ALLEN & OVERY

Financing the gap: a blueprint for decarbonisation

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Contents

Introduction

Achieving Net Zero by 2050 is arguably the greatest policy and economic challenge of our time.

Transforming the world's energy system will require trillions of dollars of investment in physical assets and innovation. While progress is being made on many fronts, much more needs to be done.

There is still a significant gap between the capital needed and that being delivered. Mobilising investment to support faster decarbonisation will only be possible through unprecedented regulatory reform and international cooperation.

"Financing the gap" is our contribution to this goal. On the pages that follow, we explore the forces shaping international energy markets, pinpoint some of the most important barriers to decarbonisation, and identify 18 areas we believe can accelerate progress.

Net Zero is a critical issue for the businesses we support. Our position operating at the nexus of the energy industry and financial markets gives us a deep understanding of the dynamics driving the transition, and their commercial and legal consequences for organisations in every sector.

We hope "Financing the gap" provides clarity on the challenges ahead, as well as some of the solutions.

Executive summary

Energy use contributes almost three-quarters of global greenhouse gas emissions, making the transition to low-carbon power – and the development of technologies such as carbon capture, utilisation and storage (CCUS) – critically important.

Switching, however, is not simple. Building new, cleaner infrastructure is costly, and in some parts of the world, high-carbon plants have years of operational life left to run.

Governments must also ensure they have sufficient power supply to meet demand. Renewables such as wind and solar are intermittent and must be balanced with dependable generation capacity. Gas has been the transition fuel of choice for the West, but Russia's invasion of Ukraine raises significant questions about the security and cost of supply, and the risks of investing in new gas-fired plants.

The challenge of innovation

There is also the challenge of innovation. Hydrogen supply chains and CCUS are essential to tackle hard-to-abate emissions produced by industrial processes such as steel manufacturing, as well as international transportation and mining. But massive investment is needed to develop these systems at scale, which in turn requires decisive policy and collaboration among governments, investors and business.

Policy and public sector financing alone cannot deliver the investment needed. Private capital is critical to close the Net Zero financing gap. Measures such as carbon taxes, emissions trading schemes and feed-in tariffs are helping to create markets that boost participation, yet despite these changes, more needs to be done across the world to channel additional private capital towards the transition.

Regulation focuses on shifting markets to change behaviour

Policymakers have so far generally focused on shifting markets rather than forcing companies to reduce their emissions. A wave of regulation followed the signing of the Paris Agreement in 2015, followed by the introduction of a multitude of corporate disclosure frameworks. These help direct investors and asset managers to make more sustainable investment decisions, but they are also a work in progress, so are fuelling accusations of "greenwashing" and an uptick in regulatory investigations. There are moves to harmonise reporting standards – something that is essential to achieving Net Zero.

Against this backdrop, we have identified 18 steps we believe can accelerate decarbonisation.

01
Establish a robust international carbon market

Current markets are fragmented and complex. A lot of work is needed to build the infrastructure necessary to support a robust and transparent global market. Issues that must be addressed include the legal nature of an emissions unit, and protections against reversibility risk.

02
Provide greater clarity over directors' duties and sustainability

Alongside moves to embed sustainability into general corporate decision-making, greater focus is now being given to directors' duties. Boards would benefit from a more explicit expression of what those duties should look like when it comes to sustainability. We can expect more scrutiny of governance structures and the discharge of duties from shareholders, NGOs and other stakeholders, particularly in relation to corporate Net Zero transition plans.

03
Support a 'just' global transition

In 2009 the West pledged $100bn a year to support climate adaptation and mitigation measures across the developing world, less than some individual Western nations are committing to domestic Net Zero initiatives. Industrialised economies must also help developing countries create effective regulatory frameworks and "leapfrog" to the best technologies, and are under pressure to compensate them for the "loss and damage" caused by historic emissions. Agreements at the UN COP summits require consensus, so these issues affect how much progress can be made.

04
Provide government backing to build hydrogen supply chains

Massive investment is needed to make green hydrogen technology affordable at scale. Governments are trying to incentivise private investors in a variety of ways, including by introducing support measures that make projects more readily bankable. These however must be supported by collaboration between industries, states and policymakers to support scalable supply chains and reduce costs.

05
Increase investment in next-generation nuclear power

Governments are playing a key role in developing infrastructure by either funding projects directly, encouraging the involvement of private capital or creating progressive regulatory frameworks to boost adoption. Generation IV reactors promise to be quicker and cheaper to build. This de-risking of the construction phase should help overcome financial barriers to investment, while the expected inclusion of nuclear energy in the EU Taxonomy could drive further private investment.

06
Follow Europe's lead on decarbonising real estate

The technology exists to decarbonise buildings, but it is not clear who will pay. The EU has had energy efficiency targets in place for more than a decade, but perhaps the toughest rules are in the UK. Here, legislation has been developed that will require owners of commercial properties to improve their efficiency ratings. The law has been designed to sidestep typical contractual terms that place the onus for statutory changes on tenants, potentially providing a model for other countries to follow.

07
Develop science needed to protect biodiversity

Policymakers and regulators have only recently introduced frameworks for businesses to track, disclose and manage their impact on nature. The Taskforce on Nature-Related Financial Disclosures (TNFD) has perhaps the greatest long-term potential, although to succeed it must strike a balance between the complexity of the science involved in quantifying nature-related risks and impacts, and the need for easily comparable data.

08
Enhance terms to increase appetite for sustainability-linked bonds

Sustainability-linked bonds incentivise companies to act in a more sustainable way, with the issuer penalised if it fails to meet certain pre-defined performance targets. We believe they could be enhanced to drive greater sustainability impact, for example, by hard-wiring charity donations or carbon offsetting into the terms for investors who benefit from the issuer's poor performance.

09
Manage liability risks to boost uptake of carbon capture

Carbon capture, utilisation and storage (CCUS) is expensive and complex to develop at scale, particularly where it is designed to extract carbon directly from the air or transport it over long distances to be stored. Then there is the conundrum of how to build capacity where the supply chain is not vertically integrated. CCUS therefore needs considerable regulatory support, cross-sector collaboration and targeted financial incentives for investors. The CCUS industry is working with insurers on products to manage risk, but governments may need to offer guarantees to encourage greater market participation.

10
Collaborate across borders to develop CCUS in Asia

Interest in CCUS is growing in Asia, although not every country (for example Japan) has storage capacity. Government incentives will be needed to drive increased investment, alongside regulatory reform to streamline the permitting process. Asian governments are moving towards a regulatory regime for CCUS based on existing oil, gas and mining regulations. More international collaboration will be needed to create the infrastructure for moving CO_2 across borders to be stored.

11
Scale innovative multilateral mechanisms to aid transition in developing world

Development banks have crafted a range of innovative measures to support the decarbonisation of the global South – from de-risking infrastructure projects to taking over the running of coal-fired power stations with a view to phasing them out more quickly. These mechanisms provide the means to decarbonise developing economies, but can they be scaled at sufficient speed to help deliver Net Zero?

12
Use the U.S. Inflation Reduction Act as inspiration

The Inflation Reduction Act (IRA) aims to tackle rising prices by expanding tax incentives for investment in clean energy infrastructure, including nuclear, green hydrogen and standalone storage. The IRA is significant in many ways, not least because of the regulatory certainty it provides. It extends the period over which tax credits apply to more than a decade, taking energy policy outside the usual four-year political cycle. This, coupled with its breadth of scope, offers a model for other governments to follow.

13
Implement long-overdue reforms of U.S. interconnection rules

The transition to low- or zero-carbon power in the U.S. requires the interconnection of large amounts of new, clean generation to the grid. However in many areas it can take years to conduct the studies needed before a generator can enter an interconnection agreement with the local transmission owner. The current system was established by the Federal Energy Regulatory Commission (FERC) two decades ago and operates on a first-come, first-served basis. FERC has now issued a notice of proposed changes to the rules, which will affect transmission owners nationwide. An order could be made in Q1 2023, although it will take time to clear the backlog once any new regime has been introduced.

14
Support cooperation to decarbonise transportation

The technology needed to decarbonise transportation is still in development. Green hydrogen offers great potential – particularly in shipping – but building the supply chain to serve the sector globally will take many years. Without an international price for carbon, industry collaboration will be essential to incentivise supply of zero-carbon fuels. Aviation faces similar challenges, exacerbated by the fact that clean technologies often add weight, making them harder to deploy on long-haul routes. Emissions from international transportation are not included in countries' Paris commitments, but Europe in particular is applying regulatory pressure through its economy-wide Net Zero strategy. Further pressure from lenders and customers – coupled with government incentives and regulatory reforms – will accelerate progress, but whether this will keep pace with Net Zero pathways is unclear.

15
Redesign electricity markets for our new reality

Across Europe the price of wholesale electricity is determined by the "merit order principle", whereby all generators are paid the cost of the last unit needed to meet demand (typically gas). Governments have deployed short-term subsidies, revenue clawbacks and windfall taxes to reduce prices, but longer-term reforms are needed. A new model – such as decoupling electricity prices from gas – is needed to accelerate decarbonisation and reduce costs.

