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Global trends in the energy sector and their implication on energy security in NATO's southern neighbourhood

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Theme

The global energy landscape is undergoing a profound transformation. Failing to recognise its megatrends would be detrimental to the upstream development of energy strategies and to the overall energy security of NATO's southern neighbours, particularly in the Middle East and North Africa (MENA) region.

Summary

The energy sector has undergone major transitions from the use of wood as a dominant fuel to the adoption of coal and, more recently, oil. In the 21st century gas has grown faster than any other fossil fuel and today renewable energy is growing even faster. The changes, combined with volatile energy prices and occasional shocks, create complex scenarios for the future of the energy sector. This has numerous implications, not only for the socio-economic development of NATO's southern neighbourhood, and Middle Eastern and North African (MENA) countries in particular, but also for energy security. Policymakers in the region should keep an eye on the current megatrends in the energy sector, and the short-term implications of one-off shocks like COVID-19, in order to define long-term strategies for a resilient energy sector.

Analysis[1]

Technological innovation, renewable energy deployment, new energy regulations and changing consumer behaviour are driving the megatrends that will shape the future of energy policies. In today's world, understanding the interdependencies of opportunities and risks associated with these factors and being aware of how they could affect individual NATO countries, or their neighbouring countries as a whole, will enable NATO to better prepare for future operational challenges.

As part of NATO's southern neighbourhood, the Middle East and North Africa (MENA) region has long played a central role in the global energy order, thanks to the abundance of fossil fuel reserves in several MENA countries. However, new socio-economic and political developments, one-off shocks such as COVID-19, and major technological innovations in the energy markets will have a significant impact on the region's energy security. These trends challenge MENA's traditional role at the global level and highlight the various opportunities that renewable energies represent. Moreover, since COVID-19

[1] IEA (2019), *World Energy Outlook*. Unless mentioned otherwise, data in this ARI are extracted from the International Energy Agency (IEA). The 2030 scenarios discussed refer to the IEA's 'stated policies' scenarios, which incorporate today's announced policy intentions and targets.

has disrupted the short-term energy outlook, its long-term impacts on the energy sector will be influenced by the recovery paths taken by countries in the region.

This analysis begins by providing an overview of the major long-term global megatrends in the energy sector prior to COVID-19. It also briefly discusses the short-term implications of the pandemic on the energy sector. It then addresses the importance of these megatrends for NATO itself before analysing, from an economic perspective, the potential implications for energy security in the MENA region.

Megatrend 1: renewable energy on the rise

Renewable energy has re-emerged at the forefront since concerns about global warming have grown over the past few years.

Renewables have entered a virtuous circle of technological progress and cost reduction, thus becoming increasingly competitive with fossil fuels, particularly for electricity generation. The global weighted average levelised cost of electricity [2] for solar photovoltaic (PV) and onshore wind fell by 77% and 35% respectively between 2010 and 2018.[3] Global electricity generation from renewables also grew by 7% in 2018. Most of the growth was led by China, which accounted for nearly 37% of growth in offshore wind and for 44% of the increase in solar PV. The significant progress of renewable energy deployment remains, however, concentrated in the electricity sector. The share of renewables in the transport and heating sectors is still limited, although displaying modest growth.

These trends are expected to strengthen in the upcoming decade. Demand for renewable energy is projected to increase globally by 64% between 2018 and 2030, from 1,391 million tons of oil equivalent (Mtoe) to 2,287. Its share in total final consumption will also increase from 10% to 14% during the same period. The use of renewables will witness the fastest growth in the electricity generation sector. Their share of total generation will account for 37% in 2030, compared with 26% in 2018. While hydro will remain the main source used, most of the growth will come from solar PV and wind and, to a lesser extent, from geothermal and concentrating solar panels. The use of renewables is also expected to double in the transport sector, led by biofuels and renewable electricity, and to increase in the heating sector as well, thanks to a higher use of modern biomass, renewable electricity and solar thermal.

In the short term, renewable energy has been the most resilient energy source during the COVID-19 pandemic. According to the IEA, global renewable energy demand is expected to increase by 1% in 2020. Power generation from solar, wind and hydropower is also expected to increase by almost 5% in 2020, despite supply-chain disruptions resulting from the pandemic in several key regions. However, the pace of the addition of new renewable capacity could be slowed down, depending on whether or not economic

[2] The LCOE is the full price of energy (electricity in most cases) over the lifetime of the equipment that produces it.

