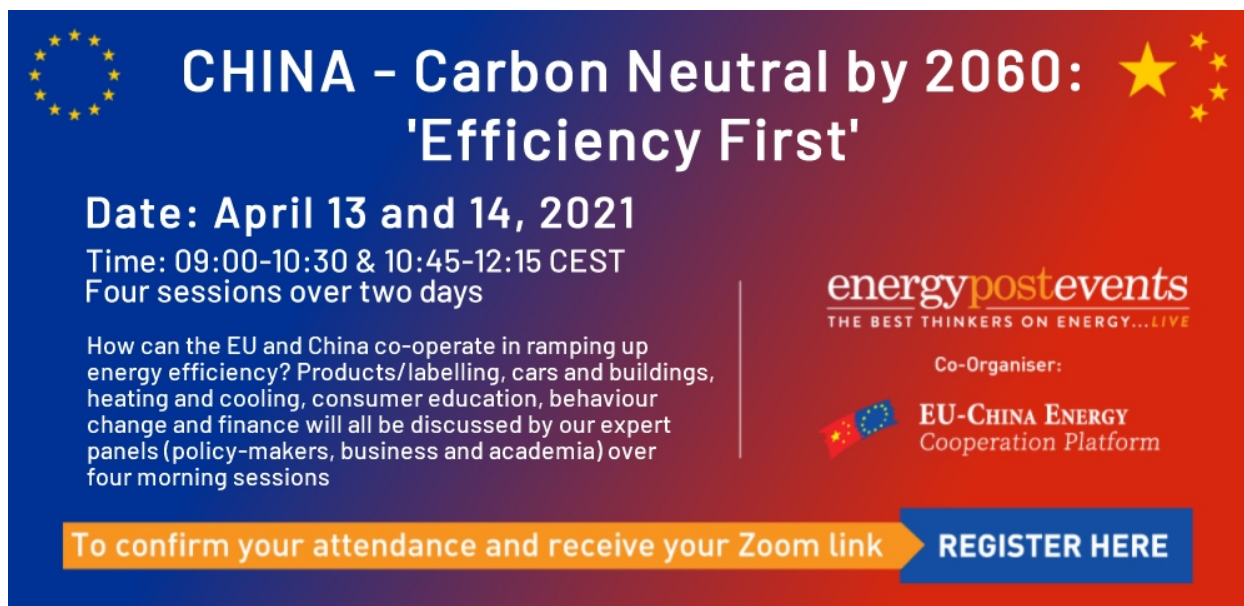


China – Carbon Neutral by 2060: “Efficiency First”

An online panel event held on 13rd and 14th April 2021



CHINA – Carbon Neutral by 2060: 'Efficiency First'

Date: April 13 and 14, 2021
Time: 09:00-10:30 & 10:45-12:15 CEST
Four sessions over two days

How can the EU and China co-operate in ramping up energy efficiency? Products/labelling, cars and buildings, heating and cooling, consumer education, behaviour change and finance will all be discussed by our expert panels (policy-makers, business and academia) over four morning sessions

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Co-Organiser:
EU-CHINA ENERGY
Cooperation Platform

To confirm your attendance and receive your Zoom link **REGISTER HERE**

Session One: The Big Opportunities for 2030 and Beyond

Participants

Sam Thomas – Senior Advisor, RAP (UK)

Magdalena Kouneva – Director General, REEP (Belgium)

Paul Waide – CEO, WAIDE STRATEGIC EFFICIENCY EUROPE (Ireland)

**Guido D. Giacconi – Founder and Chairman, In3Act and former Chair, Energy Working Group, EUCCC
BEIJING**

Benoît Lebot – Senior Policy Advisor, FRENCH MINISTRY FOR THE ECOLOGICAL TRANSITION (France)

Matthew James (Moderator) — Managing Director, ENERGY POST

Highlights

Policymakers have four legs to address climate change: lifestyle and behaviour change, renewable energy, carbon sequestration and energy efficiency.

Energy efficiency of the global energy system has doubled in the past 30 years, but there is still massive potential. Under most scenarios energy efficiency is the largest, most cost-effective way to decarbonise the world, and should be aiming to contribute to at least a 50% reduction in emissions. To deliver this there needs to be a huge effort to build human capacity and put in place a policy framework to mobilise finance.

International collaboration on energy efficiency is needed, the same way countries collaborate on developing hydrogen, nuclear power, or carbon capture and storage technologies. This will not only help all countries achieve faster and cheaper energy efficient solutions, but shared climate goals could help ease political tensions, for example between the US and China.

International standards of energy performance across all sectors and industries need to be made more visible so people have the information they need to make more energy efficient choices. Capital is available, but there are not enough investment-ready projects for them to fund, at least not of the size and depth required to have a major impact.

Wide-reaching regulations need to be put in place, and financial incentives alone won't be enough. Many of the measures will be politically unpopular, so there needs to be major public engagement to understand the changes they need to make to address the crisis.

However, there will be major additional benefits to doing so; job creation, cost-savings, productivity increase and health benefits. In Asia more than 30% of adult deaths are attributable to fossil fuel air pollution. In Europe it's 16%.

China and the EU focused on driving energy efficiency

- China and the EU both have ambitious mid-term and long-term climate targets, with a focus on energy efficiency.
- Both have a mixture of regulatory pricing and supporting policy measures to drive the market towards cost-effective energy efficiency solutions.
- Shared decarbonisation aims help overcome geopolitical tensions between China and the US.
- While learning should be shared, differences need to be understood. The model for Europe, with 27 countries, and for China are totally different, not only from a political standpoint, but from geographical, social, technological, and energy system standpoints.
- China's energy efficiency challenges are different; 60% of its primary energy source is coal and coal makes up 85% of the electricity mix. Electrifying its vehicle fleet will actually increase emissions.

Buildings are the EU's focus this decade

- The direct emissions from heating Europe's homes now generates more emissions than all of Europe's coal power plants.

- Energy efficiency in buildings will be a focus for Europe over the next decade. The European Commission foresees a 60% reduction in emissions from buildings between 2015 and 2030; this will require a complete overhaul in policy for both energy efficiency and heating decarbonisation in homes.
- The European Commission sees one in four homes switching from fossil fuel heating to electric heating. To do that it will need to rebalance carbon pricing, expand the regulation of utilities and increase taxes on fossil fuels.
- But it will need better demand-side energy management to deal with the intermittency of renewables. Better communication is needed between storage and the systems to displace energy use when it's not needed, and also to store energy and send it back to the grid.
- Incumbents, particularly in gas, are putting forward politically persuasive arguments around continuing to use their gas networks to pump hydrogen for space heating, even though most economic analyses show that the direct burning of hydrogen in homes is not a cost-effective solution.
- Energy efficiency regulations will be expanded to apply to all homes, not just new-builds and major renovations.
- It is politically very difficult to regulate homeowners to improve energy efficiency, but there are sectors of the building stock, such as the private rented and commercial sector, where it is more feasible.
- Strong public engagement is needed on what's required to be carbon neutral by 2050 - and what that implies for the assets that they own, especially their buildings.
- Need to create strong, up-front investment signals to convince owner-occupiers of a building to make major investments in energy efficiency.
- Many markets outside of Europe don't have any standards in place to indicate the energy efficiency performance of buildings.