16
Evolve supply chains to keep pace with drive to Net Zero

Supply chains can contribute up to 90% of an organisation's carbon footprint. Companies and finance providers are collaborating with suppliers to drive down emissions, although trade tariffs and sanctions can be a barrier to progress.

17
Reimagine education to increase energy literacy

The energy transition is a complex challenge. Democratic governments are guided by what voters want, yet our current approach to education ill-equips us as a society to take an informed view on the decisions that need to be made. That has to change. Issues such as climate change are non-linear, and we need education systems that foster a holistic understanding of broad themes and instil a creative approach to problem-solving.

18
Japan unveils green subsidy programme – can it compete with the U.S. Inflation Reduction Act?

The Japanese government's ambitious support package aims to unlock USD1 trillion of investment in low carbon infrastructure over the next decade. We break down the draft law and explore some of the issues that still need working through

The Net Zero challenge

Here, we explore the dynamics shaping global energy markets and the challenges of transitioning to a low-carbon economy. We also identify 18 ways to accelerate the shift, from reforming corporate governance rules to reducing the liability risks around carbon capture, utilisation and storage.

Despite greenhouse gas (GHG) emissions continuing to rise[1] – and "irrefutable evidence"[2] those emissions are having a catastrophic effect on the environment – progress on more ambitious climate targets has stalled.

In order to meet the objective of the Paris Agreement and keep global temperature rises below 1.5C, our atmosphere can absorb no more than 400 additional gigatonnes of CO_2. At today's run rates this "carbon budget" will be exhausted by 2030. It is therefore essential that emissions are cut drastically over the next decade, with the UN estimating a 45% reduction is needed by 2030 to keep 1.5C within reach. However, it is possible the current energy crisis will result in even higher carbon outputs as Paris signatories backslide on their commitments in a bid to keep the lights on.

As a result, work to develop the low-carbon infrastructure we will need at scale beyond 2030 – such as nuclear power and possibly hydrogen – must happen now. Maximum effort must also be applied to things that can make an immediate impact, such as renewables, electric vehicles, energy efficiency measures, grid upgrades and reducing consumption.

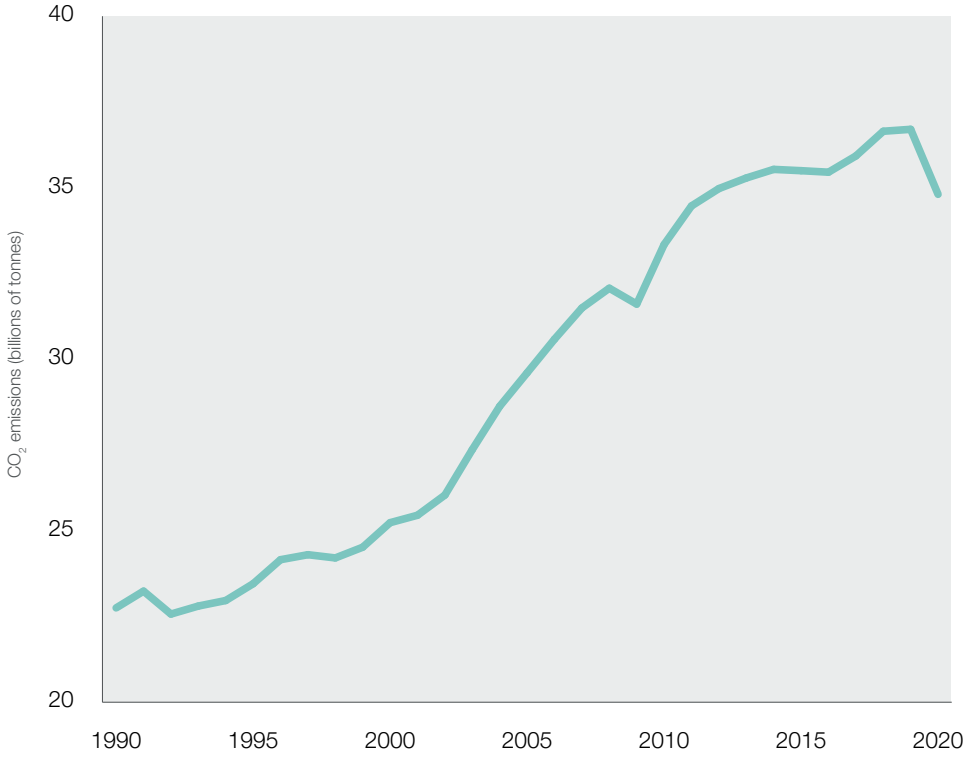
Decarbonising the global economy will involve unprecedented cooperation between the public and private sectors, among governments, citizens and NGOs, and among nations with vastly different priorities. It will require transformational policy and regulation to unlock private investment in renewable infrastructure and green innovation.

And if that was not enough, it will be made more difficult by the short-term need for governments to address the immediate challenges of energy security and rising inflation, both of which have the potential to delay the difficult decisions that lie ahead.

"Decarbonisation will require unprecedented cooperation between the public and private sectors, among governments, citizens and NGOs – and among nations with different priorities"

Emissions rise 50% since 1990

Global CO_2 output (1990-present)



Source: World Resources Institute

Energy use contributes almost three-quarters (73.1%) of global emissions[3]. Any exploration of how to deliver Net Zero therefore has to consider the major trends shaping global energy markets.

The first is decarbonisation itself, through which the most carbon-intensive methods of energy production (eg burning coal to generate power) are switched for cleaner alternatives (eg gas and renewables), and the use of hydrocarbons for transportation and storage gives way to electricity, batteries and/or hydrogen and ammonia.

At the same time, work is ongoing to scale carbon capture, utilisation and storage (CCUS), which has the potential to remove GHGs from hard-to-abate industrial processes such as steel, chemicals and cement production. The technology is available, but is challenged by the fact that the cost to capture carbon has to be less than the cost to emit it. In most countries, the latter is negligible – or non-existent.

Transitioning to low-carbon power is not a straightforward process. While the marginal cost of electricity from some renewables is lower than from fossil fuels (because the inputs – wind, sunlight, the movement of water – are free), the cost of developing the necessary infrastructure is high (because the systems must be "overbuilt" to deliver the same output). Governments also have to ensure they have enough power to meet demand, putting intermittent sources such as wind and solar at a disadvantage relative to, say, gas, which has a high "capacity factor" (ie gas-fired power stations can run almost all the time).

The uneven impact of coal-fired power

Then there is the issue of existing infrastructure. The typical coal-fired power plant in the developed world is between 30 and 40 years old[4], putting it close to the end of its operational life (the average coal facility is decommissioned after 46 years[5]). This means it is easier for governments in the West to remove coal from their energy mix than it is for their counterparts in Asia, where almost 50% of primary energy comes from coal[6] and the average coal-fired plant is just 13 years old[7].

These facilities have long remaining lives so will not quickly come offline without a major market shift. Indonesia's state-owned power utility for example has announced plans to decommission all its coal-fired plants by 2056, 18 years later than Germany, 26 years later than Spain and 32 years later than France[8].

Here, some of the innovative structures developed by multilateral financing institutions (see page 25) offer hope, although whether they can be scaled quickly enough to make a meaningful impact on emissions remains to be seen.

How can Asia switch to lower-carbon fuels?

There are also ways to reduce the carbon intensity of coal-fired energy production, for example by converting coal-fired facilities to run on a mix of coal and ammonia, which is rich in hydrogen and produces only nitrogen and water as by-products.

Another way is to replace or retrofit them with gas- or biomass-fired turbines. Switching from coal to gas cuts carbon emissions by between 40 and 50%[9], but Russia's invasion of Ukraine has sent gas prices soaring[10].

The bigger challenge to Net Zero is that new plants continue to be built in some countries, running counter to the UN's warning against the development of any new fossil fuel infrastructure in order to stay within acceptable temperature limits.

