Greek Energy Forum

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What is the Prize for Greece in Developing its Natural Gas Market?

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1. Financial Prize: Monetising Domestic Hydrocarbon Resources

The monetisation of the hydrocarbon resources in Greece could be a double bet. For Greece, whose economy is dominated by tourism and the service sector, the exploration and production of the domestic natural resources could potentially alleviate the high energy trade deficit the country faces as it would substitute expensive imported oil products and gas with domestical production, while at the same time it would create an additional source of income through the receipt of royalties and taxes, and potentially even via export revenues.

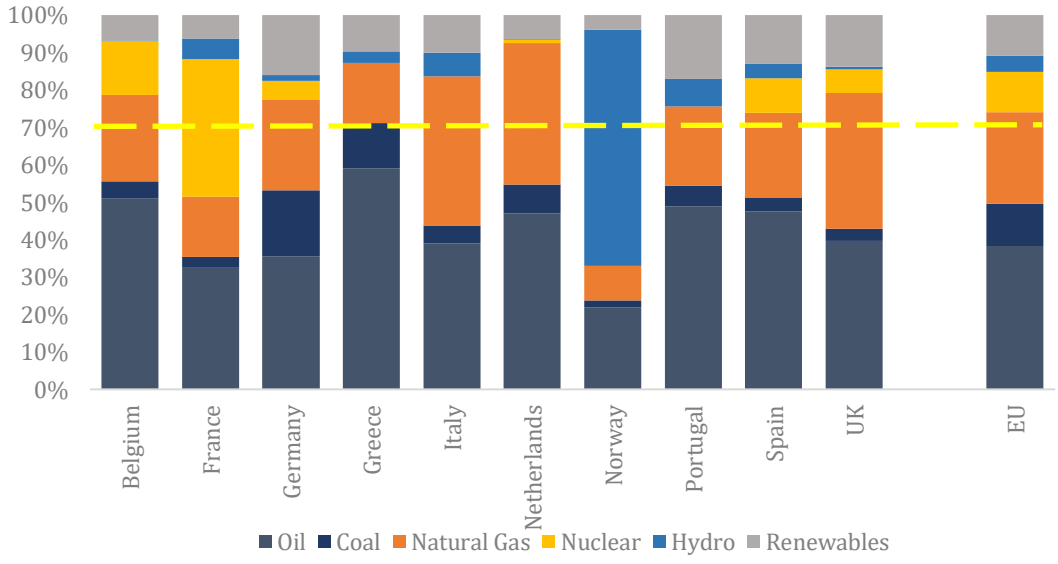
1.1. Energy mix and import dependence

Greece is classified as an energy poor country, importing the majority of its energy needs.

The consumption of primary energy in Greece shows some differences compared to other European economies (Figure 1). The country exhibits a higher dependence on the use of petroleum and solid fuels, with a share of 59% and 12% compared to an EU average of 38% and 11%, respectively.

The Greek economy also uses less natural gas, although consumption has been increasing over the last few years aligned with the government's plan for increasing the use of gas. Currently, the share of natural gas usage in the primary mix stands at 16% versus the EU average of 25%, while it is important to highlight that the country does not consume any nuclear energy which would normally be a driver for higher usage rates.

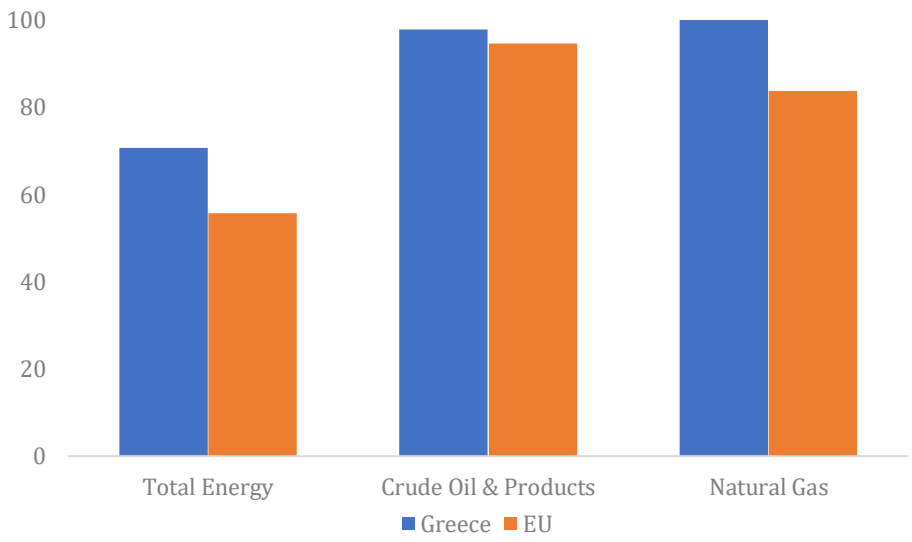
Figure 1: Primary Energy Consumption by Fuel Source in EU Countries, 2019



Data Source: BP Statistical Review of World Energy, 2020

With limited domestic energy production, Greece is classified as an energy poor country, importing the majority of its energy needs. In particular, Greece imports about three-quarters of its demand, including almost all the oil and gas it consumes. This implies a high score in the import dependence ranking, much higher than the average share at the EU level for all main fossil fuels (Figure 2).

