Shaping A Renewed Atlantic Vision of Energy Security: Old Trends, New Paradigms[1]

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1 Abstract

The energy sector faces many challenges that undermine economic growth, energy security and access, and environmental sustainability. To address these challenges, Atlantic Basin countries need to improve access to reliable energy, diversify their energy mix with low-carbon alternatives and improve energy efficiency in the long term. However, the transition to clean energy will also create new risks and challenges that differ from one Atlantic country to another, requiring additional risk mitigation measures and raising the question about the appropriate pace of energy transition. Therefore, the key to managing these risks, lies in robust, equitable, and interdependent global markets and supply chains coupled with strong regional partnerships and national alliances. Therefore, a new energy security paradigm for the Atlantic Basin must emerge to address current and future challenges and ensure that energy security for some does not create massive insecurity for others. However, this new paradigm will require making explicit the new geopolitical risks and trade-offs of sustainable energy systems.

2 Introduction

The energy sector has experienced prolonged disruptions since the Covid-19 pandemic, the war between Ukraine and Russia, and the resurgence of volatile oil and gas prices. Added to this are the worsening climate crisis and its cascading effects. The combination of these adverse events has increased tensions in global energy markets and challenged the three imperatives of the energy triangle: economic development and growth, energy security and access, and environmental sustainability. In addition, the politicization of energy resources, an inherent feature of the global energy system, particularly concerning gas and oil, has exacerbated the turmoil in global energy markets. As nations continue to adjust their energy security priorities in the face of growing uncertainties, the path forward is not straightforward, as countries with different energy system structures, socio-economic levels, and political systems may follow different paths. Indeed, the immediate concerns in response to the war in Ukraine and the risk of further economic recessions are critical. But allowing these concerns and their impact on global oil and gas markets to drive the discussion misses the long-term threats to sustainable energy security. The literature agrees that countries can improve their energy security by diversifying their partners in the short term, diversifying their energy mix with low-carbon alternatives, and improving energy efficiency in the long term. But where do we draw the line between the short and long terms?

For decades, geopolitical risks related to energy have primarily focused on the availability of sufficient and affordable oil and gas, from the 1973 Arab oil embargo to the controversial Nordstream 2 pipeline. These "traditional" threats to energy security would be significantly reduced in a clean energy world. But new risks will emerge, both from new sources of clean energy and from the decades-long transition process in which the old geopolitics of oil and gas will coexist with the new geopolitics of clean energy. As the energy transition reshapes the energy system, energy security concerns will require additional upstream risk mitigation measures, from strategic reserves for oil and storage infrastructure for natural gas to ensure sufficient investment in sustainable and responsible mining for the transition. These changes are likely to create a new set of challenges and a new set of winners and losers. Therefore, the global energy system is changing fundamentally but remains deeply interconnected. Data increasingly connect it, and it is less about physical volumes of commodities and more about changing the uses of capital. The key to managing these risks lies in robust, fair, and interdependent global markets and supply chains, coupled with strong regional partnerships and national alliances. Therefore, a new energy security paradigm must emerge to meet current and future challenges. This new paradigm will require making explicit the new geopolitical risks and trade-offs of sustainable energy systems. It will also require ensuring that the energy security of some - the major powers and developed economies - does not create massive insecurity for others - the many developing countries with substantial unmet energy needs and significant natural resources.

This chapter aims to examine the new energy security paradigms for the Atlantic Basin in a changing world and to analyze the challenges for Africa, which is emerging as a potential new energy actor. The first section traces the evolution of the concept of energy security, distinguishing between short-term and long-term security and between developed and developing countries. A second section maps common energy security risks across the Atlantic and by region. A third section focuses on the case of Africa and its energy relations with Europe. In contrast, a fourth section discusses the possible foundations of a new paradigm for energy security in the Atlantic Basin.

I. Evolution of the Concept of Energy Security: From Securing Oil to Securing Different Types of Energy

The concept of energy security as a policy issue emerged in the early 20th century, mainly in supplying oil to armies (Yergin, 1991). Theoretical reflection on the concept dates to the 1960s and gained momentum with the oil crises of the 1970s. At that time, energy security meant a stable supply of cheap oil under exporters' threat of embargoes and price manipulation (Colglazier and Deese, 1983; Yergin, 1988). Interest in energy security waned somewhat after the late 1980s as oil prices stabilized and threats of political embargoes diminished, only to reemerge in the 2000s, driven by rising demand in Asia, gas supply disruptions in Europe, and pressure to decarbonize energy systems (Yergin, 2006; Hughes and Lipscy, 2013; Hancock and Vivoda, 2014). Energy security challenges now go beyond oil supply and encompass a broader range of issues related to equitable access to modern energy and climate change mitigation (Yergin, 2006, Goldthau, 2011).