Carbon capture, utilisation and storage explained

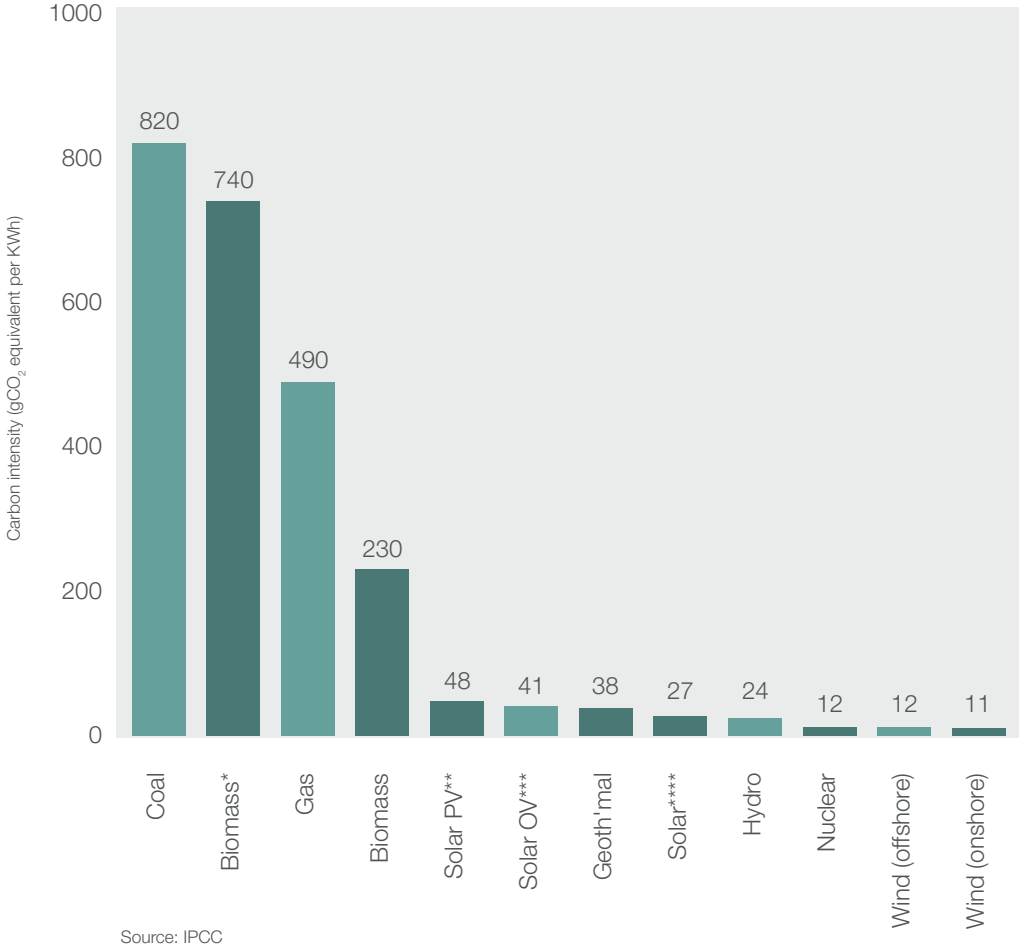
Carbon capture, utilisation and storage (CCUS) refers to a range of technologies designed to remove the CO_2 released by carbon-intensive activities, which can then either be sequestered in the ground – for example in the same subterranean reservoirs from which fossil fuels are extracted – or used in other industrial processes.

CCUS technologies have been in development for some time and governments are starting to offer significant incentives for private-sector involvement, including tax breaks, subsidies and other guarantees.

Major carbon storage projects have already started in countries such as Australia, China and Norway. In the United States, the Inflation Reduction Act (see page 26) provides significant financial support for carbon capture, although the landscape for storage permits is more challenging.

Coal is most carbon-intensive energy source

Average life-cycle CO_2 equivalent emissions



Source: IPCC

*Co-fired **Utility ***Roof ****Concentrated

Whether nuclear is a realistic option for Asia (outside of China, South Korea, Japan, India, Pakistan and Bangladesh) over the next decade is also in question. Many countries across Southeast Asia for example do not have a legal regime to share liability for an accident between suppliers, operators and the host and neighbouring states. Some nuclear plants can also take a long time to build[11] (not least because of the tendency for governments to develop their own safety and permitting requirements, extending construction timelines) and require significant upfront investment.

"Coal-fired facilities have long remaining lives and continue to be built in some countries – so will not quickly come offline without a major market shift"

Renewable energy – pros and cons

Source	Pros	Cons
Solar 	Government subsidies (eg feed-in tariffs) have allowed solar to scale As a result, solar is now the "cheapest energy in history", according to the International Energy Agency (IEA) Quick and easy to install on existing infrastructure	Output cannot be adjusted on demand, requiring overbuild of generating capacity and investment in storage Significant physical area needed to generate power at scale Solar plants are distributed across countries; power grids typically radiate from existing power plants near cities Converting solar energy to electricity is inefficient, and unlikely to become much more efficient due to limits of technology Photovoltaic cells are often made of non-renewable materials and have a limited lifespan, without economical recycling
Wind 	Again, subsidies such as contracts for difference have enabled wind to scale Price of wind power has therefore been falling in recent years	Not available on demand Windiest areas tend to be remote (eg offshore or away from population centres), making construction and transporting power back to grid a challenge Inefficient to convert wind to electricity
Nuclear 	Good for baseload power – can be operational >90% of the time and scaled on demand One of the lowest carbon outputs of any energy source	Nuclear plants require significant capital investment and can take a long time to build Public fears around waste and potential for accidents need to be addressed Different regulatory standards between countries makes innovation difficult
Hydrogen 	Most abundant element in the universe; only molecule used as fuel that does not contain carbon Can be used as both an energy source and an energy carrier like electricity (ie can store and transport energy from other sources)	Different methods of producing hydrogen can contribute to GHG emissions, and hydrogen leakage may exacerbate climate change "Green" hydrogen (the cleanest form, produced by using renewable energy to power electrolysers that split water into hydrogen and oxygen) is expensive. Electrolysers required need to be developed at scale to cut costs Hydrogen production uses more energy than it generates Hydrogen itself is volatile, and hydrogen molecules are so small they can escape from natural gas pipelines. However ammonia, produced from hydrogen and nitrogen, is cheaper and easier to store and transport Larger volumes of hydrogen are needed to produce the same energy output as natural gas

Governments focus on energy security

This points to a second key energy market theme, security of supply (defined by the International Energy Agency as "uninterrupted availability of energy sources at an affordable price"). Here, the war in Ukraine has fundamentally changed the landscape. Buyers looking to replace Russian energy have reinvigorated the liquefied natural gas (LNG) industry, where the last of the LNG projects without CCUS should reach the financial investment decision (FID) stage over the next five years.

The countries most reliant on Russian supplies – Germany and Italy – have turned to coal[12] to cover the immediate gap, while underground gas storage tanks have been filled[13]. Longer term however, the crisis is expected to accelerate the transition to lower-carbon power. Europe is channelling more investment into green energy[14], while Japan's Prime Minister, Fumio Kishida, has restarted his country's nuclear programme[15] a decade after it was mothballed in the wake of Fukushima.

Renewables have been at the heart of the energy security debate for some time. Vietnam for example has spent many years building out its hydropower resources to the point where hydro now generates more than 25% of its electricity. Further renewable capacity is being added via significant investments in wind and solar.

Vietnam is a good example of the benefits of policy certainty, even in a centralised system with energy monopolies (which typically do not create the best conditions for change). That said, Vietnam's grid still contains a significant proportion of coal-fired power, and the Vietnamese government has not yet released its Power Development Plan 8, which would further incentivise renewables and accelerate the transition from coal to gas.

The drive to improve energy security is also boosting investment in supply chains as countries shift away from globalised, just-in-time networks. For example, the U.S. is spending $500m to help domestic companies build solar factories in India[16].

This "friendshoring" – strengthening supply chains for strategic allies – aims to reduce America's reliance on China. This rewiring of the global system and recalibration of geoeconomic competition will eventually add redundancy to the energy system, which could increase the overall cost of power but reduce price volatility.

Why 'change of law' risk threatens Net Zero

The third major trend influencing energy markets is the threat of public policy inaction giving way to rapid shifts in legislation and/or regulation. This "change of law" risk makes it harder for private sector organisations to make financial investment decisions.

Many private investors will only commit capital once legislation has been passed and they can calculate their expected returns with minimal legal uncertainty. Here, government hesitancy represents too big a risk, given the potential for any new policy to go against them (for example by favouring nuclear, leaving renewable facilities stranded).

By contrast, other investors may see an opportunity in acting before a change in law, looking for the most attractive economics on a country-by-country basis and balancing this with their knowledge of the jurisdiction concerned. Their reasoning is that once new infrastructure has been built, the legal change will follow.

Policy uncertainty in the developing world is driving international capital towards developed markets. According to the IEA's 2022 Southeast Asia Energy Outlook[17], private capital comprised almost 60% of spending on low-carbon power in Southeast Asia between 2016 and 2020, far below the 90% seen in the West.

Policy inaction not only makes it harder for governments to decarbonise their economies at the same time as they tackle rising inflation, mitigate the effects of climate change and invest in health and education, it is also politically risky.

Any lag in policy can drive a wedge between governments and organisations with Net Zero targets, particularly if they are science-based. Companies – seeking a commercial advantage from their environmental credentials – may start to influence the public directly by promoting their green commitments, products and services. NGOs may also step into the policy void by seeking to educate society on the issues at play, driving more people to care and begin agitating for a change in the law – and possibly voting for a change of government.

In a world with an entrenched energy system that is 80% reliant on fossil fuels, the Net Zero transition cannot be delivered without government support. Ultimately, policy must work across sectors to drive structural change, for example through carbon pricing or the creation of mandatory carbon markets which level the playing field between fossil fuels and low-emissions alternatives.

Policymakers focus on incentives over obligations

Rather than simply mandating industries to reduce their GHG outputs, policymakers have long tried to use markets to accelerate progress. The signing of the Paris Agreement in 2015 and a change in tone from central banks unleashed a tidal wave of regulation designed to channel private capital towards climate-enhancing activities. Since then, we have seen the rise of green taxonomies and a focus on corporate sustainability disclosure, both of which are critical to help investors and asset managers make better decisions and for businesses to articulate their environmental credentials.

An alphabet soup of disclosure frameworks have been introduced, including the EU's Sustainable Finance Reporting Directive (SFDR) and upcoming Corporate Sustainability Reporting Directive (CSRD), and rules from the Task-Force on Climate-Related Financial Disclosures (TCFD), the Sustainability Accounting Standards Board (SASB), and stock exchanges around the world. While many of these transparency regimes started out as voluntary, major companies in the UK and France are now subject to mandatory reporting requirements, with the EU and U.S. considering similar measures.

