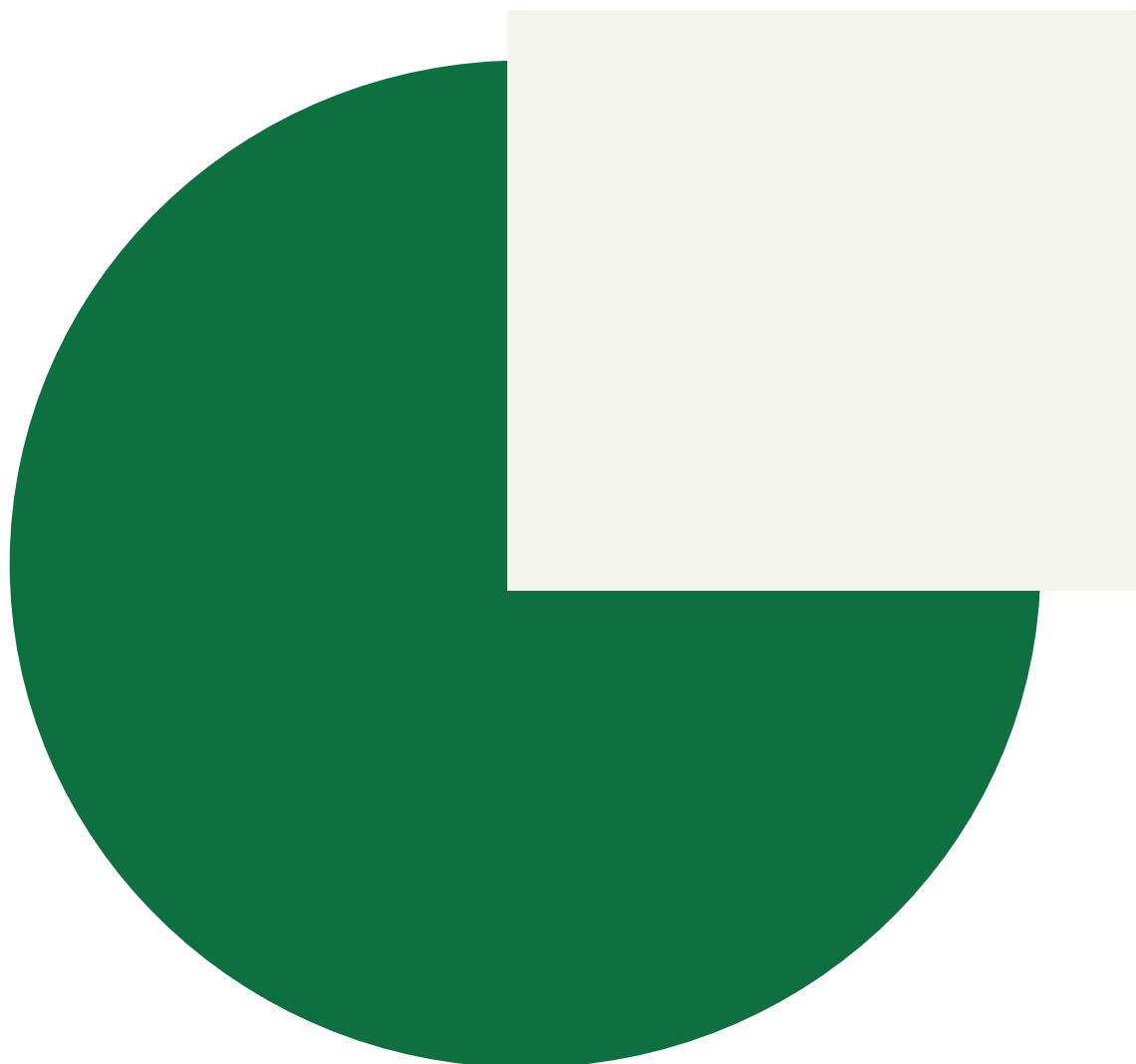


China at the gates of the European power grid



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Authors

Clémence Pèlerin, Hugo Marciot

Foreword

Olivier Grabette

45, Rue d'Ulm 75005 Paris
legrandcontinent.eu
geg@ens.fr

References

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Olivier Grabette • RTE General Delegate, President of CIGRE France

Foreword

China inspires both fascination and concern, and the electrical sector is no exception. China is fascinating by the scale of its transformations, the size of its market, the amount it invests, and its technological capacity. But it instills fears with its industrial giants ready to conquer the global electricity market, threatening the European champions in the sector; not to mention its hegemonic views expressed in the Belt and Road Initiative.

For more than 20 years, through the various energy directives, European institutions have looked at the role of electricity transmission system operators through the lens of the internal market and the competition between its players. When the State Grid Corporation of China (SGCC) acquired 25% of REN, the Portuguese gas and electricity transport operator, a thunderbolt hit the small world of the European power grids. How could an integrated Chinese state-owned company that manages the transmission, distribution, and marketing of electricity, that has numerous technology suppliers at its disposal, do what was denied to RTE because of its patrimonial link with EDF?

In 2015, at the launch of the Bits & Watt program at Stanford University, I had the opportunity to attend the speech by Liu Zhenya, former CEO of SGCC and initiator of the Global Energy Interconnection, a project presented as China's contribution to the fight against global warming and to solving energy access issues for the greater good of humanity. While this rhetoric may sound amusing, the project is actually growing. For instance, China has assigned a dedicated workgroup to support the project in the CIGRE, the International Council on Large Electric Systems. Regarding technology, Chinese industrials are on the verge of becoming leaders in ultra-high voltage power electronics, which are fundamental building blocks of the project. What conclusions can be drawn? What strategy could be implemented in response to this Chinese vision of a global electricity network that it would undeniably dominate?

This study by the Groupe d'études géopolitiques rightfully reminds of what China has already done for more than 8 years in our continent's electricity sector, crucial to the European low-carbon strategy. Building on this, the authors fully analyze the different facets of the Chinese strategy and highlight the risks for European energy and technological sovereignty. Finally, they suggest possible responses for the EU.

To me, this reading seems essential for any leader in the sector and politician interested in energy and European sovereignty, in order to understand what is at stake in the future of global electricity networks.

Executive Summary

The same way as roads are key points for any land-based military conquest, 21st century networks are crucial targets for intelligence, influence and economic warfare. In an increasingly digitalized industrial economy, power infrastructure becomes the target par excellence. They are less known to the general public but turn out to be even more strategic than telecommunications networks. Because they carry electricity from large production facilities to the other end of a country, because they interconnect a country's power grids to its neighbors', electricity transmission networks are now essential to economic and social life. Any blackout would indeed cause huge socio-economic costs. As these networks go hand in hand with the European construction, they will be crucial for greater European solidarity in terms of energy.

Hence, companies operating these European electricity transmission networks are highly strategic for the European economy. As such, they spark the interest of external players. China, in the first place, is worrisomely increasing targeted investments in the European power transmission sector. What are the objectives behind such investments and what are their consequences? How can these infrastructures and their operators - who continuously deliver electricity where it is needed- be better protected from such outsiders' moves in order to ensure the security of the European Union's electricity supply?

