CLINGENDAEL INTERNATIONAL ENERGY PROGRAMME | CIEP

# EUROPE'S ENERGY RELATIONS

## BETWEEN LEGACY AND TRANSFORMATION

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CLINGENDAEL INTERNATIONAL ENERGY PROGRAMME | CIEP

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# 1 THE INTERNAL AND EXTERNAL DYNAMICS OF EU ENERGY RELATIONS

In this dossier dedicated to energy in Europe, the Clingendael International Energy Programme (CIEP) offers insights into the evolving political relations in oil, natural gas and the transition towards a cleaner energy mix. This introduction provides a critical overview of the overarching factors that shape Europe's energy relations.

Our first reflection is that European energy policy-making has often been a reaction to single events, such as the 1973 oil crisis, the 2006 and 2009 Ukraine gas crises, and the 2011 Fukushima nuclear incident.

Although these kinds of shocks can alter the course of energy policy-making, we also observe that energy policy-making is very much shaped by legacies. In other words, the way in which new forms of trade or new energy mixes come about is shaped by path dependencies. Two broad types of path dependency that are analysed here are national endowments (both in terms of natural resources and industrial assets) and long-standing political-economic relations (namely with external energy suppliers).

The finding that national endowments and political-economic relations shape energy interests leads to the observation that different European countries have very different energy priorities.  Despite the progress in EU energy policy-making in recent years, different national interests guide policy choices at the Member State level, and also tend to determine a focus on gas relations rather than oil at an EU level – as we will explain. In three articles, on the impact of climate change policy on energy flows in the EU, on gas trade relations, and on oil trade relations, CIEP illustrates the room to improve coherence of EU and Member State energy policy-making, both from an energy perspective and from the broader perspective of international relations. In a fourth article, we underline the importance of energy trade to the Netherlands.

Another overarching factor that is increasingly shaping the EU's energy relations is climate policy. The transition towards a cleaner energy mix poses fresh challenges in terms of energy system adaptation and national-oriented approaches often disregard the impact that they can have on neighbouring countries. Therefore, apart from looking at the EU's external energy relations, we also devote attention to changing internal relations between EU countries. Finally, we notice that climate policies are not only relevant for the international dimensions of renewable energy – as is commonly understood. As we stress throughout the dossier, climate policies are also set to become one of the most important factors shaping international oil and gas relations.

This leads to the final theme, which is the importance of considering energy in the broader picture of political and economic relations. Our energy choices have the potential to impact social, economic and political realities in neighbouring countries, particularly in the Former Soviet Union (FSU) and Middle East and North Africa (MENA) regions. Transformations there are in turn likely to have important repercussions on Europe. Therefore, taking into account the impact that our energy choices have on neighbouring countries is strategic.

## EVENT-DRIVEN ENERGY RELATIONS

Energy trade relations of the EU and its Member States have always been dynamic, responding to developments in the international economy, international energy markets, and geopolitics. In the recent past, several events have structured the external energy trade relations, such as the oil crises of the 1970s, conflicts in the Middle East and the gas crises in the 2000s between Russia and Ukraine. The oil crisis of 1973 led to a flurry of new energy relations initiatives internationally, at the EU level (then comprising of only nine Member States) and at the national level. In November 1973, the International Energy Agency (IEA) was founded under the aegis of the OECD in Paris with substantial powers in case of an oil market disruption. France disagreed with the American-led response to the oil crisis, but shadowed the strategic oil policies of the IEA through similar EU policies. Nevertheless, the fact that Member States signed the International Energy Programme (IEP) Agreement of the IEA first, before implementing a common policy, gave precedence to the IEA in oil over EU policies. A month after the IEA was founded, in December 1973, the EU agreed to a common energy policy. Due to the many national powers over energy policy-making and the preference to determine the policy nationally, it took a very long time before that policy had developed some teeth. The result is that in energy mix matters the Member States are competent, in other energy policy matters the competency is shared with the EU, while in climate change matters the EU is competent. While it is up to the EU to negotiate on behalf of the Member States in the UNFCCC, it is up to Member States to join IRENA. Coherence in terms of governance of energy and climate change policy is absent.

## LEGACIES

### NATIONAL ORIENTED POLICIES

National priorities are traditionally shaped by the available domestic resources, notably coal and natural gas in the case of Europe. Other countries without significant fossil reserves have opted for the development of a strong nuclear power sector. The priorities of energy policy, namely affordable, clean and secure energy, have led to a mixture of different energy technology combinations and import dependencies, which vary per demand function. In general coal, natural gas, nuclear, and increasingly also wind and solar, have been the main fuels in the power sector, while oil has been gradually phased out from this sector. Oil products are important for transportation (air, rail, and road) and industrial demand (also feedstock) throughout the EU. They are also widely used in residential heating in some Member States. Natural gas is used in the power sector of the EU, but also for residential heating and industry (both for high temperature heating and as a feedstock).[1] Coal is an essential source of residential and industrial heating in some Member States, while in some countries electric heating is also important. Moreover, the level and dispersion of industrial activities in the Member States and the availability of energy networks also impact the possible fuel choices. All in all, the EU Member States all have their own energy mixes, energy network and storage specificities which determine their internal EU and external energy relations.

### LIBERALISATION

Legacy is also visible in the different degrees of advancement of market liberalisation across Europe, a process that gained traction with an increasing dominance of neoclassical economic thinking and neoliberal politics in past decades. As a generalisation, we can safely say that Eastern Europe is more reluctant and slow in implementing the reforms promoted by Brussels to break up incumbents and unbundle production and transmission of energy. Countries with a long-standing tradition of trading and a developed financial system, on the other hand, have been the fastest to adapt and are now price setters for the whole of the EU, notably in natural gas markets. The liberalisation of the electricity and natural gas markets has indeed been a major attempt to break with legacies and has had an important impact on both internal gas flows in the EU, and on relations with non-EU gas exporting countries. However, long-term contracts still cover the bulk of supplies to Europe – with some legacy contracts running well into the 2030s.

1 http://www.clingendaelenergy.com/publications/publication/european-union-industrial-energy-use-with-a-focus-on-natural-gas.

### ENLARGEMENT

Another major influence on the development of external relations were the successive enlargements of the EU. The enlargement to Eastern European countries in 2004 was the most significant for current energy relations. Opening up the European Union to countries whose energy infrastructure had been thought of as part of Soviet infrastructure and whose industrial endowment reflected industrial policy choices taken in the Soviet era had a bearing on the whole block's energy policy-making.  As a result of legacies from Soviet times, some countries that are now Member States of the EU are disproportionately dependent on Russia as an energy supplier. The higher degree of dependency on Russia can translate into opposite postures, but in any case, these postures are quite different from the pragmatism displayed by large Western European countries in their dealings with Russia on the energy dossier. While a number of Eastern European Member States translate their perception of overreliance on Russian energy into overt hostility – lobbying at the EU level to break away from Russia – others translate it into strict political alignment. The import dependence of Eastern Member States on oil and gas supplies from Russia is playing a major role in the external energy policy posture of the EU. Particularly the gas relation has become highly politicised, mainly because of the problematic relationship between Ukraine and Russia. The main export trunk line for natural gas runs through Ukraine, and two gas crises in the 2000s temporarily cut off the EU from its main gas supplier. The ongoing political instability in Ukraine continues to pose a serious security of supply risk for the EU, and a security of demand risk for Russia, resulting in high-risk political interference in the country by both the EU and Russia. Russia's security of demand priority is bypassing Ukraine by building Nord Stream 2 and Turk Stream.  However, Central-Eastern EU Member States oppose these plans – which are on the other hand supported by a number of EU companies and Member States such as Germany – because they would lose transit fees and leverage vis-à-vis Moscow.

## ENERGY AND CLIMATE CHANGE POLICIES

The last major development that now also shapes EU energy relations is the climate and energy policy towards 2050, requiring a deep decarbonisation of the EU-economy. While the electricity sector is cleaned up by increasing the use of low-carbon energy technologies such as solar and wind technology, also other parts of the EU energy economy need to decarbonise. In other words, in addition to clean electrons, the EU economy also needs clean molecules to deeply decarbonise electricity demand and storage, residential heating, industry and mobility. This is important in order to realise integrated energy sector transition, also known as 'Sektorkopplung' (sector coupling). Building a completely new energy production park and accompanying infrastructure will take time and the current energy intensity dimensions of electricity transmission compared to gas and oil are often misunderstood.[2] In most Member States, the share of electricity demand is presently about 20% of final energy consumption. Increasing the share of electricity demand by electrifying residential heating and mobility will require adjustments to the electricity systems, such as smart grids, storage, and more transmission and distribution capacity, but also requires managing the timing of the demand to coincide with increased supply of low carbon electricity. The latter is important to stay on a path of declining CO2 emissions to reach the goal of 80% less emissions compared to 1990, the main purpose of the energy system transition.

In the past few years, the emphasis in Member States has been to increase the production of renewable electricity to comply with the EU 20-20-20 policy. However, in Germany, the rise in wind and solar capacity went hand in hand with the reduction of low carbon nuclear energy, largely muting for now the expected positive impact on $CO_2$ emission reductions of the power sector. Wind and solar produce electricity when there is wind or sun. Their production does not necessarily coincide with demand for electricity, forcing traditional power producers to manage the difference. Due to the interconnected EU power market, the increasing production of new 'variable' energy technologies such as solar and wind is also felt across national borders.

These new energy technologies will also change the energy relations within the EU, which is the subject of the article on energy transition and internal energy relations. With more wind and solar in the EU energy system, the urgency of building new energy conversion capabilities (chemical storage in batteries or conversion to storable molecules such as hydrogen) increases because the ability to push the electrons across the border into the market of a neighbouring country declines with the buildup of similar solar and wind capacities. Remarkably, the language in many EU Member States does not reflect the existence of a common market, when structural imports of power from a neighbouring Member State are seen as problematic, while exporting to these same neighbours, sometimes at negative prices, is seen as a necessary and easy outlet for balancing their own system. The impact of particular national choices with regard to renewable energy on neighbouring Member States is very large, and can seriously reduce the solution space for that neighbouring country to engage in its own integrated energy system transition. So far, the energy transition policies have stimulated national policy approaches, which, due to the difference in approach and speed, impacted on the business models of companies in neighbouring

2 See CIEP (2017) "Speaking Notes: Integrated Energy System Transition".

countries and the solution space of governments in their energy and climate change policies. We also see that the liberalisation of the EU electricity and natural gas markets makes it somewhat complicated to combine with the more interventionist approaches to energy system transition.

### FUTURE IMPACT ON EXTERNAL SUPPLIERS OF THE EU

The impact of EU energy and climate change policies is potentially also very large on the external suppliers of the EU. Moreover, with weaker drivers for EU energy demand growth due to energy efficiencies, modest economic growth and an ageing population, the prospect of growth in demand for fossil fuels is projected to be sluggish. The introduction of new energy technologies, drive trains for road transport and low carbon fuels will change the longer-term outlook for the flow of imported natural gas and oil and as a result, the energy relations with the main EU suppliers, forcing them to either expand their client base elsewhere and/or develop new monetisation models for their resources. Particularly external EU suppliers that have invested heavily in supplying the EU market through investments in pipelines might be economically weakened when it is difficult for them to develop new markets or new monetisation models. The uncertainty about demand developments in the EU already impacts investment decisions in energy supplying countries. The difficulty with investments in conventional oil and gas developments is that the lifetime of the projects lies outside the demand projections for the fuels that they produce and transport.

## CONCLUSION

The EU and its individual Member States have complex relations with their external suppliers. Moreover, climate policies seem to reverse some of the successes of the liberalisation of the EU energy market. The belief in the speed of energy transition and the role of oil and gas in the future EU energy economy is either not very well understood, due to the dominant emphasis on decarbonising electricity production or ignored due to the complicated political relations with some of the suppliers of the EU. The traditional multilateral approach to oil and to some extent gas relations may also change due to the changed position of the US as an important producer and consumer. A long period of shared transatlantic international energy interests may come to an end. Without the multilateral support, the EU is no longer in the lead in international energy diplomacy, which explains the EU's diminished engagement and which may require reliance on other countries to keep the international energy market open.

# 2 ENERGY TRANSITION: WHAT ABOUT THE INTERNAL EU ENERGY MARKET?

Trouble in the European internal energy market is brewing, if not already visible today. It is clear that the urgency to decarbonise the EU energy system is recognised, but the route to achieve decarbonisation is far from clear. At the heart of the problem are two notions which are often misunderstood. The first notion is that 'renewable energy policies' and 'climate policies' are not the exact same thing, even though they are related. The second is that energy flows in the European Union are largely unhindered by national borders, due to the process of completion of the EU internal energy market. Experience with renewable energy policies in Germany and their cross-border market effects gives insights into both notions and offers important lessons for the decarbonisation of the entire European energy economy in the coming years and decades.

The first week of 2018 started with remarkable news from Germany. It was reported that 'Germany ran 100% on renewables for the first time on New Year's Day'.[3] Seemingly, for energy transition in Europe's biggest economy, it was an excellent start of the year. But in the following week, Reuters reported that German Coalition negotiators agreed to scrap the 2020 climate targets. CDU and SPD 'had agreed in exploratory talks to form a government coalition that the targeted cut in emissions could no longer be achieved by 2020'.[4] So, despite continued long-term commitment to 2030 and 2050 objectives, the near-term nationally determined climate target for 2020 will in fact be missed (Figure 1).

3 http://renews.biz/109715/germans-notch-renewables-record/.

4 https://www.reuters.com/article/us-germany-politics/german-coalition-negotiators-agree-to-scrap-2020-climate-target-sources-idUSKBN1EX0OU.