[3] IRENA (2019), *Renewable Power Generation Costs in 2018*.

stimulus packages, post COVID-19 and in response to the economic downturn, include a renewable energy component.

Megatrend 2: decarbonisation is underway… but at varying speeds

The 2015 Paris Agreement and the growing concerns about the irreversible consequences of climate change has placed decarbonisation of the energy sector and the fight against climate change at the forefront of international debates.

This megatrend underscores the need to reduce polluting emissions caused by the production and use of fossil energy sources, which has been a driving force in the energy system in a number of developed countries for many years. Increasingly stringent emission standards have been introduced in some European countries, triggering important technological innovations, such as in the transport sector with electric vehicles. Moreover, pressure from consumers, investors and regulators have caused companies, particularly in Europe, to devote more time and resources to reducing their environmental impact.[4] This has been helped by the decreasing cost of renewable technologies and their growing competitiveness, making them sustainable alternatives to fossil fuels in certain sectors. However, if some advanced economies are already on the path of decarbonisation, thanks to, among others, the changing energy demand structure due to advances in energy efficiency, this might not be the case for many developing countries. The imperative of industrialisation, urbanisation and economic development in developing regions will continue to lead to higher energy demand, which is likely to be met, at varying degrees, by fossil fuels. Indeed, if forecasts show that energy-related carbon dioxide (CO2) emissions in advanced countries decline in aggregate by 3.6 Gt by 2050, for developing countries, particularly in Asia, they are expected to increase. These overall CO2 trends mask, however, significant differences between particular sectors and technologies.

Nonetheless, this does not in any way diminish the urgency for decarbonisation. It is even indispensable for the fight against climate change and for achieving the objectives set out in the Paris agreement. In the short term, the decline in energy demand in 1Q20 resulted in a major drop in global CO2 emissions, exceeding any previous declines. Global CO2 emissions are thus expected to fall by almost 8% in 2020 compared with 2019. However, any decrease in GHG and non-GHG emissions is most likely unsustainable in the long term if there is not a shift towards green recovery. Indeed, these reductions are not the result of governments and companies adopting new policies and strategies, but rather the immediate result of an exogenous shock, which has serious repercussions for the health and economic activity of individuals.[5]

[4] G. Sammarco (2020), *The Origin of the Energy Transition: Mega-Trends*, Eni.com.

[5] R. Berahab (2020), *Energy Markets Amid the COVID-19 Pandemic: What Do We Know So Far?*, Opinion, Policy Center for the New South.

Megatrend 3: oil proves resilient despite the crisis

In spite of the very optimistic outlook for renewables and the major developments they have witnessed in terms of technology and costs, oil will likely continue to dominate energy use and production in many developing regions of the world, unless major policy changes are made now.

Global oil demand is expected to account for 30% of global energy demand by 2030, followed by coal (24%) and natural gas (24%). Oil demand is projected to increase mainly in developing countries, by an annual average of 0.9 million barrels a day (mb/d) between 2018 and 2030, whereas it should decrease in developed countries. Even though oil will remain the dominant fuel, its growth in overall global demand is expected to slow down during the 2030s, without it necessarily hitting a peak in overall use. As for oil production, North America is expected to account for the largest share by 2030 (45%), followed by Eurasia (21%). Russia's share in global oil production should slightly fall, while that of 'smaller producers' like Brazil and Guyana should increase. These developments have far-reaching consequences for OPEC's share of total production, which is expected to decrease to 37% in 2030, compared with 41% in the mid-2000s. Nevertheless, continued investment in new sources of supply in OPEC and Russia is still essential for the long-term stability of the oil market.

