Magazine of EU-China Energy Cooperation Platform

EU-China Energy Magazine

2022 June Issue

About ECECP

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 Energy Cooperation'.

The Joint Statement was signed during the 8th EU-China Energy Dialogue that was held in Brussels on 9th April between Commissioner for Climate Action and Energy Miguel Arias Cañete and the Administrator of the National Energy Administration of China Mr ZHANG Jianhua, back-to-back with the 21st EU-China Leaders' Summit on 9 April 2019 and was witnessed by Jean-Claude Juncker, President of the European Commission; Donald Tusk, President of the Council of Europe and Dr Li Keqiang, Premier of China.

The start of the implementation of the EU-China Energy Cooperation Platform (ECECP) was included in the EU-China Leaders Summit Joint Communique.

> The overall objective of ECECP is to
>
> *'enhance EU-China cooperation on energy. In line with the EU's 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 National Development and Reform Commission - Energy Research Institute.

EU-China Energy Magazine

2022

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Dear All,

Welcome to the June 2022 issue of the EU-China Energy Magazine.

We are almost halfway through the year and the geopolitical situation continues to keep us on our toes. There are no quick solutions to the military conflict in Europe, and rising energy prices and tightening global energy supplies make strong energy cooperation more important than ever. For the EU, moving away from dependence on Russian energy imports is a top priority, while maintaining the Green Deal. In this issue, we have invited Octavian Stamate, Counsellor for Climate Action and Energy, EU Delegation to China, to give an overview of the EU's strategy in these unprecedented times, as set out in the REPowerEU Plan.

This issue also includes an article on the new report by the European Union Chamber of Commerce in China on how European companies are supporting China's path to carbon neutrality by 2060, and two articles on how social innovation and active consumers can support decarbonisation.

It is not often that ECECP blows its own trumpet. This month, however, we are delighted to include a testimonial from the outgoing EU Ambassador to China, Nicolas Chapuis, who has taken the opportunity to recognise the work of ECECP in encouraging cooperation between the EU and China despite multiple challenges, including but not limited to those posed by the ongoing Covid-19 pandemic.

This month, ECECP has thwarted Covid-19 once again: we have managed to publish the June issue on schedule despite our English editor, Helen Farrell, having tested positive for Covid. Congratulations and thanks to her and to our ever-patient Chinese editor, Daisy Chi, for once again delivering a very informative issue against the odds.

Flora Kan
ECECP Team Leader

Message from the Ambassador of the European Union to China

Just over three years ago, I spoke at the Launch Event of the EU–China Energy Cooperation Platform. In front of a fine gathering of officials, experts, regulators, grid operators and business representatives from Europe and China, who were obviously entertaining great hopes for this initiative, I first and foremost pointed out the good auspices under which this collaborative effort was beginning its work. High level policy dialogue had just been held in Brussels, culminating in the signature of a Joint Statement, in the presence of the top leaders. I also highlighted the enormous potential for positive engagement between the EU and China in this particular policy area, which is crucial to achieve meaningful progress in tackling the climate crisis and to generate a positive momentum in terms of sustainable development worldwide.

Today, as my tenure as Ambassador of the European Union to China comes to a close, I am taking stock of what has been actually achieved, and I am really pleased to note that the Platform

and its competent and dedicated team have definitely met the high expectations held by both sides, and this has happened in spite of unforeseen and sometimes tremendous challenges, including, but not limited to, the Covid-19 pandemic, with its retinue of restrictions and limitations.

The Platform has managed to establish itself as a privileged venue of interaction, coordination, reflection and productive exchanges between European and Chinese stakeholders of all extractions. In the course of dozens of workshops and networking events, on-and offline, discussions covered topics of mutual interest, such as promotion and integration of variable renewables in the energy system, market-based financing of energy efficiency measures, reform of the energy market, introducing innovative energy solutions, the role of gas in achieving low-carbon development and so on. The deliberations that took place at these events provided valuable material for a series of excellent comparative studies and reports, as required by the Joint Statement. These documents effectively provide a comprehensive blueprint for a clean energy transition in China, taking European expertise and experience as a starting point. They also give some guidance on the adjustments still necessary to make China an even more favourable environment for businesses that stand ready to offer solutions designed to facilitate and accelerate the clean energy transition.

The Platform has also helped to meet the ever growing thirst for information among those interested in the latest energy policy developments in the EU and China, as well as the prospects and state of play in terms of bilateral cooperation. I know that the readership of ECECP's website and its flagship publication, the now monthly Magazine, has grown exponentially over time, and its WeChat account now has hundreds of followers. This outreach work has helped make the EU a relevant and active presence in China.

Before I conclude, I wish to convey a message to partners and friends of the Platform, to reassure them that the venue for dialogue and mutual understanding represented by the Platform is here to stay, and is set to develop further. Hopefully, it will demonstrate the necessary resilience against an occasionally turbulent backdrop, and inject the positive (and clean) energy that is essential to support the ongoing dynamism and strength of EU-China bilateral relations.

Nicolas Chapuis
Ambassador of the European Union to China

INVITED ARTICLE

EU moves decisively to curb dependence on fossil fuels and accelerate the clean energy transition

On 18 May 2022, the European Commission presented the REPowerEU Plan. This is a policy initiative designed to accelerate a radical transformation of the EU energy system by significantly reducing consumption of fossil fuels, while effectively tackling the climate crisis. The bold move is also a direct response to the global energy market disruption caused by Russia's invasion of Ukraine.

The REPowerEU Plan will achieve its objectives through energy savings, diversification of energy supplies, and an accelerated roll-out of renewable energy to replace fossil fuels in homes, industry and power generation.

The envisaged transformation will generate growth, strengthen EU energy security and reaffirm its global leadership in climate action.

The Recovery and Resilience Facility (RRF), a dedicated financial instrument designed to support the building back of the EU economy in the post-pandemic era, will provide necessary resources for cross-border and national infrastructure, as well as for energy projects and reforms.

Saving energy is the cheapest and quickest way to address the current energy crisis. Therefore the plan puts forward a proposal to enhance long-term energy efficiency measures, which includes raising the binding Energy Efficiency Target from 9% to 13%, alongside adoption of short-term behavioural changes aimed at reducing demand of oil and gas by 5%. At the same time, Member States are encouraged to use fiscal measures to encourage energy savings, such as reduced VAT rates on energy efficient heating systems, building insulation and appliances and products etc. Contingency measures in case of severe supply disruption and prioritisation criteria for customers have also been put in place.

The EU is engaged in talks with actual and potential suppliers of gas, in order to diversify and increase deliveries, while the newly created EU Energy Platform will enable voluntary common purchases of gas, LNG and hydrogen by pooling demand, optimising infrastructure use and coordinating outreach to suppliers. Based on the experience gained with the common purchase of anti-COVID vaccines at EU level, the Commission will consider the development of a 'joint purchasing mechanism' which will negotiate and contract gas (and renewable hydrogen) purchases on behalf of participating Member States. Measures that will require Member States to diversify their supply sources are also under consideration.

It is clear that EU energy independence can be realistically achieved only through a massive scaling-up and speeding-up of renewable energy provision in power generation, industry, buildings and transport. Therefore, the Plan raises the EU's ambition in terms of rolling out renewables, with a Fit for 55 target increase from 40% to 45% for year 2030, matching the EU Solar Strategy aim for a doubling of solar photovoltaic capacity by 2025 and installation of 600GW by 2030.

To achieve these goals, a new legal requirement will come into force: solar panels will have to be installed on all new public and commercial buildings and new residential buildings. The rate of deployment of heat pumps and integration of geothermal and solar thermal energy in district and communal heating systems is expected to double. Major renewable projects will benefit from a shortened and simplified permitting processes, and Member States will have to designate 'go-to' areas, based on EU digital maps and datasets on environmentally sensitive areas. For hard-to-abate sectors, there will be a big push to replace oil, gas and coal with renewable hydrogen, with a target of 10 million tons of domestic production and 10 million tons of imports per year. At the same time, the Commission will issue a definition of 'renewable hydrogen', to ensure that production leads to actual decarbonisation. There is also a plan to increase production of bio methane to 35 bcm/yr by 2030, including through the Common Agricultural Policy.

The EU hopes that, through energy savings and efficiency measures, electrification, and increased uptake of renewable hydrogen, biogas and biomethane in key sectors such as industry, transport and construction, it could save up to 35 bcm/yr of natural gas by 2030 on top of what is foreseen under the Fit for 55 proposals.

EU Emission Trading System allowances currently held in the Market Stability Reserve will be used to support the whole process, by supplementing the RFF financial envelope. Thus, ETS will not only effect emissions reduction by inhibiting use of fossil fuels, but it will also contribute towards the strategic goals of EU energy policy. To achieve REPowerEU objectives, EUR 225 billion is already available in loans under the RRF. However, an additional EUR 210 billion is needed by 2027. Financial instruments designed for regional and cohesion policies, the Common Agricultural Policy and to support innovation will provide funding of around EUR 35 billion. To allow import substitution, limited additional gas infrastructure will have to be built, at a cost of a further EUR 10 billion, which will be drawn from the budget allocated to EU Projects of Common Interest. Almost EUR 1 billion will go towards the necessary adaptation of the power grid. The amount of money required is significant, but it is worth every penny, as it represents investment in EU energy independence and security, and will eventually allow the bloc to save almost EUR 100 billion per year, by cutting imports from Russia or elsewhere.

The success of the REPowerEU plan depends to a large extent on the EU's successful engagement with partner countries, primarily in the vicinity of the EU, but also around the world. The EU external energy strategy, made public as part of the REPowerEU plan, explains the EU's vision for a global clean transition: to reduce overall energy demand, ensure fair competition for resources and boost energy savings, energy efficiency and development of renewables. These topics were on the agenda of the 10th edition of the EU-China Energy Dialogue that was held, on the margins of the EU-China Summit, on 31 March 2022. On this occasion, Commissioner Simson and Administrator Zhang reviewed progress on the implementation of the Joint Statement on EU-China Energy Cooperation, signed back in 2019. The high-level EU-China energy dialogue focused in particular on energy security, the green energy transition and electricity market reform. LNG, natural gas and oil markets featured prominently in discussions on energy security.

The EU and China have a common interest in building a properly-functioning global energy market that will help them to be less dependent on fossil fuel imports and accelerate the transition to a cleaner energy system worldwide. Only by working together can the EU and China achieve success in reshaping the world's energy landscape, in order to tackle effectively the existential threat related to climate change, and to guarantee the sustainable, secure and affordable supply of energy to humanity as a whole, for generations to come.

Octavian Stamate
Counsellor - Climate Action and Energy
EU Delegation to China

INVITED ARTICLE

How EU business can support China's quest for net zero

On 25th May, the European Union Chamber of Commerce in China (European Chamber) in partnership with Roland Berger, published Carbon Neutrality: The Role of European Companies in China's Race to 2060. Based on a member survey and extensive interviews, the report identifies areas where EU-China cooperation can be deepened so that China can frontload the technologies and holistic solutions it needs to accelerate its carbon neutrality drive and accomplish its 30/60 Goals[1].

China's recognition of the importance of fighting climate change was reflected in the ambitious pledges made by President Xi Jinping at the United Nations General Assembly in 2020. The unprecedented scale of the challenge demands an inclusive approach, with China bringing to bear all the tools it has at its disposal. It will require China to fundamentally restructure its energy economy, reshape whole industries and accelerate the development of nascent technologies and value

1. *China's 30/60 Goals are to peak carbon emissions before 2030 and to achieve carbon neutrality by 2060.*

chains, as well as promote an environmentally conscious and energy-efficient society.

Driven by stringent environmental regulations and consumer demand, and guided by their global corporate carbon neutrality pledges, European companies are well placed to help China to pursue its 30/60 Goals. The report finds that 67 per cent of European companies operating in China are already pursuing carbon neutrality, and 40 per cent have established decarbonisation teams in China, many of which report directly to the board. However, three main barriers currently prevent European firms from fully contributing to China's carbon neutrality drive.

First, more policy guidance at the national, local and sectoral levels is needed to enable businesses to make informed investment decisions today with 2060 in mind. Although China has started rolling out its '1+N' policy framework, it needs to be quickly fleshed out. As it stands, 65 per cent of European companies report that a lack of industrial guidance and best practice sharing from the government or NGOs could prevent them from achieving their decarbonisation goals in China.

