EU-CHINA

Energy Cooperation Platform

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Reciprocal Opportunities and Challenges for Local and International Innovative Firms Operating on a Level-Playing Field in the Energy Sector

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EU-China Energy Cooperation Platform was launched on 15 May 2019 to support the implementation of activities announced in the 'Joint Statement on the Implementation of EU-China Cooperation on Energy'. The overall objective of ECECP is to enhance EU-China cooperation on energy. In line with the EU's Green Deal, Energy Union, the Clean Energy for All European initiative, the Paris Agreement on Climate Change and the EU's Global Strategy, this enhanced cooperation will help increase mutual trust and understanding between EU and China and contribute to a global transition towards clean energy on the basis of a common vision of a sustainable, reliable and secure energy system. Phase II of ECECP is implemented by a consortium led by ICF, and with National Development and Reform Commission - Energy Research Institute.

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Executive Summary

There is no lack of ambition in the policy targets of the EU or China when it comes to net zero. While the EU has set an ambitious target to be climate-neutral by 2050, China intends to reach peak emissions by 2030 and achieve carbon neutrality by 2060 (known as the 30/60 target).

At the same time, disruption to fossil fuel supply routes during 2022 has prompted energy price spikes and supply issues. This disruption comes on top of the impact of the pandemic on trade routes. The result of all these factors is that there is now a heightened interest in energy security in both the EU and China.

This combination of circumstances has brought the need for renewable sources of energy, and energy conservation, sharply into focus. The already announced push for renewable capacity is doubly attractive with the knowledge that locally-produced renewables are much safer for national energy security than imported fossil fuels.

Today, the challenge ahead is to reduce use of fossil fuels, enable rapid deployment of related innovative technologies and to press ahead with carbon capture. Most energy technologies are not on track to provide the clean energy transitions targeted by governments, according to IEA annual monitoring.[1]

Both the EU and China have introduced programmes to encourage development of innovative technologies that will boost production and development of renewable energy. China's Five-Year Plans have over the past decade focused on energy innovation, and the 14th Five-Year Plan prioritises new energy vehicles, bioenergy, hydrogen, energy storage, CCU and batteries. Among a host of measures to support innovation, the EU has introduced its EU Green Deal, and most recently REPowerEU.

There is plenty of appetite for collaboration and cooperation amongst companies in China and the EU. When China lifted its quarantine restrictions on 8 January 2023, it unlocked a rush of applications from businesses keen to take advantage of the country's skilled labour, cutting edge R&D, and extensive production and manufacturing facilities. Meanwhile, flights from China to the EU have quickly filled with company representatives bringing the country's leading products to the EU - one of China's largest markets.

Within the energy landscape, innovation is central to the drive for net zero, and China, as a global manufacturing and innovation hub, is key to reaching that target.

'Collaboration between innovation actors is an important aspect of successful energy innovation systems… Without effective international collaboration, global energy transitions to net zero emissions could be delayed by decades,' warns the IEA in its 2022 report 'Tracking Clean Energy Innovation: Focus on China. Working separately, there is a danger that these regions, which together account for one third of global energy consumption, will develop standards and technologies that are either

1 Tracking Clean Energy Innovation: Focus on China - IEA report 2022.

incompatible or in competition with each other and so will not achieve the accelerated development that the planet requires.

This report is structured in three sections. First we present the situation of European energy companies in China, then the situation of Chinese companies in the EU. The report concludes with ten action points for the EU, and ten action points for China, that can encourage energy innovation and so help the world to turn the tide of climate change towards climate neutrality.

Methodology

Together with the heightened focus on energy security, the lifting of Covid restrictions in China has brought about a new wave of commercial interest and policy making in the EU and China's energy innovation sector. The authors of this report are providing a perspective that is as up to date as possible, by conducting interviews with 15 leading industry players in the EU and China to find out what stands in the way of clean energy cooperation, and what can be done to overcome those obstacles.

We have also sought to establish what policies and processes are enabling companies to work across borders to achieve maximum emissions reductions. We have referred to the most recent written accounts of the latest developments, including the IEA's 2022 report 'Tracking Clean Energy Innovation – Focus on China', the EUCCC's 2022 report on European Business in China, the 2022 report from the Chinese Chamber of Commerce to the EU, and articles and discussions featured in the ECECP magazine and in ECECP workshops. Our aim is to provide a practical resource that identifies issues and offers potential solutions and examples of successful outcomes.

Some of our interviewees have asked to remain anonymous due to commercial confidentiality.

1. EU Innovation in China

1.1 Overview

Technology innovation, cooperation and coherent government policy are vital to bring both China and the EU to their net zero emissions targets by 2060 and 2050 respectively. While both regions are prioritising research and development to foster energy innovation and to accelerate emissions reductions, there remain many areas where it would be beneficial to pool expertise and ensure that the new technologies are available to the largest possible number of energy users. China has moved to attract the maximum number of investors into the country, setting up free trade zones that give foreign companies the option of establishing a 100% foreign-owned company in certain sectors, and offering tax breaks, incentives and subsidies to encourage newcomers. China has also revised its intellectual property (IP) legislation and enforces high penalties on companies and individuals who infringe IP rights, in a bid to reassure investors into the country.

A number of larger companies, such as Denmark's Danfoss, Shell China, and France's TotalEnergies, have had a presence in China for several decades, and have a long-term vision to enable them to access the huge market represented by China's vast population of 1.4 billion. While China is trying to increase its openness, it remains the case that in sectors that are listed on China's annually-updated Negative List, foreign enterprises can only take part via joint ventures in areas that relate to the national core economy.[2] While it is not uncommon for countries to protect their national security by limiting foreign investment, companies report that they find such moves a barrier to activity in the country. Small and medium sized businesses (SMEs) report that it is harder for them to break into China's market: they do not have the resources or manpower to fund patents, the tendering process, nor the cultural, linguistic and local knowledge necessary to enter into regional and provincial markets. However, in interviews with industry experts, it is clear that European SMEs have successfully entered the Chinese market, although these stories are not often told.

In recent years, foreign investor confidence has been knocked by the mass lockdowns that were imposed in an attempt to contain the spread of Covid-19. In addition, as policy and industrial standards in China and the rest of the world diverge, some companies are starting to decouple parts of their China operations from their global operations, to hedge against potential global shocks and to remain compliant in both China and their home markets.[3] The EU has recently introduced policies to shore up its own production of energy infrastructure, so as to reduce its reliance on China.

While China's state owned enterprises have easier access to finance (e.g. preferential borrowing) and political support that are not generally accessible to private companies,[4] the findings of ECECP are that China has introduced IP legislation and

2 https://investmentpolicy.unctad.org/investment-policy-monitor/measures/3792/issued-new-negative-list-for-foreign-direct-investment

3 Business Finland: China positioning paper 19.12.2022

4 Tracking Clean Energy Innovation: Focus on China - IEA - 2022, page 51.

free trade zones that look set to deliver near equal status between Chinese and European entities. It remains true, however, that in particular provinces some Chinese companies still receive favourable treatment.

Nevertheless, even in 2022, European investment in China jumped by 92.2%[5] year on year, reversing several years of decline. It is likely to rise even higher in 2023 with the lifting of Covid-19 travel restrictions and surge of business interest. The investors are led by Germany, the Netherlands, France and the UK, with the recent surge in investment reflecting some major deals in the automotive sector. China continues to expand its 'Catalogue of Encouraged Industries for Foreign investment': the 2022 version extends to 1 474 items across two catalogues, and includes areas of the renewable energy industry in which European companies can compete and supplement the Chinese clean energy market. These include the energy storage market, smart grids, energy efficient technologies and hydrogen energy.[6]

Below are selected innovative areas of the energy sector in which the EU is playing a part in China, highlighted at an innovation workshop hosted by ECECP in 2022.

1.1.1 Carbon Technology

The ambitious 30/60 target has brought carbon technologies such as CCS, CCUS, direct capture and carbon renewables into the spotlight. This is because, alongside the rush to install renewable capacity, the replacement and phasing out of coal fired power plants cannot happen overnight: China is relying on coal to provide flexibility and security of supply as it ramps up renewable capacity. TotalEnergies is engaged in several demonstration and pilot projects across different sectors. The Horizon 2020 project CHEERS (Chinese European Emission Reduction Solutions), launched in 2017, is funded by the EC and China's Ministry of Science and Technology. It is the world's largest chemical-looping combustion based carbon capture project.

1.1.2 Biofuels

As an agriculture superpower, China is in a position to support its rapid urbanisation with clean and sustainable transport fuels, offering the opportunity to use organic waste and wastewater sludge. China's 14th Five-Year Plan signals stronger policy in support of advanced biofuels, representing a boost for the sector in China and an opportunity for EU companies, such as Sweden's Scania or Denmark's Novozymes, that have applied the technology in Europe.[7] In particular, sustainable and low-emission biogases are set to be prioritised.

5 https://www.china-briefing.com/news/european-investment-in-china-prospects-for-2023/#healthcareHeader
6 Ibid.
7 http://www.ececp.eu/wp-content/uploads/2022/06/innovation02-2-2.pdf

1.1.3 Flexibility solutions

Introducing a high penetration of variable renewable energy (VRE) into an energy system that is increasingly electrified comes with intermittency challenges that require flexibility solutions. China's recent announcement that it intends to promote energy storage in the electricity market could unlock the potential for the use of long duration grid scale battery storage systems. There are also opportunities for organisations that offer advice on smart charging solutions, such as the Sino-German Energy Transition Project at GIZ.

1.1.4 Hydrogen and Power-to-X

Hydrogen offers the option of long term storage that can complement the battery storage flexibility solution, and help offset the intraday imbalances caused by VRE generation. With its abundant wind and solar capacity, China offers a promising set of opportunities for green hydrogen. Hydrogen can not only absorb the intermittency of renewables and reduce curtailment, but can also be used to produce other H_2-based carriers such as ammonia or methanol that can then be transported long distances. France's Air Liquide is among the companies ambitious to work in China's coal-dominated power sector, offering options to convert hydrogen to ammonia and so decarbonise coal-fired power plants through co-firing.

1.1.5 Floating Offshore Wind

Offshore wind power is already well developed in the EU, whereas China's offshore sector is in the early stages of commercialisation. A UK-funded study in 2021 suggested that China has the potential to develop 600 GW of floating offshore wind.[8] In 2022, China had installed 17 GW of offshore wind. Shell China, which has a 100-year history of operations in China, is one of several companies actively seeking to bring their experience from European test projects into the Chinese market.

1.2 Localisation[9]

In China, while strategic guidelines for the promotion of clean technologies are set at the national level, e.g. in the Five-Year Plans and their sectoral versions, provincial and municipal governments are responsible for implementation in their respective local or sector-specific development plans.[10]

8 https://focus.cbbc.org/how-the-uk-could-help-china-unlock-600gw-of-offshore-wind-potential/#.ZAs_TXbP25c

9 In this report, localisation is understood to mean the adaptation of a product or service to suit the local environment. It may include hiring local staff, engaging in community projects, setting up local headquarters or offices, and putting time and energy into becoming aware of the issues that matter to the community in which a company wishes to bring its innovative solution.

10 Accelerating the incubation and commercialisation of innovative energy solutions in the EU and China, http://www.ececp.eu/en/innovation-01-en/

Companies that are already established in China's energy sector point to long-standing efforts to be culturally aware, and the need to be ready to provide social and economic support to the regions in which they are active. 'One way to overcome many of the challenges that foreign companies face is to think and act in a very local way, with a local mindset,' states Alessio Petino of the EU SME Centre. Such efforts lead to positive sentiment at a local and provincial level, and mean that the company activities are more likely to be accepted within the local markets.

- Danfoss, a Danish engineering company with a focus on energy efficiency and carbon reduction, first entered the Chinese market in 1996. Today, it describes China as its second home market 'Our business is growing very quickly, especially products related to decarbonisation,' says Lu Xia, Public Affairs Lead at Danfoss China. As a large business, Danfoss is a major corporate citizen[11], particularly in Guangzhou province and Tianjin city. As such, the company received significant support during the Covid-19 pandemic and in its day to day operations. In Beijing and Shanghai, the company is cooperating closely with the local government in new projects.

- Shell China has a 100-year history of activity in China, and invests in local projects such as education, environment and capacity building. It is China's largest foreign investor with interests in petrochemicals and as a supplier of LNG, bitumen and lubricants. It is now actively looking at offshore wind development.

- Schneider Electric has been operating in China for more than three decades, and manufactures most of its products in the country for domestic use and markets abroad. The company is tapping into the groundswell of innovation in China by setting up its own global innovation hubs in the country. The company's Green Energy Management Innovation Program is a unique acceleration programme that recruits Chinese start-ups to join the programme who work with Schneider and the co-host to develop the innovative project.[12]

- Hydrogen Electric fuel cell solutions provider PowerCell is a more recent arrival in China since 2019 and takes a long-term approach to its investments. Fuel cell solutions can be applied in on-off road transportation, shipping, stationary and aviation, and the company has projects under way on six continents. Encouraged by 30% of sales revenue generated from the China market back in 2018, PowerCell set up a subsidiary in Shanghai with 100% ownership. The aim is to work closely with local customers and become integrated into the supply chain. 'The reason we set up our China subsidiary is to better serve our local customers. As we are the first point of contact for stakeholders in China, we can better understand our local market needs and trends, increasing mutual understanding between our engineers and customers,' says George Zhao, business manager at PowerCell.

- Swedish truck manufacturer Scania has worked for almost 60 years in China, selling its first timber trucks to the Chinese Ministry of Forestry via Machimpex for long-term durability trials in 1965. After its representative office was opened in Beijing in 2004, Scania Sales (China) Co. Ltd was set up as the first wholly owned foreign CV importer in China in 2007.[13] In 2020, Scania acquired Chinese company

11 Corporate citizen = a company that is aware of its social responsibility

12 ECECP Workshop: Carbon Neutral by 2060: Innovation http://www.ececp.eu/en/china-carbon-neutral-innovation02-2-2/

13 https://m.chinatrucks.com/news/5654.html

Nantong Gaokai Auto Manufacturing. It is setting up a truck production facility in Rugao, Jiangxi Province, and aims to make China its regional centre for sales to other Asian markets. It also intends to set up its own R&D facilities in the country.