Work under way to harmonise disclosure regimes

In a bid to enable stakeholders to compare company performance, bodies such as the Securities and Exchange Commission (SEC) and the International Sustainability Standards Board (ISSB) are pushing to harmonise the plethora of international reporting standards. There are now so many frameworks out there that this work is essential to accelerate decarbonisation. We are also seeing a rise in regulatory investigations into allegations of greenwashing, putting pressure on financial institutions, asset managers and pension fund trustees over whether their activities are genuinely green.

NGOs are launching headline-grabbing lawsuits over alleged inconsistencies in corporate disclosures and targeting companies without robust, measurable implementation strategies in place to deliver their Net Zero targets. Although designed to accelerate decarbonisation, some institutions are reconsidering their involvement[18] in high-profile climate initiatives over their increasingly stringent disclosure regimes and the associated threat of litigation. How companies generate sustainability data in a way that minimises risk is therefore critical. With such an intense focus on Net Zero, even the most sophisticated organisations need to navigate the landscape with care.

"Policy uncertainty in developing countries is driving international capital towards developed markets, even though bolder action would ease pressure on less wealthy governments"

Net Zero pathways

Against this backdrop – skewed incentives for decarbonisation, global policy uncertainty, pressure on security of supply and a more complex risk environment for business – how can we accelerate the Net Zero transition? Here, we identify 18 steps we believe can make the biggest difference.

01

Establish a robust international carbon market

Matt Townsend
Partner, London

Scott Neilson
Partner, Tokyo

Setting a global price for carbon is critical to delivering Net Zero. But we have a long way to go before the necessary infrastructure is in place to deliver a fully functioning carbon market

Efforts quickly to remove coal from the global energy mix are challenging given the remaining lifespan of many plants in developing countries. Taking coal-fired power offline needs to be affordable at scale, and this will remain elusive while releasing CO_2 is essentially free.

Governments have reduced the cost of wind and solar power[19] via demand-pull instruments (eg feed-in tariffs in the UK[20]) and deployment subsidies (eg tax incentives in the United States[21]). However, inflation and supply chain pressures are now pushing prices back up. The cost of solar panels[22] for example has risen sharply, threatening the economics of projects whose developers bid competitively for tariffs under more favourable market conditions.

Why a global price for carbon is critical

Setting a global price for carbon and other greenhouse gases is therefore critical to delivering Net Zero (indeed the UN's 2022 Emissions Gap report identifies carbon pricing as one of six policy levers that can transform the financial system to support decarbonisation). Yet despite more than three decades of debate, we are some way from this goal. Carbon markets are characterised by fragmentation, complexity and divergent models. This must be addressed – urgently.

One of the flagship structures in the Kyoto Protocol was the Clean Development Mechanism (CDM). This was designed to drive project-based investment into developing countries while generating significant carbon credits. These credits could be used to offset voluntary and compliance-driven targets and became a tradeable commodity, yet the CDM regime fell short.

> "There is a need for greater standardisation of key market principles, such as the legal nature of an emissions unit and adequate protections against reversibility and deliverability risks"

Article 6 of the Paris Agreement has again revived hopes, but we still have a long way to go before the infrastructure is in place to deliver a robust and transparent carbon market and incentivise the project-based investment required to deliver Net Zero.

Key market principles must be standardised

There is also a need for greater standardisation of key market principles, such as the legal nature of an emissions unit, adequate protections against reversibility and deliverability risks, and how best to address change-in-law risk. It is essential that the detailed framework developed out of Article 6 addresses these long-running themes. However, this will take time. Separately, the Task Force on Scaling the Voluntary Carbon Markets is continuing with its work, but has a massive job on its hands to transform how these markets work.

Demand response creates complex global picture

Despite there being more emissions trading schemes than ever, the market has not signalled a game-changing global price for carbon. This is a significant piece of the puzzle that, perhaps inevitably, governments are deploying an array of policy measures to solve. Europe's proposal for a carbon border adjustment mechanism has not been universally popular, with Brazil, China, South Africa and India claiming it is protectionism masquerading as climate action[23]. Carbon taxes and incentive-based measures are being rolled out piecemeal in line with local energy security concerns and political priorities, creating a complex global picture.

These themes will continue to impede the investment and market coherence needed to deliver Net Zero. Investors and operators need to find mitigating strategies, but the sooner governments – whether bilaterally or through multilateral bodies such as the UN – can deliver a coherent framework in which to price and trade carbon, the quicker we move out of the slow lane.

02

Provide greater clarity over directors' duties and sustainability

Matt Townsend
Partner, London

A fundamental shift is under way to embed sustainability into everyday corporate decision-making. This will require changes to governance regimes – and a new focus on directors' duties

Until recently, little serious attention had been paid to the role of corporate governance in tackling the climate challenge. There has, however, been a marked shift, with policymakers increasingly seeing governance reforms as an important part of the solution.

What's changed? There is a slow but steady recognition that climate transition cannot simply be an adjunct to the day-to-day issues businesses face. Much regulation treats sustainability as an externality and focuses on driving greater transparency through the publication of modern slavery statements, ESG policies, emissions reduction targets and so on. However, a fundamental shift is under way to embed sustainability into everyday corporate decision-making. A good example will be how transition plans need to be implemented within an organisation.

Governance regimes need to evolve

Ultimately, this change will require governance regimes to evolve in a number of significant ways. This is overdue; governance standards serve multiple purposes, including to protect investors, but they need to reflect the expectations and norms of the societies in which businesses operate. While embedded in long-standing principles, governance models therefore need to be highly flexible and organic.

> "Sustainability cannot be delegated to a nominated director or a committee. All directors need to feel a responsibility, which requires greater clarity over their statutory duties as regards sustainability"

So how could they evolve? First, many are calling for greater focus to be given to the role of directors' duties. Directors are increasingly cognizant of ensuring that sustainability is woven through their decision-making. This has led some to demand a more explicit expression of those duties in statute.

Boards need expertise for ESG data

Boards also need to ask themselves whether they have the expertise to understand the ESG data their companies generate, and the fast-evolving regulatory and policy landscape. This is not something that can simply be delegated to one nominated director or a sustainability committee. All directors need to feel a responsibility, which again takes us back to greater clarity being required over their statutory duties in this regard. Boards need to take a fresh look at the governance infrastructure of their businesses. How sustainability is integrated into, rather than simply bolted on to, existing frameworks remains a key challenge, particularly in large financial institutions. Ensuring appropriate oversight, monitoring and decision-making on sustainability issues is critical.

Greenwashing claims are increasing pressure

These challenges are coming into focus thanks to the broadening nature of greenwashing claims and regulator-led investigations. We expect to see more intense "under the bonnet" scrutiny of businesses' governance systems and decision-making structures, particularly as shareholders, NGOs and other stakeholders look carefully at corporate transition plans.

Reforms are on their way, largely driven by the EU. Aside from a more explicit iteration of statutory duties, we are seeing proposals for mandatory environmental and human rights due diligence across value chains, among other things. This may sound like something only likely to excite lawyers, but companies should keep a close eye on where these measures head as they, too, are likely to provide avenues for NGO-driven challenges.

Pressure rising for sustainability disclosure

The demand for corporate sustainability data is also set to explode. Investors are demanding it and climate reporting standards will necessitate it. Companies could outsource this work to third parties, although they may want to be masters of their own fates. Those that do will need robust systems and processes in place to generate and verify data that will be scrutinised by regulators and the wider market. A clearer picture of what is expected from boards – and the governance standards and systems they oversee – is needed. We remain in a phase of slow evolution, but faster reform is needed to ensure directors are clear about the scope of their duties and our governance systems are fit for the challenge sustainability presents.

03

Support a ‘just’ global transition

Scott Neilson
Partner, Tokyo

The West built its economy on hydrocarbons, but the effects of climate change will be felt more severely elsewhere. The developing world therefore needs to be supported through the transition

The economic disparity between the developed and developing worlds is a material barrier to agreeing global climate targets. A “just” transition is critical for many stakeholders – the West built its economy on hydrocarbons, but the effects of rising temperatures will be disproportionately felt elsewhere. The U.S., UK and EU member states have together contributed almost half (47%)[24] of historic GHG emissions. By contrast, Southeast Asian countries are responsible for 2%. Yet according to the Global Climate Risk index[25], six of the 10 countries worst affected by climate change between 2000 and 2019 were in Asia.

Is $100bn enough for the developing world?

Tackling emissions in the developing world will require both demand- and supply-side reforms. As a gauge of the potential costs, Germany is set to spend €177bn[26] on climate action and economic transformation between 2023 and 2026. In 2009, wealthy countries pledged $100bn a year between 2020 and 2025 to support climate adaption and mitigation measures across all developing nations.