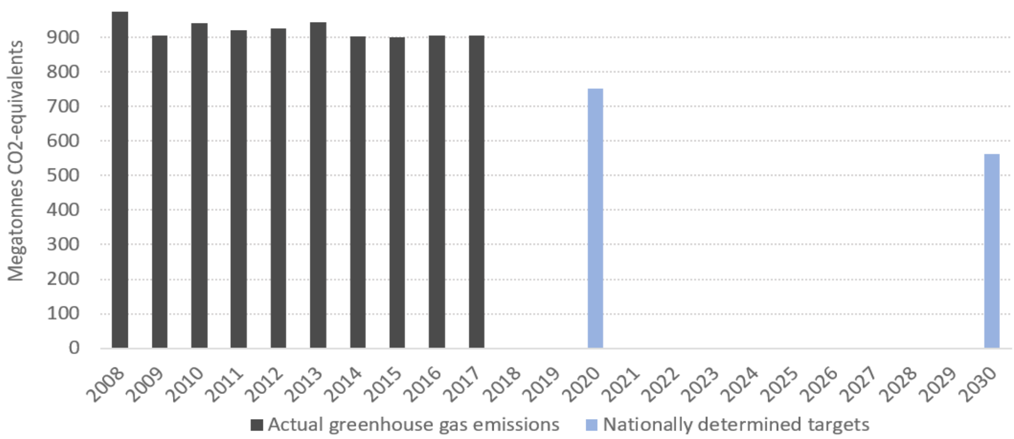



FIGURE 1. GERMAN GREENHOUSE GAS (GHG) EMISSIONS SINCE THE GLOBAL FINANCIAL CRISIS HIT EUROPE AND THE NATIONALLY DETERMINED TARGETS FOR GERMANY FOR THE YEARS 2020 AND 2030 (AGORA ENERGIEWENDE, 2018)

Renewable success, yet climate disappointment started 2018 in Germany. These events demonstrate the somewhat counterintuitive notion that 'renewable energy policies and successes' and 'climate policies and successes' are not one and the same. In order to obtain a proper understanding of this, and its fallout, it is relevant to go back in time and revisit a number of important agreements and events that shaped energy and climate policies in Europe.

## EUROPEAN ENERGY & CLIMATE POLICY: A BRIEF HISTORY

In 1992, the United Nations Framework Convention on Climate Change (UNFCCC) was established, followed by the Kyoto Protocol. These international successes provided great impetus to European climate policy-making. In the same period, the way in which European countries approached the energy market changed drastically. While in the 1990s gas and electricity markets in most EU Member States were still dominated by local monopolies, a process of liberalisation of the gas and electricity markets among Member States commenced. In 1996 and 1998, respectively, liberalisation directives for gas and electricity were adopted. The EU internal energy market started to take shape in the late 1990s and 2000s. The conviction that free markets would automatically lead to the optimal power mix was at the basis of these policies. This led to a flurry of new investments, mergers and takeovers in the industry. Many investors saw this as an opportunity to expand their business across other EU Member States.

A major share of greenhouse gas emissions relates to the energy sector. Climate and energy policy-making are therefore strongly related. The combination of the shift towards an integrated liberalised EU energy market, and the international climate targets derived from the Kyoto period 2008-2012 led to awareness across Europe that the climate policy of European countries should acquire a supra-national dimension. Moreover, trust in the efficiency of markets combined with confidence in continued European energy market integration led to the adoption of an ambitious pan-European market-based environmental policy instrument, the European Union Emission Trading Scheme (EU ETS). Approximately half of the greenhouse gas emissions in Europe were to be covered by the scheme. In 2005, its establishment was considered a success.

The development of the EU internal energy market and the pan-European emission trading scheme to regulate carbon emissions could be considered as an open invitation to any energy supplier to contribute to clean, affordable, and secure energy for Europe in a non-discriminatory fashion. The price placed on carbon emissions would steer activities towards the more climate friendly solutions.

By the second half of the 2000s, the EU, keen to be a leader in the climate change negotiations, wanted to solidify this position with regard to its climate and energy policies. While uncertainty remained over an international climate agreement and governance, and no successor to the Kyoto protocol was in sight, the EU established a framework for the period up to 2020. In 2009, essential legislation was enacted, often referred to as the Climate & Energy Package, in which the 2020 policy goals were laid out.[5] Paris was still a long way down the road, but the EU had at least set its agenda for the period up to 2020.

Here, something remarkable was happening, which can be interpreted as the start of the breakaway from the established philosophy of regulating the energy sector primarily with the pan-European emission trading scheme, while also respecting the EU internal energy market. The package was based on the agreement in 2007 amongst European leaders to realise the 20-20-20 targets by 2020. That is, multiple targets were set, focusing not only on cutting carbon emissions by 20%, but also with improving energy efficiency by 20% and achieving a share of 20% of renewable energy in the energy mix. Moreover, even though the energy market was regulated under the pan-European emission trading scheme, national renewable energy targets were set, too, to fulfill the EU-wide objective of 20% renewable energy in the European mix.

5 https://ec.europa.eu/clima/policies/strategies/2020_en.

Clearly, this betrayed a lack of confidence in the ETS as a sufficient measure to steer the energy sector towards a cleaner, more sustainable and more efficient energy mix. And perhaps, too, there was an underlying disagreement between stakeholders over what constitutes 'clean', 'sustainable', and 'efficient'. Is all carbon-free energy clean? Is nuclear energy clean? Is renewable energy the only acceptable carbon-free energy solution? Should carbon capture and storage (CCS) be encouraged? How should bio-energy be judged? Opinions differed widely and greatly, and continue to do so today.

The EU-wide 20% target for renewable energy suggests that value was attached to increasing the share of renewables in the European mix, in any case. Importantly, too, the establishment of national sub-targets suggests that all Member States should contribute to it. But no pan-European support scheme for renewables was developed. Rather, the renewables directive provided individual Member States the opportunity to financially support a selected number of energy technologies. Increasingly, the focus shifted away from a technology-neutral approach to reducing carbon emissions, and towards the increase in use of a pre-specified set of renewable energy technologies.

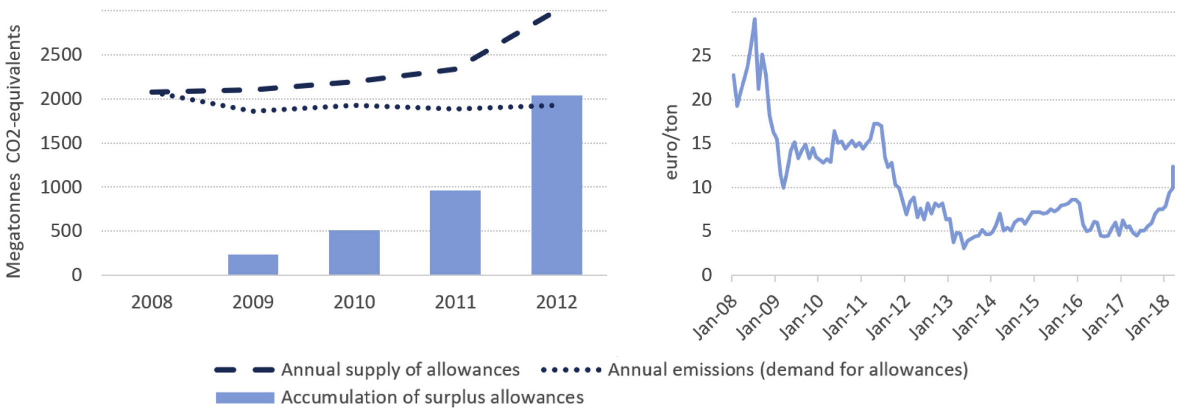



FIGURE 2. CARBON ALLOWANCES IN THE EU ETS IN THE FIVE YEARS FOLLOWING THE GLOBAL FINANCIAL CRISIS (LEFT) (DATA FROM EC, 2014). CARBON ALLOWANCE PRICES, PEAKING IN 2008, JUST BEFORE THE GLOBAL FINANCIAL CRISIS HIT EUROPE (RIGHT) (DATA FROM ICE, 2018)

In 2008, the global financial and economic crisis hit the EU. Industrial carbon emissions went down and therefore demand for carbon allowances turned out to be lower than initially anticipated. The supply of allowances had been fixed by regulation to ensure a limited supply of allowances in line with the 2020 emission limits. Year after year, surpluses of allowances led to a growing stockpile of unused allowances (Figure 2). This led to allowance price levels far below the early levels, a situation that persists today. Despite the fact that the emission trading scheme was implemented successfully and it functioned according to design, it resulted in a very low cost on carbon emissions. Although the sentiment in the carbon market turned in February and March of 2018, as of yet, the emission trading scheme failed to significantly incentivise industry to increase energy and carbon efficiency.

## IN THE CENTER OF THE EU: CLIMATE & ENERGY IN GERMANY

The following paragraphs focus on recent developments in the German energy mix – which provide a useful case study applicable across the EU. First of all, the focus is justified by the fact that Germany is the EU's most populated country and largest economy. Secondly, and perhaps more interestingly, the ramifications of energy policy choices in Germany are illustrative of the significance of the challenges ahead for other European policy-makers, and demonstrate that renewable energy policies can take a different course than climate policies.

In 2011, the Fukushima disaster had a particular impact on energy policy-making in Germany. Chancellor Merkel responded with an important switch in energy policy. Eight of the seventeen nuclear reactors were immediately closed. While Merkel's government had been hesitant to phase out nuclear power in the preceding years, Fukushima changed it all. Earlier governments had set a timeline for closing all German reactors over time (Plan A). But as existing nuclear plants provided large volumes of energy at a low cost, without any carbon emissions, various groups in Germany argued for revising the phase out and extending the lifetime of reactors (Plan B). The Merkel government was working towards Plan B. In 2011, the Fukushima crisis implied a radical return to Plan A. Energy and climate policies in Germany, centered increasingly on the targeted support of a pre-specified set of renewable energy technologies.

In Europe's largest economy, a global industrial powerhouse, the scene was thus set by 2011, less than ten years to go to target year 2020. Nuclear power was then clearly put on its way out. Instead, renewable energy production was on the rise, enjoying financial and regulatory support from national schemes. At the same time, carbon allowances – which were meant to put a cost on greenhouse gas emissions from industrial facilities, including power plants – were cheaper than many expected.

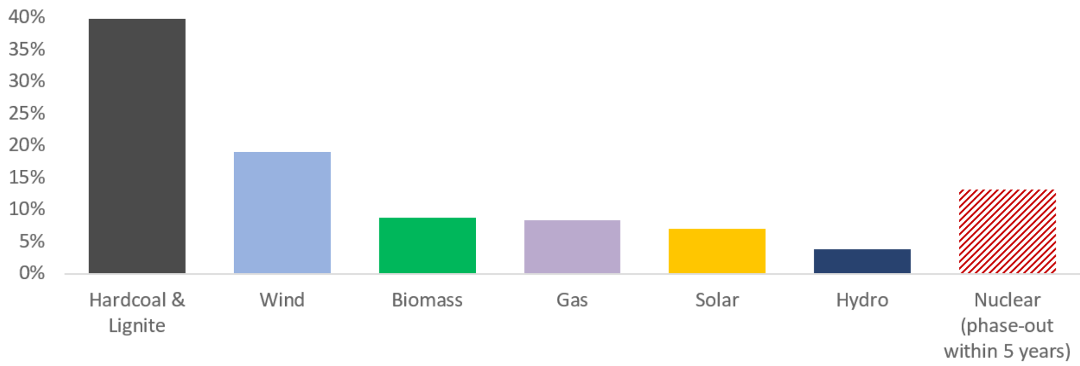



FIGURE 3. ELECTRICITY GENERATION SHARES IN GERMANY IN 2017 (DATA FROM FRAUNHOFER, 2018)

For industrial electricity consumers in Germany, surprisingly, this unimaginable course of events was not that discomforting. Low costs of carbon for the coal-fired and lignite-fired generators kept wholesale electricity prices low. In today's liberalised energy markets in Europe, day-to-day competition between electricity producers is strongly determined by fuel costs, most certainly so if no serious cost is attached to carbon emissions. As a result, coal fired power plants fared well after the economic crisis and the Fukushima incident, while cleaner gas-fired generators served a supplemental role. Meanwhile, new renewable energy supplies, financially stimulated through public support schemes, contributed further to a prolonged period of ample electricity supplies and low wholesale prices. Nuclear closures did not therefore lead to excessively high electricity prices. Germany continued to be a supplier of low-cost electricity, not only to domestic industrial consumers, but also to consumers in neighbouring markets. Households and small and medium-sized businesses, not the energy-intensive industries, for which exemptions exist, largely pay the levies to finance the support for renewables.

However, carbon emissions from Germany's energy sector did not go down as much as nationally planned. Here it is important to note that energy and climate policies in some Member States had a particularly strong focus on increasing the share of renewables. Often, a strong focus was put on supporting solar and wind, and therefore, on change in the electricity sector. Other bits of the energy demand, e.g. demand in transportation, demand for heating in the built-environment, and industrial energy demand, largely served by fuels other than electricity (Figure 4), escaped policy attention. As a result, the carbon reduction potential in those parts of the European energy system did not fully materialise. Neglecting this potential meant that the 2020 targets could only be achieved by highly effective policies in the electricity sector, and failure to implement such policies was likely to result in breaking promises. In Germany, specifically, the one-sided emphasis on the electricity sector, combined with phasing out nuclear power while not significantly reducing carbon emissions from the use of coal, was a recipe for missing 2020 targets, even while electricity generation from solar and wind increased dramatically.

Let us now go back to the headlines from Germany quoted at the beginning of this article. In fact, on New Year's Day, not all energy demand was met by renewables. It was rather demand for *electricity* that was met by renewables. Moreover, it should be noted that electricity demand is relatively low on a public holiday like New Year's Day. In addition, weather conditions were favorable to renewable energy production, as Atlantic winds were flying over Western Europe. This is how a milestone for renewables was achieved on one specific day, while short-term climate targets for 2020 are not being met and now seemingly abandoned. A significant rise in electricity generation from wind and solar has been achieved, but the reduction of greenhouse gas emissions of the German economy has not been as significant as planned.

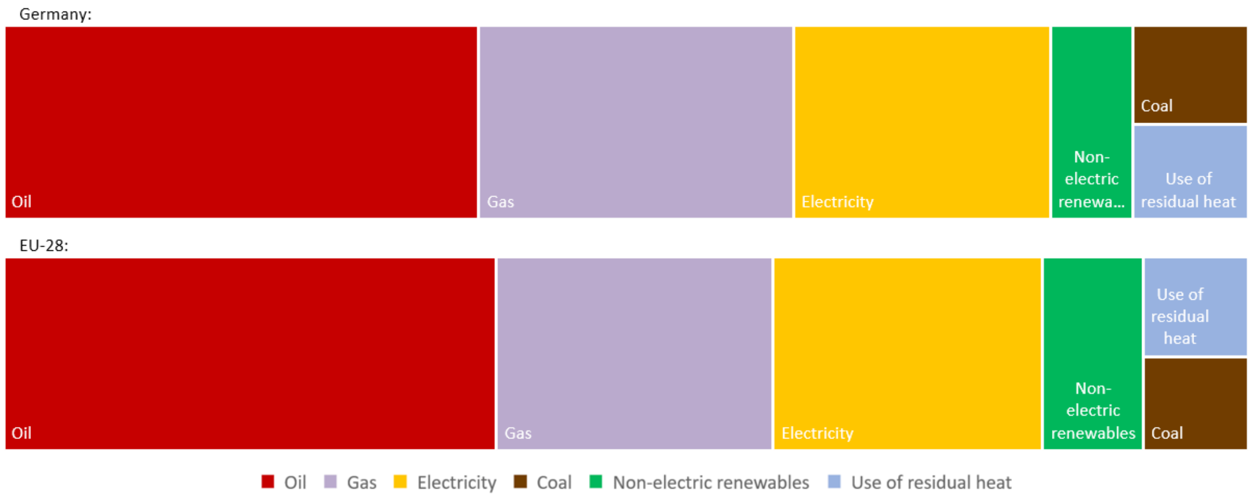



FIGURE 4. BREAKDOWN OF FINAL ENERGY USE IN GERMANY AND IN THE EU-28 IN 2016 (EUROSTAT)

## ELEVATING EU CLIMATE POLICY TO THE NEXT LEVEL

Why is all of this so relevant for European energy and climate policy making and for Europe's internal energy trade? It is because national policy decisions and approaches have significant cross-border effects. It is because the danger of a one-sided emphasis on the electricity sector alone looms across the continent, while the EU energy system encompasses more energy carriers than electricity alone (Figure 4). And it is because diverging policy-making and policy competition threatens to hinder progress.