Over the short term, fossil-fuel markets are faced with an increasing degree of uncertainty, resulting from the COVID-19 pandemic and its ramifications on the global economy. Oil markets have already been severely affected. Prices have collapsed by around 66% between January and April 2020, reaching an all-time low of US$23.34/b and US$16.5/b for Brent and WTI crude oil respectively in April.[6] Major reductions in refinery production in China, combined with a significant decline in transport, industrial and commercial activity and the slow-paced measures taken by OPEC+, have led to a substantial slowdown in global oil demand in the first quarter of 2020. As a result, global oil demand could be lower by 9.3 mb/d in 2020 compared with 2019, or by 6.5 mb/d in case of a strong rebound of the economy in the second half of 2020. It will then recover gradually as economies come out of lockdowns and activity levels rise. Nonetheless, unless major policy changes are made, this downward revision is less likely to significantly alter the long-term trends in oil markets, particularly for developing countries. Since May 2020 oil prices have started to increase again as a result of the lifting of lockdown measures. They increased on average by 44% in May (US$30.38/b) compared with the previous month, by 30% in June (US$39.46/b) and by a further 7% in July (US$42.07/b).[7]

Megatrend 4: gas witnessing the fastest growth among fossil fuels

Global natural gas demand is expected to grow more than twice as fast as oil demand. It is expected to reach 4,720 billion cubic metres (bcm) in 2030, a level almost 20%

[6] World Bank (2020), *World Bank Commodity Price Data (The Pink Sheet)*.

[7] *Ibid.*

higher than today. This is in stark contrast to the growth in oil (9%) and coal (1%) demand during the same period.

Unlike oil demand, which is confined to the transport and petrochemical sectors, natural gas demand covers broader sectors of the economy. Industry accounts for almost half of the projected growth in natural gas use, thanks to its increased use in steel and petrochemical production and in manufacturing. In the electricity sector, natural gas demand is driven by developing economies to meet the strong growth in electricity needs and to support the deployment of renewable electricity generation. In the transport sector, both compressed natural gas, used for passenger vehicles, and liquefied natural gas, used for marine transport and large road vehicles, are making breakthroughs. The growth in gas demand should be led by Asian countries, in particular China, which could witness 89% growth between 2018 and 2030, as well as Africa (40%), whereas it is expected to decline in the EU (-8%).

As for natural gas production, it is expected to grow by 20% between 2018 and 2030. Growth should mainly be led by the US, whose production should increase by 29% by 2030, thus exceeding the growth of Middle Eastern production. The evolution of gas production should, however, go through two distinctive phases. The first phase extends to 2025, where almost 70% of the growth in production should come from unconventional sources, mainly led by shale gas. The US should be responsible for nearly 40% of growth. The second phase, from 2025-40, would see a shift in momentum back towards conventional natural gas, with accelerating production growth in the Middle East and several emerging exporters in sub-Saharan Africa. In the short term, natural gas has been less exposed to the collapse in demand for transport fuels amid the COVID-19 crisis. Consequently, the decline in global natural gas demand is less than that of oil. According to the IEA, global natural gas demand could decrease by 5% in 2020, or by 2.7% in the event of a faster post-lockdown recovery.

Megatrend 5: promising prospects for the decentralisation and digitalisation of electricity

The decentralisation of energy, particularly in the electricity sector, is set to rise in the next decade, especially in regions that still lack access to electricity, such as Africa.

This megatrend would be stimulated by several factors: (1) the falling costs of renewable energy technologies, which are an important component of distributed grids; (2) the emergence of new technologies for efficient management of distributed grids; and (3) the fact that decentralised systems are in some cases more cost-efficient than centralised grids, especially in areas with low population density. Therefore, the trend for the next decade is to replace the systematic resort to upsizing centralised grids with decentralisation, when it is cost-effective, while at the same time developing distributed network management technologies. This scenario emphasises the crucial role of geospatial analysis in order to determine the areas most suited for decentralised off-grid solutions, while extending the main grid at the same time.[8]

[8] IEA (2019), *World Energy Outlook*.

Digitalisation is set to play an important role in the energy sector as well. It has the potential to increase the connectivity, efficiency and reliability of energy systems. Artificial intelligence, for example, may enable digital energy systems to manage electricity demand remotely. This is already the case in some African countries, where Solar Home Systems are remotely monitored by energy providers to deliver electricity at the right time, in the right place and at the lowest cost, once proof of payment is made.[9] This also entails the consumer's increasing role in energy distribution. The transition is of utmost importance in order to meet global electricity demand, which is set to grow at 2% on average annually by 2030. Two distinct regional paths for electricity demand emerge from the IEA's predictive scenarios: (1) an upward scenario in developing countries, where advances in digitalisation and demand for electricity increases due to rising incomes, expanding industrial output and a growing services sector; and (2) a downward scenario in advanced countries where increases in electricity demand are offset by energy efficiency improvements.