> “Governments in the developing world do not have the money to develop new energy systems at the same time as they tackle climate change and invest to grow their economies”

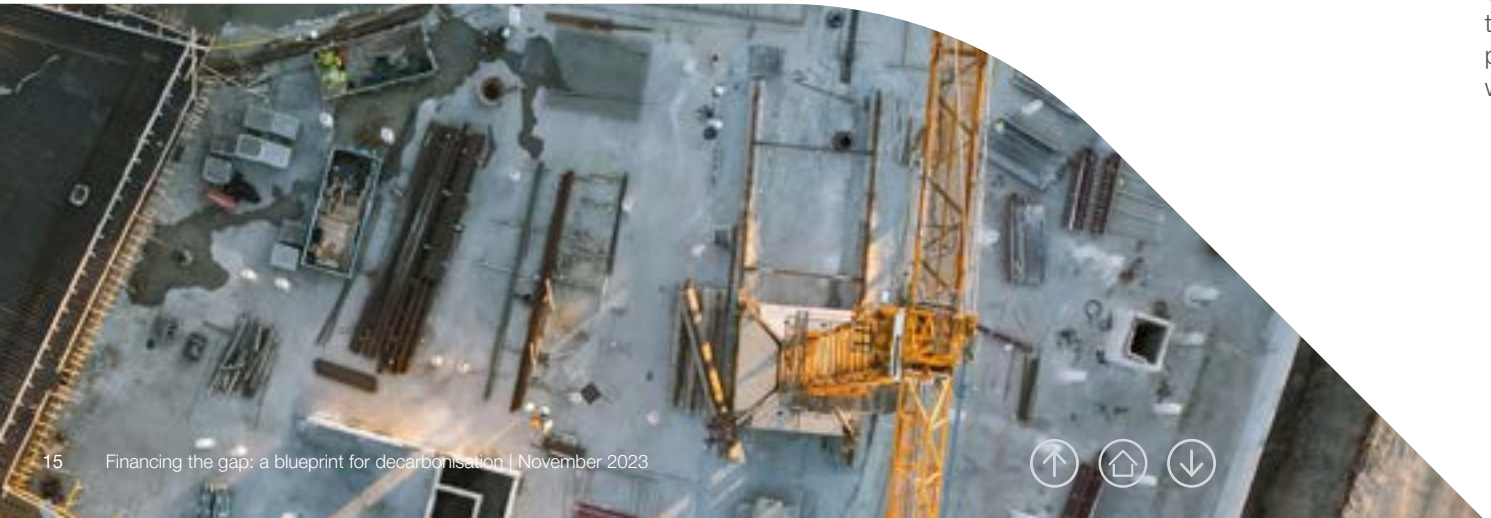
Raising the price of carbon will eventually lower the cost of energy. But in the short term, power will become more expensive as low-carbon infrastructure is built out at scale. Governments in the developing world simply do not have the money to develop these new energy systems at the same time as they tackle climate change and invest in healthcare and education to grow their economies. Boosting the budgets of multilateral agencies would help bridge the gap, but this is largely not happening.

Support global South with regulatory reform

There are, of course, more ways for the West to support the transition than by simply providing money. Emerging economies desperately need new regulation to support their transition, and wealthy nations could accelerate this process by passing on the lessons learned from their own regulatory reforms. This could involve guidance on how to decentralise power infrastructure from state-owned monopolies; increase the efficiency of “wheeling” (ie the process by which an electricity generator exports power to an end user over someone else’s transmission network); develop liability regimes for CCUS and nuclear; set a price for carbon; or reform reporting rules.

> “Developed countries can help emerging economies ‘leapfrog’ to the most effective technologies by sharing their knowledge of smart grids and other innovations”

Additionally, there is a massive opportunity for emerging economies to “leapfrog” to the most effective technologies. Here, too, developed countries can support this process by sharing their knowledge of smart grids and other innovations. Governments in the developing world can also do more themselves – delivering regulatory reforms, committing to policy change, and making difficult decisions to break up state monopolies. The West must play its part, but Net Zero cannot be achieved without countries working together.



04

Provide government backing to build hydrogen supply chains


Michael Diosi
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Hitomi Komachi
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Hydrogen will be key to decarbonising industries such as steel. But to build the supply chains required to develop economies of scale, state intervention will be needed

What role will hydrogen play in delivering Net Zero? Some believe it will transform everything from power generation to mass transit thanks to its flexibility as a carrier of energy. For others, hydrogen's high cost of production, relative inefficiency as a feedstock (compared to, say, natural gas) and storage and transportation challenges make it a distraction from more workable solutions.

In reality, hydrogen's current value lies somewhere in between – as a way to decarbonise a variety of hard-to-abate industrial processes (such as steel production), and as a source of green power for countries with limited renewable capacity.

Investment required to create economies of scale

Massive investment in infrastructure and innovation is required to create the economies of scale that will reduce costs to the point where hydrogen can replace other forms of energy. For that to happen, government intervention is required. Efforts to support more private investment in hydrogen production have taken various forms, from direct state funding towards construction projects to revenue support measures that make infrastructure developments more readily bankable.

> "Efforts to support more private investment in hydrogen have included direct state funding of capex projects and revenue support measures that make infrastructure developments bankable"

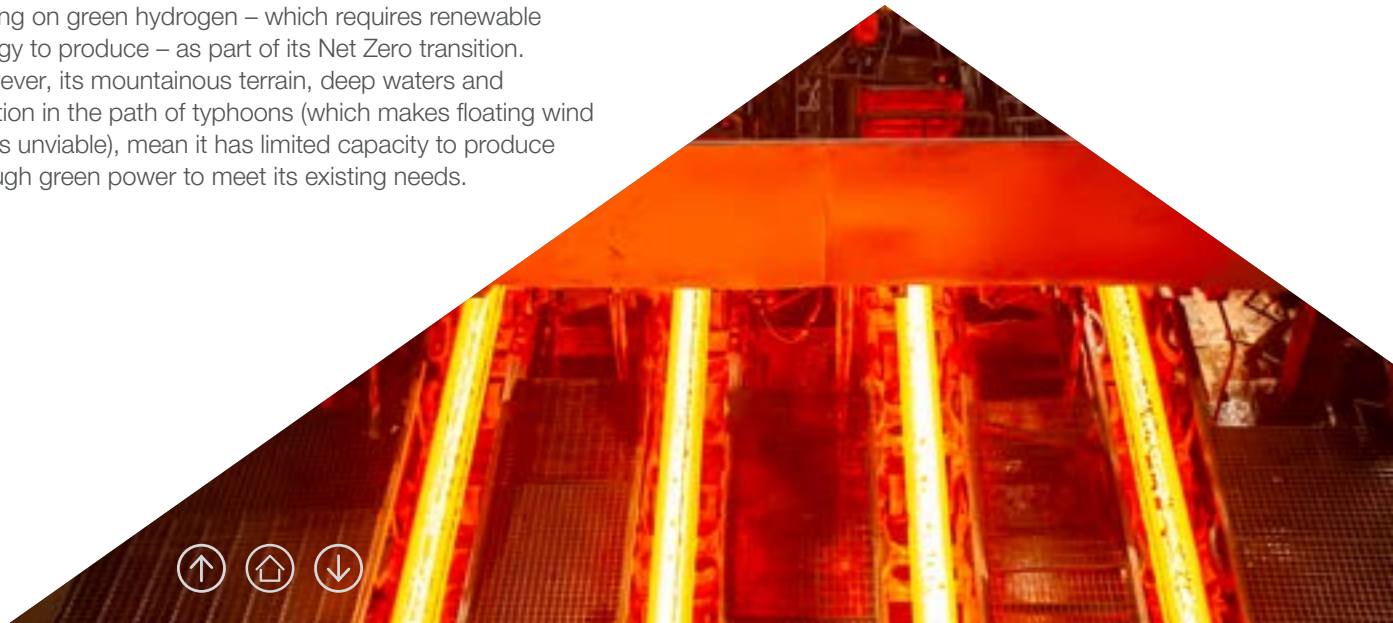
The EU and the UK are looking to deploy the sort of feed-in tariffs and contracts for difference that have boosted wind and solar generation, while President Biden's Inflation Reduction Act (see page 26) – which offers tax breaks to companies that provide clean power – is expected to accelerate progress in the U.S. Japan is betting on green hydrogen – which requires renewable energy to produce – as part of its Net Zero transition. However, its mountainous terrain, deep waters and position in the path of typhoons (which makes floating wind farms unviable), mean it has limited capacity to produce enough green power to meet its existing needs.

Japanese research reveals future use cases

In response, Japan intends to establish itself as a demand centre, and has conducted research into the price at which hydrogen becomes a potential substitute for fossil fuels in different settings. This work has identified heavy goods vehicles and shipping as the next applications that are within reach, potentially providing a pathway for other countries to follow.

Japan's plan has found a willing ally in Australia, which has massive potential as a green hydrogen producer. To boost its hydrogen supply chain, the Australian government is aiming to be a leader in regulatory certainty. Steps it has taken to date include implementing a scheme to certify green hydrogen, amending regulation to allow hydrogen into existing gas networks, and reviewing its entire regulatory framework to identify what rules need to change to facilitate hydrogen production and transport.

For now, hydrogen can abate some of our hardest-to-reach emissions. We are fortunate to be helping efforts to build an international supply chain, and when they succeed, hydrogen will finally be playing its part as a zero-carbon solution to our global energy needs.



