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China's Energy Sector and the Search for Structural Power

Tiago Luís *Carvalho*[*]
Portuguese Air Force Academy
Orient Institute, School of Social and Political Sciences, University of Lisbon
Portuguese Air Force Academy Research Centre,
Military University Institute, Portugal

Abstract

Literature on China's power lacks a structural power perspective regarding the energy sector. This study addresses this gap by posing the research question: Has the internationalisation of national energy companies enhanced China's structural power in the energy sector? Using a qualitative case study, structural power is examined in relation to the international efforts of the five leading Chinese state-owned enterprises in China's outward foreign direct investment. Underpinned by Pustovitovskij and Kremer's operationalisation of structural power, the empirical analysis encompasses the most relevant energy subsectors. The findings reveal a sharp contrast between subsectors: while Chinese national oil and gas companies, as late entrants, face technological lag, China's early, large-scale investments in power and renewables have secured market dominance and the ability to set global standards for green energy technologies. These advancements have directly enhanced China's structural power. The adverse reactions of major competitors to China's growing influence in energy geopolitics reinforce this conclusion.

Keywords: *Structural power, China, Oil and gas, Renewable energy, Internationalisation.*

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[*] Professor, PhD, Portuguese Air Force Academy, Portugal. Researcher at the Orient Institute, School of Social and Political Sciences, University of Lisbon, Portugal. Researcher at the Portuguese Air Force Academy Research Centre, Military University Institute, Portugal. The views expressed in the article are solely those of the author and do not reflect the opinions of the institutions mentioned. Published work and contact details on: https://www.researchgate.net/profile/Tiago-Luis-Carvalho. Email: tiagosilvacarvalho13@gmail.com.

1. Introduction

Despite a broad consensus on recognising the resurgence of the People's Republic of China (PRC) as a great power, there are still literature gaps in the comprehensive understanding of its power. In particular, current literature lacks a structural power perspective regarding China's[1] energy sector. Indeed, energy has been a pivotal domain of China's Communist Party (CCP) and Xi Jinping's strategies to elevate the country's position in global value chains (GVC). The spearhead of those plans is the national state-owned enterprises (SOEs). This article examines the achievements of those enterprises in Beijing's quest for structural power by answering the research question: Has the internationalisation of Chinese energy companies enhanced China's structural power in the energy sector?

Strange's (1998) concept of structural power, which focuses on influencing global norms and systems, provides the basic theoretical framework to assess structural power. Pustovitovskij and Kremer (2011) enhanced the concept, operationalising structural power in terms of the balance between needs and internationally available goods. Dependency is the key indicator of power. Made in China 2025 is clear evidence of the CCP's prioritisation of structural power, aiming to reduce dependencies on critical technologies. The analytical model of this article seeks to evaluate China's international dependencies in the energy sector (dependent variable) in relation to Chinese SOE internationalisation efforts (independent variable).

The methodological approach is a qualitative case study and follows a deductive logic. The research object comprises the five largest Chinese energy SOEs by outward foreign direct investment (OFDI):[2] China National Petroleum Corporation (CNPC), China Petroleum and Chemical Corporation (Sinopec), China National Offshore Oil Corporation (CNOOC), State Grid (SG), and China Three Gorges (CTG). These entities ensure comprehensive sectoral representation, spanning oil, gas, power, and renewable energy subsectors. The analysis encompasses information up to 2024, derived from both primary - mainly energy enterprises' reports, which provide the quantitative data - and secondary sources - academic literature and reports from international organisations, contributing with qualitative data.

This article is divided into five parts. Following the Introduction, the second part discusses the application of the structural power concept to the energy sector, situating the analytical model in the existing literature. The third section provides the contextualisation of Chinese internationalisation policies and the selected energy SOEs. Before the Conclusion, the empirical analysis includes a thorough evaluation of China's position on the relevant energy subsectors, with the necessary mapping of the SOEs' main internationalisation efforts regarding their search for structural power, divided into import diversification, import reduction and export improvement.

2. Conceptualising China's Structural Power

Strange (1998) introduced the concept of structural power, defining it as the "power to shape and determine the structures of the global political economy within which other states, their political institutions, their economic enterprises and (not least) their scientists and other professional people have to operate" (24-25). However, merely influencing structures does not inherently constitute power. Pustovitovskij and Kremer (2011) thus propose an analytical model for this type of power, based on four key concepts:

- Goods: Considering the international system, goods are resources - material, positional or ideational, which are general, limited or exclusively available – that match a particular need of another actor.
- Actors: It is not a state-centric term. The only criterion to be classified as an actor is to provide goods.
- Needs: The actors' needs vary in terms of immediacy (referring to the difference between the current realisation of a certain need and its possible fulfilment) and priority, as determined by the influence of domestic policy groups.
- Outside options: The outside options consist of, perceived or real, international alternatives to obtain the necessary goods to meet one's needs.

The source of power resides in the structure created by the relations between actors. Structural power consists of the availability of outside options when combining the needs and goods of all players, consequently providing the actor with bargaining power in international negotiations. For example, various developing countries obtained new options when China, amidst US-EU competition, established itself as a major foreign aid provider (Pustovitovskij and Kremer, 2012).

In the energy sector, the needs can be summarised as the country's energy consumption while the goods are the necessary components to produce the required energy. Improving a country's structural power implies shifting its needs or goods production (import reduction) or the needs and goods production of others, obtaining more outside options (import diversification), or becoming other actors' outside options (export improvement).

Energy has been deeply studied as an instrument of power, although not structural power or OFDI influence. The exception is Russian energy relations, where a structural power approach has been applied to supply dynamics (e.g., Sassi, 2022). China is a common subject in the structural power literature, except for the energy dimension. Some studies combine an evaluation of multiple primary power structures (Arnold, 2024), while the most selected power structure is finance (e.g., Liu and Tsai, 2021; Gürcan and Donduran, 2023). Another dominant trend is the comparison of China with the other major powers, mainly the USA (e.g., Malkin and He, 2023; Morin and Tepper, 2023), the EU (Pavlićević, 2019), and India (Gabusi, 2020).

Regarding arguments and conclusions, there is a consensual recognition of the rise of China's structural power. The production dimension - GVCs, market power, asset ownership, and standard-setting – is positively highlighted (Malkin, 2022). Conversely, constraints and limitations of China's quest for structural power are discussed in numerous papers. These limitations are viewed in relation to the USA's structural power, sometimes in a total zero-sum logic. On one hand, there are those authors who argue that the USA remains the sole power. Taking the financial dimension case, despite disposing of substantial resources, China fails to shape international monetary policies (Ciorciari, 2014). The USA is considered to have the lead in two of the current most relevant sectors for power competition: semiconductors (Malkin and He, 2023) and space (Morin and Tepper, 2023). China would need a "world-making moment" to modify the systemic slope from the USA towards itself (Kitchen and Cox, 2019). Yet, the literature is divided in this regard. The USA's structural power is also pointed to be declining as China's structural power increases (Gürcan and Donduran, 2023). In the middle ground, Liu and Tsai (2021) identify both China's structural deficits in its quest for structural power and the USA's decline.

Despite the holistic nature of the chosen analytical model, this paper's scope is limited to structural power in the energy sector. Consequently, its conclusions should be read with the understanding that increasing structural power in one domain does not necessarily signify an overall increase in a country's structural power (Pustovitovskij and Kremer, 2012).