Visibility of energy performance across all sectors

- Energy markets don't work effectively with regard to energy efficiency unless measures are put in place to overcome market barriers, such as access to finance, fragmented supply chains, barriers to knowledge, and split incentives.
- Regulatory frameworks can regulate inefficient uses and create the stick of removing inefficient practices, and the carrots of financial incentives.
- Energy efficiency needs to be visible to users and the marketplace so competing services can be compared and users can take action
- 37% of countries don't have any equipment or product energy efficiency standards in place. Even in the countries which do, standards are not comprehensive.
- In Europe, not everyone knows the energy performance of their building, despite the EU's buildings energy performance rating scheme in place for 15 years.
- Measurements need to be more thorough and holistic.
- Measurements need to be dynamic; users need to see how real-time performance and the real-time consequences of their actions impact energy performance.

- Measurements need to be more ambitious. Progress has been made optimising energy efficiency during the use of projects, but not across the full product life-cycle, from manufacturing, distribution, use, recycling and disposal.

Emerging markets

- There has been significant private capital invested in green energy and sustainable investment over the past two years, driven by falling technology costs and new business models.
- The challenge now is to shift the focus away from large emerging markets towards less-developed country economies, and to scale-down projects so that they can be applied at a sub-national level.
- The challenge is not the shortage of capital but a lack of projects which are investment ready.
- Need to find a way to transfer effective models and technologies to developing countries so they can leapfrog development to green and efficient energy use. These markets need to be a focus because it is where, due to growing populations and a rapid urbanisation agenda, most growth in energy demand will be seen.
- There is a lot of interest in green banking in developing and creating national climate finance facilities.
- Need to focus on building the green banking sector within local economies, to provide credit enhancement and guarantees for projects to attract private capital.
- Large scope for cooperation between the EU and the rest of the world, especially with developing nations, to adopt the EU's taxonomy standards for energy efficiency and clean energy investments.

Session One Summary

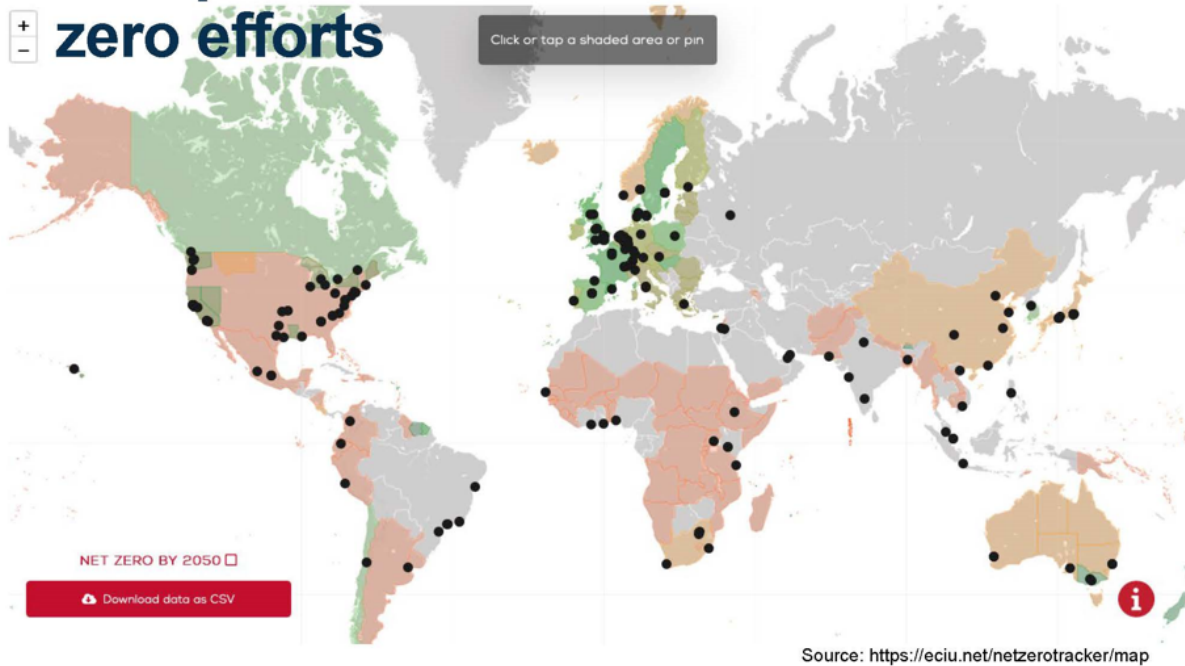
This is a summary, not a verbatim transcript, of the key points made during the online panel event.



Sam Thomas
Senior Advisor, RAP (UK)

ST: China and the EU are not alone in having long-term, mid-century climate targets as called for by the Paris Agreement. In 2018 the EU Commission set out its vision to be climate neutral by 2050, and that objective was endorsed by the European Council in 2019. Last year President Xi Jinping set out a carbon neutrality target for China by 2060, making that the single biggest climate pledge so far in the Paris Agreement.

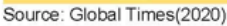
Europe and China not alone in net-zero efforts



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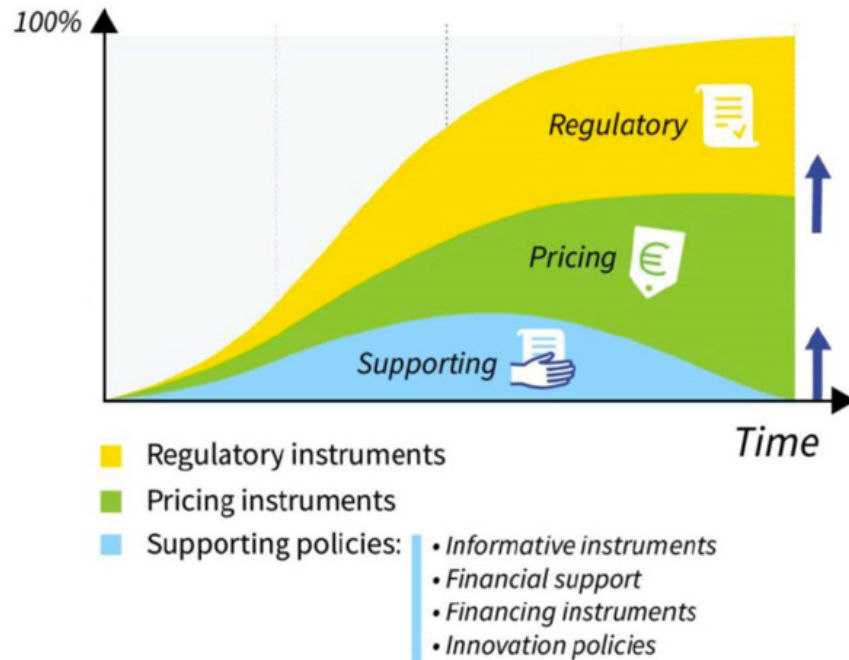
Both have ambitious medium-term plans as set out by China through the five-year planning process, and in the EU most recently through the Green Deal, which replaced the “energy efficiency first principle” at the heart of energy and climate policy.

[illegible]

Source: European Commission(2020)

Both have ongoing political processes, so over the coming months and years we will see negotiations and further publications that will define the overarching climate policy architecture. China's 14th Five-Year Plan set out new energy intensity targets and we're expecting further detailed plans over the coming months and years. In the EU, the Commission will propose updates to the EU targets in June, along with associated reviews of the various directives to support those climate targets, including many on energy efficiency.