Megatrend 6: greater flexibility of energy systems

The increasing deployment of renewable energy will require greater flexibility of energy systems, which is seen as a cornerstone of electricity security. Reliability of energy will thus be a major concern, particularly with regard to the intermittent nature of renewable energy.

Natural gas has long constituted an important source of flexibility in many regions, but other alternatives will be required. Batteries, for instance, can provide flexibility for rapid response and contribute to the balance of the electric grid. They can allow electricity generated from renewables to be stored and fed into the grid at another time, when system needs are greater. Over the next 10 years, battery storage is expected to be the fastest growing source of power system flexibility, thanks to economies of scale and improvements in technology. The cost of battery storage is expected to nearly halve by 2030, decreasing from US$400/kwh for a four-hour storage system, to a little over US$200/kwh. The deployment of battery storage is expected to be led by India, China and the US. However, the widespread deployment will require further reforms in the electricity market to incentivise adequate investment.

In addition to batteries, other sources of flexibility have emerged, such as demand-side response, which reduces demand peaks and allows electricity to be redistributed to periods of lower charge and cheaper electricity. Hydrogen and power-to-x is another example. This technology converts electricity into carbon-neutral synthetic fuels, which can be used in other sectors or stored until needed. However, further investment will be needed in order to achieve greater technological progress that would render these technologies cost-competitive. Worldwide, Africa has one of the largest potentials for hydrogen production. By 2030 production costs of hydrogen in North Africa are expected to be two to three times lower than in most European countries or Japan. Energy storage for off-grid and backup power could thus be an interesting application for hydrogen fuel

[9] R. Berahab (2020), *How are Innovative Financing Approaches Contributing to Wider Electricity Access in Kenya?*, Policy Paper, nr 20/09, Policy Center for the New South.

cell. Over the short term, the COVID-19 crisis could impede progress on clean energy technologies. The pandemic is, indeed, already having a major impact on energy systems around the world, thus curbing investments and threatening to slow the expansion of key clean energy technologies.

Why are these trends important for NATO?

Energy security is an essential element of resilience, which has become increasingly important in recent years due to the new security environment. The changing global energy landscape, and the risk of energy-supply disruptions, could thus affect the security of societies of Allies and partners, and have an impact on NATO's military operations. NATO's role in energy security was first defined in 2008 at the Bucharest Summit and has since been strengthened. And in 2014 NATO adopted its 'Green Defence' framework, which aims to 'further develop NATO's competence in supporting the protection of critical energy infrastructure; and continue to work towards significantly improving the energy efficiency of their military forces'.[10] In light of the megatrends discussed in the previous sections, the tightening of the global oil market and the recent oil price disruptions, not to mention the threat of terrorist attacks on critical infrastructure, have once again made energy security an issue of strategic importance.

Climate change is also becoming an increasingly important part of NATO's agenda. On the one hand, by acting as a threat multiplier, climate change is likely to affect NATO's core business and its posture on deterrence and defence. On the other hand, given the growing importance of investing in green energy in EU countries' growth strategies, this interest will inevitably spill over to NATO through the European allies. In addition, new developments in the energy sector are bound to change the geography of global energy production, as more emphasis will be placed on optimising the production of renewable energy. In the future, NATO and partner countries' energy systems will thus undergo significant changes. Societies will adapt to low-carbon economies, with global and local consequences. These consequences can be both positive and negative. Changes towards more renewable energy systems have several advantages and are supported by a strong political will. However, the security environment will continue to evolve as new risk factors and threats emerge as a result of systemic changes in the way we produce and use energy. In order to better adapt to the changing energy environment, NATO and partner countries need to understand these changes and their impact on their neighbours.[11]

What are the economic impacts for NATO's southern neighbourhood?

