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Geopolitics and Italian Foreign Policy in the Age of Renewable Energy

by Luca Franza, Margherita Bianchi and Luca Bergamaschi

Ministry of Foreign Affairs and International Cooperation

ABSTRACT

Climate change is a major security challenge of the 21st century. While inaction would lead to catastrophic consequences (with implications for energy security), action also involves radical transformations affecting the global energy landscape. Renewables will be a pillar of the energy transition and their wider adoption has already started to affect political relations and the very notion of energy security, with new risks and opportunities emerging. While renewables increase decentralisation and regionalisation, they also retain a global dimension (mostly related to critical mineral availability and the integration of global value chains). Renewables greatly augment the importance of digitalisation. Energy security concerns will gradually shift away from access to resources and transit issues to electric grid security, cybersecurity and system adaptation. There is also an intense geo-economic competition to develop comparative advantages in renewables. Finally, fossil fuel exporters are going to be affected by the transition. Italy has built a position of leadership in renewables, which could be further consolidated and translated into geopolitical leverage. Challenges also exist, requiring adaptations to Italy's foreign energy policy.

keywords

Italy's foreign policy | Energy | Renewables | European Union

Geopolitics and Italian Foreign Policy in the Age of Renewable Energy

by Luca Franza, Margherita Bianchi and Luca Bergamaschi*

* Luca Franza is Head of the Energy, Climate and Resources Programme at Istituto Affari Internazionali (IAI). Margherita Bianchi is a Researcher at Istituto Affari Internazionali (IAI). Luca Bergamaschi is Associate Fellow at Istituto Affari Internazionali (IAI).

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Executive summary

RES and the changing nature of energy geopolitics and security

Technological innovation, declining costs, public and private finance, policy, and consumer preferences have been key factors boosting the adoption of renewable energy sources (RES) over the past two decades – and will continue to be key for further development of such sources in future. The energy transition could take different shapes and there is space for various solutions, but renewables will certainly be one of its pillars. The wider adoption of RES has already started to affect political relations and the notion of energy security, with new risks and opportunities emerging. Further transformations will take place as the energy transition deepens. How Europe and Italy will manage this transformation is critical for ensuring the achievement of climate change goals and an orderly and just transition.

Concerns over energy security have shaped international relations since the end of World War II. In an energy system dominated by RES, energy security will significantly change. The focus will gradually shift from the security of waterways, pipelines and physical volume deliveries to the security of electricity grids, which will need to be expanded to accommodate a higher share of RES and to better balance the fluctuations of the system. Intermittency is indeed a distinctive and challenging feature of RES, which requires new flexible and smart systems. The focus is already shifting from RES installation to system adaptation costs. The gradual substitution of fossil fuels with RES might result in fewer conflicts to control energy flows thanks to the lower energy intensity, lower concentration and virtually unlimited availability of RES. Renewables also have the potential to reduce the impact on resources such as water, creating a stronger baseline for security and sustainable development. RES could also result in significant trade balance savings for current net fossil fuel importers, also reducing their exposure to supply shocks and fossil fuel price volatility.

RES generally contribute to a diffusion of power across new actors and geographies by favouring decentralisation and regionalisation of energy production, consumption and trade. This, together with a broader shift towards electrification and digitalisation in all sectors, is set to redefine national energy security interests and expose countries to new risks and opportunities. Energy self-sufficiency might not always be cost-effective or possible, and countries will face a number of "buy or make" decisions. In any case, full regionalisation and decentralisation are unlikely because technology, materials and supply chains will continue to be affected by global market developments. The emphasis is often on concerns related to availability of rare earth and critical minerals. While their current geographic concentration might give rise to some geopolitical tensions for access and trade, further innovation and exploration are likely to ease this risk. As demand for these materials increases, so will the incentives to look for them, thereby expanding reserves and increasing the number of players involved in exploration and

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extraction. Moreover, battery life is increasing and alternative solutions (such as cobalt-free batteries) are under constant evaluation. Increased circular economy means that new industries stockpile, re-use and recycle critical materials, thereby increasing overall efficiency and lowering geopolitical risks.

The fall in fossil fuel demand provoked by the energy transition (including a wider adoption of RES) poses a significant security risk for fossil fuel producing countries. Lower revenues from fossil fuel exports can undermine political, social and economic stability, in particular in the Middle East and North Africa (MENA) and former Soviet Union (FSU) regions. If unmanaged, the transition could trigger social and political turmoil with negative spill-overs in neighbouring areas, including Italy. These should be avoided by continuing to engage diplomatically with these regions and also by supporting a gradual and just transition for the most exposed and export-dependent countries. If managed properly, diversification away from fossil fuels and the lower rent concentration in renewables could play a role in reducing rent-seeking behaviour, cronyism, corruption and authoritarianism. Cross-country and cross-regional trade in renewables could become a viable option allowing new bonds of interdependence, provided that substantial investments are allocated for generation and infrastructure. Finally, global energy governance should be adjusted to these transformations and address new priorities. It should be closely linked to climate governance.

The role of Europe in the global shift to RES

The European Green Deal attempts to respond to this new landscape and contribute to redefining Europe's geopolitical posture in the global stage. Europe starts from a position of leadership based on the relatively high share of RES in its energy mix, high level of investment, innovation, specialisation, advanced policy schemes for RES integration, strong political support and widespread infrastructure. At the same time, the European Union (EU) should not be too complacent as progress in reducing CO_2 emissions is still too slow. The EU's campaign to 'lead by example' should be carefully crafted because it could be perceived as moral grandstanding and alienate consensus in other countries. The EU should adapt its strategy because the liberal-democratic, multilateral order is increasingly under pressure. The European Green Deal is an ambitious vision with a strong external dimension. It combines soft power with realism, including references to the objective of establishing European RES champions.

Oil and gas imports weigh quite heavily in the EU's overall trade balance (20 per cent of import value in 2018). Energy import dependency is remarkable (55 per cent in 2018), in particular from Russia (30–40 per cent market share in oil, gas and coal imports). As also recognised by the European Green Deal, a stronger focus on RES would reduce import dependency and improve the trade balance. Geo-economically, RES can increasingly become a key strategic asset of industrial policy by enhancing the productivity and competitiveness of EU businesses while also reducing exposure to stranded asset risks. Europe's strength will rest on the

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ability to gain a competitive advantage in specialised products and services rather than in labour-intensive manufacturing. This will require a more strategic political and policy approach to RES in order to unlock shared benefits from cost savings, increased regional cooperation and innovation across all member states. While member states all nominally identify RES as an important pillar of decarbonisation, they do not always show converging interests. Support for deployment is not equal across the EU and there is still opposition by some countries and domestic interest groups. It is becoming increasingly clear in the EU that an inclusive, participatory approach to RES development and deployment is essential in order to avoid future backlashes.

2021 will be a testing ground for Europe to operationalise "green deal diplomacy" and drive more global clean energy cooperation. The next Conference of the Parties to the United Nations Convention on Climate Change (COP26), co-organised by the United Kingdom in partnership with Italy, as well as the Italian and British Presidencies of the G20 and G7, respectively, will provide important opportunities to do so. The European Green Deal makes clear that efforts to fight global warming should be a guiding principle for EU foreign policy. This will also be increasingly shaped by climate and sustainable finance and trade policy, which are set to become key vehicles for (and enablers of) the EU's global energy transition agenda.

Italian foreign policy in an RES-dominated world

Italy was an early mover and remains one of the world's most important markets for RES. Approximately 35 per cent of electricity production is generated by RES, above the European average. Even if growth in new investments has considerably slowed down in recent years, Italy ranks seventh in the world for cumulative investments in RES capacity, with 82 billion US dollars invested between 2010 and 2019. In an EU context, Italy is leading in geothermal energy and hydropower and their specific components; has the second highest installed solar PV capacity and generation; the third highest RES labour productivity; is fifth by capacity and production and sixth by turnover and employment in the wind sector; and has a remarkable leadership in heat pumps, hosting more than half of all of the EU's heat pumps currently in operation. All renewable sectors in Italy are estimated to have provided over 120,000 jobs in 2018. Renewable electricity alone provided double the amount of employment from fossil fuels in 2017. Italy hosts a dynamic private sector including utilities with RES production and commercial operations around the world, competitive producers of cables and other RES components, and large energy companies interested in the transition and endowed with significant know-how and capital. Other key enablers of the energy transition include regulatory agencies, transmission and distribution system operators, service providers and research and development agencies. The Statistical Factsheet provides a full overview of Italy's position in key RES indicators.[1]

[1] Istituto Affari Internazionali (IAI), *Geopolitics and Italian Foreign Policy in the Age of Renewable Energy. Statistical Factsheet*, Rome, IAI, June 2020, https://www.iai.it/sites/default/files/iaip2013_

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While Italy starts from a position of leadership, complacency is not an option. Other countries are moving fast and faster, and Italy needs to strengthen efforts to acquire a new competitive edge. This will also hinge on its industrial policy priorities and on investment in research and innovation, which needs to be significantly higher. Italy has a widespread, digitalised, reliable and efficient electricity network and was an early mover in deploying smart metres. However, more (anticipatory) investment in electricity infrastructure is needed in order to allow for a higher penetration of RES and achieve decarbonisation targets. Infrastructure includes storage units, batteries, demand-side management systems and other digitalised solutions, the national grid, and interconnections. While electric mobility is set to become the major pillar of the decarbonised transport system, Italy is lagging behind in this sector and in addressing the negative impacts of its transport system compared to other EU member states. This is against a backdrop of a potentially significant comparative advantage in electric vehicles that can be captured by more investments in (and policy support to) battery development and the charging infrastructure. Other comparative advantages for export specialisation include insulation, solar PV, efficient lighting, and efficient heating and cooling.

Solar and wind are expected to be the key drivers to achieve the government's target of 187 TWh of renewable electricity generation by 2030 (an increase of 65 per cent compared to 2019) set in the National Energy and Climate Plan (NECP) submitted at the end of 2019. Other drivers include heat pumps, thermal solar production, and six million electric vehicles (of which four million all-electric) by 2030. While these increases are significant, the NECP will need to be updated to reflect the upcoming new EU 2030 targets (to cut greenhouse gas emissions by 55 per cent below 1990 levels by 2030) and the national and EU commitments to achieve climate neutrality by 2050.

While conventional energy security concerns around fossil fuels remain high in Italy, this could gradually change as decarbonisation deepens. The deployment of RES in Italy has already made it possible to decrease fossil fuel consumption by 17 per cent in 2017. How quickly this trend continues will shape energy security considerations and the geopolitical salience of RES for Italy, in particular across the following trends:

• RES will continue to change the notion of energy security, and Italian foreign policy should be adapted to this new reality. Since 2010, Italian fossil fuel demand has decreased and, as decarbonisation efforts increase, it is expected to further drop. Italian foreign policy should regularly assess its priorities in light of such transformations, adapting relations with Italy's main fossil fuel suppliers accordingly. In any case, relations with countries in the MENA and FSU regions will remain important, also because strategic interests go beyond energy.

statistical_factsheet.pdf.

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• The wider adoption of RES is transforming the Italian energy sector, reshaping the national interest. RES can open up new business opportunities for Italy and create new comparative advantages for a country that is highly exposed to global competition. They can also create bonds of positive interdependence with new partners. Companies based in Italy have important stakes in countries and regions around the world, including Latin America and Sub-Saharan Africa. Italian foreign policy should increasingly engage with those regions. Regions in Italy's neighbourhood such as the Western Balkans also hold RES generation potential.

• A wider adoption of RES would reduce Italy's geopolitical reliance on fossil fuel suppliers, transit countries, maritime chokepoints and vulnerability to supply shocks; improve Italy's trade balance; and shelter Italy's trade balance (and the overall economy) from commodity price volatility. Every year Italy imports about 90 per cent of its oil and gas needs and the average annual net fossil fuel import bill between 2008 and 2018 amounted to 44 billion euro – of which 2 billion was for coal, 17 billion for gas and 25 billion for oil. Imports are dominated by countries in the MENA and FSU regions. This high degree of dependency has arguably impacted on the room for manoeuvre in Italian foreign policy so far.

• As fossil fuel demand from major consumer markets decreases, Italy's fossil fuel exporters will face the critical challenge of having to rethink their economic and social development models. It is in Italy's (and Europe's) security interest to support this process smoothly and ensure an orderly and just transition. This can also give rise to business opportunities for Italian companies.

Main policy recommendations

• Given the key role of RES in the fight against climate change and in the energy transition, recognised as priorities for the country, Italy should encourage their wider adoption in the European neighbourhood and around the world. This requires action on multiple levels (political, diplomatic, financial and regulatory). Italy needs to align its geopolitical priorities to the new energy landscape, while managing the transition in an orderly way. In order to act as a global RES advocate, Italy will need to coherently and more strongly support RES at home. The focus will gradually shift away from fossil fuels. In line with commitments to the Paris Agreement and the objective of having an orderly transition, fossil fuel companies will be required to put in place strategies for diversification.

• In order for Italy to better assess and manage the transition and the promotion of RES and other clean technology, an independent "Energy Observatory" could be established as a network drawing on a broad range of expertise. This should provide independent, unbiased, evidence-based, transparent and reliable information, assess risks and opportunities posed by the transition, recommend policies and – in so doing – guide diplomatic and political decisions. More analysis is needed in particular to more clearly identify Italy's untapped comparative advantages in RES technologies.

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• Building on efforts by the Policy Board on Inter-ministerial Coordination on Energy Issues – established within the Directorate General for Global Affairs of the Italian Ministry of Foreign Affairs and International Cooperation – further institutionalisation and strengthening of coordination and inter-ministerial dialogue are desirable. An institutionalised coordination group for energy diplomacy would comprise senior officials from different ministries (Foreign Affairs, Economic Development, Economy and Finance, Infrastructure, Environment, and Agriculture) and the Office of the Prime Minister. The Energy Observatory should inform its work and the government should mandate the Observatory to explore key questions and issues. The objective is to align diplomatic efforts across different areas of competence, better assess the speed, risks and opportunities of the transition, and ultimately discuss how to design a more strategic and proactive foreign energy policy in line with climate change goals.

• A priority of Italian foreign policy is to assess and adapt relations with today's fossil fuel suppliers, in particular from the MENA and FSU regions. Reduced fossil fuel exports are likely to erode revenues and foster instability in these regions. They will also tend to reduce interdependence between Italy and these regions over time, even if political relations will remain important as strategic interests extend beyond energy. Crises in fossil fuel producing countries in the MENA and FSU regions could have significant security spill-overs on Italy. Maintaining trade interdependence with these countries in a highly decarbonised world is sensible. This should increasingly build on RES and other clean technologies. New future-proof ways of constructively engaging with these partners need to be found. Italy, with the support of the EU, should favour the establishment of new economic development models in those countries. Renewables can give rise to new value chains diversified from fossil fuels and create local employment, in particular for the youth. Italian companies could also find new business opportunities in these regions thanks to RES.

• At the same time, more attention should be given to strengthening relations in growing markets for clean technology – in particular Latin America, Africa and East Asia – through high-level political engagement. Also thanks to RES, new bonds of positive interdependence can be created beyond traditional areas of interest, thereby expanding Italy's geopolitical reach. Italian embassies and trade offices should facilitate the identification of new partners, business opportunities and the transfer of know-how and regulatory best practices.

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1. Introduction

This paper explores the evolving geopolitics of renewable energy sources (RES) and the potential implications of a wider adoption of RES for the European Union and for Italian foreign policy. Its purpose is to provide an initial mapping of key issues and trends in order to offer guidance for the policy debate.