05

Increase investment in next-generation nuclear power

Troy Edwards
Partner, London

Long-term contracts, price guarantees, direct state investment and the sharing of construction-phase risks are all options for governments looking to boost private funding of nuclear projects

Few experts see a credible path to Net Zero without nuclear energy. New nuclear provides a reliable and plentiful supply of low-carbon power, which will be vital in a world increasingly reliant on variable sources.

But if nuclear power is to play a leading role in our future energy mix it will require huge upfront capital investment. Some jurisdictions will also need to adopt innovative technologies and shift public perception.

Governments have a critical role to play by incentivising the participation of private capital or, alternatively, directly funding new-build nuclear projects.

Creative financing vehicles required to unlock innovation

Where direct government funding is not possible or preferred, progressive regulation, accompanied by creative financing vehicles, will be vital to unlock innovation and drive the development of new infrastructure.

> "Small modular reactors require a lower capital outlay for generation capacity, which should be well-suited to support stable, efficient power grids alongside an uptick in renewable power"

The fourth generation of nuclear reactors, currently in development, may simplify the task. In particular, small modular reactors (SMRs) will require a lower capital outlay for generation capacity that should be, in principle, well-suited to combining with increasing levels of renewable generation to support stable and efficient power grids.

Generation IV reactors de-risk project development

Many Generation IV reactors promise additional efficiencies and cost savings, largely through a design which allows much of the construction to be completed in a factory before being shipped to its operating location. This de-risking of the project development phase should, once proven, help to overcome financial barriers to investment in nuclear projects and therefore support broader adoption.

Governments must allay public concerns

Despite its promise, Generation IV projects remain in the early stages of development, and funding any type of nuclear project has never been easy. Then there is the further challenge of public concern over the perceived risks of nuclear power, which remains strong[27] in many countries. Memories of Chernobyl and Fukushima – supported by pop culture re-imaginings (including the excellent HBO drama on Chernobyl[28]) – continue to pose a barrier to development in some jurisdictions, notwithstanding that the practical risk from nuclear power is extremely limited.

Against this backdrop, it is no surprise that most of the new nuclear supply that has been introduced over the past 10 years has been in China, where state-owned companies implement central decisions.

Energy crisis prompts policy rethink

However, there is strong evidence of renewed interest in nuclear energy, triggered by the growing urgency of the climate crisis, the war in Ukraine, improved construction techniques for Generation III projects and the promised technological advances of Generation IV reactors. Indeed, both Germany and Belgium – which had planned to phase out nuclear power by 2022 and 2025 respectively – are reviewing their policies.

> "Some governments have started sharing R&D expenses on fourth generation projects, while others are designing commercial and regulatory frameworks to encourage investment"

Among countries with existing nuclear power fleets, the change in attitude is most obvious in Japan, where Prime Minister Fumio Kishida has signalled a policy rethink. A decade on from the Fukushima disaster, Japan is bringing idle plants back online, prolonging the operational life of existing reactors and recommitting to developing new reactor technology. Similarly, South Korea has moved to expand its nuclear power investment by restarting construction on two domestic nuclear projects and setting a target for nuclear power to provide a minimum of 30% of the nation's electricity by 2030. The government in Seoul is also increasing the activity of its state-owned companies in foreign nuclear schemes, including in Poland, Saudi Arabia and the Czech Republic.

States share cost of new project developments

Around the world, some governments have started sharing R&D expenses on fourth generation projects. The UK recently announced £120m of funding to support the development of new nuclear energy projects, while a similar scheme in South Korea has pledged $100m. Other countries are going further, designing regulatory and commercial frameworks that encourage investment as well as introducing revenue support measures such as long-term contracts and price guarantees.

EU set to include nuclear in green taxonomy

Nuclear energy also looks set to be included in the EU Taxonomy, the European Union's list of officially approved "green" investments, although this may be subject to legal challenge. Assuming this policy stands, this characterisation will allow significant pools of capital to invest in nuclear power which would not otherwise be the case. In parallel, financial incentives offered in countries seeking private sector investment in new-build nuclear might include a combination of long-term contracts, price guarantees, direct state investment and, critically, the sharing of construction-phase risk, which is typically viewed as a major impediment to mobilising any form of private capital.

This more positive mood around nuclear power is driving renewed interest from corporates. Established players, such as EDF and Rolls Royce, are being joined by new entrants in both the roll-out of third generation and the development of fourth generation technology to provide power to national grids. TerraPower, backed by the Bill and Melinda Gates Foundation, has specific, long-term social and environmental aims and is now involved in the development of an experimental reactor project in Idaho.

Still, Generation IV is largely untested. What we can say with certainty is that nuclear power is again at the forefront of discussions around energy security and climate change – and that is a big step forward.

06

Follow Europe's lead on decarbonising real estate

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Aemelia Allen
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Europe's real estate decarbonisation rules are among the most stringent in the world. By focusing on efficiency – and allocating responsibility for funding upgrades – they offer an example to follow

Decarbonising real estate is potentially transformational for Net Zero. According to the UN Environment Programme Finance Initiative, real estate is responsible for 40% of global emissions[29].

The good news is that much of the technology required – from heat pumps and solar panels to low-energy lighting – is readily available. The challenge, though, is funding. Who will pick up the tab for retrofitting existing stock, particularly in the commercial sector? In the short term, increased energy efficiency will benefit tenants more than owners, yet owners retain the long-term interest in the asset.

EU offers roadmap to deliver Net Zero buildings

The way market forces and energy-efficiency legislation interact in Europe – particularly in the UK – highlights the challenges ahead, and offers a roadmap for how they can be overcome. In 2010, the EU led the way by introducing proposals for minimum energy performance requirements for both commercial and residential buildings via the Energy Performance of Buildings Directive.

> "Funding upgrades is the big challenge. In the short term, increased energy efficiency benefits tenants more than owners, yet owners retain the long-term interest in the asset"

These requirements have now largely been translated into national laws. Some countries have also taken a range of further steps to reduce real estate-related emissions. The Netherlands, for example, aims to phase out natural gas as an energy source for buildings by 2050. In Baden-Württemberg, Germany, replacement heating systems must either use a minimum percentage of renewable energy, or their owners must implement a package of measures to improve energy efficiency.

UK regime designed to avoid litigation

The UK has developed arguably the most stringent real estate decarbonisation requirements in Europe in the shape of the Minimum Energy Efficiency Standards (MEES) regulations, which were passed in 2015 but are being reformed to deliver the country's Net Zero strategy. Under current proposals, owners of commercial properties will need to raise the Energy Performance Certificate rating of their buildings to level C by 2027 and to B by 2030.

UK lease agreements typically have a "statutory compliance clause" enabling landlords to pass the cost of statutory changes on to their tenants. The MEES regulations take these mechanisms out of the equation by putting no specific obligations on owners to meet the minimum energy efficiency targets. Instead, those that fail to comply will face enforcement action if they grant new leases or continue to let sub-standard property.

Widespread changes to real estate stock typically become mired in debate over who will pay, but the UK government has been clear that the responsibility for improving energy efficiency rests with the property owner, and the market is responding accordingly. By removing ambiguity in this way, it potentially provides a model for other governments to follow.

07

Develop science needed to protect biodiversity

Gauthier van Thuyne
Partner, Brussels

More than 50% of global economic output depends in some way on biodiversity. Frameworks are emerging to measure the impact of business on nature, but the science needs work if they are to succeed

Reversing biodiversity loss will be critical to achieving an effective and sustainable transition to Net Zero. According to the World Bank[30], more than half of global economic output is either moderately or highly dependent on nature. Loss of biodiversity can reduce pollination and damage agricultural yields; around 75% of food crops rely at least partly on animal pollination, while countries in Sub-Saharan Africa are set to lose almost 10% of their GDP each year from 2030[1] if ecosystems such as forests, fisheries and pollinators collapse.

Despite this, policymakers and regulators have only relatively recently begun to introduce frameworks for organisations to measure, disclose and manage their impact on nature. This challenge has been compounded by the difficulty in assessing biodiversity loss.

Emerging regulations shine spotlight on business impact

The EU is leading the way on biodiversity regulations, publishing a proposal to limit the consumption of products that contribute to deforestation or forest degradation. The draft rules would require companies that import palm oil, beef, timber, coffee, cocoa and soy into the EU to carry out due diligence on their suppliers.

> "Draft European rules would require companies that import palm oil, beef, timber, coffee, cocoa and soy into the EU to carry out due diligence on their suppliers"

The level of scrutiny required would depend on where these products are sourced, with countries assigned either a low, standard or high deforestation risk score. In August 2022, the Australian government introduced a credit scheme to reward and incentivise activity that protects biodiversity. Credits gained by, say, farmers who protect the environment – for example by planting trees to prevent soil erosion – can be traded in a newly created marketplace. In the UK, the 2021 Environment Act contains provisions for the creation of a biodiversity credits programme, although no formal framework has been established.

Biodiversity disclosure frameworks mirror climate regimes

The creation of the global Taskforce on Nature-related Financial Disclosures (TNFD)[32], led by financial institutions, corporations and market service providers, has perhaps the greatest long-term potential to improve biodiversity. TNFD was established in 2020 to develop a new risk management and disclosure framework around nature- and biodiversity-related risks for financial institutions and businesses.