3. China's Energy Internationalisation

Totalling USD 451.87 billion—or 31.5 per cent of China's total OFDI—between 2005 and 2023 (AEI and Heritage, 2024),[3] energy distinguishes itself as Beijing's main sector of interest. This prioritisation relates to China's energy mix and associated concerns - economic, security, geopolitical, and environmental - as identified in the various Five-Year Plans (Guilhot, 2022). OFDI, in particular, is viewed as a means to improve Beijing's standing in the GVC (Chiang and de Micheaux, 2022). China's moving up the GVC means less dependence on outside options, while improving its capacity to be an outside option for others. This reduces the power of those dominating those options. Negative measures are therefore expected against the newcomer. For example, the deterioration of relations between the United States of America (USA) and China is assessed as being related to China's rise in GVC (Ilhéu, 2020).

China's internationalisation policy is underpinned by an industrial policy that shields underperforming enterprises (Evenett *et al.*, 2024) and exempts SOEs from paying dividends (Xu, 2017). Additionally, Beijing's sovereign rating enhances the international credibility of its SOEs, enabling them to access overseas capital markets to finance their global expansion (Xu, 2017). The scale of the domestic market, where these companies hold government-created dominant positions, further promotes their internationalisation capabilities, providing a significant comparative advantage (Ma and Ma, 2023).

The initial overarching strategy to promote Chinese OFDI was the Going Out strategy launched in 2000, which simply aimed to internationalise Chinese enterprises. The following strategies, the Belt and Road Initiative (BRI) of 2013, Made in China 2025 of 2015, and China Standards 2035 of 2021, showcased a clear geopolitical focus:

- The BRI combines geographical criteria (land and sea corridors towards China) with massive infrastructure building in countries with high-profile risks, thus expanding Beijing's influence networks.
- Made in China 2025 was an industrial strategy focused on increasing China's self-sufficiency in critical and emerging technologies. On the

one hand, it reduces China's need for foreign suppliers, while on the other, it boosts China as an essential outside option for most countries.

- The China Standards targets the definition of international technical standards. International standards setting merges Beijing's previously mentioned strategies, as it facilitates internationalisation (Going Out), enables connectivity between countries (BRI), and raises the international value of Chinese products (Made in China). This is discussed in Chinese media, where we can find an expression that summarises the mindset underlying these strategies: 得标准者得天下 [He who wins the standard wins the world, Own translation] (Lu, 2016).

China's OFDI is also driven by contingency responses rather than strategic frameworks, such as circumventing trade restrictions imposed by the USA. This was evident in the case of solar supply chains, where China's global export leadership facilitated the rise of Vietnam and Malaysia as key players in PV exports (IEA, 2022).

Concerning the energy and its subsectors, China's OFDI distribution corresponds to its energy mix: fossil fuels still lead, although diminishing, while renewables are surging.[4] From 2005 to 2023, China's energy OFDI was led by three oil and gas companies (AEI and Heritage, 2024): CNPC, Sinopec and CNOOC. They represented, respectively, 16.3 per cent, 14.3 per cent, and 10 per cent of the referred OFDI (AEI and Heritage, 2024). These National Oil Companies (NOCs) were world leaders in revenues, standing as 4th, 5th, and 65th in the Global Fortune (2023) ranking of companies' revenues.

Both China's oil and gas subsectors are characterised by high dependence on imports, thus creating structural vulnerabilities. Renewables and electricity stand on an opposite vector. The world's electricity imports/consumption ratio of 3 per cent (IEA, 2020) exemplifies the previous statement. The main renewable energy sources for China's electricity production are solar, wind, and hydro (BP, 2024). Among the top five energy SOEs in China's OFDI, the 4th and the 5th, namely SG and CTG, operate within these subsectors. They represented 7 per cent and 6 per cent of China's energy OFDI between 2005 and 2023 (AEI and Heritage, 2024)

CTG stands as a front-runner in renewable energy. CTG is the "world's largest hydropower development and operation enterprise" (CTG, 2023a: 8). After CWE, one of the first eight Chinese SOEs authorised to internationalise, was transferred by the Government to CTG in 2008 (CTG, 2009), CTG became a global leader in hydropower plant construction, with projects in more than 80 countries and permanent offices in 32 of those countries (CTG, 2023a). CTG is also indirectly a leader in wind turbine manufacturing. Chinese Goldwind is the world's number one wind turbine supplier, with a 14 per cent global market share in 2023 (BloombergNEF, 2024).

The key to the renewable sector's politically defined growth goals is the integration of this new energy in the electricity networks (Pan *et al*., 2020). This falls precisely within SG's core business: transmission networks (retailing and distribution) (Xu, 2017). The SG network covers 88 per cent of continental China, employs over 1.48 million people, serves 1.1 billion clients, and holds assets worth RMB 4.67 trillion (SG, 2022). Worldwide, in terms of 2022's revenues, SG ranked third, making it the world's largest utility company (Fortune, 2023).

These five companies possess vast resources, granting them unparalleled potential to drive structural changes through economic actions, particularly FDI. This underscores the critical importance of the chosen case study.

4. Empirical Analysis

Considering energy technology exports alongside FDI and finance diplomacy, China has become a leader in the global energy sector (Kong and Gallagher, 2016). This section addresses how that leadership translates into structural power, namely, if selected companies:

- Obtained more outside options for China (import diversification),
- Improved China's goods production (import reduction),
- Became other actors' outside options (export improvement).

4.1. Import Diversification

Import diversification may seem to pertain primarily to the oil and gas subsectors, which highlights the importance of international supply for these energy types. However, supply dynamics are not entirely absent from the electricity and renewables subsectors, where the supply of technology also represents a critical source of power. The vulnerability concerns in the new geopolitics of energy are not on energy supply disruptions, but on technology and materials access (IRENA, 2024: 30). Similarly, advanced technology is essential for oil and gas companies to optimise resource exploitation.

Beijing's objectives, however, diverge when it comes to energy supply versus energy technology. The key distinction lies in the potential to domestically secure these needs. In terms of energy supply, Chinese companies have focused on diversifying their suppliers internationally, while for energy technology, efforts are concentrated on promoting self-sufficiency. This subsection addresses the first case, while the following subsection, import reduction, focuses on the second case.

Starting in the 1990s, Chinese NOCs began internationalising to acquire shares in overseas oil and gas production, commonly referred to as equity oil and gas (Kuteleva, 2022). As of 2022, CNPC reported that its overseas operations accounted for 42.3 per cent of its oil production, 17.9 per cent of its gas production, and 19 per cent of its crude refining throughput (CNPC, 2023). In the same year, CNOOC Limited, the main subsidiary of CNOOC, reported 29.8 per cent of equity oil production and 21.6 per cent of equity gas production from overseas (CNOOC Limited, 2023). Also in 2022, the Sinopec Corporation, the main subsidiary of Sinopec, reported 10.7 per cent of equity oil and 27.8 per cent of equity gas production from overseas (Sinopec, 2023a).

Compared to domestic (mainland China) consumption, these figures are insufficient to address dependency concerns. Using 2022 China's oil consumption numbers (Energy Institute, 2023), the CNPC oil overseas production accounted for only 11.7 per cent of China's needs; the CNOOC Limited, 2.7 per cent; and the Sinopec Corp., 4.1 per cent. In terms of China's gas consumption in 2022 (Energy Institute, 2023), the CNPC overseas gas production accounted for only 8.5 per cent of China's needs, 1.2 per cent in the case of CNOOC Limited, and 2.6 per cent in the case of Sinopec.

Furthermore, most of the equity oil and gas is not redirected to China but sold on international markets, and, even during a crisis, doubts remain about the feasibility and the cost of redirecting these resources to China (Taylor, 2021). Unlike what it looks at first glance, NOCs' internationalisation is designed to contribute to China's quest for structural power. Positioning its SOEs along the global energy supply chains fosters China's influence over these subsectors (Lind and Press, 2018). NOCs have to balance the government's security concerns with their profitability (Kuteleva, 2022). This observation aligns with Carvalho's (2024) findings on the internationalisation strategies of SG and CTG. Consequently, within the analytical framework of this paper, these companies' diversification efforts do not represent a significant and direct enhancement of China's own resources.