1.1 Context and scope of research

Energy geopolitics is set to undergo significant transformation as a result of the energy transition, particularly due to the growth of RES. At this stage, it is difficult to exactly forecast what kinds of transformation will take place. Uncertainty is aggravated by COVID-19 and the economic crisis that it has triggered. However, an indefinite prolongation of the current status quo in energy geopolitics can be ruled out. On the one hand, *inaction* in fighting global warming would lead to catastrophic consequences, with major implications (also) on energy security. Climate change stands out as one of the most important collective security issues of the 21st century, also because of its potential spin-offs in terms of greater chances of social tension, conflict and migration. On the other hand, *action* involves a radical transformation of global energy consumption, production and trade patterns – also entailing a fundamental change in the world's energy security landscape.

Against this rapidly changing landscape, RES are playing a central role in the energy transition. One of the two overarching aims of this paper is to add new insights to the current discussion on the geopolitics of RES. A wider adoption of RES in the world's energy mix has the potential to set in motion a vast number of changes. Many of these changes are the direct implication of features of RES themselves and aspects of their production, distribution and trade. These include aspects related to the effective management of RES intermittency and the changing role of energy infrastructure, the security issues surrounding energy networks, the growing role of digitalisation and technology, the emergence of consumer-producers (prosumers), changes in asset specificity and distribution of rents. The paper shows the geopolitical implications of trends such as regionalisation and decentralisation, which are expected to be favoured by the transition to RES. This shows how the notion of energy security is changing as a result of a wider adoption of RES. For a comprehensive and detailed analysis of the implications of each of the abovementioned trends, additional research is needed.

Secondly, the paper looks at the impact of a wider adoption of RES on balances of power. This includes reflections on the strictly geopolitical dimension as well as a more geo-economic dimension that considers trade balances and comparative advantages. Fossil fuel production is the main economic lifeline for many oil and gas producing countries, and even some net energy importing countries have built their geo-economic success on carbon-intensive economic development models. On the other hand, many countries stand to benefit from the energy transition,

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particularly today's net energy importers that will be able to innovate, and countries with low energy access that will be able to leapfrog to renewables. Finally, countries around the world are equipped with different resource endowments to invest in the energy transition (as well as in mitigation and adaptation strategies). A geopolitical reshuffling is thus almost certainly guaranteed.

According to the most widely recognised energy and climate models,[2] the current global greenhouse gas (GHG) emission trajectory – based on the implementation of the current national commitments presented as required by the Paris Agreement (the Nationally Determined Contributions or NDCs)[3] – would lead to an average temperature increase of up to 3°C by 2100. This is well above the thresholds beyond which scientists warn about destructive and irreversible consequences, and well above the goals agreed internationally in Paris in 2015 to limit warming to 1.5 degrees. In order to attain this goal, achieving climate neutrality by 2050 is a necessary step. All scenarios modelling such a future display a rapid uptake of RES – together with energy efficiency. According to the International Renewable Energy Agency (IRENA), each region has great potential for increasing its share of RES in total energy use.[4] Beyond clear environmental benefits, RES would also bring broader affordable energy access, improved human welfare as well as job creation, enhanced security and resilience, economic and social development[5] and democratic empowerment – all vital elements to reach the UN Sustainable Development Goals.

The EU is committed to reach climate neutrality by 2050 through a socially fair transition. Nevertheless, other large emitters are either moving too slowly or backtracking on their climate commitments. In a number of developing countries, for instance, RES are being promoted while at the same time new coal capacity is being installed (with more than 500 GW of new coal plants having been added worldwide[6] in the last decade alone). On the other hand, RES dominate new additions to the global power generation mix – having reached 2,537 GW in 2019 (+176 GW

[2] See for example United Nations Environment Programme (UNEP), *Emissions Gap Report 2019*, Nairobi, UNEP, November 2019, https://www.unenvironment.org/node/26776; or Intergovernmental Panel on Climate Change (IPCC), "Summary for Policymakers", in *Global Warming of 1.5°C*, October 2018, https://www.ipcc.ch/sr15/chapter/spm; as well as the International Energy Agency (IEA)'s scenarios (New Policies Scenario in particular for current commitments).

[3] The world is on a dangerous GHG emission trajectory even when we take into account existing national emission reduction commitments. For instance, before the US had withdrawn from the Paris Agreement, it was calculated that the GHG trajectory delivered by all the NDCs submitted at COP21 would lead to 2.7°C global warming.

[4] IRENA, *Global Energy Transformation. A Roadmap to 2050*, Abu Dhabi, IRENA, April 2018, https://www.irena.org/publications/2018/Apr/Global-Energy-Transition-A-Roadmap-to-2050.

[5] IRENA, *A New World. The Geopolitics of the Energy Transformation*, Abu Dhabi, IRENA, January 2019, https://www.irena.org/publications/2019/Jan/A-New-World-The-Geopolitics-of-the-Energy-Transformation.

[6] Frankfurt School-UNEP Centre and BNEF, *Global Trends in Renewable Energy Investment*, Frankfurt am Main, Frankfurt School of Finance & Management, September 2019, https://www.fs-unep-centre.org/global-trends-in-renewable-energy-investment-2019.

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from 2018).[7] Over the past three decades, multilateral and regional frameworks have been developed to tackle climate change. However, fragmentation is on the rise and multilateralism is increasingly under threat.

The COVID-19 crisis risks increasing fragmentation and could pose significant challenges to the energy transition[8] if we look beyond short-term positive effects on local air pollution and CO_2 emissions.[9] On the other hand, the pandemic could be a reminder of the importance of sustainable growth and offer opportunities for a green recovery. The postponement of COP26 to 2021 will provide more time for countries to review their policies, and record-low oil prices offer an opportunity to phase out fossil fuel subsidies. However, the risk that carbon-intensive stimulus packages are put in place as part of recovery plans is high. The response that countries will give to the economic recession triggered by COVID-19 will have a major impact on climate. If capital is largely invested in high-carbon infrastructure with lock-in effects, there is a risk that emissions might eventually turn out to be higher than without COVID-19. Conditionalities might therefore be needed to ensure that the economic stimulus does not undermine efforts to limit climate change.

In this paper, "geopolitics of RES" refers to both the geopolitical factors affecting production, trade and consumption of renewable energy and the geopolitical consequences of its wider adoption. This goes well beyond the study of great power politics and major global shifts, and *de facto* covers any political driver that is relevant to shape the geopolitical perception and position of a country – including therefore social and geo-economic developments.

1.2 Zooming in on Europe and Italy

This study focusses on the EU and Italy, looking in particular at the implications that a wider adoption of RES has for Italy's foreign (energy) policy. Section 2 feeds into Sections 3 and 4 by identifying the main global trends, which are then translated into implications for the EU and Italy.

Italy has been an early mover in the adoption of RES and the point is often raised that the country enjoys a position of leadership in the sector. This can and should be translated into enhanced geopolitical leverage, also considering that opportunities offered by fossil fuels are limited given Italy's poor fossil fuel endowment and chronic import dependence. The country has indeed offered solid policy support

[7] IRENA, *Renewable Capacity Statistics 2020*, Abu Dhabi, IRENA, March 2020, https://www.irena.org/publications/2020/Mar/Renewable-Capacity-Statistics-2020.

[8] Luca Franza, "Is Coronavirus Good for Our Sick Planet?", in *IAI Commentaries*, No. 20|13 (March 2020), https://www.iai.it/en/node/11432.

[9] Lauri Myllyvirta, "Analysis: Coronavirus Temporarily Reduced China's CO2 Emissions by a Quarter", in *Carbon Brief*, 19 February 2020, https://www.carbonbrief.org/analysis-coronavirus-has-temporarily-reduced-chinas-co2-emissions-by-a-quarter.

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to RES and has very strong private players investing in renewables. A mapping of Italy's leadership in RES situated in a broader discussion on energy geopolitics is needed. This paper will attempt to take stock of Italy's leadership in a number of areas related to renewable energy and share reflections on further potential. Notably, it will assess Italy's position by looking at its ranking within the EU in a number of RES metrics, including employment, turnover, installed capacity, generation, investment and trade. This study essentially provides a first overview, which can be a good point of departure for assessing Italy's leadership (existing and potential) in RES. More in-depth studies are needed, particularly on the geo-economic aspects of the transition to RES and a more accurate identification of existing and potential comparative advantages.

The penetration of RES in Italy has grown substantially in the last decade (albeit slowing down in recent years), and RES now contribute around 18 per cent of Italy's total final energy consumption. As will be shown in this paper and in a related Statistical Factsheet compiled by the Istituto Affari Internazionali (IAI), Italy is one of the countries that has invested the most in renewable energy capacity in the last decade, and has a leadership position in a number of renewable energy sources, as well as great potential for further deployment. Political commitment towards renewables is also strong. At the end of December 2019, the government submitted to the European Commission its integrated National Energy and Climate Plan (NECP) that foresees a 30 per cent share of RES in total final energy consumption by 2030. Politically, Italy supports the objective of achieving climate neutrality by 2050 both at a European and at a domestic level, as well as the increase of the EU 2030 emission target to 50–55 per cent (which will require a review of the NECP).

The stake for Italy is clearly not just a domestic one. Longstanding dependency on imported fossil fuels has influenced the Italian government's foreign policy in the last decades, as well as the action of public and private players in the energy domain and the country's trade balance. A wider adoption of RES has the potential to significantly change Italy's foreign policy posture in a number of areas. More broadly, it also has the potential to change global dynamics and the social, economic and political landscape of countries located in Italy's neighbourhood, including the Middle East and North Africa (MENA) region and Russia. From a geo-economic perspective, RES are a relatively young sector in which Italy can aim to acquire significant comparative advantage. This can translate into an improved trade balance and new opportunities for strong Italian RES players throughout the world, creating new bonds of positive interdependence with countries where investments take place.

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2. The geopolitics of RES: Global trends

2.1 Drivers of RES growth and comparative advantages

In the last decade RES have emerged as the fastest growing energy source. Understanding the main drivers behind the growth of RES is important to build a view on future drivers. Furthermore, it makes it possible to sketch areas where countries can intervene to exploit the full potential of RES in terms of sustainability, security and affordability as well as gain a position of leadership in the sector.

Technology, economics, policy, finance and consumer preference have all been key factors in boosting RES adoption so far, and will continue to be key in future. Besides directly intervening in energy market regulation, policy can also shape the technological and the economic/financial landscapes – making them more or less favourable to RES. However, not every single development can be controlled by policy makers. There could very well be "black swan" events or unexpected technological innovations that significantly alter the RES landscape. Moreover, it is important to emphasise that countries are not insulated from each other. Instead, they are part of a global system where the policies of one country may reduce costs in a certain RES technology, which can then be adopted more affordably by other countries. A combination of proactive forward-looking visions and reactive flexible adaptations is thus required.

Declining costs have indeed been a prominent driver of RES growth in the last decade. While mature RES technologies – including hydro and geothermal – have long been competitive, others – solar and wind in particular – have seen their cost decreasing significantly more recently. Since 2010, the levelised cost of electricity (LCOE) for solar PV dropped by 81 per cent, for onshore wind by 46 per cent and for offshore wind by 44 per cent.[10] The trend is expected to continue in the near future: in five years, the average cost is expected to fall by 59 per cent in solar PV, 26 per cent in onshore wind and 35 per cent in offshore wind.[11] Encouraging forecasts also apply to prices of concentrated solar power (CSP) technologies (a 37 per cent drop)[12] and the cost of lithium-ion batteries (an 80 per cent drop).[13] RES are already the cheapest option for generation in many areas of the world and are expected to gain further competitiveness in the next years. A combination of green industrial policies and associated economies of scale in manufacturing, improvements in equipment generation, some competition along the supply chain, and lower costs of finance have all helped reduce RES installation costs.[14]

[10] Frankfurt School-UNEP Centre and BNEF, *Global Trends in Renewable Energy Investment*, cit.

[11] IRENA, *The Power to Change: Solar and Wind Cost Reduction Potential to 2025*, Abu Dhabi, IRENA, June 2016, https://www.irena.org/publications/2016/Jun/The-Power-to-Change-Solar-and-Wind-Cost-Reduction-Potential-to-2025.

[12] IRENA, *A New World. The Geopolitics of the Energy Transformation*, cit.

[13] Ibid.

[14] Frankfurt School-UNEP Centre and BNEF, *Global Trends in Renewable Energy Investment*, cit.

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In future, the focus is expected to shift from installation costs to system adaptation costs. Once again, a combination of supportive technological, economic and policy variables will be needed to ensure effective system adaptation. Countries that are more successful in efficiently integrating RES into their energy system will be at an advantage relative to other countries. This includes keeping costs under control while at the same time guaranteeing supply stability and a widespread extension of networks.

Other enabling factors of RES come from innovation and digitalisation. New digital technologies, such as smart grids, big data, blockchain technology, artificial intelligence and the Internet of Things are now being progressively applied to the energy industry,[15] accelerating the use of RES in smart generation and transmission systems. These elements will gain in importance as electric grids will become more central to the energy backbone, and as our economic development, mobility and energy consumption patterns change as the energy transition deepens. Countries that aim to gain a position of leadership in RES, particularly if they cannot count on low labour costs, will have to strive for technological leadership. Finding ways to protect original technological innovations from free-riding by other countries is part of a sound strategy to promote and defend RES leadership.

The importance of policy and regulations for a widespread and smooth adoption of RES cannot be overestimated. National strategies and targets have supported RES by providing guidance to investors and should continue to do so. By 2018, nearly all countries and several sub-national jurisdictions (including federal states and cities) had adopted some form of RES target although most efforts have focussed on the power sector so far, creating urgency to expand the scope of RES to other sectors.[16] Crucially, targets and visions have been complemented by feed-in tariffs, tax breaks and other support and guarantee schemes. Specific decarbonisation strategies at the national level (i.e., the phase-out of coal by a defined timeline in many European and Northeast Asian countries or the dismissal of nuclear energy due to high costs and security concerns in countries like Germany) have also strengthened and will further strengthen RES penetration. Often, the objective of lowering local air pollution has been a more important driver for support to RES than the fight against global warming, as in the case of China. Countries that are able to craft stable and forward-looking policy frameworks (to guide and stimulate coherent investments) and effective regulations (to manage the consequences of a wider adoption of variable RES) will be at an advantage relative to others.

The engagement of the private sector is likewise fundamental. Private investment in RES, in particular by utilities, is a key component of the energy transition.

[15] IRENA, *Artificial Intelligence and Big Data. Innovation Landscape Brief*, Abu Dhabi, IRENA, September 2019, https://www.irena.org/publications/2019/Sep/Artificial-Intelligence-and-Big-Data.

[16] REN21, *Renewables 2019. Global Status Report*, Paris, REN21, June 2019, https://www.ren21.net/gsr-2019.

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Companies are being pressured to reduce their carbon footprint and recognise the carbon risk to their operations. A growing number of banks, sovereign wealth funds, pension funds, multilateral development banks and insurance companies are progressively "greening" their action and divesting from fossil fuels, rerouting part of their investments to RES. Finance is indeed one of the key drivers behind rising investments in RES capacity: the scaling-up of public finance sources (i.e., grants, guarantees, risk mitigation instruments, etc.) is a necessary condition alongside private finance. Countries where the government manages to strike a balance between offering a strategic vision (to avoid investment dispersion) and allowing the market to express its innovation potential through competition will be at an advantage. It is also crucial for countries to have dynamic, innovative and financially solid private players that are willing to invest in the RES sector.

Finally, the global RES momentum is also a result of consumers' preferences over cleaner options and pressure on both public and private actors. Pressure from public opinion is expected to increase in future as the energy transition dossier gains in importance. The most successful countries will be those that are able to fulfil public expectations with regard to a wider adoption of clean energy technologies while making sure that all communities benefit from them.