In their latest joint report, EUCCC and the Mercator Institute for China Studies (MERICS) China's Innovation Ecosystem – The localisation dilemma[14] look at the wide spectrum of R&D strategies European companies are deploying in China to mitigate risks and maximise their competitiveness. The report, based on a survey of 107 European companies and follow-up interviews, distinguishes between four different localisation strategies; i) integrators, which are companies that are heavily involved in China's innovation ecosystem; ii)market-chasers, who recognise China as the key global market for certain technologies; iii) withholders, who have a very limited R&D footprint in China due to technology leakage concerns, and iv) niche cultivators, companies that keep their R&D at home so as not to risk any leakage. The market is described as 'a complex environment that necessitates a wide range of localisation strategies to be deployed depending on the industry each company is in and the contribution they can make to China's strategic goals, as well as their size', demonstrating that localisation strategies can vary widely from company to company.

1.2.1 SMEs/Startups

SMEs are drivers of the economy in both the EU and in China. They create the large majority of employment and contribute from 50% to 60% of gross domestic product (GDP) and tax revenue in the two markets.

In ECECP's first innovation report, the authors note: 'Meijer et al. describe SMEs as often overlooked cradles for the commercialisation of technologies in the renewable energy market, as they are able to commercialise sustainable technologies by developing new products and creating new organisational forms and business models. In particular, the authors identify external financial investment, having strong entrepreneurial abilities of the management, early-stage prototyping and piloting, and legitimising sources such as an official 'stamp' for product quality as key drivers for commercialisation of SME solutions.'[15]

Yet, just as in Europe, SMEs in China can find themselves at a disadvantage compared to larger companies. 'They do not have the same resources as large multinational companies to enter a market,' says Tara Joensuu, CEO and founder of Osa Technology, a consulting company that supports China's path towards decarbonisation through the promotion of international business and research cooperation. She goes on to classify European innovative companies into three groups: a) large multinationals that have plenty of resources and whose main issues relate to policy restrictions; b) SMEs that have been established for 20-30 years. These are interested in the Chinese market, but have limited funds and are very protective of their IP; c) younger SMEs, such as startups with 'sexy' technologies, which have strong investment from abroad and a clear plan of how they are going to enter each market. 'If these companies are not interested in the Chinese market right now, they're not going to be interested for a

14 https://www.europeanchamber.com.cn/en/publications-innovation-report

15 http://www.ececp.eu/en/innovation-01-en/

while because they are pretty much controlled by their investors,' says Joensuu.

Alessio Petino, business advisor at the EU SME Centre, reports that SMEs hoping to do business in China can encounter a lukewarm reception. 'SMEs are not seen as a priority compared to multi-national companies, as their contribution to the KPIs of local administrations is more limited in the short term,' says Petino. 'They might not get the same level of favourable treatment and support: this applies to all sectors, not just green technology.'

There is support for SMEs planning to bring innovative products to China, from EU-funded organisations such as the EU SME Centre, to independent consultancies based in China or Europe. 'The process of establishing a company in China can be complicated or straightforward depending on the nature of the business and the support from local administrations. Some Chinese municipalities and provinces are more efficient than others, and the efficiency of one-stop services varies. Nanjing is an example of a city where almost everything can be done online with minimal paperwork, while Beijing is more challenging,' states Petino.

Besides registration, participation in tenders is also a challenge for foreign SMEs. For example, Finnish company Savosolar reports that, while the tendering process and selection is conducted fairly, the difficulties arise because of the complexity of the tendering process and the challenges associated with language barriers. Joensuu provides more detail about the issues they can face. 'The tender is usually predetermined with the customer ahead of time, and they usually put it on the tender website for a short time. You have to buy those tender documents very quickly to be able to participate in it,' she advises. 'You have to have connections … Having that local distributor or local partner is the easiest way to do it.'

1.2.2 Access to Finance and Subsidies

EUCCC reports that the Chinese authorities are trying to make access to financing more straightforward for SMEs. Measures include creating a new Beijing Stock Exchange for innovation-orientated SMEs; providing capital to local banks to issue loans to small businesses; ramping up long-term loans for manufacturing firm; and rolling over a CNY 400 billion relending quota that supports inclusive financing. So far though, participation of foreign investors in the Beijing Stock exchange is still relatively restricted.[16]

The perception among EU companies is that subsidies are not generally available to foreign entities, but this is not the case. Although information about subsidies is fragmented, it is accessible; in many cases, the lists of successful companies are publicly available for a period of time, explains Petino. 'You do need to know how to write an application for subsidies, there is a lot of paperwork, and you may need to go through different government departments to get stamps, but it is all accessible with some effort.' Companies may have a short period of time (between two weeks and a month) to submit their application, but they can anticipate when a call for subsidies is likely to be published, through contact with the local administrations or simply by

16 EUCCC European Business in China Position Paper 2022-23

mapping when similar calls were published in the previous year. 'If you know how to do it, you can plan for it,' advises Petino. He cites an EU-based SME that engaged a Chinese expert based in Europe, who guided them through the process of applying for subsidies and finding a foreign partner. EU companies can also employ consulting firms or intermediaries in China who can guide them through the process for a fixed fee, plus a percentage of the subsidy obtained, if successful.

'The Chinese government provides significant support to SMEs, primarily through tax cuts, subsidies, incentives for R&D, and rewards for high-tech status. However, SMEs generally do not receive as much strategic support as multinational corporations, such as connections with big state-owned players or meetings with local administrations. While SMEs may receive incentives and support in hiring or bringing in foreign R&D staff, they are not typically involved in high-level strategic meetings,' summarises Petino.

1.2.3 Finding a Partner

Identifying a foreign partner is key when it comes to setting up business in China. While China offers incentives and subsidies to newcomers, it does not give any help bringing SMEs together with local administrations and potential partners. Such 'partnering work' is not necessarily the state's role: 'It is a business decision,' says Petino. 'Not a barrier.' Some help is available: the EU SME Centre can guide companies through their first steps in China. Equally, there is support from China for hiring local labour and bringing in research and development. 'If you're setting up a consulting company with no physical assets, it could cost just a few thousand euros,' says Petino. 'But you need the support of the local administration if you require land for production facilities or access to certain resources.' He points out that the efficiency of local administrations can vary. In Nanjing, for example, everything is digital and there is very little paperwork for companies entering the region. In Beijing, on the other hand, the bureaucracy can be much more burdensome - although it is improving. 'You need to think and act with a local mindset,' advises Petino.

Joensuu agrees that support from the local authorities is crucial both in terms of funding and finding a partner. 'When you discuss [an innovation] with local leaders and get them on board, then they can provide the funding to do that pilot demonstration,' she says. 'SMEs need very clear information about the current policy situation at a local level and the Five-Year Plan.'

ECECP's report on innovation in 2022 'Accelerating the incubation and commercialisation of innovative energy solutions in the EU and China' provides a useful list of 12 key issues encountered by SMEs seeking to bring innovative technology into China[17] (see Figure 1). While not unique to China or the EU, they reflect the difficulties encountered by smaller companies that do not have huge financial or manpower resources, and that are trying to break into a new international market.

17 Accelerating the incubation and commercialisation of innovative energy solutions in the EU and China,http://www.ececp.eu/en/innovation-01-en/

Figure 1: Challenges facing SMEs in China

Challenges		Definition
C1	**Lack of market knowledge**	Lack of knowledge about customer needs and specifications of foreign markets.
C2	**Lack of cultural knowledge**	Lack of knowledge and understanding about the culture, language and business etiquette of the new market.
C3	**Regulatory barriers**	Lack of knowledge of legislation; slow and costly administrative procedures and restrictive regulations.
C4	**Financing**	Difficulties in accessing external finance, higher financing costs.
C5	**Recruitment**	High costs for recruiting new professionals; different recruitment channels in the new market.
C6	**Intellectual property management**	Uncertainty as to whether patents are necessary; costs and time required for patent applications.
C7	**Absence of network**	Absence of a local network of customers, partners, investors, policy makers and employees in the new market.
C8	**Rapid technological change**	Challenges in adapting to rapid technological change and high technological demands.
C9	**Language barrier**	Difficulties communicating with public administration, employees, customers and business partners. Translation time and costs.
C10	**Higher burden of proof**	Showcases and pilot projects are needed in the new market to build trust and information among potential customers, partners and employees.
C11	**Management time**	Additional administrative time, i.e., for travel and coordination.
C12	**Communication of public support**	Lack of familiarity with public programmes and difficulties applying for public funding; lack of access to public contracts.

1.3 Local Barriers to Foreign Technologies

China is now the world's largest investor in energy research and development after the US, with the government ploughing USD 8.4 billion (CNY 61.2 billion) into energy

R&D in 2020. [18] Investment by Chinese companies dwarfs that figure: they accounted for USD 35 billion (CNY 255 billion) of investment into energy R&D in 2020. Cheap finance has become widely available, particularly through state-backed venture capital and innovation funds, which are pumping money into Chinese start-ups and entrepreneurship. 'China is promoting a culture of innovation and seeking to develop a skilled workforce able to advance the country's technology development ambitions,' states the IEA in its report 'Tracking Clean Energy Innovation: Focus on China'.

There are unforeseen consequences to this emphasis on home-grown R&D excellence. There is an overlap between business and public sectors in China, given the prominent role of state-owned enterprises, particularly in the energy sector. The entry point into China for foreign enterprises seeking to bring new technology to the country is generally with state-owned enterprises. These then demonstrate to the foreign company an equivalent Chinese technology at one of the country's design institutes. There are clear benefits to this type of initial contact for a European company that is new to working in China: in ECECP's innovation report, Linde plc noted many advantages to working with design institutes e.g. the design institutes know the industry and regulations in China. [19]

The problem, for the European innovator, is that while the technology at research institutes is the best that China has to offer, it does not necessarily reflect the technology that is in use on a day to day basis. 'In China, you have to enter the market from the top down and at the top level. In any other open country you can directly contact an individual power station,' says Sauro Pasini, former head of research at Enel. Even when a foreign partner is allowed access, for example, to a functioning power plant, the Chinese operators may not disclose the problems at the plant to a potential foreign partner due to a sense of pride and not wishing to demonstrate inferior technology or equipment.

Tara Joensuu agrees that there is complacency among Chinese companies which leads to a failure to contemplate new technology: 'A lot of companies, and Chinese companies especially, are very secretive about their technologies because they don't want people to understand how good or bad it actually is. It's easier to be very vague about their technology, so they just make their company sound very good, whereas they probably could benefit from an improved version of their technology or cooperation. But if they already have a stable business, they're not necessarily looking to do better and go higher. They're already satisfied with what they have.'

In addition, the managers of a power plant often do not know the actual output or consumption data at the plant: their employees may not give them a full picture of the results, in order to be seen to be meeting local or national targets. This means not only that the foreign partner does not get a true picture of the potential for energy saving technology, but also that the Chinese side may not benefit from technology that, while perhaps equivalent in quality to what is available in China, may be more immediately available and at a more competitive price. 'When we exchange information with China we exchange with XI'AN Thermal Power Research Institute Co., Ltd., [which is] paid by the largest utilities and is developing top technologies. What really happens in the real power stations is a completely different story that you don't

18 IEA Tracking Clean Energy Innovation: Focus on China, p47.

19 http://www.ececp.eu/en/innovation-01-en/

know until you visit them,' says Pasini. 'There is still a lot of margin for improvement. What they are really doing in the plant is completely different from what they do in the advanced research centres.'

EU industry experts also comment on another unforeseen consequence of the centrally-set priorities for technology innovation, such as investing in hydrogen, or electric vehicles. Local government officials will often make these priorities the focus of all their efforts, to the exclusion of other technologies.

PowerCell is offering hydrogen electrification solutions for marine, on-road, off-road, stationary and aviation transport. In China, hydrogen applications for general purpose electric vehicles are prioritised by most players. PowerCell would like to see subsidies and policies extended to include the other transport sectors. 'At the moment subsidies both in policies and funds for China's hydrogen industry are very necessary,' says George Zhao of PowerCell.

Tara Joensuu echoes his concerns. Even though there are efficiency improvements that can be made in coal-fired plants, many of which are 20 or even 30 years old, the focus in China is on renewable energy and hydrogen technologies. With decarbonisation targets guiding investment decisions, local decision makers feel the investment period for coal-fired power plants is too short to make it worth investing. 'If you have anything renewable energy- or hydrogen-related, bring it to me, and I will help you with it. But coal fired plants, that's like the past, we're not so interested in it,' one local decision maker told Joensuu. When China initially issued its green bond guidelines it included coal technology and thermal power. However, following international criticism of the draft guidelines, the amended Green Bond Endorsed Project Catalogue, published by the Bank of China, NDRC and CSRC in April 2021, omits any coal-fired technology from the list of technologies eligible for green funding. More positively, however, China included clean coal in its latest revision to the Green Industries Guidance Catalogue, in April 2023.[20]

The danger is that the potential for energy efficiency in coal-fired units, which account for 60% of power generation capacity in China, and 40% of the country's carbon emissions, could simply be overlooked with a consequent impact on the global efforts to achieve net zero emissions.

