Magazine of EU-China Energy Cooperation Platform

EU-China Energy Magazine

2022 September 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.

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Dear All,

It has been a turbulent time since publication of our summer issue. First and foremost, we were saddened by news of the deaths of the UK's Queen Elizabeth II and former Soviet Union President Mikhail Gorbachev, both important figures in the cause of peace and European unification. One of our colleagues put it well: 'Queen Elizabeth II presided over the end of the Cold War she inherited, and it ended peacefully with a crucial contribution from UK political elites whose ultimate boss she was … Gorbachev was a man from the East who came with an olive branch, and House of Britain was the first to open the door for him in the West.' It remains to be seen how the world will develop without these two giant figures.

At the time of going to press, news reached us that Guido D. Giacconi, National Vice President at EU Chamber of Commerce in China, had passed away. Guido was a close friend of ECECP and supported us right from the beginning. Our thoughts are with his family at this difficult time.

In the past few weeks, ECECP has held a number of workshops to discuss some of the crucial energy issues of our time. You will find on our website a summary and video recording of the workshop held with the IEA on Clean energy innovation in China: the road ahead. Documentation relating to a second workshop, The Future of Gas, will be posted up shortly. The planned EU Energy Innovation Expo 2022 will now take place at the end of October 2022, and will form part of the EU Climate Diplomacy Week's China activities.

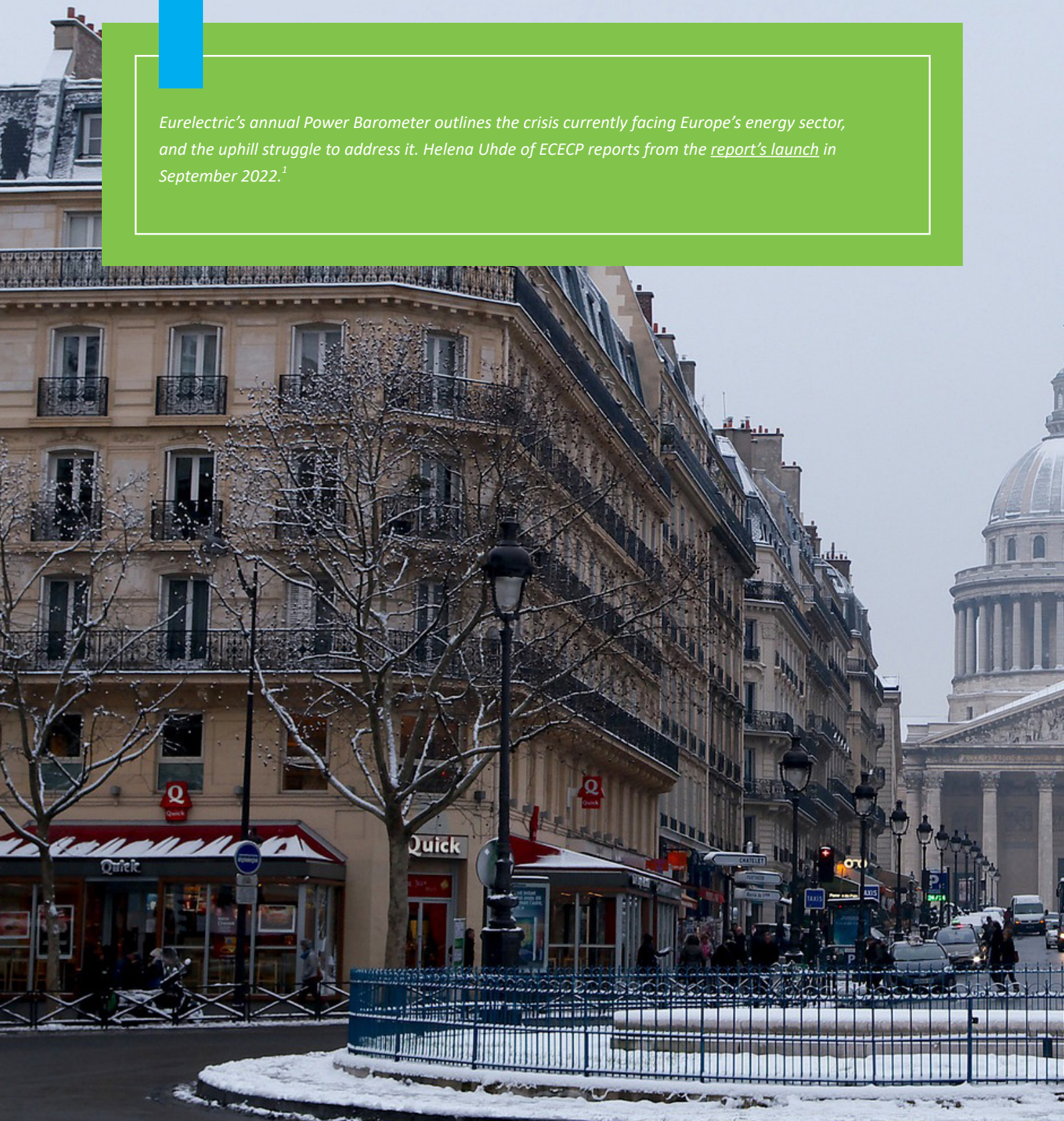
We thank our dedicated editors for their hard work and for soldiering on while I am recovering from COVID.

Flora Kan
ECECP Team Leader

Can Europe escape the energy crisis?

Insights from Euroelectric's Power Barometer 2022

Eurelectric's annual Power Barometer outlines the crisis currently facing Europe's energy sector, and the uphill struggle to address it. Helena Uhde of ECECP reports from the report's launch in September 2022.[1]




McDona
McDonald's

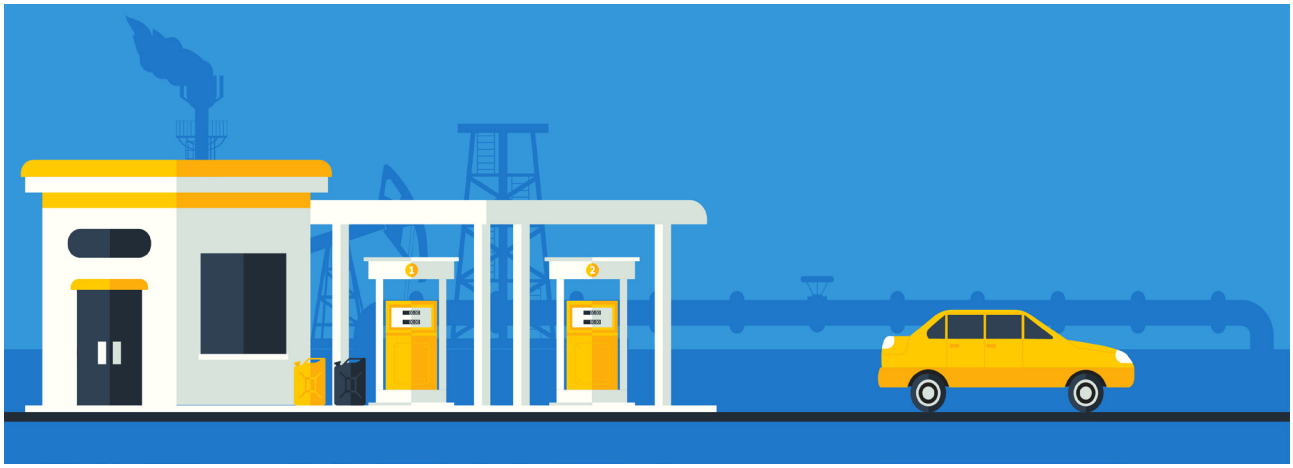
Rising prices put Europe under pressure

In August 2022, the EU-27's annual inflation reached 10.1%.[1] Suddenly, the economic indicators are having a tangible impact on millions of Europeans. Eurelectric, the European association of the electricity industry, attributes about one third of the price increases to high energy prices. In its annual *Power Barometer*, Eurelectric summarises the prevailing energy situation and provides recommendations to decision-makers. The data shows that between January 2021 and August 2022, day-ahead electricity prices increased by 532%, reaching an average of EUR 405 / MWh in August 2022. For households, fixed-term contracts limited the price increase to 8.2% in 2021, however, new contracts in capital cities rose by 84% between January 2021 and June 2022. Rising energy prices are putting pressure on the pandemic-hit economy, vulnerable consumers, and policymakers - raising questions about whether the European electricity market is still functioning, and whether market intervention is needed.

Volatile energy market prices have a negative impact on consumers, electricity generators and the EU economy as a whole, acknowledges Frans Timmermans, Executive Vice President of the European Commission, who is leading the Commission's work on the European Green Deal and its first European Climate Law. However, in his keynote speech opening the Power Barometer 2022 presentation he stressed that there is a limit to what policy makers can do: 'No intervention in the electricity market can make up for the fact that billions of cubic meters of gas are being kept out of global energy markets because of Russia's energy blackmail. And no intervention in the electricity market can compensate for the fact that this year's drought has severely affected power generation in the EU.' In his opinion, what is really needed is 'homegrown, affordable renewable energy' and a reform of the electricity market to better accommodate an increasing share of renewable energy.

Eurelectric Secretary General Kristian Ruby also warns against ill-considered market interventions that do not address the root causes of the high prices: 'The price signal, even though it's high prices right now, is critical when it comes to providing a message to people, to families, to industries that you need to save energy.' In other words, the market is functioning and sending a signal of scarcity of supply. The question of how to deal with the social impact of high prices is a central issue: 'How do you strike that balance between protecting the vulnerable and continuing to have a signal to save energy? That is a critical piece of this new political discussion that is coming at us at racket pace.'

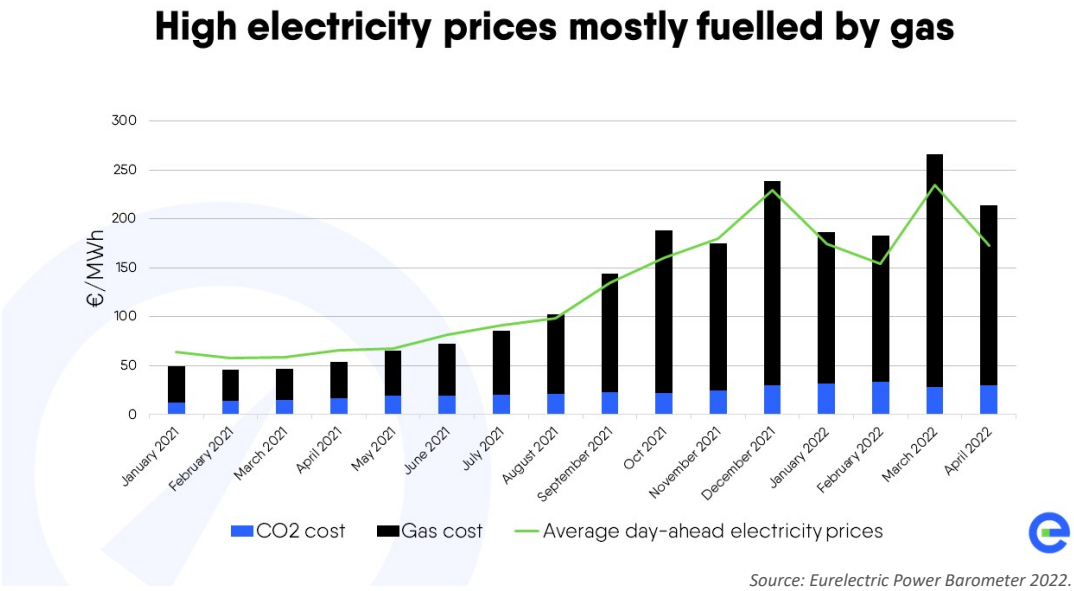
1. Eurostat (16 September 2022). Annual inflation up to 9.1% in the euro area- Up to 10.1% in the EU. https://ec.europa.eu/eurostat/documents/2995521/14698150/2-16092022-AP-EN.pdf/741bf6b2-1643-6ff0-34e7-31522ce1e252



Getting to the root cause

Ruby identifies Europe's dependency on fossil fuels as the key issue: 'The root cause of the problem is a shortage of gas supply and our addiction to imported fossil fuels. Governments should seek to tackle this, rather than resorting to distortive, ad-hoc interventions in the electricity market. In parallel, we also encourage sobriety measures to save energy this coming winter.' This is supported by data showing that the electricity price increase is due to high gas prices rather than CO_2 costs (see Figure 1). Fossil fuels, including natural gas, oil and petroleum, provide 57% of the EU's final energy consumption, with Russia as the leading supplier.

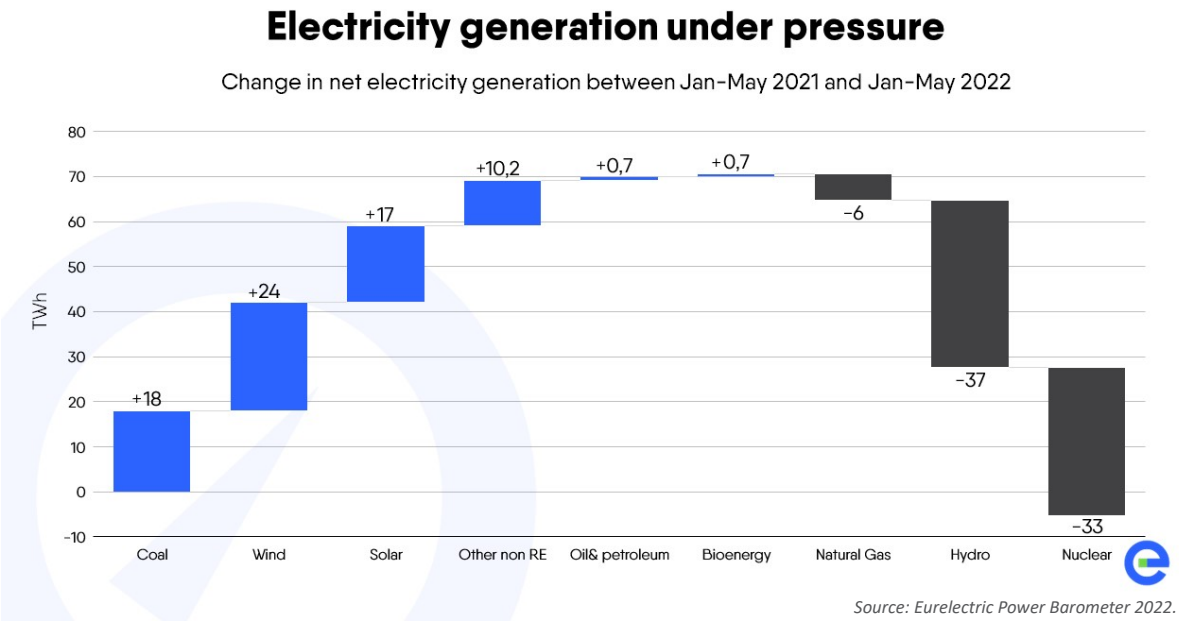
Figure 1 Average day-ahead electricity prices.