2.2 Key features of RES

RES display several characteristics that differ considerably from fossil fuels, such as lower concentration, virtually unlimited availability, and intermittency. RES are more prone to giving rise to decentralisation and regionalisation in energy production, consumption and trade. However, energy self-sufficiency is not always possible as technology, materials and supply chains will continue to be affected by global developments. In general, RES shift the focus from security of waterways, pipelines and physical volume deliveries to the security of electricity grids and the supply of critical materials.

Unlike fossil fuels that are geographically concentrated, RES exist in one form or another in all countries – although of course at different degrees. Reasonably, certain regions might have geographical advantages over others for certain resources (i.e., coastal regions tend to have better yields in wind power generation, solar irradiation varies by region, hydropower production needs mountains, and so on) but unquestionably a larger number of countries gain energy production potential thanks to renewables. Also, the availability of RES is unlikely to change much over time, apart from very specific exceptions,[17] whereas fossil fuels are finite.[18]

[17] For instance, reduced availability of water for hydropower production owing to drought.

[18] Daniel Scholten and Rick Bosman, "The Geopolitics of Renewable Energy: Exploring Political Implications of Renewable Energy Systems", in *Technological Forecasting and Social Change*, Vol. 103 (February 2016), p. 273-283.

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The large availability of RES worldwide could be a blessing for countries that have been chronically dependent on foreign supplies and that could become net exporters of renewable energy or key components for RES technologies (i.e., Morocco for solar energy and Chile for lithium) or for those regions poor in energy access but rich in renewable resources that could be exploited (also) in a decentralised manner (i.e., Sub-Saharan Africa).

However, this does not mean that energy self-sufficiency is always possible or desirable. This is essentially because, as said, the RES potential is not spread equally across the globe. Some countries could more efficiently generate certain types of clean energy than others. Countries will ultimately face a "buy or make" decision, a choice between cheaper imports from regions with more favourable conditions (and lower costs) and greater security of supply guaranteed by domestic production (albeit potentially less cost-efficient).[19] In an open world, a country will more likely or efficiently specialise in the aspects of renewable energy trade in which it has a comparative advantage based on endowment, technology, costs and transport options among other things. Likewise, some companies could be better positioned than others to succeed in the growing RES market, ultimately affecting their country's stance in an RES-dominated world. Having strong RES players in the private sector empowers the host country from the perspective of energy security.

Apart from widespread availability, intermittency is a relevant feature of renewable energies, requiring countries to adequately equip their systems for a secure penetration of variable energy. Intermittency poses different security of supply challenges if compared to fossil fuels. RES intermittency arguably turns the market from demand-driven to more supply-driven. Several countries have committed to accelerating investments in battery storage for electric power systems. Hydrogen is also being increasingly explored as it holds promise as a storage and sector integration solution. As the contribution of variable energy sources rises, broader digitalisation also plays a key role in keeping grids balanced. Finally, electricity market integration, for example across Europe, can also help reduce intermittency, even if there are limitations because some weather patterns are correlated.

Moreover, relative to concentrated hydrocarbons, RES generation technology hints at a more distributed energy system where everyone is a potential supplier – opening to new business models that differ from centrally operated systems and making decentralisation another expected tendency. Decentralised production has the potential to enhance empowerment and inclusion for communities and for some of the 860 million people still without access to electricity.[20] Nonetheless, on the other side, less centralisation might result in more fragmentation of supply

[19] Ibid.

[20] IEA, *SDG7: Data and Projections*, Paris, IEA, November 2019, https://www.iea.org/reports/sdg7-data-and-projections/access-to-electricity.

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and, with that, difficult coordination.[21] Wider fragmentation in itself opens new perspectives in the geopolitical arena – touching upon novel political, policy and industrial considerations.

The renewable energies that have been most successful so far, and arguably those with most future potential (wind and solar), are more easily converted into electricity, which is in turn expected to gain traction as an energy carrier. In a world powered by RES we can therefore expect rising electrification, requiring a more integrated electric infrastructure to connect producers and consumers. Differently from globally traded fossils, a stronger regionalisation of energy policy (and geopolitics) is also foreseeable unless technological innovations and cost-abatement in transmission help cover longer distances.

In addition to their local and regional dimensions, which are stronger than in fossil fuels, renewables also have a global dimension. This mostly relates to technologies, materials and supply chains. If compared to fossil fuels, RES appear less exposed to market and political disruptions once a generating unit is up and running. What creates uncertainty is instead the unpredictability in the prices of technologies, materials and components[22] with intermediaries and contributors to global supply chains potentially influencing the end user's capacity to produce or use RES. There are already illustrative examples of price volatility and cyclicality in some of the materials needed for the production of RES equipment such as polysilicon.[23] At the time of writing, impacts from the ongoing COVID-19 pandemic are largely unclear, but it is possible that the crisis will result in shorter supply chains and, with that, in an additional push for the regionalisation of energy policy and geopolitics. Potentially higher costs might emerge as a result of the need to increase redundancy, diversification and localisation in RES value chains.

2.3 The transition to RES and geopolitical shifts

All energy shifts have had major social, economic and geopolitical implications, marking history and triggering power adjustments – including the shift to coal and steam power during the Industrial Revolution in the 19th century; the rise in importance of oil in the 20th century;[24] and the increasingly strategic significance of natural gas and pipeline politics, particularly since the 1970s. It is therefore inevitable that a deeper transition to RES will trigger important systemic shifts.

[21] Daniel Scholten and Rick Bosman, "The Geopolitics of Renewable Energy", cit.

[22] Debra Sandor et al., "System Dynamics of Polysilicon for Solar Photovoltaics: A Framework for Investigating the Energy Security of Renewable Energy Supply Chains", in *Sustainability*, Vol. 10, No. 1 (January 2018), Art. 160, https://doi.org/10.3390/su10010160.

[23] Ibid.

[24] IRENA, *A New World. The Geopolitics of the Energy Transformation*, cit.

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The trends and key features of RES outlined above could bring along a "dispersion of power"[25] and, with that, changing geopolitical dynamics. A substitution of commodities with renewable energy might result in fewer confrontations as we know them today, whether maritime tensions – i.e., around the South China Sea or in the Strait of Hormuz – or related to routes and fossil fuel infrastructure – i.e., Ukraine. Importantly, with a progressive uptake of renewables, the concept of energy security itself evolves and is determined by new elements. Concerns over energy security have marked the conduct of international relations. In an RES-dominated energy domain, security assumes different connotations.

Considering energy security under a traditional lens, the development of RES could be positive for many countries as they become less reliant on others (provided that certain conditions are met). This could result in significant trade balance savings for current net energy importers. IRENA for instance projects that 275–315 billion US dollars in annual fossil fuel imports could be reduced in the G7 countries by 2030 thanks to RES and highlights the important role renewable energy can play in improving the robustness of the energy system to external shocks in the long term.[26] Of course projections on expected savings depend on a number of assumptions, including prevalent fossil fuel prices and future rates of RES penetration – but the potential is undeniably large.

The transition to RES can also result in a redefinition of energy security and energy geopolitics through increased regionalisation. With greater RES penetration and electrification, "grid communities"[27] – groupings of countries interconnected with each other through transmission lines – are expected to grow in importance, linking countries that share interests, are exposed to certain sets of risks and negotiate on cost/benefit allocation. Some analysts reflect[28] on the possibility that the principle of territorial and infrastructural control might be similar to that of pipelines once RES are deployed on a larger scale – with new producing/transit countries potentially threatening an interruption of electricity supplies or with new asymmetric dependencies arising. Others wonder whether the external supply of electricity could be used as an "energy weapon"[29] or if wider RES infrastructure could be a target for hostile non-state actors.[30] Super-grids for example span

[25] Ibid.

[26] IRENA, *Roadmap for a Renewable Energy Future, 2016 edition*, Abu Dhabi/Bonn, IRENA, March 2016, https://www.irena.org/publications/2016/Mar/REmap-Roadmap-for-A-Renewable-Energy-Future-2016-Edition.

[27] Daniel Scholten and Rick Bosman, "The Geopolitics of Renewable Energy", cit.

[28] Meghan O'Sullivan, Indra Overland and David Sandalow, "The Geopolitics of Renewable Energy", in *Center on Global Energy Policy Working Papers*, June 2017, https://energypolicy.columbia.edu/node/2004.

[29] Gonzalo Escribano Francés, José María Marín-Quemada and Enrique San Martín González, "RES and Risk: Renewable Energy's Contribution to Energy Security. A Portfolio-Based Approach", in *Renewable and Sustainable Energy Reviews*, Vol. 26 (October 2013), p. 549-559.

[30] Karen Smith Stegen, Patrick Gilmartin and Janetta Carlucci, "Terrorists versus the Sun: Desertec in North Africa as a Case Study for Assessing Risks to Energy Infrastructure", in *Risk Management*, Vol. 14, No.1 (February 2012), p. 3-26.

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across countries, with potential risks for conflict but also opportunities for regional cooperation and peace.[31] In any case, decentralisation and digitalisation of electricity production and transmission could provide increased resilience from external shocks and a source of added value for the community involved. It is clear that "grid communities" of countries and "electricity communities" locally organised are not mutually exclusive. To fully decarbonise our economy in a cost-effective way we need to fully exploit their complementarity.

RES systems depend on exploiting cost-free renewable flows rather than extracting stocks, involving lower energy intensity, thus decreasing the economic and geopolitical incentives for states to engage in conflicts to secure RES resources.[32] Electricity trading also tends to be more reciprocal than trade in oil and gas, again lowering potential for conflict. The prominence of grids however clearly opens new strategic security choices, concerning ownership and decision rights on their management. In this regard, solid political agreements and regulatory frameworks to avoid opportunistic behaviours become crucial.

Furthermore, from a political economy perspective, the security of an electricity-based energy backbone with more decentralised production could be provided by many different actors, as opposed to the oligopoly of a fossil fuel centred economy. Being connected through smart systems is critical to ensure that electricity flows in a secure way all the time to everybody. In this context open markets through cooperative trade relations should be ensured for the exchange of materials, goods, service, patents and people.

Conversely, the growth of digitalisation in the energy sector could raise some security and privacy risks in the absence of a clear rules-based framework, as the intensifying connection of appliances, infrastructures, vehicles and equipment may provide additional entry points for digital assault. Effective counter-measures have to be foreseen as cyber security rules and new smart grid systems are being developed, prioritising cyber security in their design.[33] Moreover, national security justifications are increasingly invoked by states to prevent foreign companies from purchasing electricity networks and utility companies, highlighting the growing threat of cyber espionage and interference over critical infrastructure. In recognition of this new reality, the EU has started to take action.[34]

Many other aspects are interesting from a geopolitical and security point of view. The first one is the use of resources, and in particular water: by 2050 the demand

[31] Meghan O'Sullivan, Indra Overland and David Sandalow, "The Geopolitics of Renewable Energy", cit.

[32] André Månsson, "A Resource Curse for Renewables? Conflict and Cooperation in the Renewable Energy Sector", in *Energy Research & Social Science*, Vol. 10 (November 2015), p. 1-9.

[33] IRENA, *A New World. The Geopolitics of the Energy Transformation*, cit.

[34] A 2019 proposal to screen foreign investment at the EU level cleared the path for closer monitoring of third-country companies willing to invest in the EU's strategic sectors, including energy. See European Commission, *Screening of Foreign Direct Investment*, last update on 25 March 2020, https://europa.eu/!nW78kd.

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for water and food is forecast to rise by 50 per cent making the food/climate/energy nexus increasingly relevant. A broader uptake of RES is thought to reduce water stress significantly, requiring far less water withdrawals than conventional energy.[35] Clean technologies also offer attractive solutions to power desalination, vital for many countries around the world (i.e., Gulf countries).[36] Additional security dimensions include potentially increased tensions between countries over the transfer of technology. There is also a potential for a cooperative approach, with a crucial role to be played by the private sector and multilateral bodies. As mentioned in previous sections, countries are faced with the strategic priority of stimulating technological innovation and protecting it from free-riding by other countries in order to maintain a comparative advantage.

Finally, a broader deployment of RES is a key precondition for sustainable development whose geopolitical impact is significant. Energy poverty should progressively be considered a security issue as bringing wider clean access means creating a baseline for security. These considerations are important for Europe in a context of a shift from the traditional understanding of security (securing access to oil and gas) to one of strategic positioning in technology and infrastructure capacity as well as in efficient management of the system. Similarly, this applies when considering China's global expansion, including through the Belt and Road Initiative, on the one side and the weaknesses of the EU's neighbourhood on the other, where some are still poorly integrated (i.e., the Balkans) or potentially excluded from innovative know-how, adequate investments and policies (i.e., Africa). The Balkans – and south-eastern Europe in general – have an important RES potential, which is however largely untapped (except for hydro).[37] Sounder investments in their RES and support in cross-border infrastructure for better integration might improve the flexibility of the European electrical system and provide secure and sustainable energy throughout the Balkan region.

2.4 Cooperation and competition in materials and manufacturing

IRENA identifies[38] three types of countries that might emerge as new "leaders" in a world with substantial RES penetration: 1) those with a high technical potential for RES generation – even if the remoteness of these locations might have an impact on their export potential; 2) mineral-rich countries that have the opportunity to become part of the global production and value chain; and 3) frontrunners in innovation technology. While the availability of RES such as wind and solar is

[35] IRENA, *Renewable Energy in the Water, Energy & Food Nexus*, Abu Dhabi, IRENA, January 2015 https://www.irena.org/publications/2015/Jan/Renewable-Energy-in-the-Water-Energy--Food-Nexus.

[36] IRENA, *A New World. The Geopolitics of the Energy Transformation*, cit.

[37] IRENA, Joanneum Research and University of Ljubljana, *Cost-Competitive Renewable Power Generation, Potential across South East Europe*, Abu Dhabi, IRENA, January 2017, https://www.irena.org/publications/2017/Jan/Cost-competitive-renewable-power-generation-Potential-across-South-East-Europe.

[38] IRENA, *A New World. The Geopolitics of the Energy Transformation*, cit.

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virtually unlimited once generating units are up and running, the production of such units and their components relies on globalised value chains. The Statistical Factsheet produced by IAI in conjunction with this paper contains figures on mineral reserves and RES component manufacturing.

Access to and costs of certain types of RES depend on minerals (including rare earths, copper, aluminium, graphite, nickel, cobalt, lithium and manganese among others).[39] The supply chains from mine to market have been recently affected by tensions, with trade wars weakening the World Trade Organisation and political and economic clashes between China and the United States. Critical minerals[40] are at the moment found in substantial geographic concentration. The Statistical Factsheet contains more detailed figures. What is usually emphasised is that on rare earths, China dominates production and supply because of its leading processing capabilities. Around 37 per cent of rare earths are found in the country.[41] Lithium – whose consumption for batteries is increasingly important – is highly concentrated in Latin America's "lithium triangle": Argentina, Bolivia and Chile, though reserves are significant elsewhere, in particular in Australia and China. US and Asian businesses have started engaging exploration companies to secure access to lithium and China has pursued mine investments in South America and Australia to increase control over of the supply chain.[42] The largest reserves of cobalt are found in the Democratic Republic of Congo (51 per cent), which accounts for approximately 70 per cent of world mine production.[43] Again, China moved to secure its influence over the industry becoming the leading producer, the principal supplier to the US and the main cobalt consumer itself (largely for the rechargeable battery industry). China is also a big investor in the Australian cobalt mining industry and an importer of its minerals.