The concern is echoed by the IEA in its 'Tracking clean energy innovation: Focus on China' report. 'While central decision-making enables the steering of national efforts towards new technology priorities and long-term goals quickly and effectively, it presents risks of 'picking winners' … Within a given technology area, 'picking companies' such as by mandating SOEs also hinders competition that could trigger technology improvements and decrease incentives for major incumbents to innovate beyond targets set out by policy.'[21]

Former head of research at Enel Sauro Pasini also points to inconsistent application of technology and the need to keep an open mind on the information provided by staff on the ground. 'We visited a plant that they said was similar to one we were developing in Europe. They built it, and ran it for a few days, but then the plant was closed and so [in fact] they have no experience in running such a plant. Several times

20 http://www.pbc.gov.cn/goutongjiaoliu/113456/113469/4342400/2021091617180089879.pdf
21 Tracking Clean Energy Innovation: Focus on China: IEA 2022.

they said they are doing something, they probably did it once, but they don't exploit all that can be derived from it. Unless you visit them and put real questions on site to understand what they have actually done, they say they have done everything. But when you go and look specifically, you often discover that this is not completely true. … You typically find your data behind closed doors.'

Recently, business analysts have observed increased concerns in China regarding technology transfer, with national and provincial policies being released to maintain the country's industrial pole position. The Ministry of Commerce of China has reportedly added wafer equipment and manufacturing technology to its list of technologies being restricted for export, reports a solar advisor who works with EU companies operating in China. 'Limitations or restrictions on technology exports are nothing new … but the timing is interesting. The last time China produced this type of list was in 2020, and the version before that was in 2009,' he reports. The purpose is to maintain China's technological leadership, and limit technology transfer, i.e. to protect China's companies and limit development of competition abroad. It still is not clear whether the recent move was prompted by industry or by the recent push outside China to develop homegrown energy technology and production rather than maintain reliance on Chinese manufacturing.

1.3.1 Narrowing the Technology Gap Between EU and China

> *China holds nearly one-third of the world's renewable energy patents and is a global leader in the sectors related to the green supply chain, including key minerals, industrial processes, manufacturing and assembly of parts and components, etc. The EU leads the world in the research and development of low-carbon technologies such as smart grid, hydrogen energy networks, carbon capture and storage, and the establishment of safe, recyclable and sustainable battery value chains. Therefore, China and the EU should draw on each other's strengths to create synergy and win-win results. (Striving for a Common Future - CCCEU Report on the Development of Chinese Enterprises in the EU in 2022)*

While in the EU there is a tendency to believe that European green technology is further advanced than in China, in many sectors this is not the case. The technology cycle has shortened from seven years to around two years, posing a challenge for European bureaucracy which struggles to keep up with China's rapid decision making processes.

'In general, China is stronger in technologies and applications that are at the end of the value chain, such as digital or customer demand applications. China is ahead in introducing digital products globally; it is not rare to see products in the EU originating from Chinese innovation. However, China is a bit behind in original innovation and basic research, despite putting a lot of money into it. This may be due to the political system's strong focus on KPIs and short-term results, which doesn't stimulate researchers to come up with disruptive ideas. But once China has the technology or idea, they can create innovative solutions to be introduced on the market at a speed that cannot be matched,' explains Petino.

One key advantage enjoyed by China that is frequently mentioned in the interviews

with ECECP is its rapid administrative processes. 'Paperwork to build a plant and do an environmental impact assessment in China can be done in no time. By the time my factory in Europe is up and running, there's a better technology already in the market in China. How am I supposed to compete on the price level?' reports a solar PV expert.

China's massive energy R&D investment is completely out of range for the EU. In the solar industry, for example, the top five companies invested the equivalent to half a billion euros in R&D during 2022 alone. Chinese ministries have published papers on smart PV manufacturing and the smart energy industry, while the provincial industry's solar PV development plans extend for the next two to four years. Although European countries have announced initiatives to develop their own solar manufacturing industry, it is China that is setting the standards, simply by virtue of the fact it produces 90% of the world's solar panels. The EU alone spent EUR 20 billion on solar panel imports from China in 2022. China's strategic focus on the solar market has paid dividends: whereas ten years ago, China was looking to the EU for technological advances, today it is China that is leading the way.

Industry specialists see similar developments in other sectors. In the EV industry, it is evident that China's focus on EV development and manufacturing will lead to national standards and then by sheer virtue of scale, these will be adopted as international standards. 'If I'm in a position to set, to define the standard, that's good for my equipment manufacturers, it's good for the manufacturer of the product itself … if you no longer have a manufacturing industry in Europe, you hardly have any voice,' reports a solar industry specialist.

In one example, an expert Chinese consultant in the heating and cooling sector referred to an HVAC project carried out by a Dutch company in Japan. The well collapsed during the drilling process, and a Chinese specialist company took over and resolved the problem. 'I don't think other European countries necessarily have much more advanced technology than ours in this area.'[22]

The risk here, for China, is that of complacency: is China's energy sector missing out on technological advances by closing its eyes to opportunities and developments elsewhere in the world, simply because of their awareness of the superior R&D funding in China?

For example, with regard to boiler efficiency, the feeling in China is that 'they have done so much work on coal fired units, they have covered the technological gap with Europe … they don't feel we can teach them a lot, even if in some specific sectors like boiler optimisation we have an experience that they may not have,' says former Enel head of research Sauro Pasini. Yet advanced methodologies that can balance boiler performance are necessary to achieve the flexibility that coal power plants will need to deliver over the coming decades. The technology is vital to provide short and long-term balancing services that will allow higher levels of renewable penetration while maintaining the reliability and security of electricity supply in China.

Even though Chinese and European companies are separately achieving similar advances in green technology development, they may not be open to applying the full global range of available technologies by working together. The result is that the rapid

22 Interviewed by the ECECP team in March 2023.

reduction in emissions required to meet the 30/60 target, which is already at risk, may be missed if all available innovative technologies are not brought into the energy sector.

The challenge now remains for EU companies to convince their Chinese counterparts that the incorporation of additional technology innovations from the EU will accelerate progress towards net zero, and that concentrating on home-grown solutions and sectoral targets limits emissions reductions.

1.3.2 Free Trade Zones - Open for Business

China's Free Trade Zones (FTZs) are special economic zones established to foster free trade and pilot free market models. 'FTZs have some relaxations, making them useful even for the energy sector which tends to be more closed at the national level,' states Petino. Currently, 21 of China's 31 provincial-level administrative regions have approved FTZs, covering seven regions across the country. Since their inception in 2011, new FTZs have been announced in 2013, 2015, 2017, 2018, 2019, and 2020. For more details, please refer to the list of Free Trade Zones in China (below).

The Free Trade Zones (FTZs) in China are divided into seven regions, as follows:

North China:

- Tianjin FTZ: Tianjin Port, Tianjin Airport, and Central Business Zone
- Hebei FTZ: Xiong'an, Zhengding, Caofeidian, and Daxing Airport zones
- Beijing FTZ: Tech Innovation, International Business Service, and High-end Industry zones

East China:

- Shanghai FTZ: Waigaoqiao, Pudong Airport, Yangshan Port, Lujiazui Financial, Jinqiao Development, Zhangjiang High-Tech, and Lingang New zones
- Fujian FTZ: Pingtan, Xiamen, and Fuzhou zones
- Zhejiang FTZ: Zhoushan Archipelago, North Zhoushan, South Zhoushan, Hangzhou, Ningbo, and Jinyi zones
- Shandong FTZ: Jinan, Qingdao, and Yantai zones
- Jiangsu FTZ: Nanjing, Suzhou, and Lianyungang zones
- Anhui FTZ: Hefei, Wuhu, and Bengbu zones

South China:

- Guangdong FTZ: Guangzhou Nansha, Shenzhen Qianhai & Shekou, and Zhuhai Hengqin zones
- Hainan FTZ: Hainan Free Trade Port
- Guangxi FTZ: Nanning, Qinzhou Port, and Chongzuo zones

Northeast China:

- Liaoning FTZ: Shenyang, Dalian, and Yingkou zones
- Heilongjiang FTZ: Harbin, Heihe, and Suifenhe zones

Central China:

- Hubei FTZ: Wuhan, Yichang, and Xiangyang zones
- Henan FTZ: Zhengzhou, Luoyang, and Kaifeng zones
- Hunan FTZ: Changsha, Yueyang, and Chenzhou zones

Southwest China:

- Sichuan FTZ: Chengdu Tianfu New Area, Qingbaijiang Railway Port, and Luzhou South Sichuan Port zones
- Chongqing FTZ: Liangjiang, Xiyong, and Guoyuan Port zones
- Yunnan FTZ: Kunming, Honghe, and Dehong zones

Northwest China:

- Shaanxi FTZ: Central Zone, Xi'an International Port, and Yangling Demonstration zones

It may not be widely understood that China's national FTZ policy encourages regional governments to set their own priorities for innovation and investment, depending on their own particular needs, and that they have the flexibility to go beyond national guidelines.

In the first ten months of 2020, the total import and export value of the initial 18 FTZs (excluding the newly established Beijing, Hunan, and Anhui FTZs) reached CNY 3.8 trillion (EUR 0.5 trillion), contributing to 14.8% of China's mainland trade. These FTZs attracted CNY 1 310 billion (EUR 176 billion) in foreign investment, representing 16.4% of the total foreign investment in mainland China. In 2021, these zones continued to draw in foreign investment and trade, accounting for 18.5% of foreign investment and 17.3% of imports and exports in China. [23]

The FTZs have played a crucial role in opening up, incubating and building world-class industrial clusters. China has actively developed high-end and high-tech industries in free trade zones, including new-generation information technology, digital economy, renewable energy, new materials, bio pharmaceuticals, and modern services. For example, the Hubei FTZ has established a complete industrial chain for new-generation information technology, becoming China's largest R&D and production base for optical communication.

The Guangxi FTZ has built a green petrochemical and new materials industry cluster for ASEAN countries, with a significant increase in industrial investment. The Zhejiang FTZ has fostered a cross-border e-commerce industry cluster through innovative financial service solutions, boosting the province's cross-border e-commerce imports and exports by CNY 330.29 billion (EUR 44.32 billion), accounting for one-sixth of the national total.

1.3.3 Case Study: Hainan FTZ Model

Hainan Province has implemented a range of policies to encourage foreign investment and promote economic growth in the region. These policies include a income tax cap of 15% for foreign enterprises, as well as a 15% tax rate reduction for industry

23 Development Report of China's Free Trade Zones, International Trade and Economic Cooperation Research Institute of the Ministry of Commerce, 2022. https://finance.cnr.cn/jjgd/20221215/t20221215_526095966.shtml

enterprises that are registered and operate mainly in Hainan.

In addition, eligible capital expenditure by enterprises can benefit from accelerated depreciation and amortisation, while citizens and employees of foreign enterprises can benefit from a 15% personal income tax cap if they reside in Hainan for a cumulative period of 183 days in a single tax year.

Moreover, foreign enterprises that meet certain conditions can benefit from a zero-tariff policy for imported production equipment, transportation, and tourism equipment, as well as raw materials consumed in production and processing activities (or service trade).

Goods in Hainan that are produced by industries in sectors promoted in the FTZ zones, such as tourism, modern services, and high-tech industries, and that do not contain imported parts whose value-added exceeds 30%, as well as goods entering the mainland from the Hainan FTZ should, in principle, go through relevant import procedures and be subject to customs duties and import-related taxes according to import regulations.

In support of the tourism industry, modern service industry, and high-tech industries, Hainan offers a corporate income tax exemption for newly added overseas direct investment income of enterprises established by Southeast Asia and other overseas countries and regions until 2025.

To facilitate import and export management systems, Hainan offers customs clearance policies for goods that meet specific conditions, including exemption from customs duties, tax rebates, and simplified procedures. Foreign citizens may also benefit from visa-free policies for business, visiting, family reunions, medical treatment, exhibitions, sports, and other purposes.

Additionally, Hainan promotes open aviation policies, allowing foreign airlines companies to operate passenger and cargo services between Hainan and third countries. Free cross-border capital flow within a certain quota is available for enterprises based in Hainan and related enterprises established in overseas countries and regions.

Finally, Hainan aims to improve services for foreign enterprises which set up headquarters in Hainan FTZ. Hainan offers consulting and business services for foreign enterprises, and supports the development of tourism and medical industries with foreign companies.

‘Free Trade Zones are very useful, for different reasons. They offer an efficient way of processing business and often there is no tax payable, especially if you ship to other countries,’ reports Petino of the EU SME Centre. He points out that when it comes to intellectual property, the FTZs have fast track systems to assist companies with the legal issues, and there is support for discovering infringements, collecting evidence and prosecuting IP infringements.

1.4 Targeted Centrally Guided Innovation: Upsides and Downsides

In China, the National Energy Administration (NEA) is the key energy policy maker. It works with the National Development and Reform Commission (NDRC) to translate the Five-Year Plan into energy-specific plans and policies. The NEA sets standards in the majority of the energy technology areas, including fossil fuels, power grid, storage and renewables through dedicated committees consisting of government, industry and sectoral experts. The IEA's 2021 report 'Tracking Clean Energy Innovation in China' provides an excellent overview of the public institutional landscape of energy innovation in China.[24]

Budgets have been steadily increasing over recent years, and China has become a clean energy venture capital powerhouse, led by electric mobility start-ups. These have benefited from government support, including CNY 65.2 billion (EUR 8.4 billion) of public funds ploughed into R&D in 2021 alone.

IEA estimates of R&D spending by globally listed Chinese companies indicate that they spend more on energy R&D than in any other country. In 2020, Chinese firms spent almost CNY 255 billion (EUR 33.2 billion) on energy R&D, up 15% on 2019. In the solar PV industry alone, a technology that is already mature, the biggest five companies invested around CNY 3.8 billion (EUR 0.5 billion) in R&D in 2022 to improve efficiency gains and widen the applications. State-owned enterprises (SOEs) benefit from stronger financial support and political connections relative to private firms. Private companies are central to solar PV, EV and battery technology development.

In the EU, combined public and private spending on energy R&D totalled EUR 8.4 billion (CNY 64.3 billion) in 2019, according to the IEA, vastly below the level of spending in China.