Once again, it is relevant to come back to the electricity and gas directives of the 1990s, which established the EU internal energy market according to the philosophy of the EU single market. Electricity flows across national borders. Energy in the internal market is just another tradeable good, and electricity offered cheaply on the market in one EU Member State can flow to other Member States, no matter which EU household sponsored it. Coal-fired and lignite-fired power generation that cannot be absorbed in one EU Member State, because the wind is blowing and the sun is shining, flows elsewhere. Moreover, operators often have an economic incentive to let such inflexible coal and lignite plants run at these moments so that these are available at a later hour, once the sun has set or the wind has died down.

Importantly, the effects on electricity prices affect the economics of other power plants across borders, and therefore complicate decarbonisation efforts of various governments. Hydro capacity in the European Alps, nuclear power plants in Sweden, efficient gas-fired heat and electricity producers in the Netherlands, as well as wind farms in Denmark, are confronted with such price effects. It complicates the political economy of the energy transition in different countries that have different points of departure and different governance traditions. While in one EU Member State, public guarantees paid by households could be an accepted way of coordinating investments in the energy sector, this may not be true in other Members States where the argument is upheld that 'renewables should stand on their own feet'. At the same time, low-carbon investment without public guarantees is difficult to achieve if carbon emissions are not priced properly, which is currently the case in the internal energy market.

In order for Europe to demonstrate climate leadership in the coming years, it is of the utmost importance to make sufficient progress with the European decarbonisation agenda. Policy competition amongst EU Member States should not lead to an internal European struggle that works for industries and energy consumers in some Member States, but that is preventing others from organising their transitions. This may be the case when some Member States lack access to the policy toolkit that they desperately need, given their particular energy legacies and distinct governance traditions. Not recognising the successful establishment of the EU internal energy market, and not taking full note of cross-border energy flows, risks that policies and measures in one EU Member State negatively affect climate progress in other Member States and vice versa. Moreover, the impact on important energy suppliers and, perhaps tellingly, the impact of this policy competition on non-EU members of the European energy community is largely ignored in the internal deliberations.

Therefore, Europe is in need of a 'common currency' for climate policy that facilitates decarbonisation of the complete European energy economy, making use of all the technological potential, institutional capacity, and social capital around. While more is indeed needed, the idea of pan-European carbon pricing, raised at a time of firm belief in the common EU internal energy market, may have been not such a bad idea after all. If only the price was right.

# 3 BONE OF CONTENTION OR INSTRUMENT OF PEACE? DISCUSSING THE ROLE OF GAS IN THE EU'S RELATIONS WITH SUPPLIERS

Gas trade plays an important role in shaping the external relations of the EU, particularly with near abroad countries in the Middle East and North Africa (MENA) and the Former Soviet Union (FSU).

But does gas play a positive role in the relations between the EU and gas exporting countries? More broadly, how does gas influence Europe's standing in the global arena? We will present two alternative views on these divisive issues in the second part of this paper. First, we will begin by sketching the main elements of Europe's external gas trade.

## GAS TRADE BETWEEN EUROPE AND ITS SUPPLIERS – UNDERSTANDING CURRENT TRENDS AGAINST THE HISTORICAL BACKGROUND

The divisiveness of debates on the role of gas is exemplified by the current polarisation of positions on Nord Stream 2 (Figure 5), Russia's planned expansion of a pipeline that bypasses transit countries.

This is exposing internal divisions between European countries, between companies and politicians, and within the Brussels establishment itself. Misconceptions and simplifications abound in the debate.

The role of gas in the European energy system is a complex one, as are its macro-economic, geopolitical and societal ramifications. The following paragraphs aim to bring clarity to the debate by focussing on the international dimension of gas trade. We look at current trends against a historical background.

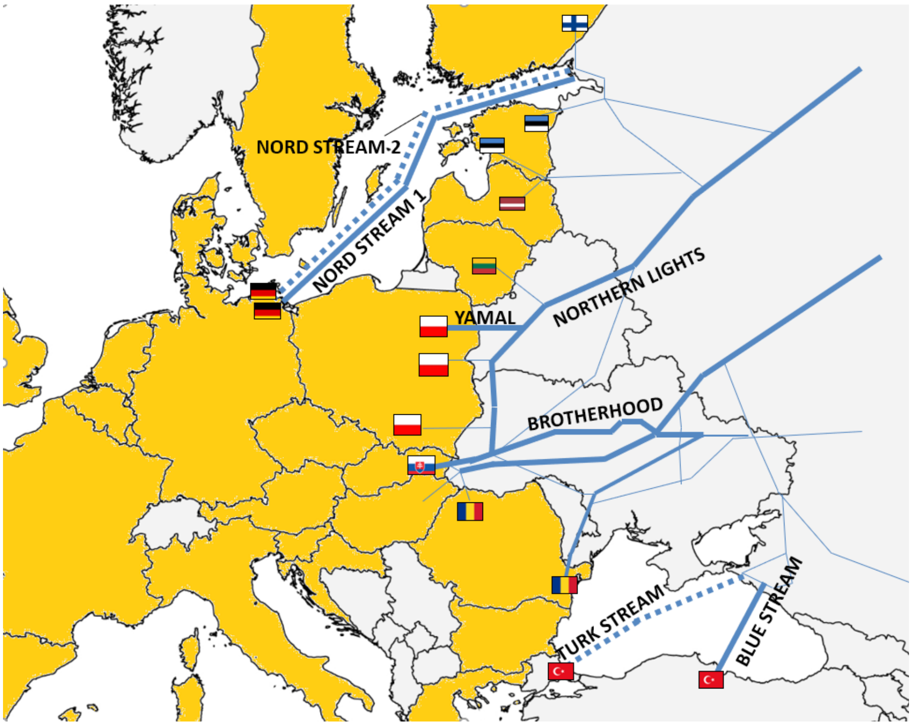



FIGURE 5: CURRENT PIPELINES FROM RUSSIA AND PIPELINES UNDER CONSTRUCTION OR PLANNED AT THE EU/TURKEY ENTRY POINTS (CIEP 2018)

Somewhat ironically, the idea of importing gas from Russia is rooted in the project of distension that gained ground in the 1970s and culminated with the Helsinki Act of 1975. In spite of opposition by the United States, larger Western European countries like West Germany, France and Italy struck deals with the Soviet Union to buy substantial volumes of natural gas. In exchange, steel companies from Western Europe supplied the pipes. The tacit strategy in Western Europe was not to allow Russian gas to exceed 30% of consumption. This tacit rule is still respected today. The current political debate (on Nord Stream 2 and other issues) shows that it is going to be difficult for Russia to substantially increase its market share in Western Europe, even if Gazprom has large spare capacity.

Long-term contracts were signed in the 1970s and 1980s to underpin considerable capital investment, necessary both to develop the giant fields of Western Siberia and to build trunk lines over a distance of more than 3,000 km. The legacy of these investments still has a very important bearing on EU-Russia gas relations – and arguably EU-Russia relations overall. Long-term contracts signed by State-controlled energy monopolists on both sides of the Iron Curtain and bulk investments called for demand aggregation over a number of countries and high-level political coordination.

The origins of gas trade between Europe and Russia are thus essentially politically coloured.

These long-term contracts, which provided the backbone of security of supply for decades, are now under threat. Since market liberalisation has allowed end-users to freely purchase gas on hubs[6], suppliers like Gazprom had to renegotiate long-term contracts – removing one of its main features: oil indexation[7]. Up to now, this has clearly dented Gazprom's rents.

While beneficial to European consumers in a period of oversupply, it is still unclear whether the 'new architecture' of gas trade[8] will benefit European consumers in the long term, as the wave of new supply wears off. Many observers highlight that long-term oil-indexed contracts provided more stability. Now, European buyers have to compete on the world stage – for instance with eager Asian buyers – to attract gas supplies. Although more transparent, hub prices can also be more volatile.

As the Soviet pipeline system was designed to serve a country that was thought to always remain united, the breakup of the USSR led to a number of unresolved issues that still define EU-Russia relations today. The most notable ones are Eastern Europe's overreliance on Russian gas (due to the dominance of westbound connections and the scarcity of both West-East connections and North-South/South-North connections) and tense negotiations with Ukraine and Belarus over transit terms.

At the moment, Russia is strongly attempting to bypass Ukraine as a transit country by building Nord Stream 2 under the Baltic Sea and Turk Stream under the Black Sea. While supported by Germany and a number of Western oil and gas companies, the project is opposed to different degrees by the Americans – who are discussing sanctions that may block the project, the European Commission – which wants to keep Ukraine's role as transit country for geopolitical and macro-economic reasons, and Eastern European countries – which want to preserve transit fees.

6 Hubs are market places (virtual or physical) where gas is exchanged and prices are set by supply and demand.
7 When the price of gas in long-term contracts is indexed to the price of a basket of oil products.
8 Based on gas-to-gas competition (gas volumes competing with other gas volumes on hubs) rather than on oil-indexed long-term contracts.

It is unclear whether Russia will be successful in building all the new pipelines that it plans, although the rationale is clear. Pipelines running through Ukraine are obsolete, and they are now used at almost full capacity. Capacity cannot be increased unless more money is invested in them. This is difficult given the current political tensions and Ukraine's financial problems. This only leaves one option: if Russia wants to monetise its spare capacity, it needs to build new pipelines. Moreover, there is the abovementioned route diversification objective, which holds even in case Russian gas volumes would remain flat rather than grow. A likely scenario is that Russia will have to keep some transit volumes through Ukraine (although at lower levels than today), while building one or two new pipelines (although probably not before 2020).

Relations between Europe and other gas suppliers are far less politicised, and the outlook for supplies from these countries looks somewhat clearer. Norway is the EU's second gas supplier (110 Bcm), playing a particularly important role in Northwest Europe (Figure 6). Statoil – Norway's national oil company – has accepted hub indexation before the Russians and the Algerians, managing to retain market share. Norway is recognised as a very reliable supplier in Europe. However, the EU is aware that it cannot count on Norwegian gas to fill the emerging supply-demand gap. The reason is that production rates in North Sea fields are declining and lower oil prices do not help production of gas found in association with oil.

The third supplier to the EU is Algeria (Figure 6), which primarily sells to Italy and Spain. Sonatrach, Algeria's oil company, has tried to resist changes to gas contracts similarly to Gazprom, but eventually gave in like its Russian counterpart. In spite of a temporary spike in supplies, there is consensus that Algerian exports to Southern Europe cannot grow in the medium and long term because Algerian gas demand is rising, thus reducing the availability of export volumes.

Apart from pipeline gas, Europe also imports 49 Bcm of Liquefied Natural Gas (LNG) (Figure 6) and this volume is expected to grow. Flexible LNG from the US and other countries is expected to compete head-to-head with Russian gas in the years to come, bringing diversification and low prices. However, global market conditions could change between 2020 and 2025, leaving Europe to compete with high-paying Asian buyers to attract LNG cargoes.

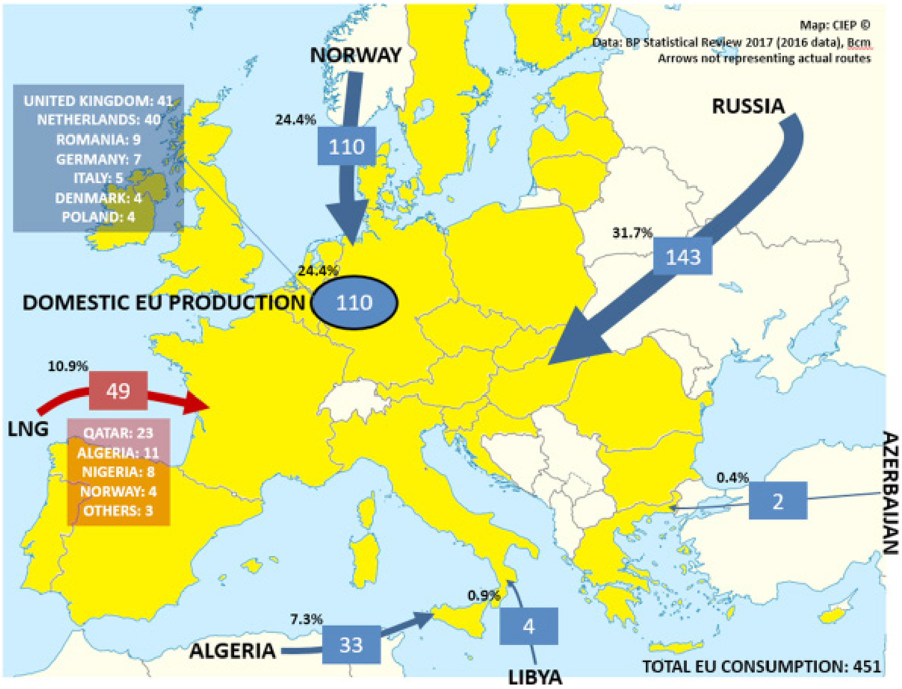



FIGURE 6: OVERVIEW OF DOMESTIC EU GAS PRODUCTION AND IMPORTS OF GAS (CIEP, BP – 2016/2017)

A number of projects to boost supply diversification are on the table, namely pipelines from Iraqi Kurdistan, the East Mediterranean, Iran, Azerbaijan and Turkmenistan (Figure 7). However, they are all hampered by geopolitical tensions and financial constraints. As Europe consciously moved towards a model based on short-term rather than long-term trade, and as policies do not sketch a clear role for gas in the European mix, massive investments in gas pipelines are currently seen as high-risk investments. It is highly unlikely that new pipelines from these countries will be built before 2025.