Second, there is also the need for a more transparent, open, and flexible power market. While China leads globally in installing new renewable energy generation capacity, barriers prevent businesses from fully utilising it. This is a serious challenge for 69 per cent of companies, whose decarbonisation efforts in China could be derailed without sufficient access to renewable energy. China's emissions trading system (ETS) also needs to be reformed and its deployment accelerated.

Third, the development and roll out of leading green technologies is stifled by a lack of open markets and common standards, as well as limited corporate and consumer awareness. For example, 54 per cent of respondents from the environment sector to the European Chamber's Business Confidence Survey 2022 (launched in June 20th 2022) reported missing business opportunities because of market access restrictions or regulatory barriers; and 31 percent of companies report that the lack of a low-carbon culture in China could be prevent them from achieving their decarbonisation goals. Furthermore, common standards are needed to provide assurance to those looking for truly 'green' investments and to eliminate green washing.

Although China's 30/60 Goals are extremely ambitious, European Chamber members believe they can be achieved provided China leverages all the tools at its disposal, including implementing deep market reforms and utilising proven European technologies and holistic solutions that companies have developed through experiences acquired on the ground. Having worked on decarbonisation with government stakeholders, non-governmental organisations (NGOs) and civil society in their home markets, they are in a position to make strong contributions.

However, European companies currently face numerous challenges that prevent them from doing so, which include the following:

- A lack of clear information at the national, local and sectoral levels.
- The lack of a transparent, open, flexible power market and well-developed carbon market.
- Insufficient access to renewable energy sources.
- Investment barriers.
- Undeveloped value chains for green technologies.
- The absence of a low-carbon culture in China.

Achieving carbon neutrality is the world's most urgent common mission. It is also the first subject in history that has managed to align—at least some extent—all the great powers. They understand that greenhouse gases (GHGs) have no 'passport', and that that exceeding 2°C of global warming would have disastrous socioeconomic consequences, mainly hitting the world's poorest.

China's 30/60 challenge

When China began to open and reform its economy in 1978, the approach it adopted was 'crossing the river by feeling the stones', which served the country well and gave it the confidence to move cautiously but steadily forward with further opening, culminating in WTO accession in 2001. At that time, China was a developing economy by most measures, and hence every step and condition to complete the accession process was meticulously negotiated.

While it was expected by other WTO members that post-accession reform and opening would accelerate, China continued to exercise restraint. This worked to China's advantage as it selectively opened parts of the economy to foreign investments where it needed technology and/or competition, while protecting its domestic companies to allow them to build scale and develop competence in strategic areas of the economy (this plan became concrete with the launch of Made-in-China 2025 in 2015, which clearly outlined the strategic industries in which China had determined to become self-reliant).

China made remarkable economic progress, and its focus on manufacturing and exports saw it become the 'factory of the world'. However, while this economic model propelled growth at breakneck speed, it also came at a significant ecological cost. Over the past four decades, China has suffered rapid environmental degradation because of its over-reliance on cheap, highly polluting sources of energy (mainly coal) to fuel its manufacturing economy. The result is huge amount of soil depletion, wastewater, solid waste, and high GHG emissions from the energy supply and overall industrial and social systems.

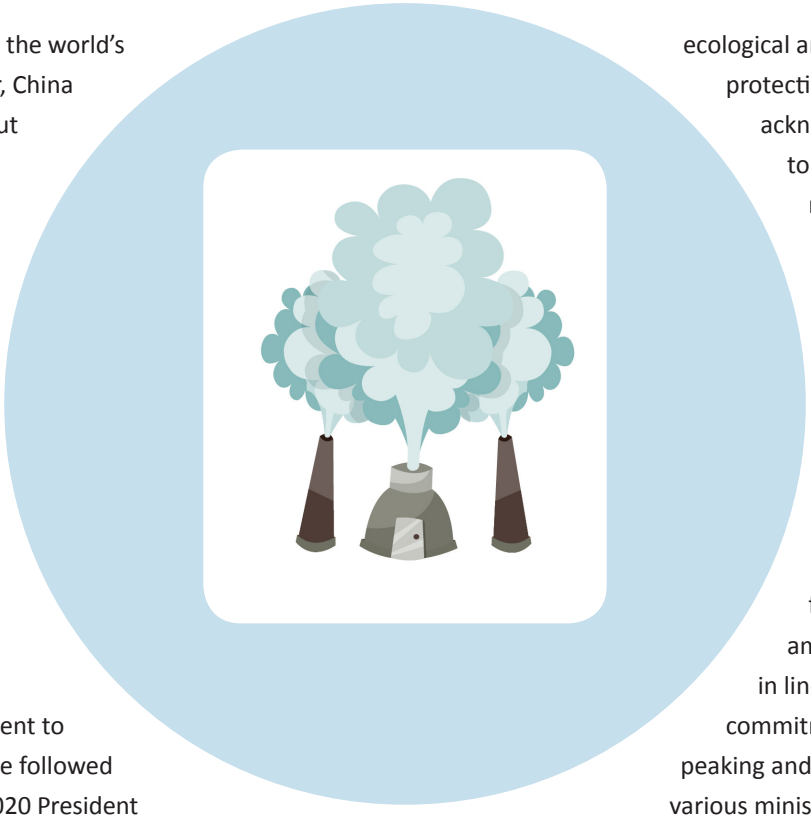
The climate crisis came to prominence as a global topic in 1988, when the Intergovernmental Panel on Climate Change (IPCC) was formed[2]. Since then, China's level of participation in related discussions has steadily increased. In 1993, China ratified the United Nations Framework Convention on Climate Change (UNFCCC), and it was a non-annex I signatory to the Kyoto Protocol in 1988, with ratification following in 2002. China's status under the Kyoto Protocol allowed it to only undertake nationally appropriate mitigation actions (NAMAs), whereby it declared its 'intent to mitigate greenhouse gas emissions in a manner commensurate with… [its]…capacity and in line with… [its]…national development goals.'[3]

In March 1994, China officially passed the China 21 Actual Agenda – White Paper on China's 21 Actual Population, Environment and Development, and during the 11th Five-year Plan (11FYP) period, China put forward the concept of 'sustainable development' as a major national development strategy and put it into practice for the first time.

However, by 2004, China had recorded the world's largest carbon footprint,[4] hence investing in low-carbon technologies, strengthening environmental controls and density controls appeared in China's 11th Five-year Plan (11FYP) (2006–2011), and were even more prominent in China's 12FYP (2011–2016). Meanwhile, within the context of the Kyoto Protocol, some in China argued that climate change was largely caused by developed nations, and therefore those countries needed to shoulder the most responsibility for fixing it. This argument became harder to sustain when it was reported that China had emitted more GHGs than the entire developed world

2. *Jackson, Peter, From Stockholm to Kyoto: A Brief History of Climate Change, United Nations, viewed 8th April 2022, <https://www.un.org/en/chronicle/article/stockholm-kyoto-brief-history-climate-change>*
3. *Nationally Appropriate Mitigation Actions (NAMAs), United Nations Climate Change, viewed 12th April 2022, <https://unfccc.int/topics/mitigation/workstreams/nationally-appropriate-mitigation-actions>*
4. *How is China Managing its Greenhouse Gas Emissions?, China Power, viewed 8th April 2022, <https://chinapower.csis.org/china-greenhouse-gas-emissions/>*

combined in 2019[5]. As the world's largest carbon emitter, China now accounts for about 29 per cent of the world's total GHG emissions, while its GDP represents about 19 per cent. Hence, China's carbon intensity is far higher than world average, and accounts for approximately three times that of the European Union.



China's firm commitment to fighting climate change followed when in September 2020 President Xi Jinping announced to the United Nations General Assembly China's pledge to peak carbon emissions before 2030 and to be carbon neutral by 2060 (30/60 Goals)[6], putting climate change high on China's policy agenda.

China's carbon neutrality pledge was not just a result of mounting external pressure, nor was it following in the footsteps of Europe with its 2050 carbon neutrality pledge and the launch the European Green Deal. The increasingly extreme weather conditions that China faces and the huge costs resulting from environmental depletion (estimated at around nine per cent of GDP) have been pivotal, as has the recognition that the situation presents just as much an economic opportunity as it does an existential threat.

Decarbonisation is now an imperative in China and local government authorities and Chinese companies are being forced to address it. Prompted by President Xi's decisive commitment, China's 14th Five-year Plan (14FYP) (2021–2025) incorporated among its pillars 'Green Development', deemed indispensable to building an 'ecological civilisation'. However, although the need to strengthen ecological and environmental protection has been explicitly acknowledged by China's top leadership, its national 14FYP did not provide specific objectives. The few targets included in the plan, i.e., reducing CO_2 intensity by 18 per cent and energy intensity by 13.5 per cent over a five year period, lack ambition and are not in line with the top-down commitments for carbon peaking and neutrality. While various ministries and government bodies—including the Ministry of Ecology and Environment, the National Development and Reform Commission, the National Energy Administration, the Ministry of Housing and Urban-Rural Development—have issued their own 14FYPs with further details, they still do not focus on how to practically achieve the 30/60 Goals. This makes 2025 another significant milestone in addition to 2030 and 2060. By that time China will need to have fleshed out its '1+N' policy framework, and have added more granular detail at the provincial, municipal and industry levels.

China is aiming to achieve carbon

5. *Report: China emissions exceed all developed nations combined, BBC, 7th May 2021, viewed 8th April 2022, <https://www.bbc.com/news/world-asia-57018837>*
6. *Darby, Megan & Farand, Chloé, Xi Jinping: China will aim for carbon neutrality by 2060, Climate Home News, 22nd September 2020, viewed 3rd March 2022, <https://www.climatechangenews.com/2020/09/22/xi-jinping-china-will-achieve-carbon-neutrality-2060/>*

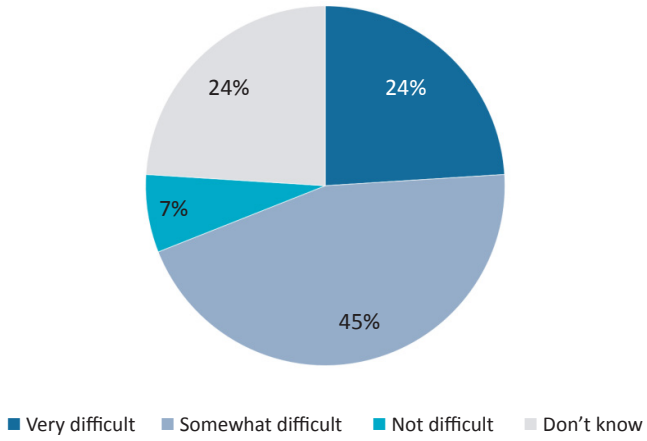
neutrality under extremely challenging conditions relative to the rest of the world. This situation is recognised by European companies and makes it more difficult for them to reach their own decarbonisation goals in China and, therefore, globally.

While Europe is moving towards carbon neutrality at a time when its per capita electricity consumption and overall energy intensity are decreasing, China is doing so while its per capita electricity consumption is continuing to increase, despite its energy intensity decreasing slightly each year. China's economic growth is also still largely dependent on manufacturing for both domestic consumption and export, and while this remains the case its transition towards an economic model based on services and consumption—which would allow it to vastly reduce its energy intensity—is still some way off.[7&8]

According to European companies, the main challenges to China achieving its 30/60 Goals are reducing industrial dependence on cheap energy while maintaining energy security, and the fact the current energy mix contains only a small proportion of renewables.

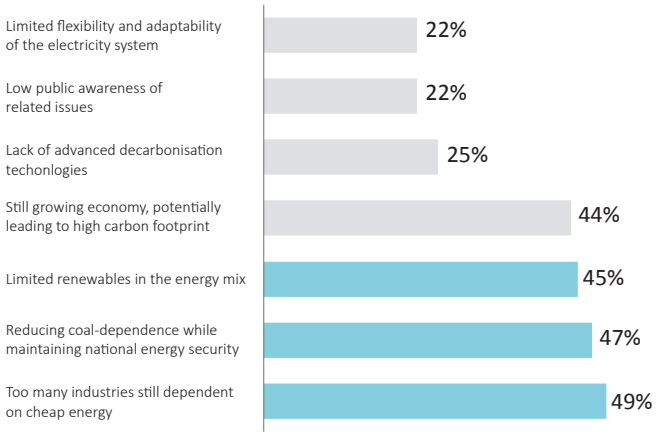
Companies face an uphill battle to decarbonise their China operations

Please indicate the level of difficulty for your company to achieve its decarbonisation and/or carbon neutrality goals in China



Limited renewables in energy mix, coal dependency and reliance on cheap energy key challenges

What do you think are China's top-three challenges to achieving carbon neutrality?