As with other key commodities, strategic materials might expose countries to geopolitical tensions. However, many of the abovementioned considerations apply to the current conjuncture, which is very likely to evolve in the years to come alongside RES uptake. First, as demand for these materials increases, so will the incentives to look for them, expanding the horizon of reserves and increasing the number of players involved. Secondly, broader battery life and alternatives to (or different combinations of) the use of rare earths and other critical metals

[39] André Månberger and Bengt Johansson, "The Geopolitics of Metals and Metalloids Used for the Renewable Energy Transition", in *Energy Strategy Reviews*, Vol. 26 (November 2019), Art. 100394, https://doi.org/10.1016/j.esr.2019.100394.

[40] The EU has its own list: European Commission, *2017 List of Critical Raw Materials for the EU* (COM/2017/490), 13 September 2017, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52017DC0490.

[41] Calculated from Joseph Gambogi, "Rare Earths", in US Geological Survey (USGS), *Mineral Commodity Summaries*, January 2020, p. 132-133, https://doi.org/10.3133/mcs2020.

[42] Sophia Kalantzakos, "The Geopolitics of Critical Materials", in *IAI Papers*, No. 19|27 (December 2019), https://www.iai.it/en/node/11144.

[43] Kim B. Shedd, "Cobalt", in US Geological Survey (USGS), *Mineral Commodity Summaries*, January 2020, p. 50-51, https://doi.org/10.3133/mcs2020.

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in RES technologies are under constant evaluation – as in cobalt-free batteries.[44] Thirdly, a circular economy industry is emerging, with minerals progressively being stockpiled, re-used and recycled. These foreseeable scenarios make it more unlikely that cartels will emerge, that single countries will assume overall control over crucial supplies or that there will be an effective threat of scarcity. Even if cartels emerge around critical materials, these would probably be unable to attain power comparable to that exerted by cartels such as the Organisation of Petroleum Exporting Countries (OPEC) fifty years ago over oil markets.[45]

China currently stands out from other international competitors as a global power that has articulated a resource strategy, now encompassing vast areas,[46] including notably solar PV modules, where it has a market share above 70 per cent. At the same time, however, the Organisation for Economic Co-operation and Development (OECD) countries retain leadership in significant areas of advanced RES technology and equipment, on which China is in turn dependent to produce labour-intensive solar panels. Considering China's plans – geographically, economically, territorially and digitally streamlining Eurasia and Africa –potential new forms of dependency may be on the horizon. Competition and cooperation are not only to be considered in relation to access or control of specific RES components and materials, but likewise in relation to business opportunities worldwide. China's ambition over the broad RES potential in Africa and other developing regions might hinder other public and private players trying to unlock RES resources in the continent unless they are supported by high-level political engagement.

2.5 Risks and opportunities in oil and gas exporting countries

Energy is an essential input for all citizens and economies but in certain countries oil and gas revenues define the very structure of the state and represent the bulk of GDP and export value. The widespread adoption of RES by major fossil fuel importers (not only the EU but also – increasingly – non-OECD Asia) is likely to reduce fossil fuel consumption with negative repercussions on rentier states, particularly on those that are slower to adapt. The legitimacy of many regimes in fossil fuel producing countries is built on generous hand-outs to the population and heavily subsidised energy. In these contexts, the social contract often revolves around oil and gas revenues and the negation of representation is being justified (and tolerated) on the basis of the lack of taxation. Significantly lower revenues from fossil fuel exports have the potential to alter the social-political balance in these countries, creating or aggravating unrest.

The process of change towards new economic, social and political models will certainly be complex, and in many cases it will require overarching institutional

[44] IRENA, *A New World. The Geopolitics of the Energy Transformation*, cit.

[45] Meghan O'Sullivan, Indra Overland and David Sandalow, "The Geopolitics of Renewable Energy", cit.

[46] Barbara A. Finamore, "China's Quest for Global Clean Energy Leadership", in *IAI Papers*, No. 20|05 (January 2020), https://www.iai.it/en/node/11259.

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improvements to allow faster private sector growth.[47] The potential trade-offs that come with a growing role of RES must be managed effectively and gradually, but not all the oil and gas producing states will necessarily lose their current competitive advantage in international trade thanks to their RES production potential. This applies particularly to countries in the MENA region.

The social and economic rationale to capitalise on their abundant cleaner resources is indeed evident, for both internal and foreign policy considerations. First of all, in a context of growing population and energy demand, a sustainable answer is in the interest of MENA countries themselves. Reduced GHG emissions from an expanded use of RES lowers the risk of instability that climate change would otherwise generate. The MENA region is in fact going to be particularly impacted by global warming.[48] Gulf countries can notably produce energy very efficiently from solar installations, and their output could be exported to global markets as clean molecules in future.[49] According to IRENA's "Renewable Energy Market Analysis: GCC 2019", renewable energy is already the most competitive source of power generation in Gulf Cooperation Council (GCC) countries. Achieving stated 2030 targets can bring significant economic benefits to the region, including the creation of more than 220,000 new jobs whilst saving over 354 million barrels of oil equivalent. By 2030, the achievement of RES targets would translate into a reduction of CO_2 emissions in the power sector by 136 million tonnes (22 per cent reduction relative to today) and a reduction of water withdrawals in the power sector by 11.5 trillion litres (17 per cent reduction).[50] Cross-country and cross-regional trade in renewables (in the form of either electrons or molecules[51]) could become a viable option, creating a mutually beneficial interdependence in the longer term.[52]

The transition will be full of challenges for MENA countries but in the longer term it might offer them opportunities, reducing the chances of resource curse and Dutch disease dynamics,[53] as more diversified and progressive economies than

[47] See for example Nicolò Sartori and Margherita Bianchi, "Energia nel Mediterraneo e il ruolo del settore privato", in *IAI Papers*, No. 19|21 (November 2019), https://www.iai.it/en/node/10976.

[48] Wolfgang Cramer et al., "Climate Change and Interconnected Risks to Sustainable Development in the Mediterranean", in *Nature Climate Change*, Vol. 8, No. 11 (November 2018), p. 972-980.

[49] IRENA, *Hydrogen: A Renewable Energy Perspective*, Abu Dhabi, IRENA, September 2019, https://www.irena.org/publications/2019/Sep/Hydrogen-A-renewable-energy-perspective; Axel Michaelowa and Sonja Butzengeiger, "Breakthrough of Hydrogen Technologies until 2030: Chances and Risks for Gulf Countries, International Policy Implications", in *EDA Insights*, September 2019, https://eda.ac.ae/docs/default-source/Publications/eda-insight_hydrogen-economy_en_finala0c50239ddfe6fca8ebaff00006646c8.pdf.

[50] IRENA, *Renewable Energy Market Analysis: GCC 2019*, Abu Dhabi, IRENA, January 2019, https://www.irena.org/publications/2019/Jan/Renewable-Energy-Market-Analysis-GCC-2019.

[51] Ad van Wijk and Frank Wouters, *Hydrogen, the Bridge Between Africa and Europe*, September 2019, http://profadvanwijk.com/?p=1257.

[52] See more in: Fridolin Pflugmann and Nicola De Blasio, "Geopolitical and Market Implications of Renewable Hydrogen – New Dependencies in a Low-Carbon World", in *Belfer Center Reports*, March 2020, https://www.belfercenter.org/node/128441.

[53] For a definition of resource curse (political consequences of large natural resource endowment, including authoritarianism, rent-seeking and cronyism) and Dutch disease (monetary consequences

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before are likely to emerge.[54] In the long term, diversification away from fossil fuels and the lower rent concentration in renewables could play a major role in reducing rent-seeking behaviour, cronyism, corruption and authoritarianism (aspects of the resource curse theory). Moreover, it could insulate MENA economies from commodity price volatility and Dutch disease dynamics on currencies, job markets and de-industrialisation.

However, the pathway to such a cleaner scenario is not straightforward. If abrupt and unmanaged, the transition might give rise to unprecedented social and political turmoil within those countries, likely to trigger negative security spill-overs also in neighbouring areas. Local downsides or state failures should in this sense be avoided at all costs, by guaranteeing a gradual transition for the most affected countries. Italy has a particularly high stake in the stability of major current oil and gas producing countries in the MENA region and the Former Soviet Union, given its relative geographical proximity to those areas and the potential direct exposure to spill-overs such as refugee flows.

Different variables, such as demography and the economic outlook, might result in different levels of vulnerability for fossil fuel exporters. IRENA considers[55] the countries most vulnerable to the energy transition to be those with energy rents above 20 per cent of their GDP, limited financial buffers (i.e., limited foreign exchange reserves and smaller sovereign wealth funds) and lower GDP per capita. According to IRENA, a highly exposed yet resilient region is for instance the Gulf by virtue of the massive resources that it can invest in diversification. Russia, Algeria or Azerbaijan are considered moderately exposed and resilient provided that they implement policies to diversify their economies on time. Libya stands out as one of the countries that are the most exposed and the least resilient.

In recognition of the new RES-dominated upcoming reality, with the related risks and opportunities, several oil and gas exporting countries themselves have developed plans for including more RES into their mix and diversifying their economies. Gulf countries show some encouraging signs – though with insufficient RES penetration so far,[56] with the United Arab Emirates (UAE) for example having set ambitious targets – including a 70 per cent decarbonisation target for the economy in 2050 – or Saudi Arabia developing solar and wind projects targeting 9.5 GW of renewable energy by 2023. Russian efforts in supporting RES are increasing,

of windfall revenues from natural resources, including loss of competitiveness in the export of non-commodity items) see Jeffrey A. Frankel, "Natural Resource Curse: A Survey", in *NBER Working Papers*, No. 15836 (March 2010), https://www.nber.org/papers/w15836.

[54] Meghan O'Sullivan, Indra Overland and David Sandalow, "The Geopolitics of Renewable Energy", cit.

[55] IRENA, *A New World. The Geopolitics of the Energy Transformation*, cit.

[56] The collapse of the oil price in 2014 and the energy industry's inability to force GCC countries to rethink their overall strategies and adopt policies to reduce reliance on increasingly unpredictable oil revenues. A faster penetration of renewables should however accompany the oil to gas shift. See more in Nicolò Sartori, "The Gulf Cooperation Council's Shift to Gas. Avoiding Another Fossil Fuel Trap", in *IAI Papers*, No. 18|25 (December 2018), https://www.iai.it/en/node/9847.

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although with debatable and insufficient outcomes.[57] Norway, home to the biggest hydrocarbon reserves in Europe, generates power almost exclusively from RES and in 2017 has engrained in legislation the goal of becoming a "low carbon society" by 2050.[58]

In our southern neighbourhood, all North African countries have established targets for RES, although the lack of adequate regulatory frameworks, financial barriers and in some cases conflict are slowing the process.[59] The region has expanded its installed capacity from RES in both solar PV and wind capacity – pushed by Morocco, which is not a rentier state. The state of play in the region however leaves huge margins for improvement, with several North African countries displaying less than one per cent of RES in their energy mixes.

2.6 What global energy governance?

The importance of governance in the transition to RES should not be underestimated. As the world shifts to an RES-dominated energy system, the current international energy policy priorities and the *modus operandi* in the energy arena will progressively change. Today's energy governance architecture clearly displays the old division between consumer countries, gathered under the International Energy Agency (IEA), and the producing countries, members of OPEC and the Gas Exporting Countries Forum (GECF). This division appears inadequate to deal with the current and future transformations.[60]

There is no global mechanism used by the international community to comprehensively address its collective energy needs. Energy is covered by organisations that: 1) are multilateral but have low or no normativity, essentially being fora for discussion and study (International Energy Forum - IEF, World Petroleum Council - WPC, International Renewable Energy Agency - IRENA, International Solar Alliance - ISA); 2) have selective geographical membership (EU/ European Economic Area - EEA, ASEAN Free Trade Area - AFTA, North American Free Trade Area - NAFTA, Union for the Mediterranean - UFM); 3) have selective membership based on status (G7, G20) or "partisan" energy interests (OPEC+, IEA, GECF); 4) have a relatively weak political energy grip (UN) or have limited impact on energy because energy is exempted from most provisions (World Trade Organisation - WTO), or else because key signatories are missing (Energy Charter).

[57] Alexey Khokhlov and Yury Melnikov, "Market Liberalisation and Decarbonization of the Russian Electricity Industry: Perpetuum Pendulum", in *Oxford Energy Comments*, May 2018, https://www.oxfordenergy.org/?p=31041.

[58] Climate Action Tracker, *Norway*, last update on 2 December 2019, https://climateactiontracker.org/countries/norway.

[59] Simone Tagliapietra, "Energy in North Africa: Challenges and Opportunities", in *Atlantic Community*, 4 March 2019, https://wp.me/paICRU-GC.

[60] Nicolò Sartori, "Searching for a New World Order", in *World Energy*, year 11, No. 43 (June 2019), p. 85-89, https://www.aboutenergy.com/en_IT/flip-tabloid/oil_43_EN/index.html.

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Furthermore, there is still a stark division between international energy governance and international climate governance, the latter being mostly governed by the UN Framework Convention on Climate Change (UNFCCC). As RES increasingly become key to decarbonisation, energy governance should more coherently walk in parallel with climate governance, mainly discussed in the UNFCCC and other *ad hoc* fora. Whether or not the reorganisation of governance will result in new or updated bodies is difficult to say at this stage especially as the COVID-19 pandemic forces a rethink of global governance. A better streamlining of priorities and funds against the proliferation of bodies should be prioritised. At the moment, leaders seem unconcerned with setting a common architecture to navigate a much more complex energy domain.[61] Lack of trust in multilateralism and rising nationalism worldwide – potentially worsened by the COVID-19 responses – do not help. Some options are on the table, including the extension of the IEA mandate and a reinvigorated role for the G20, whose members account for almost 80 per cent of global GHG emissions.[62] These solutions are however sub-optimal and temporary as they cannot capture all dynamics triggered by the uptake of RES and the wider energy transition.

A deeper analysis is needed to identify new options that meet the new needs for speed and the orderly management of the transition. Other relevant dynamics to take into account when imagining future governance are: 1) new challenges from countries that will likely gain leverage from strategic materials but display weak governance and poor democratic records; 2) the role of sub-national or sub-federal levels (cities, municipalities, states and non-state actors), which could add layers of governance (as is emerging in particular within the US and across transatlantic cooperation).[63]

3. Europe and the geopolitics of RES

3.1 The EU's identity as an RES leader

On the global stage, the EU projects itself as a leader in the energy transition and the fight against climate change, including in the promotion of RES. This serves a high-level political narrative: the EU aims to be perceived as a responsible global player whose main asset is "soft power". Defence of climate and support to RES fits the picture of the EU as a benevolent multilateral project protecting "global commons". However, some mercantilist elements are also (increasingly) present in the EU's RES agenda, as will be discussed in the next sections of this chapter.

[61] Ibid.

[62] UNEP, *Emissions Gap Report 2019*, cit.

[63] Margherita Bianchi and Nicolò Sartori, "Diplomazia climatica transatlantica, sfide ed opportunità", in *Focus euroatlantico*, No. 13 (January 2020), p. 26-34, https://www.iai.it/en/node/11208.

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The EU is on solid ground to claim a position of global leadership in RES, even if it should not be too complacent. This status rests on: 1) the comparatively high share of RES in the EU's energy mix;[64] 2) high levels of R&D[65] and ability to innovate in the renewables sector;[66] 3) high levels of both public and private investment in RES capacity;[67] 4) leadership in certain RES technologies[68] and consolidated leadership in the utility sector; 5) strong political support to RES; 6) international diplomatic advocacy ("green diplomacy"); 7) sophisticated RES support schemes, regarded as best practices around the world;[69] and 8) advanced discussions on Variable Renewable Energy Sources system integration, also thanks to the experience of a number of pioneering EU countries.