> "The success of the TNFD project will depend on striking a balance between the complexity of the science involved in quantifying nature-related risks, and the need for clear, comparable data"

It follows in the footsteps of the Task Force on Climate-Related Financial Disclosures (TCFD), whose framework has become a global standard for climate risk reporting and already plays a role in government-mandated climate reporting requirements.

Science critical to success of reporting rules

TNFD recently published beta versions of its risk management framework, setting out guidance for organisations that plan to pilot the system. It intends to publish its final recommendations in September 2023. The success of the TNFD project will depend on whether it can strike a balance between the complexity of the science involved in quantifying nature-related risks and impacts, and the need for clear, easily comparable data. Both are required to drive investment and operational decisions.

Importantly, the Science Based Targets Initiative (SBTi) will be publishing guidance on the role that protecting forests should play in companies' Net Zero commitments. The SBTi will issue the Forest, Land and Agriculture (FLAG) guidance strongly encouraging companies to invest in "beyond value chain mitigation" (BVCM), including tropical forest protection and peatland restoration.

08

Enhance terms to increase appetite for sustainability-linked bonds


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Magdalena Biereder
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Sustainability-linked bonds are seen as more environmentally effective than conventional ESG bonds – and if their terms were to change, they would be more effective still

Sustainability-linked bonds (SLBs) are increasingly used as a corporate financing instrument. Through their terms, they incentivise companies to act in a more sustainable way; if the issuer fails to meet certain pre-defined sustainability performance targets, it triggers a built-in adverse variation of the bond terms. Interest rate rises are the most common punishment. SLBs stand in contrast to conventional ESG bonds, which focus on a company's use of the bond proceeds.

As far as ESG bonds are concerned, if a company intends to use the funds for a sustainable cause – for example, by upgrading a factory to incorporate the most up-to-date manufacturing processes – the bond may receive an ESG label even where the company's broader sustainable business practices may not otherwise be best-in-class.

Sustainability-linked bonds grow in popularity

This relatively looser approach, with generally no adverse bond term consequences for an issuer if it fails to use the proceeds as initially advertised, has led to some hailing SLBs as a more effective tool to address overall sustainability challenges. They are also growing in popularity, comprising 26% of the total value of ESG bonds in 2021, up from 6% in 2020.

> "Instead of leaving it to the conscience of investors, directing gains from a company's poor environmental performance to ESG causes could become the default option"

That's not to say that sustainability-linked bonds could not be enhanced. For a start, investors actually benefit from a company's bad environmental performance through receiving higher coupon payments. In response, some investors have pledged to donate any gains they make to ESG charities.

Loan contracts may provide model for more effective terms

Instead of leaving it to the environmental conscience of individual investors, directing such funds to ESG causes could become the default option, by hard-wiring charity donations or carbon offset payments into the bond terms. And rather than merely relying on sticks, it may also be possible for bond market participants to adapt some of the terms more commonly seen in sustainability-linked loans to incentivise better ESG behaviour, such as interest rate decreases as a reward for good sustainability performance. We are starting to see these features appear in certain bonds, although more widespread adoption will require some market education.

The current market and investor expectations for SLBs are shaped by voluntary guidelines such as the "Sustainability-Linked Bonds Principles[33]" published by the International Capital Markets Association[34]. With $189bn in issuance volume in 2021[35] and year-on-year growth of 941%[36], further market guidance on the donation of gains from poor ESG performance may be desirable.

09

Manage liability risks to boost uptake of carbon capture


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Goran Galic
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Rachel O'Reilly
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Complex regulatory, operational and financial challenges must be addressed before CCUS can be developed at scale – not least how to help investors manage long-term storage liability risks

Policymakers are introducing high-impact incentive packages and liability-capping schemes in a bid to trigger widespread deployment of carbon capture, utilisation and storage (CCUS). Despite the general recognition that CCUS can play a significant role in achieving Net Zero, various complex regulatory, operational and financial issues have so far acted as barriers to adoption.

First, the technology itself – which has been in development for decades – is often complex and expensive. This is particularly true for methods that require considerable investment in infrastructure, such as extracting carbon from the air or transporting it over long distances to be stored.

The challenges of creating robust CCUS supply chains

Then there are challenging market dynamics to tackle. For example, in jurisdictions where the entire CCUS value chain is not vertically integrated (such as the UK), providers of transport and storage services will need confidence that there are sufficient carbon emitters, (or some other way to mitigate under-utilisation) to make investments worthwhile.

> "The development of carbon-capture clusters, where storage opportunities are located close to industrial facilities, can drive the take-up of CCUS"

Conversely, emitters want to be certain that transport and storage infrastructure will be in place before they commit to the capital investments needed to retrofit their plants with carbon-capture technology. The development of carbon-capture clusters, where there are concentrations of industry and nearby storage opportunities, can drive the take-up of CCUS by helping to mitigate these risks and keep costs lower.

Regulatory support required to drive development

Moreover, CCUS requires considerable regulatory support, namely land-use permissions, streamlined permitting procedures and risk-mitigation measures, especially in relation to long-term liabilities for the security of carbon storage facilities. Gaining government approval for sequestration permits, rights of way for pipelines and land-use permissions is another potential hurdle.

In the U.S., only two states – North Dakota and Wyoming – currently have primacy for Class VI wells, meaning they have been authorised to permit CCUS projects. The Environmental Protection Agency is responsible for permission in other states. However, governments are counterbalancing these challenges by offering incentives to encourage more private investment, typically in the form of tax breaks, subsidies and other guarantees.

In Australia, for example, CCUS projects that meet prescribed requirements can qualify for carbon credits. In the U.S., the newly passed Inflation Reduction Act (see page 26) provides significant financial support for CCUS projects, for example, by extending and increasing the value of the current Section 45Q tax credit to any project that begins construction in the next 10 years.

> "In the U.S., the newly passed Inflation Reduction Act provides significant financial support for CCUS projects"

In the UK, a suite of measures is being developed including grant funding for capital costs, a regulated income/asset regime for carbon transport and storage networks, and various other subsidy models for emitters.

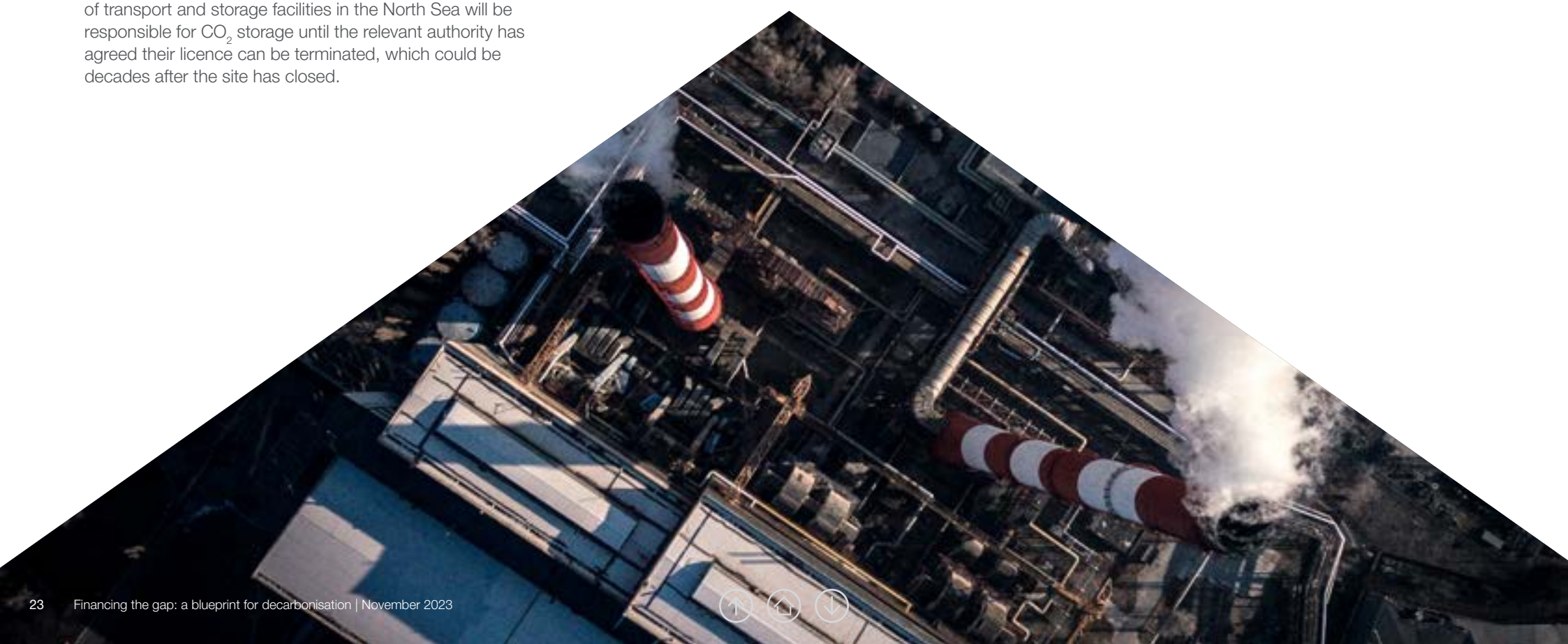
Who is responsible for carbon stored in ground?