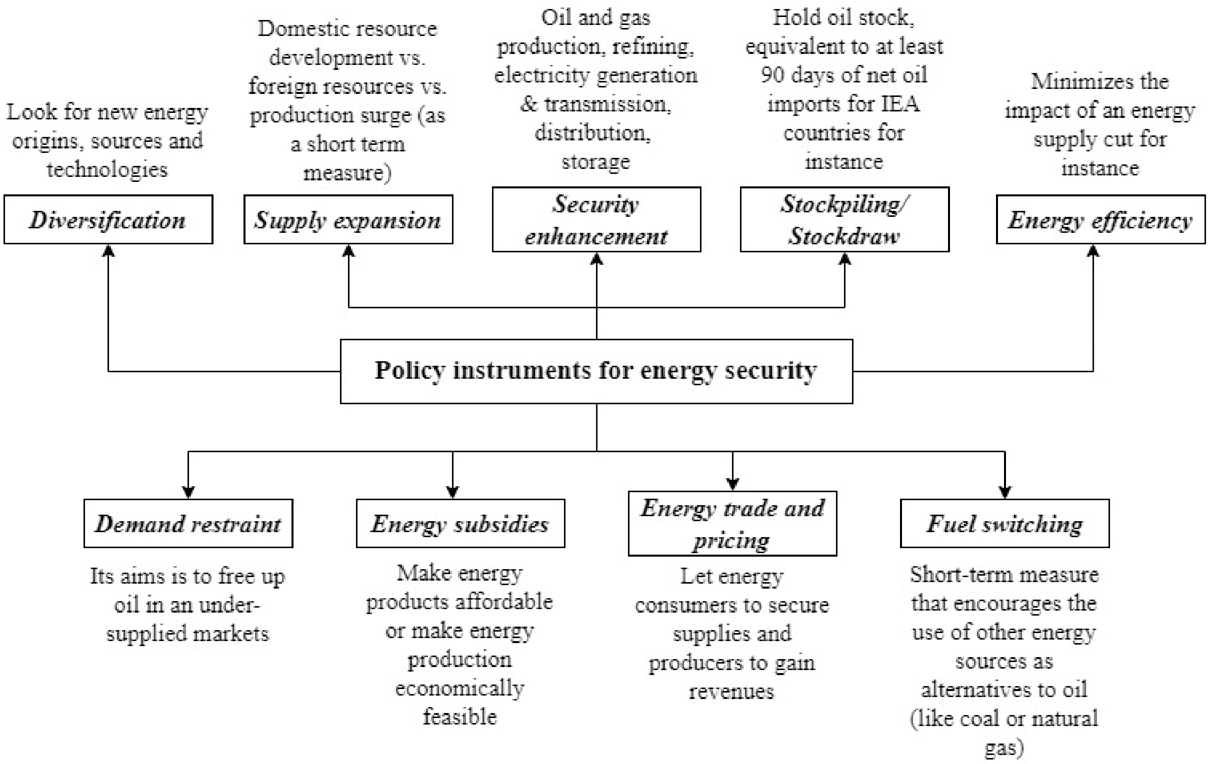
From a theoretical perspective, there are about 45 definitions of energy security, with some similarities among them. Some look at this concept from the perspective of the Organization for Economic Cooperation and Development (OECD) countries, which consider unanticipated disruptions in energy production or import as threats to energy security (OECD, 2007). Others focus on aspects such as electricity supply, which mainly affects developing countries with mostly incomplete electricity grids, resulting in limited access to electricity. However, various definitions of energy security mean the same concept is expressed differently in different circumstances. This explains much of the variation in energy security priorities and policies between countries, particularly on both sides of the Atlantic and between North and South. Ultimately, the meaning of energy security depends on what a nation is accustomed to. For example, if a nation is accustomed to low or stable prices, events or circumstances that lead to high or volatile prices will be seen as threats to energy security. Therefore, these differences highlight the need for conceptual clarity to support national policy analysis and international comparison.

If in the past the association of the terms "energy" and "security" meant simply the stability of the flow of energy, today it is appropriate to refer to other issues. For example, the International Energy Agency (IEA) defines energy security simply as "the uninterrupted availability of energy sources at an affordable price," which does not include environmental or social considerations. According to the IEA, there are two other dimensions of energy security: long-term and short-term: "Long-term energy security is mainly concerned with timely investments to provide energy in line with economic development and environmental needs. Short-term energy security, on the other hand, focuses on the ability of the energy system to respond promptly to sudden changes in the supply-demand balance" (IEA, 2023). Therefore, there is a need to develop a "holistic" definition of energy security that could reveal and reflect the complexity of the concept and should include two additional dimensions: technology and regulation. Furthermore, during the "International Energy Charter" negotiations in 2014, an attempt was made to develop a common concept of energy security for developing and developed countries, as an integrated concept of energy security would be at the nexus of interdependence between all actors involved.

Moreover, according to the literature, there are three main threats to energy security: politically induced disruptions of energy flows, the devastating effects of natural disasters, and inadequate planning (Larrea Besterra et al. 2019). The first threat mainly affects consuming countries, while the other two mainly affect supplying countries. From the perspective of importing countries, this concept includes the availability, reliability, and affordability of energy supplies and geopolitical considerations. For example, the development of renewable energy sources in Europe is not viewed from the perspective of increasing the security of supply but rather from the perspective of complying with international environmental agreements. For many energy-exporting countries, international energy security means exporting energy at a "reasonable" price that guarantees new investments in energy. This view developed after the collapse of oil prices in 1986. There is another view, that of transit countries, for which energy security could be defined as "*obtaining a technically reliable, stable, competitive and environmentally friendly supply of energy resources for the country's economy and social sphere*."

In addition to the IEA definition, it is relatively common to refer to energy security issues in terms of the four A's: availability, affordability, accessibility, and acceptability. The first two remain central to the IEA definition. The other two A's were associated with energy security in the 2007 Asia Pacific Energy Research Center (APERC) report. The four A's are partly rooted in the classic energy security studies of the 1970s (which lumped together the concepts of availability and affordability) and partly inspired by the health access literature, where the other concepts- access and acceptability were introduced as early as 1981. In neither tradition do the four A's answer any of the key questions about security: "security for whom?", "security for what values?", and "security against what threats?". In response to this shortcoming, another stream defines energy security as "low vulnerability of vital energy systems," which opens the door to more detailed specifications of vital energy systems and their vulnerabilities, consisting of exposure and resilience risks (Cherp, 2014). Admittedly, the concepts of vital energy systems, vulnerabilities, risks, and resilience have different meanings in different contexts and for different actors. In particular, they reflect the characteristics of energy stocks, flows, infrastructure, markets, and prices and political constructs rooted in institutional interests, memories, and different perspectives on the future.

Figure 1: Policy Instruments for Energy Security



Source : Larrea Besterra et al., 2019

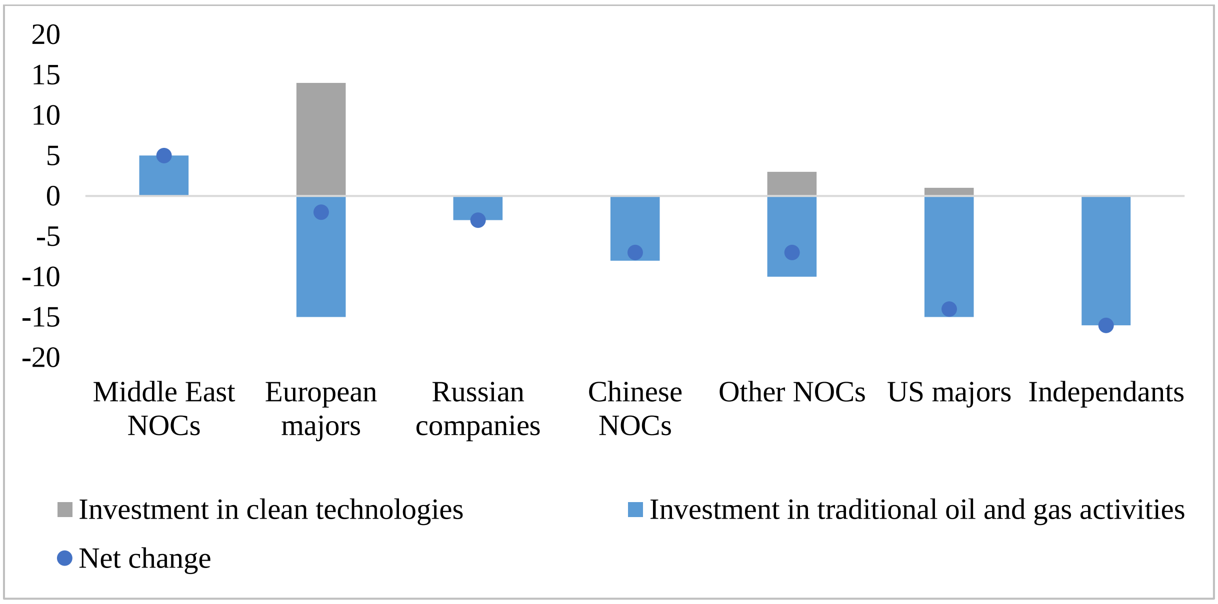
From a quantitative point of view, there are no standard measures to assess energy security, especially since the inclusion of more perspectives (as in the four A's, with environment and society, etc.) has made this task even more complicated. Thus, energy security can be divided into 320 simple and 52 complex indicators. Nevertheless, nine policy instruments can be used to assess energy security and concern diversification, supply expansion, security enhancement, stockpiling, energy efficiency, demand restraint, energy subsidies, energy trade and pricing, fuel switching, and production surge (Figure 1).

