therefore be that Norwegian electricity can play a certain balancing role in the European context, but gas—and oil—will remain the main energy commodities to be supplied to Europe—at least until they will be replaced by other, less harmful sources of energy in the EU that has an ambition to reduce its environmental energy footprint to zero (Gullberg, 2013; Schjøtt-Pedersen, 2016).

Concluding Remarks

The aim of this chapter was to contribute to a better understanding of the role of the Norwegian natural gas in the European market in the 2020's. To be able to draw any conclusions on the future role of the Norwegian gas we decided to examine its historical role in the most important market in Europe and factors that have had and will have impact on the evolution of the strong energy relationship developed between Norway and the EU. The main conclusions from this examination are as follows:

- Norwegian gas has become the main energy commodity exported from Norway to the EU and will remain so due to the composition of the resource base in Norway, a short re-bump in oil production in Norway notwithstanding.
- Several structural factors that have been influencing gas relations between Norway and the EU are going to influence these relations also in the coming decade, but their influence will be weighted differently. This has to do with the changing energy priorities in the EU. More focus now is on the sustainability of the energy system and closely related issue of climate change caused by the use of fossil fuels and less on the security of supply, with the need to have access to competitively priced energy that will make the EU more competitive globally being viewed as less acute. Once climate change has been defined as a an existential threat not only to the EU, but to the whole mankind, the EU embarked on policy of reducing environmental footprint of energy to zero, which bodes ill for all fossil fuels, including Norwegian gas.
- Norwegian gas is perceived as a politically safer commodity than the Russian one, especially after the 2014 conflict in Ukraine that has provided additional motivation to look for new sources of gas by those actors who perceive energy dependence on Russia as a serious security challenge (Van de Graaf & Colgan, 2017). This has opened

some new market opportunities to Norwegian gas and the construction of the Baltic Pipe that is to be concluded as planned in 2022 will redirect some 10% of Norwegian gas production to new markets. Construction of new LNG terminals has also provided some new market opportunities in countries, such as Poland or Lithuania, but the volume of LNG from Norway is relatively small due to limited production capacity.

- The depletion of existing gas fields in the UK, the Netherlands and Denmark opens also some new market opportunities for the Norwegian gas. Also decision on phasing out of nuclear power by 2022 and coal by 2038 taken by the German authorities will open some new possibilities in the relatively saturated German gas market even if the Nord Stream 2 project is completed.
- The availability of gas to be shipped from Norway to markets abroad is one of the structural uncertainties as the known reserves allow for maintaining production at the current level for some thirteen years and new large discoveries are uncertain and are expected in the areas far away from the existing infrastructure and markets.
- Norwegian gas will face growing competition from new, renewable sources of energy and if the EU climate plans are implemented, it should be phased out by 2050. The only possible but maybe less probable rescue for all fossil fuels could be development of the cost-effective large-scale CCS technology that would help address the question of their environmental footprint. However, it remains to be seen how economically viable such a technological solution will be in a situation when the costs of renewable energy are getting lower due to technological innovations and effects of economies of scale. The CCS technology will also be crucial and help extend the lifespan of the Norwegian gas turning it into an important input in green hydrogen, a new promising energy source combining the best of the two energy worlds—the fossil one and the green one (European Commission, 2020d). Finding a viable solution to elimination or substantial reduction of the environmental footprint will also silence critics of fossil fuels and make them less unacceptable.

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