To fully grasp the implications of those investments for European energy security, they must be analyzed in the light of the Chinese global strategy, adopted over the past decade. These acquisitions reveal the weakness of Member States' foreign investments control tools and underline their inadaptability to the electricity transmission networks specificities. With the European Commission vowing in early 2020 to enhance these tools and with the ambitious Green Deal depending on power-transportation networks to support the energy transition, it is of utmost importance to provide specific and reinforced protection to these strategic assets.



Clémence Pèlerin • Project manager, energy and environment · Groupe d'études géopolitiques

Hugo Marciot • Policy advisor on electricity markets. He holds two MScs in both energy regulation law and energy economics

China at the gates of the European power grid

1. China's conquest of the European power sector

Energy has a very high capital intensity at all stages of its value chain. But most of all, it contributes to socio-economic development and has numerous geopolitical and environmental impacts. Today, although energy consumption in Europe is stable or even declining, electricity is a major and growing part of it. On the one hand, new uses, mainly arising from digitalization, are increasing the demand for electricity; on the other hand, energy transition policies aim to electrify the overall energy consumption, so as to reduce greenhouse gas emissions downstream, while decarbonizing production upstream, particularly through renewable energies. For these reasons, investments in the power sector and its infrastructure are growing significantly, mainly in Europe but also in other economically powerful countries.

The energy sector is indeed an integrated part of the new Chinese Belt and Road initiative (BRI). Moreover, according to recent research, energy represents two-thirds of China's spending in the BRI, the remainder going to the transportation and telecommunications sectors¹. In Europe, the surge of Chinese investments in all sectors is due to the combination of two factors. First, the 2008 European debt crisis. Then, they are fostered by the mutual sense of an economic opportunity to deepen Chinese-European relations, notably through the purchase of Euro Bonds and investments in strategic infrastructures. For example, between 2010 and the end of 2012, the volume of Chinese investments in the European Union qua-

drupled, from 6 to 27 billion euros². This is due to the decrease in asset values and to a revised Chinese policy for overseas mergers and acquisitions. This is completed by the long-standing phenomenon of deindustrialization in the West and China's ambition to pursue an active investment policy in Europe. Between 2015 and 2016 alone, Chinese investment in the EU grew by 77%; among the most concerned sectors are telecommunications, real estate and automotive. In 2019, the transport, energy, utilities and infrastructure sector was the fourth largest sector of Chinese foreign direct investment (FDI) in the EU, with 800 million euros³.

The Global Interconnection Initiative: The view of Climate Leadership through Electricity Infrastructure

Within the energy sector, electricity is an interesting component of the BRI in Europe for China, as it is a strategic sector for the Union. More specifically, as it is embedded in a complex value chain and lies at the crossroads of competition, security and innovation, electricity transmission is one of the pillars of the new BRI. This is demonstrated by the mega-project of intercontinental connection of Chinese and European power grids and, in the longer term, the global junction of all power grids worldwide. Presented in 2015 by President Xi Jinping at the United Nations Sustainable Development Summit, this project known as the Global Interconnection Initiative is led by the Global Energy Interconnection development and cooperation organization (GEIDCO), an international nongovernmental organization. It aims primarily at developing electricity infrastructure on both sides of the Eurasian continent. According to GEIDCO, the Global Energy Interconnection project intends to establish a «modern, clean and electricity-centric energy system that is globally interconnected, jointly built, and mutually beneficial to all»⁴. This international infrastructure responds to three well-identified challenges in the energy transition: interconnecting national and regional energy systems to (1) facilitate and improve the integration of renewable energies, (2) increase the flexibility of networks in the face of rising alternatives and intermittent energies, and (3) ensure greater security of electricity supply, in a context of strong electrification of the energy mix. The organization's ultimate objective is to achieve a low-carbon and sustainable development⁵.

This project of unprecedented scope will be deployed until 2070 in successive stages. The first stage, estimated in 2035, plans to connect the Chinese to European domes-

1. Thomas S. Eder et Jacob Mardell, *Powering the Belt and Road*, Mercator Institute for China Studies, 27 juin 2019

2. Jamil Anderlini, *Chinese investors surged into EU at height of debt crisis*, Financial Times, 6 octobre 2014

3. Agatha Kratz, Mikko Huotari, Thilo Hanemann and Rebecca Arcesati, *Chinese FDI in Europe: 2019 update*, Mercator Institute for China Studies and Rhodium Group, April 2020

4. Global Energy Interconnection, *Development concept*

5. Global Energy Interconnection, *Global consensus*

tic networks; the second stage, in 2050, aims at developing the African and American networks; finally, the third stage will focus on connecting the Arctic, linking the five continents through these «energy arteries»⁶. In addition to its futuristic dimensions, this project is built on Ultra High Voltage («UHV») network for the transmission of very high-speed, alternating or direct, electrical current. China has been developing this technology since the end of the 2000s as a necessary complement to the deployment of telecommunications technologies such as 5G. Thanks to substantial state and local funding and thanks to the scale of the networks installation (in 2020, China would have spent more than \$20 billion on the deployment of UHV projects)⁷, China has already managed to significantly reduce the costs, although several difficulties remain. One is technical and lies in the fact that, despite fewer electricity losses by the Joule effect, the transmission distances of the GEI project will necessarily imply significant losses in the transmission of electricity, which will further reduce profitability. The other difficulty is economic: UHV cabling is very expensive, especially on a continental and global scale, even though economies of scale theoretically seem considerable. While the post-coronavirus context could slow down the deployment of this project abroad, it could be an opportunity for China to activate economic stimulus plans, through public investment and major industrial programs⁸. The Chinese Communist Party have already taken that step with the announcement of new infrastructure projects in March 2020⁹.

Since its creation, the GEIDCO has been embedded in international partnerships and in the fight against climate change within climate negotiations and initiatives. The organization published multiple Action Plans, including the 2017 Action Plan to promote the United Nations 2030 Agenda for Sustainable development, the Action Plan to promote the Paris Agreement during the COP24, and the Action Plan for the Promotion of Global Environmental Protection¹⁰. In an effort to enhance the legitimacy of the project, partnerships with more than 70 countries and organizations such as UNFCCC or the G20 Global Infrastructure Connectivity Alliance have been concluded. In this regard, it is particularly interesting to observe how the rhetoric promoting this project, which is also an integral part of the Belt and Road Initiative, are meant to coincide with global policies to fight climate change. China has indeed installed more renewable energy facilities than any other country in the world and has multiplied both political and industrial initiatives to assert its leadership

in this area. China's foreign investments in fossil fuels are contradicting this image of an ambitious environmental player both at home and in international negotiations¹¹.

The debt crisis in Europe and the Trojan horse of Chinese strategic investments in electricity transmission

Chinese investments in strategic infrastructure stem from the economic and financial crisis of 2008-2012. In the years immediately following the financial crisis, Southern Europe was the main recipient of these transactions. Italy accounted for nearly the annual total in 2014¹² and became in 2019 the first European country to officially join the BRI by signing a memorandum of intent and more than 2.5 billion euros in contracts. Some symbolic announcements marked the 2010s, such as the acquisition of a 51% stake in the Greek port of Piraeus in 2016, the launch of the 16+1 Format in 2012¹³ and the increased cooperation between the Italian shipbuilder Fincantieri and the Chinese State Shipbuilding Company.