II. Energy security in the 2020s Across the Atlantic: Old and New Threats

The energy crisis the world is experiencing began during the coronavirus pandemic. At that time, the demand for transportation fuels, especially oil, dropped dramatically due to economic downturns, lockdowns, and reduced travel. Oil producers lost out, causing them to slow investment and production. As the world emerged from the pandemic, demand recovered faster than supply, leading to a tightening of oil supplies. The war in Ukraine exacerbated these trends in early 2022, placing natural gas at the center of this energy crisis. This differs from previous crises, where oil was almost always the culprit. Whereas in the past natural gas was a purely regional fuel, linked by pipelines that transported it from one country to another under stable and very long-term contracts, today, the rise of liquefied natural gas (LNG) has globalized its supply so that a crisis in one region can spread to others through the LNG market. In this context, the war in Ukraine has led Europe to absorb a more significant share of the world's LNG production to reduce its dependence on Russia, resulting in higher prices for all regions. This is the first time that a natural gas crisis has become global in this way (IMF, 2022). Faced with this situation, some countries, such as Germany and Belgium, have returned to using coal or nuclear power for electricity generation to free up natural gas for other uses. This has brought back the trilemma of energy security, energy transition and economic growth, and the necessary trade-offs between short-term and long-term priorities. It has also created new energy security risks, some common to all countries in the Atlantic region, while others differ from one region to another.

A major energy security risk common to the countries of the Atlantic Basin is that a poorly managed energy transition will fail to synchronize reductions in fossil fuel supply and investment with reductions in fossil fuel consumption. Currently, the world is underinvesting in all forms of energy. Years of mounting pressure to divest from the oil and gas sector and the industry's poor returns have certainly reduced investment in this sector to levels consistent with meeting the climate commitments announced by many countries (Figure 2). However, investment in clean energy has not kept pace with countries' current energy needs. Clean energy investment would need to increase by a factor of 2.4 by 2030 to change the current outlook for oil and gas demand and enable countries to meet their targets (Bordoff & O'Sullivan, 2023). Indeed, if oil and gas investment falls but demand does not, prices will rise in a tight market, increasing the geopolitical leverage of producers like Saudi Arabia, which can cushion shocks. We are already living in a situation of high energy prices. While Europe is in the spotlight because of real gas shortages, developing countries in Africa and Latin America are most affected because fuel prices may be unaffordable for low-income households. These countries may struggle to find natural gas since Europe now captures a significant share of global LNG production, as Russia is no longer seen as a reliable energy supplier. Developing countries may eventually turn to Russia for gas supplies, reshaping energy trade patterns and increasing the fragmentation of energy markets. Developing country governments are also less able to subsidize energy for a large portion of their population that may need it. For example, Argentina, Ecuador, and Sri Lanka

Figure 2: Change in investment by different groupings of oil and gas companies, 2022 vs. 2019 (billion USD 2021)

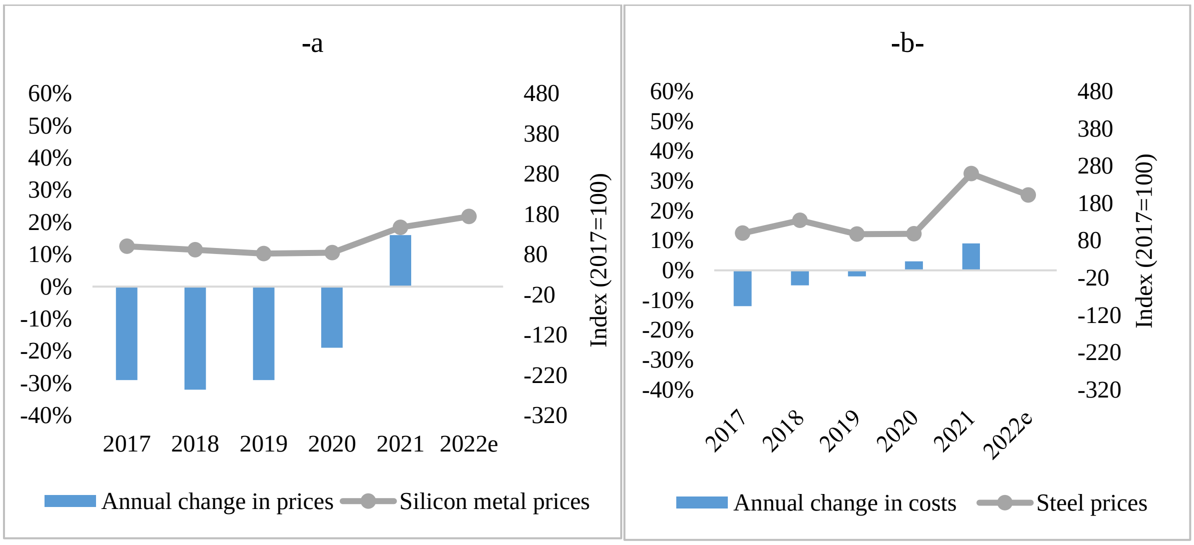


Source: International Energy Agency. Note: NOC: National oil companies.