Source: Eurelectric Power Barometer 2022.

Quite separately from the imprudent dependence on Russia, the climate crisis is posing an ever growing problem for electricity generation. Ruby summarises the challenge: 'We are experiencing a historical pressure on our assets in the power sector. A lot of it is triggered by more extreme weather caused by climate change.' In the first five months of 2022, due to the drought and other operational constraints, 37 TWh less hydropower and 33 TWh less nuclear power were generated compared to the same time in 2021 (see Figure 2). Wind and solar power generation increased by 24 TWh and 17 TWh respectively, but not enough to cover the shortfalls.

Figure 2: Change in net electricity generation.



Source: Eurelectric Power Barometer 2022.

Energy savings are crucial

With temperatures dropping and a block on Russian gas supplies, the question of whether Europe's gas storage facilities are full enough to get the region through the winter is weighing on people's minds. Two different gas storage pathways for this winter are depicted in Figure3.

Ruby emphasises that storage will only be sufficient with energy savings: 'If we continue to use energy as we do today, the storage facilities will be empty by March 2023. There's no way around massive energy savings.'

On 20 July 2022, the European Commission proposed a gas demand reduction plan to prepare the EU for supply cuts, aiming at a 15% cut in gas use until next spring[2]. The proposal makes the mammoth task into a community endeavour. 'All consumers, public administrations, households, owners of public buildings, power suppliers and industry can and should take measures to save

2. European Commission (20 July 2022). Save Gas for a Save Winter: Commission proposes gas demand reduction plan to prepare EU for supply cuts. https://ec.europa.eu/commission/presscorner/detail/en/IP_22_4608

gas,' the EC stated. The voluntary gas demand reduction plan was adopted by the Council on 5 August 2022[3]. Member States have agreed to a 15% cut in gas use between 1 August 2022 and 31 March 2023 compared to their average consumption over the last five years, and can choose independently how to achieve those cuts.

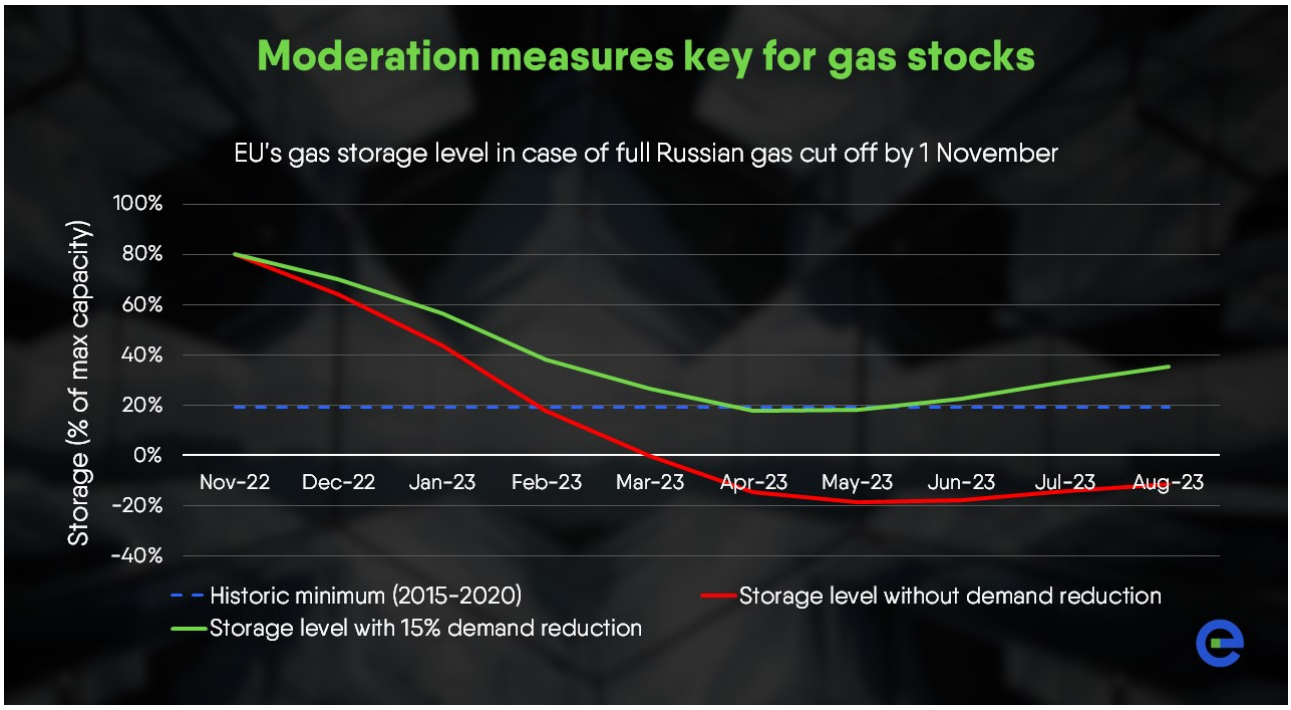
Not losing sight of the long-term vision

Despite the current pressures on the energy system, it is important not to lose sight of the long-term vision. With the presentation of the European Green Deal in December 2019 and its Fit for 55 implementation strategy, the EU has set out to reduce greenhouse gas emissions by at least 55% by 2030 and to become a climate neutral continent by 2050.

Eurelectric defined five enablers that are needed to reach these goals. First of all, all technologies are needed for capacity growth. Following Russia's invasion of Ukraine, the EC introduced REPowerEU, a plan to end Europe's dependence on Russian fossil fuels as soon as possible, with a two thirds reduction in Russian gas consumption by the end of 2022. Key measures include an increased energy efficiency target from 9% to 13%, diversification of energy supplies, and an higher renewable target (rising from 40% to 45%) by 2030. Eurelectric estimates that an additional 753 GW of renewable energy capacity is needed within the next eight years – corresponding to roughly 80% of today's capacity.

Second, permitting needs to be accelerated. 'We've been repeating this message for years and years and still not enough is happening,' points out Ruby. Currently, around 90 GW of wind projects are waiting for permission - around four times

Figure 3: EU-27's gas storage level. Source: Eurelectric Power Barometer 2022.



Source: Eurelectric Power Barometer 2022.

3. Council of the EU (05 August 2022). Council adopts regulation on reducing gas demand by 15% this winter. https://www.consilium.europa.eu/en/press/press-releases/2022/08/05/council-adopts-regulation-on-reducing-gas-demand-by-15-this-winter/

more than is under construction. Improving the permitting process would compensate for some of the missing capacity: '90 GW is six-times as much wind as we have deployed onshore as of today in the EU-27', explains Ruby.

Third, 23% more investment in distribution grids is needed this decade. Eurelectric estimates that 70% of new electricity capacity will be added on the distribution side of the grid, in the form of local solar PV and wind farms. Electrification, e.g. in the form of electric cars and heat pumps, is set to put further stress on the distribution grid. At the same time, the power grid is aging: today, one third of the grid in Europe is more than 40 years old and needs to be modernised. Investment is vital, says Ruby: 'We have an upward going trend in the investments, grid investments have risen in the last year by 10%. That's great. But what we actually need is closer to 40% in order to do the necessary modernisation and digitisation of the grid.' While EUR 31bn was invested in the grid in 2021, Eurelectric estimates that it will take about EUR 38bn a year until 2030, and about EUR 61bn from 2031-50, to develop the network in a smart and flexible way.

Fourth, investment of EUR 84bn/yr in generation capacity is needed to meet Europe's decarbonisation goals. 'We have a positive trend, but we're still behind the curve. That's why permitting and investor certainty are the things we keep talking about,' says Ruby. Investment in power generation reached EUR 64bn in 2021, but need to reach €98bn between 2030-50 to meet the targets.

Fifth, access to critical raw materials needs to be made easier. Inflation, and problems with access to resources, are raising the costs of the green energy transition. For example, the global average cost of solar PV modules has increased by 16%, the price of wind turbines is up 9% and battery packs prices have surged 20% between January 2021 and March 2022. Ruby gives a guarded welcome to political measures announced to ease the problem: 'We're really happy that this is taken up by the European Commission – we have seen announcements of a raw material strategy, but it's critical that we take a holistic view at this.' For example, the European Commission's RoHS[4] and REACH Directives[5] restrict the use of the toxic chemical lead. While such restrictions are important to protect health and the environment, lead is used in batteries and power cables – which are important components for the transition.

Electrification is a key pillar of decarbonisation

It is clear that policymakers have to make difficult decisions where there is not always an optimal solution. However, one of the key pillars of the crisis response is a

4. Restriction on the use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS)
5. Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

clear priority: Electrification, where it is possible. Ruby comments: 'If we do all the things right, we could reach a level of electrification of the European economy of 34% by 2030. But it's going to be challenging. The green track is the track away from Putin and our addiction to fossil fuels.'

In the transport and heating sector in particular, electrification has significant potential to support the transition away from fossil fuels. Eurelectric estimates that 57% of the gas consumed by buildings and industries for hot-water, space and process heating systems could be replaced with heat pumps and electric arc furnaces. This is beginning to show in the trend of heat pump installations. In 2021, sales of heat pump grew by 25%, reaching 2 million units in Europe. 'That's a lot compared to previous years, but we need to almost double that figure by 2026. That means we need to install as many heat pumps in those five years as we have heat pumps in Europe today,' comments Ruby.

A clear trend is emerging in the transportation sector. Between 2019-21, annual sales of electric vehicles (EVs) grew by 349%. Eurelectric projects that EVs could count for 60% of new sales by 2030. The number of charging stations in Europe also increased by 57% between 2020 and 2021. 'It is again the same story, there's a positive trend but not enough to maintain the curve and take the high way away from our fossil fuel addiction', says Ruby. Furthermore, the number of charging stations is very unevenly spread: 'Three quarters of all the installed charging points are concentrated in five markets: the Netherlands, Germany, France, Italy and Sweden. So we also need to see a better distribution of the charging infrastructure, where you can really go from Poland to Portugal in your electric car without any stress on your way.'

The positive trends in the area of investments in grids, generation, heat pumps, electric transportation give hope, but the figures also show that Europe's trends are still far from reaching its climate targets.

Solving the dilemma is a political obligation

At the end of the event, Ruby stressed again that the source of the problem must be solved: 'In the discussion over what we do right now, I think, there's a fundamental political choice over whether to intervene in the electricity market or the gas market. Eurelectric has been very clear that we need to address the root cause of this issue. We need to address and control the prices. Europe has sent around EUR 100 billion to Mr Putin since he invaded Ukraine. Can we really believe that? We have a piece of indispensable homework, which is to reduce that money flow. That is a political obligation that I cannot see we can abate.'

The dilemma that needs to be solved is tremendous: accelerate independence from fossil fuels, strengthen efforts to meet climate goals, and at the same time keep energy affordable for households and industry. This is partly reflected in the emergency market intervention of the European Commission that was proposed on 14 September 2022.[6] Key measures are being outlined to reduce electricity demand and redistribute the energy sector's surplus revenues to final customers, as well as previously agreed measures on filling gas storage and reducing gas demand to prepare for the upcoming winter. The next few months will show whether the interventions are working and whether everyone is participating sufficiently in the group task of saving energy.

By **Helena Uhde**
ECECP Junior Postgraduate Fellow

6. European Commission (14 September 2022). Energy prices: Commission proposes emergency market intervention to reduce bills for Europeans. https://ec.europa.eu/commission/presscorner/detail/en/IP_22_5489

The energy market in time of war

The ongoing energy crisis, fuelled by the conflict between Russia and Ukraine, is putting Europe under increasing pressure as the continent faces many uncertainties this upcoming winter. Every week this September, a CERRE academic will author a short piece aimed at discussing options and questions raised by this crisis.

The series' first piece, titled 'The Energy Market in Time of War', is authored by Prof Michael G. Pollitt, CERRE academic co-director and assistant director at the Energy Policy Research Group, University of Cambridge.

As a well-educated economist, I believe that 'the market' is a wonderful thing in general, spectacular in some respects and deeply misunderstood in others.

One key misunderstanding is that there is no such thing as the 'free' market in the formal economy. Markets are highly regulated social institutions which are set up to deliver particular societal goals. So it is with the market for electricity and gas.

As such, in a modern democracy energy markets are our servants, not our masters. If the market is not delivering for society, we can change it. When it is as significant as the energy market, there is a moral imperative to act when a situation arises where market prices rise to unprecedented levels. The war in Ukraine and the consequent significant curtailment of European gas trade with Russia has sharply raised the price of gas and consequently the price of electricity, exacerbated by the

post-Covid recovery in global gas demand. Wholesale electricity prices in Europe are now around double (in real terms) the level they have been at any time since 1999. They have been around this level for an unprecedented 6 months. What is more, high prices are expected to continue for at least 2.5 years by forward markets. The forward price of electricity at the time of writing in 2025 is expected to be over twice its normal level, while the forward price of gas (TTF) is expected to be over four times its normal level in March 2025.

The circumstances are exceptional. We are at war – a war that we must win – with an enemy that is determined to inflict long-term economic and political damage on European democracies. The damage that is being inflicted is material. In Germany the estimated loss of GDP from sustained high energy prices is up to 12%, while inflation is expected to peak at 13% in the UK following announced price rises in household electricity and gas on 1 October 2022, of which gas, electricity and fuel would be 6.5%.

In war time, normal market arrangements for essential goods and services are suspended, in favour of administrative arrangements designed to balance the need to produce goods and services efficiently and the need to achieve equitable allocations of those goods and services. Private ownership of production can continue, but war profiteering must be limited, and profits strictly regulated. In war time, all are encouraged to economise on the use of limited resources (especially if they can afford not to), produce their own where this is possible ('dig for victory') and to accept inconvenient (and sometimes binding) restrictions on use ('rationing' and 'put that light out').

What we need in energy is to put the economy on such a 'war footing'.This immediately suggests five actions which European governments, supported by the European Commission, need to plan to implement this winter.

First, we need a significant programme of demand reduction with monitoring and financial incentives to comply. This should take the form of limiting the use of electricity and gas for non-essential services. Commercial buildings and government offices should have maximum winter temperatures and minimum air conditioning temperatures which are significantly lower than last year; there should be bans on open doors to commercial

buildings in winter; buildings should be encouraged to go dark at night; we should implement day light saving this winter. The target should be to reduce weather corrected electricity and heating demand by at least 15%. This would materially reduce demand for gas and reduce wholesale prices for both gas and electricity. A small reduction in demand could significantly decrease the price of gas and electricity, given their small price elasticities of demand.