Figure 2: Energy Import Dependence Rate 2019, %



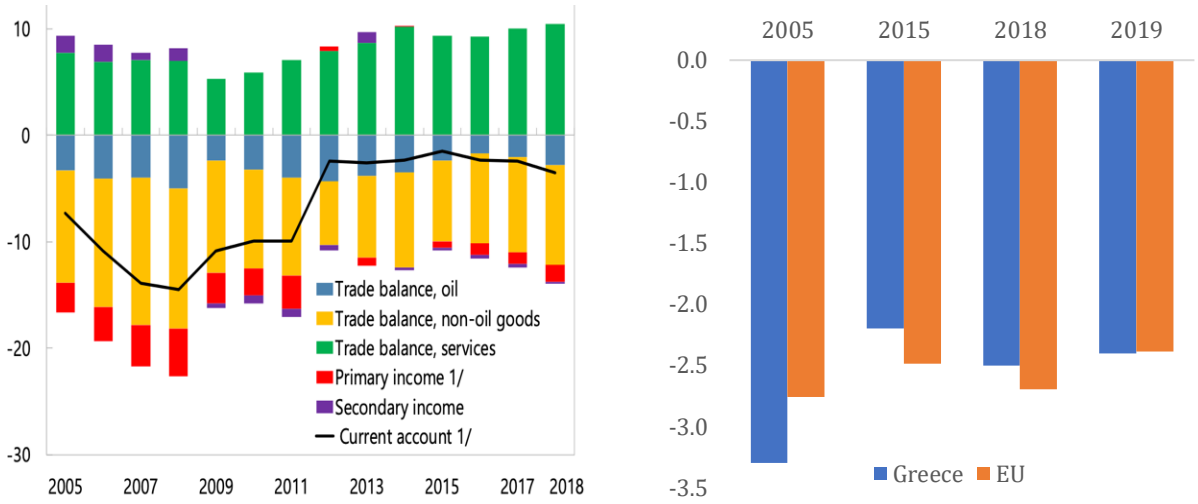
Data Source: Eurostat, 2020

1.2. Macroeconomic implications of energy consumption

Consumption of natural gas is expected to increase by about 40% over the next decade.

Structurally in deficit, the trade balance in the country improved between 2005 and 2015, driven largely by petroleum products, moving from about 3.5% to 2.2% of GDP and getting closer to the EU deficit level as a whole. However, over the last few years, the trade balance has widened again, mainly accounting for higher gas trade deficits, reflecting the ongoing structural change in Greece's energy mix which sees the importance of natural gas growing (Figure 3).

Figure 3: Current Account Components (left) and Net Trade Balance of Energy Products (right), % of GDP



Data Sources: IMF, 2019; Eurostat, 2020

With the Greek government committed to phase-out the use of lignite in power generation by 2028 in an attempt to reduce the nation's carbon footprint, consumption of natural gas is expected to increase by about 40% over the next decade, compensating for the dip in coal supply. That is highly likely to further weigh on the energy import costs and the country's trade deficit.

1.3. Revenue generation

HHRM's seismic research indicate that Greece's potential deposits of natural gas alone could be significant, reaching up to 70-90 trillion cubic feet.

Extracting natural resources can be a crucial component of governments' finances and nations' real wealth, if managed properly, after contributing substantially towards fiscal revenues and income.

A number of countries have achieved great success in managing their extractive industry and fostering growth and prosperity, including Norway which is seen as an exemplary case study thanks to its effectiveness to tax the industry and its ability to save the proceeds to be used for the economic development of the country. Prime examples also exist in the East Mediterranean region. Despite its limited hydrocarbon resources, Tunisia – the country where the Arab Spring is claimed to have originated from – has had its own success story to tell. Israel also belongs to the club of the oil producing countries, with Cyprus further pursuing its own hydrocarbon hunt in the region.