A mix of policy instruments



Source: Adapted from CE Delft (2020)

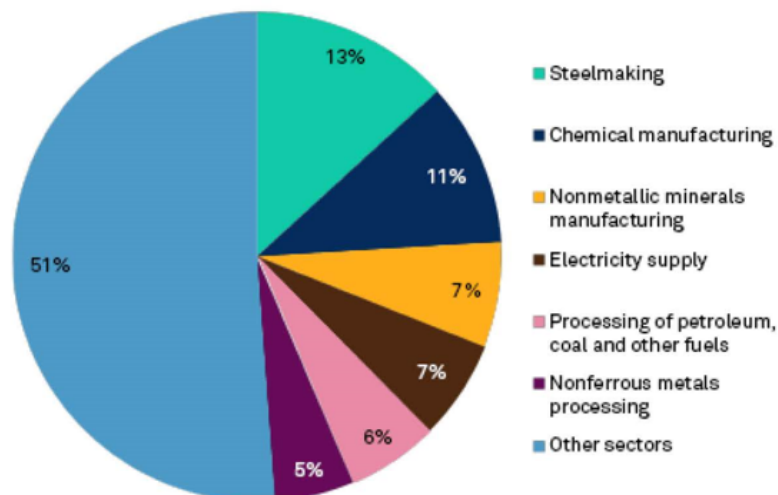
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If we dive down another level we see a mixture of regulatory pricing and supporting policy measures in both areas. These really are needed, particularly in energy efficiency, to overcome the barriers and market failures that affect the uptake of the most cost effective ways of ensuring an energy and just transition. We need these measures to ensure all parts of society can join the transition. So we have a mix of policy instruments.

China: A focus on industry

China's energy consumption by sector in 2018



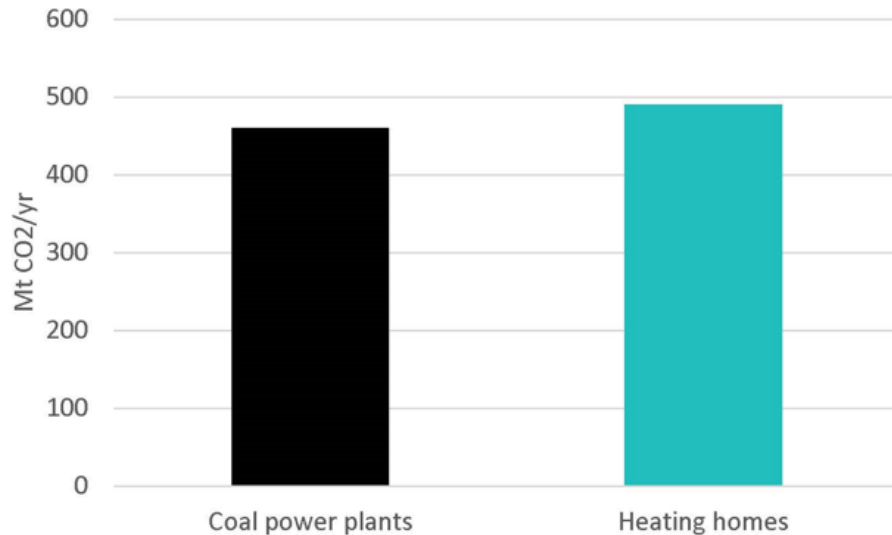
Data released Sept. 23, 2020.

Source: China Statistical Yearbook 2020 compiled by National Bureau of Statistics of China

In China we have seen great progress recently on transport electrification, and over many years we've seen product appliance and lighting standards. But the biggest efficiency gains so far have been in the industry sector. That's partly because of the size and potential in the sector, but also because of the mix of regulation, pricing and supporting measures.

In particular we see the translation of the high-level energy intensity targets to individual enterprises through the Top 10,000 Programme. It's not just a heavy-handed instrument, we've also seen pricing incentives that are linked to those targets: you get preferential electricity tariffs if you over-perform on your targets; we've seen regulation to support the uptake of energy efficiency equipment through motor and equipment standards; and we also see supporting policies to develop the ESCO (Energy Service Company) market to ensure the finance can flow through to those industries through energy performance contracting.

Heating emits more carbon than all coal power plants in Europe



Source: Europe Beyond Coal (2020), Bertelsen and Mathiesen (2020)

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In Europe we've also seen some strong gains on the industry side, with the power sector set on its path towards decarbonisation and new vehicle CO2 standards driving transport electrification.

The focus for the next decade has turned towards buildings. The direct emissions from heating Europe's homes now generates more emissions than all of Europe's coal power plants.

A focus on buildings in the EU

To meet the -55% economy wide 2030 target the building sector must reduce (on 2015 levels):

- GHG emissions by **60%**
- final energy consumption by 14%;
- energy consumption for heating & cooling by 18%

This means a major focus on **energy efficiency** and **heat decarbonisation**

(Renovation Wave strategy)

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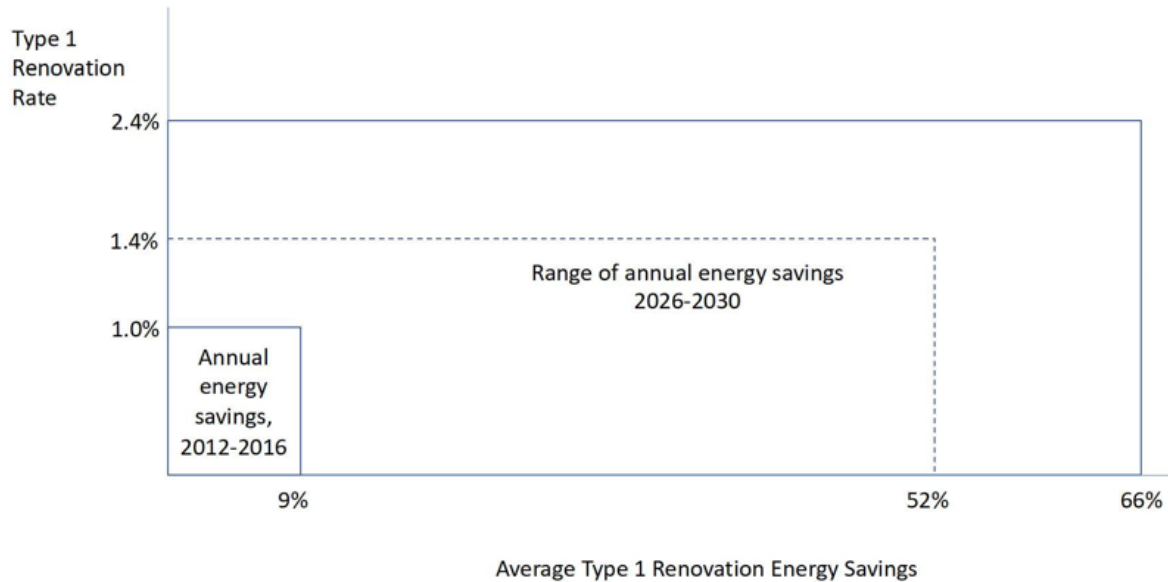
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This text is taken from the Renovation Wave, which is a strategy being developed in the EU to support building renovation. It's aligned with the most recent impact assessment that the EU Commission published last year to support the higher 55% emissions reduction target.