Second, we need to target the reduction of European gas demand specifically. We should import certain energy intensive products used by European industries and adapt production processes where such goods can be imported cheaply from friendly countries. This allows us to import embodied energy. Where possible, the life and availability of gas import substituting resources should be extended and increased, whether it be German nuclear power plants, coal fired power plants in the UK or local gas production in the Netherlands. We also need to encourage energy use when wind and sun are available and should move to a system where we discourage energy use specifically on low wind (and low sun) days. We should encourage use or charging of household devices and appliances during these times. Doing this will minimise aggregate imported gas use.

Third, we need a collective 'dig for victory' in energy. Home production is possible for those with roofs and governments must encourage the installation of PV on private homes and commercial buildings; the EU should reduce tariffs on necessary renewable energy equipment; we need an active programme of energy efficiency advice and interventions; we should be encouraged to switch off devices where possible at home and at work; turn down or off radiators in rooms we are not in; we should reward and encourage efficient use of public spaces to keep warm; local authorities should also be encouraged to unblock planning permissions for local energy schemes; and we should call out inefficient use of energy in workplaces and public buildings and bureaucratic objections to energy production, such as the installation of solar panels on historic buildings with no visual impact.

Fourth, we need fair pricing schemes for energy, which also encourage energy saving. One obvious way to do this at the national level is via the implementation of a rising block tariff, with a rebate, for all household energy consumers. This is a way of effectively rationing energy while maintaining affordability. Under the rising block, each household could be given a lower price energy allocation, which could be determined by the measurable household characteristics at a low price and then face sharply rising prices for using more than their allocation. This could be combined with a reward for reducing energy consumption relative to last year's measured consumption. The low-price allocation would incorporate

a significant assumed reduction, except for certain protected vulnerable customers, in demand relative to last year.

Finally, we need a temporary system to deal with profiteering in the energy sector in these exceptional times. National regulators and finance ministries need to assess how much money is going into the electricity and gas sectors and whether there are excessive untaxed returns (which is not necessarily obvious in some countries). We need to know how much these are and which asset owners are receiving them. We then need a fair ex post assessment and taxation of these. Profiteering in war time undermines morale and must be properly policed. Some returns to speculative investments may be fair and not material to the overall bill, other returns are large, completely unforeseen by their asset owners and should therefore be taxed and redistributed.

Something must be done about energy, and we need to put in place a scheme to deal with it now. We all hope the Russia-Ukraine war will end and that we can remove war time restrictions. However, we must prepare for the worst: that this energy situation will continue for an indefinite period. We need an intervention which is efficient and fair.

Can something significant be done, quickly? The answer is yes.

In 1939, the UK began rationing household coal (the primary source of heating fuel) within days of its entry into World War Two. This successfully reduced household consumption of coal.

In 2003, New Zealand ran a ‘Target 10’ public advertising campaign to reduce electricity use by 10% in weeks due to the need to meet a shortage of water in its hydro

dams (the target was achieved in 6 weeks).

In summer 2011, Tokyo reduced electricity demand by 18%, following the Fukushima Crisis in March 2011.

From April 2011 to March 2012, the UK installed 270 000 PV systems on roof tops (1% of all households), following the implementation of a generous Feed-in-Tariff, less generous than the announced price of electricity from 1 October 2022.

Who should do what?

We have four major actors in the energy sector; the government: in the form of national Energy and Finance ministries and the EU; independent energy regulators; the system operators of the electricity and gas system; and the rest of the industry as owners of the generation and production assets, networks, and retail businesses. All have their parts to play in the wartime energy economy.

National governments need to oversee a comprehensive plan for the implementation of emergency measures, including passing the necessary special legislation. The Finance ministry needs to be involved to underwrite any funding deficit. The EU should spread good practice and ensure that national schemes do not undermine the integrity of the single markets in electricity and gas.

National regulators need to undertake the detailed calculations on what it will take to fund the private industry in wartime. It also needs to work out and approve exact pricing plans for regulated customers and how to maintain the efficient operation of wholesale electricity and gas markets while regulating the overall payments received by the industry.

Electricity and gas system operators need to keep the lights on and the gas flowing. They also need to come up with comprehensive advice on how gas use can effectively be minimised during the supply crunch this winter. Good analysis of what it will take to make the best use of gas will depend on detailed analysis of gas use.

A lazy myth in our society is that well-run private companies don't generally act in the interests of society.

The rest of the energy industry needs to get behind the government's efforts to deal with crisis. It is the industry's corporate social responsibility to cooperate with the government at this time and not seek to resist a temporary suspension of existing long-term contracts. A lazy myth in our society is that well-run private companies don't generally act in the interests of society. The energy industry has the opportunity to step up and prove that this myth is wrong in its response to this crisis. The longer-term advantage to the sector in terms of societal goodwill is obvious.

The economic response to the COVID-19 pandemic reminded everyone of the power of pragmatic economics which focuses on outcomes that are good for society, not on rarefied economic models or, worse, economic ideology that insists on purist market approaches for their own sake. It also reminded us of the necessity and power of democratic government in market economies faced with an existential crisis. The wartime economists who worked tirelessly to set wartime prices and rations in Allied Countries in World War Two helped produce and allocate scarce resources, maintained the morale of their populations and, in turn, helped win the war. The same can and should be true in this current crisis.

By **Michael G. Pollitt**
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China's CO_2 emissions fall by record 8% in second quarter of 2022

China's carbon dioxide (CO_2) emissions fell by a record 8% in the second quarter of 2022, a 230m tonne ($MtCO_2$) reduction that is the largest in at least a decade.

The new analysis for Carbon Brief, based on official figures and commercial data, shows China's emissions have now fallen year-on-year for four consecutive quarters, extending what was already the longest sustained decline in recent history.

The latest quarterly decline was driven by China's ongoing real-estate slump, strict Covid control measures, weak growth in electricity demand and strong growth in renewable output.

China's coal-fired power generation declined by 4% year-on-year in the first half of 2022, but saw an increase in July and August, due to record-breaking heatwaves and droughts in a large part of the country. This has not changed the more salient drivers of falling emissions.

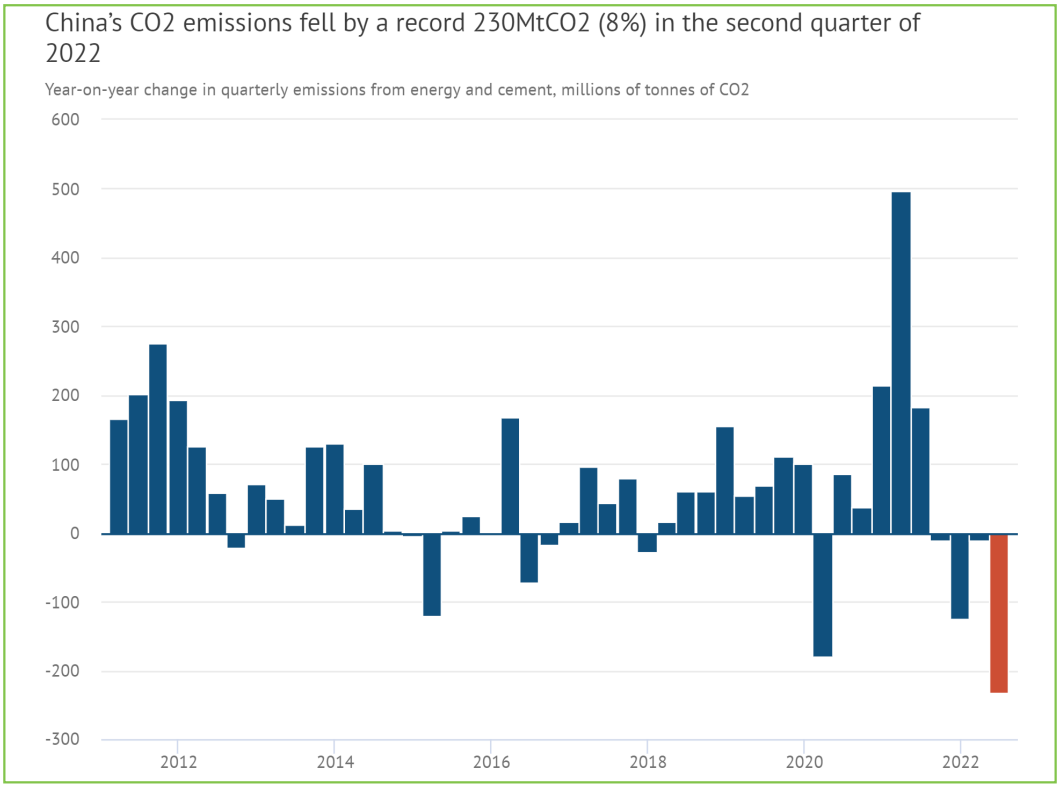
The Chinese government is now responding to the economic headwinds the country faces with a new stimulus package that aims to revive real estate and speed up infrastructure projects, but will also benefit clean-energy investment.

This policy response will determine whether China's emissions have already peaked or whether they will rebound before peaking later this decade.

Record drop

The new analysis shows that China's CO_2 emissions fell 8% in April to June, compared with the year before. In absolute terms, this is the largest quarterly reduction in at least a decade, amounting to some 230MtCO_2, as shown in the chart below.

Year-on-year change in China's quarterly CO_2 emissions from fossil fuels and cement, %.



The drivers of the record drop in emissions from April to June 2022 are broken down by fuel and by sector in the chart below.

Reading from the top, there was a significant drop in transport oil consumption due to Covid control measures, with oil refinery throughput – a proxy for oil product usage – falling by 11%

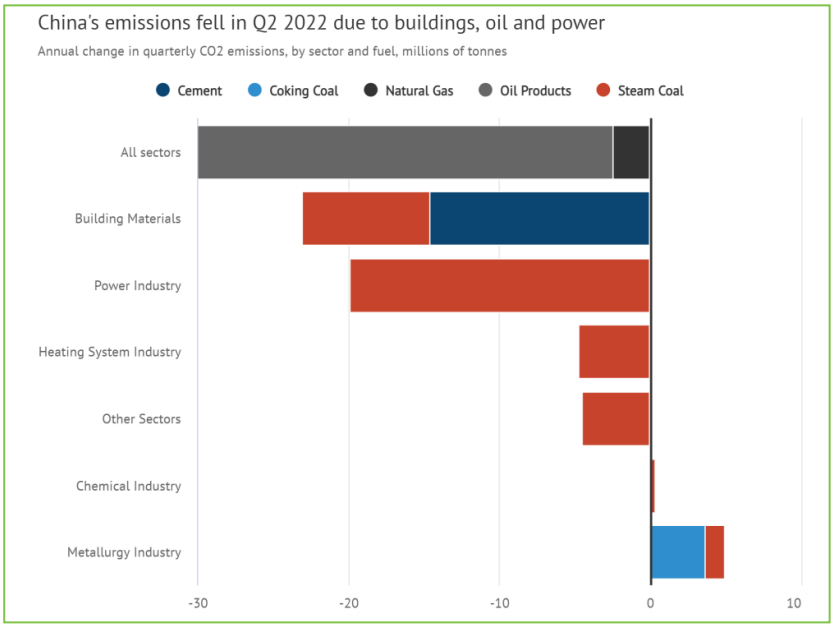
Next on the chart is falls in steel and cement output due to the real-estate slump – with cement production falling 18%. Real-estate construction starts and completions fell by 44% and 33% in the second quarter, to the lowest level since 2009, as the financial distress of the sector intensified. (Year-on-year changes for the second quarter have been calculated from reported year-to-date numbers for March and June 2021 and 2022. See 'data sources' section below.)

The other major contributor was a 6% fall in coal use in the power sector, as a result of slow electricity consumption growth and strong increases in renewable power generation.

Elsewhere, consumption of metallurgical coal increased by 4%, for a total reduction in use of the fuel of 5%. Import substitution was clear as imports of thermal coal fell by 45% amid surging domestic coal production, up 12%, and contracting demand.

The drop in gas consumption of 5% is notable as demand for the fuel had been increasing continuously since the early 2000s.

In total, China's CO_2 emissions have now fallen by some 380MtCO_2 across the 12 months from July 2021 through to June 2022, a 3% reduction year-on-year.



Year-on-year change in China's CO_2 emissions in the second quarter of 2022, broken down by fuel and sector, millions of tonnes.

Coal bounce

Wind and solar power installations have continued to make new monthly records, as shown in the chart below. In contrast, while thermal power – largely coal – continues to be added to the grid, additions in 2022 to date are at the lowest rate in the past five years.

Nevertheless, emissions from power generation have rebounded in July and August, as a record heatwave has increased electricity demand for air conditioning and droughts have affected hydropower generation at a time that usually has good availability of water.

New power generating capacity additions, shown as cumulative totals year-to-date.

In the largest hydropower producing province, at the peak of the drought, Sichuan's hydropower generation has plummeted by more than 50% of typical levels to 440 gigawatt hours, leading to severe power shortages. Factories have been ordered to either close down completely or to limit production, and households and services urged to save power. Other provinces in central China are implementing similar measures.

The new round of electricity shortages is exposing shortcomings in China's current grid management arrangements, as the drought-hit, hydropower-rich provinces have continued to export large volumes of electricity while rationing local consumption.

The shortages are leading to renewed calls for reforming the electricity system and, on the other hand, for more coal power capacity to be added. Both responses will likely be realised.

On paper, in light of reported peak demand and available capacity, the Central China Grid region should be able to comfortably meet local power needs, despite the present circumstances.

However, the region continues to export very large amounts of hydropower to eastern provinces under inflexible, fixed contracts. In Sichuan, according to Northern China Power University professor

Yuan Jiahai, 15 gigawatts (GW) of hydropower continues to be exported, while the capacity shortfall is 13GW.