7. *It has been projected that the service sector will account for 72 per cent of China's GDP by 2030: Service sector to account for 72 percent of China's GDP by 2030: gov't think tank, State Council, 6th April 2017, viewed 12th April 2022, <http://english.www.gov.cn/news/top_news/2017/04/06/content_281475618220064.htm>*
8. *According to the World Bank, in 2020, China's service sector accounted for 54.53 per cent of its GDP, which placed it 91st in a list of 169 countries ranked by their share of services. By comparison, Hong Kong was ranked first with services making up 88.99 per cent of its economy, and Macau ranked second with services making up 88.66 per cent of its economy: Share of services: Country rankings, The Global Economy, viewed 12th April 2022, <https://www.theglobaleconomy.com/rankings/Share_of_services/>*

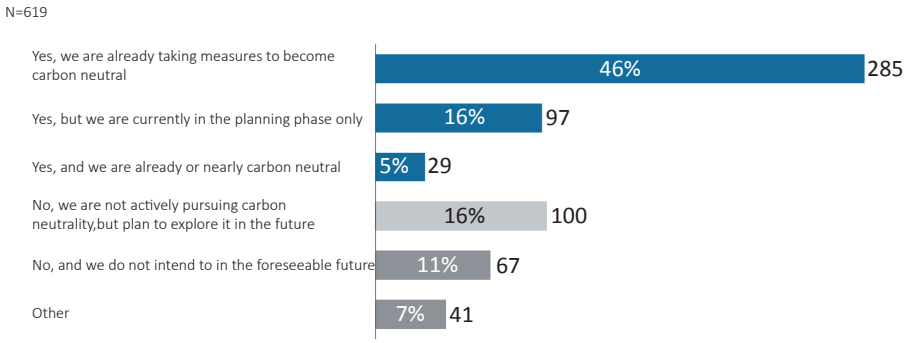
Most European companies in China have global decarbonisation pledges to fulfil and are already comparatively well advanced with their strategies: 40 per cent have established decarbonisation teams in China, with many of these teams reporting directly to boards; and 69 per cent have achieved at least a basic level of preparation.

Hence, China does not need to reinvent the wheel in its pursuit of carbon neutrality. European companies have deployed effective, innovative decarbonisation technologies and holistic solutions in their home markets and want to work with China to help it quickly frontload, presenting a strong argument for deepening EU-China industrial cooperation.

The two most significant drivers for European companies to decarbonise are environmental, social and governance (ESG), and regulation. This creates a mutually reinforcing situation as these companies are both driven to meet their own corporate commitments and obligated to comply with regulations, globally.

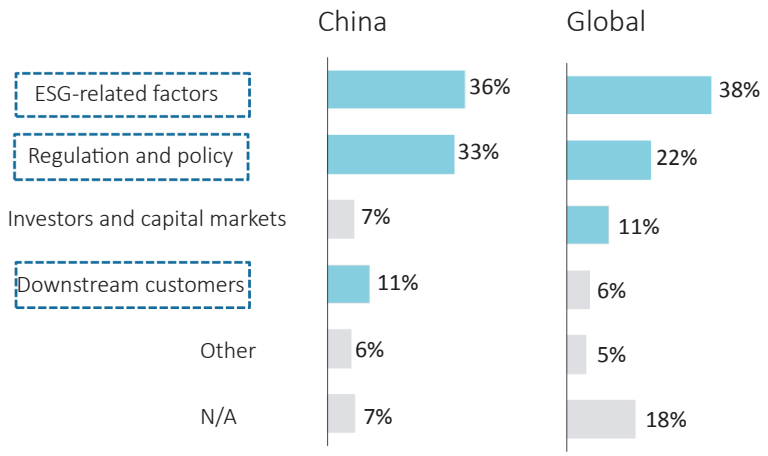
Most members taking concrete steps to decarbonise their China operations

Is your company pursuing the idea of becoming carbon neutral?



European companies impelled to decarbonise by external factors

What is the key driver of your company's decabonisation strategy?



At the government level, the European Union (EU) is already deep into the process of developing and rolling out the European Green Deal. Much like China's provinces, each EU Member State is at a different level of development and has unique socio-economic conditions, making the EU a logical institutional partner for China to collaborate with on formulating practical decarbonisation policies.

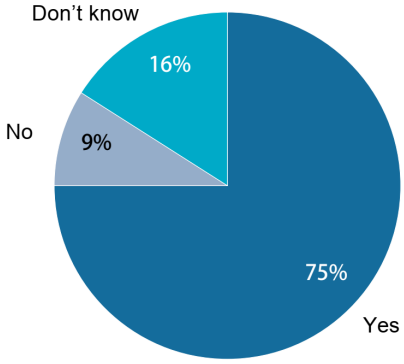
A less tangible challenge for China will be bringing about a wholesale change in mindset, starting with local officials that are still highly target-driven and often struggle to see the bigger picture (this was one of the main reasons for the electricity shortage and curtailment crisis in 2021). Even when local authorities are presented with KPIs related to decarbonisation, the methods employed for achieving them often lack a measured, scientific approach. Addressing this will require further fine-tuning to China's environmental governance model to ensure robust incentive and accountability mechanisms are in place through more effective and professional enforcement at the local level.

Within corporate culture and consumer society there also needs to be a wider understanding of both climate change and the need for international common standards to ensure that 'green washing' does not take hold. This can be accelerated through the creation of a framework that enforces corporate transparency and accountability regarding emissions. All companies operating in China must be held to the same environmental standards and should be subject to the rigors of independent, third-party environmental assessments, adopting well-established international standards. China could play a proactive role by adapting and tuning its economic and industrial conditions and not introducing new local standards which would make it challenging, if not impossible, to create a global carbon market.

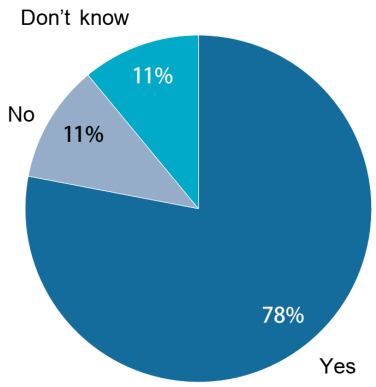
Despite these challenges European companies believe that China can achieve its goals: 75 per cent believe China will be able to peak emissions before 2030, and 78 per cent think it can become carbon neutral by 2060.

European companies have confidence in China's ability to decarbonise

Do you think China can achieve its goal of peaking its carbon emissions before 2030?



Do you think China can achieve its goal of becoming carbon neutral by 2060?



Conclusions

China and the EU have both made formal commitments with stringent goals to become carbon neutral. Both are facing unprecedented challenges to drastically reshape their economic and social models across all value and supply chains, as well as to develop a low-carbon culture among businesses and the population as whole.

China's success will be predicated on its ability to leverage as much expertise as possible. This will require providing European companies with increased market access and a level playing field on which to operate so they can make greater and more proactive contributions.

A clear mutual benefit in this regard is that China is fertile for both receiving and developing European technologies and cooperating to improve and localise them. European companies can also significantly contribute to China's 30/60 Goals through comprehensive environmental protection and circular economy solutions, including resource recycling, energy efficiency, demand side electrification, district energy modelling, energy storage, green hydrogen, and digitalisation of the energy system, among others.

However, it must be borne in mind that even with the political will to achieve carbon neutrality, China's plan could be derailed by decoupling. The scale of the challenge of achieving the 30/60 Goals demands an open and collaborative approach – China cannot go it alone. The EU and China must therefore remain open and committed to multilateralism and keep the channels of bilateral communication and cooperation, as well as trade and investment, fully open.

Guido D. Giacconi
Vice President
European Union Chamber of Commerce in China

Seizing the innovation opportunities in China's carbon neutrality journey

Recent energy crisis and power crunch have reminded us once again how painful it can be to cut off dependency on fossil fuels while transitioning towards a low-carbon energy economy. The shift brings about disruptive changes to the way we supply, transmit, store and utilise our energy, and creates unprecedented challenges to the overall planning and operation of the existing energy system.

In the face of the ever increasing pressure to meet climate goals, governments and enterprises are striving to overcome the pains of the green energy transition while establishing new models to adapt to the changes. To achieve climate neutrality, the pace at which we need to decarbonise is at least six times faster than what has been realised globally so far. The main strategies are to maximise the use of renewables and clean energy carriers, and to improve energy efficiency[1].

Technological innovation, therefore, is needed more than ever to deliver the required drastic changes, and is now increasingly the primary driving force of the energy transition. Breakthrough technologies, along with the penetration of existing advanced

1. https://ec.europa.eu/info/news/research-and-innovation-repower-eu-2022-may-18_en

technologies, have the potential to reshape the competitiveness of different fuels and energy sources, just as we have witnessed in the solar and wind sector over the past decades.

Ever-increasing momentum for green innovation

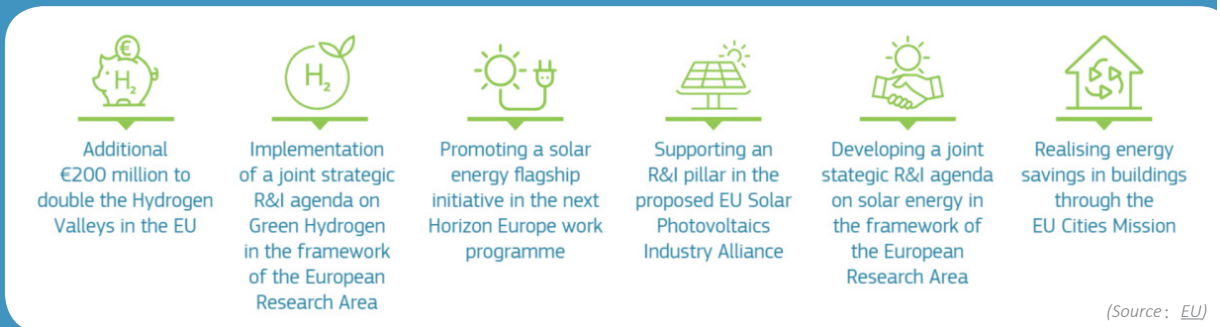
The ongoing pandemic and its aftermath, along with the current regional conflict in Ukraine, have added more uncertainties to the energy transition agendas. However, both the EU and China are firmly determined to make innovation a focal point in the drive to deliver on long-term carbon neutrality objectives and position themselves to take the lead in the global value chains for clean transition.

This momentum is translated into concrete plans and actions as well as increased funding for low carbon technology R&D. EU's newly introduced REPowerEU plan and China's 14th Five-Year Plan for Energy Technology Innovation both clearly signal an accelerated push for low carbon innovation.

In addition to policy support, research and innovation are critical for delivering solutions and system transformations. Under Mission Innovation, both the EU and China have pledged to double their public clean energy R&D spending over five years. IEA's recent tracking statistics show that in the US and Europe, bigger budgets drove the growth of spending on low-carbon energy research, development and demonstration (RD&D), while China, with a relatively lower base, has seen a faster acceleration in its spending on clean innovation. Between 2015-20, China's public low-carbon energy RD&D budget grew from USD 2.5 billion to USD 4.1 billion, up 64%, while the EU's RD&D budget increased by 26.5% to USD 10.5 billion[2].

There is good reason to believe that these spending commitments will inject creativity into the transition towards a clean, sustainable and affordable energy economy.

R&I main contributions to the REPowerEU objectives



(Source: EU)

Five key identified areas in China's 14th Five-Year Plan for Energy Technology Innovation.

- advanced renewable generation and integration;
- new technologies that support renewables in the electricity system;
- safe and efficient nuclear power;
- green and efficient fossil fuel exploration and utilisation;
- digital and intelligent technologies in the energy system.

2. https://www.iea.org/reports/energy-technology-rdd-budgets-overview/global-energy-rdd#abstract

EU-China collaboration: crucial to energy innovation growth

Even though unprecedented decarbonisation efforts have been made by individual economies, the world needs enhanced international collaboration if it is to achieve the pace of green transition needed to avoid climate disaster. The EU and China share broad common interests and goals for the clean energy transition. These two major economies, which are jointly responsible for one third of the world's final energy consumption, are both constructive forces and key contributors to the drive towards a global low carbon transition. Moreover, EU and China have a lot of common ground when it comes to advanced clean energy technologies and industrial manufacturing capacity, which are a prerequisite for productive collaboration in energy innovation and bringing innovative technologies to the market.