The analysis of Chinese investments in European energy infrastructure unveils recurring methods and objectives. First, Chinese companies usually acquired majority stakes through initial minority stakes. In addition, these heavy investments focus on specific segments of the energy value chain, aiming for both influence and, most of all, profitability. In this regard, power networks are ideal investments due to their unique revenue profile, regulated and in a natural monopoly situation on national land¹⁴. Whether in electricity transmission or distribution networks, the 2010s recorded substantial investments, first in Southern European countries, which were undergoing massive privatizations, and later in Northern Europe.

In 2011, the Portuguese government sold its shares in the national transmission system operator (TSO), Energias de Portugal (EDP), as part of the rescue and privatization program set up by the European Commission and the IMF. The state-owned company China Three Gorges (CTG) then bought them back for 2.7 billion euros. Six years later, as the main shareholder with 23.27% of the capital, CTG filed a takeover bid to buy out all EDP's remaining capital for 9 billion euros. The initiative was prevented by EDP's statutes, which prohibit any shareholder from holding more than 25% of the capital. The takeover bid,

6. Global Energy Interconnection, *Development strategy*

7. Bloomberg News, *A 1,000-Mile Long Clean Energy Artery Is Completed in China*, 4 juin 2020

8. 7 priority areas in the field of infrastructure have been identified by the PCC for post-COVID economic recovery: the 5G network, industrial IoT, data centers, UHV transport networks, IRVE and high-speed lines between the country's major cities.

9. Power-Technology.com, *China Develops \$26bn Ultra High Voltage Electrical Grids to Stimulate Economic Recovery*, 22 mai 2020

10. Global Energy Interconnection, *Global consensus*

11. Clémence Lizé and Clémence Pèlerin, *Climate: where is China going?* Le Grand Continent, April 20, 2020

12. Id.

13. The 16+1 Format is a multilateral economic partnership signed by China and 16 Central and Eastern European countries (Albania, Bulgaria, Bosnia and Herzegovina, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Montenegro, Poland, Romania, Serbia, Slovakia, Slovenia).

14. Nabil Wakim, *Comment la Chine achète l'Europe de l'énergie*, Le Monde, August 29, 2018

launched in May 2018, was dropped almost a year later as shareholders refused to change the said-statutes. However, this is not the only remarkable investment in the Portuguese power system: in 2012, CTG also acquired 49% of EDP Renewables - EDP's renewable energy subsidiary - and the state-owned investment company CNIC Corporation Limited in turn acquired 5% of EDP's capital in 2015. State Grid Corporation of China (SGCC) also purchased 25% of the grid operator Redes Energéticas Nacionais (REN) for €387 million in early 2012, becoming the largest shareholder. It was then in a position to appoint the chairman and three members of the board of directors¹⁵.

Portugal best illustrates this Chinese investment strategy, which is directed towards various components of a strategic and traditionally monopolistic value chain, and fostered by the European austerity context¹⁶. Other Southern European countries such as Italy or Greece have experienced the same investment moves. In 2014, SGCC bought 35% of the Italian public holding CDP Reti for 2.4 billion euros, «the largest investment SGCC has ever made abroad, but also the largest contract ever signed by China in Italy»¹⁷. CDP Reti is also a 30% shareholder in the TSO Terna and the gas operator Snam. Through this acquisition, SGCC therefore took a blocking minority and a voting right in the board of directors of these two companies. Although it is not a TSO, the equipment manufacturer Shanghai Electric Power concluded in December 2014 a strategic partnership with the Maltese TSO Enemalta, by acquiring 33% of its capital. In Greece, SGCC had already acquired a minority stake (24%) in the Independent power transmission operator (ADMIE) for 320 million euros in 2014, the Italian TSO Terna entering ADMIE's capital at the same time. Once again, the Greek government sold its shares as part of the Greek rescue plan and to comply with requirements imposed by the IMF in exchange for fundings.

Northern Europe is not spared by this dynamic, although it is significantly different there. In the United Kingdom, the economic context surrounding these decisions is dominated by Brexit and has more to do with reorienting investment in the British economy outside the Union. Theresa May's government nevertheless approved in 2017 the sale of 61% of the TSO National Grid gas division to an international consortium including the China Investment Corporation (10.5%) and investors such as Macquarie (14.5%)¹⁸. Moreover, SGCC acquired

24.92% of the holding company Encevo, which in turn owns the Luxembourg TSO Creos. Yet, in other instances, governments interventions effectively blocked some takeover attempts, thereby preserving European shares in some TSOs. For example, the Spanish government did not respond to SGCC's interest in purchasing its share of the TSO Red Eléctrica de España (REE). In Germany, where power transmission relies on four different TSOs, the 50Hertz TSO has twice seen 20% tranches of its capital put up for sale by their respective shareholders. Twice, SGCC attempted to buy them back in order to give its equipment subsidiary a significant advantage in future calls for tenders related to the extension of the German network¹⁹. Twice, German institutions opposed these acquisitions by involving the public bank Kreditanstalt für Wiederaufbau (KfW). In Belgium, the electricity distributor Eandis was also coveted by Chinese investors, but the city of Antwerp barred an attempt to buy 14% of the shares²⁰. As of today, China successfully acquired TSOs' shares in seven EU Member States.

A recent and heterogeneous awareness in Europe

In specific terms, these acquisitions have two direct implications for the European electricity sector. On one side, they often grant voting rights to Chinese state-owned or parapublic companies in board of directors of grid operators, which are directly involved in the energy security of member states. On the other side, they go hand in hand with a deeper financial dynamic, which has already affected other components of the electricity value chain, such as power generation. But these acquisitions take on their full meaning once put in the light of the aforementioned GEI project: Italy and Greece, both in terms of harbours and energy, are ideal entry points for the transcontinental grid. Some analysts even fear that a sufficiently important Chinese influence on European electricity infrastructure will eventually allow China to sell domestically produced electricity to EU member states at a cheaper price, as a result of the abundant electricity production that would flow from the world's first renewable power plant. At first glance, such a transcontinental network may seem advantageous in all aspects. It would grant access to cheap renewable electricity, making it beneficial for both the environment and the European consumer. But these advantages hide less explicit economic and geopolitical effects. The effect of economic dumping and technological lag, as already observed in other sectors, would be particularly strong in the case of a transcontinental network. China would indeed continue to supply European countries with renewable means of production (solar panels, wind tur-

15. Andrei Khalip, Factbox: *Chinese investments in Portugal*, Reuters, May 14, 2018

16. Xu Yi-chong, *Sinews of Power. Politics of the State Grid Corporation of China*, Oxford University Press, 2019

17. French.china.org.cn, *China's SGCC completes acquisition of 35% of Italian company CDP Reti's shares*, December 1, 2014

18. Chris Peterson, *CIC buys 10.5% of National Grid's gas division*, China Daily, 9

décembre 2016

19. DW, « China's SGCC to buy stake in German grid operator 50Hertz », février 2018

20. Alan Hope, *Antwerp puts end to potential Chinese energy deal*, Flanders Today, 3 octobre 2016

bines, power electronics, etc.), while providing them with renewable electricity at a lower price than that at which Member States could sell their; a phenomenon that arises from the combination of the scale effect of its plants and the production costs internalization. Furthermore, this abundance of Chinese renewable power and its cheapness could make European countries highly energy-reliant on a foreign power, thereby reproducing the dependence on Russian gas. Finally, the potential complementarity of production profiles (Chinese renewable production reaching high levels when European renewable production is low, for example at night, due to time differences) could lead in the most extreme scenarios to a strong marginalization of the European conventional (i.e. thermal) production, which will likely be less needed.