Beyond direct supply considerations, OFDI also carries a political dimension, as improving economic ties contributes to boosting political influence (Lind and Press, 2018). According to these authors, fostering bilateral relations with producers supports oil supply security. Moreover, China's growing influence in the oil-producing regions also contributes to Beijing's strategic aims of countering the USA hegemony (Liou, 2009).

Nevertheless, these initiatives remain ineffective in strengthening China's relational global position—and, by extension, its structural power—especially since the main vulnerabilities persist, namely the dependency of maritime supply lanes with strategic chokepoints and the external resource dependence itself (Taylor, 2021). Additionally, the Western dominance of oil and gas markets further exacerbates these challenges (Meidan, 2020). While the improvement of bilateral political relations theoretically reduces the risks of external dependence, it neither eliminates the reliance itself nor addresses the geographical constraints of supply routes.

Despite substantial investments, the outcomes of import diversification have not been structurally transformative, and, as a result, China's structural power has seen little meaningful advancement in this context.

4.2. Import Reduction

In the energy sector, reducing imports can be achieved through increased domestic production or by shifting energy consumption towards domestically sourced energy, particularly renewable energy. The focus is on reducing the external influence over China. Both approaches require advanced technologies. The five selected companies have conducted visible efforts in this regard, establishing themselves as global innovation hubs, as illustrated in Table 1.[5]

Table 1. Granted Patents until 2022

Company	Granted patents	Company	Granted patents
Sinopec	49,852	**SG** (until 2021)	129,830
CNPC (PetroChina)	19,869	**CTG**	4,547
Saudi Aramco (until 2021)	16,882	Electricité de France	4,268
ExxonMobil (until 2021)	16,447	ENEL	727
TotalEnergies	8,209	E.ON	721
BP (until 2021)	3,785	Fortum	191
CNOOC	2,583		
Gazprom	80		

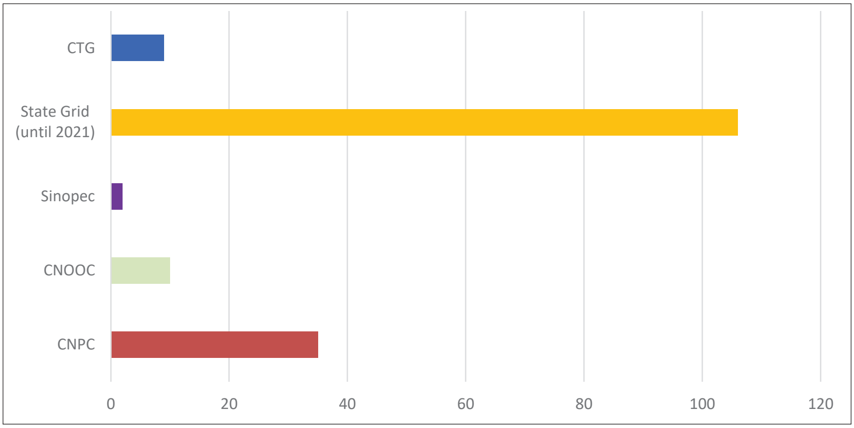
Source: Own creation using data from (CTG, 2020, 2023b; Insights by GreyB, 2023-2024; PetroChina, 2023; Sinopec, 2023b).

The numbers highlight China's efforts in innovation. Taking into account only energy transition technologies, China ranked third in world patent filing in 2023 (IRENA, 2024). However, it must be noted that most of those patents are filed in China. SG, the one with the most patents, has completed 98.7 per cent of its patent filings in China (Insights by GreyB, 2023-2024). SG also tops patent filing in other sectors, such as Artificial Intelligence: first in China, 15th in the world (WIPO, 2019).

Despite higher patent filing and granting, China remains significantly behind its competitors in terms of domestic patents filed or granted abroad: respectively, 4.6 per cent and 7.3 per cent, while the US had, in the same year, 44 per cent and 47.1 per cent domestic patents filed or granted overseas (Nirupamala, 2019). The Chinese patent boom is associated with patent subsidies. The financial support encouraged the filing of low-quality patents and even the artificial splitting of applications to multiply filings (Lei *et al.*, 2012). Acknowledging this issue, Beijing announced the gradual elimination of these subsidies until 2025 (Xinhua, 2022).

Another priority area for Beijing's plans, and a key aspect of innovation capability, is standards. Standards can be set by technical institutions or market dominance (Rühlig, 2024). China has been active in both approaches, the OFDI being particularly impactful in the second approach (The US-China Business Council, 2020). Nevertheless, companies can also directly participate in the referred institutions. International standards-setting numbers highlight the effort of these Chinese enterprises in both approaches, led here as well by SG.

Figure 1. Selected Chinese SOEs in International Standards-Setting (until 2022)



Source: Own creation using data from (CTG, 2022, 2023b; SG, 2021, 2022; Sinopec, 2023b; Tan, Zheng, Du, and Wu, 2022).

The stated goal is for Chinese companies to lead international standards formulation to secure competitive advantages and international influence (Tan, Zheng, and Wu, 2022). However, in the oil and gas subsectors, China remains in need of (Western) outside options. China's biggest oil company, CNPC, reported several international cooperation projects in the domestic market (CNPC, 2023). CNOOC, which recently pioneered advanced extraction operations, launching the "world's first deepwater semisubmersible production and storage platform", required the crucial cooperation of four international oil companies for this project (Oil and Gas Facilities, 2021: para. 2). Collaboration with foreign companies has been a landmark strategy for Chinese firms striving to move up the value scale. CNOOC's (2017) statement on international cooperation reflects this perspective, considering it "a significant platform for the Company to build scientific and technological innovation soft power" (52), thus, improving its international operating environment, both technologically (accessing and sharing), and scientifically (improving own research).

Western standards dominate the industry, according to a Chinese NOC's affiliated paper on the current situation of offshore oil and gas platforms in China (Xin *et al*., 2022). A Chinese newspaper affiliated with the CCP and the Government states that not only standards but technology itself, more specifically, underwater connectors for offshore oil and gas extraction, constitute one of “China’s most acute ‘chokepoints’” in terms of “technological import dependencies” (Murphy, 2022: 5–6). Analysts deem it improbable that China can halt the growing difference between oil consumption and domestic production (Taylor, 2021). Nor have the NOCs closed the technology gap. Likewise, Chinese NOCs lag behind main competitors in terms of investment, domestic market maturity and industry development (Ma and Ma, 2023).

Nonetheless, the Chinese NOCs OFDI contributes to obtaining competitive factors, thus its technology catching up with Western competitors, in what Kong (2019) classifies as “modernization through globalization” (29). Domestic resources are also instrumentalised to this end. China uses its market size and unconventional hydrocarbon prospects to stimulate the cooperation between Chinese NOCs and international oil companies (Jiang and Ding, 2014).

This has the potential to reduce imports by improving domestic production and enhancing the capabilities of Chinese companies.

Given China’s massive energy demands, achieving energy self-sufficiency with fossil fuels has been unfeasible for several decades. Bumping domestic production, which has limited potential, depends on continuous international economic cooperation. Chinese NOCs’ internationalisation has contributed to the scale-up of their technological capabilities, but this remains an ongoing endeavour. Consequently, in these energy subsectors, OFDI has contributed to addressing concerns but has not structurally changed China’s constraints, leaving its external dependence on oil and gas mostly unchanged.