In particular, China's enormous market, as well as its diverse energy conditions and application scenarios have provided rich soil in which innovative technologies can be tested and flourish, sparking more cutting edge breakthroughs.

The efforts required for China to move from carbon peaking to carbon neutrality in 30 years has placed significant challenges on its existing energy system. These include greening the power supply while phasing down coal-fired plants, unlocking system and market flexibility to adapt to the increasing share of renewables, as well as optimising energy use through sector coupling and increased energy efficiency. However, every challenge come opportunities. China's push to reach carbon targets represents the biggest single opportunity for those businesses who are ready with innovative technologies and solutions to stand out in the low carbon picture, and will ensure the best possible outcomes in an incredibly competitive space.

Viktorija Kaidalova, Head of Section of Foreign Policy Instrument, Delegation of the European Union to China, made this point in her opening remarks in a recent innovation-themed online conference jointly held by EU-China Energy Cooperation Platform (ECECP), EU Chamber of Commerce (EUCCC) and EnergyPost at the end of May:

> **The 2019 EU-China statement on energy cooperation identifies four main areas for joint activities, including boosting cooperation between innovative businesses to accelerate clean energy. There is great potential for cooperation between the EU and China in this respect. The EU is ready and willing to share its industry-leading experience and cooperate with other countries. This could include sharing our best practices and regulatory approaches and developing joint projects.**
>
> *—— Viktorija Kaidalova*
> *Head of Section of Foreign Policy Instrument*
> *EU Pelegation to China*

Where can EU innovation help China?

In what areas can innovative EU technologies and experiences help China to address its transition challenges and bring the most added value to the low carbon endeavour? During the two days of online conference centered on energy innovation, experts and analysts from the EU and China engaged in extensive discussions and showcased examples of how the deployment of some key clean technologies can contribute to sustainable development and climate targets.

◆ Carbon technology

China is the world's largest emitter of greenhouse gases, hosting the majority of the world's coal-fired power assets. The ambitious and formidable 30/60 target has brought carbon technologies such as CCS, CCUS, direct capture and carbon removal into the spotlight. That is because alongside the rush to install renewable capacity, the replacement and phasing-out of coal-fired power plants cannot happen overnight: carbon technologies are still needed to reduce these residual emissions during the transition period.

Unlike the EU, which is focusing on deployment of CCS to curb industrial emissions, China's current efforts are mostly centred on the power sector, explains Xu Zhonghua, vice president of TotalEnergies R&D for Asia and national chair of the Energy Working Group at the EUCCC. However, it is engaging in various demonstration and pilot projects across different sectors and showing greater interest in developing CCUS.

In fact, for some time CCS research has maintained positive momentum in EU-China cooperation. A case in point is the Horizon 2020 project CHEERS (Chinese-European Emission Reduction Solutions[3]). Launched in October 2017, it is funded by the European Commission and China's Ministry of Science and Technology. It is the world's largest chemical-looping combustion (CLC) based carbon capture project, its aim being to provide heat recovery steam generation with CO_2 separation, demonstrating the effective application of CCS in industrial operations. The innovative CLC-CCS technology offers considerable potential for retrofitting combustion processes and has the potential to remove 96% of combustion-related CO_2 while eliminating capture losses to almost zero[4].

But how can such innovative carbon technologies be shifted from pilot projects to commercial scale deployment? According to energy and climate analyst Simon Göss, regulatory certainty and suitable incentive instruments are crucial for a commercial roll-

3. https://cordis.europa.eu/project/id/764697
4. https://www.sintef.no/en/projects/2017/cheers-chinese-european-emission-reducing-solutions/

out. 'The best way is to integrate CCS into carbon pricing, as is currently done in the EU ETS. Carbon prices are at a level that creates a business case for CCS.' However, in China, the national carbon market was only established in 2021, and thus far there are no clear price signals to guide business decisions. This represents a key challenge for carbon tech commercialisation.

◆ Biofuels

Modern bioenergy such as biogas and liquid biofuels are integral and strategically significant in the low carbon landscape. Bioenergy not only offers a clean and sustainable fuel for transport sectors, but also offers the opportunity to use organic waste. That is particularly relevant for an agriculture superpower like China that is experiencing rapid urbanisation. Despite abundant sources for biofuel production, China's current level of industrialisation in the sector is still low compared to Europe as a whole, and to Sweden and Denmark in particular. However, the newly released 14th Five-Year Plans on bioeconomy and renewables sent out stronger policy signals in support of the spread and application of advanced biofuels in key areas such as municipal administration and transport. They signal a boost for for China's biofuel sector, and are likely to unlock more opportunities for market-ready EU solutions.

Swedish truck manufacturer Scania advocates a process that creates biogas from sludge, (a water treatment byproduct)[5]. Mats Harborn, CEO of Scania China, believe biogas has a bright future in the Chinese market. The company is working with the city of Rugao, in Jiangsu Province, to set up a pilot project to prove the concept.

Novozymes, a Danish biological solution provider, applies breakthrough technology that uses cellulase enzymes and yeast strains to increase the production efficiency of cellulosic ethanol from agricultural and forestry waste. The company estimates that if E10 fuel regulation (10% ethanol blending in gasoline) is fully implemented, G2 cellulosic fuel ethanol could meet 5% of China's annual gasoline

> **China today uses energy to dry the sludge and reduce the volume, and then puts it into landfill. Instead, we could then digest it and make usable gas that can go straight into the gas network, or can be fed into factories, or upgraded to fuel gas. In Sweden, a water treatment plant takes water as a raw material to produce gas, heat, electricity and fertilisers. We want to see wastewater being used as a resource to be upgraded into something commercially sellable. We're on the doorstep of big developments of this seemingly simple technology.**
>
> *—— Mats Harborn*
> *CEO of Scania China*

5. *EU-China Energy Magazine, 2021 Christmas Issue: Biogas: the green key to energy security.*

consumption. The technology has the potential to reduce CO_2 emissions in China's road transport by 37 million tonnes, equivalent to the annual emissions of roughly 15 million vehicles.

Flexibility solutions

Transforming an energy system into a highly electrified one with high penetration of VRE comes with challenges of greater intermittency which requires system flexibility solutions. Energy storage technologies could help meet this requirement. They have the ability to manage intermittency, enabling a greater share of VRE to be integrated into the power system while increasing reliability and energy security. While various energy storage innovation and deployment is under way across the world, long duration grid scale battery storage systems are gaining popularity. These systems, such as the flow battery, have the potential to absorb excess renewable power and deliver flexibility that could extend over a few days[6]. As promising as they should be, the business models available for grid-scale energy storage projects in China remain rather limited, presenting a major obstacle to development of such projects. However, the country's recent announcement that it intends to promote energy storage in the electricity market as independent entities will open up revenue channels that could help unlock the potential.

In addition to large stationary batteries, small batteries in people's electrical vehicles could also help mitigate the inter-day fluctuation of the new power system when smart charging and vehicle to grid (V2G) technology come into play. As the biggest EV market of the world, China has greater potential to leverage the capacity of EV to balance the grid, although there are still obstacles to be overcome. According to Anders Hove, project director of Sino-German Energy Transition Project at GiZ, 'In China, a stronger grid company could offer greater incentives for smart charging. Also, more batteries being located in commercial vehicles or in ride-sharing vehicles could lead to more incentives for smart charging. But the lack of a real wholesale power market, spot market and real time power prices remain the major barriers.'

Although energy storage technologies, whether big or small in scale, have a crucial role to play in providing the flexibility services we need, Anders believes that they are secondary solutions. Much more flexibility potential exists in the overall efficient operation of the power system itself, as is evident in the German power system. This not only includes the spot power markets that link over a broad geographical area, but also the flexible operation of the existing transmission system[7]. Clearly, there is no one-size-fits-all solution, and in fact, every possible source of flexibility will need to be carefully planned and fully exploited, including demand response and end-uses with sector coupling.

Hydrogen and Power-to-X

While intraday imbalances caused by VRE generation might be better managed with batteries in economic terms, seasonal variations need long-term storage solutions such as hydrogen.

Hydrogen has the potential to serve as a long-term storage medium in a renewable-powered world. It can not only absorb the intermittency of renewables and reduce curtailment, but also be used to produce other H2-based carriers such as ammonia or methanol which can then be transported long distances. According to Mickael Naouri, public affairs director of P2X business in France's Air Liquide branch, China enjoys key advantages in developing P2X, with its abundant wind and solar capacity (a prerequisite for large-scale production of green hydrogen).

6. *EU-China Energy Magazine, 2021 Christmas Issue: Reimagining energy storage - flow batteries for a fossil fuel-free future*
7. *EU-China Energy Magazine, 2021 Autumn Issue: Power sector flexibility lessons from Germany for better integration of renewables.*

Source: DNV

The company is engaging in the hydrogen industrial chain, from renewable sourcing and hydrogen production to transport and downstream, partnering with Chinese companies Sinopec and Houpu to develop sustainable transport across China.

'While we have been focusing on transport sector, which is easy to start with, the real game changer will be in China's coal-dominated power sector, in which hydrogen can be converted to ammonia to decarbonise coal-fired power plants through co-firing,' noted Naouri. In addition, hydrogen use in hard-to-abate sectors such as the steel making industry also offers as yet untapped potential.

◆ Floating offshore wind

For wind power developers, the dream is to conquer the deep seas: the stronger and more consistent wind in deep-sea water, further from the shore, gives a better power yield. Floating offshore wind is emerging as a key technology focus, allowing for installation of wind farms much further from the shore at an affordable cost.

An IRENA study shows that depths of over 50 metres, floating offshore wind may offer a economically and environmentally attractive option compared to traditional fixed-bottom foundations alternatives, which is associated with invasive activity on the seabed during installation[8]. This innovative technology is capable of expanding the global offshore wind power market to 13 TW[9], sharply up on the current figure of 55.7 GW by the end of 2021[10]. Regions with large seabed drops like China and Europe are set to benefit – though it should be noted that the technology is still in the early stages of commercialisation.

China is poised to be a leader in global offshore wind generation, and its burgeoning offshore sector is being driven by fast-growing demand. As a late starter, compared to northern European countries, China can benefit from the lessons already learned by European wind developers. A recent UK-funded study suggests that China has the potential to develop 600 GW of floating offshore wind, representing a multi-billion dollar market[11].

A key characteristic of developing offshore wind is the availability of cross-sectoral knowledge and experience relating to the offshore oil and gas sector. This is why

8. https://www.irena.org/publications/2022/Mar/Renewable-Technology-Innovation-Indicators
9. Ibid.
10. https://irena.org/publications/2022/Apr/Renewable-Capacity-Statistics-2022
11. https://brandigohost.com/index.php/download/24/dit-energy/185/en_dit_china-fow-market-report-2022.pdf

energy superpowers like Shell are naturally focusing on offshore wind and especially the frontier floating-based technology as a handrail to realise their own net zero ambitions. Shell is actively seeking to bring its experience, gathered from multiple floating designs with different combinations of wind turbines in European test projects, into the Chinese market to explore the technology potential with Chinese stakeholders. According to Zhang Dongye, offshore wind country manager at Shell China, the company sees an enormous potential for floating wind technology in China, combining European innovation with China's quickfire approach to benefit both sides.

How to make the most of the opportunities

For these innovations to succeed in China, it is crucial for European technology providers to understand the differences in the business, political and cultural conditions of the Chinese market, and most importantly to embrace them. To that end, working closely with local Chinese partners will help to adapt the product and solution to the local market.

Meanwhile, even though some successful innovations in the European market are very tempting to Chinese stakeholders, building real cases and pilot projects will still be crucial when introducing Chinese customers to the new technologies and preparing for market development.

In addition, building up a truly localised ecosystem, which involves getting to know and working with local partners, from startups to major players, is the recipe for foreign business to succeed in China, as experienced by multinational electric business superpower Schneider Electric. According to Luc Liu, general manager of corporate alliance and digital ecosystems at Schneider Electric, the company attaches much emphasis on localised R&D and startups, which helps them to seize early opportunities and thrive in the Chinese market. Through its Green Energy Management Innovation Program (an innovation acceleration initiative), Schneider Electric joins Chinese startups to build solutions that address actual business needs.

'A lot of disruptive innovations don't come from powerhouses or multinationals. Sometimes they come from the edge. So it matters how you work with the startups from the beginning. They can help secure your strategic position as early as possible and understand the market pulse. For China, speed is critical, so you will want to be the first,' noted Liu.