This shows that the building sector is the one sector in the EU where we need to make the biggest gains over the coming decade. The impact assessment set out by the European Commission foresees a 60% reduction in emissions from buildings between 2015 and 2030 - and if you consider that emissions in the sector have actually risen since 2015, it will be an immense challenge. It will require both a step-change in policy and vision in both energy efficiency and decarbonisation. It's also a major opportunity for those industries.

Let's have a look at those two elements in turn: energy efficiency and heating decarbonisation.

Energy savings from building improvements up 10-20 times



Source: Adapted from European Commission Fit for 55 Impact Assessment (2020)

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We're seeing 1% of buildings being renovated per year and the amount of energy savings we're seeing on average is 9% across those buildings. Those are relatively shallow energy efficiency gains and quite a low rate of renovation, especially when you consider the age of the building stock in Europe.

By 2026-2030, the Commission foresees the renovation rate roughly doubling to between 1.4% and 2.4% a year, and the depth of those energy savings from those building renovations has to increase to 50-60%. If you combine those two aspects, you see that the energy savings from building improvements isn't being produced by the building's energy efficiency lobby. It's got to increase by 10 and 20 times, so that is a massive change, and only half the story.

Scale of change immense

Between 2026
and 2030, **1 in 4**
homes will switch
from fossil fuel
heating to electric
heating



Source: Adapted from European Commission Fit for 55 Impact Assessment (2020)

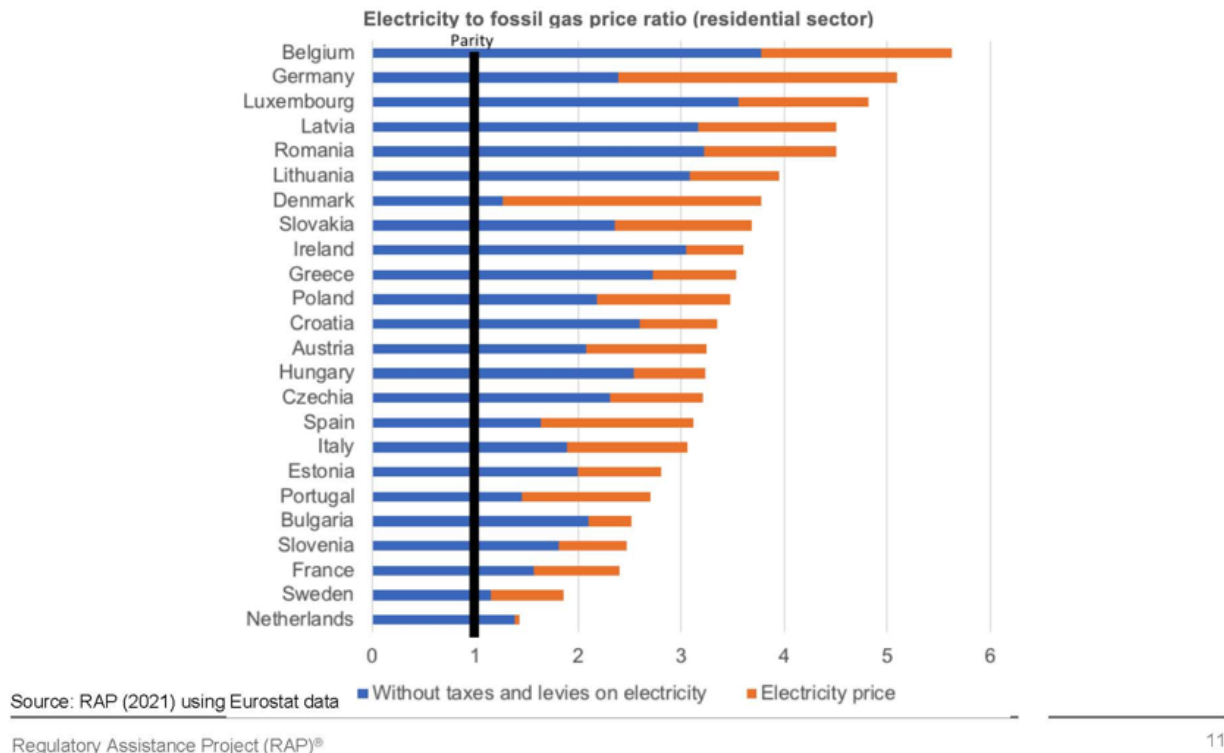
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Between 2026-2030, the Commission foresees one in four homes will switch from fossil fuel heating – coal, gas or oil – to electric heating. Again, that is an immense change. We're going to be asking people to switch from a fuel they are very comfortable using, such as fossil gas, and moving to a new heating system, generally using a heat pump. How are we going to do that? Well, we need that mixture of regulation, pricing and supporting measures.

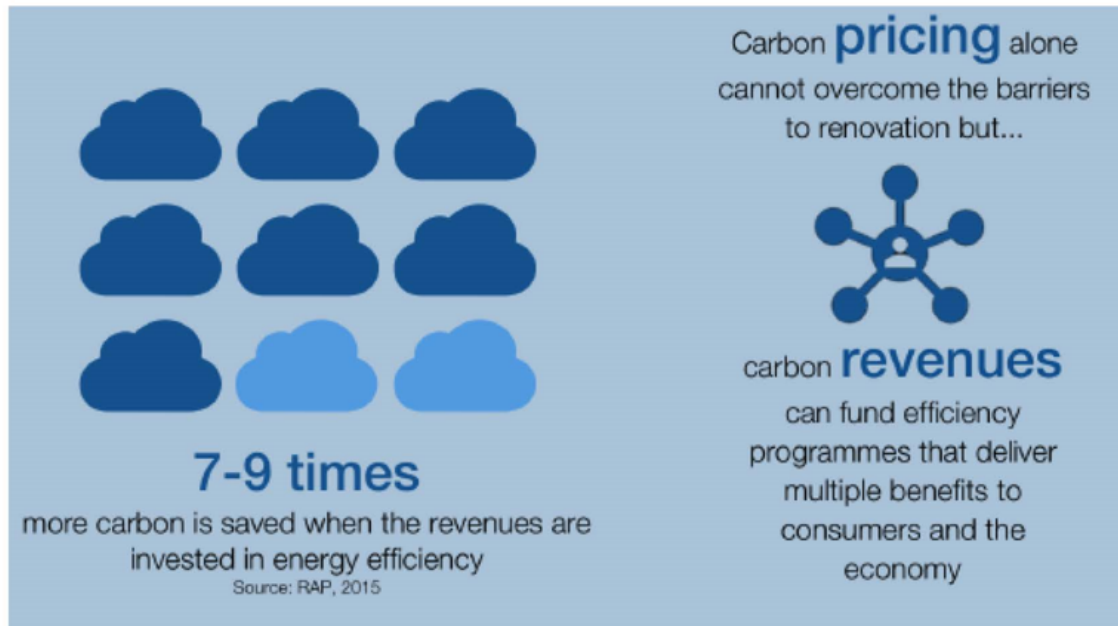
So, let's start with pricing.