Chinese investments in European electricity infrastructure peaked between 2012 and 2016, at the height of Member States' economic vulnerability, primarily in Southern Europe. It is interesting to note that this trend was nevertheless preceded by a decade of close cooperation between the EU and China on energy and economic matters. This is particularly evidenced by the launch in 2003 of the EU-China Comprehensive Strategic Partnership and the EU-China 2020 Strategic Agenda for Cooperation.

The tone of the strategic cooperation between China and the EU has substantially changed compared to the early 2000s and two political stances, around which Member states position themselves with increasing assertiveness, have risen. On the one hand, the general opinion and several politician stances see these investments as an economic and industrial opportunity; Italy's official membership in the BRI and the conclusion of a Memorandum of Understanding in March 2019 (two years after the signing of a first Action Plan for the Strengthening of Economic, Commercial and Cultural-scientific Cooperation between Italy and China 2017-2020) is a good example. By sealing a privileged relationship that satisfies both Italian export prospects to China and the Chinese investment strategy in Europe, both parties seek to hook up Europe and China through Italy's «traditional role as terminal of the maritime silk routes»²¹. The Under Secretary of State at the Ministry of Economic Development, Michele Geraci, even called on the European Commission to take greater account of Member States commercial interests in the construction of its trade policy with China²². This intervention claims political and commercial freedom in a context of disagreement between Member States on the subject. Portugal also concluded a memorandum of understanding with Beijing in December 2018 deepening economic cooperation within the BRI, mainly regarding infrastructures. Portuguese diplomacy has nevertheless

denied claims of privileged relationship or -or even dependence- with China²³. But the Minister of Foreign Relations Augusto Santos Silva told the Financial Times that he hoped for «credible» offers from European and American investors in future calls for tenders, lamenting that in the case of energy companies liberalized as from 2011, only Chinese investors were convincing²⁴.

On the other hand, other countries have recently toughened their approach to Beijing, among them Germany, as aforementioned, and France. Since 2017, the two countries have jointly called for new regulations regarding foreign investment (see below). Following the cooperation and the development of mutual economic opportunities that prevailed from the early 2000s to the mid-2010, more voices in Europe are speaking out against a purely competitive approach to network infrastructures that pays little heed to their geostrategic importance. This view has occupied a central place in the 2017 European debate around the questions of China's market economy status and the European institutions' response to the risks of dumping, debate in which the European Parliament was given a central role²⁵. However, the increased outreach of the Global Energy Interconnection in international organizations, and its promotion by China, both in terms of development and energy transition, suggests a gap with European vigilance.

Still, electricity transmission infrastructures - held either by their operators or by their government- are by their very nature essential to a country's economic and social activities. They are also hubs of technological innovation, and the interconnection of European networks makes the operation of each national grid particularly crucial for the supply of neighboring States. These continuous cross-border flows of electricity induce an energy solidarity that strengthens European cooperation and integration. As they start acting as facilitators of the building of the internal electricity market, these networks become highly strategic infrastructures for the European Union.

The crucial importance of these networks for the European power system - and, by extension, for the European economy as a whole - calls for special protection against foreign takeovers. Alignment of foreign interests with those of EU Member States is inherently uncertain and any foreign acquisition would likely pose risks for the European electricity supply and economies. Because these buyouts are massive and originate only from China, they are a major continental issue, especially as European electricity markets and systems are increasingly interconnected and weakened as a result. The presence of

21. Memorandum of understanding available at the following link: http://www.governo.it/sites/governo.it/files/Memorandum_Italia-Cina_EN.pdf

22. Sarah Zheng, *Italian government's China expert urges EU to make it easier for member states to deal with China*, South China Morning Post, 15 mai 2019

23. *Lisbon rebuffs claims Portugal is China's 'special friend' in EU*, Financial Times, 19 janvier 2020

24. id.

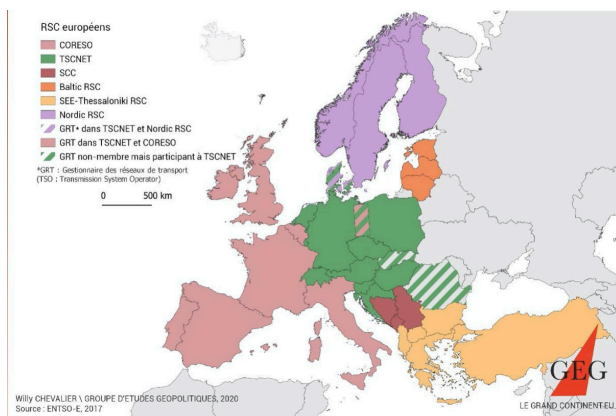
25. Gabriel Grésillon, *L'Europe trouve enfin la parade face au « Made in China »*, Les Echos, October 3, 2017

a third country in the capital of several major TSOs reveals the economic fragility of the EU electricity sector, which allows a third country to weigh on European energy security.

2. Strategic assets imply additional protection: electricity supply from Vilnius to Lisbon without flowing by Beijing

Amid this uneven awareness in the EU and the strategic nature of European transmission networks and their operators, drawing lessons from the Chinese investments is crucial for both European sovereignty and security. To better protect these strategic networks, the European framework needs new appropriate measures that could include requiring European ownership of these infrastructures or toughening foreign investment controls.

Encouraging minimum government ownership of transmission facilities



Despite the importance of the issues at stake, they remain fairly absent from the public debate. In addition, as the Union sticks to its neutrality regarding members' ownership regimes, there are no EU-wide requirements regarding the ownership of electricity transmission networks. At most, the EU has extended the 1996 and 2003 directives that introduced the first rules for legal and functional divisions (subsidiarization and management autonomy) between the electricity generation and supply and the network operation within the vertically integrated company to which the TSO belongs. This extension achieved by the Directive 2009/72/EC of July 13, 2009 draws common rules for the internal electricity market and outlines two options for structuring the ownership of TSOs. The first one is an unbundling model, supported by the Commission: under an ownership unbundling regime, a given legal entity must no longer be able to exercise simultaneous economic control over both a generation/supply company and a transmission operator. The second one suggests an independent system operator, ensuring the integrity of vertically integrated groups and the separation of interests (see below). Apart from this common

framework that ensures TSOs independence from their parent company, TSOs' ownership is still regulated by individual Member States' property laws. European treaties - and article 345 of the Treaty on the Functioning of the European Union (TFEU) - indeed recognize the discretionary power of member states regarding their ownership regimes, thereby limiting European competence in this area. Nevertheless, extending the rules governing the unbundling of regulated networks to vertically integrated companies could usefully be considered, especially in the fields of services, equipment, or technologies that are essential for these networks.