Policies to encourage innovation, such as the 2015 policy document 'Made in China 2025' and its longer-term partner paper 'China Standards 2035', are encouraging domestic innovation. In 2021, China's Central Committee released the National Standardisation Development Outline, setting new targets for China's standardisation system until 2035. Also in 2021, the 14th Five-Year Plan for Construction of the National Standard System for Promoting High Quality Development was published.

The results of this vast investment in the energy infrastructure is evident in several energy sectors: China now produces 90% of the world's solar panels. In just 20 years, it has completely eroded Europe's prior lead in the solar sector. In the automotive sector, sales in China of petrol and diesel cars fell 20% in absolute terms in February 2023 from a year earlier thanks to a state-sponsored surge in development and sales of electric vehicles (EVs): analysts believe EVs may account for 80% of car sales in China by 2030.[25] China is also a world leader in the design and manufacture of battery storage and wind turbines, and is now beginning to throw its weight behind the drive for heat pumps and green hydrogen.

But as China's energy investments and technology innovations surge, what is happening to international standards and conformity with global producers? Analysts

24 https://www.iea.org/reports/tracking-clean-energy-innovation-focus-on-china

25 'China's green leap is a nightmare for Saudi Arabia and Russia', The Telegraph, 7 April 2023.

warn that while China's dominance in specific sectors may allow it to set global standards, it comes with unforeseen consequences.

As a WTO member, China is obliged to notify other WTO members about proposed technical regulations and conformity assessment procedures, to ensure no unnecessary obstacles are created that limit trade or foster protectionism. However, there are still cases whether either no notification is given or the information is incomplete. The EUCCC reports that one reason for this is that regulations are formulated by different ministries and government authorities that work independently from one another.

Concerns have been expressed to ECECP by companies operating in China that technological roadmaps and standards are being developed separately in the EU and China, whereas global standards would make it more straightforward to invest and achieve maximum energy savings. Inconsistency in e.g. electromobility is a disadvantage for both EU and Chinese companies.

Against this, industry experts point to the fact that China is already leading the way in solar panel design and manufacture. As the main global supplier of solar panels, the standards it sets are gradually by default being adopted as international standards. Observers predict that China's current emphasis on EV R&D, and allocation of eye-watering investment into the sector, will result in the same dominance in the market and the same ability to set international standards. A similar scenario is evident in wind turbine manufacturing, with Chinese companies now accounting for six of the ten top turbine producers in the world.

But EU companies fear the emissions targets will be missed because this market dominance is not being pursued together with developers in the rest of the world. 'China needs to make up its mind regarding technological roadmaps and standards. The industry needs to invest massively to meet the CO^2 reduction targets and in order for us to use our money in the best way, the more the world can unite around global standards (i.e. charging) the more we can focus our investments to get best return for us and for the climate. Europe has developed a charging standard, the Megawatt Charging System (MCS), together with the US, and we are betting on battery electric vehicles with fast charging networks. China is the world's largest truck market and it would be very unfortunate if China deviated too much from international standards,' says Swedish truck manufacturer Scania, which has recently set up a manufacturing facility in China.

In another example, China is prioritising a national hydrogen development plan, but there are numerous codes and standards on hydrogen value chains that need to be simplified and aligned with those already used by internationally recognised bodies, such as the International Standards Organisation, to create a more sustainable and globally competitive market. In the heating sector, standards, legislation and remunerations to blend hydrogen into natural gas pipelines need to be introduced, reports the EUCCC. Its report goes on to stress the need to raise minimum energy performance standards and for more collaboration with the EU on mutual recognition of energy efficiency standards and certification schemes, which would thereby reduce costs for importers and exporters.[26]

26 EUCCC European Business in China Position Paper 2022-23, page 221

There remains plenty of space for European technology innovation in China's energy sector. 'China tends to be stronger on applications that are at the end of the value chain. Demand-led tech is the focus for China, and it is way ahead. It is a bit less ahead in regional innovation and regional research,' comments Alessio Petino of the EU SME Centre. He puts this down to the political emphasis in China on short term results and the top down design of funding programmes and grants. Because of the priorities set by the Five-Year Plans and the state-led apparatus, disruptive technology is less evident in China, despite the vast investment into R&D.

1.4.1 Chinese Protection of Intellectual Property

The perception among EU companies on IP issues in China tends to be negative, and is usually far removed from the actual situation, says Helika Juergenson, project manager at the China IP SME Helpdesk. On the one hand, SMEs in particular can underestimate the need for Chinese patents or other forms of IP protection, believing their patent in the EU will suffice. On the other hand, many companies still believe that it is impossible to protect and enforce their IPs in China, and consequently may not prioritise registering and monitoring their rights because they believe the patent will not be enforced. The actual situation is much more complex and both perceptions are only partially true.

Tara Joensuu from Osa Technology shares this view: 'Entering a market is a big step, especially for SMEs. They usually have an innovative solution and are often very reluctant to do anything in China because they are very afraid that their IP will be stolen. And even if they have a patent, it is expensive to protect it in the long term.'

IP protection is crucial for companies entering the Chinese market, and a comprehensive strategy is needed to avoid potential legal issues and infringement. Counterfeiting happens in the case of trademarks as well as patents. 'For SMEs that have a limited budget, fighting counterfeiters can be extremely difficult, especially as there might be many of them and they often hide behind shell companies,' states Juergenson. Some companies may have learned the hard way by losing their trademark or not protecting their trade secrets, but more recently startups have tended to be more IP-conscious. However, there are still many companies that do not prioritise IP protection, often due to budget constraints. Juergenson strongly advises against entering the market without proper IP protection.

The EU-funded China IP SME Helpdesk was launched in 2008 and offers free advice to EU SMEs and SMEs from countries participating in the Single Market Programme on general questions about IP, especially companies that are in the planning stages of entering China, who want to know about the general IP issues. Information is provided through webinars, and an inquiry helpline that allows companies to pose any IP-related questions and provides feedback usually within three working days. The Helpdesk also provides one-on-one consultation sessions free of charge where the companies can discuss their IP strategy directly with the IP business advisor.

There is a significant difference between large companies and SMEs in what they can do to protect their IP in China. Larger companies usually have their own legal departments, including China experts and an in-house investigation team that can

commit significant resources to handling IP infringement cases. ‘They can afford a long lawsuit that takes years, even up to ten years, like in the case of Michael Jordan and Nike's trademark dispute’, notes Juergenson. Large companies can also be proactive in enforcing their rights, targeting potential infringers even if the infringement is not clear.

On the other hand, SMEs with limited resources can only focus on protecting their main rights and deciding whether they can afford enforcement or not. They face more challenges in IP protection and enforcement in China. However, there are downsides for larger companies as well. Larger companies often have more visibility and are more well-known, which can make them a target for infringers. Smaller companies may have less visibility and fewer infringers, but they still need to protect their IP rights to prevent any potential harm to their business.

It is important to note that there is no international patent system; however, there is the international patent application system, also known as the Patent Cooperation Treaty (PCT). This is a centralised procedure administered nominally by the World Intellectual Property Organisation (WIPO). Main responsibilities are delegated to national/regional patent offices such as the Chinese Patent Office, European Patent Office (EPO), United States Patent and Trademark Office (USPTO), etc. This simplifies the patent application procedure to an extent. Ultimately, however, companies need to interact with each national / regional patent office of the country where they want to get the patent, and that is where the divergence and costs start to be incurred. Each resulting patent is a national / regional patent. Countries tend to recognise each other's trademarks, but there is no legal effect. While there are initiatives in ASEAN to simplify the patent procedure, there is no global patent. This means that IPs are still very much territorial.

If a company already has a patent registered in an EU Member State, this can act as a shield against disclosures in the 12 months subsequent to filing of the patent. However, they will still need to apply for a patent in China. The crucial date for filing for a patent in China is within 12 months from the earliest patent application date for that particular invention, explains Rose. This is not the same as the date the patent is granted (which, if an EPO-granted patent, might be five years after the filing date). A patent application in nearly any country in the world will give a company this right.

If they cannot obtain patent protection in China, they will need to explore other options such as trade secret protection. In China, companies can only start enforcing their patents once the patents have been granted, a process that can take anywhere from three to five years.

‘The core technology that gives a competitive advantage should be identified for protection,’ emphasises Juergenson. If a company has been granted a patent in Europe but not in China, anyone can use the technology in China but should not be able to patent it there. ‘To protect assets, it is important to understand competitive strengths and explore options for trade secret protection or patent improvements. Other forms of IP, such as trademarks and design patents, can be complementary and should also be considered in a comprehensive IP strategy. It is important to prepare for potential infringements and have a budget set aside for potential lawsuits. Overall, it is best to conduct IP due diligence before entering the market,’ advises Juergenson.

In the last few years, China has made intellectual property rights protection a priority. The most recent version of the patent law came out in 2020 and offers adequate protection of patents in China. Since 2019, China has improved or amended all of its intellectual property rights laws to keep up with the fast changing market conditions. It began in 2019 with the trademark law and followed it up in 2020 with copyright and patent law. It also updated its Anti-Unfair Competition Law in 2017 and 2019. Discussions are under way on further amendments to the trademark law to further handle the pathway trademark registration issue. The patent laws themselves have improved, as well as the actual enforcement system. Former Huawei patent attorney Matthew Rose points out that the website at the Intellectual Property Office is now much more sophisticated and operates in at least two languages with an effective search function.

The number of professionals available to provide specialist support has also swelled. 'There has been an explosion in the number of people in the agency, like patent agents and IP help desks in the Chinese innovation areas. There's an IPR helpdesk there for Chinese companies and most tech parks have some kind of installed integrated helpdesk,' says Rose. 'The people I've interacted with at the Chinese Patent Office have been very professional.'

In general, companies doing business in Tier One cities in China, like Beijing, Shanghai, Shenzhen and Guangzhou, may encounter fewer IP infringements because even infringers are aware of the strict laws and regulations and know that they can be enforced. Companies can feel more confident about IP protection management and enforcement in these cities because they can enforce their rights in court. In smaller and economically less developed provinces, IP enforcement may not be as strong, and local favouritism may still exist. In some cases, local police have been known to inform companies in advance of raids. Companies may have different experiences with the IP system and protection management and enforcement in China depending on their location and past experiences. In Tier One cities the enforcement system has improved. 'Generally, foreigners are able to enforce their rights against a Chinese plaintiff,' states Juergenson.

While many companies experience success in China and are able to conduct business without any issues, these stories do not often reach public awareness. 'There are positive cases of companies successfully obtaining patents and winning infringement cases, even for SMEs. The Chinese legal system has improved, and foreign companies have the ability to protect their rights with smart enforcement strategies and allocated budgets,' says Juergenson.

Companies considering entering the Chinese market can anticipate varying degrees of support from associations and EU-funded organisations, according to which Member State they belong to. There is no universal EU approach. So while the EU-funded Brussels and Beijing-based IP SME Helpdesk offers support to all EuropeanSMEs seeking advice, the level of support varies back in their home countries, leaving some innovative companies struggling to find out about tenders or how to bid. A number of EU Member States have set up organisations and support programmes to help companies get started, such as Business Finland, the Netherlands Innovation Network, Cleantech Route China (Flanders), Exportinitiative Energie (Germany), and the Danish Innovation Center. A (non-exhaustive) list of helpful companies can be found in the annex to this report.

In interviews with experts, Business Finland is mentioned again and again: they are very active in China and have, among other things, a joint laboratory with Tsinghua University. Business Finland offers pioneering support to SMEs and is active not only at a national level, but also in three local provinces, Shanghai, Jiangsu and Zhejiang.

1.5 The Tendering Process

Article 16 of China's Foreign Investment Law states that 'The State shall guarantee that foreign-funded enterprises can participate in government procurement activities through fair competition. Products produced and services provided by foreign-funded enterprises within the territory of China shall be treated equally in a government procurement.'[27]

In 2022, a business confidence survey found that 42% of businesses reported market access issues and 22% licensing issues. Other companies reported feeling compelled to form joint ventures due to the 'Made in China 2025' strategy and hence needing to transfer technologies. [28]

In addition, there have been reports that in the past 12 to 18 months provincial governments have given an advantage to project developers who not only developed a renewable energy project but also promised to invest in R&D, a factory or other infrastructure at the same time, thus putting companies that do not have the necessary financial resources at a disadvantage. However, according to latest reports, this practice has been stopped by the NDRC.

Participation in tenders is not easy, especially for SMEs. 'You need resources and knowledge, you need contacts and heads up, you need to know how to handle the massive paperwork required; sometimes the standard processes are volume-based, so you have to pursue very aggressive pricing strategies that sometimes are not even worthwhile,' states Petino. Nevertheless, there are benefits: 'Participating in tenders in China can help build networks for companies, ultimately each company must weigh up for itself whether it is worthwhile,' says Petino.

Some companies active in China report that tenders may be predetermined with the customer ahead of time, and will only be put on the tender website for a short period. The customer who has the sale has to find other companies to participate in the tender and ensure that they offer very high prices, so they can be sure of having the winning bid.

Several companies are finding ways to work around the sometimes inconsistent application of the existing legislation by provincial authorities.

For example, Schneider Electric reports that it is working actively with Chinese startups through its Green Energy Management Innovation Program, recruiting companies to work with it to develop their concepts and so enabling access to a wider global market.

27 EU Position Paper in China, 2022, page 103.

28 MIC 2025 is a Chinese government initiative that aims to secure China's position as a global high-tech powerhouse. Its purpose is to reduce China's reliance on foreign technology imports and invest in domestic innovations in order to create Chinese companies that can compete both domestically and globally.

In another example, Danfoss has set up a number of government cooperation projects with China and with many private companies, with the aim of supporting China's 30/60 target. It now has 19 plants in operation in China, demonstrating its expansion from the initial company set up in Tianjin 27 years previously.