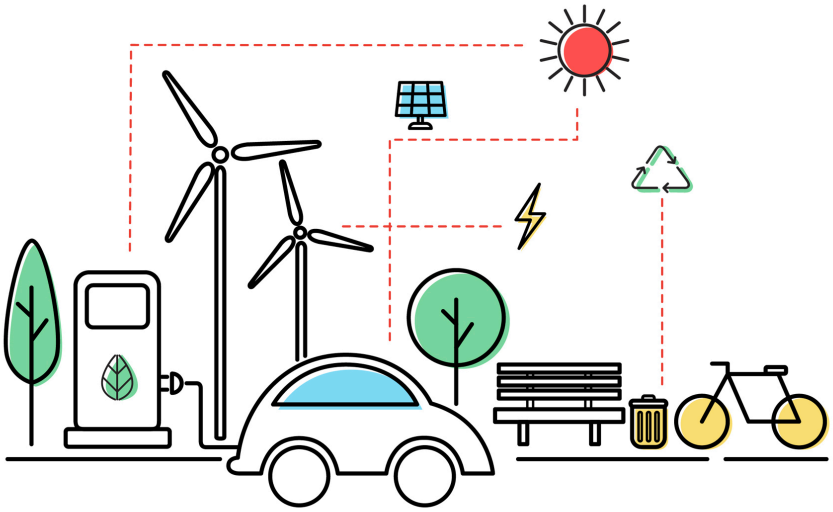
Furthermore, even taking into account the export commitments, the existing coal power capacity and available hydropower capacity would be sufficient to meet local peak loads, if all thermal power plants were operating at full power when needed and electricity was dispatched efficiently across provinces.

Sichuan's thermal power plants were reportedly generating at 12.75GW, while the province has 18.25GW of thermal power capacity. This indicates capacity utilisation of 70%, at a time when the shortage was at its worst, a situation where 100% would be expected.

The State Council's new stimulus package (see below) announced after electricity rationing started, includes 200bn yuan ($29bn) for state-owned power generators to 'ensure electricity supply', which could be designed to persuade plants to keep running despite the high fuel costs.

Full power supply was restored in Sichuan and Chongqing on 31 August, 17 days after electricity rationing first started.

The drop in hydropower output is leading to a surge in coal power generation to make up for the shortfall. Hydropower output will likely remain affected for months as reservoir levels are historically low.



However, the variations in hydropower output are not affecting the more fundamental trends that have seen emissions fall in the first half of the year.

Grid reforms

The Sichuan power shortage is once again revealing the rigid and inefficient way China's power grid is being operated. Since generation is not shared flexibly between provinces, the only way for local officials to avoid power shortages is to build very large amounts of 'dispatchable' capacity, which, in practice, means coal and gas.

The response to this shortage is, therefore, likely to include more coal-fired power projects in central China and could pave the way for inland nuclear power projects, which have been stuck for more than a decade.

But the situation also highlights the need to reform China's grid operation. Unless a new pricing system is established to consider coal plants' idle time when clean power is at its peak, these reforms face resistance because they would mean higher-cost coal power generators would operate for fewer hours, leading to large losses of revenue.

The widespread coal and electricity shortage last autumn resulted in fast-tracking changes to the power

market that had been stalled for years. It also created momentum for further reforms: a high-level policy on reforming electricity systems and, importantly, institutions is expected late this year.

Analysis of the situation in China's leading business publication Caixin highlights how the crisis could speed up power system reform even further. It argues that there has been an overemphasis on long-distance bulk electricity transmission, whereas integration of provincial grids has been neglected.

Making grid operation – particularly inter-province transmission – more flexible is the key to avoiding the kinds of electricity shortages currently being seen, according to a recent analysis by Draworld Environment Research Center and the Centre for Research on Energy and Clean Air.

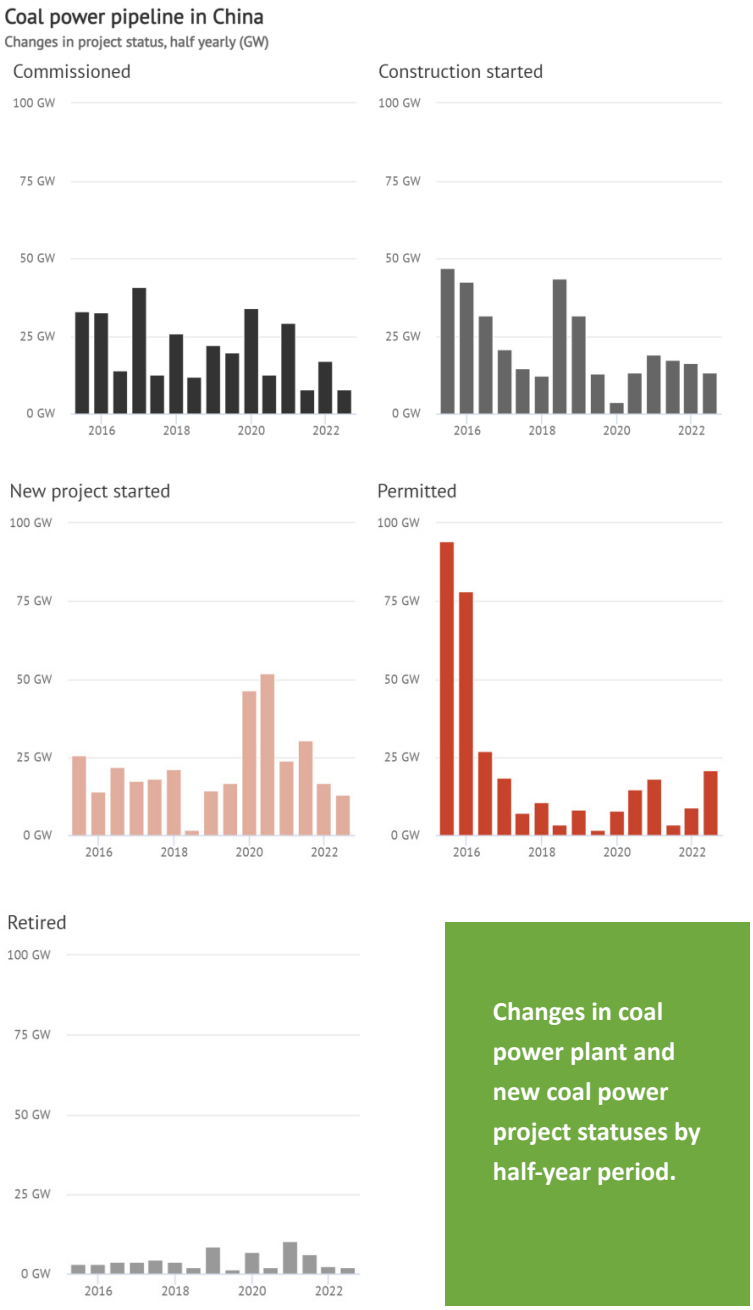
The analysis found that greater flexibility would reduce the need for coal-fired power as a backup during the transition to a lower-carbon grid, avoiding the need for 30GW of coal-fired capacity in the East China grid.

Coal investment

The amount of new coal power projects given government permits in the first six months of the year reached 21GW, the largest amount since 2016.

On the other hand, construction starts, completions and new project announcements slowed down. These project steps are controlled by the power companies, rather than the government.

These divergent trends, shown in the charts below, appear to reflect officials seeking to promote more capacity even as power firms go slow, as coal power has been unprofitable for the past year.



Changes in coal power plant and new coal power project statuses by half-year period.

The perceived need for more coal-fired capacity is also leading to a slowdown or even reversal of plant retirements. For example, two 300 megawatt (MW) units of Huaneng Liancheng power plant and two 330MW units of Datang Gansu Gangu power plant had been shut down, but were granted permission to restart in March this year.

On top of plans for new coal power capacity, there has also been an increase in announcements of new coal-based steelmaking capacity, compared with the level seen in the past two years.

More electric arc furnace capacity was also announced than in previous years, but this is mainly replacing older electric arc capacity, not shifting the mix of capacity, based on data compiled from provincial government websites.

Interest in building new electric arc furnaces might, nevertheless, indicate that the industry is starting to prepare for the shift implied by China's carbon targets.

Although a government plan for the steel industry has not yet been published, the target of peaking iron and steel emissions before 2025 has been confirmed indirectly. The China Coking Industry Association referenced this target in its CO_2 peaking action plan.

Steel is the largest emitting sector in China after power generation, so the industry's targets have a major bearing on the country's emissions peaking timetable and level.

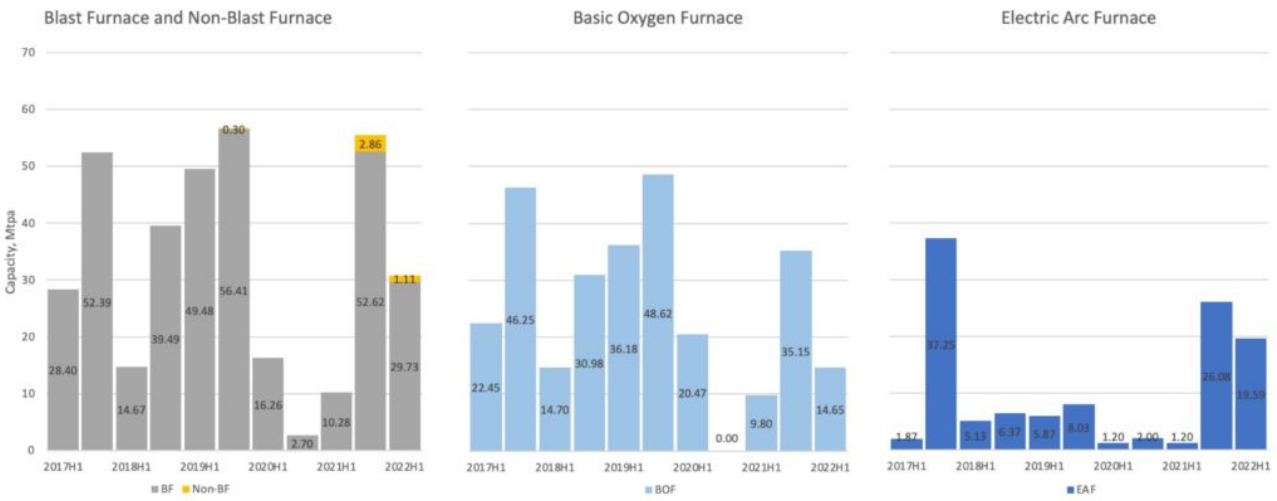
New stimulus

With the contraction in the real-estate sector and Covid controls taking a toll on consumer demand, China's GDP target for this year will be challenging to meet.

In response, the State Council – China's administrative authority – recently introduced a broad stimulus package worth 1 trillion yuan ($145bn), including measures to revive real estate and accelerate infrastructure projects.

This comes after stimulus policies introduced earlier in the year, which have had a muted effect.

Announced iron and steel 'capacity swaps', where older capacity is replaced with new plants, half-yearly by plant type.



This is because the real-estate slowdown strongly affects local government finances – and infrastructure stimulus relies heavily on local governments and local state-owned enterprises to increase spending.

While there is no explicit requirement to prioritise clean energy or other low-carbon projects in the new stimulus, in practice the project lists drawn up by provinces annually to prioritise investments do include many such projects, Indeed, a recent Greenpeace analysis found increases in the share of low-carbon energy investment planned by the provinces.

The latest stimulus push will, therefore, benefit both clean energy and fossil fuel projects, depending on each province's project mix.

The longer-term policy response from central government will determine whether the current fall in China's emissions marks the peak being reached earlier than targeted, or whether there will be another rebound before the ultimate peak late this decade.

A successful economic transition away from relying on real estate and infrastructure investment, combined with a continued build-up of clean energy, would be likely to result in an earlier peak in emissions.

By **Lauri Myllyvirta**

Data sources

Data for the analysis was compiled from the National Bureau of Statistics of China, National Energy Administration of China, China Electricity Council and China Customs official data releases, and from WIND Information, an industry data provider.

When data was available from multiple sources, different sources were cross-referenced and official sources used when possible, adjusting data from WIND Information to match.

CO_2 emissions estimates are based on National Bureau of Statistics default calorific values of fuels and IPCC default emissions factors. Cement CO_2 emissions factor is based on 2018 data.

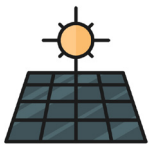
For oil consumption, apparent consumption is calculated from refinery throughput, with net exports of oil products subtracted.

When official releases did not provide changes from 2021 to 2022, these are calculated from the linked release and previous iterations of the same regular release, although a link is only provided to the latest one.

Online data charts and detailed data sources can be acquired in the original article.

Green bridge

Opportunity arising for greater China-EU climate cooperation to bring the global energy dilemma to an end.



As countries around the world respond to the risk of climate change while also navigating external and internal uncertainty, different regions, economic conditions, and political systems have produced different approaches on climate action. In this fluctuating terrain, China and the European Union's cooperation on climate actions, while bound by a shared vision, will display the following three hallmarks for the foreseeable future.

First, trends in climate action, which include matters of trade and technology, are coming into interaction with issues in other fields of multilateral cooperation and competition.

Climate change overlaps with international competition in trade and technology. Armed conflicts, as in the case of Russia and Ukraine, can also impact climate action. Recently, the EU and the wider Europe are more cautious about relations with China and more keenly looking for other green partners worldwide.

Second, the EU is establishing a new paradigm of global carbon emissions reduction, and based on this, shaping its edge in climate cooperation. After China pledged to peak carbon emissions before 2030 and achieve carbon neutrality before 2060, the EU has been closely watching China's emissions reduction efforts. The EU is also more cautious and conservative in trade and technological cooperation with China, and plans to set the standards and rules in the low-carbon field in advance, as represented by the draft of the carbon border adjustment mechanism. The draft will have a huge impact on global climate governance, spatially and temporally.

In the future international landscape of climate cooperation, some countries might formulate green emissions reduction policies, and develop technologies and standards in advance, use international trade policies to establish a framework for climate cooperation, formulate the rules of climate competition and cooperation, dominate the say over green and low-carbon development for a long time, and continue to consolidate their leading positions in green development.

Third, climate change remains the adhesive and booster of China-EU relations, of which their green partnership is an important part. China-EU cooperation will greatly reduce the risks and costs brought by uncertainty in the green transition.

For the EU, China is a like-minded partner, considering its ambitions in global environmental governance, determination to deliver on its commitment and ability of policy execution. The European Green Deal—a set of policy initiatives issued in 2019 by the European Commission with the overarching aim of making the EU carbon-neutral in 2050—echoes China's '1+N' policy system issued in 2021, showing that the two great minds are thinking alike on climate challenges and transition routes.

The China-EU green partnership is a window onto and highlight of bilateral relations, and climate cooperation enjoys broad prospects. On the one hand, China needs to prepare for the green 'threshold' such as the carbon border adjustment mechanism draft, which will drive up the environmental and technological innovation costs for Chinese companies doing business in the EU and the wider world. China needs to recognize how much the EU values establishing and safeguarding international low-carbon rules and standards. It also needs to accelerate the low-carbon transition at home and gain a bigger say over access to green industries.

On the other hand, China and the EU are facing a common transition dilemma and should strengthen coordinated development in the energy field. Both face a similar challenge on their energy transition paths: how to guarantee energy supply in the short term and reduce emissions in the long term, and rationally use both coal-fired power and renewable energy. This requires technological breakthroughs, forward-looking planning and action, and strengthened cooperation with a more inclusive and open attitude.