In the renewable and electricity subsectors, SG and, to a lesser extent, CTG, succeeded in positioning China at the forefront of international standard-setting. Figure 1 shows evidence of SG’s decisive contribution to this achievement, which stemmed from SG’s ability to persuade Beijing to support its pioneering initiatives in key power technologies. Recognising the power of standard-setting, SG engaged early in international standard-setting for Ultra-high-voltage (UHV) electricity transmission technologies, securing significant advantages in sectoral leadership and cost reduction (Xu, 2017). This SOE’s OFDI, for example, in Brazil, contributed to the global expansion of this technology. Consequently, SG is the world leader in UHV deployments, operating or commissioning 34 lines within China and two of the five lines outside China (Quimbre *et al*., 2023).

Nonetheless, in a paper sponsored by a SG subsidiary, Zhang *et al.* (2022) identified several challenges for Chinese influence in international standard-setting in this sector. They can be divided into two dimensions: domestic and foreign. On the Chinese side, the factors are disorganisation and lack of personnel for this task. On the foreign side, SG is still struggling for recognition and cooperation. SG capital shares in foreign power companies are deemed as a mitigating factor due to the positive impact of influencing foreign companies' decision-making towards Chinese standards (Quimbre *et al.*, 2023). In the Philippines, for example, SG even supported the national power transmission company, in which SG holds a shareholder position, in the development of its standards system (Yuhai and Haixiang, 2017).

CTG's importance in international standard-setting is due to its invested non-controlled company of Goldwind, which, if accounted for in Figure 1, would rank second with 42 participations in international standards-setting (Goldwind, 2024). However, the 2023 global leader in wind turbine manufacturing, 95 per cent of Goldwind's projects commissioned in that year were in China (BloombergNEF, 2024). This stresses the importance of caution when observing Chinese stats in the high-tech sectors. Excluding China and Vietnam, Goldwind's global market share in 2023 diminished to 1.7 per cent (total Goldwind's market share for the same year was 14 per cent) (Wood Mackenzie, 2024). At the same time, it also reinforces the magnitude of China's market. According to the previous source, China's domestic market was responsible for 65 per cent of the global wind capacity commissioned in 2023.

International leadership aside, CTG also strives for domestic self-sufficiency. This SOE frames itself as seeking to upgrade China's industry, highlighting, upon a hydropower basis, the development of solar, onshore and offshore wind power (CTG, 2023a). The same report indicated progresses in domestic manufacturing in the offshore wind segment.

Outward investments contributed to CTG's strategy. One investment in particular must be highlighted: EDP, the main Portuguese renewable energy producer and distributor, in which CTG invested in 2012. Excluding China, EDP is the fourth largest onshore wind energy producer in the world; it is also a leading player in solar and offshore wind energy (EDPR, 2024). The EDP-CTG strategic partnership has significantly contributed, via international market knowledge, to CTG's successful internationalisation (Carvalho, 2024).

The CTG's core business, the hydropower industry, has a long-standing partnership with international companies. For the Three Gorges project itself – the world's largest dam and CTG's primary purpose - most of the turbines were brought abroad (Dewey & LeBoeuf LLP, 2010). According to the same author, the Chinese government took advantage of this situation to leverage expertise for domestic manufacturers, working side by side with foreign manufacturers. Recently, Xi Jinping exalted a CTG project that included the world's first 1GW generator, which included key domestic components (CTG, 2023a).

The shift to renewable energy sources presents several challenges for power networks, in terms of transmission and integration. The SG's UHV transmission lines tackle the first issue. For the integration and planning of green energy networks, SG recurred to OFDI. Its investment in Portugal exemplifies it: a country renowned for its exceptional integration of renewable energy, where SG invested in the national transmission operator. One of the key motivations was to acquire expertise and advance network management strategies for intermittent energy sources (Carvalho, 2024).

Overall, China has established itself as the leading global producer of technology in the renewable energy subsector, from electric vehicles to batteries and solar panels (Meidan *et al*., 2024). This progress has gradually reinforced Beijing's ambitions for self-sufficiency in critical technologies. However, the dominance is not complete, as a residual need for international cooperation in high-end technology persists. Nevertheless, the reliance is significantly less pronounced than in the oil and gas subsectors and does not overshadow China's leadership in renewable industries.

The Chinese success in renewable energy technology has accelerated the country's transition towards a more electric-based economy (Meidan *et al*., 2024), with the domestic power sector responding promptly, even in a mostly peremptory manner, to the necessary transformations. This shift promoted another type of dependency reduction crucial to China's structural power in this sector: fossil fuel import dependency. The transformation of domestic needs reduces external power over China. Combined with a relatively autonomous renewable energy industry (and a necessary advanced power sector)—i.e., a sustainable increased resources power—China's domestically led green transition is making substantial improvements to its structural power within this domain.

4.3. Export Improvement

Among the three dimensions examined in this section, exports present the most evident shift in China's structural power within the energy sector. Beijing's leadership in the renewables and electricity subsectors naturally translates into exports, which, in turn, further contribute to consolidating China's dominant position in this global industry (Meidan, 2020). Leading clean energy exports improves China's structural power in the energy sector by affirming China as an indispensable outside option to other countries. This dynamic is supported by China's overcapacity in producing affordable renewable energy technologies (Meidan *et al.*, 2024). In terms of numbers, in 2022, China accounted for circa 70 per cent of the world's solar manufacturing, 50 per cent of the world's wind turbines, and 90 per cent of the world's lithium-ion battery manufacturing (Wood Mackenzie, 2022).

OFDI played a role in enabling China's export success. Invested companies privilege Chinese products (Carvalho, 2024). SG's primary objective is the global market: it invests in UHV to sell its products rather than capitalise on intellectual rents. Thus, it pushes for low-cost intellectual property to facilitate broader adoption of its products (Center for Energy Environmental and Economic Systems Analysis, 2015). SG affirms that its OFDI has created a framework for mutual exchange, allowing it to export its technology and expertise (Yuhai and Haixiang, 2017). According to Xu (2019), SG's global rise also helped other Chinese companies in SG's supply chain to shift from a dependency on imports to export competitiveness.

Moreover, the network dimension of OFDI, discussed in section 4.1, is a determining factor influencing exports. SG's OFDI can help redefine the sector's geopolitical landscape by integrating the power infrastructures of the BRI countries into a cohesive network (Meidan, 2020). Beijing and SG have a specific initiative for this issue: Global Energy Interconnection (GEI). The goal is to establish a globally interconnected yet centralised grid (Xu, 2017). The plan to implement it rests on three vectors: UHV lines, extensive fields of renewable energy, and smart grids (Downie, 2020). China leads globally in each of those three technologies. Through the control of the governing bodies of GEIDCO and related technical standards institutions, Beijing is positioned to influence future grids' structures (Quimbre *et al.*, 2023).

Nonetheless, developments of international power interconnections have been limited (Downie, 2020). This is true for China itself, with numerous constraints, ranging from geography to security (Chi *et al.*, 2022). These types of challenges also apply to Europe. SG investments contributed to boosting Chinese influence on the European electricity infrastructure. The economic relation could further expand to inbound flows of cheap Chinese electricity. Yet, this could easily lead to overdependence. Debt traps resulting from major energy infrastructure construction are also a reported concern, adding to the national security risks due to links with the CCP and the People's Liberation Army in companies dealing with critical infrastructures (Quimbre *et al*., 2023).