Rebalancing heating costs



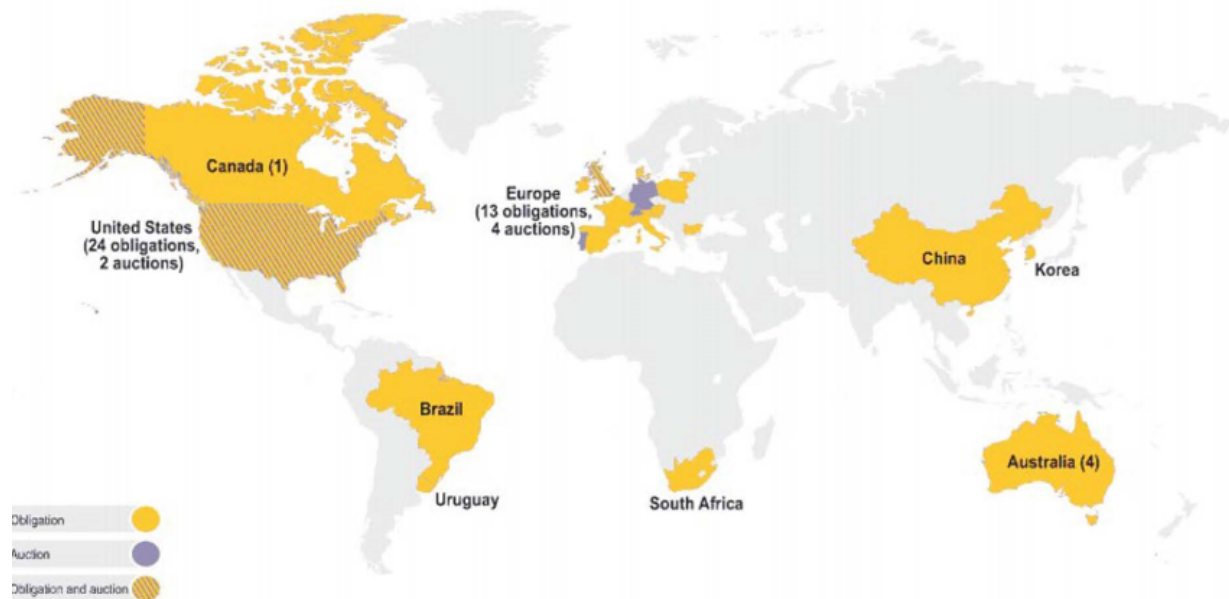
Electricity, the fuel that we wish people to switch to, is more expensive than fossil gas in all EU markets. The question we need to put out there is how can we expect people to switch if carbon taxes and levies are almost entirely in place in the electricity sector and fossil fuels are relatively lightly taxed? One thing we need to do is ensure that we see a rebalancing of carbon pricing.

Generating revenue to spend on targeted decarbonisation



But that can only be part of the solution. It needs to be part of a comprehensive policy framework that involves recycling those carbon revenues and adding to them to support investments in buildings decarbonisation, particularly amongst those households least able to invest and most affected by the higher fossil fuel prices. And, crucially, we're going to need some regulation.

Energy utility efficiency obligations in both EU and China



Source: IEA, Market-based instruments for energy efficiency (2017). All rights reserved.

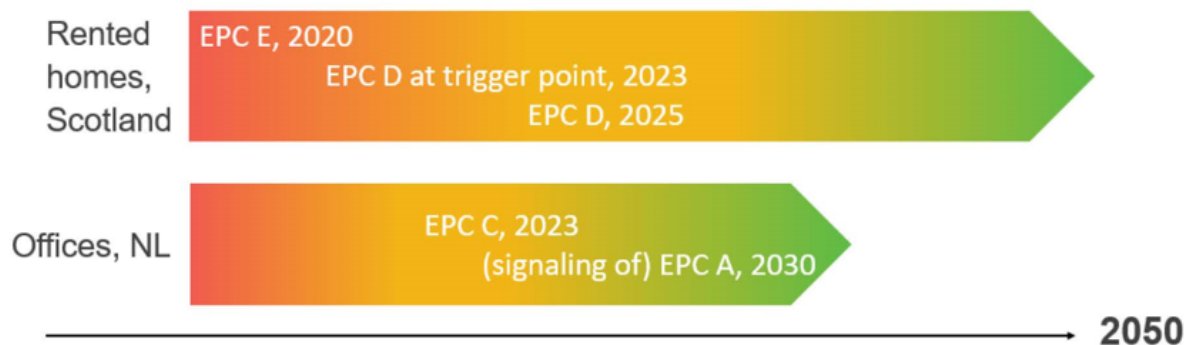
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We can see two types of regulation. First of all, we have regulations on energy utilities. These have been developed across the world in the last 30 years, including in China and now many EU member states, primarily to deliver energy efficiency improvements. Given the need to drive heating system replacements over the coming decade, there may be scope for expanding the model out from simply efficiency to also clean heat as a way of driving building electrification.

Regulations on existing buildings

Existing examples:

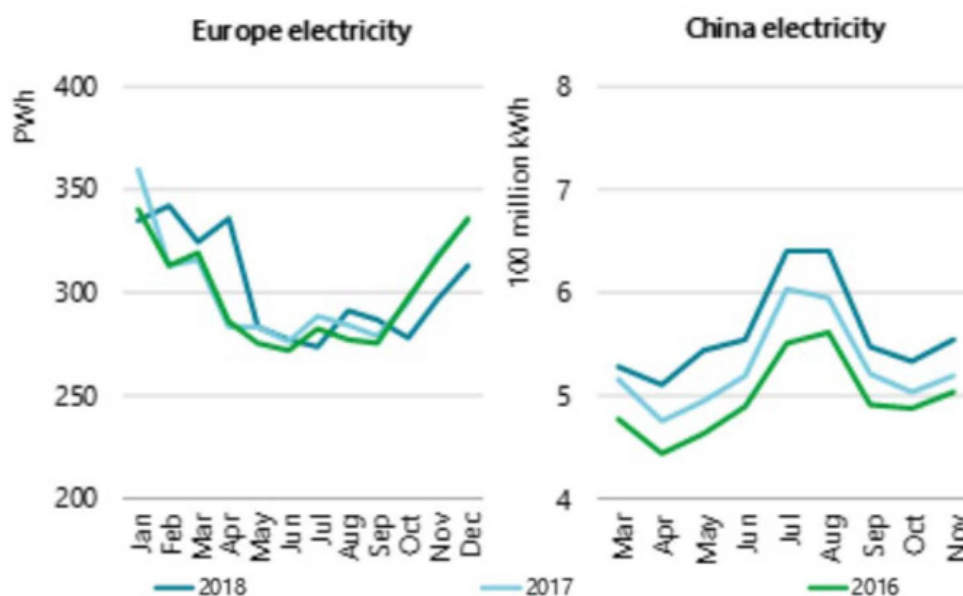


In Europe we expect to see regulations on existing buildings. Both in China and in the EU we already see regulations on new-builds and major renovations, but there is now a move in Europe to apply regulations to all its existing buildings, given the unresponsiveness of building owners to economic incentives alone.

We need to drive that demand for renovation and heating system replacements. The Energy Performance of Buildings Directive's review is expected to contain proposals for member states to place regulations on existing buildings, as a way of providing a clear roadmap and staged deadlines by when buildings must meet energy performance criteria.

This has already been put in place in some parts of Europe. In Scotland, in privately rented homes there are particular barriers to buildings renovation requiring successive improvements over the coming decade. In the Netherlands, we see in the commercial sector really strict regulations being put on existing buildings. So far, the signal has been placed that by 2030 they all need to meet the toughest Energy Performance Certificate (EPC) rating.