Looking ahead, clean energy innovation will play a crucial role in achieving China's carbon neutrality objectives. That creates countless opportunities for European business which are ready to bring their groundbreaking technologies and expertise to China in areas such as grid-scale battery storage, energy efficiency[12], coal-fired power plant performance optimisation[13], grid flexibility, floating wind, recyclable wind blades[14], sustainable heating and cooling[15], as well as cross-cutting systematic solutions.

Working with China to explore the potential of these innovative technologies, and facilitating their diffusion across the bigger world, will support success for both Europe and China, while bringing benefits to the global community.

Daisy Chi

12. *EU-China Energy Magazine, 2022 April Issue:Energy efficiency solutions from EU that could help meet China's 'Dual Carbon' Goals*
13. *EU-China Energy Magazine, 2021 Autumn Issue: How to tap the efficiency potential of coal-fired power*
14. *ECECP Newsletter, 2019 Christmas issue: The Neglected Future: Lets Make Plans for the Retired Wind Turbines*
15. *EU-China Energy Magazine, 2022 April Issue:The Renaissance of Aquifer Thermal Energy Storage in China*

Social innovation for the energy transition

Can social innovations bring about additional significant energy and cost savings on the way to a clean energy transition? And how can citizens be empowered to be the pivotal agents for a sustainable and equitable energy transition? Horizon 2020, the EU's research and innovation funding programme, has funded four research projects on social innovation in the energy sector between 2019-2022, namely COMETS, SONNET, SocialRes and NEWCOMERS. Helena Uhde reports for ECECP from the hybrid conference of the four sister projects, which took place in April 2022.

The recent announcement of the EU's REPowerEU plan has given a new impetus to the quest for energy independence and a climate neutral transition[1]. The EC's Fit for 55 package, launched in July 2021, aims to reduce net greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels. Today, the new geopolitical situation, in the context of Russia's aggression against Ukraine, calls for further action aimed at significantly reducing the EU's dependence on Russian fossil fuels while accelerating the energy transition.

The REPowerEU plan includes actions on energy saving, diversification of supplies, substitution of fossil fuels by accelerating Europe's clean energy transition and combining

1. *For further information on the announcement, please see the article 'EU moves decisively to curd dependence on fossil fuel and accelerate clean energy transition' by Octavian Stamate, Counsellor Climate Action and Energy, EU Delegaton to China, that is featured in this issue.*

investments and reforms in a smart way[2]. Member States, regional and local authorities, as well as all citizens and businesses, are called upon to reduce Europe's energy dependence on Russian energy through the implementation of the REPowerEU plan. Among other things, the plan proposes 'to create regulatory sandboxes to foster innovation in the sector' as well as an innovation fund to cover 100% of the costs of competitive bidding.

Regulatory Sandboxes

Regulatory sandboxes, defined as 'testing innovations in a real-world environment subject to regulatory safeguards and support' are an emerging policy tool included by the European Commission in the 'Better regulation toolbox 2021', a report of regulatory best practices[3]. Regulatory sandboxes are usually organised for a specific case, limited to a specific policy and implemented locally. The European Commission identified five characteristics that current examples of regulatory sandboxes share: genuine innovation, societal and/or consumer benefit, readiness for testing, defined scope and time, as well as safeguards that ensure that policy objectives and legal requirements are preserved.

On 16 November 2020, the European Council adopted the conclusions on the role of regulatory sandboxes on an innovation friendly EU regulatory framework and affirmed that the tool provides development opportunities especially for SMEs[4].

The German Federal Ministry for Economic Affairs and Climate Action (BMWK) has developed a handbook for regulatory sandboxes, presenting practical examples and providing a background on the legislation in Germany. The ministry emphasises that the purpose of regulatory sandboxes is not deregulation, but rather 'to learn about the opportunities and risks that a particular innovation carries and to develop the right regulatory environment to accommodate it'.[5]

France's energy regulatory commission (CRE) decided to implement regulatory sandboxes (testing environments) in 2020, which allows the commission to 'to grant exemptions to the conditions of access to and use of networks and facilities for the experimental deployment of innovative technologies or services in favour of the energy transition and smart grids and infrastructures'. [6]

2. European Commission. REPowerEU Plan {SWD(2022) 230 final}.
3. European Commission (2021). Better regulation toolbox. https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox_en
4. European Council (2020). Regulatory sandboxes and experimentation clauses as tools for better regulation:Council adopts conclusions. https://www.consilium.europa.eu/en/press/press-releases/2020/11/16/regulatory-sandboxes-and-experimentation-clauses-as-tools-for-better-regulation-council-adopts-conclusions/
5. BMWK (2022). Regulatory Sandboxes – Testing Environments for Innovation and Regulation.https://www.bmwk.de/Redaktion/EN/Dossier/regulatory-sandboxes.html
6. Commission de Regulation de l'Energie (2021). Regulatory Sandbox. https://www.cre.fr/en/Energetic-transition-and-technologic-innovation/regulatory-sandbox

Technological innovation alone will not achieve climate targets

The targets cannot be met through technological innovation alone. For technical innovations to be adapted, they must be affordable and accessible. Or as Bill Gates puts it: 'Although it's great that governments are putting more money into green recovery programs and people are becoming more willing to pay the green premium for, say, building materials, innovation isn't coming fast enough. Products aren't getting cheaper or better fast enough, and the market isn't growing as fast as it could—or needs to'.[7]

Solar photovoltaic (PV) modules are a case in point. Over the last four decades, the cost of solar PV modules has fallen by 99%[8]. According to research by the Massachusetts Institute of Technology (MIT), apart from technological efficiency gains, economy of scale has been the main contributor to cost savings. To be more precise, about 60% of the total cost reduction can be attributed to policies that stimulated market growth. A breakdown of costs from the National Renewable Energy Laboratory (NREL) shows that hardware accounts for only about 35% of costs[9]. Marketing, permitting and other administrative outlays account for the majority of expenditure. These figures show that solar PV systems could be made even more affordable and accessible.

This type of research, described as 'new ideas that meet social needs, create social relationships and form new collaborations' is recognised by the European Commission as social innovation[10].

> 'Social innovation is the process of developing and deploying effective solutions to challenging and often systemic social and environmental issues in support of social progress. Social innovation is not the prerogative or privilege of any organizational form or legal structure. Solutions often require the active collaboration of constituents across government, business, and the non-profit world.'
>
> —Sarah A. Soule, Neil Malhotra, Bernadette Clavier[12]

Under Horizon 2020, the EU's research and innovation funding programme, four research projects on social innovation in the energy sector were funded between 2019-2022, namely COMETS, SONNET, SocialRes and NEWCOMERS. In April 2022, the four sister projects conducted a hybrid conference 'Putting people at the heart of the energy transitions', in which they shared key findings of the project. According to the project partners, social innovation in energy fosters 'people-centred changes in the ways of doing, thinking, and organising energy'. [11]

7. *Gates, B. (2021). How clean-energy technology can follow in the footsteps of the humble Microwave. World Economic Forum. https://www.weforum.org/agenda/2021/07/clean-energy-innovation-sustainability-jet-fuel-storage/*
8. *Chandler, D. (2018). Explaning the plummeting cost of solar power. MIT News.https://news.mit.edu/2018/explaining-dropping-solar-cost-1120*
9. *U.S Departement of Energy. Solar Soft Cost Basics. https://www.energy.gov/eere/solar/solar-soft-costs-basics*
10. *European Commission. Social Innovation. https://ec.europa.eu/growth/industry/strategy/innovation/social_en*
11. *COMETS, NEWCOMERS, SocialRES and SONNET (2022): Putting people at the heart of energy transitions. Social innovation in energy: four projects shine a light on the path forward. Policy brief, April 2022. Brussels/Antwerp: COMETS, NEWCOMERS, SocialRES, SONNET H2020 projects.*
12. *Stanford Graduate School of Business. Defining Social Innovation.https://www.gsb.stanford.edu/experience/about/centers-institutes/csi/defining-social-innovation*

Project identifies 18 types of social innovation in energy

In the energy sector, examples of social innovation include energy communities, local electricity exchanges and new forms of participation and learning. The SONNET project aimed to identify the different forms of social innovations in the energy sector.[13] The team analysed 500 examples of social innovations in energy in Europe and derived a typology of social innovations, categorised by the social relations and energy activities involved. The 18 social innovation types include a wide range of models, ranging from local energy production and consumption and collaborative eco-efficient housing, to energy education and participatory energy dialogues. For each of the types, the project provides case studies from different European countries. Three examples are highlighted below.

1

Example 1: The Citizen's Convention on Climate, France (participatory energy dialogues)

This example falls into the category of participatory energy dialogues which include social innovations that open up new ways to involve citizens in shaping urban policy, often initiated by community-led or grassroots organisations and local public entities. The Citizen's Convention on Climate is a randomly-selected citizen assembly for discussing greenhouse gas emissions reductions. 150 participants were randomly selected with the aim of obtaining a panel that represents the French population. The mandate of the assembly was to identify ways to reduce greenhouse gas emissions by at least 40% (compared to 1990 levels) by 2030, in a spirit of social justice. France's President Macron has pledged to submit these proposals 'unfiltered' to either a referendum, a vote in parliament or direct implementation. On 21 June 2020, the members of the Civic Convention adopted a final report with proposals for decarbonising consumption, travel, housing, food, production and work, as well as for the constitution, governance and financing of the transition. One of the proposals was the constitutionalisation of environmental control, to be exercised by a 'defender of the environment' and the strengthening of citizens' power by transforming the Council for Economic, Social and Environmental Affairs (CESE) into a 'Chamber for Citizen Participation'.

https://www.conventioncitoyennepourleclimat.fr/en/

2

Example 2: NDSM Energie, Netherlands (cooperative energy production and consumption)

Cooperative energy production and consumption includes models where green electricity or heat is produced and supplied by local communities in a cooperative model. There is a growing number of cooperative business models initiated and operated by community-led energy organisations such as energy cooperatives or non-profit companies. Their aim is to generate energy locally and sustainably.

NDSM Energie is an energy cooperative in Amsterdam founded in 2013 and led by, and for, entrepreneurs. The cooperative aims to encourage local businesses to install solar panels on their premises and invest in heat storage or other energy-saving innovations by sharing experiences and offering mutual advice. This initiative demonstrates how a local community can work towards a sustainable city and inspire other entrepreneurs.

https://ndsmenergie.nl/

13. SONNET (2022). Typology of Social Innovation in Energy Transitions. https://sonnet-energy.eu/typology/?id=750#CL00

Huge untapped energy transition potential

In another study, SONNET's project team surveyed 6 000 citizens in France, Germany and Poland. Those canvassed showed a keen interest in personal investment in decentralised renewable energy generation, but low actual participation. This is a sign of the large untapped potential for grassroots involvement in the drive for energy savings. The researchers found that financial considerations such as return and risk, as well as low minimum investment requirements, are particularly important when it comes to getting consumers on board. Local governments can amplify investment in social innovation in energy 'by matching investments by citizens'. Social innovations can contribute to a shift in the behaviour and role of actors in the energy transition, e.g. the Swiss Energy City label has turned passive municipalities into active players in the Swiss energy transition, while campaigns against coal mining in Poland have turned passive citizens into conscious consumers. Participatory experimentation and education can thus contribute to a change in roles and a decentralisation of responsibility for the energy transition.

The importance of local players, such as cities and citizens, in climate action was also recently stressed by the European Committee of the Regions: 'cities and regions remain crucial to speed up the deployment of renewable energies and improve energy efficiency while ensuring citizens' engagement and support through open participatory processes'.[14]

What next for social innovation in energy?