In light of what has been described, what can we say about the debate on whether importing gas empowers or weakens Europe in its external relations? The two following paragraphs present alternative views: one is a pessimistic storyline, while the other is more optimistic about the role of gas.

## GAS CONSUMPTION AND IMPORTS MAKE EUROPE MORE VULNERABLE AND WEAKEN EUROPE'S STANDING IN THE GLOBAL ARENA

Numerous environmentalists and investors in renewables stress that gas – a fossil fuel – contributes to global warming and delays the transition to a carbon-neutral energy system. When applied to Europe's positioning in global affairs, this argument is associated with the conviction that Europe will benefit, also geopolitically, from being a first-mover in the energy transition.

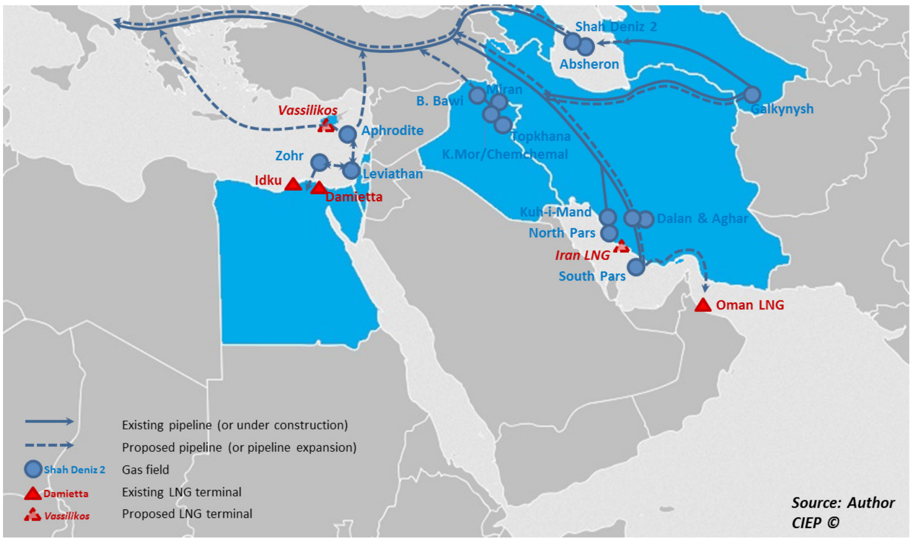



FIGURE 7: OVERVIEW OF EXISTING AND PROPOSED GAS INFRASTRUCTURE PROJECTS IN EUROPE'S SOUTH-EASTERN NEIGHBOURHOOD (CIEP)

Additional investment in gas infrastructure is perceived as a distraction. Since the world will sooner or later fully decarbonise, it is in Europe's interest to develop a competitive advantage in green energy technologies. This line of thought does not make a distinction between domestic and imported gas.

Sometimes, the argument that gas extraction is also *locally* harmful is added. Fossil fuel extraction, it is argued, creates tensions and causes detriment to local communities and to society at large, while decentralised renewables empower communities and enhance social harmony. More broadly, economic activities with less concentrated rents are seen as more prone to innovation and more compatible with the liberal-democratic model. This is a spin-off of theories that associate fossil fuel endowments with authoritarian regimes, conflicts, rent-seeking, corruption and macro-economic distortions.

Other stakeholders, not specifically concerned about environmental or societal ramifications, emphasise the security threat inherent to being dependent on foreign gas imports. In principle, they do not object to the consumption of domestically produced gas. Since European gas production is inexorably declining, however, this remains a theoretical distinction in the current debate. Even if the outlook for future European gas consumption is quite uncertain, falling domestic gas production will most likely entail higher import needs in the next 10-20 years (Figure 8).

This narrative – increasingly widespread among policy-makers, analysts of international security and the military establishment – has gained traction in the wake of the latest Ukraine crisis due to Europe's dependence on gas imports from Russia, a country that is increasingly perceived as hostile. This stance can simply be the basis of arguments in favour of geographic diversification, but sometimes leads to a generalised rejection of gas as a source of energy. Eastern European Member States like Poland and the Baltic Republics are particularly keen on embracing this hard security narrative.

It is important to highlight that, although conceptually distinguished, hostility to gas motivated by ecological considerations and opposition grounded on security considerations are often *de facto* bundled together.

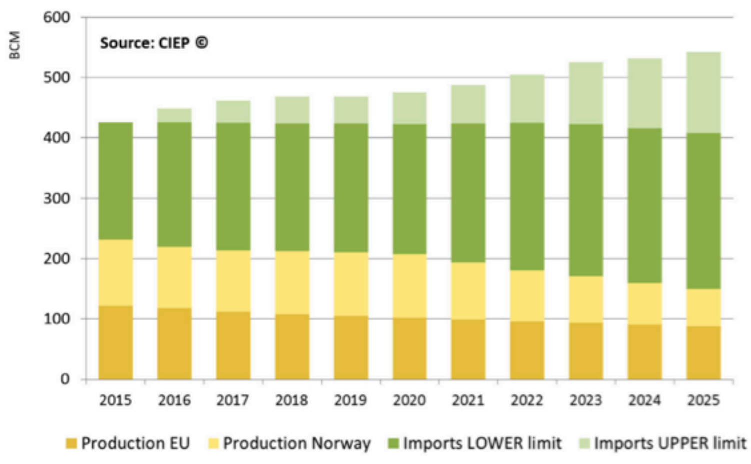



FIGURE 8: PROJECTIONS OF EU'S AND NORWAY'S GAS PRODUCTION VS. EU'S IMPORT NEEDS BASED ON DIFFERENT DEMAND SCENARIOS (CIEP)

## FAR FROM BEING A SECURITY THREAT, GAS IS A KEY COMPONENT OF EUROPE'S ENERGY SYSTEM AND SHOULD BE GIVEN A ROLE IN THE TRANSITION TOWARDS CLEAN ENERGY

On the other hand, it could be argued that the 'blue fuel' – which emits 50% less $CO_2$ than coal when burnt for power generation (Figure 9) – is a climate-friendly source of energy that is also compatible with the needs of European economies and energy systems, as it is more reliable than clean-yet-intermittent wind and solar.

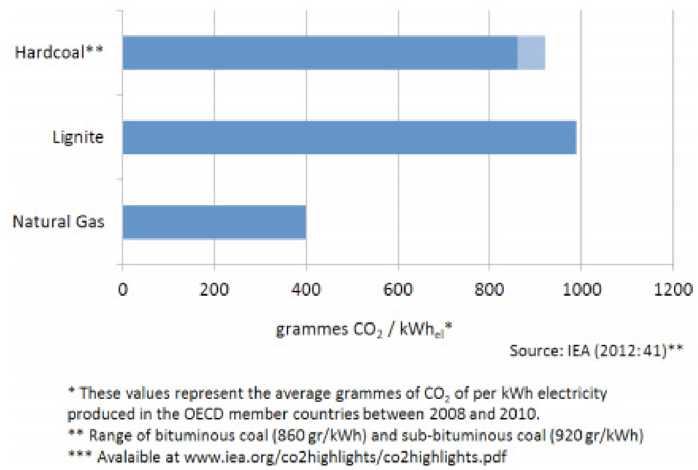



FIGURE 9: COMPARISON OF CO2 EMISSIONS OF GAS AND DIFFERENT TYPES OF COAL WHEN BURNT IN POWER GENERATION (CIEP/IEA)

It is sometimes forgotten that a number of economic activities, like heavy industry, are still very much molecule-based and their electrification is not easily attainable.[9]

Though necessary in the long term, an abrupt and full transition to renewables would be costly and destabilising for Europe. In spite of extraordinary cost savings achieved in installed capacity, the cost of adapting the whole energy system to new sources of intermittent energy is very high – and the transition needs to be carefully managed to avoid shocks to the economy and the emergence of new vulnerabilities. The opportunity cost of not picking low-hanging fruits like gas should thus be taken into account in this discussion.

Not always successfully, the gas industry is trying to present itself as a climate-friendly player. For instance, European gas producers – unlike their American counterparts –

9 Pisca, I., Outlook for EU gas demand and import needs to 2025, Clingendael International Energy Programme, 2016.

strongly back the introduction of more aggressive carbon pricing[10]. For them, the ideal $CO_2$ price would be one that drives out polluting coal from electricity production and allows gas to play its role as the preferred partner to renewables. Carbon pricing reforms could still take place in Europe and this is a field of decision-making that should be watched for.

The pro-gas camp has a number of arguments to counter the perception that gas imports make Europe vulnerable. First of all, natural gas is abundant worldwide. Only a fraction of the world's reserves has been exploited, and technological innovations mean that more of these reserves are becoming accessible. A wave of investments in the last decade has created a situation of oversupply in the global market, which is a clear advantage for importers like the EU.

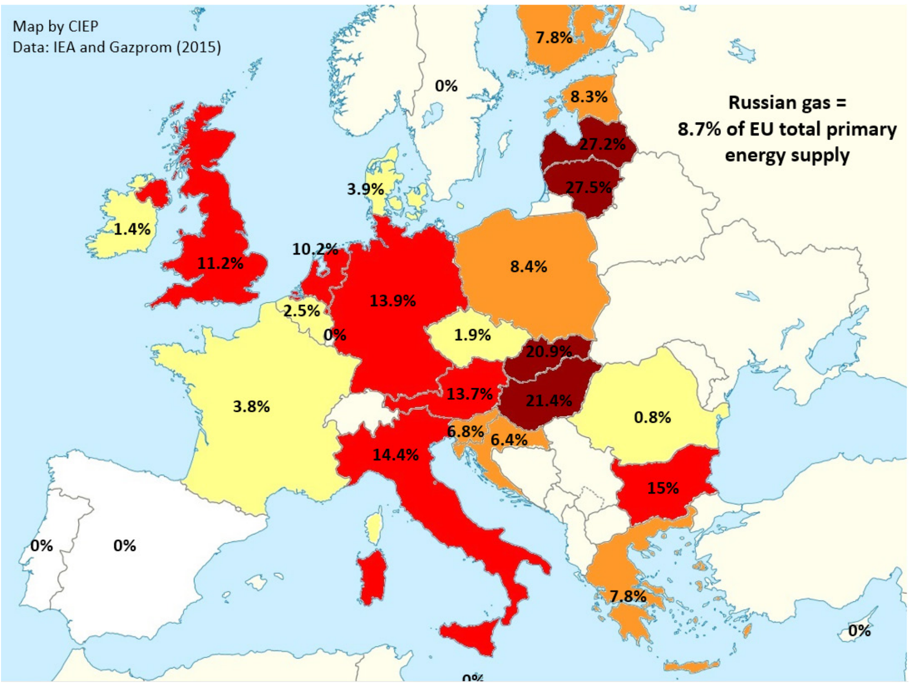



FIGURE 10: SHARE OF RUSSIAN GAS ON TOTAL PRIMARY ENERGY SUPPLY IN THE EU-28 (CIEP, IEA, GAZPROM – 2015)

Besides, the advent of liquefied natural gas (LNG) contributes to reducing the politicisation of gas trade by stimulating competition and breaking up natural monopolies. A liquid, easily traded commodity is less vulnerable to the exertion of market power and price manipulation, which can be seen as benefitting importers.

10 Pricing mechanisms that would delvier higher prices of CO2, which is thought to favour gas over coal.

Finally, countries that are politically close to the EU (the United States, Australia and Canada) feature among the fastest-growing LNG exporters. US cargoes have already reached European shores in 2017 and Eastern European countries are particularly keen on using US LNG to diversify from Russian gas.

Moreover, preoccupations about Europe's overreliance on Russia appear exaggerated. As a matter of fact, the EU's dependence on Russian gas is actually only 8.7% when calculated in terms of primary energy consumption (Figure 10).

Though not agreed on by all the actors that see gas favourably, there is the additional argument that in spite of resurgent tensions, Russia has historically been a reliable gas supplier. After all, the only disruptions to Russian gas supply were recorded in 2006 and 2009 in relation to Ukraine transit: a few weeks of commotion over 40 years of trade relations.

Liberal observers typically add that trade helps with cementing good political relations, and that economic interdependence acts as a deterrent to escalations. From this perspective, discontinuing gas imports from Russia or other countries would deteriorate, rather than ameliorate, Europe's security.

Indeed, one of the lines of tension between Europe and gas suppliers is that Europe signals that it needs more gas in the medium term because of its declining gas production, while at the same time it also signals that it intends to get rid of all fossil fuels in the longer term. It is very hard for suppliers to allocate investments (and make macro-economic decisions) when signals are so conflicting.

## CONCLUSION

All in all, what has been said points to the fact that Europe will keep on trading with its traditional pipeline gas suppliers for at least another two decades. Even if the breakup of the Soviet Union left a legacy of unresolved issues that still defined EU-Russia energy relations, there have been promising developments such as Gazprom's acceptance of new terms of trade[11]. Russian gas exports to the EU are expected to remain large, although for political reasons Russia will not be allowed to sell all of its spare capacity. LNG will be Gazprom's main competitor for some time, but uncertainty reigns after 2025.

11 In its response to an investigation by the Directorate-General for Competition, Gazprom has preliminarily accepted to renounce destination clauses and to move delivery points if requested. In the last years, Gazprom has also renegotiated the terms of its contracts, accepting the introduction of hub indexation in replacement of oil indexation.

It is thus in Europe's interest to cultivate good relationships with historical gas suppliers while looking for new ones. However, both the use of political channels to cultivate existing relations and the aim to actively promote supply diversification have been complicated by market liberalisation – which gave power to markets clawing it back from policy-makers. Contradicting signals about the desired role for gas in the energy transition make it difficult for investors to make decisions and add uncertainty to relations between Europe and external suppliers, whose economic prosperity often depends on gas exports. If not managed carefully and gradually, this could compound instability in the neighbourhood (and particularly in the MENA and FSU regions) and represent a new line of tension in relations.

# 4 CHANGING CRUDE OIL TRADE FLOWS AND OIL DIPLOMACY

EU external energy policy-making is predominantly focused on natural gas, while internal energy policy-making is focused on decarbonisation and renewables. Although these might be legitimate long-term views on energy policy, they obscure the attention for short- and medium-term energy interests, where oil still plays an important role. What is the future of EU oil diplomacy?