China and the EU can explore more areas of cooperation. The REPower EU program is gaining momentum, and investment in renewable energy has been increasing. Meanwhile, China boasts a leading edge in the production and consumption of wind and photovoltaic power, electric vehicles and batteries, has a huge market, and the cost is expected to fall. All this can serve as the basis for deepening cooperation between the two parties.

They can diversify the development cooperation mechanism and expand the mutual trust foundation in standards formulation and R&D. In the future, the two sides can continue to expand the scope of cooperation based on the international platform of sustainable finance.

They can also set up a special working mechanism to promote R&D cooperation in the energy sector. If necessary, the setting of such working mechanisms can be included in high-level dialogue, to increase the possibilities of cooperation, and create the foundation and opportunities for cross-border cooperation among Chinese and EU energy companies.

On the whole and from the long-term perspective, their respective green actions have established a broad platform for climate cooperation between China and the EU. They should better communicate their shared vision and consolidate the foundation of cooperation. While achieving their green goals respectively, their green partnership can make their economy more resilient, empower them to lead the world out of the energy dilemma, and promote global low-carbon transition and green recovery.

By **Meng Qi**
Senior project adviser of Greenpeace
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Clean energy innovation: China's story

Within just a few short years, clean energy technologies in China have moved from the margins to take up centre stage in the nation's carbon neutrality vision. Thanks to policies increasingly focused on technology innovation, strong support for funding and resources and institutional reforms, China has evolved into a global energy innovator. The IEA's recent report - Tracking Clean Energy Innovation: Focus on China -offers a detailed survey of China's clean energy innovation developments. This article presents some of the key points raised at the launch event in China, co-hosted by ECECP and IEA.

Over the past few decades, China has attached great importance to the development of clean energy as a key lever to boost productivity and bring about sustainable development. By the end of June 2022, renewable energy installed generation capacity had reached 1.1 TW in China, accounting for 45% of the capacity mix. China's grid-connected wind and solar capacity has rocketed 90-fold between 2012-21, and it now represents the leading market for wind and solar[1]. Despite the impact of Covid-19, the development of renewables has shown strong resilience: newly installed generation capacity maintained double digit growth in the first half of 2022, accounting for more than 80% of overall new capacity.

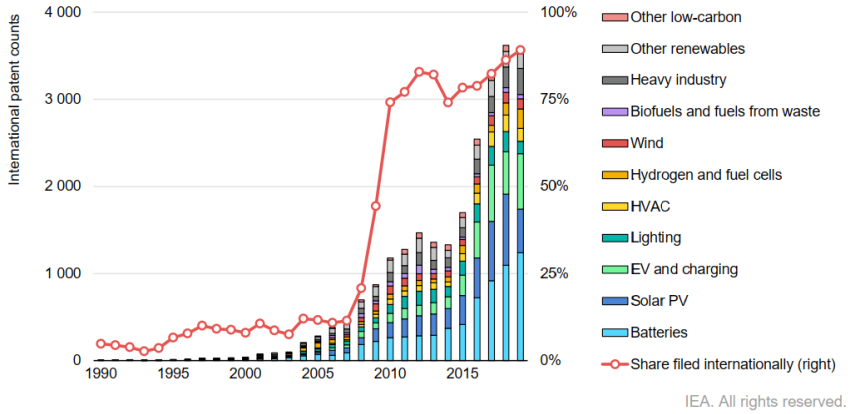
The rapid growth of China's clean energy development has been supported by its huge production capacity. Within two decades, China has become the leading manufacturer of renewable power equipment. According to Fang Xiaosong, Director of International Affairs Department of Electric Power Planning and Engineering Institute (EPPEI), Chinese companies supply about 70% of PV and 50% of wind equipment globally, making China a key player in the world's energy transition.

From 'Made in China' to 'Created in China'

China is widely recognised as the 'World's Factory'. While 'Made in China' used to be a synonym for cheap products, this stereotypical image has undergone radical change, thanks to the country's focus on technological development and backing for home-grown technology innovation. From solar PV and EV batteries to third generation nuclear reactors and the Experimental Advanced Superconducting Tokamak (EAST) nuclear fusion reactor, Chinese clean innovations are revolutionising the energy markets.

Behind this transformation lies China's improving innovative capacity, which can be partially explained by the emphasis on patenting and research output over the past few decades. The IEA report 'Tracking Clean Energy Innovation: Focus on China'[2] shows that the number of patents relating to energy in China has increased nearly 40-fold between 2000 and 2020. Quality has also improved. There has been a boom in international patents since the start of the decade, led in particular by strategic technologies such as batteries, solar PV and EV. China's share of international patenting is now ahead of the US and Europe, and equal with Japan. This reflects a strengthened global presence in energy innovation and a growing awareness of the need to protect homegrown innovation.

International patents in selected low-carbon energy technology areas filed by Chinese inventors, and share of these patents that are international (1990-2019)



Source: Tracking Clean Energy Innovation: Focus on China, IEA.

1. http://www.ce.cn/cysc/ny/gdxw/202209/20/t20220920_38114533.shtml
2. Tracking Clean Energy Innovation: Focus on China, IEA:https://www.iea.org/reports/tracking-clean-energy-innovation-focus-on-china

Another sign that China's clean energy innovation has become fully developed is its academic and research output. The innovation output of China's research institutions and universities, especially in the fields of natural sciences and new energy technology, ranks among the top in the world. A recent energy-specific bibliometric research report jointly published by Chinese Academy of Sciences and Springer Nature[3] shows that China accounted for more than 25% of global publications between 2015 and 2019 in fields such as solar, wind, biomass, geothermal, nuclear, hydrogen, energy storage and energy internet. The statistic is evidence of China's burgeoning bank of knowledge relating to clean tech.

The vitality of China's innovation in clean energy did not develop overnight: it is the result of decades of policy support built on robust institutional foundations, more resource investment in technology R&D, strong marketing pull levers, and most importantly close cooperation with global partners.

Establishing a solid institutional foundation for innovation

Over recent years, the Chinese government has attached great importance to the development of clean energy, and has provided solid legal foundations to support energy innovation. Gao Hu, Director General of Energy Economics and Development Strategy Centre at NDRC Energy Research Institute, notes that since China's Renewable Law come into force in 2006, development of its renewable energy industry has been guided by its Mid- and Long-term Plan for Renewable Energy. This long-term vision has been implemented by means of successive Five-Year Plans (FYPs), along with associated action plans and guidelines.

These FYPs and affiliated policy documents not only set clear priorities and timescales for China's energy innovation, catering for the realities of industry development, but also map out favourable industrial policies that support the flourishing of clean technologies and industries. They provide clear directions for innovation activities and reassurance for investors from the business sector.

'The legislation and overarching plans serve as an important basis and provide long-term certainty for overall society to embark on clean energy development and innovation. This helps to form a virtuous circle that continuously channels investment, talents and technical input toward innovation activities in an effective way.'

—— Gao Hu

Director General of Energy Economics and Development Strategy Centre, Energy Research Institute

3. New Energy Technology Research Opportunities And Challenges :http://english.casisd.cn/research/rp/202104/P020210414280971702407.pdf

Key energy innovation priorities outlined in China's recent five-year plans

	11th FYP (2006-2010)	12th FYP (2011-2015)	13th FYP (2016-2020)	14th FYP (2021-2025)
General innovation approach	Ramp up technology manufacturing to boost exports	Prime domestic markets and manufacturing innovations	Seek novel innovations in priority technology areas	Keep edge in manufacturing and prime breakthrough innovations
Key focus areas for energy innovation	Nuclear, coal, automobiles and new materials	Solar, wind, EVs and charging	Next-generation renewables, energy storage, new energy vehicles and batteries, smart power grids, and buildings energy efficiency	Next-generation batteries and new energy vehicles, hydrogen and fuel cells, advanced biofuels, CCUS, industry, and smart digital systems

Source: Tracking Clean Energy Innovation: Focus on China, IEA.

In the 14th FYP period (2021-25), the key policy documents released so far, including 14th FYP for Energy Technology Innovation[4] and the newly introduced sci-tech implementation plan supporting the carbon targets[5], show an increasing focus on clean energy innovation as a means of meeting China's dual carbon targets. While the technology innovation plan directly focuses on detailed measures to promote innovation of the energy sector, the sci-tech plan features ten specific actions across different sectors to promote technological breakthroughs and innovation in low-carbon transition. Together, these documents are facilitating the strong momentum behind clean innovation. According to Jean-Baptiste Le Marois, Energy Technology and Innovation Analyst at IEA, these overarching plans, coupled with China's coordinated decision-making process, allow the country to 'quickly align efforts from different actors, public, private and academia for example, so that everyone works towards national priorities, and this is a key strength in China'.

Substantial flows of resource in innovation

The process of bringing an innovative clean-tech from the research lab to the mass market can be a long one, and favourable policy framework alone cannot guarantee its success. Strong support from public and private funding, and R&D input, are vital as a new technology matures.

It has been shown that government R&D spending in a given field or industry, especially when sustained over long periods, correlates with future innovation in related fields[6]. According to IEA and Mission Innovation statistics[7], China is now second only to the USA for spending on energy research and development (R&D). Further energy R&D funding growth is now likely: during the 14th FYP it is set to grow 7% annually. In 2020, China invested USD 8.4 billion of public funds into energy innovation, and of this, the share taken by low-carbon budgets has risen to almost 50%. Although the country does still allocate

4. https://www.gov.cn/zhengce/zhengceku/2022-04/03/5683361/files/489a4522c1da4a7d88c4194c6b4a0933.pdf
5. https://www.most.gov.cn/xxgk/xinxifenlei/fdzdgknr/fgzc/zcjd/202208/t20220817_181987.html
6. https://geopolitique.eu/en/articles/renewable-energy-is-chinas-innovation-system-adequate-to-enable-a-low-carbon-transition/
7. See footnote 2.

substantial funds to R&D in fossil-fuel related technologies, the focus is now clearly on cleaner, efficient and flexible use of fossil fuels, in line with the national target of carbon neutrality.

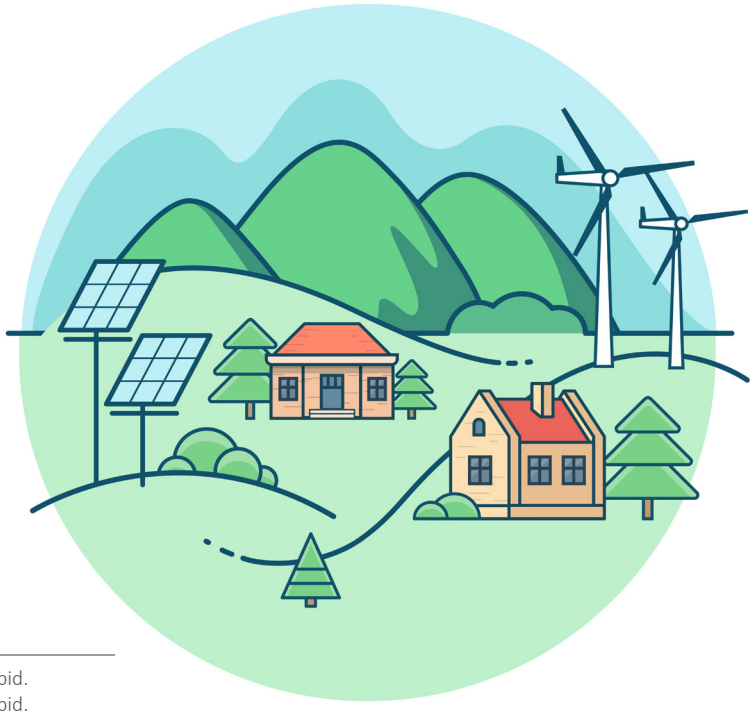
Private investment is supplementing the huge sums of public money. IEA estimates of R&D spending by globally listed companies suggest that Chinese companies –state-owned, private or with mixed ownership – spend more on energy R&D than in any other country[8]. In recent years, China has become a clean energy venture capital powerhouse, notably led by electric transport start-ups. These start-ups have reaped the benefits of support from government, state-owned enterprises and universities, with the latter injecting abundant well-educated R&D talent into the sector. These success stories open significant opportunities to position the country in global supply chains for EVs, and could provide a template for other low-carbon energy technologies[9].

Strong marketing pull levers for innovation

China's unique market and economic characteristics have enabled the development of effective marketing pull levers to promote innovation. The IEA research demonstrates that China's huge domestic market size, top-down implementation approach, export-oriented manufacturing, availability of cheap capital for industry development, and comprehensive industry-wide strategies all constitute incentives for innovators to keep developing new, better and cheaper technologies, and trigger feedback loops from users back to innovators[10].

As clean energy technologies are often costly and technically difficult at the initial stage, a lot of investment and breakthroughs are needed at this point. According to Gao Hu, China attaches great importance to clean energy demonstration projects as a key means of creating a domestic market in a project's early stages. Various demonstration initiatives, such as 'Golden Sun' in distributed solar and '10 City 1000 NEV' for deploying new energy vehicles, have opened up significant business opportunities that have enabled these technologies to develop rapidly at larger scale.

In addition, local governments in China are highly involved in the creation of a clean energy market. They have been taking integrated measures based on local conditions to implement national low-carbon strategies. This means that innovative clean technologies can be tested in diverse situations, which has made a significant contribution to the overall maturing and industrialisation of these technologies.



8. Ibid.
9. Ibid.
10. Ibid.

Where market creation interventions alone have not been enough to stimulate innovation, China has also established comprehensive industry-wide strategies to promote the rapid development of clean energy-related manufacturing industries, which help to bring down overall production costs further, and to encourage subsequent technology improvements.