The share of RES in the EU's energy mix has more than doubled in the last 15 years (from 8.5 per cent in 2004 to 18 per cent in 2018), an increase predominantly driven by wind power, solar power and solid biofuels.[70] The EU is on track to meet its target of RES accounting for 20 per cent of its total final energy consumption by the end of this year. The fact that the RES target (judged ambitious when it was adopted) will be met will boost the EU's credibility as a global RES leader and advocate.

RES were a key instrument for the EU to cut GHG emissions by 23 per cent between 1990 and 2018, while the economy grew by 61 per cent. It is important to underline that the economy grew because achieving lower emissions by shrinking the economy is not something desirable, certainly not in the EU's narrative.[71] In

[64] The share of RES in the EU's total final energy consumption is 18 per cent, relative to a world average of 10 per cent. The share of RES in power production is 32 per cent in the EU, relative to a world average of 26 per cent. RES make up 19 per cent of the EU's heating sector, relative to a world average of 10 per cent. In transportation, RES account for 8 per cent of consumption in the EU, relative to a world average of 3 per cent (source: Eurostat 2018 data).

[65] European R&D on RES amounted to 500 million US dollars in 2018. In the same year, total European energy R&D totalled 7.34 billion US dollars (28 per cent of the world's total), behind the US (8.2 billion) and China (8 billion). Source: data from IEA, *World Energy Investment 2019*, May 2019, https://www.iea.org/reports/world-energy-investment-2019.

[66] For instance, as measured in the Global Cleantech Innovation Index where in 2017 three EU countries topped the ranking: Denmark, Finland and Sweden, while Germany came up 8th and France 13th. The US is 5th and China only 15th.

[67] In 2018, Europe invested 60 billion US dollars in RES capacity (22 per cent of the world's total), behind only China (88.5 billion). The importance of the EU's contribution to global RES investment becomes even clearer when we look at cumulative figures (total EU investments on RES amounted to 698 billion US dollars between 2010 and the first half of 2019, i.e., 27 per cent of the world's total, and second only to China, by a thin margin). Source: data from Frankfurt School-UNEP Centre and BNEF, *Global Trends in Renewable Energy Investment*, cit.

[68] Namely, wind energy converters (where EU countries such as Germany, Denmark and Spain have a leadership position) and high-tech components in RES manufacturing, storage and infrastructure (e.g., cables).

[69] Feed-in tariffs and purchase agreements as crafted in the EU were imitated and adapted in many countries around the world.

[70] Eurostat data (2018).

[71] This is not universally accepted, as there are also movements that promote "de-growth" and claim that capitalism is incompatible with the energy transition and decarbonisation. This is far from being the mantra in Brussels, where a win-win narrative that the energy transition and economic growth can go hand in hand and strengthen each other appears dominant.

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combination with higher energy efficiency, RES are the main factor that allows for the reduction of the carbon intensity of an economy. In addition to their environmental benefits, RES make economic sense as they are now competitive with fossil fuels even without public financial support. As will be discussed later, their increase in the energy mix can positively impact on the economic competitiveness of the EU.

Both the share of RES and their growth rate in the last 15 years vary greatly across sectors. In 2018, RES accounted for almost one third of EU power production (32.1 per cent, up from 14.2 per cent in 2004), almost one fifth of EU heating and cooling (19.7 per cent, up from 10.4 per cent in 2004), but only 8 per cent of energy use in transportation (this is still the steepest relative growth rate across sectors, up from 1.4 per cent in 2004).[72] Beyond its overarching 20 per cent target, the EU also set a 10 per cent sectoral target for RES use in transportation by 2020, which it is expected to (just) miss. One of the important challenges that will have to be met in the future is indeed that of further expanding RES utilisation beyond the power sector.

3.2 The European Green Deal

Policy and politics have played a key role in promoting RES in the EU and strong policy and political support will remain a key driver for further RES adoption in the future. On 11 December 2019, the European Commission presented the European Green Deal,[73] an ambitious package of measures containing a forward-looking policy and political vision. It contains the pledge to cut emissions by 50–55 per cent by 2030 compared to 1990 levels and achieve climate neutrality by 2050. These commitments have been incorporated into the EU Climate Law presented in March 2020. The EU is the first emitter to have made such a pledge.

The European Green Deal emphasises the principle that the energy transition should be just and fair for all individuals, communities and regions. This rests on the important recognition that socio-political acceptance is key for a deployment of renewables that is sustainable in the long term. While EU public opinion is generally supportive of energy transition policies and renewable energy tends have a better standing than fossil fuels, there is still scepticism about RES in certain social groups, generational cohorts and carbon-intensive regions. Public and political opposition to RES is not uncommon in EU regions where RES deployment has had important effects on the landscape (e.g., in some northern provinces of the Netherlands) and/or led to a higher energy bill for households (e.g., Germany). A number of populist parties, for instance the Dutch PVV and the German Alternative für Deutschland, are adopting a narrative that pitches a green urban elite against hard-working citizens living in rural areas. As renewables are going to grow in

[72] Eurostat data (2018).

[73] European Commission, *The European Green Deal* (COM/2019/640), 11 December 2019, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52019DC0640.

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importance in the years to come, it is crucial to make sure that the largest possible number of people are on board, and no community feels left behind. An inclusive, participatory approach to RES is very important from a socio-political perspective in order to avoid future backlashes. Ignoring discontent is not going to help RES.

The European Green Deal also calls for the development of a "green deal diplomacy", aimed at persuading countries around the world to pursue the energy transition. This narrative corresponds to a liberal, multilateralist approach. The green deal diplomacy is presented as an instrument to advance a collective interest – the protection of global commons. At this stage, it is unclear whether green deal diplomacy is a mere rebranding of international energy transition diplomatic advocacy – in which the EU has a long track record that predates the European Green Deal – or whether it really represents something new. COP26, co-organised by Italy and the UK, will be an occasion for the EU and its member states to show what they can do by operationalising green deal diplomacy. A remarkable statement contained in the Green Deal vision is that climate policy implications should become an integral part of the EU's thinking and action on external issues. This appears to convey the message that efforts to fight global warming should not just be an ancillary agenda, but rather a guiding principle for EU foreign policy.[74]

The European Green Deal recognises that the EU needs to be a credible example in order to be a credible advocate. Therefore, one fundamental way in which the EU plans to implement its *external* RES agenda will be by acting *internally*, in line with historical EU energy policy-making – where reform of the internal market has been a pillar of energy security and external energy policy.

Climate and sustainable finance are increasingly leveraged to promote EU climate objectives around the world. Attesting to this are the EU's efforts to set up a global financial system that supports sustainable growth through taxonomies, standards and labels to channel investment. The EU is also providing financial aid for sustainable development, including for example RES projects in Sub-Saharan Africa and other developing regions.[75] The EU already accounts for 40 per cent of global *public* climate finance, but now needs to step up efforts to stimulate *private* climate finance.[76] The commitment of the European Investment Bank (EIB) to phase out investment in fossil fuel projects from 2021 will certainly translate into more EU funds being channelled to RES projects in developing regions. EIB guarantees

[74] "Climate policy implications should become an integral part of the EU's thinking and action on external issues". Ibid., p. 21.

[75] In Africa, insufficient energy access is a major obstacle to development. Following the current trajectory, in 2030 over 600 million people in Africa will be living without access to electricity, representing 36 per cent of the population. Bridging the gap in energy access will require approximately 300 GW of renewable energy capacity. Europe could help private sector investment to increase energy access in Africa with innovative initiatives, which bring together the construction of an enabling regulatory framework, an adequate financing support and solid de-risking measures. This would benefit African countries and boost Europe's geopolitical status.

[76] European Commission, *The European Green Deal*, cit.

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have a multiplier effect thanks to the beneficial impact that they have on the cost of capital (a key component in RES projects, which are capital-intensive). This is particularly important for RES projects in developing countries where capital is scarce and expensive due to high perceived political risk and difficult access to finance.

Other declared priorities of the European Green Deal are: 1) strong defence of the Paris Agreement – which is being threatened by the recent withdrawal of the US; 2) greater engagement with climate politics in such a forum as the G20, where the EU is represented as a bloc as well as through three member states; 3) inclusion of international carbon markets in the global agenda along the model of the EU's newly revised, more efficient European Trading Scheme; 4) renewal of the EU–China partnership in RES; and 5) further engagement with developing countries and establishment of "green alliances" – with a special emphasis on Sub-Saharan Africa.[77]

Last but not least, trade policy is identified as a key vehicle for the EU's global energy transition agenda. The idea is that trade agreements should only be concluded with parties that have committed to the Paris Agreement (and are actively working towards meeting their commitments). In future, the EU could thus conduct preferential trade with countries that use higher shares of RES to produce their goods. The European Green Deal also asserts that EU trade policy should ensure undistorted and fair trade and investment in raw materials, namely those needed for batteries and the manufacturing of RES equipment, remove non-tariff trade barriers in RES and in general facilitate trade in clean energy.

The ambition to establish "European champions" in carbon-free technologies, including RES and batteries, also features in the European Green Deal. This rests on the recognition that competition exists and that other countries do not shy away from pursuing "green mercantilism". China in particular has showered the national renewable energy industry with subsidies as part of its green industrial policy, with well-known negative repercussions for EU renewable manufacturing in the 2010s. This adds a geo-economic component to the European Green Deal – in line with the European Commission's pledge to be the "most geopolitical ever".

A risk that the EU has to consider is that of "carbon leakage", whereby carbon-intensive activities are outsourced from the EU towards other countries because of stricter regulation in the EU. A carbon-adjusted border tax that would limit this phenomenon is under discussion in the EU, and indeed is mentioned in the European Green Deal. Apart from climate considerations, such a tax would favour EU manufacturing in a number of sectors. However, retaliatory measures from

[77] An Africa-Europe Alliance for Sustainable Developments and Jobs to unlock Africa's potential in sustainable energy has been established. Moreover, an EU Comprehensive Strategy with Africa will be launched soon and a dedicated EU-Africa Summit will be held in 2020. As part of the Africa-Europe Energy Partnership, there is also an Africa-EU Renewable Energy Cooperation Programme.

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third parties should be expected if carbon-adjusted border taxes are introduced. Since many other sectors in the EU depend on export markets, they would suffer from the introduction of such taxes. The net macro-economic effect of this measure is thus very difficult to assess at this stage.

3.3 Strategic considerations around the EU's support to RES: Sustainability, security and competitiveness

The EU (both at the level of the European Commission and at the level of individual member states) supports RES in order to achieve multiple goals. Renewable energy is in fact regarded as instrumental to: 1) reduce GHG emissions, in line with increasingly ambitious climate commitments; 2) reduce pollution and improve local air quality, with benefits for public health; 3) diversify sources of energy, against a background of high – and rising – dependency on imported fossil fuel, in particular from Russia; 4) boost macro-economic prosperity, by improving the EU's external trade balance, by opening new opportunities for high added value EU manufacturing and EU value chains, and through the multiplier effect of new infrastructure construction; and 5) create jobs within the EU, with an expected net positive effect (i.e., also taking into account the loss of jobs from fossil fuel substitution). In sum, RES appear to be promoted in pursuit of all three of the EU's core energy policy priorities: not only sustainability, which is usually emphasised, but also security and affordability (competitiveness).

One of the main geopolitical reasons why RES are being promoted in the EU is that they are regarded as substitutes for imported fossil fuels, with potentially positive consequences for both security of supply and affordability. The EU's energy import dependency has been growing in the last decades. As shown in Figure 1, in 2017 the EU imported 87 per cent of the oil and 74 per cent of the gas it consumed (up from 75 per cent and 49 per cent in the year 2000). Dependency on Russia in particular is strong – and growing (40 per cent in gas, 31 per cent in crude oil and 38 per cent in coal in 2017).[78] The deterioration in EU–Russia relations that followed the 2014 Ukraine crisis sharpened concerns about exposure to Russian hydrocarbons, reinforcing the argument that domestic RES are desirable from a geopolitical perspective.

Oil and gas represent the bulk of the EU's energy import bill. In fact, they are large enough to have a remarkable bearing on the Union's overall trade balance. In 2018, for instance, oil and gas represented around 20 per cent of the EU's total import value (around 400 billion US dollars).[79] This is a remarkable amount of money. By

[78] Eurostat data (2017).

[79] Eurostat COMEXT database (2018). The value of total crude oil imports into the EU averaged 244.2 billion euro per year between 2010 and 2018. Adding oil products, the total oil import bill averaged 311.4 billion euro per year. The value of total gas imports into the EU averaged 73 billion euro per year between 2010 and 2018. Commodity prices have been highly volatile, and have resulted in an equally volatile import bill.

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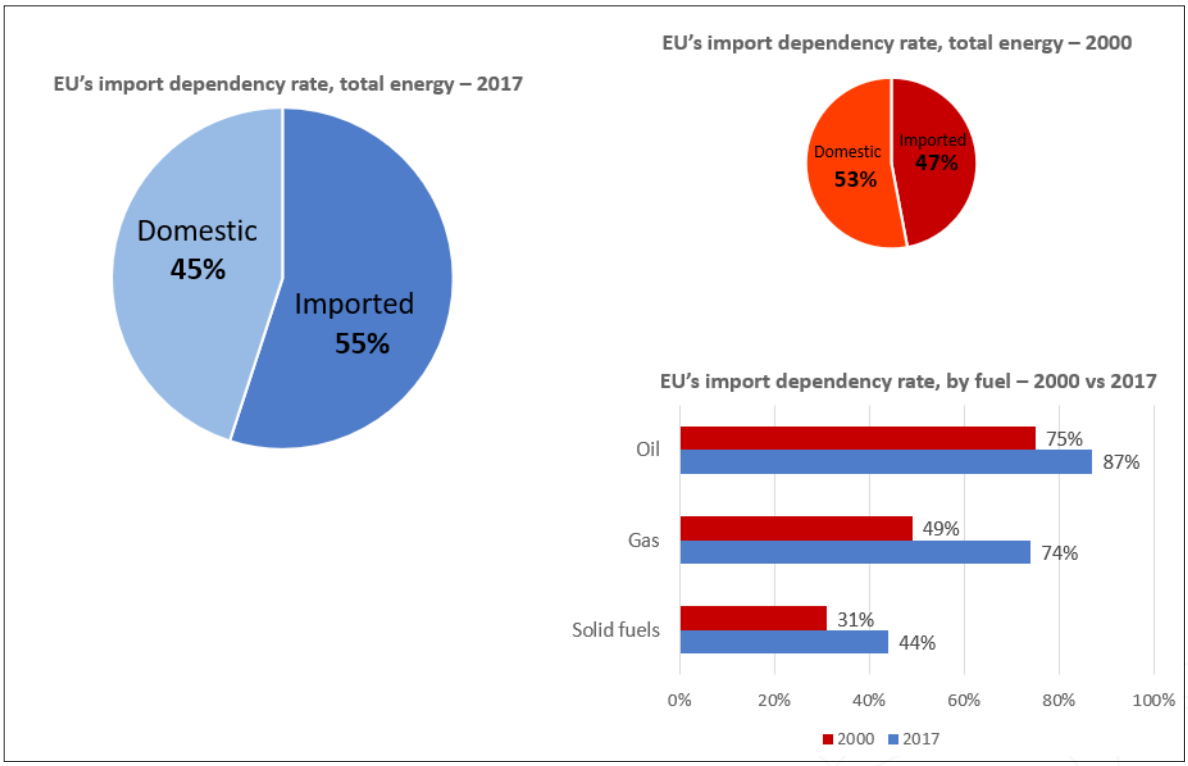
comparison, this is around four times higher than the average annual investment foreseen under the European Green Deal; on a par with the GDP of a mid-size EU economy like Austria's; and around half of the ambitious bond-buying programme put in place by the European Central Bank to counter the economic crisis provoked by the COVID-19 pandemic in 2020. The hope is that reduced dependency on oil and gas imports, also achieved through higher domestic RES production, will improve the EU's trade balance.