These Western reactions, although a challenge to further international cooperation, can also be viewed as evidence of China's success, in terms of structural power. In a study on the various renewables subsectors, the European Union (EU), as a whole, with the United Kingdom still included, leads in value-added by having the highest value (i.e., filed in more than one patent office) in patent families' filings and market share (Directorate-General for Energy, 2022). According to the same source, in 2018, the EU represented 67 per cent of the world's wind market, while China, 18 per cent. In hydropower, EU had 39 per cent vs. 23 per cent of China. The exception was the solar market, where, in 2018, China led the patent filings, with 35 per cent of the world's total. The EU only represented 4 per cent. Since solar is the main traded renewable energy technology by value (it represents 78 per cent of renewable energy technology world trading, excluding intra-EU trade), and it is led by China, Beijing is leading the global trade in renewable technology.

EU lagging behind China in the solar industry is officially associated with "China's unfair trade practices", that is China still practises, for example, export restrictions over gallium and germanium, two rare earth materials essential for solar panels (Von der Leyen, 2023). The old energy paradigm had the major energy resources (fossil fuels) geographically clustered. This facilitated direct control. The new paradigm is characterised by globally abundant energy resources (renewable energy). However, access to renewables depends on technologies and materials, such as solar panels and lithium, which are also clustered in specific regions (IRENA, 2024). China strategically tops this concentration (Simmons, 2024). This creates not only dependencies but also bottlenecks that are easy to weaponise. And China has weaponised them several times now. This instrumentalisation of economic means, however, has a downside. When Beijing geopolitically leverages its export power, the subsequent rise in prices and the downward perception of China prompt global investments in alternative resources, not forgetting efforts to recycle or even to replace the need for them (Meidan, 2020). The international reaction to China's structural power in rare earth elements completely matches the definition of structural power: reducing the necessity for outside options, which, in this case, have been quasi-monopolised by China.

In this context, reducing the dependence on China has become a top priority for several Western nations, allocating major resources to this objective. The European Commission (2022), for example, identified a strategic vulnerability of the EU concerning China in solar photovoltaic technologies, which are crucial, not only to meet climate goals but also for space and defence. However, China's dominance in certain components or technologies presents substantial short-term obstacles to substitution, notably in segments such as electric vehicles (Simmons, 2024: 3). Likewise, the US government recognised this when some components or materials were left out from the measures to de-risk battery supply chains from China in the Inflation Reduction Act until 2026 (Manning, 2024).

The selected companies in this paper are among the targets of US measures to restrict Chinese trade and investment. CTG, CNOOC, and, indirectly, SG—the direct target is Sugon, whose computers play a critical role in SG's operations (Miller, 2019)—are officially listed as "'Chinese Military Companies' operating directly or indirectly in the United States" (US Department of Defense, 2024: para. 1). The listing enables the US government to impose exceptional measures against these entities as part of a sustained effort to counter China's integrated approach, where civilian enterprises contribute to the modernisation of the Chinese Armed Forces. To allow a restricted regime for targeted companies, the US Commerce Department maintains a list of entities that could pose risks to national security, on which CNOOC is included (Bureau of Industry and Security, 2024).

The measures aiming to reduce China's dominance in the energy sector are producing ripple effects, such as raising the costs for new projects, with added difficulties in securing key components, which is already delaying renewable energy projects in the USA (Millard and Jopson, 2023). With the estimated total cost of $700 billion for the period 2024-2031, according to RystadEnergy (2023), the desired outcomes of these Western efforts—namely, countering China's dominance in the energy sector—are unlikely to materialise before the next decade, at the earliest.

Chinese NOCs also export (petroleum) equipment, e.g., CNPC exported equipment to over 80 countries in 2022 (CNPC, 2023). However, it does not fit structural power considerations, because in this subsector, Chinese manufacturers, despite their large-scale advantages, still face a deep technological disparity compared to their international counterparts, depending on imports for key components and falling short on quality and high-end technology (G. Zhang *et al*., 2022).

For the gas subsector, similar challenges persist regarding catching up in advanced technology, hindering domestic industry development. As reported by Chinese SOEs' affiliated sources, China struggles with gaps in both manufacturing and adoption of high-end technology (Li, 2022). Even in the domestic market of oil and gas equipment, Chinese companies dominate only in low-value segments, while foreign companies, with only 10 per cent market share, secure the high-end segment (export.gov, 2019).

Between the three dimensions addressed by this paper, the increase in exports has, for evident reasons, the most direct impact on third countries. From a purely cooperative perspective on the power and renewable energy subsectors, China's affordable and competitive products would be universally welcomed as a substantial step forward in fighting climate change. However, industrial, economic, political and security concerns meddle with Western response to China's recently acquired leadership in these subsectors. While OFDI played a role in this achievement, the foundational effort of establishing the basis for a globally competitive industry was internal. Moreover, the characteristics of the new energy paradigm eliminate China's previous limitation under the fossil fuel-based paradigm of insufficient domestic resources, which required a constant supply from troubled regions through communication lines often constrained by bottlenecks. Despite significant OFDI, no transformative shift has occurred in the oil and gas subsectors. The reasons are primarily domestic, including insufficient energy resources and a late entry into the global market. As a result, these energy sources continue to represent a vulnerability for China.

5. Conclusion

The green transition has an undeniable potential for disrupting global power balances. Hence, the energy sector has been a primary area of concern and investment for China, as consistently highlighted in its strategic plans. From a structural power analytical lens, Beijing aims to scale up the Chinese industry (enhancing the quality of its goods) and to transition towards a clean energy mix (altering its needs).

This paper analyses China's structural power within the energy sector, focusing on whether the internationalisation of Chinese energy companies has strengthened China's structural power in this domain. The research design is a qualitative case study of five Chinese SOEs. The selected companies' subsectors match the current Chinese energy mix and future trends. Fossil fuels remain a major source, while renewable energy growth is exponential, with all the inherent challenges of a paradigm transformation.

Chinese SOEs' internationalisation in the energy sector has followed strategic aims related to its structural position, with different results in oil and gas, and in power and renewables. OFDI has played a significant role in both cases, growing China's global importance in these energy sectors. Chinese NOCs - CNPC, CNOOC, and Sinopec - have invested heavily in oil and gas-producing countries worldwide. They gained access to oil and gas reserves and infrastructure, improving their position in those sectors. These investments enabled China to secure long-term supply agreements, diversify its energy sources, improve its import capabilities, enhance its bargaining power in energy-related negotiations, and strengthen its ability to influence global prices and trading patterns. However, despite the identified positive contributions of China's internationalisation in oil and gas, Beijing's structural power in these subsectors remains very limited. Chinese SOEs are still dependent on foreign suppliers. This applies not only to basic crude and gas supply, but also to high-end technology.

OFDI in the power and renewables subsectors has also been massive. By expanding its presence in the global electricity market, including transmission, hydro, solar and wind subsectors, Chinese SOEs have gained influence, achieved economies of scale, promoted their technology exports, and raised their cost competitiveness. These investments have allowed China to dominate UHV networks and the production of wind turbines and solar panels, enabling it to shape the global renewable and power grid market, as well as standard development. SG and CTG have contributed to the affirmation of China as a viable option for third parties within the framework of the global energy transition.

Overall, China has been a "price taker" in the oil and gas subsectors, whereas in the renewables and power sector, it is globally setting the stage, including supply chains and critical infrastructures (Meidan, 2020: Abstract).

Furthermore, according to the same source (aligning with this paper's conclusions, even though it is not framed as structural power), China's leadership in renewables has benefited geopolitically. The negative response from Western countries underscores the significance of China's current position in the energy sector.