While the four projects are ending in 2022, the next generation of European-funded research projects on social innovation in energy has already begun: EC², ENCLUDE, EnergyPROSPECTS, and GRETA are working from different angles on energy citizenship and energy communities. The timing seems to be just right. The current political focus on energy transition and energy independence, as reflected in Fit for 55 and REPowerEU, 'presents a window of opportunity to move social innovations in energy initiatives from the niche level into mainstream debate by offering people simple avenues to get involved'.[15]

Helena Uhde
ECECP Junior Postgraduate Fellow

3

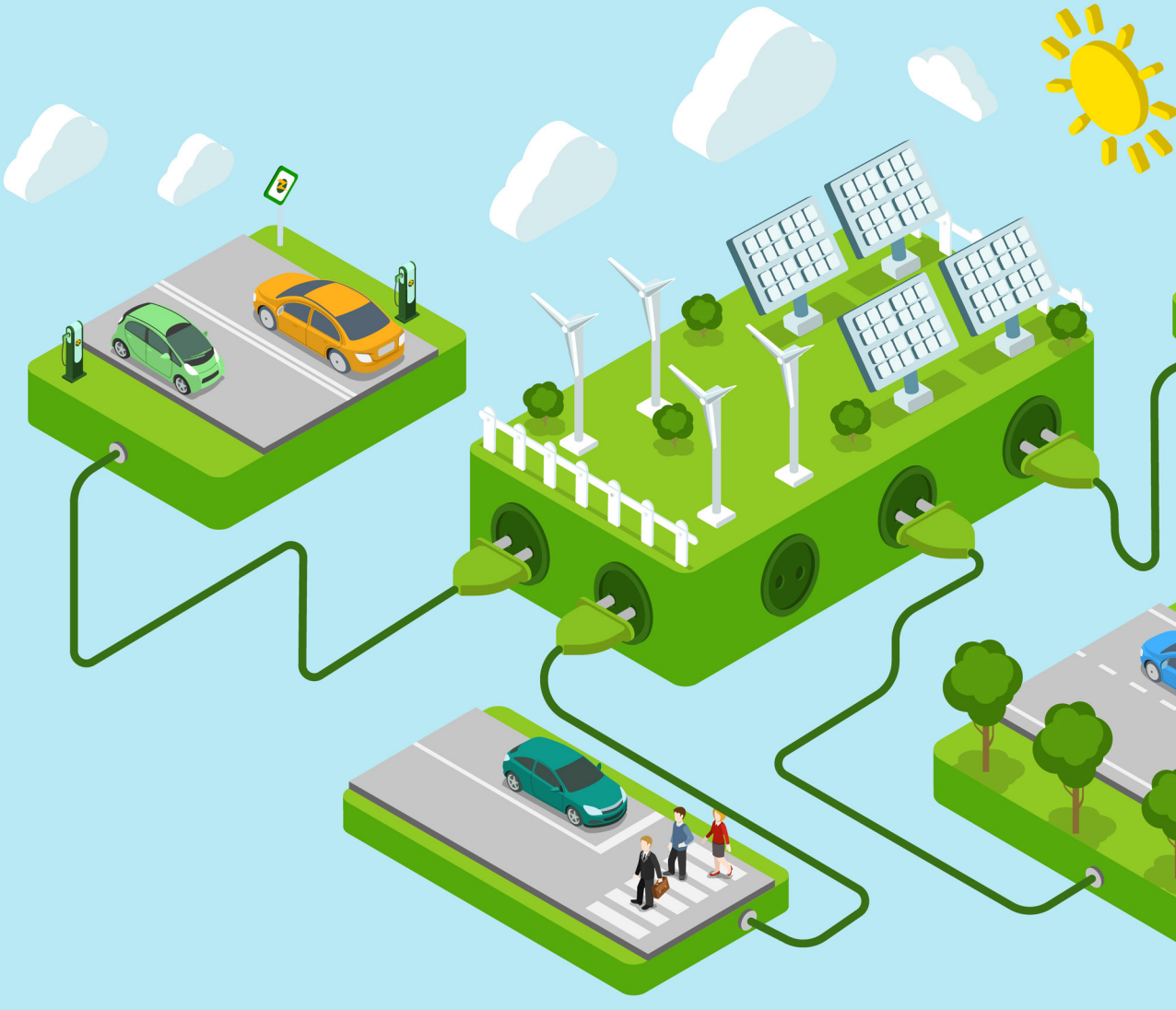
Example 3: Energiestadt Label, Switzerland (energy gamification and nudges)

Energy gamification and nudges includes games, apps and competitions that provide incentives for more sustainable behaviour. Mostly organised by communities or non-profit organisations, winners are rewarded with a sense of achievement or sometimes with actual prizes. For example, the 'Energiestadt' label is awarded to a city or municipality that has made above-average efforts in its municipal energy and climate policy. Allowances are made for the scope for action available. In order to confirm the quality and the continuous commitment of the municipality, a re-audit takes place every four years. Cities applying for the award can benefit from financial support for innovative projects and further advice.

https://www.energiestadt.ch/

14. *European Committee of the Regions (2022). REPowerEU: Local and regional authorities must be taken into account to ensure a rapid transition towards secured, affordable and sustainable energy.https://cor.europa.eu/en/news/Pages/Climate-pact-2-may-2022.aspx*
15. *See 11.*

Will distributed renewable energy pave the way for green electricity trading in China?



A couple of months after the release of new green electricity trading rules in the Southern China area by the Guangzhou Power Exchange (GPX), Beijing Power Exchange (BPX) finally issued the Implementation Regulations of Green Electricity Trading in the SGCC domain.

Distributed solar and wind participate in green electricity trading

Both documents recognise 'distributed new energy' projects as power sellers in the green electricity market. According to the BPX version[1], aggregated distributed renewable projects are eligible to participate in green electricity trading, while distributed renewable projects in the Southern China region will be allowed to join subsequently[2]. The regulation has not provided a definition of aggregated distributed renewable projects or disclosed the implementation details. International players active in the distributed power market advise that aggregation means managing these decentralised assets as a single, large, and predictable power source[3].

According to current green electricity trading rules, every MWh of green power will be bundled with one Green Electricity Certificate (GEC). Therefore, distributed wind and solar power will need to obtain GECs just like utility-scale projects. This is good news for distributed new energy, whose eligibility for GEC has been clarified and confirmed. According to the rules set out on the Chinese GEC website, for the time being only onshore wind and utility-scale solar can receive GECs, while the schedule for distributed wind and solar has yet to be published.

Currently, distributed solar is developing far more rapidly than distributed wind. According to the National Energy Administration (NEA), grid-connected distributed solar capacity reached 107.5GW by the end of 2021[4], accounting for one third of total solar capacity in China and 60 per cent of new solar power in 2021. Over 92 per cent of distributed solar is concentrated in the provinces of the SGCC region[5]. According to SGCC's New Energy Development Report 2021, distributed solar's total capacity could reach 180GW in the SGCC domain by the end of 2025. There is no doubt that distributed renewable energy is set to become an important source of green electricity. Currently, it would achieve prices 10 per cent higher on the green electricity trading market compared to the historical grid offtake price. Can the inclusion of distributed new energy help the green electricity trading market to take off?

But distributed new energy power market trading still faces hurdles

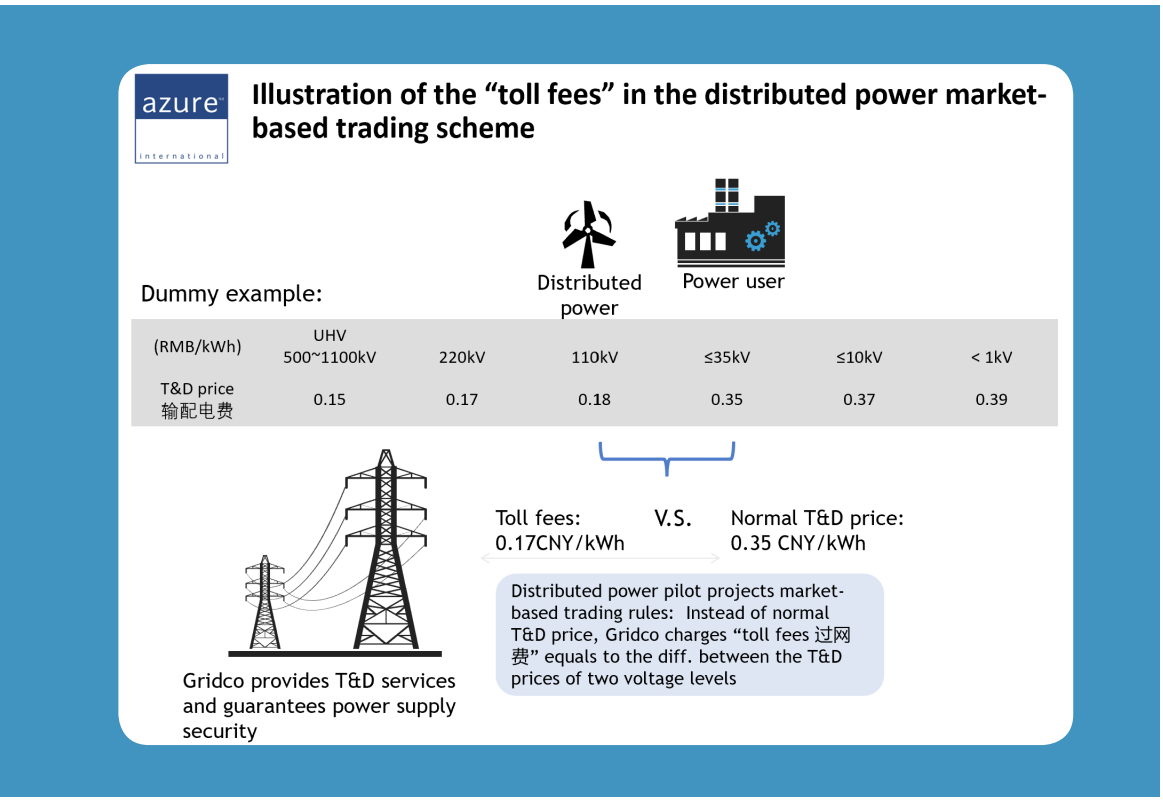
As per grid companies' standards, distributed solar refers to solar projects with a capacity below or equal to 6MW, which are usually installed on the rooftops of private households or commercial and industrial (C&I) buildings and factories. The aggregation (i.e. managing these decentralised assets as if they were a single,

1. *SGCC Region Green Electricity Trading Rules and Regulation, BJX, 2022.5.*
2. *Southern Region Green Electricity Trading Rules and Regulations, GPX, 2022.2.*
3. *Innovation landscape for a renewable-power future, IRENA, 2019.*
4. *2021 Solar Power Construction and Operation Status, NEA, 2021.12.*
5. *SGCC's New Energy Development Report 2021.*

large, and predictable source of energy) and management of these small-scale installations is a critical technical and commercial challenge facing the energy industry. Nevertheless, a solution to the problem may be just around the corner: many provinces have already started inviting distributed power aggregation operators (such as virtual power plants) to participate in the ancillary services market.

Most distributed power cannot benefit from being located close to power users. Unlike utility-scale wind and solar, which is usually situated far from main power load centers, distributed new energy projects are mostly built on the rooftops of industrial parks and households, adjacent to power users. Under the current regulatory framework, when C&I users buy electricity from rooftop solar projects without their own wired connection, they have to pay the same power transmission and distribution fees for power generated elsewhere in the province (except in certain pilot regions).

In 2017, the National Development and Reform Commission (NDRC) and the NEA introduced the first batch of pilot projects with distributed power market-based trading[6] (' 隔墙售电 '). According to the pilot market trading rules, under certain conditions (e.g. connection voltage level, capacity, etc.), power projects can sign direct bilateral trading contracts with nearby power users. This allows power users price advantages compared to more distant power supplies, thus reflecting the cost savings associated with transmission and distribution (T&D). Instead of being charged the full T&D price, they are charged the price difference between two voltage levels (see Figure below). However, despite several efforts to promote this reform, its success has been limited.



6. *Notice about Distributed Power Market Trading Pilots, NDRC [2017]1901, 2017*

Distributed power trading is still very controversial. Some blame the grid companies for protecting their own interests. It is true that if more projects start trading power without paying the standard T&D fee, the status and profits of the grid companies would be weakened. Some argue that a comprehensive market-based scheme needs to be implemented to better balance grid companies' rights and duties, given that they are responsible for the supply security of all power users.

National and provincial governments appear determined to make progress. In January 2022, the NDRC issued a guiding policy to 'Improve the system, mechanism and policy measures for green energy and low-carbon transformation'. The policy notably provides the following guidance:

- Under the premise of complying with the power planning layout and the safe operation conditions of the power grid, renewable power generation projects are encouraged to supply power to nearby industrial parks or enterprises using innovative power transmission and operation processes.
- Industrial parks or enterprises are encouraged to purchase green electricity through the power market.

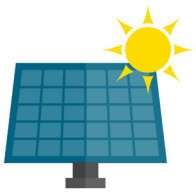
On 25 May 25 2022, Zhejiang province issued the Zhejiang 14th FYP New Power System Pilot Construction Plan[7]. The plan includes an innovative scheme to pilot distributed power market-based trading that prioritises sales to nearby power users.