International cooperation at the core

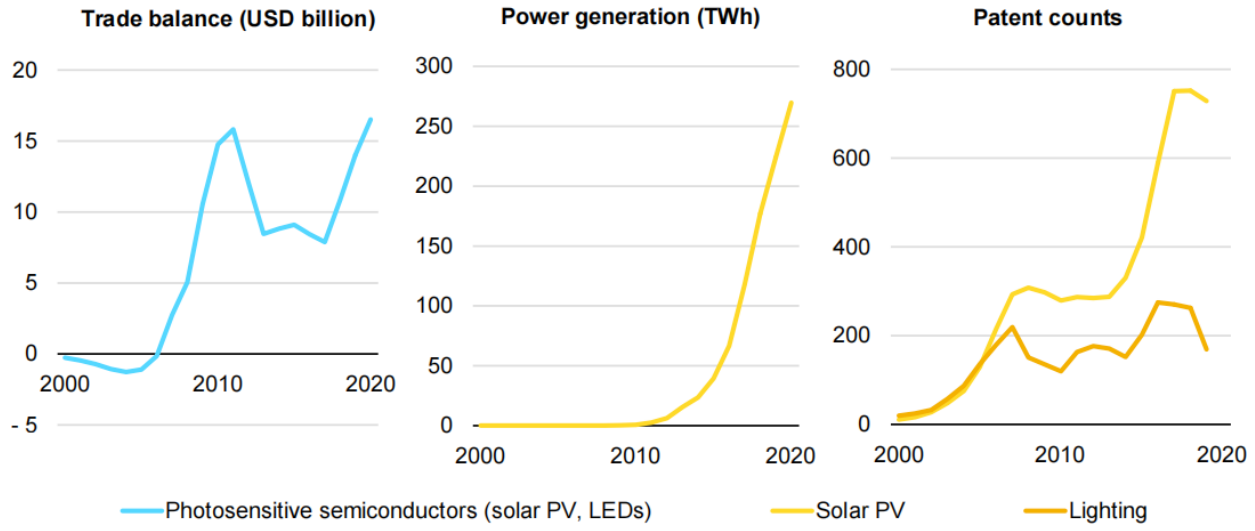
China's approach to clean energy used to be based on a technology catch-up approach, which would see secondary innovation based on imported technologies. However, with the growing R&D support for innovation, this situation has changed. Today, China has proactive and close collaborations with international innovators.

As observed by IEA, international collaboration has been at the core of China's innovation strategy in the past decades, by learning through joint ventures, investing abroad, or acquiring overseas firms. By collaborating with international partners, China's domestic innovation capabilities have seen steady improvement.

A classic case in point is the solar PV industry in China. China has successfully moved from being a technology importer to a global innovator. The start of its innovation journey was its development work with foreign universities and this was followed by joint ventures and domestic corporate partnerships, which further helped to achieve economies of scale and cost-based competition for export markets. China has now evolved into the global centre of PV innovation systems, with Chinese manufacturers regularly breaking the conversion efficiency records and making an increasingly important contribution to global patenting.

In recent years, China has proactively engaged in global innovation networks such as IEA Technology Collaboration Programmes, Mission Innovation and the Clean Energy Ministerial.

Trade balance in solar PV and LEDs, power generation from solar PV and patenting trends in solar PV and lighting technologies (2000-2020)



Source: Tracking Clean Energy Innovation: Focus on China, IEA.

According to Fang Xiaosong, China has established cooperative relationships with more than 30 international organisations and is working with over 100 countries and regions on clean energy projects.

Despite the strong engagement in international energy innovation partnerships, IEA research has found fewer collaborations between Chinese researchers and international peers in terms of filing for co-patented inventions or co-publishing scientific papers[11]. It is clear that more effort will be needed to deepen cooperation on innovation.

Much hope rests on accelerating clean energy innovation

Clean energy innovation is key to delivering the rapid transition needed to meet global climate targets, against a backdrop of rising policy ambitions and a changing technology landscape. Looking forward, about half of the emissions savings necessary will come from technologies that are currently at demonstration or prototype stage[12]. In addition, many of the clean energy technologies that are available today, such as offshore wind, new energy vehicles, green hydrogen and certain applications of CCUS, will need an innovative boost to bring down costs and accelerate deployment.

China's improving ability to innovate in low-carbon energy technologies is having an important impact on the course of the global energy transition. The country has grown into a global manufacturing powerhouse in several key technology sectors, including solar PV, wind turbines and electric vehicles. These Chinese stories of clean energy innovation illustrate some of the key evolving features of China's innovation ecosystem, which offer hope to global innovation efforts. They prove that faster innovation can be achieved where policy support is aligned, when targeted resources come from public and private sectors, and with enhanced international cooperation.

In the future, clean energy innovation will continue to play a crucial role in meeting China's climate objectives and especially in some hard-to-abate sectors such as heavy industry and long distance transport. Here, there is a limited array of available decarbonisation tools, and many more breakthrough innovations are still needed.

By **Daisy Chi**
ECECP editor

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11. See footnote 2.
12. https://www.iea.org/topics/innovation

Decarbonising the built environment: opportunities and challenges

Decarbonising buildings is central to the global transition towards a zero-carbon future. Buildings account for about 30% of CO_2 emissions due to the high energy use associated with building operations, including heating, cooling, and general electricity use[1]. Thanks to Covid-19, in 2020 there was a temporary 10% fall in CO_2 building emissions, but to meet the net zero goals set out in the Paris Climate Agreement further progress is crucial. Government policy will be central to success, reports ECECP intern Christina Hadjiyianni.

1. UNEP/IEA (2017) 'Towards a zero-emission, efficient, and resilient buildings and construction sector.' UN Environment and International Energy Agency. Global Status Report 2017.

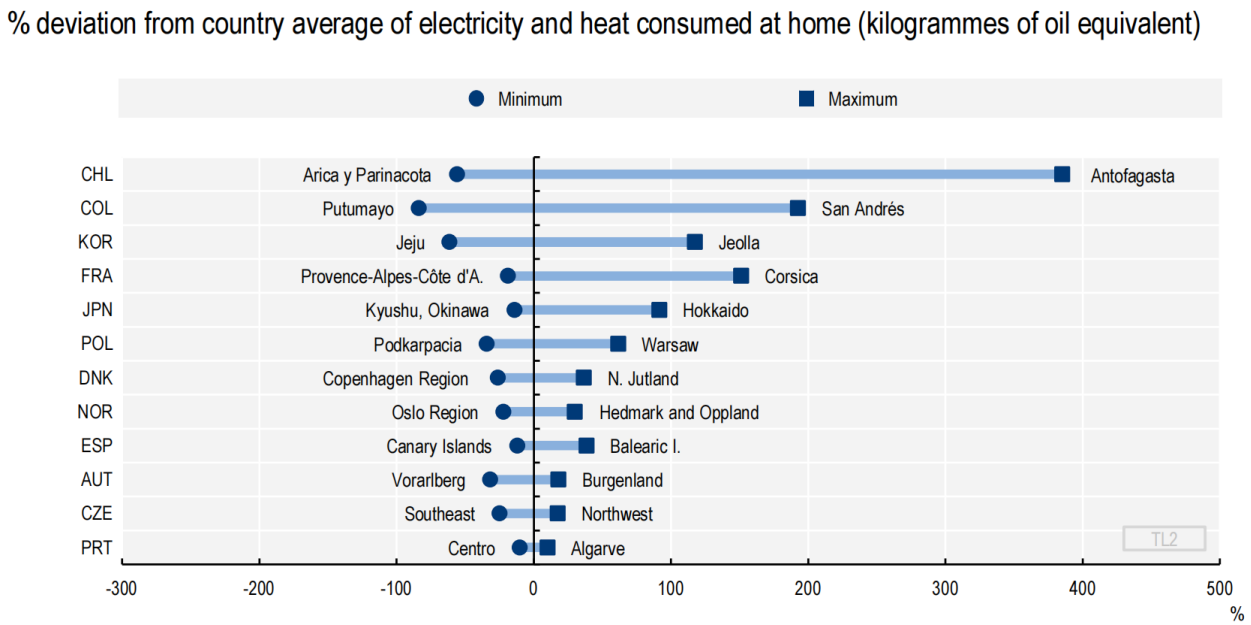
The OECD's recent survey of global cities and regions highlights how the built environment is crucial to climate targets and the types of actions needed to meet global targets and identifies the ways in which policy can help overcome key obstacles to accelerate change[2].

The importance of cities and regions for decarbonising buildings

Carbon emissions from buildings vary according to city and region, primarily because built environments differ, not only in terms of scale but also the local characteristics of buildings and their construction (Figure 1). Local city or regional policy environments affect building regulations in various ways and at different levels, including housing affordability, preparedness level among the construction industry, the level of energy poverty amongst the population, and the ability of local government and institutions to enforce and certify regulations.

Motivation, both political and personal, is the key factor driving decarbonisation. For example, the EU requires all new buildings to be nearly zero-energy by 31 December 2020[3]. However, the extent to which this directive reduces CO_2 emissions will depend on member states and whether they are motivated to put this into national regulations. Without mandatory reform, property owners are unlikely to rush to pay for energy-saving adaptations.

Figure 1. Disparities amongst large regions, in household energy consumption per capita (including electrical appliances, lighting, space heating and cooling, water heating, and cooking, but excluding transport and consumption outside the home), in 2018. (OECD, 2022)



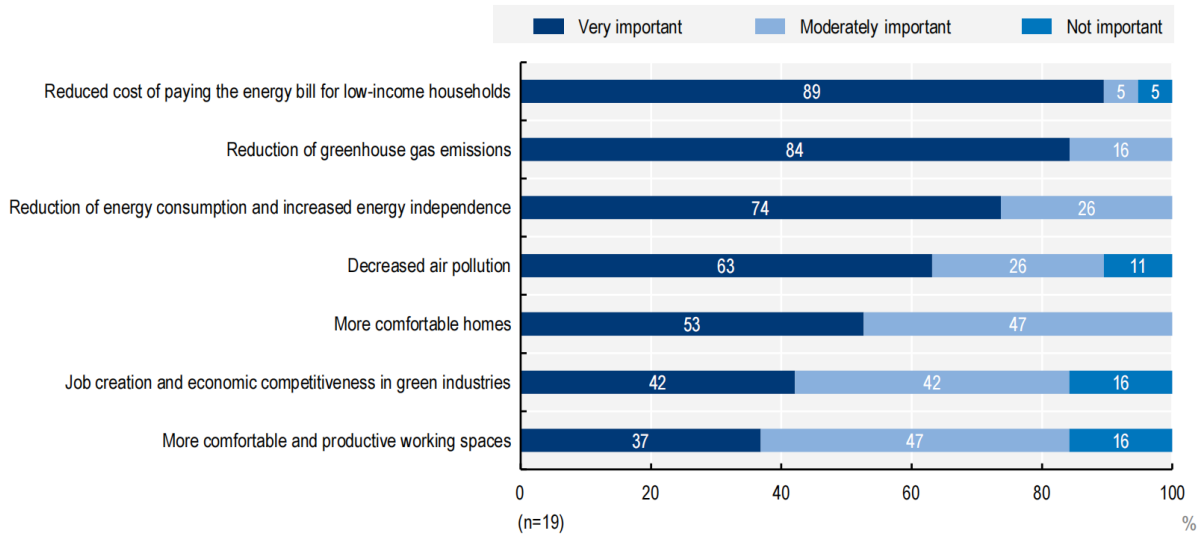
2. Starting point for this article was the recently published OECD report: OECD (2022), 'Decarbonising Buildings in Cities and Regions', OECD Urban Studies, OECD Publishing, Paris, https://doi.org/10.1787/a48ce566-en (accessed 29 July 2022).
3. European Commission (2019) 'Nearly zero-energy buildings' Available at: https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/nearly-zero-energy-buildings_en#:~:text=The%20Energy%20Performance%20of%20Buildings,energy%20after%2031%20December%202018. (Last accessed 13/09/2022).

This is further complicated by energy sources, climatic conditions, and seasonal temperature variations. Different types of energy are used to power buildings, ranging from low-carbon energy sources, such as renewables and nuclear power which tend to be used in cities, to carbon intensive sources primarily used in rural areas. This diversity affects the implementation of decarbonising strategies and the ability of governments to realise their net-zero building ambitions.

Cold regions and those that experience colder winters tend to have high building emissions due to fossil fuel heating. Meanwhile in warmer regions and during warmer weather, there is increasing use of energy-intensive air conditioners. Estimates indicate that cooling energy demands will triple by 2050, making cooling the fastest-growing use of energy in buildings[4]. Given that this trend is only likely to accelerate thanks to rising global temperatures, this is a critical challenge. There is a window of opportunity now for governments to promote and support the electrification of heating, using technology such as heat pumps, some of which can regulate temperatures during both summer and winter.

There are benefits that come alongside decarbonisation of buildings, and these may spark more interest in the transition (Figure 2). These include job creation - by 2030, the European Commission expects 160 000 green jobs to be generated in construction. The improvement to energy efficiency is likely to prompt mental and physical health benefits as air quality improves, with a probable reduction in cardiovascular and respiratory disease, and fewer cases of chronic

Figure 2. Primary benefits of energy efficiency in buildings (OECD, 2022).



Source: OECD Survey on Decarbonising Buildings in Cities and Regions.

4. IEA (2018), The Future of Cooling: Opportunities for Energy-efficient Air Conditioning, International Energy Agency, https://iea.blob.core.windows.net/assets/0bb45525-277f-4c9c-8d0c9c0cb5e7d525/The_Future_of_Cooling.pdf (accessed 28 July 2022).

stress and depression[5]. The report also states that energy efficiency improvements may eventually make energy more affordable, thanks to the resulting reduced energy consumption. This point is particularly relevant in the context of the current energy price spike that has followed the onset of armed conflict in Ukraine.

Key roles and actions of cities and regions

Cities and regions are working to decarbonise buildings in four main areas: regulation, financing, planning and co-ordination and engagement of local actors. In terms of regulations, ambitious policy measures are being introduced that affect building energy codes and public buildings and can be scaled up towards 2050 targets. A wide array of tools and frameworks for building decarbonisation already exist and can be leveraged to achieve the EU targets. They include mandatory building energy codes, strict requirements for public buildings or buildings on public land, restrictions on the sale and rent of the worst-performing buildings, and carbon emission caps for large buildings.

Most cities and regions already have strategies in place, but implementation is a challenge because of financing issues and the fact that compliance with regulations is often voluntary. Policy makers now have the opportunity to broaden the coverage and enforcement of energy codes to achieve net-zero building stock.

However, it will be difficult for new and existing buildings to be covered under one policy framework, whilst also ensuring housing affordability. Hence, keeping policy local and integrating these actions into national plans is important. Effective financing, along with new technologies and building models, are crucial to success. Financial incentives to meet the high upfront costs include tax breaks, low-interest mortgages, and grants. Such measures, in parallel with stricter regulations, may encourage individual property owners to invest in building renovations. The measures would also help reduce the burden of these regulations on vulnerable households.

OECD indicates that citizen engagement is already high at

5. IEA (2019), Multiple Benefits of Energy Efficiency: Health and Wellbeing, International Energy Agency, https://www.iea.org/topics/buildings (Last accessed 01/08/2022).

the local level, but there is room to expand private sector engagement and support for local industry in terms of financing. Further diversification of financing would help meet the needs of property owners with locally available resources. This can be done through new business models and innovative programmes, as demonstrated by the Netherlands' Energiesprong programme (Textbox 1). Another European model is 'The Brussels Capital Region', in Belgium, a 'one-stop-shop' for energy efficiency renovation[6]. Such programmes also create local jobs and provide training opportunities.