A key insight for other power structures is that OFDI alone is insufficient for achieving structural changes. The values and outcomes of the Chinese OFDI in the oil and gas subsectors support this view. While FDI can enhance one's structural power, the existence of a competitive basis is a prerequisite for achieving significant results. The Chinese OFDI in the power and renewable energy subsectors serves as an excellent example. Moreover, FDI tends to attract substantial visibility, which contributes to the expected negative reaction from *status quo* powers when faced with a potential challenger—an economic Thucydides Trap.

Notes

[1] In this paper, "China" refers to the People's Republic of China (PRC).

[2] According to AEI and Heritage (2024) data, they represented 56 per cent of China's total energy OFDI from 2005 to 2023. Note that AEI and Heritage (2024) only register investments over 100 million USD.

[3] For comparison, according to the same source, metal was the second main sector of China's OFDI, representing 12.6 per cent of total OFDI.

[4] China's energy mix mirrors the world's trends, highlighting the shared strategic significance of individual energy subsectors for both Beijing and the international community (BP, 2024).

[5] ExxonMobil, TotalEnergies, BP, Saudi Aramco, Gazprom, Electricité de France, ENEL, E.ON, and Fortum, as top-ranked companies in their sectors (Fortune, 2023), were added for comparison purposes.

Reference List

AEI and Heritage (2024), "China Global Investment Tracker". https://www.aei.org/china-global-investment-tracker/.

Arnold, Stephanie (2024), "Africa's Roads to Digital Development: Paving the Way for Chinese Structural Power in the ICT Sector?", *Review of International Political Economy*, Vol. 31, No. 4, pp. 1148-1172. https://doi.org/10.1080/09692290.2023.2297363.

BloombergNEF (2024), "China's Goldwind Retains Turbine Supplier Lead, as Global Wind Additions Hit New High, According to BloombergNEF". https://about.bnef.com/blog/chinas-goldwind-retains-turbine-supplier-lead-as-global-wind-additions-hit-new-high-according-to-bloombergnef/.

BP (2024), *bp Energy Outlook 2024 Edition*. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/energy-outlook/bp-energy-outlook-2024.pdf.

Bureau of Industry and Security (2024), "Supplement No. 4 to Part 744, Title 15". https://www.ecfr.gov/current/title-15/part-744/appendix-Supplement No. 4 to Part 744.

Carvalho, Tiago Luís (2024), *Segurança Económica Portuguesa: o Caso do Investimento Chinês no Setor Elétrico [Portuguese Economic Security: the Case of Chinese Investment in the Power Sector]*, Lisboa: Lisbon International Press.

Center for Energy Environmental and Economic Systems Analysis (2015), "Power Play: China's Ultra-High Voltage Technology and Global Standards". https://www.paulsoninstitute.org/wp-content/uploads/2017/01/PPS_UHV_English_R.pdf.

Chi, Y., Bai, G., and J.-H. Xu (2022), "Security Assessment of Transnational Power Interconnection between China and Neighboring Countries", *Computers & Industrial Engineering*, Vol. 171, No. 2, p. 108336. https://doi.org/10.1016/j.cie.2022.108336.

Chiang, M. and E. L. de Micheaux (2022), "China's Outward Foreign Direct Investment in Southeast Asia: Analyzing the Chinese State's Strategies and Potential Influence", *Thunderbird International Business Review*, Vol. 64, No. 6, pp. 581–593. https://doi.org/10.1002/tie.22311.

Ciorciari, John D. (2014), "China's Structural Power Deficit and Influence Gap in the Monetary Policy Arena", *Asian Survey*, Vol. 54, No. 5, pp. 869–893. https://doi.org/10.1525/as.2014.54.5.869.

CNOOC (2017), "2016 Annual Report China National Offshore Oil Corp". https://www.resourcedata.org/dataset/cnooc-annualreport-2016/resource/a0043d48-c415-49f6-9311-452802635761/view/12910d68-c9b8-439d-94b6-580c5e88b260.

CNOOC Limited (2023), "2022 Annual Report". https://www.cnoocltd.com/attach/0/2304111316397083.pdf.

CNPC (2023), "2022 Annual Report". http://www.cnpc.com.cn/en/2022enbyfgrme/202307/d999e8735fcb42c590cbc9e06a24fd35/files/0af045dccf63494c9827e99dbb19ffb3.pdf.

CTG (2009), "CTGPC 2008 Annual Report". https://www.ctg.com.cn/en/publications/reports40/annual_report/index.html.

——— (2020), "2019 Sustainability Report". https://www.ctg.com.cn/uiFramework/js/pdfjs/web/viewer.html?file=/ctgenglish/fileDir/resource/cms/article/1463743/1464715/2023120700543016487.pdf.

——— (2022), "2021 Sustainability Report". https://www.ctg.com.cn/ctgenglish/sustainability50/report/csr_report/index.html.

——— (2023a), "2022 Annual Report China Three Gorges Corporation". https://www.ctg.com.cn/ctgenglish/sustainability50/report/annual_report65/index.html.

——— (2023b), "2022 Sustainability Report". https://www.ctg.com.cn/ctgenglish/sustainability50/report/csr_report/index.html.

Dewey & LeBoeuf LLP (2010), "China's Promotion of the Renewable Electric Power Equipment Industry: Hydro, Wind, Solar, Biomass". https://www.nftc.org/archive/Press Release/2010/China Renewable Energy.pdf.

Directorate-General for Energy (2022), *EU's Global Leadership in Renewables: Final Synthesis Report: July 2021*, Luxembourg: Publications Office of the European Union.

Downie, Edmund (2020), "Powering the Globe: Lessons from Southeast Asia for China's Global Energy Interconnection Initiative". https://www.energypolicy.columbia.edu/wp-content/uploads/2020/04/GEI_CGEP-Report_111722.pdf.

EDPR (2024), "Annual Report 2023: We Choose Earth". https://www.edpr.com/sites/edpr/files/2024-04/EDPRAnnualReport2023_disclaimer.pdf.

Energy Institute (2023), "2023 Statistical Review of World Energy Data". https://www.energyinst.org/__data/assets/excel_doc/0007/1055545/EI-stats-review-all-data.xlsx.

European Commission (2022), "Commission Staff Working Document: EU strategic Dependencies and Capacities: Second Stage of In-depth Reviews". https://ec.europa.eu/docsroom/documents/48878.

Evenett, S. J., Martin, F., and A. Krueger (2024), "Scaling Up China's Solar

Panel Industry: Surpassing All Expectations", *Zeitgeist Series Briefing*, No. 25. Global Trade Alert. https://www.globaltradealert.org/reports/download/138.

export.gov (2019), "China Country Commercial Guide: China - Oil and Gas". https://www.export.gov/apex/article2?id=China-Oil-and-Gas.

Fortune (2023), "2022 Global 500". https://fortune.com/ranking/global500/2022/.

Gabusi, Giuseppe (2020), "China's Structural Power and the Fate of the BCIM Economic Corridor", *The International Spectator*, Vol. 55, No. 3, pp. 17–34. https://doi.org/10.1080/03932729.2020.1782071.

Goldwind (2024), "Annual Report 2023: Innovating for a Brighter Tomorrow". https://www.hkexnews.hk/listedco/listconews/sehk/2024/0425/2024042502725.pdf.

Guilhot, Laëtitia (2022), "An Analysis of China's Energy Policy from 1981 to 2020: Transitioning towards to a Diversified and Low-carbon Energy System", *Energy Policy*, Vol. 162, p. 112806. https://doi.org/10.1016/j.enpol.2022.112806.

Gürcan, E. C. and C. Donduran (2023), "The Economic and Institutional Dynamics of China's Growing Financial Influence: a 'Structural Power' Perspective", *The Japanese Political Economy*, Vol. 49, No. 1, pp. 109–135. https://doi.org/10.1080/2329194X.2023.2184387.