Many market design questions remain. The inclusion of distributed new energy in green electricity trading will unlock a large supply of green and competitive electricity. However, successful implementation is likely to require a fair, clear, and practical 'toll fees' model and comprehensive ancillary service mechanisms:

◆ How to improve the 'toll fees' model

First, a review of the 'toll fees' model should ensure that it effectively reflects the actual cost of the T&D service supplied to distributed power users. Should the current 'toll fees' model cover the additional costs of grid companies via cross-subsidies[8]? How can 'toll fees' help fund the increasingly expensive power grid upgrades? How should grid companies be compensated for their investment in grid infrastructure?

For instance, according to the existing national regulations for the pilot projects, the T&D cost



7. 浙江省'十四五'新型电力系统试点建设方案
8. 从交叉补贴视角看输配电价改革，刘子敏，申颢，《中国电力企业管理》，*2020.*

should be zero if a power user buys new energy from a power producer at the same voltage level. To the grid companies, this arrangement appears unfair. The Jiangsu grid company has taken a different route, and charges CNY 0.05/kWh for distributed power trading at the same voltages but has not disclosed the calculation details[9].This discrepancy between regulation and practice makes the introduction of a fair and comprehensive 'toll fees' model more urgent.

◆ **How should distributed power market participants engage in the ancillary services market (ASM)?**

Grid companies argue against distributed power trading, citing its potential negative impact on grid reliability. Due to the intermittency of distributed wind and solar, the daily and intra-daily power deviation of renewables would exert pressure on the local power grid. It is becoming inevitable for distributed renewable sources to share the cost of ancillary services or purchase services from the market. NEA subsidiary Henan Energy Regulatory Office has released a consultative draft paper on peak regulation service market rules, according to which distributed wind will soon have to bear peak regulation costs[10]. Power users are also liable for some of the cost of grid flexibility. In Jiangsu, even if power users buy distributed power direct, they still need to pay capacity fees to the grid company if they are under the two-part-tariff scheme[11 12]. They also pay a peak/valley time-of-use (TOU) price , which is the usual measure used by the grid company for demand-side peak regulation11. According to the NEA's principle of 'whoever provides the service will earn profit, whoever benefits will bear the cost' (' 谁提供、谁获利；谁受益、谁承担 '), it is anticipated that in future distributed new energy projects and power users will need to bear these costs and consider them in their financial modelling.

On the other hand, how can distributed power contribute to the grid resilience and earn revenues from the ASM? An emerging solution to increase grid flexibility

9. 分布式光伏隔墙售电到底难在哪？ 新能源电力投融资联盟，*2022*
10. 《关于进一步完善河南电力调峰辅助服务市场交易规则的通知（征求意见稿）》, 河南能源监督管理局，*2022.5.*
11. 江苏分布式发电市场化交易规则（试行）， *2019.*
12. 江苏分布式发电市场化交易及电网企业输配电服务三方合同（示范文本）》*2020*

is to include distributed energy resources in the wholesale power market, ancillary service market, and capacity market (if any). One example of this is in Germany, where Next Kraftwerke, a German VPP operator, uses digitalisation to aggregate 5 000 energy-producing and energy-consuming units. With a total capacity of over 4 100 MW, the VPP trades the aggregated power on different energy spot markets. The VPP contributes substantially to grid stabilisation by intelligently distributing the power generated and consumed by individual units at times of peak load[13].

Many more questions remain. The inclusion of distributed new energy in green electricity trading will unlock a large supply of green and competitive electricity for customers if the 'toll fees' model is accepted by the market players, operators, and regulators. With a long-term strategy, and fair and innovative mechanisms, the Chinese wisdom of 'crossing the river by feeling the stones' will pave the way to success.

Sharon Feng
Director of Research and Advisory Service Azure International

Azure International is a well-known and respected consulting and advisory firm that provides services in support of investment and strategic decision-making in the renewable energy industry in China. It has successfully supported a large number of firms to establish presence, secure projects and partners in China since the company's establishment in Beijing in 2003.

13. Innovation landscape for a renewable-power future, IRENA, 2019.

NEWS IN BRIEF

EU records 34% drop in emissions between 1990 and 2020

The European Union slashed greenhouse gas emissions 34% below 1990 levels by 2020, overshooting the bloc's target of 20%, according to a 961-page inventory report submitted on 31 May 2022 by the European Environment Agency (EEA) to the UN Framework Convention on Climate Change (UNFCCC).

Over the past 30 years, cuts to EU emissions have been driven mainly by the growing use of renewables and replacing coal with gas in electricity generation. The report shows an unprecedented drop in coal use, which was three times lower in 2020 than in 1990. An additional role was played by warmer winters, which led to a reduced demand for heating. Although most manufacturing industries recorded an overall drop in emissions, transport and refrigeration & air conditioning were notable exceptions, showing a rise in emissions of 53 and 80 million tonnes of CO_2 equivalent respectively. Almost all EU countries recorded a drop in emissions, but the sharp decrease was mainly due to the UK and Germany, which together accounted for 47% of total net reductions over the past 30 years.

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EHB identifies five potential hydrogen supply corridors to meet EU 2030 targets

The European Hydrogen Backbone initiative has identified five potential hydrogen supply corridors that could help meet the 2030 demand and supply targets set by the newly-published REPowerEU plan. Five large-scale pipeline corridors are envisaged, spanning both domestic and import supply markets. They are consistent with the three import corridors identified by the REPowerEU plan, and will play a key role in the cost-effective transport of large volumes of hydrogen to demand centres. They include proposals to repurpose existing gas infrastructure.

- Corridor A: North Africa & Southern Europe
- Corridor B: Southwest Europe & North Africa
- Corridor C: North Sea
- Corridor D: Nordic and Baltic regions
- Corridor E: East and South-East Europe.

Members of the EHB initiative recommend that the EC should consider establishment of these corridors as a political objective, in order to ensure the fulfilment of REPowerEU targets. Streamlining the planning and permitting procedures, unlocking financing for fast-track projects, as well as integrated energy system planning, are among the suggested priority actions.

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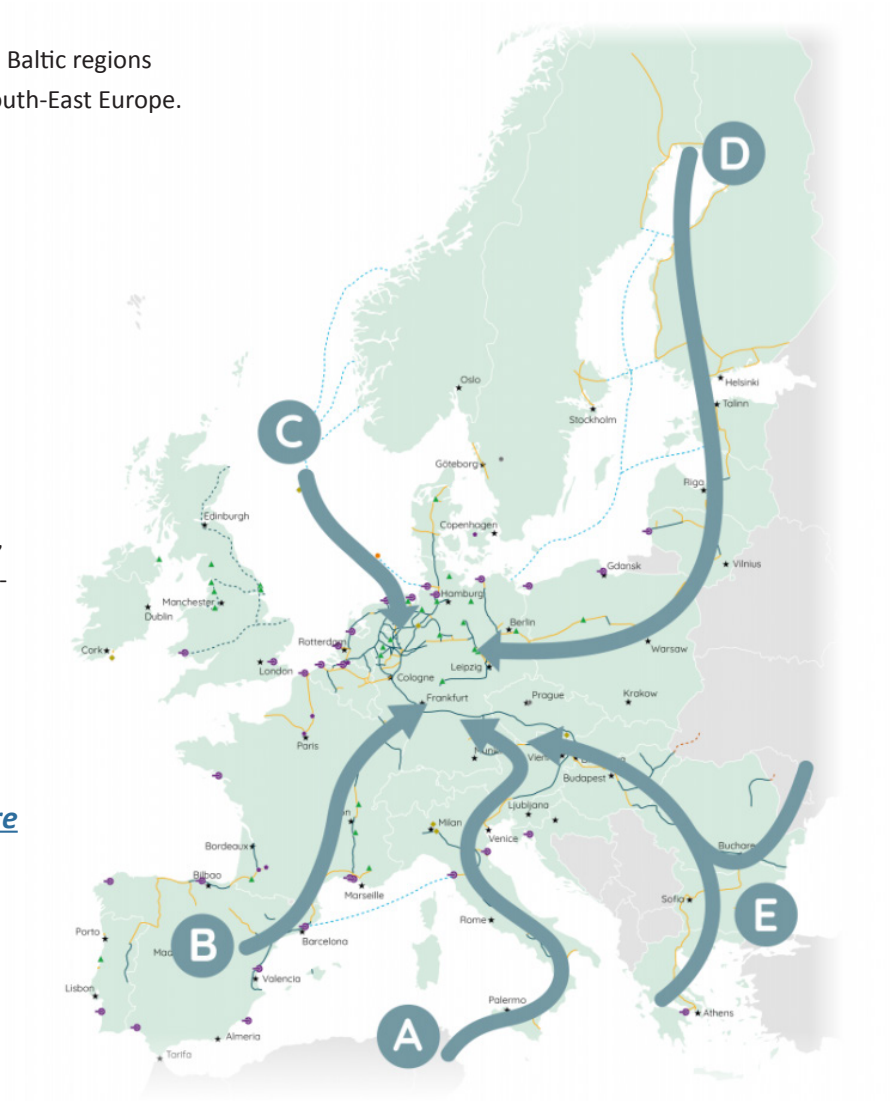

UK launches first CO_2 storage licensing round

On 14 June 2022 the UK launched its first carbon storage licensing round. The 13 licence areas include saline aquifers as well as disused oil and gas fields in the Irish Sea and off the east coast of Scotland and England.

Carbon capture and storage involves the capture of CO_2 from industrial processes which is then transported via ship or pipeline and stored in subsurface geological formations.

There are already six carbon storage licences on the UK continental shelf, capable of storing a maximum of 40 million mt/yr of CO_2 by the mid-2030s. However, this would meet just one fifth of the country's overall storage needs. According to the North Sea Transition Authority (previously the Oil and Gas Authority), the UK is aiming to store 20 to 30 million tonnes of CO_2 annually by 2030.

This licensing round is likely to be the first of many. Up to 100 CO_2 stores could be required to meet the UK's net zero target by 2050. The regulator anticipates strong competition for licences, with applications due to close on 13 Sept 2022 and licences to be awarded in 2023.

The UK is trying to balance its need for oil and gas against a background of declining domestic production alongside the goal of net-zero emissions by 2050. The upstream oil and gas sector argues it has the skills to make the country a world leader for dealing with industrial emissions.

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Spain and Portugal to lower power prices

On 14 June 2022, Spain and Portugal launched an EUR 8.4 billion scheme to subsidise fossil fuel-based power generation in order to bring down electricity prices for consumers and industry.

The measure, which will be implemented by lowering the input costs for fossil fuel-fired power stations, has been approved by the EU in recognition of the serious disruption experienced by both economies due to the soaring prices of fossil fuels.

The scheme is expected to cost Spain EUR 6.3 billion and Portugal EUR 2.1 billion. Funding for the scheme will come partly from a charge on Spanish and Portuguese buyers benefiting from the measure, and partly from so-called 'congestion income', i.e. the income obtained by the Spanish Transmission System Operator as result of cross-border electricity trade between France and Spain.

Calculation of the daily payment will be based on the difference between the market price of natural gas and a gas price cap set at an average of EUR 48.8/MWh (CNY 343).

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Germany provisionally turns to coal-fired power for energy security

On 6 June 2022 the German government announced short term measures to keep additional coal-fired power plants on stand-by for almost two years. The move is in response to rising energy prices and the possibility of future shortages. The government is clear that its decision will not affect Germany's long-term plan to phase out coal-fired power by 2030.

A draft law agreed by Cabinet would ensure that coal-fired plants in Germany previously scheduled for closure remain in functional condition. Germany already has several other coal and oil-fired plants on stand-by that can be activated in an emergency.

Despite Germany's difficult situation, its government has ruled out turning to nuclear power to fill the energy gap. Chancellor Olaf Scholz reaffirmed the government's commitment to phasing out nuclear power plants while embracing renewable energy.

Germany shut down half of its six nuclear plants in December 2021 and the remaining three are due to be taken offline at the end of 2022. According to Germany's Ministry for Economic Affairs and Climate Action, nuclear power currently provides only 5% of the country's electricity.