The first European directives, mainly competition-oriented and devoted to the liberalization of national energy sectors, however fail to protect these networks from foreign investments. TSOs are indeed ideal targets for foreign state capitalism and remain relatively unprotected against non-European takeovers. In fact, there is no minimum government ownership requirement and Member states retain the right to organize their national electricity sector. Thus, capital ownership patterns are very different from a State to another, and even - when the same State hosts several TSOs - from one TSO to another [cf. appendix 1]. Some TSOs are fully owned by private shareholders and others are listed on stock exchanges, like REE, which was listed in 1999 on the four Spanish stock markets with 80% of floating capital. The majority of TSOs are nevertheless entirely state-owned, held either by their government or by state bodies. As such, some have minimum government-owned stakes requirements, while others, although some of their capital is government-owned, are not subject to such an obligation. The French case is particularly emblematic in this respect since allowing private investors to enter RTE's stock listing would require going through a legislative procedure RTE being precisely one of the TSOs whose government ownership is guaranteed by law²⁶. The Energy Regulatory Commission (CRE) also retains the right not to certify RTE in the event of a foreign takeover it deems threatening to national or neighbors' supply security.

Not to mention those without a mandatory government ownership, 16 TSOs among the 42 members of ENTSO-E²⁷ are opened to new investors, and among these, only ten remain free of any Chinese participation. This significant exposure to foreign investments (in addition to those already registered by the European Union) should urge the EU to reconsider - or at least complete - its energy policy carried out through successive regulations and directives in the light of the new challenges posed by the Chinese expansion strategy and, perhaps, that of

26. Article L.111-42 of the energy code

27. The European network of transmission system operators for electricity, or ENTSO-E, is the European network of electricity TSOs. Created in 2009 as part of the European Union's third legislative package, it brings together 42 TSOs operating in 35 countries across Europe.

other states in the future. If the government presence in some TSOs' boards of directors has, for the time being, protected them²⁸, other countries have nevertheless already been unable - or reluctant - to oppose such acquisitions. Because any derogation from Article 345 of the TFEU is impossible, the implementation of an European framework that would ensure full national or European ownership of these strategic companies is hindered.

Within the limits set by the latter article, such an European framework could be based on incentives, through position papers or reports, to create a concerted system of golden shares held at the national or European level. Such a system would thus make it possible to establish a minimum government - or public - ownership and would ensure the right to monitor capital changes of TSOs. Public authorities would then be able to block decisions that threaten the supply security of Member States.

The European Commission does not favour the principle of this type of shares, and while the Court of Justice of the European Union (CJEU)'s jurisprudence authorizes them in specific sectors such as energy, it strictly regulates their implementation. Provided that they are properly justified and conditioned, the Court tolerates golden shares to protect «energy supplies»²⁹ when they allow public authorities to block decisions threatening supply security. Without prejudging the CJEU's ruling in the event of litigation, the conformity of these specific actions with the TFEU would seem very likely - or at least desirable. In accordance with the criteria listed by the CJEU³⁰, they indeed seem well justified by compelling reasons of general interest and proportionate - i.e., are likely to successfully achieve the goal without going beyond what is necessary.

Despite these legal uncertainties, which can be dispelled, and seem limited compared to the stakes of energy security, it thus appears urgent to homogeneously reinforce, at European level, government presence in the different TSOs shareholding structure. This would allow the community to assess and, if necessary, block any attempt to acquire part or full control of these strategic companies.

Completing a European framework still inefficient in controlling foreign investments

As an alternative - or complement - to minimum government ownerships or golden share mechanisms, it is necessary to set up an efficient monitoring of future foreign investments in these strategic sectors, in order to preserve the supply security and hence the European

economy. But EU tools remain superficial and are not adapted to the issues at stake. The European framework for controlling foreign investment in strategic infrastructures remains incomplete to this day, and this is hardly not compensated for by the few observable national systems as of today.

Indeed, several Member States already have put review mechanisms in place, based on Article 65 of the TFEU which, for reasons of public order or security, allow the control of direct investment as a derogation from the free movement of foreign capital. Although this framework is the basis of these empirically constructed instruments, it does not help building a European response to economic intelligence concerns, but only responds to public order and security considerations. While thirteen Member states have put in place extremely heterogeneous foreign investment control mechanisms, the outreach of these instruments appears to be unequal. In Germany, for example, investments from outside the EU are extensively assessed and include the service providers or designers of softwares used by strategic-sectors companies such as electricity networks or nuclear power plants. In 2012, Italy developed specific control tools (especially blocking rights) in case companies owning or controlling strategic assets in the energy sector were taken over. It did not, as mentioned above, prevent SGCC from acquiring a stake in CDP Reti, which in turn owns a significant share of the capital of the TSO Terna (see above). Finally, following General Electric's acquisition of French flagship Alstom's energy activities in 2014, France has strengthened its control system by extending it to six new «essential» sectors to the preservation of national interests, among which energy supply. Because regulation systems are not homogenous among Member states, controlling investments directed towards strategic companies is carried out in an uncoordinated and incomplete manner.

Amid growing concerns in France and Germany over the increasing amount of Chinese investments in strategic European infrastructures, the European Regulation of March 19, 2019³¹ establishes a framework for the «screening» of foreign direct investment (FDI) posing a risk to security or public order. The new framework creates a cooperation mechanism through which Member States and the Commission can exchange information on specific investments. It also standardizes some requirements for Member States wishing to maintain or adopt a screening mechanism. Above all, it allows the Commission to express views when an investment threatens the security or public order of more than one Member State, or when an investment is likely to affect a project or programme of interest to the Union as a whole, including common interest projects necessary to the trans-European strate-

28. This is for example the case of the Spanish TSO REE, for which the Spanish government has not followed up on the intentions to buy back its shares expressed by the Chinese TSO SGCC.

29. ECJ, No. C-503/99, Commission v. Kingdom of Belgium, 4 June 2002

30. ECJ, No. C-483/99, Commission v. France, June 4, 2002

31. Regulation (EU) 2019/452 of the European Parliament and of the Council of 19 March 2019 establishing a framework for the screening of foreign direct investment in the Union

gic infrastructures (TEN-E). The regulation was passed in March 2019 and is only fully applied since October 11, 2020 (although the impact of the Covid-19 pandemic on its implementation is not yet known)³².

While this unprecedented «investment screening» is a major step forward, it does not fully address all the requirements and challenges mentioned about electricity transmission. Only does it partially attune control criteria of state-specific, already-implemented systems, but without unifying control measures at the European level or imposing criteria to Member states' national screening systems. This partial control exercised by the Commission, far from being mechanical, thus falls within its power of self-referral and only applies to future infrastructures part of the European development programs for electrical interconnections (TEN-E). However, share acquisition by Chinese investors in a European TSO goes beyond this scope and, through operators, incidentally impacts existing network infrastructures.

This framework, with its complex articulation of non-standardized and sometimes incomplete systems, seems unsuited to an external threat that grows bigger with each acquisition. The European Commissioners for Competition and Internal Market Margrethe Vestager and Thierry Breton recently published a white paper on new tools for controlling foreign investments in the European Union^{33,34}, which provides an opportunity for the EU to start strengthening and standardizing the controls of investment in the electricity sector.