Figure 1 | Various figures on the EU's energy import dependency rate



Source: IAI elaboration, based on Eurostat data.

The potential held by RES for energy import bill reductions is not the only relevant geo-economic angle. The EU and some of its member states, namely Germany, are also pursuing the objective of enhancing the productivity of their firms through a green industrial policy. A green industrial policy entails structural change, with a re-orientation of labour and capital to new activities that are not only instrumental to the pursuit of climate objectives, but are promising in terms of greater competitiveness (yielding higher productivity in the long term). The aim is to achieve excellence in key green technologies and boost the global competitiveness of European firms.

Clearly, this proposition rests on a specific vision of what future economic activity will look like, that is, the attractiveness of a green industrial policy lies in the belief that the energy transition will actually unfold in a certain way. In this respect, a key strategic macro-economic objective pursued through the promotion of RES and

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a green industrial policy is the limiting of stranded asset related risks.[80] This can also assume a geo-economic dimension: it could in fact be argued that the more a country reorients its economic structure towards RES and other green industries, the more it limits its exposure to the financial crisis that will break out when major investments in stranded assets will have to be written off.

The idea of pursuing an industrial policy rests on the observation that market prices do not always provide the right investment signals. One possible market failure is the hold-up problem that emerges when an investment that would have generated knowledge spill-overs – with a positive effect on the economic system as a whole – is not allocated by a market player because it does not immediately pay off. Another market failure occurs when a corporation does not invest because there are no guarantees that complementary investments will be allocated. This is essentially a coordination problem, and it is known that the introduction of RES in new sectors or areas is greatly constrained by coordination problems (the notorious 'chicken and egg' dilemma). In fact, the viability of certain business models depends on investments in infrastructure, equipment, appliances (or other fields) that should be carried out by other parties.[81]

The key question relates to the costs and benefits of being an early mover. While being ahead of the curve can deliver a competitive edge in some cases, free-riding can dissipate early mover advantage in others. The pioneering investor risks bearing the entire risk of failure and then witnessing a dilution of its innovation profits as knowledge becomes public.[82] This applies to single corporations and entire countries alike. Pioneering countries *de facto* allow other countries to address environmental problems at a lower cost. While from a moral/normative perspective this is not an issue – as pioneering countries have triggered innovation in technologies that will help decarbonisation – it can be a problem from a geo-economic perspective.

The massive transfer of solar manufacturing activity away from Germany (the pioneering investor) to China (the main beneficiary of German green industrial policy investments) is one of the most important lessons of the last decade with regard to the geo-economic aspects of RES promotion. In the first years after the implementation of the Energiewende, German solar PV companies became global leaders thanks to an early mover advantage. Thousands of new jobs were created. However, in the early 2010s, low-cost Chinese manufacturers started to outcompete German counterparts, with the result that the value of German exports of solar PV cells fell from 8.1 million US dollars in 2010 to 4.5 million dollars in

[80] Carbon-intensive assets that will be impossible to monetise because of decarbonisation.

[81] Tilman Altenburg and Dani Rodrik, "Green Industrial Policy: Accelerating Structural Change towards Wealthy Green Economies", in Tilman Altenburg and Claudia Assmann (eds), *Green Industrial Policy: Concept, Policies, Country Experiences*, Geneva/Bonn, UN Environment/German Development Institute, 2017, p. 1-20, https://www.un-page.org/node/599.

[82] Ibid.

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2012.[83] In only a decade (from 2004 to 2014), China's market share in solar PV grew from 5 to 45 percent.[84] Many German solar PV manufacturers (such as Solon, Q-Cells and Odersun) went bankrupt in those years,[85] and jobs were lost.

This however only tells one part of the story. In the solar industry, it is true that Germany lost manufacturing activity to China, but it also established competitive advantages in high-value, specialised production. Niches where Germany has cutting-edge technology and a high market share include inverters, cables, cleanroom production facilities for cell manufacturing and assembly lines. Chinese PV manufacturers actually rely on German technology and components. Moreover, in wind, Germany managed to maintain a broader market share advantage, being a leader in offshore wind parks and large-scale onshore turbines. Siemens-Gamesa is an example of the EU renewable champions that the Green Deal aims to establish. The German experience teaches that the EU (and its member states, including Italy) should seek to gain a competitive advantage in specialised products and services rather than in labour-intensive manufacturing.

3.4 Internal EU politics and RES

Earlier in the text, we have sketched the European RES landscape by talking about sectors and types of renewable energy sources. We have also discussed what external objectives the EU is pursuing by supporting RES. At this stage, it is important to add a few short considerations about the internal European geography (and politics) of RES. This also serves as a bridge to our discussion about Italy's posture within the European context (Chapter 4).

The first element that needs to be highlighted is that RES penetration is not uniform across the EU (either in terms of shares or in terms of growth). In 2018, the share of RES in the gross final energy consumption of EU member states ranged from 7.4 per cent (the Netherlands) to 54.6 per cent (Sweden).[86] This does not always mean that some countries have been major disappointments, while others have outperformed. In fact, EU countries had given themselves different RES targets a decade ago, depending on both starting levels and expectations about future RES expansion potential. In 2018, 11 countries had already overshot their targets and

[83] Wilfried Lütkenhorst and Anna Pegels, "Germany's Green Industrial Policy. Stable Policies – Turbulent Markets: The Costs and Benefits of Promoting Solar PV and Wind Energy", in *GSI Research Reports*, January 2014, https://www.iisd.org/library/stable-policies-turbulent-markets-germanys-green-industrial-policy-costs-and-benefits.

[84] Anna Pegels, "Germany: The Energy Transition as a Green Industrial Development Agenda", in Tilman Altenburg and Claudia Assmann (eds), *Green Industrial Policy: Concept, Policies, Country Experiences*, Geneva/Bonn, UN Environment/German Development Institute, 2017, p. 166-183, https://www.un-page.org/node/599.

[85] Michele Parad et al., *Global Cleantech Innovation Index 2014. Nurturing Tomorrow's Transformative Entrepreneurs*, Cleantech Group and WWF, June 2014, p. 30, https://www.cleantech.com/wp-content/uploads/2014/08/Global_Cleantech_Innov_Index_2014.pdf.

[86] Eurostat (2018).

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the majority of EU member states were on track to meet their 2020 target, with just a handful of laggards.[87] Regrettably, when some countries realised that they were about to overshoot the target, they slowed down support to RES, which resulted in a marked slowdown in RES adoption growth in the last three or four years.

Another element that needs to be considered is that member states do not always have converging interests. Their support for measures that would expand the scope for RES is not equal. In 2019, Poland, Hungary and the Czech Republic notably lobbied against the EU-wide adoption of the 2050 climate neutrality goal.[88] Countries that refuse to implement coal phase-out plans (including, once again, Poland) do not favour a significantly higher penetration of RES – even if they have plans to expand RES capacity. Estonia is sometimes added to the group of countries pushing the brake on energy transition.[89] According to a Climate Action Network report published in 2018, these countries in particular were performing "very poorly" in terms of pursuing climate ambitions: Cyprus, Malta, Bulgaria, Estonia, Ireland and Poland.[90] Conversely, other countries, such as Sweden, Portugal, France, Belgium, Denmark and the Netherlands, are seen as part of a more progressive group lobbying for more ambitious action on climate within the EU.[91] This perception is based on current support schemes and targets rather than the actual penetration of RES at the moment.

Another element of internal EU politics related to RES is the opposition by some countries and domestic interest groups to the further integration of grids into an EU-wide network. At a pan-European level, grid integration is seen as an important component of strategies aimed at balancing intermittency and at creating price convergence. The principle is that electrons should flow as freely as possible across borders and react to price signals, thereby guaranteeing an efficient market functioning. Security of supply is also boosted by integration: due to different irradiation and ventilation patterns across the EU, pooling supplies is seen as a way to increase guarantees of a more constant availability of power generated from RES.

Yet single member states could be concerned that the influx of "cheap renewables" from a neighbouring country might create economic troubles for domestic power

[87] Sean Fleming, "These 11 EU States Already Meet Their 2020 Renewable Energy Targets", in *World Economic Forum Articles*, 18 February 2019, https://www.weforum.org/agenda/2019/02/these-11-eu-states-already-meet-their-2020-renewable-energy-targets.

[88] Jennifer Rankin, "Central European Countries Block EU Moves towards 2050 Zero Carbon Goal", in *The Guardian*, 20 June 2019, https://gu.com/p/byff5.

[89] Paola Tamma and Jacopo Barigazzi, "Behind 4 Countries' Resistance to an EU Climate Neutral Goal", in *Politico*, 25 June 2019, https://www.politico.eu/article/whats-behind-the-resistance-of-four-countries-to-an-eu-climate-neutral-goal-of-2050.

[90] Climate Action Network Europe, *Off Target. Ranking of EU Countries' Ambition and Progress in Fighting Climate Change*, Brussels, CAN Europe, June 2018, http://www.caneurope.org/publications/reports-and-briefings/1621.

[91] Ibid.; Frédéric Simon, "Germany, Poland Snub EU Appeal for Greater Climate Ambition", in *Euractiv*, 7 May 2019, https://www.euractiv.com/?p=1338282.

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producers. Another complication lies in the system and grid imbalances created by the influx of variable renewables introduced in neighbouring countries. An example is the "loop flow" phenomenon: electricity tends to follow the shortest route, which entails that electricity produced in country A sometimes crosses a stretch of country B before re-entering another region of country A. This creates potential congestions and costs for country B, even if country B does not consume the electricity it offers transit to. This creates political discussions on the sharing of costs and congestion management. Conversely, it is possible that a country opposes electric grid connections to a neighbouring country because it does not want to "subsidise" the neighbour with zero-marginal-cost power, on whose capital expenditure the country of origin has spent a lot of public money.

We will now turn our attention to Italy, which stands out as an RES leader within the context of the EU. A Statistical Factsheet compiled by IAI on Italy's ranking in a number of renewable technologies and indicators is part of this study.

4. The Italian RES landscape and shifting foreign policy priorities

4.1 Italy as early mover and RES leader

Over the past two decades, Italy has become a global leader in RES even if there has been a slower uptake in recent years and a few areas of weakness remain, namely in electric mobility (see 4.2). In 2019, renewable generation from solar, wind and hydropower accounted for around one third of Italy's net electricity generation, slightly above the EU average. Figure 2 shows statistics on installed capacity. Beyond electricity, renewable heat plays a critical role for the decarbonisation of the heat sector together with energy efficiency. Between 2014 and 2017, almost 1 billion euro worth of investments was mobilised and in 2017 alone 40 thousand installations of renewable heat were delivered.[92] Approximately one fifth of Italy's heating and cooling needs are fulfilled by RES, slightly above the EU average.[93] Conversely, RES represented only 7.6 per cent of total final energy consumption in transportation in Italy, slightly below the EU average.

Italy has a widespread, digitalised, reliable and efficient electric network, even compared to other western EU countries. Italy was notably an early mover in deploying smart metres. However, more investment is going to be needed in view of a much wider adoption of RES in the future. Without the infrastructure needed to manage and dispatch renewable energy, it will not be possible to achieve the desired decarbonisation target, in particular the 2050 goal of climate neutrality. Therefore, in parallel and arguably through upfront investment it is critical to invest in and build the enabling infrastructure for allowing higher renewable

[92] Ibid.

[93] According to Eurostat data (2018).

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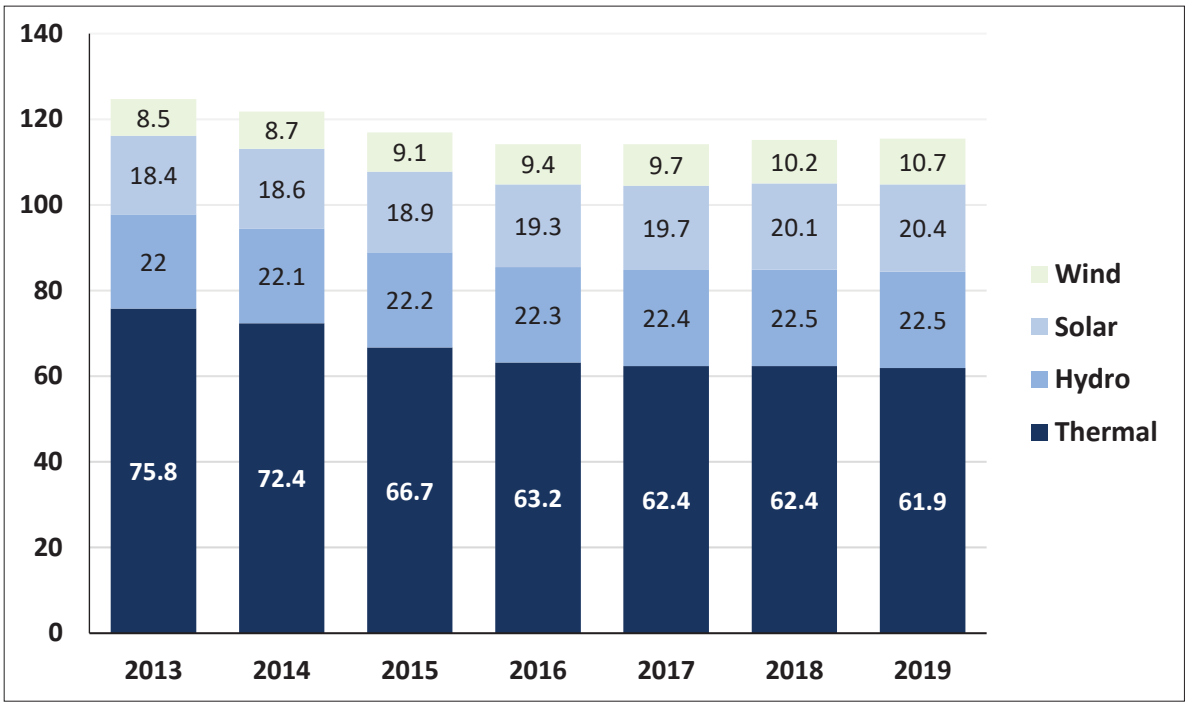
penetration. This includes storage units, batteries, demand-side management systems, the national grid, connections to the international grid and digitalisation.

Figure 2 | Installed capacity in Italy since 2013 (GW)



Source: ENEA, *Analisi trimestrale del Sistema energetico italiano*, No. 4/2019, p. 34, https://www.enea.it/it/seguici/pubblicazioni/pdf-sistema-energetico-italiano/04-bollettino-trimestrale-2019.pdf.

Our comparative analysis of Italy's performance in key RES indicators reveals that the country enjoys a position of leadership. Italy was indeed an early mover and remains one of the world's most important markets for renewable energy. Even if growth in new investments has lamentably slowed down in recent years, Italy ranks seventh in the world for cumulative investments in renewable capacity in the period 2010–2019 (82 billion US dollars) – ahead of countries such as France, Brazil and Spain.[94] In an EU context, Italy occupies the top position in all geothermal indicators (employment, turnover, usable capacity and production). Hydropower is another sector in which Italy can claim a position of leadership within the EU, as it comes first by employment, second by turnover and third by both capacity and production.