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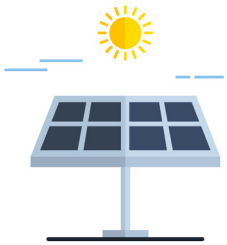
China targets 3 300 TWh annual renewable generation by 2025

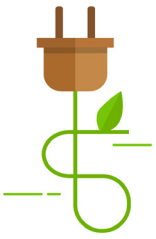


On 1 June 2022, China released its 14th Five-Year Plan for renewable energy, a key policy document in support of China's target for non-fossil energy consumption to reach about 20% by 2025.

The plan also outlines national and regional development strategies for renewables such as wind, solar, biomass and geothermal energy, and for the promotion of green hydrogen in sectors such as chemical production, coal mining and transportation.

In addition, China will expedite the construction of storage facilities and work to introduce smart upgrades to its power grids, thereby facilitating clean energy development.

Key renewable targets mentioned in the plan:



- RE consumption: Overall renewable energy consumption to reach about 1 billion tons of standard coal by 2025; over 50% of the primary energy consumption growth will be met by renewables during 2021-2025.
- RE generation: 3 300 TWh of annual renewable energy generation by 2025; incremental renewable power generation will supply over 50% growth of the overall power consumption.
- RE integration: 33% of power consumption will come from renewable sources (including hydropower) by 2025, and 18% from non-hydro renewables.
- Non-electricity utilisation of RE: renewable consumption in non-electricity sectors such as heating supply by geothermal and biomass, biofuels, and solar thermal, will reach 60 million tons of standard coal equivalent.

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China introduces market reforms to boost new energy storage

China's NDRC and the NEA issued a circular on 7 June 2022 to promote new energy storage in the power market and dispatching applications.

According to the circular, new energy storage assets (excluding pumped hydro storage) with independent measurement, control and other technical conditions, access to the automated dispatch system and capable of being monitored and dispatched by the power grid, can be regarded as independent energy storage systems serving as standalone entities in the electricity market. Energy storage projects that are bundled with renewable power projects can choose to participate in the power trading market as independent entities through certain technical means, but are encouraged to participate in tandem with relevant power generation projects. The document also proposes measures to encourage the establishment of independent energy storage providers that can provide auxiliary services and peak shaving in the power market.

These measures aim to tackle some of the biggest hurdles currently holding back development of new energy storage projects by further clarifying the positioning, market mechanisms and price mechanisms that would allow energy storage assets to participate in the power market. The circular sets out a trajectory for energy storage to achieve market-driven growth and secure economic returns, which will help unlock its potential in the new power system.

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China launches measures to reduce carbon emissions and pollution

On 10 June 2022, China's Ministry of Ecology and Environment, the NDRC, and a further five ministries jointly published a wide-ranging implementation program that aims to reduce pollution and carbon emissions. It integrates emission reduction requirements in key areas such as air, water, soil, solid waste and greenhouse gases.

Some of the key actions and targets are as follows:

- build up recycling infrastructure, encourage full utilisation of resources, and promote the construction of 'waste-free cities'.
- utilisation rate of new bulk solid waste to reach around 60%; bulk solid waste stock to be reduced.
- promote the recycling and utilisation of new types of waste such as exhausted power batteries, decommissioned PV modules and wind turbine blades.
- impose a strict ban on new steel, coking, oil refining, electrolytic aluminium, cement and glass production projects in key pollution control zones.
- promote the greening of energy supply systems and electrification of end-use energy sectors
- implement strict controls on new-coal-fired generation projects; limit overall coal consumption in the 14th FYP period, and phase it down further in the 15th FYP period.
- electric arc furnace-based steel production to account for more than 15% of total steel output in 2025 and 20% in 2030.
- output of recycled aluminum to reach 11.5 million tons in 2025; renewables to meet over 30% of energy consumption in electrolytic aluminum production by 2030.
- explore the demonstration, application and commercial operation of medium and heavy duty electric and fuel cell trucks; new EVs to account for around 50% of total car sales by 2030.

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China tightens controls on floating inland wind and solar projects

The Ministry of Water Resources (MWR) issued a guiding opinion on 25 May 2022 to strengthen the space management of inland waters, including shores and river banks. The document states that solar and wind energy projects must not be built on rivers, lakes and reservoirs, and those built in the vicinity of such bodies of water should be strictly regulated.

The MWR clarified in an interpretation document that the new guiding opinion is not a 'one-size-fits-all' ban on inland floating wind and solar projects, so long as such projects 'do not obstruct the steady flow of water, damage river banks and dykes, nor affect shipping'. All new constructions, as well as existing projects built after 2018, are now required to undergo flood risk assessments, and those that fail to pass the assessment will be forced to take rectifying action or close down.

The new policy document has prompted debate across the solar sector. There is widespread concern that it will put the brakes on development of PV projects on inland water, including floating solar, and that projects might be limited to smaller areas such as pit-ponds. Solar PV projects located on inland bodies of water have been popular in China as they do not occupy land and can reduce evaporation. PV power generation and fishery projects are particularly favoured.

The full impact of the new policy is yet to be felt, but two such projects are already reported to have been dismantled and more are likely to shut down under the new requirements.

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China's energy intensity fell 26.2% over the past decade

Official statistics show that China has significantly improved its energy utilisation efficiency since the end of 2012. In that time, the country has maintained an annual 6.5% economic growth alongside just 3% annual growth in energy consumption. The country's energy intensity has been reduced by 26.2%, which is equivalent to saving about 1.4 billion tons of standard coal equivalent or about 2.94 billion tons of CO_2 emissions.

Adaptation of industrial and energy infrastructure has accelerated to achieve further emissions reductions. Notably, China has renovated over 1TW of existing coal-fired capacity to meet ultra-low emission standards, and now has more renewable energy capacity than anywhere else in the world, exceeding 1TW.

Energy saving in key economic sectors has also seen noticeable progress. Energy consumption per unit of added value in industrial enterprises above a designated size has been reduced by 36.2%. More than 8.5 billion square meters of green buildings have been built, and about 1.7 billion square meters of existing buildings have been upgraded to be energy-efficient. By the end of 2021, China had introduced 7.84 million EVs into the transport sector as part of its efforts to accelerate the green transition.

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Featured Publication

Enhancing China's ETS for Carbon Neutrality: Focus on Power Sector

The power sector is key to China's stated ambition of achieving a peak in its emissions before 2030 and carbon neutrality before 2060. Accelerating the sector's decarbonisation requires a well-coordinated policy mix.

This report, a collaborative effort by the IEA and Tsinghua University, explores the interactions of China's national ETS with the country's renewable energy policy in the electricity sector, and in particular renewable portfolio standards (RPS). It demonstrates that the policy mix needs to be more coordinated and explores possible pathways toward an emissions trajectory that is in line with China's carbon neutrality target. The report examines the impact of different enhanced ETS scenarios on CO_2 emissions, generation mix, cost-effectiveness and interaction with RPS, and concludes with a series of policy insights that are intended to inform China's climate and energy debate.

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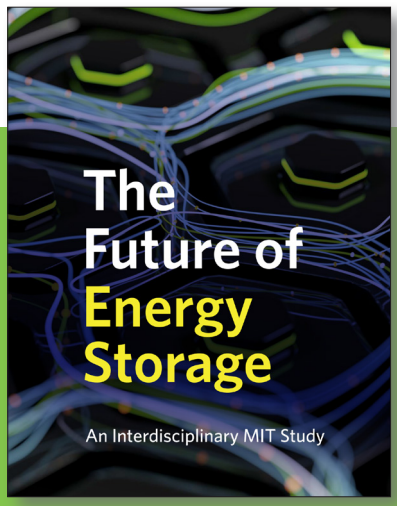

The Future of Energy Storage

This interdisciplinary study from the Massachusetts Institute of Technology (MIT) is the ninth in the MIT Energy Initiative's Future of series, which aims to shed light on a range of complex and vital issues involving energy and the environment.

The report examines the important role of energy storage in future decarbonised electricity systems. It is the culmination of more than three years of research into electricity energy storage technologies, including: opportunities for the development of low-cost, long-duration storage; system modeling studies to assess the types and roles of storage in future, deeply-decarbonised, high VRE grids; and the implications for electricity system planning and regulation.

The study will be of interest to a wide range of global stakeholders in government, industry, and academia as they work to develop the emerging energy storage industry and assess the changes in planning, oversight, and regulation of the electricity industry that will be needed to enable a much higher reliance on VRE generation together with storage.

→ *Read More*

Towards a Net-Zero Chemical Industry: A Global Policy Landscape for Low-Carbon Emitting Technologies

The chemical industry provides essential materials, technologies and components to all industrial sectors, and as such is playing a vital role in the transition towards a global net-zero society. Low-carbon emitting technologies (LCETs) are essential building blocks in this net-zero endeavour. While LCETs offer significant decarbonisation opportunities, they face many challenges and are heavily dependent on favourable policy environments.

This white paper, published by the World Economic Forum in collaboration with Ireland-based Accenture, gives a valuable overview of the current policy landscape in seven jurisdictions (China, the EU, Japan, Saudi Arabia, the United Arab Emirates, the United Kingdom and the United States) across five key LCET areas (biomass utilisation, carbon capture and utilisation, electrification, alternative hydrogen production and waste processing).

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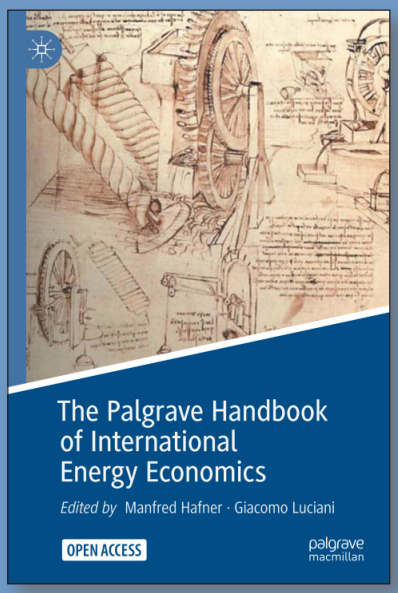


The Palgrave Handbook of International Energy Economics

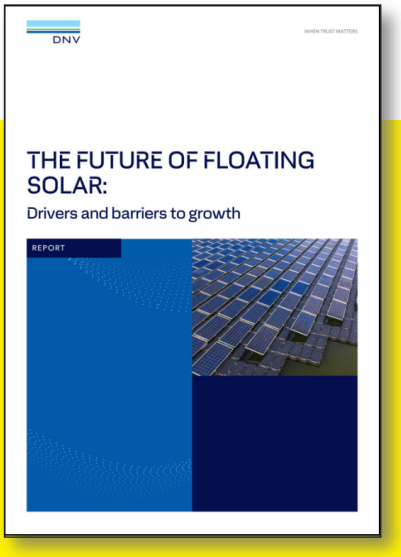
The Palgrave Handbook of International Energy Economics is an exhaustive compendium of the main economic issues relating to the energy sector. The open access handbook provides a comprehensive and accessible overview of the structural economic aspects influencing energy policies and their outcomes. It delves into some underlying economic factors that are unlikely to change in the short-to-medium term, emphasising the economic consequences and trade-offs of the technological solutions currently available.

The analysis takes stock of all the technologies currently being employed in the energy sector. This all-inclusive approach allows for a thorough assessment of the economics of the different solutions, highlighting the advantages and disadvantages of alternative options against the backdrop of the UN's Sustainable Development Goals (SDGs). It also offers a thorough analysis of energy markets, illustrating their organisation and price discovery processes, as well as some global trends that may influence future supply and demand patterns.

→ *Read More*

The Future of Floating Solar

In the next four years, floating photovoltaic (FPV) generation capacity will likely grow significantly as overall global PV capacity doubles. This report, from Norway-based risk management and quality assurance company DNV, outlines the company's view on the current and future development of FPV. It summarises the outlook for FPV installations and presents an overview of recent developments and the growth that is anticipated over the coming years. Topics in the report include drivers and challenges, recent cost developments and prospects for synergetic applications of FPV with other industries such as offshore wind.



Although concepts are still being developed and improved, progress in areas such as reducing evaporation from covered water, infrastructure availability for different locations and spatial synergies with other industries such as offshore wind or aquaculture means that floating PV, both offshore and on inland bodies of water, is raising its profile in an expanding renewables landscape.

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86-10 6587 6175
info@ececp.eu
Unit 3123 & 3125, Level 31, Yintai Office Tower C,
2 Jianguomenwai Avenue, Chaoyang District,
Beijing 100022, People's Republic of China
www.ececp.eu

Editor-in-chief: Jieqiao Chi
English editor: Helen Farrell
Feedbacks and Contributions: magazine@ececp.eu

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