Industry experts are concerned about the difficulty they have accessing real time information about a plant's performance, which means they may have inadequate information in order to submit a bid for a tender. Companies need to make contact with a company board and then go down through the various levels of management in order to get access to the power station in question. They report staff may be wary of outside observation of the actual performance of a plant, and require assurances about confidentiality before allowing access.

There is also a lack of confidence about whether winning a tender will lead to follow up business. Raul Ikonen of Savosolar reflected on the company's bid for solar heating, which it found out about through Business Finland. It found the tendering process complex and lengthy, and faced language barriers throughout, but was successful. Liaison between Savosolar and its Chinese counterpart went very smoothly whilst preparing the project for implementation, reports Ikonen, and the eventual demonstration project is working well. The company is now waiting to see if there will be any follow-up business after completion of the demonstration project.

PowerCell has successfully supported a local China partner to participate in a tender and win the bid for a CHP project. Usually such projects will last at least a year, while larger projects may take even a few years.

Thus, there is a clear divide between those companies who have been active in China for over 20 years, which are able to draw on their local experience and knowledge to press ahead with innovative initiatives, and those companies that are new to the market or that have fewer resources at their disposal, that are encountering local resistance and apparently insurmountable bureaucracy at a local level.

1.5.1 Underbidding: A Consequence of Prioritising Individual Sectors

An unforeseen consequence of the central government's decision to single out particular areas of the energy industry for subsidies and political support means that Chinese companies are jostling with each other and with foreign bidders to win the contracts. Both local and international companies are driven by the subsidies and political support from the government in the energy industry. Due to the limited number of projects, many tenders make prices and costs their first priority, which may lead to some bids that are below the actual costs. 'If only the prices and costs are considered on vehicle applications, for example, it will be very hard for the international company to compete with local ones,' says George Zhao of PowerCell. 'Not only prices, but also R&D, years of testing and durability, etc will be evaluated by the international companies, while the local companies will put the market share at the top.'

To observers, the situation is reminiscent of the rush to solar in China in the 1990s and 2000s. The government offered generous subsidies for solar projects, and Chinese

companies rushed to bid for tenders to develop and produce solar technology. In their eagerness to win, they often put in bids well below their actual costs, meaning several Chinese companies went out of business. The impact on the international market was significant. At the point when China released its first tenders, EU companies had little interest in bidding, because the EU market was booming. But when Chinese companies, supported by feed-in-tariffs, started to upscale production capacity to meet surging demand abroad, the EU solar upstream industry was unable to match China's pace.

This underbidding meant that EU companies could not win tenders and the whole EU solar panel industry was decimated and is still struggling to recover. As a result of these policies, soaring production created a glut in the market. The government then intervened again to introduce a feed-in tariff, which boosted domestic demand. Then, as the market stabilised, the government gradually removed the subsidies, and phased them out entirely in 2021. That year, 58% of the world's solar panels came from China.

The production of lithium batteries has seen similar developments. China's current lithium battery manufacturing capacity represents 73% of global capacity, with the leading manufacturer, CATL, alone producing 35% of global Li-on battery supply. According to a report from the Institute of Defence Analysis, 'the Chinese government has put in place policies to encourage consumer adoption of EVs. And, since 2015, they have been subsidising domestic battery makers such as CATL, giving them a cost advantage over foreign-owned rivals that operate in the country. Even though IDA said these subsidies are being phased out, it has given Chinese battery makers the head start they needed to compete globally.'[29] The result is that six of the top ten battery manufacturers are Chinese. Nevertheless, the rapid growth of the sector has come at a cost, acknowledged in the government's '*Notice on achieving the coordinated and stable development of the lithium-ion battery industry supply chain'* published in November 2022*.* The notice offers an honest look at the system and calls on local officials to address the issues raised. '*Factors such as explosive downstream demand and industrial growth, the complex and ever-changing pandemic situation, and increasing economic downward pressure are contributing to a recent imbalance between supply and demand and excessive price fluctuations of some intermediate products and materials in the domestic lithium-ion battery industry supply chain. In addition, the connection between upstream and downstream industries is inadequate, and hoarding and unfair competition has been seen in some areas. Production capacity has blindly expanded in some fields, while low-quality and low-price competition has occasionally taken place.' [30]*

If the same situation occurs in the electric vehicles industry, it will lead to very similar competition. 'In the end, only a few players can survive and develop,' said Zhao of PowerCell. The impact of focusing on specific sectors can help develop it very fast in a short time, but may also lead to some negative effects on the drive to net zero.

However, the provinces' focus on specific issues can also be used strategically. A European SME working on environmental remediation has found an interesting solution to exploit the thematic focus of the provinces. The company first hired a

29 https://www.onecharge.biz/blog/how-china-came-to-dominate-the-market-for-lithium-batteries-and-why-the-u-s-cannot-copy-their-model/

30 https://www.china-briefing.com/news/chinas-lithium-ion-battery-industry-overcoming-supply-chain-challenges/

Chinese national with extensive government experience and a large Chinese network to help them put together a plan. First, the team analysed numerous local Five-Year Plans and came up with a list of three potential areas where their technology would be needed. Then the company approached the local governments in these locations and presented their solution; one of these expressed interest and set up and successfully implemented a small demonstration project, bringing in one local stakeholder and providing in-kind contributions to the European SME to test its technology in that context. The project was successful and eventually became profitable: About five years later, this small European company is now working with large Chinese state-owned enterprises, including in the energy sector.

Petino confirms that this strategy seems the most promising: 'You have to offer a solution to a problem that a local government has. I think that is the way to go, and that is what local governments are looking for. There are hundreds of thousands of companies that want to enter the Chinese market, so you have to offer an added value that is visible.'

1.5.2 Access to Finance

While China's leadership has signalled its firm intent to achieve net zero by 2060, the financing obstacles to this remain formidable. The World Economic Forum estimates that the drive to reduce emissions will cost CNY 140 trillion (EUR 18 trillion) between 2020 and 2060. It is clear that the government cannot shoulder all these costs alone, and a large proportion must come from foreign investment. Access to finance, and an attractive investment environment, are crucial for any company bringing an innovative product or service to a new market.

China's government is aware of the need to make China more attractive to investors. Companies interviewed by ECECP note that there are subsidies, incentives and tax breaks for foreign companies operating in China. It is true that subsidy schemes and other support policies differ depending on the location, and it is often difficult for companies to find the relevant information.[31] 'Even when the information is publicised, it's often not centralised. There is no single website or platform where all available subsidies and programs can be found, you may need to go to the websites of the various government departments responsible for that specific subsidiary programme. Foreign companies can also receive subsidies, but the application process is lengthy and requires paperwork and coordination with multiple government bodies. Despite the challenges, it's possible to receive significant subsidies from various levels of government if you know where, when and how to apply,' states Petino.

There are also Free Trade Zones, where companies may be allowed to operate without having to form joint ventures with Chinese partners, depending on the technology involved (see above for information about Free Trade Zones).

China and the EU are scaling up green finance and facilitating cross-border green investment, with the China Construction Bank and the People's Bank of China leading the way in building their presence in the European market. Among the recommendations from the CCCEU Report 'Striving for a Common Future', its writers

31 Interview with business adviser at EU SME Centre, Alessio Petino, March 2023.

call for a two-way opening up of the financial markets and regulatory cooperation.

'China and the EU should enhance the interconnectivity of their financial markets, especially that of bond markets, support qualified financial institutions to invest in each other's markets and relax the cap on foreign ownership in the financial industry. The two sides should open their financial markets to keep diversifying offshore investment options for investors.'

The report also calls for an acceleration to the interconnectivity of financial markets of China and the EU and expansion of two-way financing channels to inject impetus and stability to the real economy.

To help mobilise the private capital required to achieve the Paris Agreement goals, the People's Bank of China (PBoC) issued its 'Guidelines for Establishing the Green Financial System' in 2016. The document highlights the importance of climate mitigation and low-carbon development. According to *China's Green Finance Development Report (2018),* issued by People's Bank of China, green bonds in China helped channel CNY 280 billion (EUR 39.5 billion) into renewable energy and low-carbon projects in 2018.' [32]

Companies seeking financial support on the ground have yet to feel the full impact of the government's recognition of the need for foreign investment. At a provincial level, domestic companies are favoured due to their closer relationships with local banks. Chinese policy has repeatedly been adjusted to create favourable conditions for SMEs to gain access to financing, but local officials see SMEs as high risk and offering low returns. Outside the newly formed free trade zones, wholly owned foreign investment initiatives are restricted, and this limitation means companies have to make a long term commitment to working in China and restricts the involvement of SMEs, which have fewer financial resources or manpower to pump into what some would describe as a bureaucratic black hole.[33]

The individual EU Member States sometimes provide separate detailed information on access to finance. For example, Project Finance International, in cooperation with the German Chamber of Commerce (AHK) in China and the project development programme of the Energy Export Initiative, has prepared a financing factsheet for German companies, which lists financing options through German state-owned enterprises such as KFW, the European Central Bank, the Asian Infrastructure Bank (AIIB) and Chinese banks.[34]

And even though the information on the Chinese side is fragmented, it is possible to prepare for subsidy applications with a little knowledge of the system: 'The subsidies are often standardised and published around the same time every year, by the same government department, and involving the same type of paperwork, so it is possible to prepare in advance,' says Petino.

32 http://www.ececp.eu/wp-content/uploads/2022/05/Innovation-EN.pdf

33 an opaque a bureaucratic system

34 https://www.german-energy-solutions.de/GES/Redaktion/DE/Publikationen/Kurzinformationen/Finanzierungsfact-sheets/fs-china-finanzierung.pdf?__blob=publicationFile&v=1

1.5.3 Carbon ETS - Set to Spur Innovation?

China's Emissions Trading Scheme (ETS) launched in 2021 and is still at an early stage of development. The main difference between it and the more established European ETS (which started operations in 2005) is that China's system has no absolute cap and is instead based on energy intensity. At present the value of carbon credits in China is far lower than its equivalent in Europe. The price of a tonne of carbon in the EU ETS was EUR 85 (CNY 740) in December 2022. China's ETS price per tonne was EUR 7.5 (CNY 56.5) at the end of December 2022. The scheme in China does not extend to hard-to-abate sectors such as aviation, industry or buildings, and is restricted to over 2 000 big emitters.

Industry players expect this price disparity to narrow with the introduction of Europe's Carbon Border Adjustment Mechanism (CBAM). This is a carbon tax on carbon intensive products such as cement and electricity which will take effect in 2026, with reporting required from October 2023. Companies operating in China anticipate that this will spur Chinese utilities to pay greater attention to how to certificate the improvements they achieve by implementing innovative technologies.[35]

Introduction of the ETS in China could have a profound impact on emissions. In the EU, it is calculated that the ETS saved more than 1 billion tons of CO^2 between 2008 and 2016. This translates to reductions of 3.8% of total EU-wide emissions compared to a world without the EU ETS.[36]

1.5.4 Conclusion

Interviews with EU companies already involved in energy innovation in China show that central government is well aware of the need for innovation and external finance and is working to reduce the red tape and bureaucracy that are so intimidating to those hoping to do business in the country. China has made huge improvements in IP protection issues and EU companies operating in the country have more legal protection. It is true that some of that messaging has not filtered down to provincial and local governments and officials. These organisations can be wary of foreign technology and investment, and anxious about showing the actual performance of power plants and other energy installations to foreign companies and revealing the need for improvement.

China's allocation of additional subsidies and tax breaks to specific energy sectors, such as EVs and Li-on batteries, is effective in spurring development in those areas, but risks creating a febrile market where companies will underbid for tenders and create unhealthy market conditions while locking out foreign companies which cannot compete with the low bid offers. While the move is intended to ensure that the targeted sectors get maximum support to ensure the most rapid development possible, the end result will be to choke off innovation (and thereby potentially effective technology that has the potential to contribute to emissions reductions), by making it unaffordable for additional new technologies to enter the market. The

35 https://www.consilium.europa.eu/en/press/press-releases/2022/12/13/eu-climate-action-provisional-agreement-reached-on-carbon-border-adjustment-mechanism-cbam/

36 https://www.pnas.org/doi/10.1073/pnas.1918128117

attendant unforeseen consequence is that other areas of the energy sector, where emissions could be cut substantially, will not be given the attention or investment required to achieve the maximum possible reduction in overall emissions.

However, larger companies offer positive examples of how an emphasis on localisation, building up trust and confidence in the local population, and overcoming language and cultural differences can result in profitable business relationships that nurture innovation. The work of Schneider Electric, which has set up its own innovation hubs in China, is a great example of how innovation can not only be encouraged within China by foreign investors, but also monitored to ensure it complies with international standards so that the technology can be applied more widely, both in and outside China.[37] Some SMEs are also reporting success, particularly when they have been able to connect with local partners and advisers. The challenge now is to bring the opportunity for such deep partnership between China and the EU to other SMEs and to companies that have no history of operating in China.

Interviews conducted by ECECP have revealed a range of strategies applied by EU and Chinese companies seeking a deeper involvement in the energy sector. These include: planning for a long term presence and including comprehensive localisation strategies; employing local experts who can give advice and support on accessing government support and navigating the tender process; accessing support from either EU or Chinese business support organisations such as Business Finland, the EU Chamber of Commerce in China, or the China IP SME Helpdesk; planning ahead to ensure resources and the correct skillset are in place; applying for trademark and IP rights in good time.

37 Luc Lui, GM of Corporate Alliance and Digital Ecosystems at Schneider Electric, reported on Schneider Electric's work in China in ECECP's innovation workshop 'China: Carbon Neutral by 2060' in 2022. http://www.ececp.eu/wp-content/uploads/2022/06/innovation02-2-2.pdf

2. Chinese Innovation in the EU

2.1 Overview

In recent years, China's energy investments in the EU soared from almost nothing in the 2000s to reach EUR 20 billion in 2015. [38] China has invested in many parts of the EU's energy market, including power grids in various European countries, traditional energy generation infrastructure, renewable energy companies and, most recently, Europe's nuclear power sector. The benefits are substantial: China's role in the energy market offers significant economic benefits and political partnership. Its enormous manufacturing power means it can produce energy-saving technology at speed and at lower cost than its counterparts in Europe, helping to bring Europe to its goal of climate neutrality. Yet there are concerns among European policymakers, ranging from worries about the risks to fair competition, to anxiety about national security.