The EU has always played a prominent role in international oil affairs. France and the UK had an important hand in the political organisation of the oil rich North Africa and the Middle East. The increasing dependency of the EU on imports from the Middle East and North Africa in the 1960s and early 1970s led to a very active oil diplomacy. This intensification in oil diplomacy efforts was further propelled by the 1973 oil crisis. This oil diplomacy became firmly embedded in the International Energy Agency (IEA), which most OECD member states joined. Although the EU tried to engage with oil suppliers in the Euro-Arab dialogue, and in the 1990s with Russia through the Energy Charter, these efforts were quickly thwarted by US objections. The EU was discouraged to pursue these more bilateral collaborations and encouraged to stick with the consumer front in the IEA.[12] From the 1970s throughout the 1990s, world oil relations have been dominated by two groups of countries; the main net-consumers of crude oil represented by the OECD/IEA countries and the main net-suppliers of oil to international markets, OPEC.

Since the turn of the century, oil flows have been changing again. The US is now a significant producer and has seen its import dependency decline substantially, while Asia has become a major importer of Middle Eastern crudes. The EU is now a mature oil market and no longer has the same political and economic significance in oil relations as before. Although the increase in US oil production has brought international oil prices down, it has also led to a new coalition in the oil market between OPEC and Russia to mitigate oversupply and low prices in the market. Before, Russia's independent oil strategy helped to balance market power, while nowadays it is siding with OPEC for economic reasons. If this new collaboration is sustained, the strategic dependence of the EU might deteriorate without the proper policy tools to remedy the situation. EU external energy policy-making is

12 Bassam Fattouh and Coby van der Linde, "Twenty years of Producer-Consumer Dialogue in a Changing World", IEF, February 2011.

predominantly focused on natural gas, while internal policy-making is focused on decarbonisation and renewables. Although these might be legitimate long-term views on energy policy, they obscure the attention for short and medium-term energy interests, where oil still plays an important role.

### DECLINING IMPORTANCE

The relations between the oil consumers and producers were strained for years after 1973 and it took until the early 1990s before official talks between the two blocks could take place.[13] In 2000, the producer-consumer dialogue was institutionalised in the International Energy Forum (IEF), with, from 2003 onwards, its Secretariat in Riyadh, Saudi Arabia. The IEF did more than bring together the IEA and OPEC member states, because from the onset other producing and consuming countries were included in the informal producer-consumer country meetings. Countries such as India and China are now, nearly twenty years later, important consuming countries, and rely heavily on supplies from the Middle East (Figure 11). They are leading members of IEF and have intense relations with oil suppliers like Saudi Arabia.

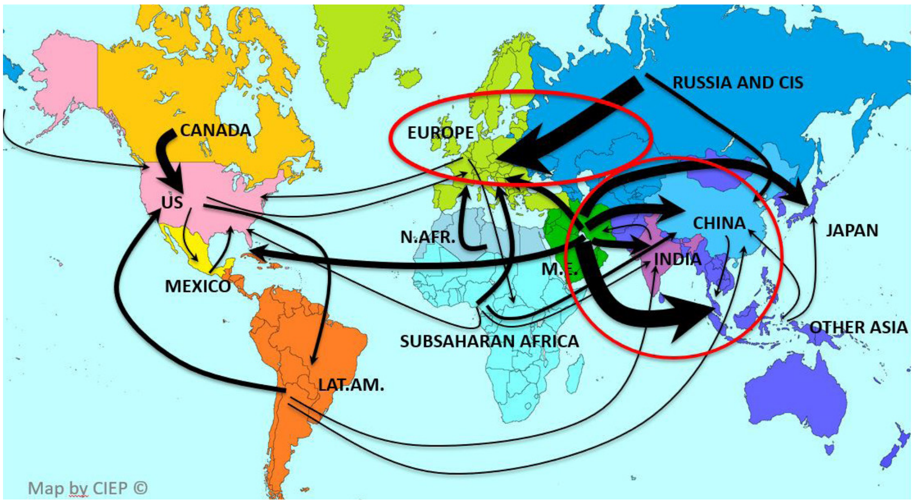



FIGURE 11. OIL TRADE FLOWS SHOW A LARGE REGIONAL CONCENTRATION (SOURCE: IEA, BP, EUROSTAT)

The intensity in the oil relations between countries in the Middle East and Asia reflects the growing importance of oil trade between these countries and the relative declining importance of oil trade with the EU and US. In the space of twenty years,

13 Bassam Fattouh and Coby van der Linde, "Twenty years of Producer-Consumer Dialogue in a Changing World", IEF, February 2011.

the share of the OECD countries in world crude oil consumption has declined from 55% in 1998[14] to 47.9% in 2016. Although this may seem a small change, in volume terms the change is significant and it reflects the growing share of emerging markets in a growing international oil market.[15] Currently, international oil production and consumption are about 99 million barrels a day (Mb/d), compared to about 74 Mb/d in 1998.[16] China's share doubled from about 6% to 12.8% of world oil consumption between 1998 and 2016, comparable to the 13.4% share of the EU, and reflects the fast growth of the Chinese energy economy in the past twenty years. China has become a substantial importer of oil and drove growth in the international oil market in the past two decades. More mature oil markets, such as the EU, remained stable over the past twenty years. Current oil imports in the EU are, despite declining domestic production, still a little below oil imports in 2000. This decline materialised after the economic crisis of 2008 and reflects lower economic activity and efficiency gains over the period.

## SHIFT IN OIL RELATIONS

The lower oil imports of the EU in 2015 compared to 2000 could easily obscure the shift in relative importance of the EU's main suppliers. Already in 2000 Russia was the EU's main oil supplier (Figure 12) with a share of 22% of total oil imports, it managed to increase its share to 29% in 2015, after peak shares of 35% in 2010 and 2011. Norway nearly matched the Russian share of EU oil imports in 2000, but saw its share halved in 2015. The political significance of this shift in relative share of oil imports is clear. Norway is a member of the European Economic Space (EES), and as such part of the EU family, while Russia is an external supplier with which relations are not always optimal. Russian oil supplies have been very reliable so far, but Russian and EU geopolitical ambitions could jeopardise this stable economic exchange. The flexibility of EU refineries to take a wide variety of crudes and oil products and the ability to blend a variety of crudes to the meet the desired Brent benchmark quality reduces the strategic dependence on a certain supplier. Less flexible EU refineries or refineries connected to an oil source by pipeline, mainly in Eastern Europe, do not have this option.

In the early 1990s, oil flows from Russia to Europe increased substantially. This was welcomed in the EU where some unease existed in relation to oil import dependence on the politically unstable Middle East. The dependence of the EU on imports from

14 Coby van der Linde, The State and the International Oil Market: Competition and the Changing Ownership of Crude Oil Assets, Studies in Industrial Organization, Kluwer, Boston/Dordrecht, 2000, p. 68.

15 BP Statistical Review of World Energy 2017.

16 Petroleum Intelligence Weekly (PIW) January 15, 2018.

the Middle East and the disruption in flows from Kuwait and Iraq during the run up to and during the First Gulf War stimulated diversification of imports to include more Russian crude. With the increasing flow of oil available from Russia, the import dependency on suppliers from the Middle East could be reduced substantially, while the dependency on Russia increased. The energy relation with Russia, already substantial because of the gas imports, was thus intensified.

The oil relation with Russia is strategically important, and given the fact that transportation and industry will continue to rely on oil as a fuel and feedstock for quite some time, it will remain important in the future. Yet, in terms of managing the EU oil relation, very little attention is reserved for this strategically important trade relation.

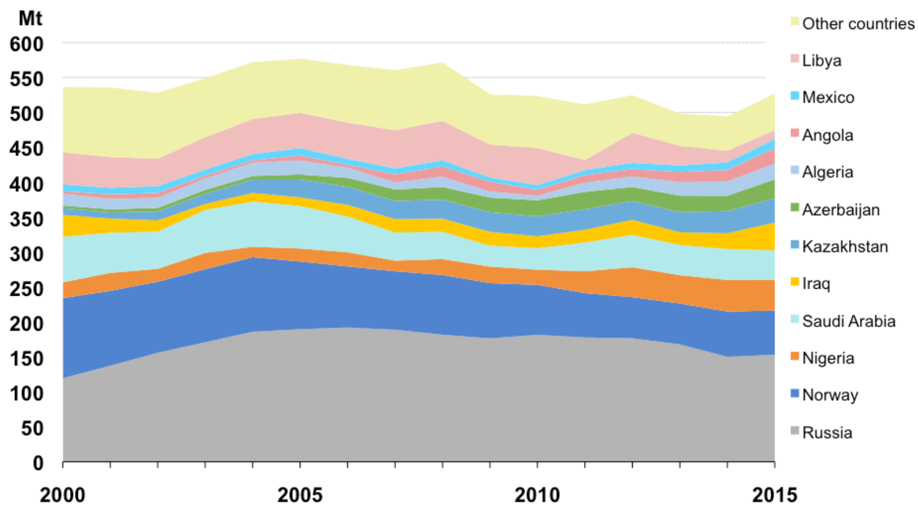



FIGURE 12. EU OIL IMPORTS 2000-2015 (SOURCE: EUROSTAT)

Global oil trade has thus become much more regionally concentrated (Figure 12) in the past two decades due to changing oil demand and supply developments around the world. The focus on energy transition, the rise of new exporters and net-importing countries in the EU may have contributed to this new reality, where EU oil diplomacy makes far fewer headlines than in the decades before. This is remarkable because the share of oil in the energy mix of the EU-28 has not changed much since 1990, with a share of oil in the total primary energy mix in 2015 of 39% and in 1990 and 2000 of about 38%. Much of the EU energy debate and diplomacy is focused on natural gas, while the share of oil in total energy demand is larger.

Although the diversity of import flows appears large, the dependence on Russian imports is substantial. Moreover, the diversity of flows disguises the relative inflexibility for some EU refineries, which are optimised for certain crude blends and mask the concentration of imports from only one or two suppliers when we look at the Member State level rather than the EU level. EU statistics are therefore somewhat misleading to understand the oil relations of the EU and its Member States.

## THE US FROM IMPORTER TO EXPORTER

In the late 2000s, another major change in international oil markets occurred, which had a significant influence on oil flows in the world and the relative power between main oil consumers and producers. From 2009 onwards, American Light Tight Oil production (LTO) increased rapidly. Until shale gas and light tight oil became economically and technically feasible, the US was destined to become a very large oil and gas net-importing country. Oil was for this reason always an important element in its foreign policy posture, and its import dependency implied joint international oil policy interests with the EU.

The US dependence on oil imports was, however, reversed by the shale revolution. Growth of US oil production has been impressive, nearly doubling production in the space of seven years, while oil prices temporarily halted expansion of production between 2015 and mid-2016 (Figure 13). In December 2017 US oil production reached 9.9 Mb/d, breaking the previous record US production of 9.6 Mb/d of 1970.[17] The US has quickly developed into a major consumer and producer of oil. Nevertheless, the US still imports substantial volumes of oil because the US oil refinery makeup does not reflect the larger domestic availability of lighter crudes. Instead it imports heavier crudes for domestic refining and exports its excess lighter crudes. The latter became possible after the US crude oil export ban was lifted in late 2015. With the exports of light crudes, the US is in direct competition with African light oil producers. American light crudes are already competing for markets in the EU, where lighter crudes are blended with heavier ones to fit the EU refinery makeup.

17 Petroleum Intelligence Weekly (PIW) January 15, 2018.

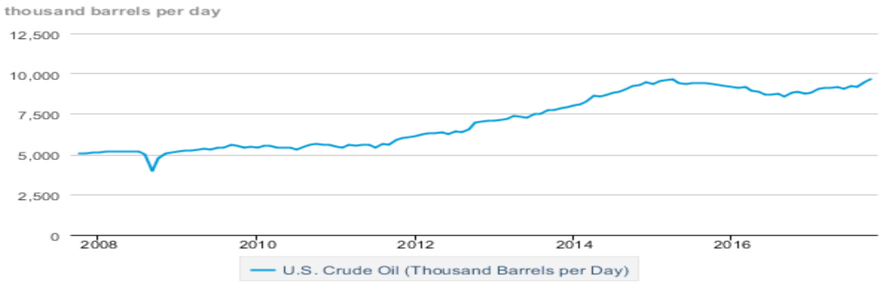



FIGURE 13. US CRUDE OIL PRODUCTION (SOURCE: US ENERGY INFORMATION ADMINISTRATION)

The American shale revolution has greatly influenced international oil (and natural gas) markets. Its rapid expansion contributed to world market oversupply in the period 2014-2018 and a drastic fall of oil prices in 2014. Currently, prices are recovering helped by a combination of growing world demand and OPEC-plus Russia production curtailments. The current expansion of American shale production, however, shows the flexibility of production and the viability of shale production at a much lower oil price level than before. Another development in the North American oil market is the steady increase of production in Canada. Oil production in Canada rose to 3.4 Mb/d in 2016. From a security of supply point of view, the North American situation has improved greatly in the past decade (Figure 14). The improvement in the oil trade balance of North America is contrasted by the stable negative oil trade balance of the EU and the increasing deficit in Asia. The traditional shared interests in oil diplomacy of OECD/IEA countries has become less obvious, although they continue to share their interests in open international markets.