Furthermore, the country comes in second in the EU in solar PV capacity and power production, and fourth in employment and turnover. Italy is also the EU's second producer of biogas (and holds the same ranking in biogas employment and turnover). Besides, more than half of the EU's heat pumps currently in operation are found in Italy. In the wind sector, Italy is sixth by turnover and employment

[94] Frankfurt School-UNEP Centre and BNEF, *Global Trends in Renewable Energy Investment*, cit.

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and fifth by capacity and production in the EU – in spite of the fact that Italy's regions with the highest density in population and economic activity have one of the worst wind potentials in the EU. Finally, Italy has the EU's third highest labour productivity in the renewable energy sector. This is particularly remarkable if it is compared to Italy's poor average labour productivity in the overall economy. For a full overview of Italy's position in key RES indicators, see Section 2 of the Statistical Factsheet.

In addition, Italy enjoys a position of leadership in a number of specific components. Italy notably has a considerable specialisation in some wind technologies, particularly wind turbine generating sets and gearboxes.[95] Moreover, Italy has a solid Revealed Comparative Advantage (RCA) in hydroelectric technologies[96] and is a net exporter of binary cycle geothermal turbines as well as the world's second largest producer of dry steam/flash cycle geothermal turbines.[97] Finally, even though electric vehicle production is low, a number of studies find that Italy has a great potential revealed comparative advantage in electric vehicles, which it can achieve with appropriate investments and policy support (cf. Box in Section 4.2).[98] Moreover, as mentioned above, Italy has a widespread, reliable and highly digitalised electric grid. The country was notably a first mover in the rollout of smart metres.[99] This confers an advantage to Italy because it increases reliability and security of supply.

Finally, Italy hosts ENEL, the largest European utility in terms of capitalisation and the global leader in renewable generation. The company has a global outreach and operates on all five continents. One of its most important markets is Latin America (in particular Mexico, Chile, Peru, Brazil, Argentina and Colombia), which contributes to expanding Italy's economic and energy clout beyond traditional focus markets. Moreover, ENEL has significant operations in the US, Spain, Australia, South Africa, Zambia and India. Italy also hosts competitive producers of cables and other RES components, and large energy companies interested in the transition and endowed with significant know-how and capital. Other key enablers of the energy transition include regulatory agencies, transmission and distribution system operators, service providers and research and development agencies.

[95] European Commission, *Energy Union Factsheet Italy* (SWD/2017/399), 23 November 2017, p. 22, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52017SC0399.

[96] EurObserv'ER, *The State of Renewable Energies in Europe. 2019 edition*, Paris, Observ'ER, 2010, p. 262, https://www.eurobserv-er.org/?p=5790.

[97] According to data published by the Clean Energy Manufacturing Analysis Center.

[98] Georg Zachmann and Robert Kalcik, "Export and Patent Specialization in Low-Carbon Technologies", in Soumitra Dutta, Bruno Lanvin, and Sacha Wunsch-Vincent (eds), *The Global Innovation Index 2018. Energizing the World with Innovation*, Ithaca/Fontainebleau/Geneva, Cornell University/INSEAD/WIPO, 2018, p. 112, https://www.wipo.int/publications/en/details.jsp?id=4330.

[99] See Tobias Ryberg, "The Second Wave of Smart Meter Rollouts Begin in Italy and Sweden", in *Metering & Smart Energy International*, No. 4/2017 (October 2017), p. 26-27, https://www.smart-energy.com/?p=54058.

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This is an excellent base on which Italy can build, but it is necessary to strengthen efforts to acquire further competitiveness, particularly because the latest Cleantech Innovation Index reveals that other countries are moving fast. It is worth emphasising that today's RCA figures are based on current exports. Whether Italy becomes a renewable manufacturing powerhouse ultimately depends on its industry policy priorities, significantly more investment in research and innovation, and whether it will be able to compete on the global stage. So far, the renewable sector in Italy and other countries has benefitted from cheap equipment produced in non-OECD countries, which have a comparative advantage due to low labour costs.

Conversely, Italy can and should take steps to acquire greater specialisation in niche technologies, components and equipment. These include for instance high-tech components of solar PV, wind turbines, geothermal technologies and concentrated solar power, but also fuel cells, lithium-ion batteries and lightweight materials. Moreover, services are going to become more and more important as the share of renewable energy in the energy mix increases. Some of these services can be exported. Examples of new services include smart grids, closed-cycle eco-industrial parks, smart transport systems, tracking systems for environmental standards along value chains, energy management systems and so on. Italy's potential to gain further technological competitiveness is certainly present, and can build on the combination of a relatively large domestic market, access to an even larger and dynamic EU market, relatively good access to finance, steady policy support and excellent technical and engineering skills. A political vision is necessary to express this potential, alongside private investment.

4.2 RES and the National Energy and Climate Plan

The final version of the National Energy and Climate Plan (NECP) submitted to the EU by the government at the end of 2019 set a target of 187 TWh of renewable electricity generation by 2030 (Table 1). This represents an increase of 65 per cent compared to 2019. Solar and wind are expected to be the key drivers given the limited growth potential of geothermal electricity and hydropower. Installed solar capacity is expected to reach 52 GW (of which 880 MW as concentrated solar power) and an installed wind capacity of 19.3 GW (of which 900 MW as offshore wind). This represents a growth of 230 per cent for solar and of 180 per cent for wind compared to 2019.

In the heat sector, the main driver of renewable generation is expected to come from heat pumps with an increase of 115 per cent in production compared to 2017. Thermal solar production will also play a role and is expected to grow by 260 per cent but its contribution in absolute terms will be much lower compared to heat pumps. The NECP envisages for renewable heat to meet 34 per cent of final heat demand in 2030.

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Table 1 | Growth targets and trajectories for 2030 for the renewables share in the electricity sector (TWh)

	2016	2017	2025	2030
Renewable production	110.5	113.1	142.9	186.8
Hydropower (actual)	42.4	36.2		
Hydropower (normalised)	46.2	46.0	49.0	49.3
Wind (actual)	17.7	17.7		
Wind (normalised)	16.5	17.2	31.0	41.5
Geothermal	6.3	6.2	6.9	7.1
Bioenergy*	19.4	19.3	16.0	15.7
Solar	22.1	24.4	40.1	73.1
Denominator – Gross inland consumption of electricity	325.0	331.8	334	339.5
RES-E share (%)	34.0	34.1	42.6	55.0

Note: * For bioliquids (included under bioenergy, together with solid biomass and biogas), only the contribution from sustainable bioliquids is given.
Source: Italian Ministry of Economic Development et al., *Integrated National Energy and Climate Plan*, December 2019, https://ec.europa.eu/energy/sites/ener/files/documents/it_final_necp_main_en.pdf.

While electric mobility is set to become the major pillar of the decarbonised transport system, it is worth noting that, compared to other EU member states, Italy is lagging behind in addressing its transport system's environmental sustainability. With one of the oldest passenger car fleets in Europe, one of the highest numbers of cars per inhabitants in the world, the highest number of premature deaths due to atmospheric pollution in Europe (70 thousand in 2016), and high fuel prices, there is a clear need for more urgent action. In 2018, RES represented 7.6 per cent of total final energy consumption in transportation in Italy, slightly below the EU average.

In the transport sector, the overall 2030 target for renewables is to meet 22 per cent of final demand. The Italian NECP puts much more emphasis on the role and development of biofuels, in particular biomethane, rather than renewable electricity through the rapidly expanding electric mobility. That said, a significant contribution from electric vehicles (EVs) and plug-in hybrid EVs is expected, driven by substantial investment over the next five to seven years. This should translate into 6 million EVs on the street by 2030, 4 million of which would be all-electric. Research from Cambridge Econometrics, Element Energy and Bocconi University[100] shows that a faster transition to electric mobility would deliver higher benefits than the current government policy. In 2030, the annual expenditure on fuel for a small-sized car will be on average 353 euro cheaper than for a car in 2020,

[100] European Environment Agency (EEA), *Italy – Air Pollution Country Fact Sheet*, 2019, https://www.eea.europa.eu/themes/air/country-fact-sheets/2019-country-fact-sheets/italy.

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thanks to greater efficiency and the deployment of electric vehicles. Compared to a conventional car, a battery EV could save the driver of a small car an average of 917 euro a year on fuel and maintenance costs in 2030, offsetting the higher initial purchasing cost. In addition, about 19,225 net additional jobs will be created. Italy should also explore ways to improve its comparative advantage in batteries (cf. Box 1).

While the increased efforts needed to reach these targets are significant, it is worth noting that the NECP will have to be adapted. In particular, the plan assumes a European target of GHG emissions reduction of at least 40 per cent. This target was agreed by European leaders in 2014 before the Paris Agreement of 2015. Today the political, policy and technological landscape has fundamentally shifted, allowing for increased ambitions. Expectations are that the European GHG emission-cut target by 2030 will be increased to 55 per cent. Moreover, both the EU and Italy have now set an ambition target of reaching net-zero emissions by 2050. The targets of the Italian NECP need to be reviewed and updated to reflect greater ambitions.

Box 1 | *Italy's position in battery manufacturing*

Batteries are recognised to be a major new market and a strategic asset for the green transition. While Italy's export potential for batteries is large, analysis by ENEA points out that "in Italy there is only a weak development of industrial capabilities in [...] components of electric vehicles, such as batteries and electric engines" adding that "in the strategic vision of the Italian manufacturers of automotive parts [...], green mobility has not yet emerged as [a] significant component of their business strategy". Unless significant investment starts flowing in the battery and more generally in the electro-mobility sector, Italy will lose out to external competition and miss the opportunity to create new high-quality employment. Italy is a net importer of batteries and therefore its revealed comparative advantage is currently negative, with some exceptions for a few selected products such as components of electric accumulators. More incisive action to create domestic demand should be considered. The demand pull for the Italian market could come from bigger European and international markets. However, as ENEA points out, "depending exclusively on the choice of external players represents a serious element of vulnerability for a manufacturing sector that could see entire segments of its value chain (those characterizing internal combustion engines) become obsolete and disappear, with heavy consequences for workers and local communities. Contrasting such a risk requires first of all strengthening the research base and capabilities, training (and re-training) of a workforce that can be ready and capable to respond to private investment, and some nurturing of the most competitive national enterprises."

Source: Largely based on M. Cristina Tommasino, Maria Rosa Virdis and Alessandro Zini, "Case Study: Technological Potential and Competitiveness in Electric Mobility Technologies: The Case of Italy", in Georg Zachmann et al., *Assessing the Technology Innovation Implications of NDCs, Technology Portfolio Choices, and International Competitiveness in Clean Technologies*, COP21 Ripples Deliverable 3.3, August 2018, p. 93, 86 and 94, https://www.cop21ripples.eu/resources/deliverable-3-3.

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4.3 The geopolitical salience of RES for Italy and implications for Italy's foreign policy

The impact of a wider adoption of RES on Italy's geopolitical stance will crucially depend on the assumed rate of RES penetration and on the pace of the energy transition. In the initial and intermediary stages of the transition, energy security concerns related to fossil fuels are likely to remain high. In the longer term, however, the importance of fossil fuels (and related energy security issues) is set to decrease. The trends described below are beginning to have major impacts and will gain even more importance towards 2030 and beyond.

1) A wider adoption of RES domestically is set to transform the Italian energy sector and affect the national economy, thereby contributing to reshaping national strategic interests. This has the potential to create shifts in Italy's stance in global affairs and foreign policy priorities. The transition to RES can have important socio-economic benefits. Overall, increased employment, social stability and a healthier population can boost Italy's resilience and thus its stance in international affairs – provided that policy-makers put in place mechanisms for a just transition.

The Italian renewable energy service provider (GSE) estimates that the renewable electricity sector, had by 2017 created twice as much permanent employment as the fossil fuels sector.[101] In 2030, employment from renewable electricity is estimated to increase by at least one third while employment in the fossil fuel sector is expected to decrease by one third.[102] The transition to RES is estimated to have had a net positive employment effect for Italy so far, and this is projected to continue in future. A key enabler for the social and political acceptance of RES will be the government's ability to put in place measures for a socially just transition,[103] which is also an important element of the European Green Deal discussed in Section 3. Protecting vulnerable communities as well as providing workers with a credible alternative to fossil fuel employment is key to the success of the energy transition. Another challenge lies in the fact that the government's tax base will be reduced as fossil fuels are phased out. Conversely, an additional benefit is that by reducing NOx and particulate matter concentrations, RES can avoid premature deaths from air pollution and reduce the occurrence of diseases such as lung cancer, chronic bronchitis and asthma. Apart from the human cost, these conditions are an economic burden for national welfare, and it should be emphasised that Italy hosts some of the West's most polluted regions.

2) RES are a key enabler of the energy transition and of the fight against global warming. The importance of these dossiers is widely recognised in Italy, including in the foreign policy community. Promoting the energy transition internationally is

[101] Italian Ministry of Economic Development, *Integrated National Energy and Climate Plan*, cit., p. 307.

[102] Ibid.

[103] Luca Bergamaschi, "There Is No Green Deal without a Just Transition", in *IAI Commentaries*, No. 20|01 (January 2020), https://www.iai.it/en/node/11217.

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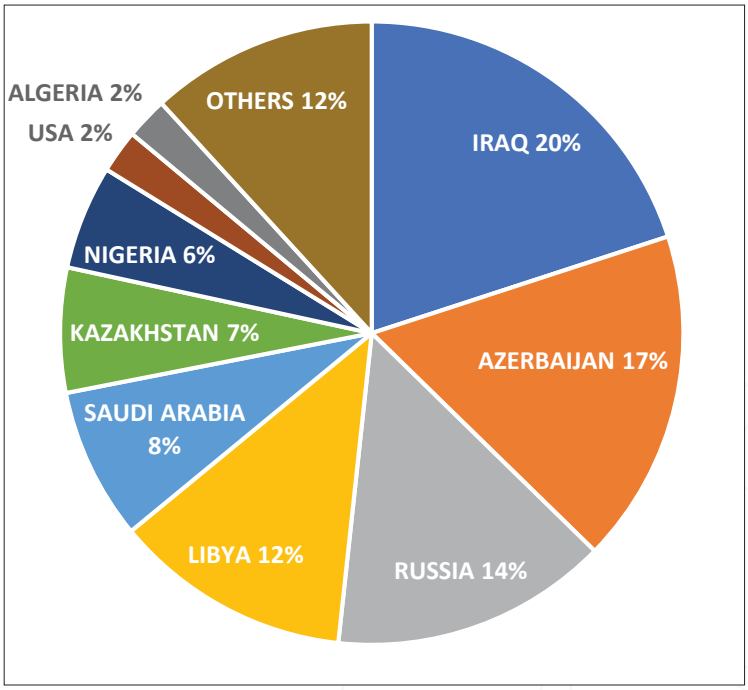
in line with Italy's national interest not only for ethical reasons but also for security, economic and political reasons. As a developed country, Italy should aim to deliver climate neutrality before 2050 as part of its fair contribution to limit warming to 1.5 degrees.[104] Italy's national security and prosperity fundamentally depend on delivering climate stability given Italy's high exposure to climate impacts, which is higher than that of other European countries.[105] Clean technology, and in particular RES, will play a key part in achieving both Italy's security objectives and its economic objectives. Geopolitically, this means that Italy needs to align its position and priorities to a new reality while managing the transition in an orderly way.

3) An additional key element is that a wider adoption of RES would limit Italy's reliance on imported fossil fuels. Broadly, this has three positive repercussions: reducing Italy's geopolitical dependence on fossil fuel suppliers, transit countries, maritime chokepoints and its vulnerability to supply shocks; improving Italy's trade balance; and sheltering its trade balance (and the overall economy) from commodity price volatility.

Every year Italy imports about 90 per cent of its oil and gas needs. Oil imports are quite diversified but are dominated by countries in the MENA and FSU regions.