Chinese industry experts speaking to ECECP see huge potential for growth in the EU, and are encouraged by the region's strong leadership in promoting renewable energy and reducing carbon emissions, as well as its ambitious targets for increasing the share of renewable energy in its energy mix. 'We see great potential for growth in this market and believe that our expertise and experience can contribute to the development of sustainable energy infrastructure across Europe,' says one wind turbine specialist.

Another solar industry spokesperson says the EU's ambitious goal to have 600 GW of solar capacity by 2030 has attracted their company to enter the market. 'Collaboration and innovation are critical factors for success in the current business climate, particularly with regard to issues of sustainability and climate change. EU and China should promote joint R&D and introduce alignment on international initiatives relating to decarbonisation and sustainability … having a strong R&D base in both China and the EU requires greater exchange of knowledge and expertise between the two economies,' she comments.

However, the EUCCC reports that Chinese investment into Europe is well short of its potential, and is falling.[39] In 2021, Chinese foreign direct investment in Europe stood at EUR 10.6 billion (CNY 82.3 billion), representing the lowest level for Chinese investment in Europe since 2013. In the same year, EU imports from China reached their highest annual value of EUR 472 billion (CNY 3 666 billion).

Yet, China's National Bureau of Statistics of China stated that R&D expenditure reached CNY 2.79 trillion (EUR 374 billion) in 2021,[40] while Chinese companies reportedly injected EUR 195.9 billion (CNY 1521 billion).[41] The country is uniquely placed to develop innovative solutions that can help to keep global warming to no more than 1.5°C and that have the potential to be shared with its international partners.

38 https://www.sciencedirect.com/science/article/abs/pii/S0301421516306711

39 European_Business_in_China_Position_Paper_2022_2023[1068].pdf

40 http://www.stats.gov.cn/english/PressRelease/202201/t20220127_1827065.html

41 https://sciencebusiness.net/news-byte/china-surpassed-eu-private-sector-rd-investment-2021

According to a survey conducted by the Chinese Chamber of Commerce in the EU (CCCEU), 85% of Chinese enterprises believe that the EU's green economy strategy will bring more opportunities than challenges. 'The green transition is vital for China to realise sustainable development, and act as an engine to drive the EU's economic recovery,' the CCCEU tells ECECP.

There is good reason for Chinese companies to feel positively about their prospects in Europe. Firstly, the European Green Deal is set to release the potential of green sectors, creating a policy environment designed to reduce GHG emissions by 55% before 2030 (relative to 1990 levels) that will enable Chinese enterprises to invest and achieve growth in these sectors.[42] Secondly, the global squeeze on energy supplies sparked by the conflict between Russia and Ukraine has prompted the EU to introduce REPowerEU, a policy initiative which is set to accelerate decarbonisation and create more demand for renewable energy initiatives in Europe.[43] Thirdly, the EU's energy sector is currently unable to achieve the same level of production and competitive pricing as China.

China has integrated its dual carbon goals into its 14th Five-Year Plan and has established its 1+N policy framework,[44] which is encouraging Chinese enterprises to focus their efforts on green electricity and green supply chains, paving the way for the free flow of products across the global market, including the EU.

Individual companies believe that their presence in the EU will contribute to their image as a global brand. 'In the coming year, approximately 80% of respondents plan to develop EU investment,' says CCCEU.

2.1.1 Sectors Where Chinese Innovative Solutions Could Drive EU Emissions Reductions

a. Solar

China is the leading player in the global solar industry. Benefiting from historically relatively cheap labour and government support and subsidies, China now produces 90% of the world's solar panels. Since around 2010, competition for market share, often between companies backed by different municipalities, has helped to drive impressive manufacturing innovations. Without innovations in silicon processing and cell assembly, the large cost reductions achieved for solar PV would not have been possible, despite economies of scale. China's Five-Year Plans have provided resources to support R&D in solar technology, with the 13th Five-Year Plan pushing for high-efficiency and low-cost solar PV. 'The gap between the performance of Chinese firms and overseas competitors has shrunk rapidly,' reports the IEA.[45]

42 https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

43 https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/repowereu-affordable-secure-and-sustainable-energy-europe_en

44 A policy unveiled in 2022, 1+N is an action plan announced by the Chinese government that aims for carbon dioxide to peak before 2030, covering the 14th and 15th Five-Year Plan periods.

45 Tracking Clean Energy Innovation: Focus on China: IEA 2022, page 14.

Chinese technology has the potential to help the EU achieve its ambitious plan for solar capacity to reach 600 GW by 2030.

b. Battery technology

With control over 70% of the world's lithium supplies, China is in a unique position to deliver the EV batteries and battery storage that Europe so badly needs to balance its growing renewables capacity. China's top power battery manufacturers, such as CATL, Envision AESC and SVOLT Energy, have all built or plan to build battery plants in Europe. Chinese companies have invested EUR 2.4 billion (CNY 18.6 billion) of greenfield investments in EV batteries during 2022, representing 23% of the total.[46]

- *EVs:* China's government has prioritised development of batteries to meet the projected demand created by the burgeoning EV market. While the priority is to meet rocketing demand in China, projected EV sales in the EU are also set to soar. Statista estimates that sales of hybrid and battery EV sales in the EU will rise from 2.93 million in 2023 to 5.5 million in 2027.[47] China's lithium battery manufacturing capacity currently represents 73% of the global total. CCCEU tells ECECP that the EV sector is ahead of all other parts of the green economy among the companies it has surveyed about energy cooperation in Europe.

On 4 April 2022, CATL's first cell production base outside China, located in Thuringia, Germany, received production approval. EVE Energy has announced plans to construct a plant in Hungary to produce cylindrical battery cells. China's Gotio Hi-tech has acquired a Bosch plant site in Germany to build its first overseas manufacturing plant.[48]

- *Energy storage:* China's government is prioritising work to improve high-efficiency battery storage technology which will underpin the vast expansion of its solar and wind generation capacity. In December 2022, the EU amended its REPowerEU strategy to include standalone energy storage, offering opportunities for Chinese technology.

c. Wind power

China leads in annual production of wind turbines, and has seen production rise every year. Wind turbine exports increased from USD 2.9 billion (CNY 18.6 billion) in 2017 to USD 7.2 billion (CNY 52.4 billion) in 2021. As of 2021, it had 328.48 GW of installed wind capacity. As a latecomer in the wind power industry, its technology may in some respects lag behind that of its global competitors, but its production capacity means that partnerships between the EU and China could bear rich fruit. There are six Chinese companies among the world's top ten wind turbine producers, and production capacity is growing rapidly.[49]

The REPowerEU policy announcement is providing a further spur for the EU's demand for offshore wind capacity. In September 2022, the nine 'North Sea' countries pledged to build 76 GW of offshore capacity by 2030, and 260 GW by 2060. In 2022, China

46 CCCEU: Striving for a Common Future - report of 2022, page 35.
47 https://www.statista.com/outlook/mmo/electric-vehicles/europe#unit-sales
48 Information from CCCEU, interview with ECECP, March 2023.
49 ECECP magazine, March 2023, China news.

was already home to almost half of the world's 54 GW offshore wind capacity, building more than any other country. [50]

China is already collaborating with Europe: in late 2021 Chinese wind turbine manufacturer Mingyang began work on a floating offshore wind pilot project in Northern Europe, and China's Envision Energy has set up its own research centre in Bristol, UK. In February 2022, China's advanced transmission technology was included in a successful bid from a consortium composed of Global Energy Interconnection Research Institute Co., Ltd., McDermott of the United States and C-EPRI Electric Power Engineering Co., Ltd. in the BorWin6 offshore wind power flexible direct current transmission project, in Germany's North Sea region.

2.2 Localisation

The barriers reported by Chinese companies relating to doing business in the EU are in some respects similar to those expressed by EU businesses operating in China. Linguistic differences are cited, as well as the complexities of dealing with 27 Member States, many of which have their own distinct national laws and regulatory requirements.

A major heating and cooling company tells ECECP that its lack of understanding of European policies, regulations and standards poses a major challenge to its decision making about expansion of its business interest in the EU. 'It is one of the main challenges we are facing.'

Like EU companies in China, those Chinese companies with a long-standing presence in Europe report the benefits of having a strong relationship with their European partners, also thanks to regional headquarters and local offices. One of the world's leading solar power suppliers has been in the EU market for almost 25 years, with production, R&D and supporting sales and services offices across Europe. While the structure of the EU and its 27 Member States comes with a good portion of complexity, for example when it comes to different tendering criteria for PV projects, the company is 'in a strong position to navigate regional and local differences and break down barriers by leveraging local expertise and networks,' comments a spokesperson.

While the structure of the EU and its 27 Member States comes with a good portion of complexity, for example when it comes to different tendering criteria for PV projects, the company is 'in a strong position to navigate regional and local differences and break down barriers by leveraging locate expertise, and networks,' comments a spokesperson of a leading solar supplier based in Brussels, Belgium.

Recruiting and retaining a local workforce is in certain cases something the Chinese companies would rather avoid. An expert consultant in the heating and cooling sector reports on a company that would prefer to employ Chinese workers rather than incur the significant costs of training up employees in its target country. Today, though, it is considering setting up offices in countries such as Hungary, where labour is relatively cheap, to train local staff. 'But [labour dispatching] is still quite important

50 https://windeurope.org/newsroom/news/north-seas-summit-focuses-on-how-to-deliver-ambitious-new-offshore-wind-targets/

because building a fully local team takes a long time.' Additionally, Chinese companies speak negatively of the complexity surrounding visa approvals, and of regulations in particular Member States that are designed to protect the local labour market

Despite these reservations, since 2018, the proportion of Chinese companies employing local employees has risen steadily. In 2021, more than 80% of employees in Chinese firms operating in the EU came from EU Member States, with half of surveyed enterprises stating that they had plans to hire more European employees in 2022. About 50% of middle and senior management were local citizens.[51]

Localisation is crucial to build trust, comments the expert consultant. 'Building trust is important because there are still biases towards Chinese projects as 'low quality' or 'not secure'. I believe that through interaction and mutual understanding, a bridge can be built between different countries and cultures.'

The Chinese Chamber of Commerce in Brussels echoes these findings. It has set some key objectives for Chinese companies engaged in business in the EU against a background of the energy crisis and supply chain disruptions:1) to set up a dedicated communication department to proactively reach out to local governments; 2) to build and enhance their professional image (i.e. engage more with professional industrial media) and speak from a business perspective rather than that of ideology; 3) to expand presence in Europe through partnership with local companies; and 4) to deepen understanding of European society and build trust with local communities.[52]

2.2.1 Market Openness

China's preference used to be to adopt technology innovation and bring it into China. For example, during the push to develop its solar capabilities, some Chinese companies acquired foreign competitors, absorbed their R&D activities, and transferred technology and knowledge. California-based Alta Devices and MiaSole Hi-Tech Corp were bought by China's Hanergy Group in Beijing in 2013, while Solarmer Energy was founded in California before its operations moved to Beijing in 2009.

In the past five years or so, however, this approach has become unworkable as the EU has tightened its oversight of foreign company acquisitions.

The writers of the 2022 IEA report 'Tracking Clean Energy Innovation: Focus on China, comment that China's innovative trajectory benefits from making foreign acquisitions or from building innovation initiatives abroad. 'Building or acquiring innovation capabilities abroad enables China to generate new knowledge by tapping into a broader pool of talents and innovators, foster personnel mobility, transfer concepts and technologies back to China, and expand into overseas markets.'

According to CCCEU's 2022 flagship report, the Chinese businesses and institutions they interviewed felt that the EU business environment had become less favourable since 2019. The downward trajectory appears to be accelerating: 53% of respondents

51 CCCEU Striving for a Common Future, 2022, page 53.

52 http://en.ccceu.eu/flagshipreports.html CCCEU Striving for a Common Future 2022 Report, page 50.

said that between the second half of 2021 and the first half of 2022, the EU business environment for Chinese enterprises had deteriorated. The overall lower rating is due to modest ratings for the political environment, economic and industrial environment, and business service environment.

Chinese companies point in particular to unilateral economic and trade policies in the EU. Specifically, the new Foreign Subsidies Regulation may put Chinese investment activities under triple scrutiny. Chinese enterprises are additionally concerned about the EU FDI screening mechanisms. 40% of the surveyed Chinese enterprises believe that the International Procurement Instrument may pose restrictions or disqualify them in public procurement procedures. 35% of respondents expressed concerns about the potential negative impact of the Corporate Due Diligence directive on market fragmentation. Some interviewed enterprises said that although they understood the high requirements proposed by the EU for the purpose of environmental protection and climate change, the Carbon Border Adjustment Mechanism would have a negative impact on China-EU trade in the mid- to long-term, particularly on the trade of iron and steel, aluminum, electricity, cement and the chemical fertiliser. 23% of Chinese enterprises were concerned about export controls on dual-use items for both civilian and military purposes, where China is not on the list of destinations to which exports are permitted. Enterprises also expressed anxiety that the EU's proposed anti-slavery regulations would pose sanction risks.

Chinese enterprises have also signalled anxiety about the EU's declared intent to decouple from China in the hi-tech, digital and green sectors. 5G cybersecurity could hinder Chinese enterprises' business in the EU. EU-China cooperation in the areas of rare magnets, solar panels, etc., may be negatively influenced due to the EU's agreement with like-minded partners, warns the CCCEU.Meanwhile, negative public opinion relating to accusations against Chinese enterprises regarding IP rights is complicating the long-term development of Chinese enterprises in the EU.