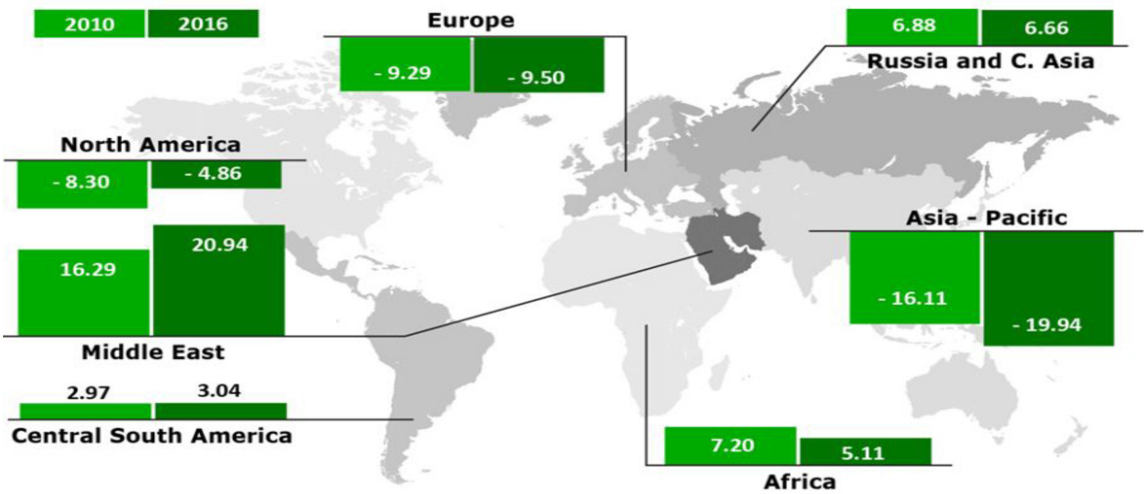



FIGURE 14. CRUDE SURPLUS AND DEFICIT REGIONS IN THE WORLD 2010 AND 2016 (SOURCE: ENI [2016] WORLD OIL AND GAS REVIEW)

## EU OIL (PRODUCT) TRADE

Imbalances in crude supplies and oil product demand have led to increased trade flows in certain oil products. In Europe, 47.5% of oil demand is in road transportation, while road, water and air transportation together total about 64%.[18] A special feature of European oil product demand is the, in part stimulated by government policies, demand for diesel. This is very high, compared to other markets. The increase in diesel was mirrored in a gasoline demand decline (Figure 15). Oil product demand in the EU does not reflect the output of European refineries. Europe, therefore, exports substantial volumes of gasoline to world markets and imports diesel to match oil product demand and supply. The buildup of refining capacities in some oil producing countries, along with India and China, has contributed to a lively trade in oil products around the world. It has also led to increased competition for coastal refineries in the EU that depend on world markets in addition to their home markets.[19]

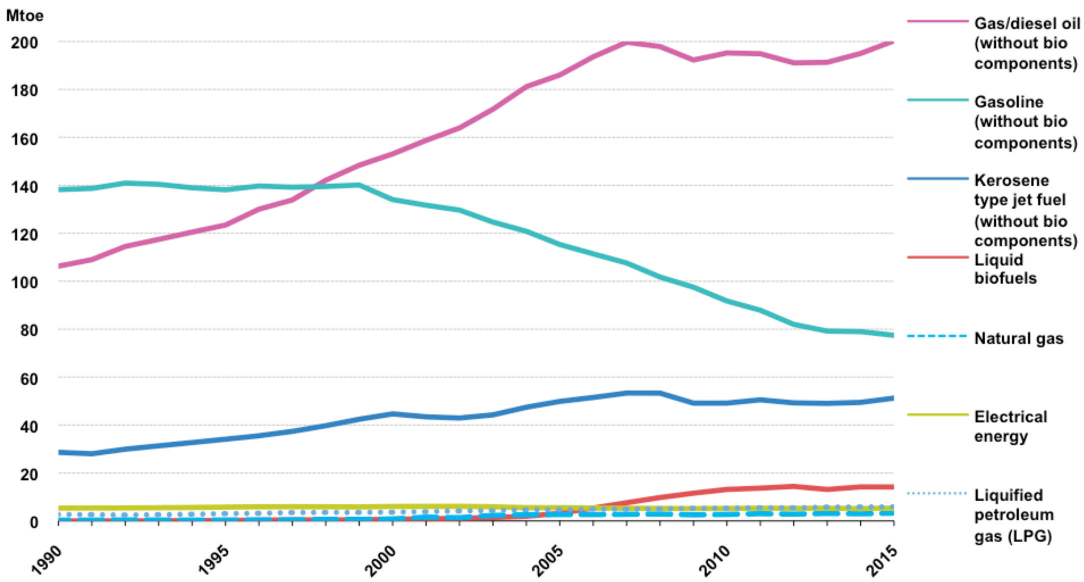



FIGURE 15. USE OF FUELS IN TRANSPORT IN THE EU-28 (SOURCE: EUROSTAT)

18 Eurostat (2017) "Oil and petroleum products - a statistical overview".

19 Nivard and Kreijkes, "The European Refining Sector, a diversity of markets", CIEP, 2017, http://www.clingendaelenergy.com/publications/publication/the-european-refining-sector-a-diversity-of-markets; and, Bergh, van den, Nivard and Kreijkes, "Long term Prospects for Northwest European refining", CIEP, 2016, http://www.clingendaelenergy.com/publications/publication/long-term-prospects-for-northwest-european-refining.

The imbalance in oil product demand and supply in the EU can be managed through international trade flows. In the future, with more competition from electric drive trains and the blending of biofuels, the mismatch between EU oil product demand and supply could increase. Refineries will need to rely more on finding foreign markets for part of their output, while at the same time they encounter stiff competition from very large and efficient export-oriented refineries in the Middle East, Russia and Asia. The traditional market for European refiners for gasoline was in the US, but due to the shale revolution they are encountering more competition from US refiners. Already, refining capacity in the EU has shrunk as a result of refinery closures or refurbishments into storage facilities or bio-refineries, and this process has not come to an end yet.[20]

## CONCLUSION

The low intensity of EU oil diplomacy is not explained by the importance of oil in the energy mix and the size of crude oil and oil product flows to Europe. With the changing posture of the US, as an important producer and consumer, and the very active oil diplomacy in Asia, the low intensity of EU oil diplomacy can perhaps be explained by several factors: 1. the complicated relationship with Russia, making active diplomatic efforts complex; 2. the belief in the speed of energy transition, where the role oil could and will play in the future is not very well understood (or ignored for the first reason); 3. the intensified cooperation between Russia and OPEC, which makes EU oil diplomacy not very effective and thus further encourages the EU to disengage from oil diplomacy; 4. the fact that security of energy supply policies are completely focused on concerns about natural gas; and 5. the fact that the US has traditionally encouraged the EU to deal with oil diplomacy in a multilateral setting (the IEA) and discouraged it to develop its own oil diplomacy agenda.

The EU has recently benefitted from very relaxed markets and depressed demand as a result of the economic crisis, but with the crisis declared over, and a very low level of new investments in oil production in the past couple of years, the EU oil diplomacy might receive a boost when markets are expected to tighten in the early 2020s.[21] Then consumers will wonder why security of oil supply was not higher on the political agenda.

20 Nivard and Kreijkes, "The European Refining Sector, a diversity of markets", CIEP, 2017; and, Bergh, van den, Nivard and Kreijkes, "Long term Prospects for Northwest European refining", CIEP, 2016, http://www.clingendaelenergy.com/publications/publication/long-term-prospects-for-northwest-european-refining.

21 IEA, "Oil 2017: Analysis and forecast to 2022".

# 5 THE DUTCH ENERGY ECONOMY: THE ENERGY GATEWAY TO NORTHWEST EUROPE

The Netherlands is an important energy hub in the Northwest European market. Not only for oil, but also for natural gas, coal, and electricity. The Dutch economy is also relatively energy intense due to the large refining and petrochemicals sector. The structure of the Dutch economy is founded on the substantial gas production in the country for more than 50 years, the large oil processing industry (refining and petrochemicals) and the logistical connections (pipelines, road, rail, air) with surrounding countries. The function of the Netherlands as an important gateway or hub for the Northwest (NW) European energy market has created strong interests in international energy trade. This article gives insights into the distinct nature of the Dutch energy economy, highlighting its integration into international energy markets, and discusses how the effect of national policies, measures and policy changes must be understood in the international context.

## THE ENERGY BALANCE OF THE NETHERLANDS

In a graphical representation of the Dutch energy balance (Figure 16), we see on the bottom left the energy produced in the Netherlands. This is mainly natural gas from both the offshore and onshore fields and small flows of onshore wind and oil. Natural gas is in part flowing to power generation stations (thermal power stations) and subsequently delivered as electricity to homes and businesses, and in part delivered as gas for heating in households and the commercial sector. In 2016, substantial volumes of gas were exported, visible in the upper right part of the energy balance. Natural gas is also imported from abroad and some of this gas is then re-exported. The Netherlands has a gas network and gas storage facilities, facilitating these flows. Some of these storage facilities are for seasonal balancing, others for daily market balancing. The seasonal storages are needed to match demand and supply. In the winter, demand for heating in households and the commercial sector is much higher, and therefore demand for natural gas is much higher. Natural gas storages are then used to supplement production, LNG and pipeline supplies. This typical seasonal profile is an important characteristic of northern European energy demand and this feature cannot be ignored when considering alternatives for gas-based heating for households and the commercial sector.

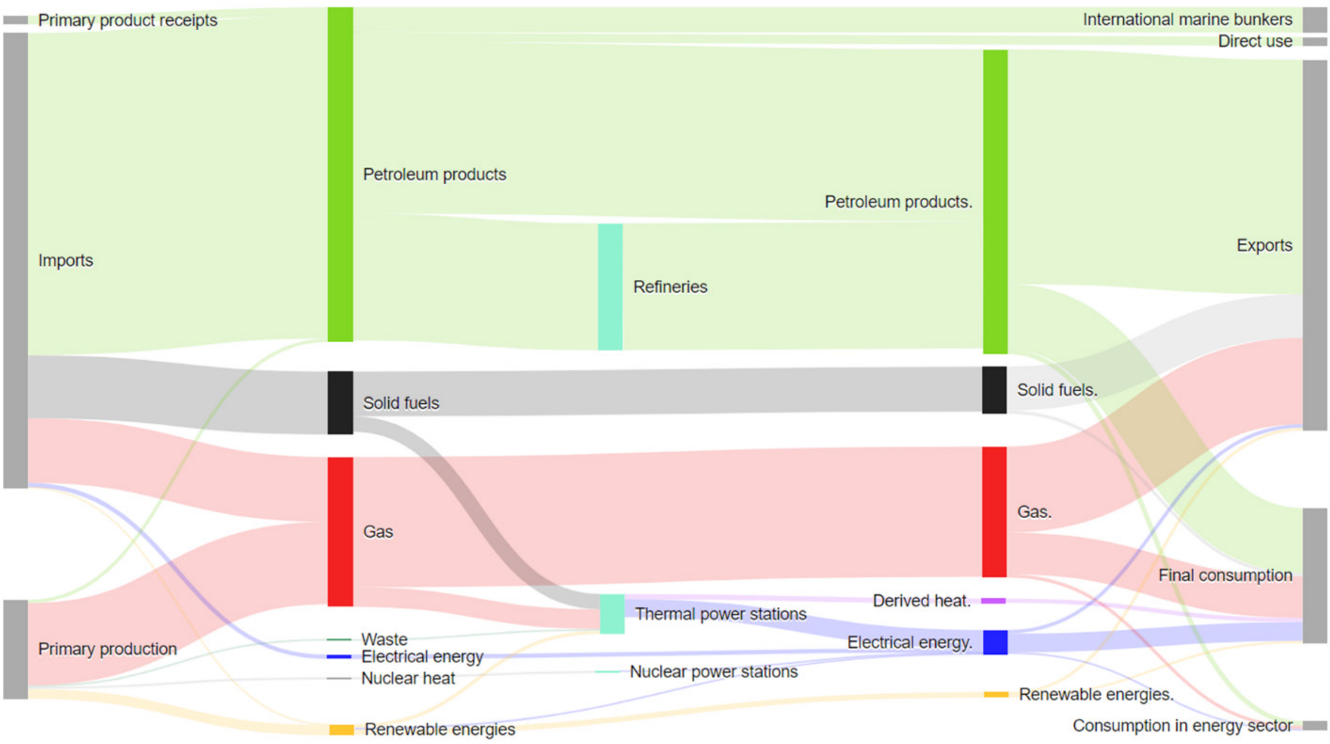



FIGURE 16. DUTCH ENERGY BALANCE (EUROSTAT, 2016)

In the upper left part of the flow chart, the import of coal is visible. Of the imported coal, only a relatively small part is used in Dutch power stations or industry. Most of the imported volumes are transit flows to Germany, and show up in the upper right hand part of the chart as exports. In 2016, more than 55 mton of coal was imported and 41 mton was re-exported.[22] Recently, some public discontent was voiced when the coal landing and transit company in Rotterdam renewed its contract with the Port of Rotterdam for another 25 years. Opponents of the contract renewal cited the intention of the Dutch government to terminate the burning of coal in power stations by 2030, making such a contract renewal for the Dutch power sector obsolete. The function as an important transit hub for Germany, where such a decision to terminate coal burning is still awaiting, was not taken into account in the commentaries, nor was the need of certain industries to use coal.

The upper left-hand part of the chart is dominated by large volumes of crude oil and petroleum products imported into the Netherlands (petroleum products include fuel oil, naphtha, kerosene, gasoline and diesel). The largest part of the imported oil flow is re-exported to Belgium and Germany and is represented in the upper right-hand

22 Source: CBS data.

part as exports (this involves both unprocessed crude oil and petroleum products). Nonetheless, a substantial part of the oil imports is processed in Dutch refineries. Some of the products produced by refineries are consumed in the domestic market in the commercial sector and in transportation. This flow from the refineries to final consumption can be seen in the bottom right hand part of the chart. Moreover, a substantial part of the products produced in the Dutch refineries (mainly gasoline) is exported.

The size of Dutch final energy consumption, but also of primary production, which are represented in the bottom left hand part and bottom right hand part of the chart, is substantially smaller than the imports and exports of energy. The graphical representation shows that the Dutch energy economy is strongly integrated in international markets, and a substantial participant in international energy trade. As a result, the scale of energy infrastructures (pipelines, ports, etc.) and processing industries (refineries and petrochemical plants) can only be understood properly in an international context, as all those facilities do not merely serve the Netherlands, but also European and international markets.

## A EUROPEAN GATEWAY FOR OIL

The energy balance of EU Member States is generally determined by a combination of natural endowments, such as coal in Poland, natural gas in the Netherlands, hydro in Austria, and policy choices, such as nuclear in France and wind in Denmark. In the Netherlands, the location and availability of a deep-sea port also plays an important role in the clustering of energy intense industries around the port and the connections with the hinterland. The large flow of oil and oil products imported in the Netherlands and visualised in Figure 17, mainly enters the Netherlands through the port of Rotterdam. The Port of Rotterdam has developed into an important entry point or gateway for European imports oil. A substantial volume of crude oil is destined for German and Belgian refineries. In turn, oil refineries deliver the feedstock to the Northwest European petrochemical plants. The transit of crude oil flows appears, without processing in the Netherlands, in the Dutch export statistics. The Netherlands clearly serves as an important hub for energy flows in NWE.[23]

In 2016, the Port of Rotterdam had a crude oil throughput of 2 Mb/d, most of which was imported from a select number of countries.[24] The Dutch refining sector has a maximum capacity of only 1.3 Mb/d, leaving about half of the imported crude oil to

23 See, for example, Kreijkes (2017) "Looking Under the Hood of Dutch Energy".

24 Source: CBS data.

be either stored, re-exported, or transferred.[25] Existing pipeline infrastructure connects the Netherlands to neighbouring Belgian and German refineries, making Rotterdam the ideal landing point for crude oil in NWE. Hence, the volume of oil that passes through the existing Dutch infrastructure should give an indication of the essential transit function that the Netherlands has for Northwest European energy security. The Netherlands is therefore the gateway for crude oil and some oil products to service the larger petrochemical cluster in the Amsterdam-Rotterdam-Antwerp-Rhine/Ruhr area, also known as ARARR (Figure 17).