In the longer term, the old geopolitics of oil and gas will eventually fade as the energy transition progresses. But the new clean energy world will also present many geopolitical and energy risks of it of which were already evident in 2022. For example, the clean energy future will require a dramatic increase in materials such as lithium and copper, which are needed for batteries, solar panels, and other clean energy components. Today, most of these minerals are refined and processed in China, and many are mined by Chinese companies around the world. Western governments have taken steps to diversify supply chains for key minerals. Still, they face challenges such as long mine development times, difficulties in approving such projects, and the geographic concentration of certain minerals. In addition, the cost of solar panels and wind turbines has risen in recent years (Figure 3). One factor contributing to this trend is the global shortage of semiconductor chips following the Covid-19 pandemic, which are used in solar panels and wind turbines.

Furthermore, while an energy system based on clean electricity would undoubtedly reduce the security risks of fossil fuels, it would also pose its own risks. Because wind and solar power are intermittent, the need for flexibility in other sources of electricity to fill the gaps becomes greater than the current system can provide. In addition, a decarbonized future will require much more electricity for cars, heating, and other needs now met by oil and gas. New energy security risks may arise for countries that rely on cross-border trade for these decarbonized electricity sources because electricity is more difficult to store or purchase from other suppliers than oil and gas. In addition, a more electrified, digitized, and connected smart grid may also be more vulnerable to cyberattacks.

Figure 3: (a) Technology cost trends and key material prices for a solar PV module, 2017-2022; (b) Technology cost trends and key material prices for the wind turbine, 2017-2022



Source: International Energy Agency

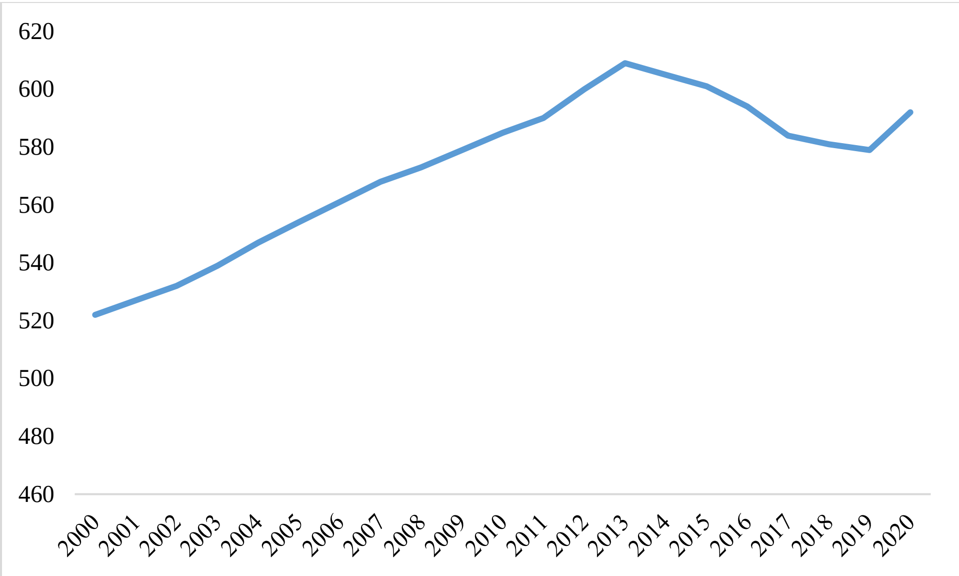
Regionally, Europe's energy security crisis is primarily about natural gas. It is not so much related to the pandemic but rather to the dependence of European countries on Russian natural gas that has developed over decades as part of their energy transition, i.e., the gradual shift from coal to renewable energy. Some countries, such as Italy, have become extremely dependent on Russian natural gas for their electricity generation, while in Germany, gas is used more for residential heating and industrial activities. Some of these uses, such as high-temperature applications like glass manufacturing, will be very difficult to decarbonize. For others, the process will be more straightforward but will take time, such as replacing residential gas heating with electric heat pumps (IMF, 2022). Russian natural gas has played a crucial role in the European energy system, not only because of the decision to rely on it but also because of Europe's own declining natural gas production. With the invasion of Ukraine, most countries no longer want their thirst for energy to finance Russia's war against Ukraine. But the fact is that the world still needs Russian energy, which puts Europe in a very delicate position and has led it to look for natural gas elsewhere, in Norway, the United States, Qatar, and Africa.

In the United States (US), near-term energy security risks have more to do with disruptions in diesel markets, particularly on the East Coast, than with direct reliance on imports from Russia. On the supply side, the U.S. East Coast experienced low distillate inventories (diesel and heating oil) and an explosion in the U.S. East Coast price premium over the Gulf Coast in 2022, with a risk of a repeat in 2023. Russia's invasion of Ukraine has further tightened global diesel markets and highlighted the consequences of the East Coast's reliance on diesel imports. About 84% of the region's distillate supply comes from outside the region, with significant dependence on a major U.S. Gulf Coast pipeline and imports. These imports, reaching 21% in 2021, are subject to geopolitical risks (Kah & Palacios, 2023). East Coast refining capacity has been cut in half over the past decade as plants have closed due to uncompetitive refined product yields and difficulty obtaining low-cost feedstocks. Other factors affecting diesel supply include refinery strikes in Europe and restrictions on Chinese refinery exports last year. On the demand side, the East Coast heavily depends on petroleum products for heating, accounting for 82% of U.S. heating oil consumption, while other regions have turned to other heating sources. The European Union's sanctions on Russian oil exports, set to take effect on February 5, 2023, could further exacerbate the diesel market. Adding to the uncertainty is the impact of price caps on Russian product exports to other markets, which are also expected to take effect on the same date.

In Africa, the main risk to energy security is deteriorating access to reliable energy. Progress in energy access has been reversed by 2022 (Figure 4). Indeed, the number of people without access to electricity decreased by about 5% between 2013 and 2019, thanks to progress in countries such as Kenya, Senegal, Rwanda, and Ghana, which adopted strong electricity access policies and supported off-grid initiatives. However, it will increase by 2% between 2019 and 2020 due to the increased complexity of extending services to remote and low-income populations, the impact of COVID-19 and pandemic-related economic disruptions, supply chain hurdles, and rising global inflation (Auth, 2023). Where electricity is available, consumption is well below the global average - the average consumer uses less than 200 kWh, less than what is needed to run a modern refrigerator - due to frequent power cuts, blackouts, and load shedding (Tobin & Sparkman, 2022). Even in Nigeria and South Africa, the industrial powerhouses of sub-Saharan Africa, power grids are often unable to support existing generation resources to meet demand. A second risk is the state of Africa's energy infrastructure, which has long suffered from underinvestment. Over the past decade, the continent has received about $41 billion in energy sector investment. This figure is small in absolute terms and represents only 3% of global energy investment compared to the rest of the world. More surprising, however, is that 99.5 % of the continent's energy investment went to power generation. Only the remaining 0.5% was spent on transmission and distribution networks (Tobin & Sparkman, 2022).