The failure to progress with the CAI by the European Parliament, and the April 2023 signalling during Ursula von der Leyen's visit to China that ratification of the CAI was nowhere near, has cast a shadow over the future of the agreement.

2.2.2 Whether to Use Chinese or Local Labour

Speaking to ECECP, an expert consultant acknowledges that Chinese companies have benefited from cheap and highly efficient labour in China, though this has sometimes been at the expense of employment standards that are strongly upheld in the EU. He believes this needs to change when they are working in Europe.

'Chinese companies have grown dramatically in international competition, sometimes at the cost of neglecting local employment, culture, gender equality and environmental projection. But they are crucial factors to be considered to get acceptance by others. Therefore, when operating in the EU market, it is important for companies to integrate themselves into the local ecosystem and engage in public welfare activities - just as some European companies have done in China. It is also important for Chinese companies to establish a positive image abroad and avoid imposing their own values on the local community.'

Nevertheless, those still weighing up the benefits of setting up business in the EU continue to call for a review of policies and regulations to remove what they feel to be unnecessary barriers to labour dispatching which then impact on efficiency and costs. 'In terms of reallocation of production capacity, we have found it difficult to achieve the same efficiency as manufactured in China,' reports an industry specialist.

It is still possible, however, to reach agreement with individual governments on particular projects to facilitate labour dispatch. For example a major Chinese wind turbine manufacturer has entered the Greek wind energy market in a demonstration project that is being supervised by the Chinese and Greek governments, an arrangement that has provided the political support and resources to dispatch Chinese employees to work on it. Enabling project development, manufacturing and installation to be completed by Chinese employees means that the Chinese side can achieve the same efficiency as its production facilities in China, with local technicians responsible for maintenance.

2.2.3 Finding Partners

Some Chinese companies echo EU companies' disquiet about the difficulty identifying suitable partners to work with when bringing products to the EU, and call for more government support and involvement of industry associations. 'We need government support to enhance communication and build trust. EU and Chinese companies need to understand each other's strengths and where they can find complementary partners. Government and industry associations' involvement is important to support finding suitable partners and increase the chances of cooperation,' reports a Chinese heating and cooling company that is planning to set up its first outpost in Eastern Europe.

2.2.4 Access to Funding

Access to funding is a key prerequisite for any business seeking to establish itself in a new region. The Bank of China (Europe) is committed to serving as a bridge linking financial innovations between China and Europe. It already participates in the carbon mortgages and carbon trade, and is one of the first Chinese banks to register in the carbon trading market. It has now reached specific finance arrangements for large local enterprises. The Bank has issued a total of EUR 350 million (CNY 2.7 billion) in loans where the interest rates are linked to social responsibility and ESG indicators, and has also issued a three-year green bond worth EUR 500 million (CNY 3.8 billion).[53]

China's financial institutions are actively developing green finance products and a variety of funding options to support green investments, with the Industrial and Commercial Bank of China and China Construction Bank announcing in 2021 that they would underwrite the first 'carbon neutrality bonds' in China.

In China, export finance activities are central to the country's 'going global' strategy, supporting domestic companies to do business overseas by mitigating commercial

53 CCCEU Report: Striving for a Common Future, Report of 2022, page 53.

and/or political risks. The instruments available to support exports include: preferential export buyers' credits; export sellers' credits; mixed credits; natural resource-backed loans and lines of credit; concessional loans; and others such as direct government subsidies or export economic zones.[54] China is not a member of the OECD and does not need to comply with the OECD rules, which the EU has previously flagged as giving Chinese exporters an advantage. China has been a member of the World Trade Organisation since 2001.

Chinese companies value the EU funding mechanisms designed to encourage energy innovation and efficiency, citing the Innovation Fund,[55] the Modernisation Fund[56] and the proposed Sovereignty Fund.[57] However, they find it can be a lengthy and time-consuming process to track down the funding available and apply for it. 'We would like to see governments effectively communicating with companies who wish to apply for funding,' says one solar industry insider. 'We call for greater transparency in the design of these mechanisms to help companies navigate the complexities of the funding process.'

2.2.5 IP Rights

With China's huge investment into R&D, it is only logical that the number of Chinese patent applications in the EU should have risen as they seek to bring their innovative solutions to an international market. Between 2012 and 2021, China's patent applications in Europe have quadrupled, from 3% of total applications to 9% in 2021, likely as a direct consequence of the increased R&D activities in China. The increase has also been sparked by Chinese government support introduced in 2010 onwards for companies to file patent applications overseas, in a bid to go up the value chain and create Chinese innovations rather than pay out for licence fees.

Observers note that involvement of Chinese companies in markets outside China is necessary not just to the global community, but also to speed up innovation and avoid the risk of developing technologies that are only used in China. 'Chinese companies need to compete in non-China markets. Otherwise, innovation could slow or there could be a 'Galapagos Island' effect where Chinese technologies develop differently and are not used anywhere else in the world,' said Jeffrey Towson, a visiting professor at the China Europe International Business School and head of the advisory firm US-Asia Tech Strategy, speaking to China Daily.[58]

For Chinese companies entering Europe, one of the main issues they face is ensuring they have IP protection that covers the whole region. Regulation varies in each Member State, and if companies apply for IP protection in each state, the fees incurred can be substantial. They are left having to make a choice as to which country to opt for that has the most potential for market development. The usual route is through centralised offices such as the EPO or the European Union Intellectual Property Office. Chinese companies can also approach the World Intellectual Property Organisation, or

54 https://www.europarl.europa.eu/RegData/etudes/note/join/2011/433862/EXPO-INTA_NT(2011)433862_EN.pdf
55 https://climate.ec.europa.eu/eu-action/funding-climate-action/innovation-fund_en
56 https://modernisationfund.eu/
57 https://ec.europa.eu/commission/presscorner/detail/en/STATEMENT_22_5543
58 https://global.chinadaily.com.cn/a/202207/13/WS62ce2218a310fd2b29e6c0a6.html

independent not-for-profit organisations such as the AIPPI (International Association for the Protection of Intellectual Property) which can offer clarification on IP rules in individual countries. 'Really, you need an expert in that area, or different teams in different countries who can work closely together to help you,' says former Huawei patent attorney Matthew Rose.

An alternative solution will soon be available: Germany has just ratified a treaty that will introduce an European patent with unitary effect, which one day may be enforceable for nearly all of the EU[59]. The start date is 01 June 2023. However, in its early stages this new patent could create a risk for companies. 'Once you get a unitary patent, you're locked into launching it into a new court system with no case law,' comments Rose, in conversation with ECECP. However, the unitary patent system could reduce IP costs for companies seeking and enforcing patent protection across the EU.

An additional area where more collaboration between the EU and China is likely to yield benefits for both sides is in the quality of searches offered by the EPO and the Chinese patent office. The EPO searches, while usually slower, are considered higher quality than that offered by the Chinese patent office. This has occasionally resulted in a situation where a Chinese patent application is granted, but then at the EPO it becomes apparent that it includes another related innovation which requires a new patent. The EPO has been having some exchange programs with the Chinese patent office to try and improve the situation, explains Matthew Rose.

2.3 What is Holding Back China's Expansion into Europe's Energy Sector?

2.3.1 EU Focuses on Energy Security

There has been a recent surge of anxiety in the EU about China's dominance in the global market following disruption to supply routes during the Covid-19 pandemic and more general political concerns. The EU is placing a renewed emphasis on energy security and wants to reduce reliance on a single supplier or importer of particular products. The perception is that Chinese outbound investments are a manifestation of China's state-led economic system, and that a large proportion of Chinese investments in Europe comes from state-owned enterprises, whose motives may not always be guided purely by commercial objectives.

This unease has been present for several years. In 2019, shareholders at Energias de Portugal blocked a EUR 9 billion(CNY 70 billion) takeover bid by China Three Gorges, reflecting anxiety about the surge of Chinese state investment in the EU. Three Gorges holds just over 20% of the company and the two companies intend to maintain their partnership, focusing on energy prospects in Latin America.

59 An explanation of the proposed European patent may be found here: https://www.mewburn.com/law-practice-library/the-eu-unitary-patent-and-the-unified-patent-court-explained

More recently, in Italy, Mario Draghi's government is setting up a new unit to screen foreign direct investments in strategic sectors.[60] The EC is also set to impose curbs on imports of Chinese green technologies, including solar panels and heat pumps.[61]

CCCEU's Report on the Development of Chinese Enterprises in the EU in 2022 stated: '38% of respondents said their business operations had been negatively affected by the political environment and 5% of them believe that the EU business environment over the last year was negative. Behind the downward trend in ratings lies the common struggle of the surveyed Chinese enterprises: the EU's overall policy, unilateral economic and trade instruments and relatively negative public opinion of Chinese enterprises render the efforts of Chinese enterprises somewhat futile when they try to integrate in the local market.'[62]

Industry insiders are clear that China is ready to collaborate on technology and innovation.

'China is generally more open to introducing technology innovation. But this area includes sensitive topics that the western world doesn't want to collaborate on, such as smart energy systems and AI. The issue is more difficult to solve because of the unbalanced trade and the fear of losing their respective advantages,' comments a Chinese expert consultant, speaking to ECECP.

A leading Chinese wind turbine manufacturer that is already carrying out R&D in the EU and has its own EU headquarters singles out the US' massive green subsidies package, the US Inflation Reduction Plan, and the EU Net Zero Industry Action Plan, which aims to ensure that at least 40% of clean tech is manufactured in the EU by 2030, as inhibiting moves that have forced the company to increase investment and deploy production factories to comply with local production requirements. It points out that it is difficult to achieve the same level of efficiency in production, project development and installation outside China.

Other Chinese companies point to the EU's 2022 Foreign Subsidies Regulation, [63] which comes into effect in 2023. It could result in their transactions triggering a third scrutiny in addition to anti-trust and FDI screening, which would impact costs, time and uncertainty. 96% of respondents were worried about the impact of the FSR when surveyed by the CCCEU in 2022.

The CCCEU survey uncovered anxiety about a number of recent EU regulations, including the EU FDI[64] screening mechanism, which came into force in October 2020. 20% of respondents said it had had a negative impact on their business, and 42% were worried about the implications for the future. The main objectives of the FDI Regulation are to provide an EU-wide cooperation framework between the Member States and the Commission and to establish common criteria to identify risks relating to the acquisition or control by foreign investors of strategic assets that might threaten security or public order.

60 https://merics.org/en/short-analysis/italy-pushes-back-against-chinas-technology-transfer

61 'Brussels to curb imports of Chinese Green Tech' Financial Times, 15 March 2023.

62 CCCEU Report on the Development of Chinese Enterprises in the EU: Striving for a Common Future 2022, page 58.

63 The purpose of the Foreign Subsidies Regulation is to provide the European Commission with authority to investigate financial contributions granted by foreign governments to businesses operating within the EU and which may thus create internal market distortions.

64 https://eur-lex.europa.eu/eli/reg/2019/452/oj

EU-China cooperation in the areas of rare magnets, solar panels, etc., may be negatively influenced due to the EU's recent alignment with like-minded partners, warns the CCCEU.

It is worth noting that for Chinese companies with assets in the EU, the Net Zero Industry Action Plan could provide access to subsidies and funding opportunities. The Act was only introduced in March 2023, and Chinese companies are waiting to see clear guidelines and communication on the eligibility criteria and application process for subsidies that could help accelerate development of new production capacity in the EU.

Meanwhile, the Comprehensive Agreement on Investment (CAI) reached between the EU and China in December 2020 has yet to be ratified. It would commit the EU to improving market access for Chinese companies, while China would offer a negative list in all industries, including service and non-service industries, to achieve full interaction with the foreign investment negative list management system established by its Foreign Investment Law. Recent political wranglings mean that ratification of the agreement, described by the EU as 'the most ambitious agreement that China has ever concluded with a third country', is still a long way off.[65] Comments from EU President Ursula von der Leyen during a visit to China in April 2023 have been taken as confirmation that the CAI agreement is nowhere near ratification.[66]

More recently, in late 2022, the European Commission launched the EU's solar photovoltaic industry alliance, with the aim of regaining production lost to China and establishing a 'Made in Europe' industry. The new alliance will promote investments in large-scale factories, aiming for an annual output of 30 GW for each solar component by 2025.[67] It is not clear yet what the effect of the move will be. 'With all these undertakings of rebuilding PV production across Europe, India and the US - what would that mean for the future export of solar panels? Would that mean that maybe Chinese manufacturers are going to move to Europe and build up production facilities there? Maybe,' muses a solar expert in conversation with ECECP. It is questionable whether European manufacturers can move as fast as China in developing and manufacturing solar panels. China is able to get environmental impact assessments done very rapidly and can get a factory up and running within a couple of months. It is going to be very hard for European companies to emulate that level of efficiency, given the difficulties around the permitting process and administration costs, and the fact that innovation is happening at such a rapid pace in China.

2.3.2 CBAM[68]

The Carbon Border Adjustment Mechanism, which is due to start being gradually

65 https://thediplomat.com/2022/03/is-the-eu-china-investment-agreement-dead

66 https://ec.europa.eu/commission/presscorner/detail/en/statement_23_2147

67 https://www.euractiv.com/section/energy/news/eu-commission-launches-industry-alliance-for-made-in-europe-solar-pv/

68 'The EU's Carbon Border Adjustment Mechanism (CBAM) is our landmark tool to put a fair price on the carbon emitted during the production of carbon intensive goods that are entering the EU, and to encourage cleaner industrial production in non-EU countries.' https://taxation-customs.ec.europa.eu/green-taxation-0/carbon-border-adjustment-mechanism_en#:~:text=The%20EU's%20Carbon%20Border%20Adjustment,production%20in%20non%-2DEU%20countries.

phased in from October 2023, will be the first carbon tariff in the world. The CBAM will put a carbon price on imports of a targeted selection of products so that climate action in Europe does not lead to 'carbon leakage'.