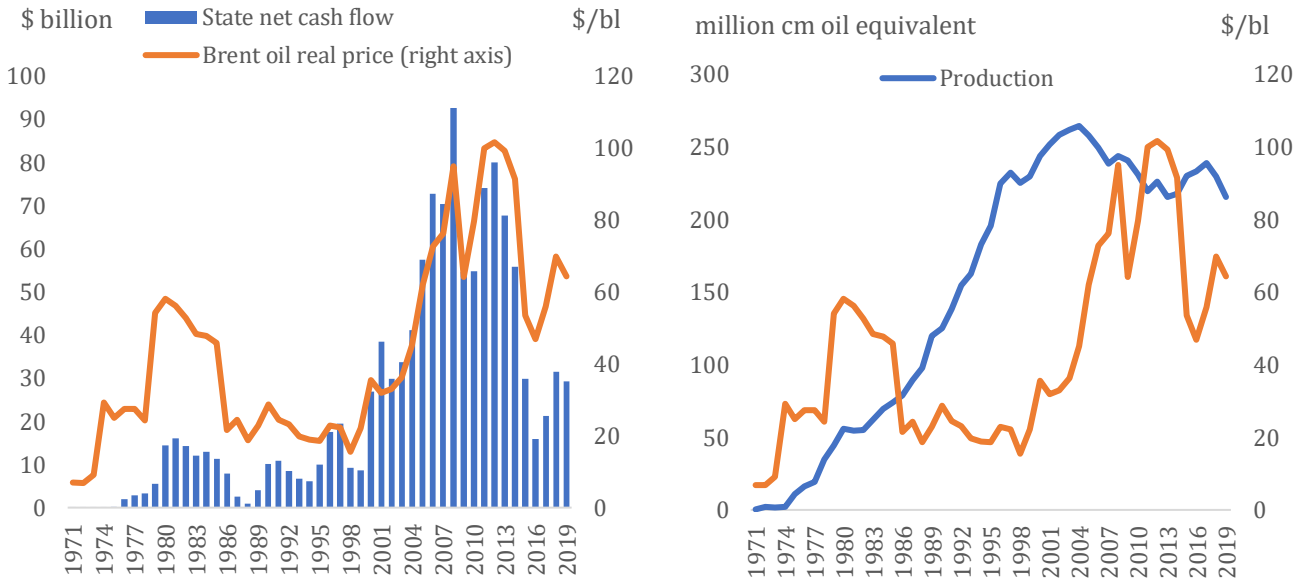
While there is uncertainty when it comes to estimating reserves, some first findings of HHRM's seismic research indicate that Greece's potential deposits of natural gas alone could be significant, reaching up to 70-90 trillion cubic feet, equivalent to as much as Israel, Cyprus and Egypt have discovered in the Eastern Mediterranean combined. To this extent, the US Geological Survey, has also supported these findings by identifying significant potential for natural gas in the region which could lead to game-changing revenues.

1.3.1. The case of Norway

Norway has continued to conduct major licencing rounds even at the current oil price levels, all the while being one of the strongest decarbonisation advocates.

The hydrocarbon industry of Norway is a successful model to study. The country has been very efficient in the way it has managed and taxed its 50-year-old oil and gas industry, which by many standards irrelatively young. To date, the country has generated about $1.2 trillion (since 1971).

Figure 4: Norway's State Oil & Gas Net Cash Flow and Oil Price (left) – Oil & Gas Production and Oil Price (right)



Data Source: Norwegian Petroleum, 2020

While oil production in the country peaked in 2004 when oil prices were high (Figure 4), adding significantly to the wealth accumulation, Norway still produced more than half of its oil output (54%) when prices were below $50 a barrel (Table 1).

Table 1: Oil and Gas Produced in Years when Oil Prices Averaged Below and Above $50 a Barrel

	Billion cm oil equivalent	Share
Below $50/bl	4.1	54%
Above $50/bl	3.3	46%

Data Source: Authors' Analysis

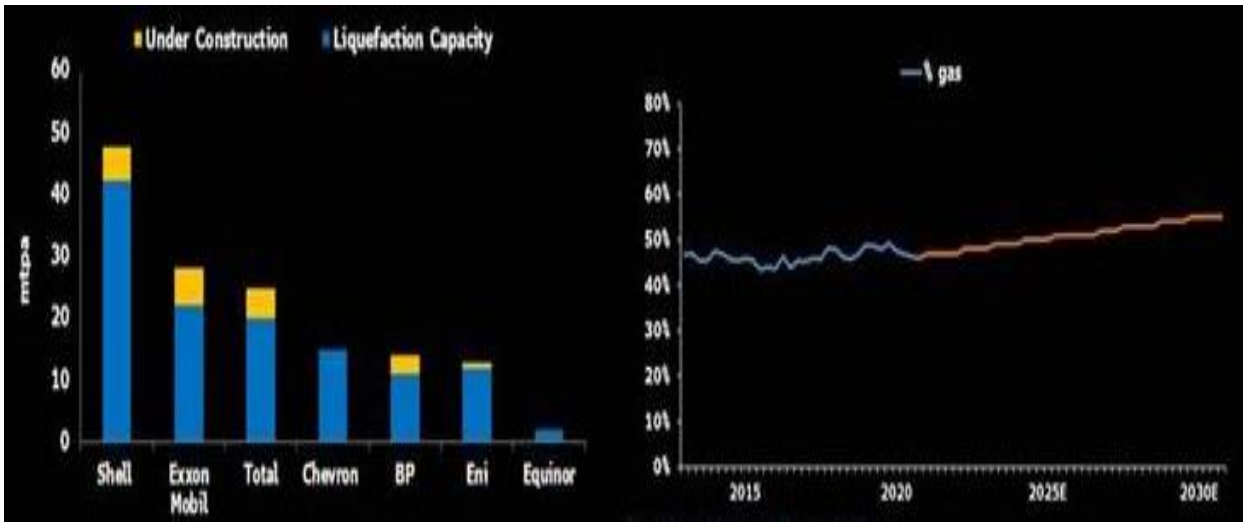
This indicates that while the success of the Norwegian model definitely benefited by the 2004-15 oil price levels, it did generate significant value for the state even at low prices. To this extent, Norway has continued to conduct major licencing rounds even at the current oil price levels, all the while being one of the strongest decarbonisation advocates.