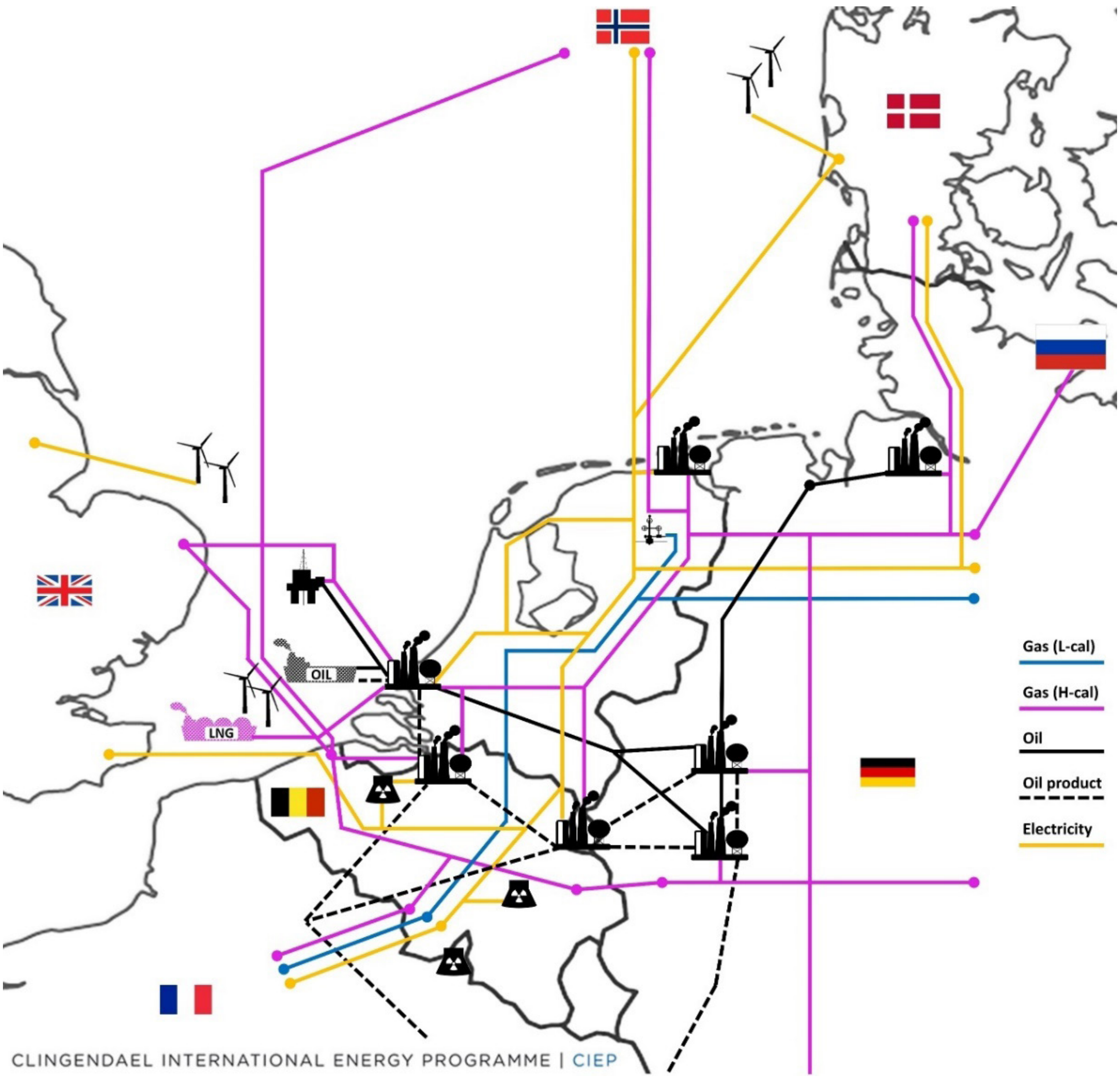



FIGURE 17.SCHEMATIC PRESENTATION OF THE NETHERLANDS AS AN ENERGY HUB

25 See, for example, BP (2017) "Statistical Review of World Energy" or, Port of Rotterdam (2017) "Facts and Figures".

## THE NETHERLANDS AS NATURAL GAS HUB

The Netherlands is not only a producer and exporter of natural gas, but also an important transit country. Pipeline connections with neighbouring countries, a receiving terminal for Liquified Natural Gas (LNG)[26] from overseas, and gas storage facilities, underpin the hub function. This natural gas hub function is not challenged by the required decline of production from the Groningen field, as the volume of imported gas in the hub is destined to increase (Figure 18). The Title Transfer Facility (TTF, the Dutch hub) is facilitated by Dutch state-owned Gasunie Transport Services (GTS; the Transport System Operator, TSO) and has developed into a virtual market place where many market parties can trade gas. Gas can either be produced in the Netherlands, or brought into the TTF area by other suppliers from surrounding areas. The combination of extensive 'hardware' (the physical infrastructures) and well-developed 'software' (the TTF approach) ensures that gas trade between market parties can continue relatively easily in case of changes in the supply-demand balance. Changes in demand or supply in the area affect the TTF market price. In effect, market mechanisms coordinate the energy flows into and away from the Netherlands. As a result from the 'gasrotonde' (gas hub) strategy, TTF prices have in fact become an important marker for gas prices across the European continent, as well as in bilateral contracts in parts of Europe that do not possess a similarly well-developed liquid hub.

Although the natural gas hub function in itself is not challenged by the decline of production from the Groningen field, the relevance of the decline in Groningen production is related to certain technical characteristics of both the gas and the gas infrastructure. The Netherlands has two distinct gas pipeline systems, one for H-gas (high calorific natural gas, the European norm, which is also imported and produced at Dutch offshore locations) and one for L-gas or "Groningen gas" (low calorific natural gas). Blending nitrogen with H-gas creates natural gas of Groningen quality, connecting the two systems. Such conversion is performed by GTS, facilitating market participants to trade gas without being restricted by the gas quality differences in the GTS infrastructure. In other words, the TTF does not discriminate between L-gas demand and supply on the one side, and H-gas demand and supply on the other, contributing to liquidity in the market. The faster-than-anticipated reduction of Groningen production due to seismic activity has created a mismatch in demand and supply of L-gas, which needs to be mitigated by either decreasing demand for L-gas or increasing nitrogen production capacity to convert H-gas into

26 Natural gas is cooled in a liquefaction plant in the exporting country and gasified in a LNG terminal in an importing country. Cooling natural gas to the point that it becomes a liquid allows more energy to be shipped to export destinations.

sufficient volumes of L-gas. In addition, mature small offshore gas fields have substantially reduced Dutch gas production in the space of a few years.

The production level from the Groningen field is determined by the Dutch Minister of Economic Affairs. Since 2012, the year of the earthquake near Huizinge, Groningen production already declined in several steps from a ten-year average of 42.5 billion cubic metres (bcm) to 20.6 bcm[27] a year in 2018.[28] On 29 March 2018, the Minister informed Parliament that production would be lowered to 12 bcm as soon as possible and that in 2030 production would be terminated.[29] Such a rapid reduction in Groningen quality supply could, however, pose a security of delivery problem for dedicated L-gas consumers in the Netherlands, Germany, Belgium and northern France, unless nitrogen production and blending capacity is expanded. Because the expansion of nitrogen production needs time, specialised labour and capital, gas production can only decline when the factory is finished. At the same time, climate change policies are aimed at replacing natural gas as the main source for residential heating. However, substituting gas demand for heating also takes time, capital and labour.

Until recently, the existing plans to convert residential and commercial consumers from L-gas to H-gas would sufficiently reduce demand to manage the security of delivery issue. However, the most recent earthquake has increased the urgency to bring production further down and below the current planned reduction of demand. Investments in the gas system are necessary to manage the expected imbalance between demand and supply, while at the same time planning to reduce demand in the built environment and industry. The current labour market constraints, which can seriously delay converting residential and commercial heating systems on a large scale, will probably support the rationality of both policy decisions (to convert H-gas to L-gas and introduce non-natural gas heating systems). However, it would be wise to coordinate the investments in the gas system, mitigating a short-term policy

27 Since 17 January 2014, ministerial decisions have reduced production from the Groningen field in various steps. Insights into the relationship between production profiles and levels on the one hand, and seismicity on the other, but also new earthquakes, initiated new production ceiling decisions. In 2014 and 2015, there would be a production ceiling of 42.5 bcm and 40 bcm for 2016. But on 9 February 2015, the minister decided to reduce production from the Groningen field to 16.5 bcm until 1 July 2015. In late June 2015, Groningen gas production was set at a maximum of 30 bcm until the end of 2015. In gas year 2016, the ceiling was set at 24 bcm and in 2017 at 21.6 bcm. After a court ruling, the minister has to make a new decision on the production ceiling for the current gas year.

28 The mining authorities had advised the minister to reduce Groningen production to manage seismic activity in the region for the safety of inhabitants. After the last earthquake at Zeerijp in January 2018, the new advice of the mining authorities is to reduce production as soon as possible to about 12 bcm a year.

29 https://www.rijksoverheid.nl/onderwerpen/gaswinning-in-groningen/documenten/kamerstukken/2018/03/29/kamerbrief-over-gaswinning-groningen

problem, and the gas demand reduction measures, addressing a mid to longer term climate change problem, so that both policy measures make economic sense. Moreover, such a decision helps policymakers avoid a predicament, with implications for the neighbouring countries and potentially the reliability of the Netherlands as a supplier. Although Groningen production is declining, it does not impede the gas hub function, because L-gas will be replaced by imported H-gas, perhaps even strengthening the hub function as gas volumes from a range of suppliers are drawn into the TTF area.

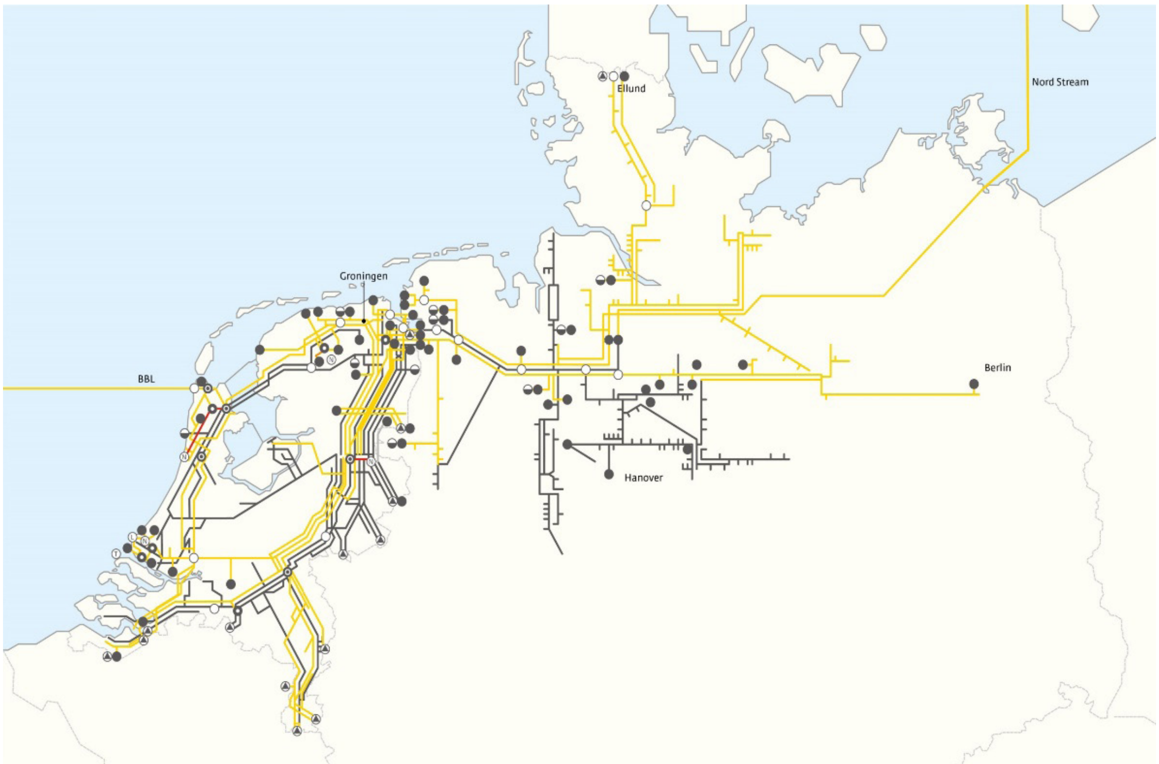



FIGURE 18. GASUNIE H (YELLOW) AND L (GREY) GAS PIPELINE SYSTEM

## A GAS HUB IN TRANSITION

The impact of energy transition on the natural gas hub is complicated. It is relevant to distinguish between uncertainties in the long term, and prospects in the short to medium term. Over time, energy transition is challenging the hub role of the Netherlands, for instance if energy becomes much less traded and instead increasingly produced and consumed locally. Electrification may substitute for some of the traded gas, when decentralised generation (solar and wind) take a larger share of demand. On the other hand, energy transition, could create new opportunities, when flows of green power and green hydrogen, develop to match intermittent supply and demand.

In either case, the role of gas in Northwest Europe (NWE) remains important in the short and medium term, as the new energy system will not be built overnight. While renewables are set to grow substantially, the share of coal and nuclear energy in the region is set to decline. In other words, renewables do not necessarily replace natural gas one-to-one in the near term, and change is not going to be symmetric. Currently, integrated energy system transition or sector coupling is gaining traction as a way to decarbonise the hub and maintain the strong focus on international energy flows. In this respect, gases (including natural gas) are expected to play a role as a 'system fuel' for quite some time, ensuring energy supply and demand is balanced year-round in the various sectors, supplementing variable production from renewable energy sources (RES) such as solar and wind. While the use of new electricity storage technologies will increase and contribute to balancing short-lived swings, larger imbalances will continue to be addressed using gases. Both the 'hardware' (gas infrastructures) and the 'software' (the well-developed virtual market place TTF) will continue to be supportive in this respect, as gases can be traded between market parties relatively easily and flexibly, depending on their exact needs throughout the year.