IEA (2020), "Electricity Market Report December 2020". https://iea.blob.core.windows.net/assets/a695ae98-cec1-43ce-9cab-c37bb0143a05/Electricity_Market_Report_December_2020.pdf.

——— (2022), "Solar PV Global Supply Chains". https://www.iea.org/reports/solar-pv-global-supply-chains.

Ilhéu, Fernanda (2020), "The Global Value Chains and the Evolution of Chinese Economic Model", *Working Paper CEsA CSG*, No. 178/2020. https://www.repository.utl.pt/bitstream/10400.5/19964/1/wp178.pdf.

Insights by GreyB (2023-2024), "Patent Profiles for BP, CNOOC, E.ON, Enel, ExxonMobil, Fortum, Gazprom, Saudi Aramco, Sinopec, SGCC, Total Energies, and EDF". https://insights.greyb.com/.

IRENA (2024), "Geopolitics of the Energy Transition: Energy Security. International Renewable Energy Agency". https://mc-cd8320d4-36a1-40ac-83cc-3389-cdn-endpoint.azureedge.net/-/media/Files/IRENA/Agency/Publication/2024/Apr/IRENA_Geopolitics_transition_energy_security_2024.pdf?rev=40bab71a18e14038b5a4973b5e3bb4d4.

Jiang, J. and C. Ding (2014), "Partner Country Series: Update on Overseas Investments by China's National Oil Companies: Achievements and Challenges since 2011", IEA. https://www.iea.org/reports/partner-country-series-update-on-overseas-investments-by-chinas-national-oil-companies.

Kitchen, N. and M. Cox (2019), "Power, Structural Power, and American Decline", *Cambridge Review of International Affairs*, Vol. 32, No. 6, pp. 734–752. https://doi.org/10.1080/09557571.2019.1606158.

Kong, B. and K. Gallagher (2016), "The Globalization of Chinese Energy Companies: The Role of State Finance". www.bu.edu/gdp//06/13/the-globalization-of-chinese-energy-companies-the-role-of-state-finance/.

Kong, Bo (2019), *Modernization Through Globalization: Why China Finances Foreign Energy Projects Worldwide*, Singapore: Palgrave Macmillan.

Kuteleva, Anna (2022), *China's Energy Security and Relations with Petrostates: Oil as an Idea*, New York: Routledge.

Lei, Z., Sun, Z., and B. Wright (2012), "Patent Subsidy and Patent Filing in China (Mimeo)". https://funginstitute.berkeley.edu/wp-content/uploads/2013/12/patent_subsidy_Zhen.pdf.

Li, Luguang (2022), "Development of Natural Gas Industry in China: Review and Prospect", *Natural Gas Industry B*, Vol. 9, No. 2, pp. 187–196. https://doi.org/10.1016/j.ngib.2022.03.001.

Lind, J. and D. G. Press (2018), "Markets or Mercantilism? How China Secures Its Energy Supplies", *International Security*, Vol. 42, No. 4, pp. 170–204. https://doi.org/10.1162/isec_a_00310.

Liou, Chih-shian (2009), "Bureaucratic Politics and Overseas Investment by Chinese State-Owned Oil Companies: Illusory Champions", *Asian Survey*, Vol. 10, No. 1525, pp. 670–690. https://doi.org/10.1525/as.2009.49.4.670.

Liu, M. and K. S. Tsai, K. S. (2021), "Structural Power, Hegemony, and State Capitalism: Limits to China's Global Economic Power", *Politics & Society*, Vol. 49, No. 32, pp. 235–267. https://doi.org/10.1177/0032329220950234.

Lu, Zehua (2016), "189项中国标准成为世界标准 [189 Chinese Standards have Become World Standards]", 人民日报海外版 [People's Daily Overseas Edition]. http://paper.people.com.cn/rmrbhwb/html/2016-09/17/content_1713012.htm.

Ma, Z. and Y. Ma (2023), "What's After Coal? Accelerating China's Overseas Investment in Renewables", *World Resources Institute*. https://www.wri.org/insights/whats-after-coal-accelerating-chinas-overseas-investment-renewables.

Malkin, A., and T. He (2023), "The Geoeconomics of Global Semiconductor Value chains: Extraterritoriality and the US-China Technology Rivalry", *Review of International Political Economy*, Vol. 31, No. 2, pp. 1–26. https://doi.org/10.1080/09692290.2023.2245404.

Malkin, Anton (2022), "The Made in China Challenge to US Structural Power: Industrial Policy, Intellectual Property and Multinational Corporations", *Review of International Political Economy*, Vol. 29, No. 2, pp. 538–570. https://doi.org/10.1080/09692290.2020.1824930.

Manning, Robert (2024), "Is Biden Deferring the Green Transition to Contain China?", *Foreign Policy*. https://foreignpolicy.com/2024/05/28/biden-china-electricvehicles/.

Meidan, M., Hove, A., Andrews-Speed, P., and Y. Qin (2024), "OIES China Energy Monthly 10 May 2024", OIES CM, No. 01, Oxford Institute for Energy Studies. https://www.oxfordenergy.org/wpcms/wp-content/uploads/2024/05/OIES-China-Energy-Monthly-Issue-1.pdf.

Meidan, Michal (2020), "China: Climate Leader and Villain", in Manfred Hafner and Simone Tagliapietra (eds), *The Geopolitics of the Global Energy Transition*, Cham: Springer, pp. 75–91.

Millard, R. and B. Jopson (2023), "Solar Supply Chains must Diversify Away from China, Warns EDP", *Financial Times*. https://www.ft.com/content/6ecee5d2-e86b-49d3-9b7f-da937bf8b993.

Miller, Maggie (2019), "Commerce Department Blacklists Five Chinese Tech Groups Due to National Security Concerns", *The Hill*. https://thehill.com/policy/cybersecurity/449777-commerce-department-blacklists-five-chinese-tech-groups-due-to-national/.

Morin, J.-F. and E. Tepper (2023), "The Empire Strikes Back: Comparing US and China's Structural Power in Outer Space", *Global Studies Quarterly*, Vol. 3, No. 4, pp. 1-13. https://doi.org/10.1093/isagsq/ksad067.

Murphy, Ben (2022), "Chokepoints: China's Self-Identified Strategic Technology Import Dependencies", *CSET*. https://doi.org/10.51593/20210070.

Nirupamala, Kanchana (2019), "Intellectual Property: Is China the Global Leader in Innovation?", *SPEEDA*. https://asia.ub-speeda.com/en/

intellectual-property-china-global-leader-innovation/.

Oil and Gas Facilities (2021), "CNOOC Launches World's First Ultradeep Semisub Production and Storage Platform", *Journal of Petroleum Technology*. https://jpt.spe.org/cnooc-launches-worlds-first-ultradeep-semisub-production-and-storage-platform.

Pan, E., Liu, S., Liu, J., Qi, Q., and Z. Guo (2020), "The State Grid Corporation of China's Practice and Outlook for Promoting New Energy Development", *Energy Conversion and Economics*, Vol. 1, No. 2, pp. 71–80. https://doi.org/10.1049/enc2.12007.

Pavlićević, Draga (2019), "Structural Power and the China-EU-Western Balkans Triangular Relations", *Asia Europe Journal*, Vol. 17, No. 4, pp. 453–468. https://doi.org/10.1007/s10308-019-00566-y.

People's Daily (2021), "习近平：能源的饭碗必须端在自己手里 [Xi Jinping: The Energy Job Must be in Our Own Hands]". https://wap.peopleapp.com/article/6338533/6228820.