1.4. Oil majors' portfolio pivoting towards natural gas

Despite the current lower oil and gas price environment and the ambitious emissions strategies unveiled by oil majors, natural gas is going to play a key part in the decarbonisation process of these companies, with their portfolios pivoting toward gas (Figure 5).

Although European and US oil majors have deferred their expenses and a number of projects are currently faced with delayed final investment decisions, they are expected to pick up in the years ahead as demand recovers from the Covid-19 pandemic. In particular, the evolution of upstream production is projected to be majority gas-weighted by 2030.

Figure 5: Buildout of LNG Portfolios Underway (left) and Oil Majors to Be Majority Gas-Weighted by 2030 (right)



Data Source: Bloomberg

2. Technical Prize: Energy Transition and Security of Supply

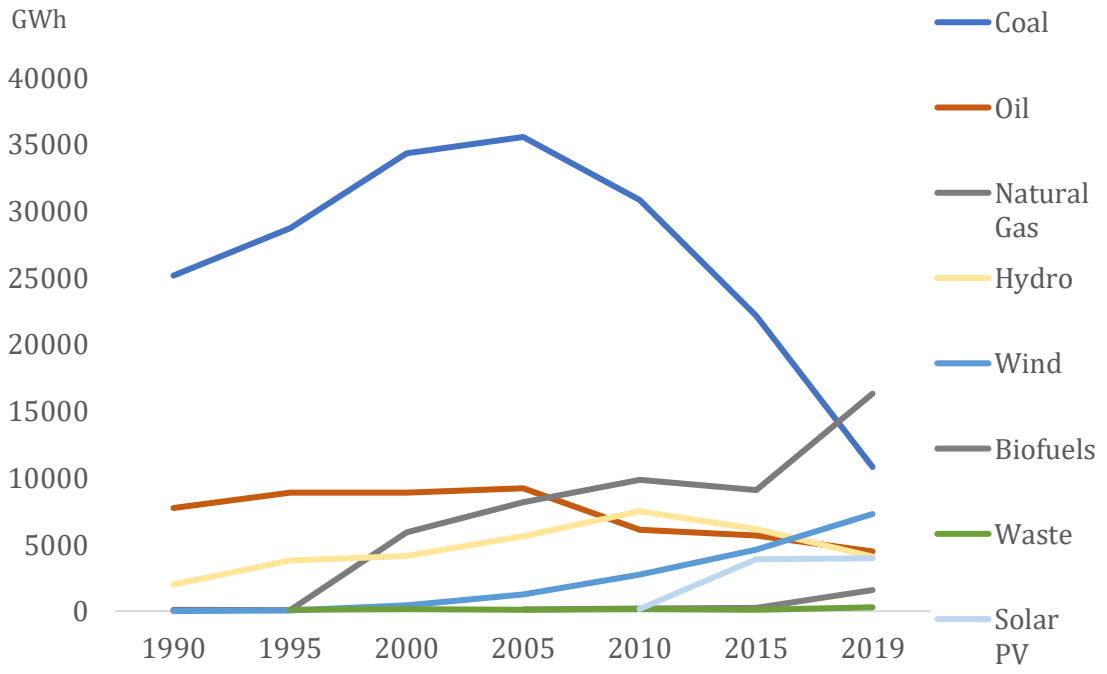
2.1. The role of gas in the 10-year Energy & Climate Plan

We expect natural gas to play an important role not only in the country's energy transition.