The MENA region is crucial for global energy markets as it hosts significant oil reserves. Therefore, political stability in the region is a key element of energy security. The latter could increasingly influence the foreign policies and priorities of NATO member states

[10] NATO (2020), NATO's Role in Energy Security; NATO (2014), Green Defence Framework.

[11] D. Jankowski & J. Wieczorkiewicz (2020), 'The Atlantic alliance is perhaps not the first port of call when it comes to fighting climate change. But NATO could make a contribution nonetheless', *Berlin Policy Journal*.

and their neighbours. The changing geography of energy supply and demand, the growth of renewable energy, increased decentralisation and greater flexibility of energy systems will therefore have far-reaching consequences for NATO's southern neighbours, particularly in the MENA region.

The socio-economic structures of MENA's hydrocarbon producers continue to heavily rely on oil rent. Long-term energy scenarios, pre-COVID-19, projected that growing oil demand from countries like China, India and other Asian countries would sustain the central role of MENA's oil-exporting countries in the global oil supply. This would offset the declining level of MENA's oil exports to traditional trading partners such as the US, which are less dependent on energy imports from the MENA region.[12] The outlook post-COVID-19 is, nonetheless, tainted with some uncertainty. A stronger rebound in the global economy could reduce the decline in oil demand and lead to a gradual recovery by the end of 2020, which could maintain long-term scenarios. However, a slower recovery, or the occurrence of a second wave of COVID-19, may have serious repercussions on the MENA region, thus challenging its role as a global energy supplier.

Beyond oil demand and supply, oil prices play a significant role as well in the energy economics of the MENA region. Well before COVID-19, oil prices have experienced a persistent decline throughout the years, which have led to numerous macroeconomic consequences for both oil-exporting and oil-importing countries in the region. After four years of stability at around US$105/b,[13] oil prices fell sharply from US$115/b in June 2014 to US$45/b in January 2015.[14] Since then, oil prices have partially recovered, reaching US$65/b in April 2018,[15] but were expected to remain within a relatively low price range of US$60-70/b until the end of the decade.[16] However, in 2020 oil prices have witnessed an even greater collapse, dropping to US$21/b on average in April 2020, before slowly increasing to US$42.07/b in July 2020.

If low oil prices continue beyond this decade, they could render several oil-exporting countries of the MENA region vulnerable, due to significant revenue losses. For instance, in Saudi Arabia, foreign reserves peaked at over US$730 billion in 2014 and then fell by some 30% by 2017. Nearly US$240 billion was used to cover a large budget deficit created by lower oil export revenues and to defend the currency peg. Despite efforts to consolidate spending, Saudi Arabia is still running a significant deficit, and has turned to domestic and international bond issuances to help finance its budget.[17] Therefore, the rentier economic models put in place by oil-producing states can no longer provide the same levels of economic development and political stability in the region. The possible

[12] E. Menichetti, A. El Gharras, B. Duhamel & S. Karbuz (2018), *The Mena Region in the Global Energy Markets*.

[13] S. Devarajan & L. Mottaghi (2016), *MENA Quarterly Economic Brief, July 2016: Whither Oil Prices?* World Banks, Washington DC.

[14] A. Berman (2015), A Year of Lower Oil Prices: Crossing a Boundary. The Petroleum Truth.

[15] World Bank (2018), 'Commodity prices to rise more than expected in 2018', Press Release, nr 2018/147/DEC.

[16] IMF (2017), *Regional Economic Outlook*, 'Statistical Appendix: Table 6. Breakeven Oil Prices'.

[17] S. Tagliapietra (2019), 'The impact of the global energy transition on MENA oil and gas producers', *Energy Strategy Review*, vol. 26, November, 100397.

decline of MENA's oil's centrality in the next decade could potentially change how the Gulf monarchies invest their wealth in the region.

Regarding MENA's oil-importing countries, sustained low oil prices are likely to stimulate economic activity, through higher real household and business incomes and additional gains through their fiscal accounts. According to a World Bank study, a 10% drop in oil prices could increase growth in oil-importing economies by 0.1 to 0.5 percentage points, depending on the ratio of oil imports to the country's GDP. In the aftermath of 2014, for example, oil-importing countries in the MENA region have seen their budgets improve thanks to lower import bills and a lower tax burden due to lower fuel subsidy costs. Morocco, for example, took advantage of that and in 2014 introduced a reform of fuel subsidies, thus liberalising fuel prices except for butane for social reasons. However, in the medium term, indirect factors could offset the positive effects of low oil prices. Indeed, an economic slowdown in MENA's oil-exporting countries, resulting from low oil prices, could have an impact on the oil-importing economies of the region through reduced remittances, subsidies and foreign direct investment (FDI).