Flexible electricity consumption will become increasingly important



Source: IEA Energy Efficiency 2019 (2019) using data from Entsoe (2019) and China Bureau of Statistics (2019). All rights reserved.

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Looking beyond 2030 there is a need to prepare for the impacts of end-use electrification, particularly in the buildings sector. In the EU, where peak winter electricity demand is going to massively grow, that is going to put a big premium on fabric improvements, both to limit the absolute level of heating service demand and to enable buildings to be more flexible - for example, to be able to pre-heat to avoid evening peaks.

The issue is not just European. In southern China last December there were challenges managing peak load - in part because of the poorly insulated building stock and despite a fair amount of heat pump application in that part of China, also being supplemented by electric assisted heating. So we need to see, over the coming decade, efficiency being put first in the power market and network planning to ensure that this issue will be dealt with.



Benoit Lebot

Senior Policy Advisor, FRENCH MINISTRY FOR THE ECOLOGICAL TRANSITION

BL: I have only one message: let's make energy efficiency the first fuel – and the condition for that is that we need to fuel energy efficiency first. We know that in climate change mitigation we have four legs to address mitigation: lifestyle and behaviour change; energy efficiency; renewable energy and carbon sequestration.

We know that energy efficiency may not be enough if we don't have the right change that goes with it. There is no scenario that we know of, from the IPCC to the IEA, that indicates that we can decarbonise this world without those four legs of decarbonisation – and energy efficiency and energy conservation accounts for the largest portion in most of the scenarios. So, energy efficiency is a universal fuel and a very domestic fuel; all countries are involved and have a potential for energy efficiency.

But energy efficiency is very complex. It's more complex than nuclear power because energy efficiency is not only adopting changing, new technology but combining that with change of behaviour. To bring the technology and the behaviour change you have to put in place enabling measures at all levels of the policy framework.

Unless all the fundamentals of energy efficiency are brought together - the human capacity, the technical capacity, the financial capacity, the need to collect and transform data into knowledge, and then use that knowledge to deploy energy efficiency policy - then we will not see the level of implementation and investment that we need.

I am less interested in targets that we set for the 2030 or 2050; I am more interested in the means that we will put in place as countries, as communities, in building the institutional technical capacities needed to achieve them. International collaboration on energy efficiency is needed, like we collaborate on fuel, on hydrogen, on nuclear power, on carbon capture and storage. International collaboration on energy efficiency can help every country spend less money and make improvements faster.



Paul Waide
CEO, WAIDE STRATEGIC EFFICIENCY EUROPE

PW: I've been working in the energy efficiency field for 30 years and a huge amount has been achieved in energy efficiency in that time.

We have doubled the efficiency of the global energy system, more or less. That has resulted in halving the amount of energy we actually need to achieve the energy services we currently deliver. If we hadn't had those efficiency gains we would have a far more polluting system than we already do, we would have far more stress in the energy system than we already do, and we would have far greater costs and far greater negative impacts associated with that provision of those energy services.

But despite these tremendous achievements, there is obviously a huge need to continue to improve energy efficiency and there's still huge potential. The potential seems to constantly renew itself because there's always new, better, smarter ways of using and saving energy than have been in place in the past.

Most of those savings that have been achieved are because of policy measures which have been introduced over this time frame.

The big realisation, in the last 20 years, is understanding that energy markets don't work effectively with regard to energy efficiency unless measures are put in place to overcome the many market barriers. People talk about finance, about fragmented supply chains, barriers to knowledge, split incentives. But the fundamental thing which has to be done in all areas where energy is being used is to make the energy performance of use visible to the users and to the marketplace. This is what an awful lot of policies have focused on over the last decades: we have ratings, energy performance, labelling of buildings, equipment labelling, vehicle fuel economy ratings and information, and benchmarking of industrial processes. If you make clear not just the efficiency of your particular services, but what the spread of efficiency is in the marketplace you can attain, and what the particular offer that you're looking at is relative to those, then you have a very powerful tool to transform the market.

We haven't finished this process. Equipment or product energy efficiency standards and labelling are only in place in just over 60% of countries currently. About 37% don't have anything. Even in those countries which do have them they're not comprehensive, they're not covering all the energy equipment and products that they could be.

And products are actually relatively well treated by comparison with, say, buildings. Yes, Europe has a well-established scheme now for getting the energy performance ratings of buildings but it's not on every single building and not everybody knows yet what the energy performance of their building is.

Many other markets in the world don't have anything to indicate the performance of buildings. In industrial processes, it might be known within certain groups, within certain sectors. So, there is a lot to be communicated still about the energy performance of how we're using energy.

Also, the boundary layers of which we present information are still somewhat incomplete. So we might know what the energy performance of a boiler is relative to others at standard test conditions, but we don't know what the energy performance of the heating system is when it's installed and operating, unless another level of assessment is done.

We need to see all these layers of performance and how that contributes to the performance of the entire building, and then how the building fits within the broader urban environment, and the energy performance of that urban community. We need all of these layers to have greater visibility of performance levels. And not just static measures either - we need to be thinking about how we can bring a more dynamic performance rating so we can actually see real-time performance and real-time consequences of actions on energy performance, as a next step in driving deeper savings.



Guido D. Giacconi

**Founder and Chairman, In3Act and former Chair, Energy Working Group, EUCCC
BEIJING**

GG: When China decides to do things, China does. What happened a year ago here in China seemed impossible, but it happened.

I participated in defining the guidelines for the 14th Five-Year Plan, which is something different compared to the past in terms of decarbonisation, energy efficiency and the energy transition. After Xi Jinping's pledge everything is moving towards decarbonisation with a top-down approach - but with a big problem: they don't know how to do it. The approaches adopted in the past cannot work anymore. Here decarbonisation is seen as a sort of Mission Impossible - although they say it is possible.

Europe and China have defined the same targets. It's the first time, after Kyoto and various agreements, where two powers - China and Europe, and we hope the US is coming - are pledging something at a global scale. From here it is perceived that decarbonisation aims could even overcome the tensions between China and the US. It's not going to be possible to decarbonise the planet if we don't adopt common standards, common approaches, common technologies, common ways of achieving decarbonisation, taking into consideration the differences.

One of the big mistakes that we Europeans make in China is that we don't take into consideration the different models. The model for Europe, with 27 countries, and for China are totally different, not only from a political standpoint, but from geographical, social, technological, and energy system standpoints. The leaders are thinking of how we can reach new paradigms, how we can approach the decarbonisation problem from a holistic and systemic standpoint.

My company is involved in designing at least three new zero-carbon urban areas. The design has been done. The local situation has been considered and we have already engineered the way to do it.

Here there is the perception that 2060 is tomorrow. China is developing a lot of new infrastructure, but the life cycle of this new infrastructure, new buildings, new ships, will be beyond 2060 - so they have to do something today. They are starting to do it, with a top-down approach where the local administration, the local leaders, are putting a lot of effort and money into this new trend.

Heating here is a big problem - 24% of coal is devoted to heating but if heat optimisation is not addressed in the proper way it's even worse than using old technology. For example, I have seen a perfectly insulated, LEED-certified building but because of the energy systems here, the only way to regulate the temperature in the apartment was to open the windows. So just regulating the temperature of an apartment here is a breakthrough change.

In terms of electrification, China is in the same shoes as us but in a different way, because the energy model in China is based 60% on coal, and 85% of coal in electricity.