Challenges to decarbonisation

The COVID-19 crisis, as well as social challenges exacerbated by the pandemic (economic downturn, poverty, and healthcare availability) are likely to have a mixed impact on decarbonisation of buildings (Figure 3). Negative impacts, stemming from the economic downturn and rising public deficit, include less demand for private energy efficiency investment and less public expenditure. At the same time, the rise in teleworking, as well as the economic downturn and rising cost of living in the wake of the pandemic, have led to more demand for energy efficiency and home improvements.

Textbox 1. Netherlands Energiesprong programme: Net-zero energy housing through energy renovations

The Energiesprong programme achieved net-zero energy by consolidating dispersed renovation needs in social housing, which created sufficient market size for private investment and led to mass application of low-cost production technologies.

Key information:

- 5 000 homes renovated (tested in France, UK, and New York State).
- Uses new technologies, e.g., prefabricated facades, insulated roofs with solar panels, smart heating, and ventilation.
- Aims to complete renovation within 10 days.
- Ensures long-term performance warranty on energy performance.
- No extra costs for residents; financed by future energy cost savings. Budget for planned maintenance/repair for 30 years.

Key lesson: Programme brought together multiple stakeholders (e.g., the construction industry, housing authorities, financial institutions, and energy utilities) and provided a comprehensive policy package for deep energy efficiency renovations.

Results: Yet to be evaluated. Currently supported by the EU, national governments, and local authorities, and is not yet viable without public subsidies - needs to find market solutions to finance itself. Greater challenges confront this model in the owner-occupied housing market since diversity of building types would make mass produced solutions more difficult.

Investment costs: From EUR 70 000 to over EUR 100 000 per residential unit. Estimated cost for a feasible business case: EUR 40 000.

Visscher, H. (2020), 'Innovations for a carbon free Dutch housing stock in 2050', IOP Conference Series: Earth and Environmental Science, Vol. 588.

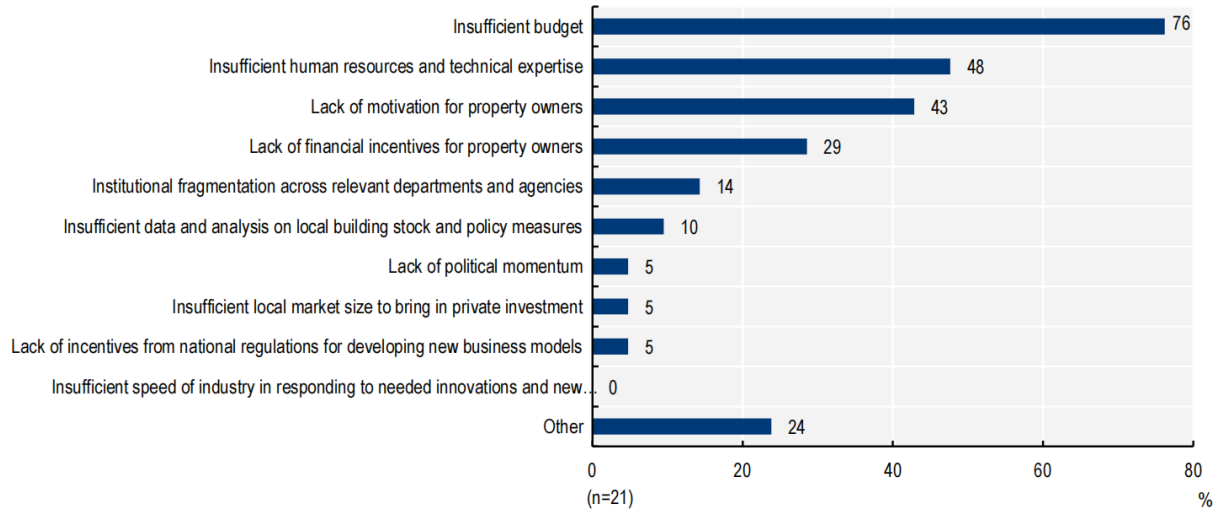
6. Renovate Europe (2020), 'Building renovation: A kick-starter for the EU economy', https://www.renovate-europe.eu/ (Last accessed 13/09/22).

A lack of data on monitoring building energy efficiency, linked to a lack of financing, is making it difficult to track progress. Policymakers must find a way to overcome these financial barriers to building decarbonisation, whilst also taking advantage of the opportunities in the current policy environment. For example, some COVID-19 recovery plans already include building energy efficiency measures.

Decarbonising buildings beyond Europe: Chinese cities and regions

In China, 55% of the population lives in cities, and yet 80% of building sector energy use comes from residential, commercial, and public buildings[7]. China's national 13th Five-Year Plan (2016-2020) includes policies to improve energy efficiency and reduce CO_2 emission. These policies are echoed in the current 14th FYP[8] (2021-2025). Four Chinese cities, including Beijing, Fuzhou, Qingdao, and Shanghai Changning, demonstrate policy implementation in different areas. Many building energy efficiency policies are driven by government through incentives, subsidies, standard development etc., and have built on experience and best practice from international cities such as Stockholm and Paris4.

Figure 3. Key challenges faced by cities and regions in decarbonising buildings, as well as an indication of the most pressing ones according to the survey findings (OECD, 2022).



Source: OECD Survey on Decarbonising Buildings in Cities and Regions.

7. Feng, W., Lu, H., Liu, X., Zhou, N., Letschert, V., Sherlock, L., Hou, J., and Wang, X., (2019) Building energy efficiency policy in Chinese cities and comparison with international cities. ECEEE Summer Study 2019. Available at: https://www.eceee.org/library/conference_proceedings/eceee_Summer_Studies/2019/3-policy-and-governance/building-energy-efficiency-policy-in-chinese-cities-and-comparison-with-international-cities/ (Last accessed 13/08/2022).
8. UNDP (2022) 'Issue Brief- China's 14th Five-Year Plan' https://www.undp.org/china/publications/issue-brief-chinas-14th-five-year-plan (Last accessed 01/09/2022).

In China, however, the success of these policies (energy efficiency and cost-benefit analysis) cannot yet be determined, as there is a lack of data due to city policies still being in the implementation stage. Some key innovative policies in place across Beijing and Fuzhou are outlined below.

Key innovative building decarbonisation policies in place across Beijing and Fuzhou

- **Beijing:** First 'ultra-energy building' demonstrations (≥15% of current efficiency standard). CNY 90,910,879 (EUR 13 million) spent on subsidies to support nine demonstration buildings, highlighting examples of best practice. Success 'could prepare the city government for implementation of policies that mandate… ultra-low energy buildings… aligning with similar policies in other major cities around the world' (p.518, Feng et al., 2019). Knowledge-sharing through Energy Foundation China, C40 China Buildings Program, and other city-networks.

- **Fuzhou:** Renewable energy demonstration buildings, funded by central government, are utilising: 'solar-thermal hot water integration' and/or 'ground-source heat pumps'. City policy also states that 'residential buildings 12< floors and public and commercial buildings, e.g., hospitals, schools, and hotels, must install centralized renewable solar hot water system' (p.515, Feng et al., 2019).

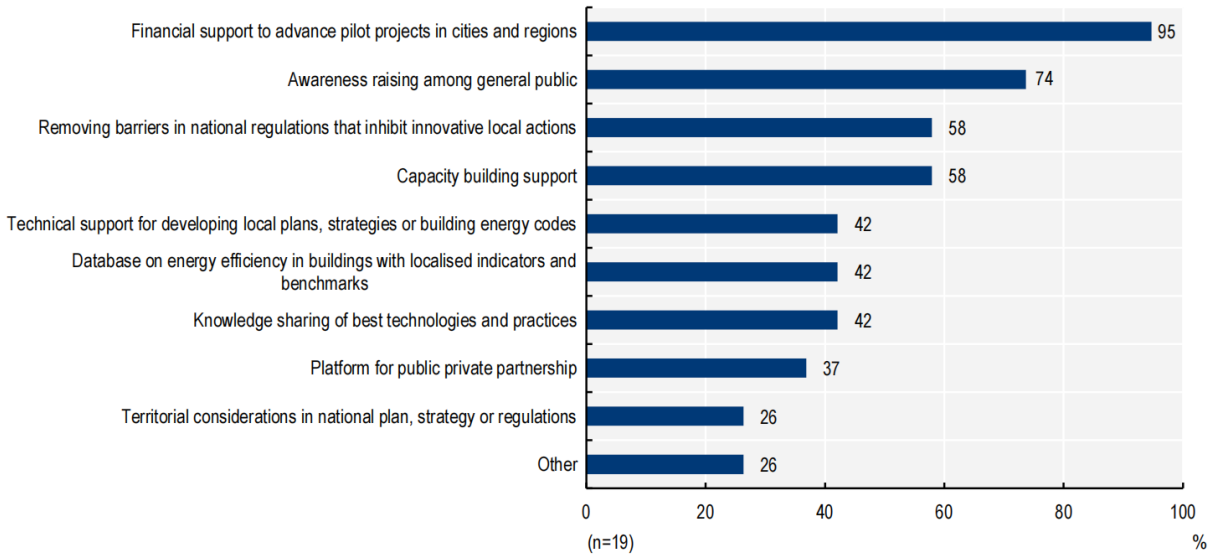
For further information see Feng et al., 2019

Looking ahead: key policy guidance

OECD highlights the importance of national government in promoting a 'whole-of-government and multilevel governance approach to decarbonising buildings', and this includes considering local contexts in national policy and encouraging local innovation. Support at the subnational level is also crucial, particularly targeted at efforts to assess progress by, for example, working to develop subnational databases and indicators, given that lack of data is a key challenge (Figure 4).

National policy frameworks for building decarbonisation are essential to long-term success and must consider multiple policy areas, such as housing and building policy, energy policy and environmental policy. Effective regulatory frameworks must also provide enough support and resources to allow cities and regions to meet their targets: 74% of cities and regions report a lack of regulatory support.

Figure 4. Types of national government support required by cities and regions.



Source: OECD Survey on Decarbonising Buildings in Cities and Regions.

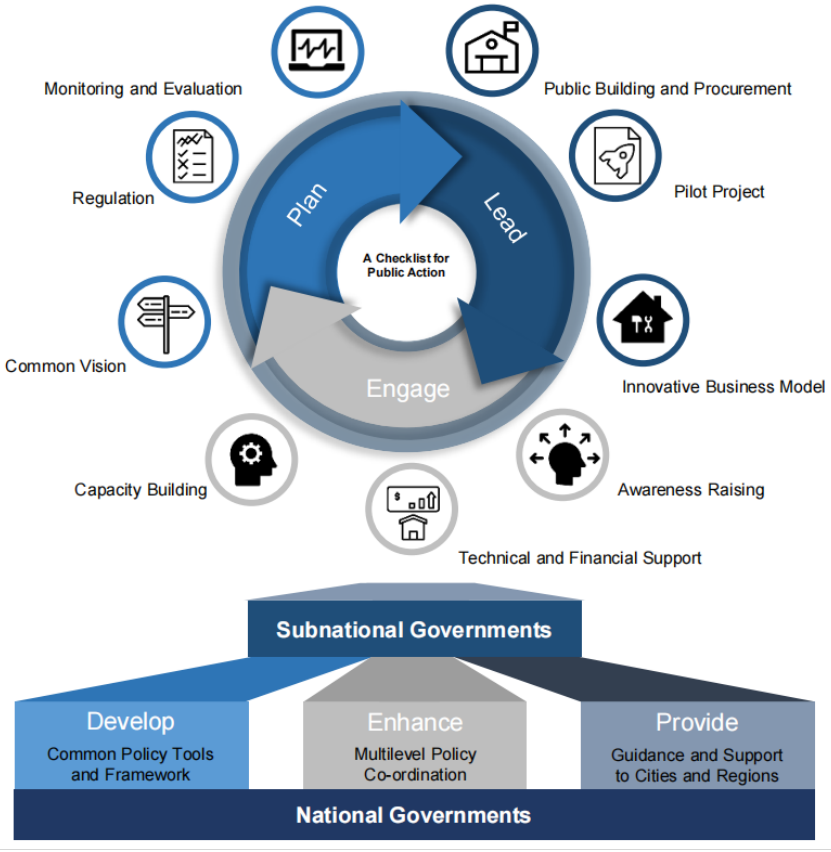
Checklist for public action

To decarbonise buildings in cities and regions government must build on the priorities in the 'checklist for public action'. The OECD has identified three national policy recommendations and nine subnational policy recommendations that help governments to realise building decarbonisation, as illustrated in Figure 5.

These actions will help cities and regions to meet global building decarbonisation targets, and will guide policy developments to overcome key obstacles that stand in the way of rapid decarbonisation.

By **Christina Hadjiyianni**
ECECP Intern

Figure 5. Illustration of OECD recommendations - build on key findings and suggest three national policy recommendations and nine subnational policy recommendations, grouped into three pillars that correspond to the key roles of cities and regions.



Monthly News Round-Up

ECECP highlights the key energy news headlines from the past month in the EU and China

EU Commission proposes emergency market intervention to reduce energy bills for Europeans

On 14 September 2022, the EU Commission proposed an emergency intervention in Europe's energy markets to tackle recent dramatic price rises. This includes exceptional electricity demand reduction measures, including a binding goal to reduce energy use by 5% at peak consumption times, and measures to impose a windfall tax on the energy sector that will be used to offset bills for end users.

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European Parliament approves new RES and energy efficiency target for 2030

The European Parliament has voted to raise the share of renewables in the EU's final energy consumption to 45% by 2030 (the current EU target is 32%), under a revision to the Renewable Energy Directive (RED). The legislation sets individual targets for sectors such as transport, buildings, and district heating and cooling. The EU Parliament has also given its backing to the revision of the Energy Efficiency Directive (EED), the aim of which is to reduce final energy consumption by at least 40% by 2030.

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EU hits 80% gas storage target early despite Russian import cuts

The EU has filled its gas storage to at least 80%, well ahead of its November deadline. The achievement comes despite continued disruptions to gas supplies from Russia, EU energy chief Kadri Simson announced on 31 August 2022. Storage in Belgium, Czechia, Denmark, France, Germany, Italy, Poland, Portugal, Spain and Sweden is already above 80%.

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EU records record summer solar power generation

Global energy think tank Ember Climate has produced a study showing that EU countries have generated record levels of solar power during the summer months of 2022. It found that 12% of electricity generated by Member States came from solar power. The EU-27 produced 99.4 TWh of solar energy between May and August 2022, an increase of 22 TWh over the same period last year.