It would thus be best that the draft laws announced for 2021 include measures to control foreign investments in electricity transmission. They could, for example, consist of prohibiting any investment from non-EU countries in these strategic companies. Alternatively, they could establish an automatic and collegial control of each investment, involving the European Commission, the Member State, ENTSO-E, the concerned TSO and, where applicable, the TSOs indirectly affected by this investment³⁵. Regarding procurement and international trade, TSOs could also be required to purchase essential services, equipment and technology from countries that are socially, environmentally and competitively equivalent with the EU.

32. Communication CI 99/1 of 26 March 2020 of the European Commission on guidelines for foreign direct investment and the free movement of capital from third countries and the protection of European strategic assets, in view of the application of EU Regulation 2019/452.

33. Virginie Malingre, Comment Bruxelles entend mieux protéger l'Europe des ambitions économiques chinoises, *Le Monde*, June 17, 2020

34. https://ec.europa.eu/competition/international/overview/foreign_subsidies_white_paper.pdf

35. Other TSOs may indeed be directly concerned by an extra-European participation in the capital of a neighboring TSO if they participate with the latter in regional cooperation initiatives through future regional cooperation centers or the operation of joint ventures dedicated to the creation of an interconnection.

Strengthen and encourage existing capital cooperation initiatives

Granting adequate legal and financial instruments to the TSOs and Member States would then put these critical infrastructures beyond the reach of non-European investors. Thus preserved, European TSOs would be able to maintain their cooperation based on co-ownership of strategic infrastructures.

Operational cooperation between TSOs already takes capitalistic shapes, through joint ownership or joint operations of infrastructures made up by several TSOs' networks. This cooperation turns out to be essential as TSOs increasingly need to coordinate their operations in a changing European power system. This is - and will increasingly be - marked by constantly developing interconnections, growing decentralized volumes of variable renewable energy, and increased cross-border flows of electricity as wholesale markets are more and more coupled. This last element, for example, led to the creation of the Joint Allocation Office (JAO), a joint venture co-owned by 25 European TSOs, which organised auctions for market players to acquire cross-border transmission capacity.

Here are some European TSOs joint ventures³⁶, which all pursue the common goal of interconnection: RTE and REE are equally shareholders of Inelfe, joint venture founded in 2008 to build interconnections between France and Spain, while National Grid has formed, respectively with Elia and Tennet Netherlands, the Nemo Link and BritNed joint ventures for the construction of the eponymous underwater interconnections.

The recent Clean Energy Package also strengthens these equity partnerships by requiring TSOs to shift their regional cooperation structures towards regional coordination centers (RCCs). These are intended to eventually replace their predecessors: the regional security centers (RSCs), the first of which were designed by some TSOs in 2008 and have since been extended to 5 regional centres by the European network codes to cover the whole of Europe. RCCs are companies exclusively owned by their customers (the TSOs) and are intended to provide them with various coordination services at a regional level³⁷. The TSOs must commit to these new structures both in terms of capital and human resources, since they currently provide human and financial resources to RSCs and will

36. A joint venture is a joint company owned equally by several companies and formed for the realization of a specific project, usually limited in time. The co-shareholder companies seek above all to create synergies between them by pooling their skills and technological know-how while limiting costs and risks.

37. For example, this involves coordinating actions to be taken in the event of an outage, forecasting the adequacy of electricity supply and demand in the short and medium term, or calculating exchange capacities between countries

also be required to do so for RCCs. From this commitment flows an increased interdependence and strengthened ties between TSOs, effectively aligning their interests for a stronger European solidarity in terms of energy.

Electricity flows do not stop at borders, as events affecting a country's power system affect its neighbours and vice versa. Therefore, as soon as the first interconnections emerged, a close coordination between TSOs became necessary. For example, it allows for collective decision-making and emergency measures, such as redispatching, to ensure the system's stability and the security of European supply³⁸.

Now that this TSOs cooperation is a significant element of the European electricity landscape, they must be perpetuated and even promoted. A way to encourage the creation of jointly-owned organizations would, for instance, consist in a required cost-benefit analysis prior to any potentially beneficial project³⁹. This would help identify its possible cross-border interest and support, when it makes sense, its Europeanisation by intensified capital links between TSOs.

While the various cross-border cooperation mechanisms cover the scope of operational exploitation, it seems to forget the R&D field, which is crucial in a context of massive infiltration of renewables and increasing interconnection of power systems. Yet, the creation of joint ventures, both to increase the visibility of these innovations and further strengthen the pooling of research resources, would be particularly useful in revitalizing R&D for electricity transmission. Sketched in a pioneering way as from 2015⁴⁰, these proposals could now benefit from the experience gained and the success of several joint ventures to be fully implemented and thus stimulate innovation in electricity transmission. In order to demonstrate their full European integration, these companies, jointly owned by the TSOs, could also adopt the status of 'societas Europaea', a universal legal form created in 2004 allowing a company to carry out its activities in all EU member states.

Strengthen cross participation between European

38. Redispatching is one of the «costly» remedies implemented by TSOs in the event of physical congestion on the network: in practice, it consists of modifying the generation plan in order to change the physical flows on the transmission network. It is generally considered in conjunction with countertrading, which consists for TSOs in prioritizing cross-border exchanges in the opposite direction of the constraining flow.
39. In such a scheme, the regulator could thus include the TSO projects of which it is aware through national planning schemes (for example, RTE's 10-year network development plan (SDDR) in France) and include it in the Ten Year Network Development Plan (TYNDP), a European 10-year network development plan drawn up by ENTSO-E to identify the most structuring European projects in terms of interconnections and the construction of new transmission capacity.
40. Michel Derdevet, «Energy, Networked Europe - Twelve proposals for a common policy on energy infrastructure», report to the President of the Republic, 23 February 2015

TSOs

Although they are a strategic link in the European electricity value chain, TSOs follow - at least when their capital is not partly held in the form of golden shares - classic economic strategies similar to those of any company. Cooperation initiatives between TSOs can thus take various forms that are more related to traditional strategic considerations (for example, the conclusion of strategic partnerships between TSOs) and even go as far as consolidation movements, opening up opportunities for the formation of European TSOs.

As such, consolidation patterns appear to be numerous. For example, REE, the Spanish TSO, owns 5% of the share capital of its Portuguese counterpart REN. Both have also concluded a strategic partnership allowing them to jointly invest in networks development in Portugal and Spain and, eventually, to participate jointly in international projects⁴¹. Similarly, the Montenegrin TSO CGES is 22.08% owned by the Terna group and 10.01% by the Serbian TSO Elektromrea Srbije (EMS). In 2010, the Dutch TSO TenneT acquired Transpower Strom-bertragungs GmbH - the TSO originally owned by the vertically integrated German company E. ON - renaming it TenneT DE. In the Netherlands, a bill was also introduced in December 2016 to possibly open up 25% of TenneT's capital to an independent TSO, provided that this cross-participation strengthens the strategic collaboration between the two. This participation could ultimately come from the German government itself, which recently indicated that it was considering the purchase of a stake in TenneT, with the German Ministry of Economy (BMWi) stating that «closer cooperation between TSOs in both countries as well as, perhaps, other neighbouring countries could contribute to a more efficient energy supply»^{42 43}. Far from being epiphenomena, these consolidation operations could continue and multiply, as some TSOs such as RTE have regularly expressed their desire to see such consolidations⁴⁴.