### THE BROADER IMPLICATIONS OF ENERGY TRANSITION

The energy balance of the Netherlands is still very much a reflection of an energy system based on fossil fuels. With the tightening of climate change policies, these flows will be impacted too, depending on the policy choice of the Dutch government but also of governments in neighbouring countries. For instance, a decision of the German government to reduce the role of coal power stations in the electricity sector would reduce the flow of coal through the Netherlands substantially. At the same time, a decision by Dutch authorities to withdraw the license to import and transit coal through the Netherlands would greatly impact the German electricity sector. They would have to find a different harbour through which to import coal and would not be able to use river barges to supply their power plants. Also, the stimulation of Electric Vehicles (EVs) in NW Europe could change the flow of oil and oil products through the Netherlands. Depending on the competitive position of the various refineries, it could have different outcomes. Restructuring of the German refineries could potentially lead to an increase in oil product exports to Germany. However, if competitive German refineries capture a larger share of the shrinking market for transport fuels, oil product exports from the Netherlands to Germany could decrease. Another option is that European refiners will export more refined product to international markets, i.e. to markets outside Europe, to compensate for the shrinking market at home.

Much is still unclear about the precise impacts that the energy transition in Europe will have on the flow and trade of coal, oil and natural gas, depending on policies of the individual Member States. It is important to keep in mind that international energy markets are dynamic in nature. It is clear, however, that apart from introducing new energy technologies to the energy system, also existing industries and infrastructures are needed to connect the new and old flows into a new system. This is particularly true for the period of transition, when decarbonised flows and fossil fuel flows need to co-exist. Also flows through the Netherlands may continue longer than domestic demand for certain energy products because neighbouring Member States rely on the Dutch hub for their flows. The pace of change in the energy system is likely to be asymmetric among the EU Member States.

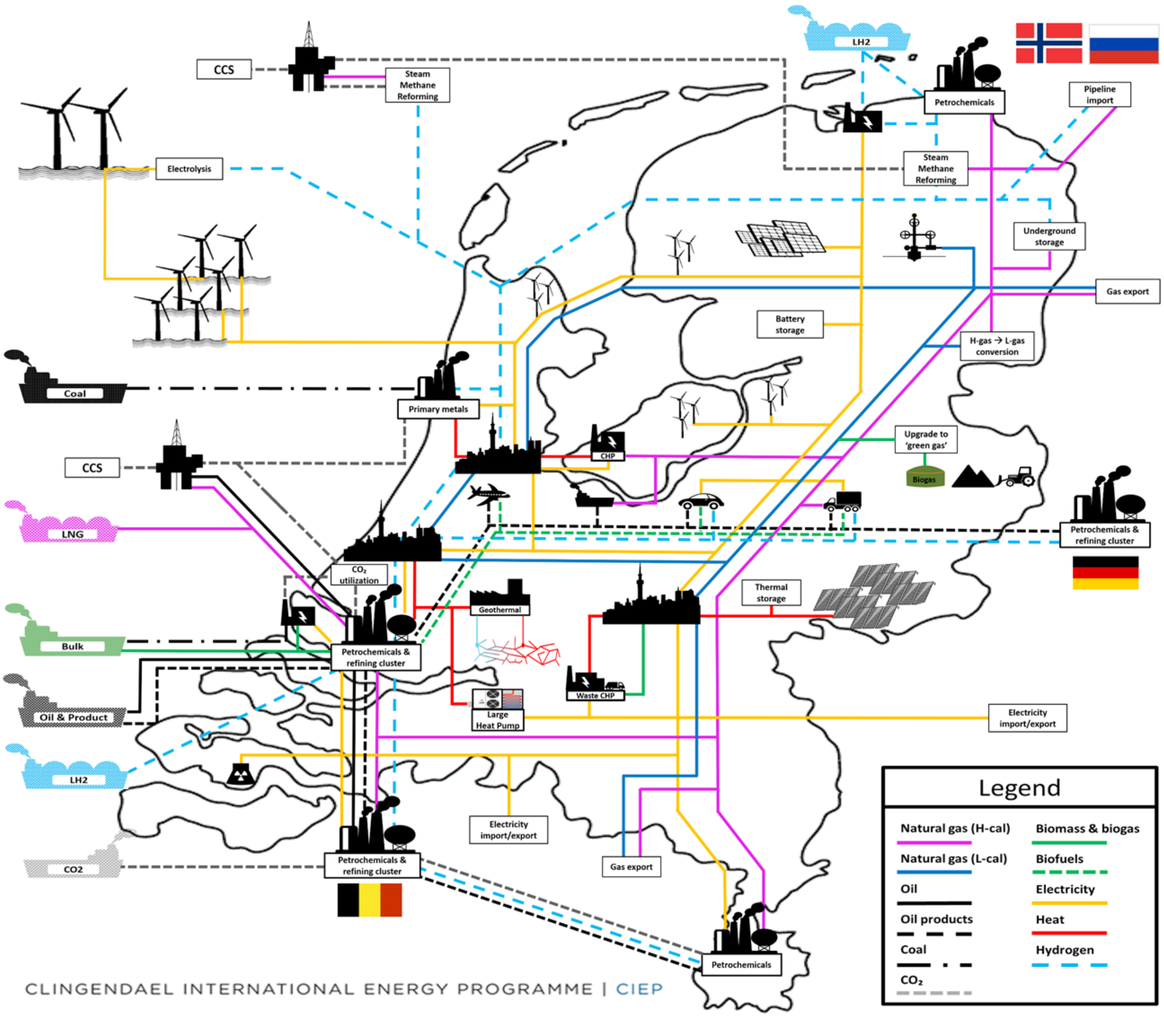



FIGURE 19. SCHEMATIC PRESENTATION OF A HYBRID ENERGY SYSTEM IN TRANSITION

The task is then to combine both traditional and new energy technologies in an effort to improve carbon and energy efficiency (Figure 19). Rather than thinking only in terms of the new energy technologies and accompanying assets, it is important to also facilitate transition of the existing assets. We know, for instance, that the restructuring of the European refining industry will take quite some time. An early exit from the European market may not contribute greatly to emission reduction, if oil products continue to be used and shipped from refineries elsewhere in the world. $CO_2$-reduction results could in fact be better, if European refineries are encouraged to improve their energy and carbon efficiency and are challenged to contribute to the clean energy system of the future. This can be done by creating new infrastructures for captured industrial $CO_2$ and organising storage in empty gas fields or other geologies (CCS), creating infrastructures to capture waste heat and deliver it to homes and offices, and by connecting industries with a large demand for hydrogen, once developed, to the green hydrogen production facilities offshore. Industrial energy demand in the ARARR is not merely a complication for energy transition, but could in fact turn out to be an enabler for it, as fast-growing new energy technologies, such as offshore wind, may be confronted with integration issues.[30] Although demand for electricity is expected to grow as a result of increased electrification of demand, matching supply and demand every day and in every season is a major challenge. Converting some of the electrons into molecules may help to connect more types of demand to green energy, but may also help to manage demand and supply mismatches. Ideally, the Netherlands can change into a hub for, initially, old and new flows, while at the same time other Member State's energy intense clusters can be connected to the new infrastructures in the Netherlands. Moreover, both hydrogen and $CO_2$ flows can be connected to create an integrated market for hydrogen and carbon capture, storage or use (CCS/CCU).

## EU ENERGY AND CLIMATE POLICY AND THE NETHERLANDS

Energy transition is currently a largely national affair with each Member State setting its own priorities and developing its own system. Increasingly, however, the renewable energy production potential of some Member States may not match the technical, economical, or socio-political absorption capacity in that same Member

30 The integration challenge of solar and wind energy is two-fold. First of all, some part of the energy economy will increasingly be electrified. That requires a lot of change in various sectors, and a lot of action by many stakeholders. Appliances, manufacturing processes, etc. need to be adapted. Secondly, the energy flows will change and become more dynamic, due to the variability of solar and wind energy. Electricity grids need to be adapted to that new reality. And more may be required to ensure that supply and demand is in perfect balance year around. That is, energy conversion technologies need to be embraced. Hiccups in all these processes in the various parts of the economy and society may become hurdles to further develop renewable energy production potential, especially when shares rise substantially. The industrial ARARR cluster can in fact contribute to increasing the absorption capacity for the new energies in the near to medium term.

State for the new renewables. In a system with national support schemes and a European market for energy, this may cause socio-economic tensions when new capacities are developed with national support schemes, but with consumption elsewhere in the EU market. Germany is experiencing such a situation where German consumers pay a surcharge in their energy bills, while consumers elsewhere benefit from low cost electricity produced by the renewable capacities. In Denmark, the notion that electricity from new offshore wind projects is difficult to absorb nationally is on the radar, too.[31] While the share of wind energy reached 37.6 percent in 2016, and while electricity demand is fully met with wind energy at times, it only made up 7.6 percent of the total energy consumption in 2016.[32] Increasing the absorption capacity of national energy systems, for instance by increasing the flexibility of the system through storage and conversion possibilities, can help maintain public support. Yet, recognising and respecting the internal energy market may turn out to be inevitable in order to achieve a successful energy transition at the European level. The Netherlands as an important hub in the current Northwest European energy market may want to claim the role of providing the market with that flexibility.

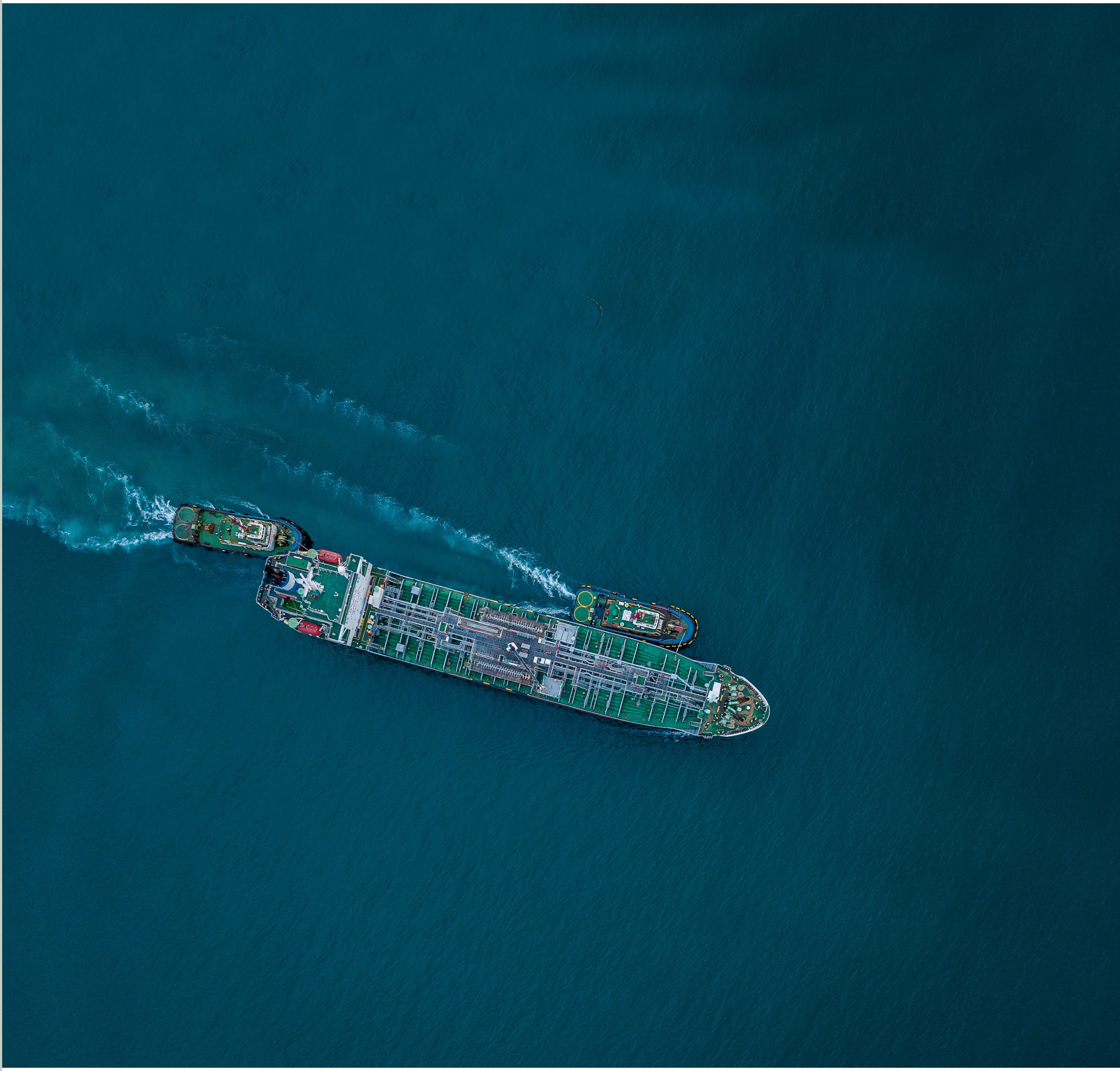
## CONCLUSION

In summary, the Netherlands is a hub for European energy. Groningen production reductions do not threaten the role of the Netherlands as a hub in Europe. At the same time, the Netherlands would have more to lose than other countries from a shrinkage in global energy trade. The transition towards renewables has the potential to challenge the role of the Netherlands as a 'molecule hub', insofar as local energy production and decentralised solutions would curb international energy trade. It remains to be seen, however, whether such a narrow view on what energy transition entails is truly indicative for the energy system of the future. It is worth emphasising that countries around the world have always tried to find a balance between domestic energy production on the one hand and international trade on the other, taking into account costs and benefits of the options. It is likely they will continue to do so in the future. Indeed, the Netherlands and other European countries did not stop coal production because of a lack of coal production potential within their borders, but because international markets proved to be a better deal than consuming costly domestically produced coal. In the same vein, the Netherlands and neighbouring countries may continue to consider the option of importing liquids,

31 https://politiken.dk/indland/politik/art6114063/Radikale-vil-bygge-Danmarks-største-havmøllepark-for-milliarder.

32 Once again, it is important to stress that the energy system comprises more than just the electricity sector. In 2016, final energy consumption in Denmark was 605 PJ (source: Eurostat). That same year, production of wind energy amounted to 46 PJ (or 1099.1 ktoe, source: Eurostat). At the time of writing, Eurostat data was not yet available for 2017. For full insight and the most recent figures, visit the website of the Danish Energy Agency at https://ens.dk or Eurostat at http://ec.europa.eu/eurostat.

gases, and electricity for their future decarbonised energy system, rather than producing all energy themselves, at any cost. Importantly, there is space for synergies, too. The ports and industrial clusters in the Netherlands can in fact be facilitators of energy transition and the build-up of new clean energy industries. However, this will not happen automatically. Policy support and high-level coordination are needed.



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