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Commission approves Dutch scheme to compensate energy-intensive companies for indirect emission costs

Under EU state aid rules, the European Commission has approved an EUR 835 million Dutch scheme to partially compensate energy-intensive Dutch companies for higher electricity prices resulting from indirect emission costs under the EU ETS. In order to qualify for compensation, beneficiaries have to reduce their greenhouse gas emissions by 3% per year relative to 2020. The support measure aims to reduce the risk of 'carbon leakage', where companies relocate their production to countries outside the EU with less ambitious climate policies, resulting in increased greenhouse gas emissions globally.

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Groups of EU countries pledge to boost offshore wind power capacity

On 30 August 2022, eight EU countries bordering the Baltic Sea agreed to increase offshore wind power generation capacity seven-fold by 2030 in order to decrease dependency on Russian energy. On 12 September 2022, members of the North Sea Energy Cooperation (NSEC) announced their intention to expand offshore wind power generation capacity in the North Sea to 76 GW by 2030 and to achieve 193 GW and 260 GW by 2040 and 2050 respectively.

+ More

G7 finance chiefs agree on Russian petroleum products price cap

In a bid to cut Russian revenues from energy during the war in Ukraine, the G7 finance ministers have agreed a global price cap on Russian oil and petroleum products. The cap will allow maritime transportation services, including insurance and finance, to proceed only if Russian cargoes are purchased at or below the price cap level.

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First rules of Germany's new 2023 RES Act enter into force

The first acceleration measures of the revised Renewable Energy Sources Act (EEG) now apply: Renewable energy will take greater priority in all decisions in the future. Additionally, there is more funding available for rooftop PV installations.

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Berlin kicks off EUR 3 billion district heating subsidy scheme

The German government has announced the start of an EUR 3 billion subsidy scheme that will be in place until 2026. It will support the construction of district heating grids that use at least 75% renewable energy. The scheme aims to boost two specific technologies: geothermal energy and large-scale heat pumps.

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German government announces fifth floating LNG terminal

Berlin has arranged for installation of a fifth floating storage regasification unit (FSRU) terminal in order to increase the amount of liquefied natural gas (LNG) the country is able to import. The move may also benefit the country's landlocked neighbours. Each of the five mobile LNG terminals will be able to provide a minimum of 5 billion cubic meters (bcm) of gas per year, and together could meet about one third of current gas demand in Germany.

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UK Prime Minister announces GBP 2 500 cap on household energy bills

New UK Prime Minister Liz Truss announced in her first policy speech to the House of Commons that energy bills will be capped at GBP 2 500 for typical households. Ms Truss also said she would support businesses with their energy costs for the next six months. She opposes a windfall tax on oil and gas companies, rather choosing to focus on developing domestic energy resources. This includes a plan to award 100 new exploit licences.

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UK onshore wind pipeline grows 4GW in a year

According to a new report by RenewableUK (formerly the British Wind Energy Association), the pipeline capacity for onshore wind projects in the UK, including projects which are operational, under construction, consented or being planned, has gone up from 33GW in October 2021 to 37 GW. The majority are located in Scotland, accounting for 78% of the total.

+ More

Blue hydrogen may drive UK to exceed its 2030 hydrogen target

According to a new report by energy group Westwood, UK is forecast to exceed its 2030 target for blue hydrogen projects, which now account for nearly 13 GW capacity of total announced hydrogen projects. The report shows that growth in the deployment of hydrogen projects will be mainly driven by blue hydrogen.

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Finnish government announces aid package to tackle rising energy prices

The measures, which are part of the government budget plan for 2023, include a VAT reduction on electricity from 24% to 10% between December 2021 and April 2023, as well as a compensation scheme for high energy bills that introduces income tax deductions.

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Oil giants sign landmark cross-border CO_2 transportation and storage deal

Northern Lights – owned by Equinor, Shell and TotalEnergies – has signed the world's first commercial agreement on cross-border CO_2 transportation and storage with fertiliser maker Yara, to transport CO_2 captured from an ammonia and fertiliser plant in the Netherlands and permanently store it under the seabed off the coast of Norway.

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Implementation plan to reach peak carbon emissions in the industrial sector announced

On 1 August 2022, China issued an implementation plan which provides the roadmap for the industrial sector to reach peak carbon emissions. By 2025, it is intended that energy consumption per unit of added value of industrial enterprises above a designated size should drop by 13.5% in 2025 compared with 2020, while emissions should peak before 2030. Detailed measures to promote electrification, energy efficiency, green production, a circular economy as well as green technologies across the industrial sector are also included.

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China to establish Carbon Emissions Accounting System in 2023

The timetable for the construction of China's carbon emissions statistical accounting system has now been published. On August 19 2022, China issued an implementation plan for accelerating the establishment of a unified, standardised carbon emission accounting and verification system at national and provincial level. This will prioritise the nation's most emissions-intensive sectors, including the power industry and key industrial sectors such as steel, chemical and construction, etc.

+ More

China issues sci-tech roadmap to support carbon reduction

On 18 August 2022, China published an action plan to support the country's carbon reduction goal by means of science and technology measures between 2022-30. The plan features ten specific actions to promote technological breakthroughs and innovation in green and low-carbon energy transformation, low- and zero-carbon industrial process reengineering, low-carbon construction and transport, negative carbon and non-carbon dioxide GHG emissions reduction, among others.

+ More

New action plan on promoting the green and low-carbon development of power equipment

China has unveiled an action plan to expedite the green and low-carbon development of electrical equipment, which includes six actions across 10 key electrical equipment fields. The plan aims to foster a marked improvement in the supply structure of China's electrical equipment within five to eight years, the aim being to enhance the efficiency of its power grid.

+ More

China identifies 23 climate investment and financing pilots

Nine departments have jointly issued a notice identifying 23 local climate investment and financing pilots including Baoding, Taiyuan and Lanzhou, in an initiative to explore a number of models and successful practices that can be replicated in channeling more investment and financing towards climate and energy transition activities.

+ More

Strong return of coal-fired power investment

The annual report from the China Power Construction Association reveals that coal-fired power investment in 2021 saw a 24.5% year on year increase, reaching CNY 70.7 billion. This was the first year of growth since 2017. China Electricity Council also reports growth in the coal sector: CNY 40.5 billion was invested in coal-fired power projects in the first seven months of 2022, up 70.2% compared to 2021.

+ More

Ten nuclear reactors approved so far in 2022

Chinese Premier Li Keqiang has approved the construction of Phase II of Zhangzhou and Phase I of Liangjiang nuclear power plants, with a total investment of CNY 80 billion. Together with the three nuclear power projects permitted in April 2022, ten nuclear reactors have been approved in 2022, representing a surge in nuclear power development.

+ More

Virtual power plants gain steam amid China's rising power demand

Virtual power plant (VPP) developments have been incorporated into China's Five-Year Plan for building a modern energy system. VPP technology is also featured in energy development outlines as well as the carbon-neutrality schemes of more than ten provincial-level regions, including Beijing, Tianjin and Shanghai.

+ More

China PV product exports rise by 113% in H1 2022

Driven by continued strong demand in the global PV market, China's exports of PV products has peaked again. In the first half of 2022, total exports of PV products, including silicon wafers, cells and modules, was about USD 25.9 billion, a year-on-year growth of 113%. In particular, PV module exports reached a total capacity of 78.6 GW, up 74.3%.

+ More

Steel sector becomes the biggest buyer of green electricity

BloombergNEF's latest ranking highlights the most active clean energy sellers and corporate buyers in China, and reveals a growing interest in green power purchasing and more diverse selection of industrial players. In 2022, the top five buyers of energy consumed six times more green power than in 2021. The steel sector stands out as the leading buyer of green energy.

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Sinopec launches China's largest CCUS facility

China's largest carbon capture, utilisation and storage (CCUS) facility, in eastern Shandong province, was brought online on 29 August 2022. The facility captures CO_2 produced from its Qilu refinery during a hydrogen-making process, and then injects it into 73 oil wells in the nearby Shengli oilfield. Sinopec Corp plans to build a further two similar size pilots in Huadong and Jiangsu oilfields by 2025.

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World's first carbon dioxide+flywheel energy storage project completed

The world's first carbon dioxide+flywheel energy storage demonstration project was completed by Dongfang Electric Corporation (DEC) in Deyang of Sichuan province on 25 August 2022. Using 250 000 cubic meters of CO_2 as circulating working medium for charging and discharging, the project has an energy storage scale of 10-20 MWh and can store 20 000 kWh of power within two hours.

+ More

First China-Finland energy cooperation demonstration project launches in Guangzhou

Guangzhou Nansha Micro Energy Grid Demonstration Project launched on 17 August 2022 in the Nansha District of Guangzhou, representing the first China-Finland energy cooperation demonstration project. Using a geothermal storage solution and a solar thermal heating system, the project enables clean energy production and seasonal thermal energy storage for more efficient energy utilization. Three Finnish companies including Convion, Savosolar and Heliostorage are involved in the project.

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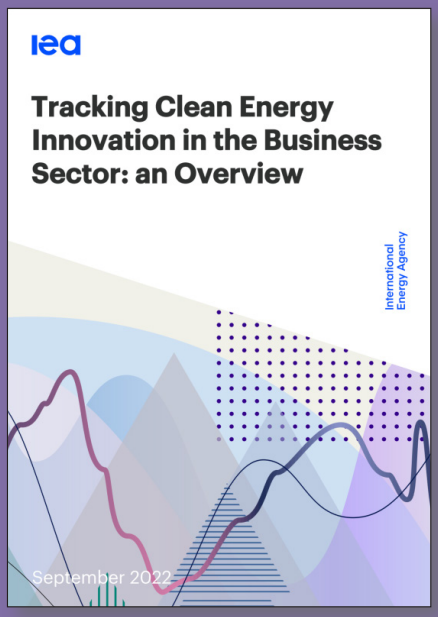
Featured Publication



Tracking Clean Energy Innovation in the Business Sector: An Overview

This report, newly published by the IEA, presents a summary of the options available to governments for measuring the clean energy innovation activities of the business sector. It illustrates the options with examples from around the world and lists some of the advantages, disadvantages and inherent trade-offs.

The business sector is a major player and tracking its activities is vital to any overview of the clean energy innovation landscape. However, information about private energy innovation is often much less readily available and less reliable than that for the public sector.

The report highlights the value of increased international cooperation on methodologies, reflecting the more general importance of cross-border collaboration to accelerate clean energy innovation.

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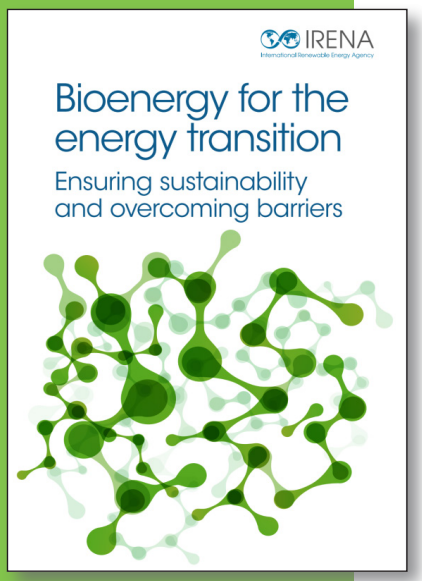

Bioenergy for the Energy Transition: Ensuring Sustainability and Overcoming Barriers

Bioenergy currently accounts for two-thirds of all renewable energy consumption worldwide. Modern applications of bioenergy can play a major role in the energy transition, especially in sectors with limited renewable alternatives.

This IRENA report provides an overview of the challenges and related policy measures required to scale up the deployment of key bioenergy applications. It assesses potential sustainability aspects and highlights the significance of a policy framework that includes: sustainability-based target setting and long-term planning; cross-sector co-ordination for bioenergy; sustainability governance supported by regulations and certification schemes; and integration of bioenergy policy making with the UN's Sustainable Development Goals (SDGs). The report also provides policy recommendations for overcoming barriers to bioenergy deployment for clean cooking, heating in buildings, electricity production, and both industrial and transport applications.

→ *Read More*

Repositioning CCUS for China's Net-Zero Future

China has committed to achieving carbon neutrality before 2060. This represents a serious pledge from top-level leadership, setting an ambitious agenda for the next 40 years. If carbon capture, usage and storage (CCUS) is to play the critical role mapped out for it in China's net-zero effort, more work needs to be done to achieve the technology suite's potential.

This report from the Global CCS Institute reviews the status of carbon targets, examines the trends and challenges for CCUS in China, and provides an analysis of the push for low-carbon industrial transformation. The authors advocates international cooperation in order to accelerate the commercial deployment of CCUS in China. Through knowledge sharing and joint projects, international cooperation can enhance public acceptance, close technological gaps, realise broader collaboration, and reduce costs and risks, the report claims.

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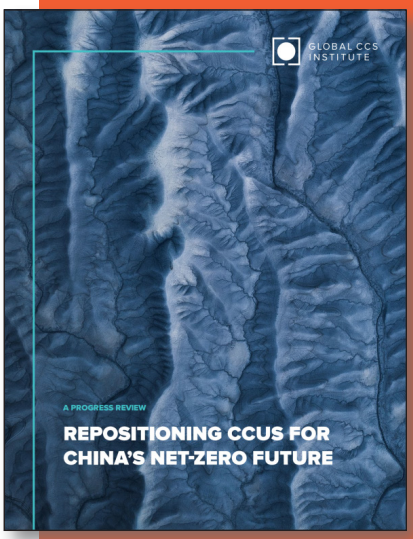

The Net-Zero Industry Tracker

This first edition of the Net-Zero Industry Tracker by the World Economic Forum, in collaboration with the Accenture consultancy, establishes a new framework to monitor and support the progress of heavy industry towards net zero. The framework follows an holistic approach and is designed to track industries' 'net zero performance' alongside their 'net-zero readiness'. It identifies a set of standard metrics to assess emissions reduction and energy efficiency, so arriving at an evaluation of performance overall.

The report aims to provide companies, policymakers and consumers with the necessary transparency to ensure that action and investments are targeted and balanced.

→ *Read More*

Pursuing a low-carbon rural energy transition in China and Germany

The rural energy transition often receives less attention than the low-carbon transition in urban or industrial sectors, despite the enormous potential for decentralised renewable energy generation and high rates of self-sufficiency. This report, by the Sino-German Energy Transition Project, describes case studies in two rural communities - Dongqiaotou in Shandong province, China, and Schwaig in Bavaria, Germany. The authors examine how to accelerate the clean energy transition in rural areas, and how communities can become more self-sufficient in their energy supply, with enhanced resilience and reduced network costs.

The report found that distributed energy, combining solar energy, heat pumps, and smart charging of electric vehicles, can offer benefits for rural energy transition in China and Germany.

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