PetroChina (2023), "PetroChina Company Limited 2022 Annual Report". http://www.petrochina.com.cn/ptr/ndbg/202304/160574715e654711b0f723a3868f6e22/files/85e626beab274137ac1e8068de282d72.pdf.

Pustovitovskij, A. and Kremer, J.-F. (2011), "Structural Power and International Relations Analysis: 'Fill Your Basket, Get Your Preferences'". *IEE Working Paper*, No. 191. https://ideas.repec.org/p/zbw/ieewps/191.html.

Pustovitovskij, A. and Kremer, J.-F. (2012), "Towards a New Understanding of Structural Power: 'Structure Is What States Make of It'", in Enrico Fels, Jan-Frederik Kremer, and Katharina Kronenberg (eds), *Power in the 21st Century: International Security and International Political Economy in a Changing World*, Berlin: Springer, pp. 59–78.

Quimbre, F., Rueda, I. A., Van Soest, H., Schmid, J., Shatz, H. J., Heath, T. R., Meidan, M., Wullner, A., Deane, P., Glynn, J., and L. Regan (2023), "China's Global Energy Interconnection: Exploring the Security Implications of a Power Grid Developed and Governed by China", *RAND Corporation*. https://doi.org/10.7249/RRA2490-1.

Rühlig, Tim (2024), "Chapter 5: China: A Technical Standardisation Power?", in Rogier Creemers, Straton Papagianneas, and Adam Knight (eds), *The Emergence of China's Smart State*, London: Rowman & Littlefield Publishers, pp. 103–122.

RystadEnergy (2023), "Too Little, Too Late: Regional Clean Energy Supply Chains not Possible Until at Least 2030". https://www.rystadenergy.com/news/regional-clean-energy-supply-chains-china.

Sassi, Francesco (2022), "Structural Power in Russia's Gas Sector: The Commoditisation of the Gas Market and the Case of Novatek". *Energy Strategy Reviews*, Vol. 41, p. 100842. https://doi.org/10.1016/j.esr.2022.100842.

SG (2021), "Corporate Social Responsibility Report 2020". https://web.archive.org/web/20230103192759/http://www.sgcc.com.cn/html/files/2022-06/10/20220610161501291488481.pdf.

——— (2022), "2021 国家电网有限公司 社会责任报告 [State Grid Corporation of China: Social Responsibility Report]". https://web.archive.org/web/20230103192307/http://www.sgcc.com.cn/html/files/2022-07/21/20220721120427708767768.pdf.

Simmons, Brad (2024), "US Efforts to Decarbonize and De-risk the Battery Supply Chains: Are They Fundamentally Incompatible?", *OIES Energy Comment*. https://www.oxfordenergy.org/wpcms/wp-content/uploads/2024/05/US-efforts-to-decarbonize-and-de-risk-the-battery-supply-chains.pdf.

Sinopec (2023a), "2022 Annual Report China Petrochemical Corporation". http://www.sinopecgroup.com/group/en/Resource/Pdf/GroupAnnualReport2022en.pdf.

——— (2023b), "2022 Sinopec Corp. Sustainability Report: Cleaner Energy Better Life". http://www.sinopec.com/u/cms/gfyw/202411/27093615d6xm.pdf.

Strange, Susan (1998), *States and Markets*, 2nd ed, London: Bloomsbury Academic.

Tan, Y., Zheng, H., and W. Wu (2022), "浅析标准化工作对企业发展战略的支撑作用 [Supporting Effect of Standardisation on Enterprise Development Strategy]", 石油工业技术监督 [Technical Supervision of the Oil Industry], Vol. 38, No. 5, pp. 8–11. https://doi.org/10.20029/j.issn.1004-1346.2022.05.003.

Tan, Y., Zheng, H., Du, Y., and W. Wu (2022), "新时期中国海油国际标准化工作的思考 [Thinking of CNOOC International Standardisation in New Era]", 石油科技论坛 [Petroleum Science and Technology Forum], Vol. 41, No. 5, pp. 57–62. https://doi.org/10.3969/j.issn.1002-302x.2022.05.008.

Taylor, Monique (2021), "China's Evolving Energy Security Strategy", *Asian Affairs*, Vol. 52, No. 4, pp. 890–913. https://doi.org/10.1080/03068374.2021.2004031.

The US-China Business Council (2020), "China in International Standards Setting: USCBC Recommendations for Constructive Participation". https://www.uschina.org/sites/default/files/china_in_international_standards_setting.pdf.

US Department of Defense (2024), "DOD Releases List of People's Republic of China (PRC) Military Companies in Accordance with Section 1260H of the National Defense Authorization Act for Fiscal Year 2021". https://www.defense.gov/News/Releases/Release/article/3661985/dod-releases-list-of-peoples-republic-of-china-prc-military-companies-in-accord/.

Von der Leyen, Ursula (2023), "2023 State of the Union Address", *European Commission*. https://ec.europa.eu/commission/presscorner/detail/ov/speech_23_4426.

WIPO (2019), "Technology Trends 2019: Artificial Intelligence". https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1055.pdf.

Wood Mackenzie (2022), "China's Renewables Boom Year Poses Major Challenges to Western Markets". https://www.woodmac.com/press-releases/chinas-renewables-boom-year-poses-major-challenges-to-western-markets/.

——— (2024), "China Leads Global Wind Turbine Manufacturers' Market Share in 2023". https://www.woodmac.com/press-releases/2024-press-releases/global-wind-oem-marketshare/.

Xin, C., Yang, P., and W. Liang (2022), "我国海洋油气平台标准应用现状分析 [Application and Development Trend of the Standardisation of Offshore Oil Platforms in China]", 中国标准化 [China Standardisation], Vol. 13, pp. 122–125. https://doi.org/10.3969/j.issn.1002-5944.2022.13.019.

Xinhua (2022), "China to End Patent Subsidies by 2025. State Council". http://english.www.gov.cn/statecouncil/ministries/202201/27/content_WS61f29de1c6d09c94e48a4616.html.

Xu, Yi-chong (2017), *Sinews of Power: The Politics of the State Grid Corporation of China*, New York: Oxford University Press.

——— (2019), "The Search for High Power in China: State Grid Corporation of China", in Loren Brandt and Thomas G. Rawski (eds), *Policy, Regulation and Innovation in China's Electricity and Telecom Industries*, Cambridge: Cambridge University Press, pp. 221–261.

Yuhai, H., and L. Haixiang (2017), "Leading the Way in Serving 'Belt and Road' Construction: State Grid International Development Limited's Path to Overseas Business Expansion [做服务'一带一路'建设的排头兵———国网国际发展有限公司海外业务拓展之路]", *CSIS Interpret: China, original work published in China Power Enterprise Management* [中国电力企业管理]. https://interpret.csis.org/translations/leading-the-way-in-serving-belt-and-road-construction-state-grid-international-development-limiteds-path-to-overseas-business-expansion/.

Zhang, C., Huang, Y., Zhao, X., Cao, L., Zhao, L., Lou, C., and P. Zhang (2022), "Analysis of the current situation and suggestion of countermeasures for international standardization for power grid industry of China", *IOP Conference Series: Earth and Environmental Science*, Vol. 1087, No. 1, p. 012067. https://doi.org/10.1088/1755-1315/1087/1/012067.

Zhang, G., Song, Z., and C. Shang (2022), "我国石油石化装备制造业高质量发展对策研究 [Study Countermeasures for High-quality Development of Petroleum and Petrochemical Equipment Manufacturing Industry]", 石油科技论坛 [Petroleum Science and Technology Forum], Vol. 41, No. 6, pp. 10–16. https://doi.org/10.3969/j.issn.1002-302x.2022.06.002.