In addition, international oil companies (IOCs) have significantly reduced their funding of hydrocarbon projects in Africa in recent years, due to increasing calls from several European countries for a faster energy transition, without accelerating the funding of green projects that could provide an alternative energy source. This underinvestment perpetuates existing problems, including poor cost recovery, low utility revenues, and high project costs for new-generation facilities. This, combined with high and rising interest rates in African countries such as Ghana, where the benchmark bank rate is 17%, poor energy infrastructure makes the risk premium for new investors high. The challenge of energy poverty therefore remains a major energy security issue for Africa, one that deserves the same urgency as the energy crisis in Europe.

Figure 4: Population without access to electricity in Africa, 2000-2020 in millions of people



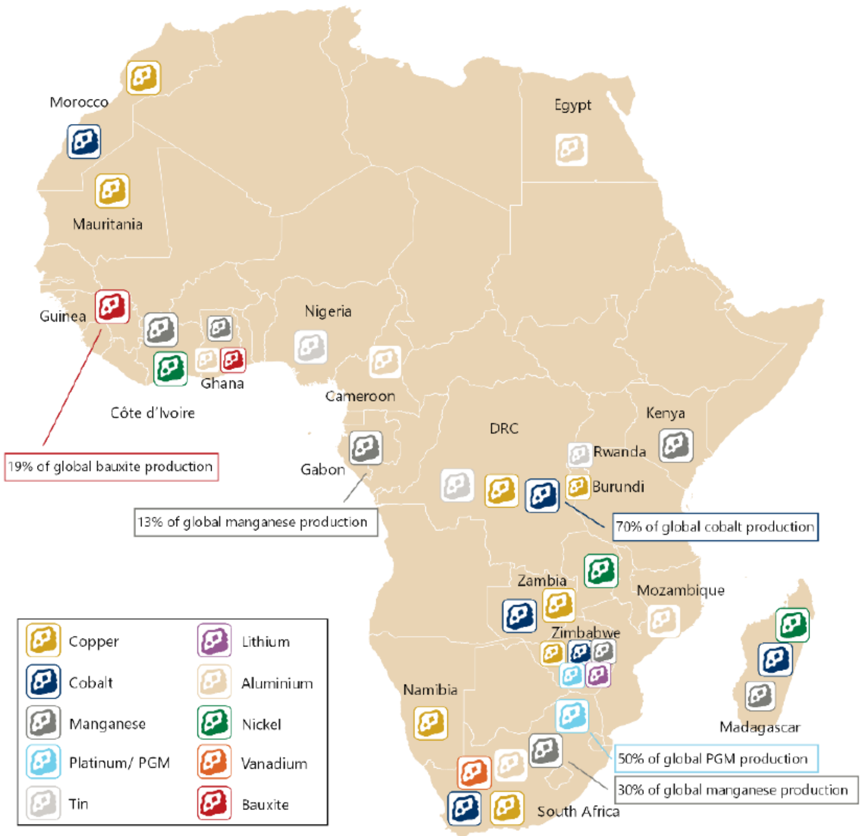
Source: International Energy Agency

In Latin America, energy security risks include political instability and policy uncertainty. In Argentina, for example, although the Vaca Muerta is the world's second largest unconventional shale gas formation, political instability, currency controls, and corruption have resulted in less than 10% of the total acreage being developed at scale. Meanwhile, President Andrés Manuel López Obrador plans to build three new LNG regasification plants in Mexico but has scared off most investors with his unstable policies to prop up state-owned energy companies. Another risk is the pressure that climate change is putting on energy systems. More frequent extreme rainfall events or, conversely, more extended droughts can add risks to hydropower generation in Latin America by altering water availability, increasing sedimentation, or causing physical damage to facilities. Aging hydropower plants may be more vulnerable and require additional efforts to mitigate climate risks (IEA, 2022a). In addition, the risk of a cyber-attack on electricity and gas utilities in Latin America remains critical. According to a 2016 Security Studies paper, "*in Latin America and the Caribbean, a cyber-attack on a power plant could be the most serious threat to a country because of the impact on the population and the physical destruction of structures over a very large area*" (Eiden et al. 2021). In late April 2020, a Brazilian power company was the victim of a cyberattack that disrupted many services for several days.

III. A look at Africa: A Continent Torn Between Meeting Domestic Energy Demands and Contributing to Europe's Energy Security

Europe's diversification away from Russian oil and gas has opened the possibility for other partners to fill the void left by Russia. To diversify its oil and gas suppliers, Europe has turned to countries such as Norway, the United States, Qatar, and Africa. The latter is an interesting case because it theoretically has a wealth of untapped renewable and non-renewable resources that can meet both Europe's short-term needs to reduce its dependence on Russian hydrocarbons and its long-term energy transition needs. In terms of hydrocarbon resources, Algeria has indicated its willingness and ability to increase gas supplies to Europe, while Egypt is making progress in positioning itself as a key regional destination for natural gas processing and re-export. Europe has also approached other countries such as Senegal, Nigeria, Tanzania, and Mozambique to increase production or develop new gas projects. In terms of the energy transition, several countries on the African continent have the potential to participate in the global decarbonization effort due to their abundance of solar and wind energy, as well as critical commodities needed for the transition, such as platinum group metals (PGMs), copper, cobalt, tin, bauxite and manganese (Figure 5). For example, South Africa has 50% of the world's PGM production and 90% of the world's reserves; 30% of the world's manganese production and 40% of the world's manganese reserves, while the Democratic Republic of Congo has 70% of the world's cobalt production and 50% of the world's cobalt reserves (US Geological Survey, 2022). Investments in exploiting these minerals could therefore contribute to diversification efforts and significantly enhance development in Africa.