Through its recently published 10-year National Energy and Climate Plan (NECP), Greece sets a clear pathway for decarbonisation, primarily focussing on the increase in importance of natural gas in the country's future generation mix as well as the development of renewable energy sources (RES). NECP clearly highlights the importance of hydrocarbons in increasing the diversification of energy sources and acknowledges the need for optimal utilisation and use of domestic energy sources (both RES and hydrocarbons included) which will facilitate the establishment of Greece's role in the region as a key energy hub.

Among its ambitious targets, the plan aims at reducing the share of lignite in power generation by 2028, which, as shown on Figure 6, has already been on a downward momentum since 2005 - also reflecting a parallel decline in energy consumption due to the financial crisis, while natural gas has been gaining market share at the expense of coal.

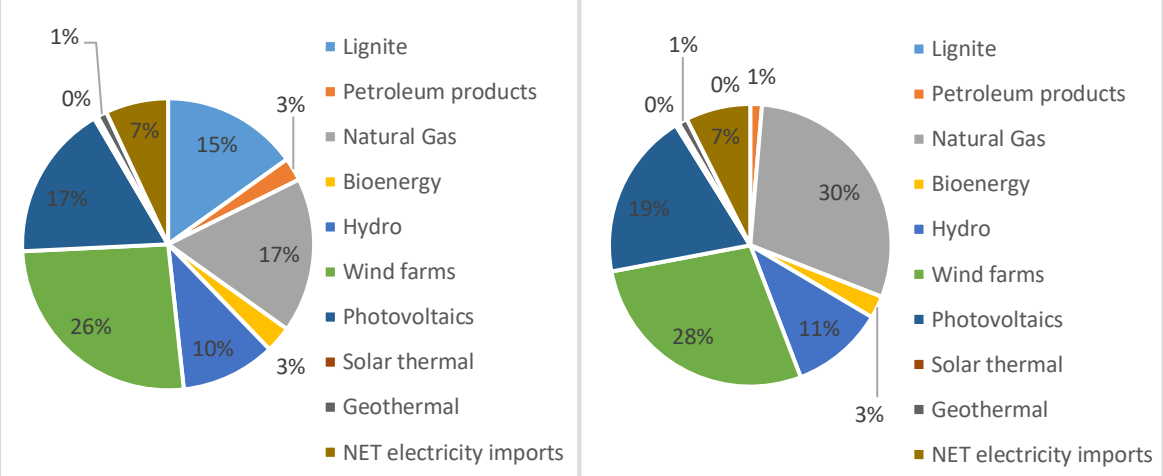
Figure 6: Electricity Generation by Source



Data Source: IEA, 2020

The initial NECP plan, which was drafted in January 2019, did not include the complete phase-out of lignite plants by 2030 and had natural gas net power production standing at roughly 17% by 2030, while renewable energy sources held a combined 58% (Figure *7*). The final draft, having increased the ambition for the rapid decarbonisation of the economy raised natural gas' share to 30% with renewable energy sources rising to 62%.

Figure 7: Electricity Generation by Source: Initial NECP (left) & Final NECP (right)



Data Source: NECP, 2019

The final draft makes it clear, therefore, that a large proportion of the retired lignite plants will be replaced by new natural gas capacity and additional imports from the continent as well as additional RES capacity. The NECP specifically mentions that additional gas capacity will provide the system "with the flexibility required by the increased share of uncontrollable RES plants".

That opens another discussion on the intermittency of RES and the need to have quickly dispatched electricity capacity to account for periods of system tightness, where the "sun is not shining" or the "wind is not blowing". Having made the large step to phase-out the carbon-intensive lignite-plants and without the large deployment of energy storage technologies, natural gas is expected to provide the system with the flexibility and security required to "keep the lights on". The RES intermittency meanwhile will require a more frequent dispatch of ancillary-balancing services from the National Grid operator, in order to tackle the periods of potential system cannibalisation. System cannibalisation means the distortion of system inertia and the need of redirection of additional loads from areas with high power generation from RES to other with lower when demand and supply of electricity are in imbalance due to mainly higher supply.

Baseload capacity and quick dispatch generators such as natural gas peaking plants and battery storage can provide flexibility on the opposite situation, when there is a need for additional generation if demand is high or RES power generation is low.

We expect natural gas to play an important role not only in the country's energy transition, but also in its role to assist in the transition of other neighbouring countries through its potential role as a major natural gas hub.

2.2. Coal-to-gas switching

Greece's energy transition could be safeguarded by the use of natural gas as a transition fuel towards net zero.

Greece pledged to shut down all lignite power plants by 2028 as a first major step to succeed on the transition to net zero emissions by 2050. However, the ambitious target of phasing-out lignite-fired power plants in a period of 8 years could pose developmental challenges during this transition.