Nevertheless, the current regulatory framework hinders the possibility for some TSOs to invest in their neighbouring and European counterparts. It would in fact involve the redesign of the three unbundling models

41. [Reuters](#), «Red Electrica to buy 5% of Portugal's REN», mars 2007
42. Benjamin Wehrmann, Germany to buy stake in Dutch grid operator TenneT as part of broader energy cooperation, Clean Energy Wire, 20 may 2020
43. David Reay, Grid operator Amprion opposes German state investing in competitor TenneT, Clean Energy Wire, June 23, 2020. It should also be noted that if opposition to such cross-holdings exists, it is based on considerations relating to the role of the State in the economy and not on considerations of national sovereignty over these strategic assets, which may conversely allow for an openness to the principle of cross-holdings.
44. B. Mallet and G. De Clercq, «RTE reaffirms its desire to be a player in European consolidation», Reuters, February 2018. It should be noted that RTE is so far only considering acting as an investor and does not intend a priori to open its capital to other TSOs in the short term. Such an operation would in any case require a legislative amendment, as RTE is - as we have seen - one of the TSOs whose public ownership is legally guaranteed.

provided for by the 2009/72/EC directive⁴⁵ models. This directive establishes multiple organisation models like the “ownership unbundling» (OU) model which establishes a capital separation between the TSO and any company engaged in electricity production or supply. Consequently, it imposes a separation between the TSO and the vertically integrated company from which it is potentially derived. This model was for instance chosen by Elia, 50Hz and Terna. On the other side, the independent transmission operator (ITO) model allows the TSO to remain a subsidiary of the vertically integrated company and to own the network infrastructure. But it comes with various requirements aiming at guaranteeing their independence and neutrality towards third parties. This is the model that was chosen for Transnet BW and RTE. Finally, there is a third model that consists in an «independent system operator» (ISO). It has little presence in Europe and is mainly developed in the United States in an antitrust logic of prohibiting a State’s transmission operators from owning the network infrastructures of the neighbouring state. This model transfers network operational duties to a third company, the vertically integrated company retaining ownership of the transmission network.

Under the directive, the ITO status prevents the TSO, for example, from taking stakes in the share capital of a TSO with another status - and in particular the status of OU - since this would allow the vertically integrated owner of the ITO to control assets placed under a status of capital separation. As there are only a few ITO TSOs, this greatly limits the investment opportunities of ITO TSOs. RTE, an ITO subsidiary of EDF, had thus begun discussions with its shareholders in 2016 regarding a takeover of the Greek TSO ADMIE but finally abandoned the transaction as h ADMIE was considering converting to OU status⁴⁶. The European development prospects of an ITO TSO like RTE are hence constrained if it does not undergo a capital separation and convert to an OU status⁴⁷. However, the desire to see RTE freed from these requirements in order to «conquer markets in Europe»⁴⁸ has recently been heard again and it revives the intentions already expressed at the end of 2010.

Yet, cross-acquisitions between TSOs would help align the interests of Member States, further link their electricity systems, smooth the information sharing, and bring together national energy policies that are currently largely out of sync. The europeanisation of TSO’s shareholding structure would also be an additional defence against fo-

reign appetites and would take a significant step towards a genuine European pooling of electricity transport infrastructures. Acquiring stakes in other TSOs must thereby be encouraged at a European level by relaxing the rules on the ITO model. This would enable the beneficial entanglement of national electrical systems without sacrificing the historical ownership of transmission infrastructures.

Making regional synergies between TSOs the basis of a coordinated regional electricity policy

By further encouraging joint investment in electricity transmission networks, the European solidarity regarding electricity could be reinforced beyond the mere cooperation in building infrastructure. t, enhancing the coordination between Member states in managing the electricity flows and building on the complementarity of energy mixes (which differ according to national energy policies and decarbonation strategies) could contribute to create regional electricity hubs (which would incidentally be larger than the current regional exchange areas), and thus ensure a better alignment of national energy systems at a regional level.

If the regional scale is currently the relevant one for a coordinated management of transmission networks, it also seems to be an ideal starting point for coordinated European and national energy policies. Soon-to-be RCCs have enhanced coordination powers and, by nature, are part of a regional perspective. As cross-border structures for dialogue and cooperation, these new regional actors will have to prove their relevance by striking a delicate balance between the regional analyses they are mandated to do and the issues that may emerge at local levels, which are likely to be different depending on the additional tasks they will eventually be in charge of depending on regional needs. This unique institutional standpoint between the local, regional and European levels demonstrates the relevance of the regional level for initiating effective cooperation. One could even consider linking RCC’s analyses about electricity supply and demand, or their exchange capacities estimates between countries, to regional political bodies⁴⁹, thus establishing a political energy coordination in the region. Moreover, beyond this operational cooperation, there needs to be mutual discussions around national energy policies and their calendar, fFor instance regarding coal phase-outs in Germany and Spain or the future place of gas in Italy’s generation mix. In this regard, linking RCCs to political bodies would enlighten the concertation about these policies’ impacts on the regional electricity security.

The synchronisation of political calendars is of course

45. «Unbundling models in the EU», presentation of the Bundesnetzagentur at the 10th Congress of American and European Energy Regulators, The Hague, April 2013

46. B. Mallet and G. De Clercq, prec.

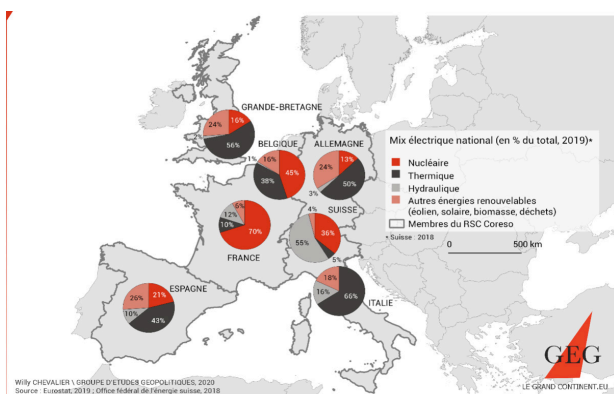
47. Fondation Jean-Jaurès, «Les réseaux électriques et gaziers, socles de la coopération énergétique européenne», note no. 251, March 2015.