Figure 5: Africa's major producers of green minerals in 2019



Source: USGS/World Mining Data

Despite this enthusiasm, Europe's renewed interest in Africa masks contrasting realities. It reveals a Eurocentric view of the pace of energy transition. Indeed, many experts question Africa's ability to increase its energy supply to Europe when Africa suffers from a chronic lack of access to energy. This raises the dilemma of meeting domestic energy needs and exploring export opportunities. Of course, the ability of countries to calibrate this trade-off depends on their own priorities and resources. But many African countries, including Algeria and Egypt, have stated that domestic demand will take precedence over the availability of gas for export. This is especially true as most of these countries face significant socio-economic challenges, including persistent inflation, following years of the pandemic and war in Europe. In addition, many African oil and gas-producing countries have limited spare capacity to rapidly increase supply due to technical, economic, or security challenges. For example, the prospects for supplying Europe from oil giant Nigeria remain uncertain. Although Nigeria has about 180 trillion cubic feet of proven gas reserves, several major oil and gas companies are pulling out of the market due to increasing security concerns and vandalism affecting production. And while potential gas giant Mozambique has 100 trillion cubic feet of proven gas reserves, most of the gas is located off the coast of the northern province of Cabo Delgado, where insurgent groups operate (Oxford Economics, 2022).

2.1 *Box 1. The Case Morocco - a future exporter of green hydrogen to Europe?*

Morocco and the European Union have partnered to increase energy security and promote clean energy. This alliance is based on a mutual commitment to sustainable development and reducing greenhouse gas emissions. Morocco has ambitious plans to increase the share of renewable energy in its overall energy mix to 52% by 2030. The country has implemented several renewable energy projects such as wind farms, solar power plants, and hydroelectric power plants to achieve this. However, the country faces challenges such as financing and technical expertise. The EU has supported Morocco's efforts by providing funding and technical assistance for renewable energy projects. For example, the EU has invested more than €1 billion in the Noor Ouarzazate solar power plant and supported the construction of new interconnectors between Morocco and Europe. In addition, the partnership has facilitated the transfer of technology and knowledge between Morocco and the EU.

With Europe's goal to increase its energy security by phasing out Russian energy imports and decarbonizing, as outlined in its REPOWEREU strategy, Morocco has an opportunity to produce and export green hydrogen to the EU. To this end, Morocco has launched a process to establish an economic and industrial sector for green molecules, including hydrogen, ammonia, and methanol, resulting in the unveiling of Morocco's "Green Hydrogen Roadmap." The country intends to produce green hydrogen through electrolysis using green electricity. In its Green Hydrogen Roadmap, Morocco has assessed the potential domestic demand and international market that it can capture. For the domestic market, green H2 produced in Morocco has three applications: (1) as an input in industrial processes, particularly in the fertilizer industry; (2) to a much lesser extent, as an alternative fuel in the transportation sector, either in the form of green H2 or synthetic fuel and to a lesser extent in the residential sector to replace imported Liquefied Petroleum Gas (LPG), which is commonly used in Morocco for cooking and heating; and (3) as a storage and flexibility solution, which is a real asset in mitigating the intermittency of renewable energy sources and securing the national grid.

While there would be some domestic use for green hydrogen, Morocco's strategy is mainly export-oriented. According to a study published by the Fraunhofer Society entitled "Study of the opportunities of Power-to-X in Morocco," the country could capture up to 4% of this global demand by 2030. The national roadmap predicts that exports will account for about 70% of Morocco's total demand. Regarding product type, it is expected that 75% of exports will be hydrogen exported in the form of ammonia and 25% in the form of synthetic liquid fuels. In this sense, Morocco has multiplied agreements with partner countries, such as Germany and Portugal, on joint projects to develop value chains and R&D around green H2. However, many of these countries - especially in Europe - have also shown interest in other countries in the Mediterranean region, suggesting that Morocco should carefully consider all aspects of its strategy.

However, as the green hydrogen industry is still in its infancy, it faces many challenges. To achieve this goal, Morocco will need to continuously ensure national competitiveness in many areas: regulatory, technical, managerial, and financial, to name a few. Fundamentally, Morocco's green H2 ambitions highlight the need for additional (1) renewable energy capacity; (2) industrial electrolyzers; (3) desalination plants, given the country's water scarcity; (4) processing plant capacity. One of the main challenges for green H2 production is its cost, which is currently two to three times higher than that of gray hydrogen. This is due more to the high cost of the electrolyzer than to the cost of the green energy itself. In fact, the levelized cost of electricity for renewable energy has dropped significantly in recent years on a global scale. Therefore, incentives will still be needed for electrolysis, transport/storage, use, and production in the short term.

In addition, given the water scarcity in Morocco, Green H2 will rely on desalination. This should not interfere with municipal water needs. Therefore, there will be constraints on the location of green H2 production, which must be close to the sea. In addition, significant investment will be required to build the appropriate infrastructure. The conversion of natural gas pipelines is not as easy as it seems, given the characteristics of green hydrogen molecules, which differ from those of gas. Therefore, developing a common market for green H2 between Morocco and Europe will require strong coordination. In addition, since the production and transport of green H2 should be environmentally sustainable, it is essential for Morocco to ensure the traceability of the green H2 value chain, from production to final disposal, a process that involves different types of rules of origin. It is, therefore, necessary to implement certifications or guarantees of origin under the regulations and standards of the exporting countries, in this case, Europe.

Source: Berahab & Zarkik, 2023.

Moreover, while African oil and gas producers may benefit from Europe's interest, primarily in the form of additional revenues, the rapid growth of oil and gas production in Africa will require significant additional investment. In recent years, however, international oil companies (IOCs) have significantly reduced their funding for hydrocarbon projects in Africa as several European countries have increasingly called for a faster energy transition. So, while Europe has pushed IOCs and African countries to move away from fossil fuels, it has not accelerated funding for green projects that could provide an alternative energy source. For example, Africa has abundant sun and wind but little operational infrastructure to harness them at the levels needed to replace fossil fuels. It also faces much higher financing costs for green projects, which are seen as riskier investments. This comes at a time when Africa still faces critical structural challenges in the energy sector, including uneven access, aging distribution and transmission infrastructure, etc. This situation could lead many African leaders to denounce what they see as Western energy hypocrisy and double standards, especially if Europe does not clarify the sequencing of its energy strategy and does not engage African countries as equal partners.

For African producers to bring additional oil and gas to market, they need to invest in future production today. But investing in oil and gas is a capital-intensive business with long payback periods. Investors need to be confident that when their products come to market, demand will be there for many years. The problem is that these same governments are encouraging developing countries to accelerate their phase-out of fossil fuels and are committed to destroying demand for these products in the coming years in their quest to decarbonize (Berahab, 2022). This risks locking oil and gas-producing countries into fossil fuels for much longer, especially in the absence of domestic policies to diversify the economy, creating stranded assets at a time when the global energy transition is underway.