Taking the example of other countries under a similar transition path, Greece will be required to balance its retiring power generation fleet with other baseload electricity capacity[1] to maintain the security of uninterrupted power generation. This baseload generation can only be feasibly and economically achieved for Greece with an increase in the importance of natural gas. The latter is already considered as an intermediate fuel for switching to low carbon emissions in all sectors in the NECP, while its importance is also considered in improvements to energy efficiency and lower energy costs compared with other conventional generation fuels.

Gas competitiveness and EU climate policies have facilitated the acceleration of coal phase-out plans for several countries in Europe, as many lignite and coal-plant operators have been forced to proceed to plant shut-downs due to low profitability. Indeed, the transition from coal to gas power generation has already taken place in many European markets in recent years following healthy competition between fuels and the changing landscape in EU climate policies. The oversupply of the natural gas market over the last 2-3 years, increasing LNG flexibility and rising carbon prices have further added to the extensive coal-to-gas switching in the region.

In European countries, such as the UK, Spain and Germany, which were or continue to be heavily reliant on coal and lignite-fired power generation, there has been clear evidence of the fall in the consumption of the aforementioned fuels coinciding with the increase in the use of natural gas. That has been partly related with the differences in the carbon intensity of coal against gas, which made coal-fired generated power less price-competitive, but also due to gas oversupply in the region.

Due to the country's strategic position and preliminary findings on the potential exploitation of its own natural resources, Greece's energy transition could be safeguarded by the use of natural gas as a transition fuel towards net zero. Considering its relatively low domestic consumption profile, the country could also decrease the need for imports, while at the same time, under certain scenarios could even become a net exporter to other neighbouring countries.

Meanwhile, natural gas use in heating and industry is expected to increase in parallel with the coal-phase out plans, while gas-boiled installations in the domestic sector will also target the use of heating oil in the longer-term. Additionally, currently, technologies on natural gas fired power plants allow for the injections of up to 40% hydrogen, providing the possibility for a gradual approach from low carbon to lower carbon and then to net zero as technologies advance.

[1] Baseload capacity, according to EIA, refers to 'the generating equipment normally operated to serve loads on an around-the-clock basis'. This becomes increasingly relevant as intermittent energy sources such as solar and wind energy are not able to provide baseload capacity, especially in the absence of very costly energy storage solutions.

3. Strategic and Geopolitical Prize: EU Domestic Gas

3.1. Declining EU domestic production and diversification of supply

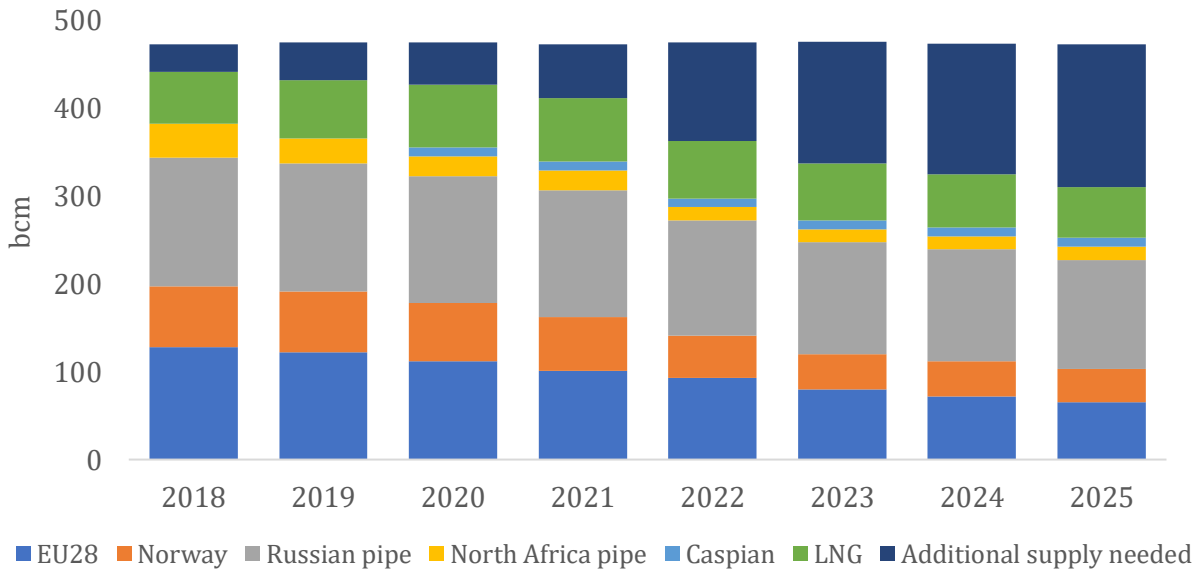
Combined with an expansion of Greece's potential natural gas resources, the country could become a strategic partner in Southeast Europe providing both security and liquidity in the expanding European gas market.

The discovery and exploitation of the vast natural gas reserves in the North Sea in 1950s and 1960s allowed European countries to meet increasing demand from domestic supplies with minimum requirements for import volumes. However, as domestic supplies started to decline and demand for natural gas in Europe increased further, the region required additional natural gas volumes from imports.