There are a couple of aspects that are going to be crucial over the years. The first: let's work together on the standards. Decarbonisation is a global issue and has to be tackled globally. Second: Do not rely only on financial tools. Europe has not been a good example of using the market levers for decarbonising.



Magdalena Kouneva
Director General, REEP (Belgium)

MK: I agree with a lot of the points that were made so far with respect to the need for more collaboration. New data already shows that developing nations have invested more in new generation and clean energy, and this is a trend that will continue. We saw this trend in 2019 and it was sustained during the Covid-19 lockdown periods.

Secondly, we've seen significant private capital investment, which is being driven by falling technology costs and new models. A lot of these trends of investment in renewables technology is concentrated in around 10 emerging markets.

REEP started its journey by investing in large, emerging economies, one of which was China, with significant investments in wind. REEP has also made significant investments in India, Mexico and South Africa for energy efficiency projects. However, around 2012 the organisation started shifting its focus from large emerging economies towards less developed economies, and away from large-scale projects towards the small-size sector.

Energy efficiency is the challenge but it's also the opportunity to leverage the small-size sector. We see this specifically at the level of public infrastructure, or infrastructure at the sub-national level, where innovative business models could crowd in private capital and overcome some of the barriers faced by cities and municipalities and local governments that have to invest in energy efficiency, for instance, in municipal water.

We also see the opportunities in the commercial industrial sector and the buildings sector in developing markets. I agree about the need for policy and regulation. Even more than 30% of the markets are not really regulated. Standards are not set. It definitely helps to have a national target. It is indispensable to have the right policy and regulatory environment and have the technical standards in place. Some of the solutions to these problems could be transferred across the countries.

We also need incentives; not just for finance but for changing behaviour, which requires bridging the gap between the capital and instruments available and the demand for these instruments.

The challenge is not the shortage of capital, it's the lack of projects that are investment-ready. In the run-up to COP26 we see a lot of interest from asset managers and institutional investors who are shifting investor packages towards sustainable investment. They want to do more with energy efficiency, more renewables, and they want to have greater exposure to emerging markets. We see a lot of demand, but there is a lack of sufficient pipelines of projects. The larger scale projects are the low-hanging fruit, but to achieve the decarbonisation targets we must reach beyond the large-scale projects and spread the gains across a large number of countries.

The local financial sector has a huge role to play. We need more nationally owned solutions and more in-country capacity. Green banks have shown significant potential in high-income economies. There is also a lot of interest in green banking in developing and emerging markets, and in creating national climate finance facilities so that countries can improve their ability to access international climate models.

We are helping to build country and green banking capacity. This could include guarantees that green loans can be repaid, or putting in place liquidity facilities in case there are delays in payments, providing a simplified form of credit enhancement or guarantees to the local financial institutions to induce them to take the risk.

If we don't start addressing the need for more private capital in the small-size segment in developing economies, we're not going to get far. These are the markets with growing populations, with a rapid urbanisation agenda and rapid economic growth.

The EU has led the way with the taxonomy standards - there is a lot of interest in green taxonomy around the world and there is a lot of scope for cooperation between the EU and the rest of the world, and especially with developing nations.



Matthew James (Moderator)
Managing Director, ENERGY POST

MJ: Sam, the EU will revise the Energy Efficiency Directive as well as aspects of the energy efficiency of buildings and performance of standards. What are the key aspects of the energy efficiency directive that you would be looking out for in order to stimulate the market?

ST: There is money out there but not enough projects coming forward, at least at the size and depth required. It's going to take a massive effort across financial and regulatory sectors to ensure we're able to measure progress.

On the regulatory side, we need to drive demand for buildings renovation and swapping out fossil heat supplies. We can much more easily regulate products, appliances, equipment. It's much more difficult to drive an increase in the uptake of more efficient solutions.

We need a regulatory approach. That can come from two angles. One, on building owners. It's going to be very difficult to regulate homeowners initially. But there are sectors of the building stock, such as the private rented sector and on the commercial sector, where it is more politically feasible to regulate buildings owners.

From the heating system end, there is potentially scope to regulate fossil heat suppliers - particularly natural gas in Europe, but also oil and coal - to force them to decarbonise their heating supplies through a range of measures, in the same way as we currently regulate energy utilities to make energy savings.

We need to regulate to increase the uptake of measures - and not just regulate to improve the performance of equipment and products as we currently do.

MJ: So, focusing on engaging stakeholders and consumers and getting them to be motivated to invest in products or to reduce their consumption directly.

ST: Particularly for buildings renovation, certainly that's a big challenge in Europe. There needs to be a whole range of measures put in place, including public engagement measures that make clear what is going to be required to be carbon neutral by 2050, or 2060 in China.

If we can get the public to understand the problem it will be easier to place the regulatory measures needed alongside incentives.

MJ: Why is that, Benoit? Why is the public awareness of what can be done not there? Is that one of the major opportunities for us, to get people to understand how this plays a role in tackling climate change?

BL: Absolutely. Most people don't get what climate change is about. In France a year and a half ago President Macron took 150 citizens, randomly selected, and gave them 10 weekends to shape a policy to reduce France's greenhouse gas carbon footprint by 40% by 2030. During the 10 weekends they had access to information from scientists, physicists, the IPCC report, Nobel Prize winners. Their 150 recommendations were much more extreme than what we, the energy efficiency specialists, were presenting. Once we understand the reality of climate change, it is easier to accept the change we need.

All this change we need - from improving energy efficiency to building renewable energy – has some beautiful co-benefits; more job creation, better prosperity, enhanced productivity, health improvements and so on.

MJ: Paul, is it about public awareness or is it about the right regulations, standards and incentives for the businesses that are operating in the sector? What do you think the big opportunities are? What are the things that you're looking out for when we review the energy efficiency directive?

PW: Of course, it's all of these things. The most comprehensive epidemiological study yet of the impact of fossil fuel pollution on public health was released two months ago. It found that in Asia over 30% of adult deaths are attributable to fossil fuel air pollution. In Europe it's 16%. These are absolutely colossal numbers that we've somehow normalised.

Part of the value proposition that we need to communicate is that there are tremendous public health benefits, which actually put the pandemic in the shade in terms of the scale of how significant they are, if achieved.

But we also need to recognise that comparative performance visibility is extremely important to get markets moving. Once you've made the energy services performances visible, people can act more, on all the levels.

Regulatory frameworks can regulate inefficient uses. You have the stick of removing inefficient practices and uses, and carrots to create the right incentives.

Sam's been talking, quite rightly, a lot about the buildings sector in Europe - and there will be exactly the same issue in China, as China's building stock ages.

We don't think about the impact of what we're doing as a legacy passed on to others. So you have to create a set of incentives which cover split incentives between the different actors temporally, but also, of course, between landlords and renters, so that it's in anyone's interest to do the right thing at the right time. That means some very strong upfront investment signals and encouragement signals when change can happen, looking over the longer term.

We need to better link the financial side to energy markets. We have very patient capital when it comes to investments in energy infrastructure and very impatient capital when it comes to investments in energy demand reduction.

We've made a lot of progress in making products much more efficient, but we also need to think about the actual used energy over the product's life cycle - production, manufacture, distribution, use, recycling, and disposal. It's extending how we view energy efficiency and energy consumption within goods and services.