Furthermore, while Africa has essential critical minerals, the main challenges are how to decarbonize the production of these minerals and how to communicate better in the energy transition to the public. Indeed, critical minerals encompass markets with very different characteristics, making it challenging to develop a strategy for each product. In addition, long lead times for mining projects exacerbate the risks of supply and demand mismatches, leading to a prolonged period of market tightness, with price volatility creating uncertainty about the large upfront investments required for production (McKinsey & Company, 2022; IEAb, 2022). For example, an analysis of major mining projects commissioned between 2010 and 2019 shows that it took an average of 16.5 years to develop projects from discovery to first production (Kinch et al., 2020; IEA, 2022). Thus, if Africa is to reap the full benefits of its mineral wealth, it must go beyond the extraction and gross export of these projects and build a whole sustainable processing industry to export higher value-added products and move up the global value chain. This will require a range of domestic reforms to create the enabling environment to prevent critical minerals from becoming a bottleneck in the energy transition.

Ultimately, Africa will have to decide what trade-offs it is willing to make between contributing to Europe's new energy demand and its own domestic needs. While Europe is working on its Green Deal, many African countries still face different challenges and have priorities that may differ from those in Europe, ranging from stimulating economic growth, reducing poverty, creating jobs, and addressing structural energy challenges. Given the diversity of the African continent, some countries may be better equipped than others to export their energy to Europe, but this must be done within a balanced partnership framework based on financial cooperation, technology and skills transfer, and the creation of positive externalities at the local level.

IV. Towards A New Paradigm of Energy Security in The Atlantic

There is a great diversity of economies and energy resources in the Atlantic Basin. Therefore, applying a single and unique concept of energy security to all these countries seems almost unrealistic. However, this very diversity of economies and energy security policies hides complementarities that, if properly exploited, can strengthen regional cooperation on energy security and generate positive externalities in the region. To foster such collaboration, these countries need to better define their strategies considering broader social, economic, and geopolitical priorities, including the ability to decarbonize their energy systems or address the lack of energy access and poverty. Several key factors can help paint a picture of what a new paradigm for energy security in the Atlantic Basin might look like, provided that countries adapt them to their own contexts:

- **Synchronizing the reduction of fossil fuels with the growth of clean technologies** has become critical to avoid disrupting the balance between energy demand and supply. Indeed, reducing investment in fossil fuels before increasing investment in clean energy risks driving up energy prices and does not necessarily promote a safe or just transition. In fact, the underlying mismatch between fossil fuel and clean energy investments has made the energy system more vulnerable to shocks, culminating in 2022. Therefore, reductions in fossil fuel investments must be carefully sequenced to ensure that they do not outpace increases in clean energy technologies. Moreover, with global net revenues from oil and gas production expected to reach nearly $4 trillion in 2022, double the level in 2021 (IEA, 2022c), this large financial windfall represents a unique opportunity for oil and gas exporting countries to diversify their economic structures to adapt to the emerging global energy economy and to hedge against volatile energy prices. In addition, some of the existing fossil fuel infrastructure performs functions that will remain critical for some time, such as gas-fired power plants that provide electricity security or refineries that supply the remaining internal combustion engine vehicle fleet. The unplanned or premature retirement of such infrastructure can also have a negative impact on energy security.

- **Reversing energy poverty and enabling poor communities to access the new energy economy in developing countries** is essential to ensure a secure and people-centered energy transition. Indeed, the recent rise in energy prices has disproportionately burdened low-income households and exacerbated their energy insecurity. In emerging markets and developing countries, the poorest households use nine times less modern energy than the wealthiest households, and millions of poor households still lack access to modern energy or clean cooking. These households often have no choice but to use low-quality, polluting fuels such as charcoal in combination with inefficient appliances to meet their energy needs, resulting in high energy bills and adverse health effects.

- **Reducing the cost of capital in developing countries** is essential to lowering the cost of the energy transition. For example, in 2021, the cost of capital for a solar PV system in major emerging economies was two to three times higher than in advanced economies and China. In addition, ensuring the diversity and resilience of clean energy supply chains has become critical, as high and volatile prices for critical minerals and highly concentrated supply chains could delay or make the energy transition more costly, thereby weakening energy security. Another key element in ensuring energy security in a transition context is providing strategic guidance and addressing market failures, but not dismantling markets.

- **Addressing the specific risks faced by fossil fuel-producing economies upfront** can help avoid delaying the energy transition in these countries, while ensuring their energy security. In this sense, diversification, both economically and in the energy mix of oil and gas producing countries, is crucial to mitigate risks. Clearly, the potential export revenues from clean hydrogen, for example, cannot replace those from oil and gas, but low-cost renewables and carbon capture, storage, and utilization (CCUS) can provide a sustainable source of economic benefits by attracting investment in energy-intensive sectors.

- **Broadening the conceptualization of energy security to include demand-side issues** can help further strengthen energy security. The 2022 energy crisis highlights the role that energy efficiency and behavioral measures can play in avoiding mismatches between supply and demand. The current tightening of oil product markets, particularly for diesel and kerosene, is a good example of the energy security gains that could be achieved through improved efficiency. Behavioral measures also have an essential role, as they can have a significant short-term impact in stimulating energy-saving behavior, as consumers often have limited visibility of the pressures on the energy system. Therefore, providing actionable data can help consumers make informed decisions. For example, a good practice in South Africa has provided real-time information on power shortages through an "electricity alert" message communicated via the Internet and television between 5:30 p.m. and 8:30 p.m. to inform the public of immediate steps to reduce peak loads. California also uses apps, text messages, and emails to communicate with citizens to reduce energy demand during peak hours when the system is most stressed (IEA, 2022c)

- **Relying on data analytics can be an asset to energy security in a world of rapid technological advancement**. Using satellite data is no longer limited to the military and intelligence communities. Satellites can collect a wide range of information from different spectrums of electromagnetic radiation, including ultraviolet, infrared, microwave, or visible light. In the area of energy security, satellites are regularly used to monitor global power grids, as well as oil and gas production and flaring (Brazilian & Hendrix, 2022). Current big data techniques can help to better inform some aspects of current energy decisions. The downside would be an increased risk of cyber-attacks, which could have security implications. As power grids and, to some extent, oil and gas infrastructure, both upstream and downstream, become more integrated with information and communication technology systems, they become more vulnerable to these attacks. Cyber-attacks also have a significant economic impact on the industry. This relatively new form of security threat requires new defensive approaches across the energy sector but is likely to play an essential role in any future approach to energy security.