Beyond oil, the MENA region is endowed with significant renewable energy resources. Wider deployment of renewable energy and demand management could help meet the challenge of the rising demand in the MENA region and reduce oil dependence. Countries such as Egypt, Tunisia, Turkey, Morocco, Jordan and the United Arab Emirates (UAE) have witnessed a great pace of deployment of renewable energy. The incentive for the latter is, in fact, stronger in non-hydrocarbon producers of the region, since it is seen as way to improve their security of energy supply, which is an essential tool for reducing vulnerabilities to external energy price shocks and for laying the foundations for sustainable growth. Morocco, for instance, continues to lead the region in terms of total installed renewable generation capacity. The Kingdom aims to have renewable energy account for 52% of the country's total installed capacity by 2030. Egypt (35%), Tunisia (30%) and Jordan (23%) have also set renewable energy targets by 2030.[18]

In oil-rich MENA countries, the pace of development of renewable energy technologies is slow due to the prevalence of several barriers and lack of real incentives. Examples include weak grid infrastructure, regulatory barriers, access to finance and subsidies for conventional energy. In the Gulf Cooperation Council countries, for example, the low penetration of renewable energy technologies can be attributed to institutional inertia, lack of clear separation of roles and responsibilities at the institutional level and the absence of specific policies and regulations. For example, since the 2014 oil price drop, many of these countries adopted new ambitious economic diversification plans. However, these plans were usually dismissed once oil prices recovered.[19] Nevertheless, economic diversification of oil-exporting MENA countries is of the utmost importance. Besides the risk of oil market volatility, two other arguments have emerged today in

[18] S. Timmerberg, A. Sanna, M. Kaltschmitt & M. Finkbeiner (2019), 'Renewable electricity targets in selected MENA countries – Assessment of available resources, generation costs and GHG emissions', *Energy Reports*, vol. 5, November, p. 1470-1487.

[19] Tagliapietra (2019), *op.cit*.

favour of diversification: uncertainty about the speed of the global energy transition (and thus the long-term sustainability of hydrocarbon rents) and the pressing need to create employment opportunities for a large and young populations.

Conclusions

Several MENA countries are among the largest oil and natural gas suppliers globally. As such they are clearly embedded in the global energy system. However, their growing energy needs are challenging their export capacities and could potentially impact their budget revenues. The recent collapse in oil prices following the COVID-19 pandemic are also putting a strain on the region's oil exporting countries. Hence, the future of the Middle East post-coronavirus remains uncertain. In fact, in the absence of an effective public policy turnaround in favour of renewable energy, the upward trend in oil and gas demand is expected to continue in many countries of the region, provided that economic recovery is rapid and there is no second wave of the pandemic. With regards to the latter, countries such as Egypt, Morocco and Tunisia have shown economic resilience despite the grave situation caused by the pandemic and other crises. Syria and Lebanon -of which the latter was afflicted by a violent explosion in the port area of the capital, Beirut-, on the other hand remain fragile, as do their energy sectors.

Regarding renewable energy, although their use is increasing rapidly worldwide, MENA countries have not yet exploited their full potential. Indeed, renewable energy is a promising alternative to address some of the challenges facing the region's energy systems and would undoubtedly enable it to play a leading role in the global energy markets. However, their implementation will need to accelerate if MENA is to maintain its leadership in the energy market and avoid becoming a peripheral player. This requires deeper reforms in the energy sector and a set of supporting tools to create an enabling environment that attracts adequate investment. With respect to its involvement in the MENA region, NATO plays an important role in securing the flow of global energy resources, conducting surveillance and threat assessments as well as protecting critical energy infrastructure and providing training and support for national security services. This role is set to increase with the emergence of new risks and challenges related to the transformation the energy sector is undergoing worldwide.