The EU imports approximately 70% of its natural gas requirements from third countries, including Russia, Algeria, Norway and others, either via gas pipelines or as LNG. Roughly two thirds of the remaining volume come from domestic European production.

European gas production has been consistently decreasing over the recent years as several fields in the UK and Norwegian Continental Shelf reach their operational end-life. IEA forecasts that EU gas production will continue to fall until mid-2020s reaching a low of 200 billion cubic metres (bcm) by 2024 (Figure 8). This is the equivalent of an annual declining rate of 3.5%. The total volume loss will therefore increase the need for additional gas imports from third countries to 162 bcm by 2025 (from 31 bcm in 2018) if demand remains steady.

Figure 8: Additional Supply Requirements in the EU after Domestic Production and Contracted Imports, 2018-2025



Data Source: IEA, 2020

Meanwhile, despite projections of a flattening natural gas demand in Northwest Europe to 2040, most Balkan countries are expected to see an increase in their natural gas requirements in the next 10 years. Countries like Albania, Bosnia and Herzegovina, North Macedonia, Kosovo, Montenegro and Serbia agreed in 2005 to embed similar regulations to the current EU climate energy package (40% reduction of greenhouse gases emissions based on 1990 levels, 27% renewable generation in the energy mix and 27% increase on the levels of energy efficiency). These targets will require an immediate shift towards cleaner fuels, which would also provide security of energy supply alongside a simultaneous increase of renewable energy sources. For these countries, natural gas seems the most viable option due to its affordability, accessibility and its ability to provide quick wins on emissions reductions against "dirtier" fuels, all of which support the strategic position of Greece in the region.

Adding to the above, Europe's primary goal remains the creation of an "Energy Union" which will make energy "more secure, affordable and sustainable". The Energy Union will provide security, efficiency, a fully integrated internal energy market as well as the tools for the wider decarbonisation of the energy system in the EU economy.

Many countries currently in Central and South-East Europe are dependent on a single supplier for the majority of their natural gas requirements. For these countries, to diversify their supplies, the EU pledged to expand infrastructure to unlock the gas potential of gas-rich countries from the Caspian basin, Central Asia, the Middle East, and the Eastern Mediterranean basin.

This expansion would be achievable through the strategic role of the Southern Gas Corridor, which has been the centre of EU efforts for diversification of supply sources. With an initial capacity of 10 bcm and the potential to triple in the next decade, this project represents an opportunity for Greece to take advantage of the development of a number of projects of common interest (PCIs) in order to fully develop a strong and reliable gas transit route connected with most of the aforementioned routes of interest. Projects such as the East-Med pipeline expand on the already strong strategic position of Greece.

The simultaneous decline of domestic European natural gas supplies, EU's efforts for diversification of supply sources and increasing demand from neighbouring countries constitute an opportunity for Greece to grasp the economic benefits of operating a Balkan natural gas hub. In a scenario where the above is combined with the exploitation and production of Greece's potential natural gas resources, the country could become a strategic partner in Southeast Europe providing both security and liquidity in the expanding European gas market.

3.2. Development of an Eastern-European gas hub

The development of major infrastructure projects has placed Greece high in the list to operate as a major natural gas hub, due to its ability to centralise gas from various sources and its geopolitical position near the "gas-hungry" Balkan regions.

The diversification in transit routes and the ability of gas storage constitute two key elements for the operation of a liquid and stable natural gas hub. Excelling in these two elements allows a country to regulate prices and provide liquidity/flexibility to avoid bottlenecks and fluxes in the smooth operation of the hub.

Greece managed in recent years to make significant steps towards these two elements, first with the involvement in the development of the Trans-Adriatic pipeline, second with the agreement over the Poseidon pipeline to transit Russian gas to Italy and third with the successful financing (through the EU PCI mechanism) of the extension of the Revithoussa LNG terminal and the development of the Alexandroupolis LNG terminal. The successful financing of the South Kavala 1 bcm storage site added to the flexibility from the above sources.

The development of major infrastructure projects has placed Greece high in the list to operate as a major natural gas hub, due to its ability to centralise gas from various sources and its geopolitical position near the "gas-hungry" Balkan regions. EU also seems to recognise Greece' role as a key gas transit hub and that is supported by the high flow of EU funds in the country's development of key projection.

Despite the fact that natural gas has stood out as the transition fuel, it is worth highlighting that a faster deployment of new renewable generation and a further tightening of EU's climate policies to 2030 and, eventually, to 2050 might risk the pace at which the market share expansion of natural gas is currently projected. Meanwhile, the market has been experiencing an overflow of gas sources through LNG expansion projects in Qatar, Russia and the US, thus increasing the competition for market share among gas producing countries in the region and globally.