Figure 3 | Italy's crude oil imports by origin, 2019



Source: ENEA 2020 based on figures from the Unione Petrolifera Italiana.

[104] IPCC, "Summary for Policymakers", cit.

[105] Giovanni Forzieri et al., "Escalating Impacts of Climate Extremes on Critical Infrastructures in Europe", in *Global Environmental Change*, Vol. 48 (January 2018), p. 97-107, https://doi.org/10.1016/j.gloenvcha.2017.11.007.

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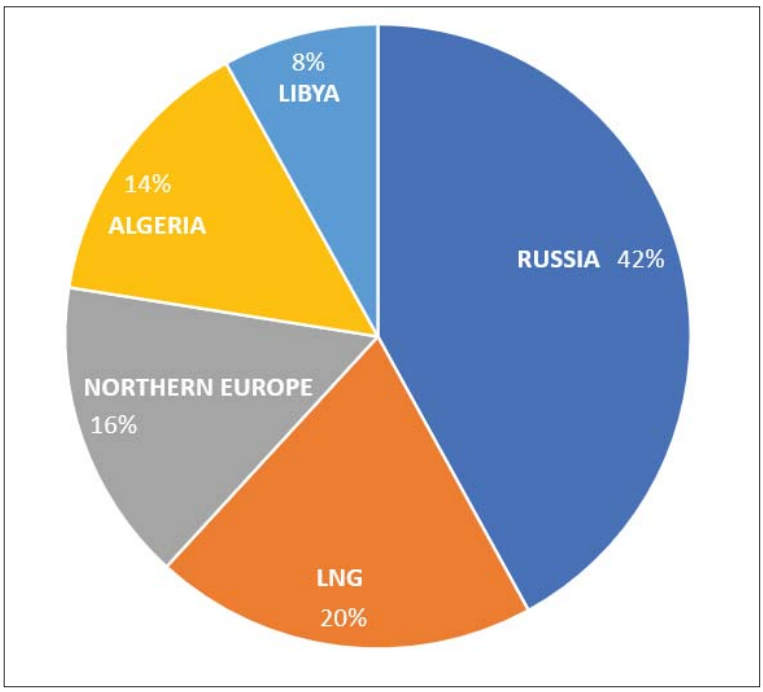
In 2019, Iraq became Italy's main oil supplier (with a market share of around 20 per cent) – compensating for oil imports from Iran that stopped completely after the US applied extraterritorial sanctions on trade with Iran.[106] Gas imports are also quite diversified, although Russia plays a prominent role (see Figure 4).

Figure 4 | Italy's natural gas imports by origin in 2019



Source: ENEA, *Analisi trimestrale del Sistema energetico italiano*, No. 1/2020, cit., p. 48.

The year 2019 saw a record level of liquefied natural gas (LNG) imports from the US, although this flow is not necessarily going to be structural because US LNG is destination-flexible and follows logics of arbitrage. New gas deliveries from Azerbaijan will also start flowing once the Trans-Adriatic Pipeline (TAP) is operational. Generally speaking, however, structural gas import diversification will face commercial challenges. While LNG has great diversification potential, finding companies (or countries) that are willing to finance capital-intensive pipelines from new exporters to the EU is difficult because there is reluctance to sign new long-term contracts.

As one of the most oil and gas import dependent countries in the world, Italy's geopolitical position has been historically influenced by the need to secure access to oil and gas. This has required the establishment and the maintenance of strong relations with fossil fuel exporting countries and the promotion of regional stability, including safety of passage for commodities across land and sea. This

[106] ENEA, *Analisi trimestrale del Sistema energetico italiano*, No. 1/2020, p. 42, https://www.enea.it/it/seguici/pubblicazioni/pdf-sistema-energetico-italiano/01-analisi-trimestrale-2020.pdf.

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approach has largely been driven by a traditional definition of energy security, which emphasises issues related to access and diversification.

This high degree of dependency on foreign fossil fuel imports has impacted on the room for manoeuvre in Italian foreign policy so far. The high degree of instability that some of Italy's non-EU fossil fuel suppliers are exposed to has shaped Italy's energy interests, priorities and geopolitical posture. Also, many of the non-EU fossil fuel suppliers are fragile states, sometimes ruled by autocratic regimes with poor records on democracy, civil rights, gender equality, media freedom and sustainable development. Energy security has thus often clashed with other foreign policy priorities and agendas, making it difficult as well as time- and resource-consuming for Italian diplomacy to strike a balance. Many of these countries – in particular those in the MENA region – are highly exposed to climate change impacts, which will further exacerbate existing political, economic and social instability there.[107]

RES are playing an increasingly important role in diversifying supplies, creating local generation capacity and lowering Italy's import bill. The deployment of RES in Italy has made it possible to avoid substantial fossil fuel consumption (17.1 Mtoe) in 2017.[108] Considering an average annual net fossil fuel import bill of 44 billion euro in recent years[109] – comprising 2 billion euro for coal, 17 billion for gas and 25 billion for oil – an increasing penetration of clean technology such as renewables, batteries and energy efficiency can have a huge impact by saving billions of euro every year, benefitting consumers and businesses and protecting them against the price volatility of international markets. This will also help manage the expected increasing amount of individual, corporate and public debt from the COVID-19 crisis, while making room for spending on infrastructure useful for the energy transition.

1) As fossil fuel demand from major consumers in the EU and North America (initially) and Asia (later on) decreases, fossil fuels exporters will face the critical challenge of having to rethink their economic and social development models. Fossil fuel producing countries will face the enormous challenge of managing falling export value, state revenues and, ultimately, GDP. Foreign exchange reserves and sovereign wealth funds are essential buffers. Cutting subsidies, raising taxes and increasing product prices will exacerbate the risk of political upheavals and repression in countries without strong financial buffers. Italy's geographical position makes it particularly vulnerable to the risk of instability in major oil and gas producers in the MENA and FSU regions. In the long term, it could very well

[107] Luca Bergamaschi et al., *EU Foreign Policy in a Changing Climate. A Climate and Energy Strategy for Europe's Long-Term Security*, Berlin etc, E3G, May 2016, https://www.e3g.org/docs/E3G_EU_foreign_policy_energy_climate.pdf.

[108] Filippo Capizzi et al., "Renewable Energy in Europe 2019. Recent Growth and Knock-on Effects", in *Eionet Reports ETC/CME*, No. 2019/8 (December 2019), p. 78, https://www.eionet.europa.eu/etcs/etc-cme/products/etc-cme-reports/renewable-energy-in-europe-2019-recent-growth-and-knock-on-effects.

[109] Unione Petrolifera on the basis of figures by Istat, 2010–2018.

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be positive for Italy to have neighbours that are less exposed to resource curse and Dutch disease dynamics, but the transition is going to be challenging.

2) RES also have great potential in terms of opening up new business opportunities for Italy, and creating new comparative advantages for a country that is otherwise challenged by mounting global competition in other economic sectors. It is worth emphasising that a more prosperous and innovative economy usually translates into greater geopolitical leverage.

As explored in Section 4.1, Italy already has a comparative advantage in a number of RES technologies and is well positioned to gain further comparative advantages. The considerations raised in Section 3 about the EU's green industrial policies and the global position of the European RES sector can also be fully applied to Italy. One of the most significant observations contained in Section 3 is that EU countries (and, more broadly, advanced economies) should focus on high-tech components rather than labour-intensive RES manufacturing. With regard to Italy, new analyses by ENEA identify a significant potential for increasing export specialisation in insulation, solar PV, batteries, efficient lighting and efficient heating and cooling.

3) Italian foreign policy efforts towards regions such as Latin America and Africa are likely to increase as RES production and business opportunities there grow in importance. Through renewable energy producers and utilities, Italy could essentially become an energy supplier in many countries, particularly in the developing world. In this way, Italy could establish bonds of positive interdependence with new countries and regions beyond traditional areas of interest, thereby expanding its geopolitical reach and diversifying its exposure to geopolitical challenges.

4) More broadly, RES will change the notion of energy security and Italian foreign policy should adapt to the new reality. Gradually, the foreign energy paradigm will shift away from acquiring and securing resources. The focus will be less on access to and transport of fossil fuels and more on the flexibility and reliability of the electricity system. In this context, the electricity grid, storage systems, batteries, demand-side management, smart digital systems and cybersecurity will become the defining features of energy security. Trends such as regionalisation, decentralisation and digitalisation will gain centre stage, as discussed in detail in Section 2.

4.4 Foreign policy recommendations

A wider adoption of RES can improve Italy's geo-economic and geopolitical stance. For this to happen, economic policy that allows Italy to fully express its RES leadership potential, engagement of the private sector and foreign policy efforts aimed at maintaining and creating a good business climate in partner countries need to be aligned. This section contains a number of foreign policy recommendations for Italy in a context of wider RES penetration domestically and

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across the world.

1) RES have a key function in the energy transition and Italy should encourage their wider adoption around the world. This requires action on multiple levels (financial, regulatory, political, etc.). Having recognised the importance of the energy transition and the fight against global warming for Italy, their promotion should become a priority in the high-level venues where Italy is represented (including European Councils, G7, G20 and Multilateral Development Banks). For a credible and effective energy diplomacy, it will be increasingly necessary to review existing priorities against a rapidly shifting landscape. Promoting both an RES-based transition and more fossil fuels could become increasingly untenable insofar as it clashes with commitments under the Paris Agreement. Fossil fuel companies will be required to put in place diversification strategies. Italy could also use RES as a soft power instrument to position itself as a responsible geopolitical player that not only supports sustainable development but also makes it happen.

2) In order to act as a global RES advocate, Italy will need to coherently promote RES and the energy transition at home. Domestically, the transition is expected to accelerate as Italy implements the NECP and the European Green Deal. It is undoubtedly significant that the 2020 Economic and Financial Document (DEF) by the Ministry of the Economy and Finance identifies the Green Deal as a top priority for post-COVID economic recovery.[110]

3) An important step is to develop tools that allow Italy to better assess and manage decarbonisation and the evolution of energy security in an energy system with greater RES penetration. Without independent and reliable information on how the landscape is changing, it is going to be difficult to build the policy and political confidence for changing Italy's traditional foreign energy policy priorities.

In order to monitor the evolution of this landscape, including the speed of decline for fossil fuels as well as the rise of RES and other clean technology, an independent Energy Observatory should be established, drawing on a network of existing institutions and knowledge. This would provide evidence-based information and would be responsible for owning unbiased views of technological trends. Such information is essential to guide diplomatic and political decisions, and could

[110] DEF is the main instrument for financial and economic planning, as it sets out the public finance and economic strategies for the mid-term. "The Government considers it strategic to encourage investments aimed at promoting forms of circular economy and fostering the ecological transition by increasing the competitiveness and resilience of production systems to environmental and health shocks and firmly pursuing policies to tackle climate change aimed at achieving greater environmental and social sustainability. Particularly important will be investments to promote a new model of productive and industrial development, resource efficient and competitive, oriented towards growth, innovation and job creation. These innovations will need to be aligned with the European Green Deal, which remains the European Union's key strategy for the coming decades." See Italian Ministry of Economy and Finance, *Documento di economia e finanza 2020. I: Programma di Stabilità*, p. 16-17, http://www.mef.gov.it/documenti-pubblicazioni/doc-finanza-pubblica/index.html#cont1.

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highlight uncertainties and opportunities for accelerating the deployment of RES. It is vital to ensure that the Observatory is independent of short-term political pressures and other interests. It should therefore be made up of independent experts with expertise on a broad range of policy areas, including climate, economics, security, foreign, health and social policies as well as technological innovation. This new body should draw experts from existing public institutions, such as ENEA and Istituto Superiore per la Protezione e Ricerca Ambientale, but it also needs to include other views from think tanks, academia, foreign policy experts, financial analysts and civil society organisations. This body could recommend policy actions to the government and the Parliament based on the evolving national and European targets. Assessing the risk and opportunities of the transition is key to building resilience and identifying the national interest, which needs to shape Italy's geopolitical position in a rapidly changing energy world.

4) Without a cross-government dialogue between different ministries, it is going to be difficult to find convergence and align diplomatic efforts across areas of competence (technology, economy, security, etc.). Stronger coordination is needed to better assess the speed of the transition, its risks and opportunities, how energy security is changing and ultimately to be better informed and aligned across areas of government.

Building on efforts by the Policy Board on Inter-ministerial Coordination on Energy Issues – established within the Directorate General for Global Affairs of the Italian Ministry of Foreign Affairs and International Cooperation – further strengthening of coordination and inter-ministerial dialogue are desirable. An institutionalised Coordination Group for Energy Diplomacy would comprise senior officials from different ministries (Foreign Affairs, Economic Development, Economy and Finance, Infrastructure, Environment, and Agriculture) and the Office of the Prime Minister. The work of the Coordination Group for Energy Diplomacy could (also) be informed by the Energy Observatory, which could be mandated to explore key questions and issues. The objective is to align diplomatic efforts across different areas of competence, to better assess the speed, risks and opportunities of the transition, and ultimately to discuss how to design a more strategic and proactive energy foreign policy in line with climate change goals.

5) A crucial element for Italian foreign policy is to assess and adapt relations with today's fossil fuel suppliers, namely Russia, Libya, Algeria, Egypt, Saudi Arabia, Qatar, Iraq, Iran and Azerbaijan. On the one hand, reduced fossil fuel exports are likely to erode revenues and fuel instability in these countries, particularly those with limited financial buffers. On the other hand, they will also gradually erode interdependence between these countries and Italy. Given Italy's geographical location, crises in fossil fuel producing countries in the MENA region could have massive security spill-overs on Italy in terms of hostility by non-state actors, smuggling and migration flows. Maintaining trade interdependence with countries of Italy's neighbourhood in a highly decarbonised world is sensible, and should (also) build on RES.

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New ways of constructively engaging with these partners need to be found. Italy, with the support of the EU, should favour the establishment of new economic development models in those countries. Italian companies could find new business opportunities in this region, which has some of the world's best solar irradiation patterns, thereby diversifying its commercial relations with them. It could provide cooperation to build new domestic, sustainable and resilient markets and supply chains. RES can give rise to new value chains diversified from fossil fuels and create local employment, especially for youth. The MENA region in particular has a vast potential for clean energy, which could be produced at very competitive prices and be primarily used to spur domestic energy access and local industrial development. In addition, a residual part of this energy could potentially become a source of supply for Italy as well (provided that suitable and affordable ways of transporting it are found).

6) At the same time, attention should be given to strengthening political relations in growing markets for clean technology, such as Latin America, Africa and East Asia. Through its renewable energy producers and utilities, Italy is already an "energy supplier" in regions beyond its immediate neighbourhood, and this role could be expanded. In this way Italy could establish new bonds of positive interdependence with new countries and regions beyond traditional areas of interest, thereby expanding its geopolitical reach and diversifying its exposure to geopolitical challenges. This economic bond should be strengthened by high-level political engagement. Italian embassies and trade offices should facilitate the identification and implementation of business opportunities for Italian companies in partner countries, as well as the transfer of know-how and regulatory best practices for the integration of renewables in the energy system – including the adoption of smart metres and digital solutions.

This paper points to the need to further investigate the interrelation between RES and foreign energy policy through three interventions: 1) the identification of Italy's untapped comparative advantages in RES technologies; 2) an assessment, recurring and updated, of how specific energy security issues are concretely changing as a result of wider RES penetration and trends such as decentralisation, regionalisation and digitalisation; and 3) the identification and formulation of targeted RES diplomacy initiatives in different geographies around the world. This paper provides an initial overview, which can hopefully serve as point of departure. Further investigation needs to be consolidated with quantitative analysis and scenarios.

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