We're increasingly seeing the nexus between energy efficiency issues and decarbonisation into the energy supply. The electrification of the building stock, for example, will include the need to have greater renewables supply, which is intermittent. As the scale rises there will be greater issues of

intermittency and unreliability, unless more is done on the demand side to bring in demand-response and flatten the load curves.

Communication is needed between storage and the systems to both displace energy use and store energy and send it back into the grid.

The big efficiency gains in transport are going to be with the electrification of the vehicle fleet. There's a question of charging infrastructure and whether it will be set up in a bi-directional way and allows the communication and sale of power back into the grid. So we need to link all these multiple layers of policy.

Within Europe's energy efficiency policy framework there are the key directives of eco-design and energy labelling for products, the energy performance of buildings for buildings and there's the energy efficiency directive, which is a bit of a catch-all, and there are incentives on the industrial side.

We need to be looking at the linkages between these policy frameworks. This could be of interest in China as well, to look at how Europe is attempting to deal with some of these interlinkage issues.

Q&A

Guoyi Han (from the Stockholm Environment Institute) asks: I have two questions. The first is: energy efficiency seems on the one hand to be the low-hanging fruit and win-win solution, but accelerating it seems to be challenging. Where should we push the hardest? Second: everyone is concerned about the EU carbon border adjustment mechanism and how it would link to things like energy efficiency cooperation.

ST: In the buildings sector there are incumbents, particularly on the gas side, who have sunk costs in their gas networks and are putting forward politically persuasive arguments around continuing to use that network to pump hydrogen for space heating. However, most economic analyses show that the direct burning of hydrogen in homes is not a cost-effective solution for space heating.

There are many, many higher value uses for green hydrogen, which will be a very expensive fuel if it's genuinely green. We're going to need backup and that is most likely to come from some form of hydrogen in the mix.

We're seeing intense lobbying that risks undermining efforts to get a more cost-effective solution that involves the coordination of fragmented investment across building owners. So, we need to focus on the whole range of regulatory pricing and supporting measures to kick-start efforts to invest by building owners.

The only thing I would say about the carbon border adjustment mechanism is that it risks undermining the global, coordinated action on climate change if trade issues become a hot topic. It needs to be embedded in the climate change discussion alongside trade. There could be a strong role for China and the EU to work together here.

MJ: Are regulatory frameworks the way forward, Benoit or Paul? If we set regulations, will people follow them? Where are the issues here? Why is it still so difficult to get people to engage with these policies?

BL: I am a regulatory guy. I have stopped believing in voluntary agreements. The key is to make sure that we package the technical solution with a financial solution at the level of the regulation target we are setting. Renovation should not only be deep, we have to line up energy efficiency at the level of the decarbonisation that we need. But we cannot wait for the market to be driven by incentives to encourage voluntary action. We have to go through a firm, smart policy that gives immediate support from the technical side and from the financial side.

We have to change the way we think about energy efficiency, and the way we decide the policy. For monetary policies to be accepted they have to come with a well-designed package of technical solutions, know-how, training and financial support.

Energy efficiency is sometimes its own enemy. We change the light bulbs but we don't change the window, the boiler or the insulation. These small steps are killing the big potential for energy efficiency. It is about changing the way we push policy, the way we design the financial instruments.

MJ: Magdalena, you mentioned the rapid urbanisation programmes. Clearly this work mitigates the potential emissions increases of that economic activity, but will the speed of development put more pressure on the EU and China to be successful in their efficiency? Do you think there will be net gain increases? Will development in the third world make the problem more acute than it already is?

MK: It will make the problem more acute if double standards prevail and if we don't have the common objectives and action that Benoit mentioned. Long ago, we realised that if we are to make real progress, we need to go beyond state-to-state relationships. While policy and regulation are still within the realm of the state, they can only work if all parts of the society drive towards the same change. We also see a change in mindset, and especially within the business community.

Africa, for instance, contributed 3-4% of greenhouse gas emissions, but the adaptation needs of the continent are between \$7bn and \$15bn annually, and we expect a rapid increase in food systems demand - more than 50% by 2030. So even if the global community makes significant efforts in supporting this energy transition and adaptation needs, unless there is a common objective and a shared plan, it's not going to be enough.

So we need to make sure there are innovative mechanisms for transferring climate solutions, know-how and technologies to countries and markets which can then leapfrog their development curve. This is one reason why investing in these business development pipelines and project pipelines is so important.

If we have a way to bring together the many small owners of many small businesses, their power increases tremendously. And there is a need for much more innovation so that system disaggregation takes place.

Mr van der Horst asks: In the Netherlands, we're talking a lot about heat pumps as an energy efficient form of heating, but they're quite expensive, take up space and only need heat for a couple of months of the year. So we see more electrical solutions coming up, particularly electric radiators, which you can easily install, have a lifetime warranty, no write-off costs, no maintenance etc., and you can manage the heat per room with Wi-Fi thermostats. Would that not be an easier option?

ST: A quick response: it depends on the context. It may be true in some buildings that you can reach the same desired level of heating service, the same level of comfort, through buildings fabric improvements and electric resistive heating. Or it may be true that it's at a lower cost than installing a heat pump.

We need to set up the policy environment to ensure that in the individual context it's up to the building owner to decide which combination of technologies they're going to put in to meet the overall societal goal. We need to ensure that those societal goals, including air pollution and future flexibility needs for a renewable electricity grid, are reflected in the incentives that are facing consumers.

MJ: Final points.

BL: We are losing the war against climate change, not because of the lack of investment in renewable energy, or carbon capture or hydrogen, but because of the lack of support to energy efficiency. We have to say loud and clear that we can deliver and we know the conditions to deliver. We need to build capacity and put in place policy frameworks to mobilise finance.

GG: First, for the next five years China's going to invest 140 trillion renminbi - the equivalent of Europe's GDP in five years – because leaders have calculated that if they do not invest this money, a 2-degree temperature rise in 30 to 40 years will imply significantly higher investments and costs. It's a big problem.

Second, we have to think out of the box. Energy efficiency in China, when 60% of the primary energy source is coal and 85% for electricity, is not going to solve the problem. Increasing the number of electrical vehicles in China means increasing emissions because electricity is produced with coal.

Finally, the comprehensive agreement of investment between China and Europe is a step ahead, and a sustainable development pillar is something that would force Europe and China to find a common table

for discussions. The carbon import tax, I hope, will force both parties to accelerate the reduction of energy and emissions intensity.

MK: In the same country we often see different impacts of climate change; drought in one part, floods in the other part. When we talk about the intersections, the links between energy efficiency and other areas, we need to think about food, water, resource efficiency etc., because these are diminishing resources and energy efficiency is not a goal on its own. There are significant populations living without energy access or clean cooking solutions.

ST: We need to make the next decade the decade of energy efficiency, because if we don't it will be too late.

PW: The key to success with energy efficiency is removing the barriers. You've got a bunch of different barriers that prevent us from getting to energy-efficient solutions, and it's not enough to remove all except one. That requires a policy framework and a robust administration of that framework. Because the framework is cross-sectoral it has to cover the different arms of government. We need to expand our policy-making administration capacity and make it more sophisticated.

MJ: My takeaways are that we need more coordinated funds and regulations, with a mandatory, maybe, aspect to them to make sure that ownership cannot be avoided. It's surprising to hear about this phenomenon of capital being available, but project pipelines not being there.

Summary compiled by [Sara Stefanini](#)

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