3 Conclusion

Energy security and interconnectivity underpin economic opportunity and stability as well as political security, all of which are top priorities on both sides of the Atlantic. Monitoring the challenges and opportunities at this intersection makes it possible to identify emerging risks and highlight trends to provide a clearer picture of the global energy landscape. While the U.S. and EU generally agree on the importance of energy security, their understandings can diverge when identifying security issues for specific projects. In addition, the energy security challenges for developing countries on both sides of the Atlantic are very different, focusing primarily on access to reliable energy and mobilizing infrastructure finance. Ultimately, however, the economy cannot stand still; the world must make do with the energy system it has, while laying the blueprint for a resilient and sustainable energy system.

The road ahead is challenging, but with global cooperation and commitment to sustainable energy systems, it is possible to achieve energy security for all. In this sense, regional cooperation on energy security in the Atlantic Basin can be strengthened by building on the complementarities of countries of this region. Thus, energy security strategies should be defined in the light of broader social, economic, and geopolitical priorities. A new energy security paradigm should consider the role of clean technologies in reducing fossil fuel use while ensuring that reductions in fossil fuel investment do not outpace increases in clean energy technologies. Energy security gains can also be achieved through improved efficiency and behavioral measures, which can significantly stimulate energy-saving behavior. There is also an urgent need to address the concerns of developing countries in the Atlantic Basin, where recent energy price increases have exacerbated their energy insecurity. Improving energy security in the context of a clean energy transition also entails reducing the cost of capital in developing countries, diversifying the energy mix, and ensuring the diversity and resilience of clean energy supply chains. Finally, data analytics, including satellite data, can be an asset to energy security in the Atlantic Basin, particularly in monitoring global power grids, oil, and gas production, and flaring. Overall, a new paradigm for energy security in the Atlantic Basin must prioritize a safe, people-centered energy transition that addresses the concerns of all stakeholders in the region.

4 References

Auth, K. (2023). *How the U.S. Can Better Support Africa's Energy Transition*. Carnegie Endowment for International Peace.

Berahab, R. (2022). *Sanctions and Energy Supplies: Challenges and Opportunities for The Global South*. Chapter X, The Aftermath of War in Europe: The West Vs. the Global South? Edited by Len Ishmael, Policy Center for the New South.

Berahab, R. & Zarkik, A. (2023). *The Case of Green Hydrogen in Morocco: Maintaining a competitive edge between domestic demands and international market pressures*. Policy Paper, Friedrich Naumann Foundation.

Bordoff, J. & O'Sullivan, M. (2023). *Why we need to rethink energy security in the transition to net-zero*. World Economic Forum. https://www.weforum.org/agenda/2023/01/davos23-rethink-energy-security-transition-net-zero/

Brazilian, M. & Hendrix, C. (2022). *New Winners, New Losers: Toward A New Energy Security*. https://warontherocks.com/2022/08/new-winners-new-losers-toward-a-new-energy-security/

Cherp, A. & Jewell, J. (2014). *The concept of energy security: Beyond the four As*. Energy Policy 75 (2014) 415–421. https://www.sciencedirect.com/science/article/pii/S0301421514004960?via%3Dihub

Colglazier Jr, E.W. & Deese, D. A. (1983). *Energy and security in the 1980s*. Annu. Rev. Energy 8(1),415–449.

Eiden, K., Goraieb, E., Nobels, K. & Wallance D. (2021). *The Latin American energy sector: How to address cybersecurity*.

Goldthau, A. (2011). *Governing global energy: existing approaches and discourses*. Current Opinion in Environmental Sustainability, Volume 3, Issue 4, September 2011, Pages 213-217. http://dx.doi.org/10.1016/j.cosust.2011.06.003

Hancock, K. J. & Vivoda, V. (2014). *International political economy: a field born of the OPEC crisis returns to its energy roots*. Energy Research & Social Science Volume 1, March 2014, Pages 206-216. http://dx.doi.org/10.1016/j.erss.2014.03.017

Hughes, L. &, Phillip Y. L. (2013). *The politics of energy*. Annual Review of Political Science. Vol. 16:449-469. http://dx.doi.org/10.1146/annurev-polisci-072211-143240.

IEA (International Energy Agency). (2023). *Energy security: Reliable, affordable access to all fuels and energy sources*. https://www.iea.org/topics/energy-security

_ (2022a). *Climate risks to Latin American hydropower*.

_ (2022b). *The Role of Critical Minerals in Clean Energy Transitions*, World Energy Outlook Special Report.

_ (2022c). *Chapter 4: Energy Security in Energy Transition*, World Energy Outlook, October.

IMF (International Monetary Funds). (2022). *In Search of Energy Security: An Interview with Samantha Gross*. Marjorie Henriquez, Finance and Development.

https://www.imf.org/en/Publications/fandd/issues/2022/12/cafe-econ-in-search-of-energy-security

Kah, M. & Palacios L. (2023). *US Diesel Supply Risks in the Era of Energy Security and Transition*. Center on Global Energy Policy. Columbia School of International and Public Affairs.

Kinch, D. & J. Holman. (2020), *New lithium supply chains could slash sector emissions by nearly a third,* Roskill, S &P Global Commodity Insights. https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/coal/121120-new-lithium-supplychains-could-slash-sector-emissions-by-nearly-a-third-roskill

Larrea Basterra, M., Alvarez Pelegry, E. & Menendez Sanchez, J. (2019). *Energy Security in the Framework of Human Security, Oil, and Gas in the North Atlantic Basin*. Chapter 3, Evolving Human Security Challenges in the Atlantic Space. Jean Monnet Network on Atlantic Studies.

McKinsey & Company. (2022). *The Raw-Materials Challenge: How The Metals and Mining Sector Will Be at The Core of Enabling the Energy Transition, Metals & Mining Practice*.

OECD (Organisation for Economic Cooperation and Development). (2007). *Policy Roundtables: Energy Security and Competition Policy*.

Oxford Economics; (2022). *Filling the void – Africa's role in European energy security*. Research Briefing, Africa, 5 April.

Tobin, W. & Sparkman, M. (2022). *To meet energy security and climate goals, Africa needs investment in infrastructure*. Atlantic Council.

US Geological Survey. (2022). *Mineral Commodity Summaries: PGM, Manganese, Cobalt*. PP. 53, 103, 127.

Yergin, D. (2006). *Ensuring energy security*. Foreign Aff., 69–82.

_ (1991). *The Prize: The Epic Quest for Oil, Money, and Power*. Simon & Schuster, New York.

_ (1988). *Energy Security in the 1990s*. Foreign Aff., 67(1), 110–132.