4. Social Prize, Emissions Savings and Biodiversity Risks

4.1. Job creation

> ***The Greek Energy Forum estimated that about 5,000 direct jobs could be created from the development of hydrocarbon activity in the country, with a multiple of those being created on the indirect services level and even more on the local communities which will host this economic traffic.***

Extracting natural resources could become a source of social growth, especially in creating employment opportunities. Many economies that host extractive industry projects see employment of their local people as one of the main benefits. The impact of hydrocarbons exploration on employment could be direct, indirect or induced, but it is the latter two which seem to be more important in terms of absolute numbers. It is estimated that for every direct job, four indirect and ten induced jobs could be created.

In Norway, the case example we looked at, around 140,000 people are directly or indirectly employed in the petroleum and its related industries, while more than 1 million jobs are expected to be created across Mozambique, Uganda, Kenya and Tanzania as a result of the latest planned oil and natural gas projects in those countries.

With regards to the employment impact in the case of Greece, a study conducted by the Greek Energy Forum estimated that about 5,000 direct jobs could be created from the development of the hydrocarbon activity in the country, with a multiple of those being created on the indirect services level and even more on the local communities which will host this economic traffic.

4.2. Emissions reduction

> ***By switching from lignite to existing gas-fired plants, there is a potential to reduce around 4% of the country's total CO2 emissions.***

The scope of natural gas in the reduction of CO2 emissions is significant. Gas emits between 50% and 60% less CO2 than traditional coal plants and up to 30% less than oil. While it is clear that natural gas is not the destination as most economies seek to achieve net zero over the next 30 years, in the current absence of an alternative solution which can offer baseload power with a lower carbon footprint, more operational flexibility and, more importantly, economic viability, natural gas becomes the default transition fuel. The ability to displace part of the feedstock with hydrogen means that natural gas is not the transition fuel just for today, but it is a flexible energy source which will have a very significant role to play in the next decades.

Focusing on the short- to medium-term, the prospect of natural gas as a key fuel in decarbonisation and the achievement of CO2 emissions savings in Greece is highly significant. Using the IEA assumptions, which state that, on average, coal-to-gas switching reduces emissions by 50% when producing electricity and by 33% when providing heat, this translates to a total CO2 emissions savings of about 10% in today's power and heat sectors in the country. Overall, by switching from lignite to gas-fired plants, there is a potential to reduce around 4% of the country's total CO2 emissions (Dedi and Mavroeidis, 2020).

4.3. Risks

The effective mitigation of such risks depends heavily on the recognition of said risks and their management.

The exploration and production of hydrocarbons in a risky activity. This is a fact which should not be overlooked in view of its potentially high economic benefits. For Greece more so, compared to other countries, given its dependency on tourism and other related industries.

However, the effective mitigation of such risks depends heavily on the recognition of said risks and their management. There are numerous examples of hydrocarbon exploration and production operations running faultlessly internationally, as well as domestically, for many decades. The example of Energean Oil&Gas, operating only mere miles away from the port of Kavala is a great example of a company operating with very high levels of operational rigour ensuring the safety of their employees and the environment.

The common thread behind the international best practices in space of safety performance has been the involvement of International Oil Companies which bring high levels of experience and operational excellence and combining it with local companies which have strong social ties and direct dependency on the local economy.

5. Conclusions

Greece offers a great paradox. Provided its strategic geographic location and its high potential for various forms of renewable energy, it is still a net importer of hydrocarbons, to the extent that it is classified as an energy poor country. Even in the absence of nuclear energy, consumption of natural gas is expected to increase by only about 40% over the next decade which has the potential to leave the Greek energy grid vulnerable to the challenges of intermittency of renewable energy sources.

Natural gas is not the destination fuel for Greece as it embarks upon its energy transition journey. However, given the need for a reliable and flexible baseload power source to compliment the expected rapid growth of renewable energy, and more importantly for an economically viable alternative, the role of natural gas will be central. Most explicitly, natural gas must be treated as an integral part of the decarbonisation journey, allowing for the faster and most effective deployment of renewable energy, and the gradual introduction of hydrogen in the Greek economy.

The development of potential deposits of natural gas in Greece could yield up to 70-90 trillion cubic feet. In the proceeds of such production are managed effectively, Greece could extract value which can be used to fuel further economic development following the example of Norway. An example that has also proven that this is possible at sub $50 per barrel prices.

Combined with an expansion of Greece's potential natural gas resources, the country could become a strategic partner in Southeast Europe providing both security and liquidity in the expanding European gas market. We should not forget that the development of major infrastructure projects has placed Greece high in the list to operate as a major natural gas hub, due to its ability to already centralise gas from various sources and its geopolitical position near the "gas-hungry" Balkan regions.