48. Hearing of Mr. Jean-François Carenco, Chairman of the Commission de régulation de l’énergie (CRE), by the Economic Affairs Committee of the French National Assembly, July 7, 2020

49. Several existing regional cooperations between Member States - such as the Pentilateral Energy Forum, which brings together the States of the Central Western Europe (CWE) region, namely Benelux, Germany, France, Austria and Switzerland - could be associated with such a «2.0» version of the RCC.

based on the good will of governments, but the complementarity of the energy mixes of States located within these RCCs makes the regional scale the heart of a future coordinated energy policy. As an example, the Coreso area - former RSC which will likely be converted in a future RCC - bringing together Portugal, Spain, the United Kingdom, Ireland, France, Belgium and Italy, includes a very diversified power generation mix combining Italian electricity generation (almost 50% of which comes from natural gas) France's nuclear generation and the strong growth of variable renewables in Spain, which is also expected to phase out its nuclear plants (i.e. around 20% of its electricity generation) by 2035. Involving future RCCs in political discussions would thus help anticipate and coordinate electricity shortfalls resulting from these thermal plants phase-outs. If, originally, RCCs were viewed as an unavoidable step in the coordinated operation of European transmission networks, they could from now on become a genuine partner in the regional energy policy coordination. Such a prospect would not open the way to a decentralisation of the energy policy within Member States themselves, but to a European regionalisation of these national policies. It would therefore constitute one of the first step towards the development of a greater solidarity for the supply of electricity.

Electricity mix of RSC (Regional Security Coordinator) member countries Coreso in 2019



3. Proposals for a sustainable protection of European electricity transmission infrastructures

In the light of the challenges mentioned above and the real appetite of non-European States for energy infrastructures, which are yet essential to the proper functioning of the European Union's economy, it now seems more than necessary to focus on the protection of these strategic infrastructures and their operators. If these financial moves, in the case of China, are part of a clear, methodological and accepted geopolitical strategy, other countries whose international influence is no longer to be demonstrated - such as the United States, who precisely demonstrated their ability to leverage all the tools of

economic warfare and intelligence during the purchase of Alstom's energy division by General Electric - could in fact follow similar strategies in the future.

Various measures, whether regulatory tools or structural adjustments to the organisation of the European electricity sector, can thus be recommended to protect over the long term both European TSOs against future non-European investments, and the strong cooperation between TSOs.

Policy 1: Encourage Member States to introduce minimum government ownership requirements for TSOs or a golden shares mechanism to enable public authorities to block decisions running against the interests of the power system users.

There is an urgent need to encourage Member States to jointly strengthen the government presence in every TSO, in order to enable public authorities to assess and, if necessary, to block any attempt to enter their capital that would be detrimental to social welfare. The Commission's proposals (see above) on protection against foreign investment could thus include the implementation of «golden shares» held at the state or European level, in order to establish a minimum government ownership requirement and a right to monitor the changes in the capital of these strategic structures.

Policy 2: Establish an automatic and collegial control of investment in the TSOs coming from outside the European Union

These proposals should furthermore specifically include mechanisms to control foreign investments in electricity transmission assets. Future legal initiatives could thus prohibit any investment from outside the EU in TSOs or institute an automatic and collegial control of every investment in these companies. This control could involve the European Commission, the Member State involved, ENTSO-E, the TSOs involved, and, when appropriate, TSOs directly affected by this takeover.

Policy 3: Strengthen cross-border cooperation through incentives to establish TSOs joint ventures, particularly in R&D.

European regulations could further encourage TSOs to set up joint ventures through, for example, a required cost-benefit analysis prior to any potentially beneficial project. This would help identify its possible cross-border interest and support its Europeanisation through intensified capital interlinkage between TSOs. These newly created joint ventures could also be required to take on the status of «European company» (societas europeae).

Policy 4: Ease the overly restrictive rules of the ITO model and allow TSOs to acquire stakes in neighbouring TSOs regardless of their status.

In order to enable a beneficial entanglement of national electrical systems without sacrificing the historical ownership of transmission infrastructures, acquiring stakes in other TSOs must be encouraged at a European level. For example, European authorities could relax rules on the ITO model, which currently prevents any ITO TSO from entering the capital of a TSO under another status.

Conclusion

All four of these recommendations constitute a non-exhaustive list of measures that, if combined, could provide the European electricity sector with opportunities for security and development. Tackling foreign investment in the European energy infrastructure and strengthening the cooperation between TSOs within an area protected from foreign takeovers could thus be two pillars of a renewed European electricity policy. In any case, these objectives must not be avoided particularly at a time when the European electricity sector is undergoing profound changes, coordinating at the regional level through new dedicated structures, and when the European Union is increasing the protection of other strategic economic sectors from these extra-European investments.

Appendix

Overview of European TSOs' shareholding structures

Country	TSO	Ownership
Albania	OST	100% owned by the Albanian state
Austria	APG	100% owned by a private shareholder
Belgium	Elia	Majoritary public participation (45%)
Bosnia and Herzegovina	NOS BiH	100% owned by the Federation of Bosnia and Herzegovina and the Bosnian Serb Republic
Bulgaria	ESO	100% owned by the holding company Bulgarian Energy, which is 100% owned by the Bulgarian State
Croatia	HOPS	100% owned by the public group HEP, which is itself 100% owned by the Croatian state
Cyprus	Cyprus TSO	100% owned by the Cypriot Public Electricity Authority
Rep. Czech	ČEPS	100% owned by the Czech State
Denmark	Energinet.dk	100% owned by the Danish state
Estonia	Elering	100% owned by the Estonian state
Finland	Fingrid	Majoritary public participation (53.1%)
France	RTE	Owned at 50.1% by EDF (of which 83% is owned by the French government) and at 29.9% by the Caisse des dépôts et consignments (owned by the French State)
Germany	EnBW	Exclusive public participation
	Tennet TSO	100% owned by the TenneT Group, which is itself 100% owned by the Dutch State
	Amprion	100% owned by private shareholders
	50 Hertz	100% owned by Eurogrid, which is 80% owned by the Elia Group
Greece	ADMIE	Majoritary public participation (51%)
Hungary	MAVIR	100% owned by private shareholders
Iceland	Landsnet	100% owned by the Icelandic state
Ireland	EirGrid	100% owned by the Irish State
Italy	Terna	29.85% owned by CDP Reti, itself 35% owned by State Grid Corporation of China International
Latvia	AST	100% owned by the Latvian state
Lithuania	Litgrid	97.5% owned by the public group EPSO-G
Luxembourg	Creos Luxembourg	Owned at 75.43% by the holding company Encevo, which is 57.81% owned by the Luxembourg government and at 24.92% by SGCC
Macedonia	MEPSO	100% owned by the Macedonian state
Malte	Enemalta	70% owned by the Maltese State and 33% by Shanghai Electric Power
Montenegro	CGES	Owned 55% by the Montenegrin State, 22.08% by the Terna Group and 10.01% by EMS

Pays-Bas	TenneT	100% owned by the Dutch state
Norway	Statnett	100% owned by the Norwegian State
Poland	OSE	100% owned by the Polish state
Portugal	REN	25% owned by SGCCI and 5% by REE
Romania	Transelectrica	Majoritary public participation (58.69%)
Serbia	ELS	100% owned by the Serbian state
Slovakia	SEPS	100% owned by the Slovak state
Slovenia	ELES	100% owned by the Slovenian state
Spain	REE	Majoritary public participation (20%)
Sweden	SK	100% owned by the Swedish state
Switzerland	Swissgrid	100% owned by private shareholders
United Kingdom	National Grid	100% owned by private shareholders
	SONI	100% owned by the holding company Eirgrid, which is 100% owned by the Irish State
	Scottish Hydro Electric Transmission	100% owned by private shareholders
	Scottish Power Transmission	100% owned by private shareholders