Even in these early stages, its effect on the energy awareness of Chinese companies, and therefore on carbon emissions as a whole, appears to be positive. It has prompted a surge of activity in China to ensure factories are built in areas with hydropower resources in order to minimise the carbon footprint. Companies are now coming forward with designs for zero carbon footprint factories, to be sure that new facilities are ready for the changes ahead. 'The Chinese government itself wants to have a greener, cleaner, more climate friendly production,' says and expert solar advisor, speaking to ECECP. 'They have very good reasons on their own to pursue such kinds of developments.'

However, some businesses interviewed by CCCEU for its 2022 report felt the CBAM would have a negative impact on China-EU trade in the mid- to long-term, particularly on the trade of iron and steel, aluminum, electricity, cement and chemical fertiliser.

2.3.3 Dealing With Higher Costs in the EU

China, with its 1.4 billion population and the state support that comes alongside the government's avowed intention to achieve net zero by 2060, provides a massive market place for the country's innovative products. Companies interviewed by ECECP make it clear that participation in EU markets is not always attractive, when they have such a fertile market on their doorstep, and when relative development costs in Europe are higher.

'Cooling and heating, such as geothermal heat pumps, is a labour-intensive industry due to the labour costs for drilling. For this reason the geothermal market in China is the largest in the world for both low-temperature and cold heat utilisation. In western countries, the market share for direct geothermal utilisation is still small because the cost of project development is high,' says one expert consultant.

2.3.4 How Can the EU Spur China's Involvement in Its Energy Sector?

Much as the EU is signalling its intent to produce its own energy infrastructure and reduce dependence on China, the fact is that China's manufacturing might dominates the solar and wind turbine industries, is soon to dominate EV battery production, and is ramping up its heat pump production. All these energy sectors are crucial to the EU's target of reaching net zero by 2030, and even as the EU seeks to shore up its domestic production and innovation, it will initially depend on China to deliver the energy efficiency hardware needed to drive a cut in emissions.

The industry experts consulted by ECECP have put forward a number of recommendations for policy and financial support from both the EU and China to help Chinese companies who are building up their activities in the EU:

1. EU-China government and industrial associations to establish more channels to promote communication between businesses.

2. Enhance bilateral communications to overcome politicisation and work towards a more open market.

3. Provide clarity on comprehensive policy framework and improve coherence between industrial and trade policy frameworks in EU Member States.

4. The EU and China should promote joint R&D initiatives and establish improved alignment of international initiatives on decarbonisation and sustainability.

5. Provide greater transparency in the design and application of funding mechanisms and help companies navigate the complexities of the funding process.

6. EU governments should reduce the administrative burdens on energy innovators and create a level playing field for investment in Europe.

7. Improve mutual recognition of policy initiatives across the EU and China, as well as among EU members.

8. Promote flagship joint R&D programmes and boosting R&D cooperation in green and emerging technologies.

9. Boost cooperation on both carbon trading systems.

10. Promote mutual recognition of green projects between China and the EU.

2.3.5 Conclusion

Conversations with industry players demonstrate that companies with a long-term presence in the EU, who prioritise relationships with individual governments and regions, are more likely to understand the tender processes and regulatory systems, and to have had the opportunity to build up relationships with local players in the EU energy sector.

Obstacles identified by those still waiting to make their move into the EU market are: protective labour market rules; lengthy approval process for labour dispatching; high project development costs; bias against Chinese products; difficulties of dealing with 27 Member States, each of which has their own policies and regulations.

None of these issues can be said to be the result of official policies adopted by the EU directed against China, but rather emanate from cultural differences and current geopolitical tensions.

However, China's presence in Europe is facing headwinds as its companies endeavour to bring green innovations into the EU. Concerns over energy security and IP rights, and anxiety sparked by supply issues during the Covid-19 pandemic are spurring Brussels to 'de-risk' from China, and find ways to boost home-grown technology rather than rely on Chinese imports or Chinese technology offerings.

The most recent moves by Brussels to prioritise energy security and promote home-grown energy solutions are unsettling for those companies that have been harbouring ambitions to break into the lucrative EU market. They are also a setback for those who have been watching the breakneck speed of Chinese R&D in key energy technologies and who want to see them contribute to the race towards global carbon neutrality.

But how quickly can the EU create the new supply chains needed to achieve its renewable energy goals? Bringing Chinese companies on board would speed the transition, industry players told the Financial Times.[69] The same article quotes Mario Kohle, chief executive of solar panel installer Enpal, who says 'Chinese manufacturing capacities are absolutely excellent and way ahead of western manufacturing capacities when it comes to solar and batteries.' Experts in Europe believe it will be impossible to introduce home-grown solar panels and batteries at a price that people are willing to pay. Even with the initiatives recently announced to boost production of energy equipment in the EU, most of the 420 GW of capacity that the EU intends to install by 2030 is likely to come from China. As China ramps up production of wind turbines, heat pumps, EVs and batteries, and continues investing in green energy R&D at a pace far beyond the reach of other economies, the task now is for the continent to engage with Chinese government and energy firms: if not, its carbon neutrality targets will be missed.

Meanwhile, if China is ready to align its energy and trading standards with global benchmarks, and allow EU innovators to address areas of energy efficiency that its own Five-year Plans are overlooking, innovative products from both regions can be adopted globally and so help to avert the looming climate crisis that threatens the future of the planet.

69 Financial Times: Europe attempts to get out of China's shadow, April 2023.

3. Call to Action

For both regions, the one issue that is flagged up as needing improvement is communication. Companies in the EU and China are calling for improved information flow at a sub-regional level to overcome firstly, the difficulties faced by Chinese companies when dealing with 27 EU Member States, and secondly, the challenges confronting European companies when approaching the complexities of China's 23 provinces, 5 autonomous regions, 4 municipalities and 2 Special Administrative Regions - each of which has their own policies and regulations. The writers of this report have developed ten action points for the EU, and ten action points for China that can encourage energy innovation and so help the world to turn the tide of climate change towards climate neutrality.

3.1 10 Action Points to Encourage EU Innovation in China

1. An extension of China's Emissions Trading System to include hard-to-abate sectors such as industry, aviation and buildings, which will create greater parity between carbon prices in the EU and China.

2. EU companies to integrate themselves into the local ecosystem and strengthen localisation.

3. China and the EU to ensure they are working to international rather than national standards, which will help to accelerate global adoption of clean innovative technologies.

4. During the tender process, bidding under cost price to be disallowed, and life cycle cost included in the evaluation criteria.

5. Global standards to be adopted for innovative products that will make it more straightforward to invest and achieve maximum energy savings.

6. Visa requirements to be relaxed for skilled technicians who do not have a relationship with a university, as well as for older and more experienced managers.

7. Companies taking part in tenders to be allowed access to data and individual sites that allow a realistic assessment of current energy performance and hence the likely impact of innovative technology.

8. Tighter environmental regulation of energy performance so that there is not a discrepancy between what is achievable in research institutes, and what is achievable on the ground in older facilities.

9. Establishment of a new portal for EU companies aiming to do business in China

that will offer support with the tender process, flag up new tenders, and help with cultural differences. The portal could also serve to track offers of funding opportunities and subsidies at MOST, the NEA, the MIIT and NDRC in China and present the information in English to make access easier for EU companies. This would be in addition to the National Public Resources Trading Platform (ggzy.gov.cn), as well as provincial, municipal and county public resources trading platforms, which list all the projects tendered.

10. SMEs and companies hoping to do business in China should be offered a better understanding of patent law, and how to protect intellectual property.

3.2 10 action points to encourage Chinese innovation in the EU

1. Improve communication and build trust between the EU and China through government support and industry associations, and development of more channels for companies to meet and communicate.

2. Streamlined and harmonised regulatory framework across the EU Member States to simplify the processes for obtaining permits, licences or certifications, for example.

3. Transparency on the subsidies available under the EU Net Zero Industry Act, and how to apply for them.

4. Strengthened mutual recognition of standards and certification schemes to promote the development of a more unified global market for renewable energy products.

5. Collaboration on new international standards for renewable energy.

6. Technology innovation cooperation between China and the EU, particularly on wind turbine control strategies and development of autonomous simulation software.

7. Regulatory certainty and coherence between legislative initiatives in the 27 EU Member States, as well as more transparency in the design and application of funding mechanisms and help for Chinese companies to navigate the complexities of the funding process.

8. Chinese companies to integrate themselves into the local ecosystem and strengthen localisation.

9. Improved alignment on international initiatives on decarbonisation and sustainability.

10. Enhance bilateral communications to address politicised areas and work on developing a market that is open to Chinese investment.

Annex

a. List (not exhaustive) of organisations assisting EU companies in China and Chinese companies in the EU.

EU IN CHINA

EUCCC
The European Union Chamber of Commerce in China, is a non-profit and non-governmental organisation established to support and represent the interests of companies from the European Union operating in China. The main objective of the European Chamber is to advocate for a better business environment.
https://www.europeanchamber.com.cn/en/home

EU SME Centre
The EU SME Centre is a European Union initiative that provides a comprehensive range of hands-on support services to European small and medium-sized enterprises (SMEs), getting them ready to do business in China. The team provides advice and support in four areas – business development, legal and government affairs, standards and conformity, and human resources.
https://www.eusmecentre.org.cn/

China IP SME Helpdesk
question@china-iprhelpdesk.eu
https://ec.europa.eu/ip-helpdesk

Business Finland
Business Finland offices in China offer advisory services and support for finding local networks and consultants. The team also answers requests for Mongolia through local official partners in Mongolia.
https://www.businessfinland.fi/en/locations/asia-india-and-oceania/china

Innovation Centre Denmark (ICDK)
ICDK in Shanghai supports Danish companies and higher education institutions in exploring opportunities to expand or establish activities in China. ICDK Shanghai helps companies discover, create and localise their business' value proposition, business model and partnership & funding strategy.
https://kina.um.dk/en/about-us/danish-representations-in-china/innovation-center-shanghai

Netherlands Innovation Centre (NIC)
NIC is one of the fastest-growing innovative high-tech innovation centers in both China and Europe with the mission to help European startups or SMEs to enter the Chinese market in a smooth and cost-efficient way. NIC has more than 3 000 m^2 office spaces in their innovation centers in Amsterdam, Suzhou, and Nanjing.
http://netherlandsinnovationcenter.com/

Netherlands Innovation Network
Netherlands Innovation Network China has offices in Beijing, Shanghai and Guangzhou. The offices facilitate research, high-tech development and innovation cooperation between the Netherlands and China. Furthermore, they represent the innovative sectors in the Netherlands and inform stakeholders about Chinese developments, opportunities and business models. Stakeholders include companies, universities, governments, and grant providers.
https://netherlandsinnovation.nl/
https://www.netherlandsandyou.nl/your-country-and-the-netherlands/china/about-us/dutch-diplomatic-network-to-china---who-are-we/innovation-department

Cleantech Route China (Flanders)
Cleantech Route China is a cooperation between the 5 Flemish provinces, FIT and Cleantech Flanders, aiming at connecting Flemish and Chinese cleantech companies.
info@routechina.be
https://cleantechroutechina.be/en

Exportinitiative Energie (Germany)
The German Energy Export Initiative of the German Federal Ministry for Economic Affairs and Climate Action (BMWK) supports suppliers of climate-friendly energy solutions in opening up foreign markets. The focus here is on renewable energies, energy efficiency, smart grids and storage. New technologies such as power-to-gas and fuel cells are also increasingly being considered. The offer is aimed in particular at small and medium-sized enterprises and supports the participants through measures for market preparation as well as market research and development.
https://www.german-energy-solutions.de

CHINA IN THE EU

China Chamber of Commerce to the EU (CCCEU)
The Brussels-based China Chamber of Commerce to the EU acts as a bridge-builder that mainly helps Chinese enterprises in Europe chart the way for increased China-EU economic interaction. It represents up to 80 members and chambers in EU Member States, covering about 1 000 Chinese enterprises.
http://en.ccceu.eu/

China-Europe Association for Technical & Economic Cooperation Constitution
http://www.ceatec.org.cn/

China Council for the Promotion of International Trade (CCPIT)
https://en.ccpit.org/

China Chamber of International Commerce (CCOIC)
http://ccoic.cn/ecms

China International Contractors Association (CHINCA)
https://www.chinca.org/EN

China Chamber of Commerce for Import and Export of Machinery and Electronic Products
http://www.cccme.cn/

China Council for the Promotion of International Trade Electric Power Industry Office (CCPIT Electric Power)
https://www.ccpitep.org.cn/

China-CEEC Cooperation Platform
http://www.china-ceec.org/eng/

Deutsch-Chinesische Wirtschaftsvereinigung e.V.
https://www.dcw-ev.de/en/

Finland-China Investment & Trading Promotion Association
http://www.fcitpa.com/en/

Chinese Chamber of Commerce and Industry in France (CCICF)
http://aecf-france.org/presentation.htm

COMITÉ D'ÉCHANGES FRANCO-CHINOIS
https://cefc-paris.fr/

Association of Chinese Investment Enterprises in the Netherlands (ACIEN)
https://acien-nl.com/en/home/

Chinese Chamber of Commerce in Sweden (CCCS)
http://www.khis.se/

b. List of interviewees:

Scania China
Danfoss China
PowerCell
China Energy Construction Geothermal Company Limited (CEEC)
Matthew Rose (former Huawei patent attorney)
An independent solar advisor
A leading solar power solutions provider
A leading wind power solutions provider
Savosolar
Helika Juergenson, project manager at the China IP SME Helpdesk
Sauro Pasini, former head of research at Enel
Massimo Gobbi, UN expert on emissions, energy and BAT/BEP implementation
China Chamber of Commerce in the EU (CCCEU)
Tara Joensuu, CEO and founder of Osa Technology
Alessio Petino, business advisor, EU SME Centre

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