Perhaps one of the most significant issues to be addressed is that of long-term responsibility for carbon stored in the ground. If investors are potentially liable for any leaks – even many decades after a carbon well has been plugged, as is currently the case in places like California – it could deter investment. Under the Australian federal regime, liability cannot pass to the state until a minimum of 15 years after injection activities have ceased, but in practice this could be longer.

In North Dakota, lawmakers are considering a proposal for liability to be transferred to the state 10 years after a well has been plugged, with the company responsible for the project obliged to pay into a sinking fund during the sequestration process. Meanwhile, in the UK, operators of transport and storage facilities in the North Sea will be responsible for CO_2 storage until the relevant authority has agreed their licence can be terminated, which could be decades after the site has closed.

Could insurance be the answer?

More broadly, the CCUS industry is working with insurers to develop solutions to liability issues. This could enable firms to indemnify themselves against long-term leakage risks or technical problems as projects are being set up. However, some level of government guarantees may be needed to encourage more insurers to enter the market, and/or to address gaps in the products available. Despite recent efforts to offer practical incentives in a bid to overcome the barriers to widespread adoption of CCUS, the need for even more targeted support for investors and coherent regulatory frameworks remains critically important if the technology is to fulfil its potential.



10

Collaborate across borders to develop CCUS in Asia

Ian Havercroft
Principal Consultant at the Global CCS Institute

Scott Neilson
Partner, Tokyo

Interest in CCUS is rising in Asia. Governments keen to build their supply chains can look to other countries for policy inspiration – but must adapt any measures to their unique circumstances

The importance of carbon capture, utilisation and storage in managing climate change is driving a wave of interest among Asian countries with large emissions-intensive industries that are reliant on fossil fuels for growth. Here, governments are considering a range of policy options to drive the investment needed to roll CCUS out at scale.

Three of the Intergovernmental Panel on Climate Change's four illustrative pathways to keep global temperature rises below 1.5C require the widespread adoption of CCUS, and worldwide there are now 30 CCUS projects in operation, 11 under construction and a further 150 in development.

Global investment focused in the West

To date, most CCUS investment has been in the West but interest is rising around the world. In Southeast Asia, for example, there are several projects in early development, including in Thailand, Indonesia and Malaysia. That said, much more investment is needed. The IEA calculates that countries in the region need to commit $1bn a year to CCUS by 2025 to remain consistent with the goals of the Paris Agreement.

> "Governments need to find time in legislative schedules for supportive CCUS legislation designed to limit investor liability and streamline the granting of permits"

How do Asian countries unlock that sort of capital? Government incentives will be needed, but in what form? Norway, for instance, has implemented a carbon tax combined with tax incentives, while the U.S. deploys tax credits and subsidies. Asian countries can learn from these policies, adopting the measures best suited to their individual circumstances.

Scaling CCUS needs a price for carbon

Finding the optimal balance between incentives and disincentives is one of the biggest challenges policymakers face. To scale CCUS in a meaningful way, the costs of emitting carbon must be more than the costs of capturing and storing it. That isn't possible without either taxes or subsidies, while emissions trading schemes and carbon credits provide an additional boost.

Governments also have to find time in legislative schedules for supportive CCUS regulation designed to limit investor liability in the short and long term, and to streamline the granting of permits and licences.

There is, nevertheless, momentum on this front. A number of Asian countries – among them Indonesia – are moving towards a regulatory framework for CCUS, with existing oil and gas and mining regulations often serving as a template. For its part, Japan has progressed a pilot CCUS scheme using a cocktail of existing legislation but has acknowledged that CCUS-specific laws will be required in the future.

International collaboration crucial to provide consistent incentives

What else is needed for Asia to take its CCUS ambitions forward? International collaboration is crucial to provide regional – and, ideally, global – consistency around incentives, taxes and carbon trading schemes. Government collaboration will also be necessary to support the creation of infrastructure to move CO_2 across borders for storage. The establishment of the Asia CCUS Network last year was an acknowledgement of the need for international collaboration. Efforts around regulation and incentivisation in the region now need to be solidified and accelerated.

11

Scale innovative multilateral mechanisms to aid transition in developing world

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Development banks have crafted a range of innovative measures to support the decarbonisation of the global South – including taking over the running of coal-fired power plants

Multilateral development banks (MDBs) have become a catalyst for decarbonisation projects in emerging economies. By creating investment platforms with generous risk-sharing mechanisms they are driving private investment towards Net Zero schemes that might otherwise not progress.

For institutional investors there are compelling reasons to partner with MDBs, including the prospect of higher rates of return, access to a broader pipeline of deals and support to invest in projects that fulfil their own Net Zero goals. The reputational upside of joining forces with an internationally respected organisation to deliver benefits in the global South is a powerful incentive in its own right.

Risk-sharing mechanisms incentivise private investment

MDBs also offer much-needed technical expertise, conducting feasibility studies, helping host states run operating tenders and working with policymakers to shape the regulatory frameworks needed to support the development of technologies such as carbon capture, utilisation and storage (CCUS).

Boosting decarbonisation in emerging markets is not a straightforward task, however. For example, some countries need to build a fully scaled and reliable grid before they can focus on power generation. Others that have made recent investments in high-carbon infrastructure, such as coal-fired power stations, will see little incentive in making a rapid switch away.

> "One of the most promising approaches is a first-loss reduction scheme through which the International Finance Corporation underwrites the first 10% of any investment losses on projects"

MDBs have developed innovative approaches to overcome these hurdles. One of the most promising is the first-loss reduction scheme introduced by the World Bank-affiliated International Finance Corporation (IFC), through which the IFC underwrites the first 10% of any investment losses on projects in developing countries. Reducing the risk in this way makes the projects more bankable, and has encouraged major financial institutions to invest.

In November 2021, a global insurer partnered with the IFC[37] to launch the MCPP One Planet programme, a cross-sector portfolio of emerging-market loans aligned with the Paris Agreement and backed with IFC first-loss protection. The IFC has since set up similar schemes with other financial institutions[38].

MDBs take over running of coal-fired power plants

A programme initiated by the Asian Development Bank (ADB) aims to accelerate decarbonisation in Southeast Asia while recognising the realities of the energy transition in the region. It is supporting an Energy Transition Mechanism (ETM)[39] that will allow public and private investors to finance ETM funds while ADB takes over the running of coal-fired plants (many of which are in their first decade of operation) with a view to phasing them out within 15 years rather than the usual 40- to 50-year lifespan.

By doing so, it is helping developing countries accelerate their energy transitions without putting short-term power supplies at risk. Proceeds generated from the retired assets will go towards cleaner investments such as renewable energy plants, clean-energy grids and storage facilities. The ADB is currently running pilot schemes of the project in Indonesia, the Philippines and Vietnam.

Looking ahead, the co-financing models and innovative investment platforms developed by the MDBs provide a mechanism to decarbonise developing economies. The question now is whether they can be scaled at sufficient speed to help deliver Net Zero.

12

Use the U.S. Inflation Reduction Act as inspiration

Sam Kamyans
Partner, Washington, D.C.

Groundbreaking law introduces long-term incentives for clean energy, including supply- and demand-side measures designed to build a robust, diverse low-carbon energy ecosystem

The U.S. Inflation Reduction Act (IRA), signed into law in August 2022, is poised to accelerate a fundamental rebuild of U.S. energy infrastructure and drive significant reductions in carbon emissions. It aims to tackle rising prices by incentivising investment in clean energy while reducing the federal deficit via a new corporate minimum tax rate, more effective tax enforcement, and measures to cut the cost of prescription drugs.

In terms of numbers, the IRA is expected to channel more than $360bn towards energy security and climate-positive technologies. The U.S. tax system has long included incentives for green infrastructure, providing credits based on investment value (investment tax credits, or ITCs) and on production/generation (production tax credits, or PTCs). Prior to the IRA, both types of credit were phasing down and were more limited in scope.

Law incentivises clean energy projects in low-income areas

The IRA extends existing ITCs and PTCs for eligible projects that start construction before January 1 2025, and introduces new incentives that cover a broader range of clean technologies including nuclear power, green hydrogen, carbon capture, electric vehicles and charging infrastructure, and a mix of storage systems.

> "The law includes local content incentives to boost domestic supply chains and creates a manufacturing credit for equipment such as small-scale grid interconnectors"

Beginning in 2025, credits are available on a technology-neutral basis so long as emissions reduction targets are satisfied. In addition, a clean fuels credit will also be introduced for a two-year period to replace an existing clean fuels excise tax credit. All told, this broad suite of credits begins phasing down in 2033.

The IRA is designed to drive a "just" transition, with credit multipliers linked to minimum pay rates for workers, and for infrastructure development in low-income areas and parts of the country historically focused on fossil fuel production and associated generation. It includes local content incentives to boost domestic supply chains and creates a manufacturing credit for equipment such as small-scale grid interconnectors.

The credits are available to companies of all sizes in a bid to build a more diverse energy ecosystem. Project owners are also able to trade their tax benefits to unrelated third parties (unlike the previous regime where owners could not freely sell credits to parties best able to utilise them), boosting owners' financing options and providing more opportunities for private investors.

IRA offers regulatory certainty beyond political cycle

The IRA is significant for several reasons. First, because the U.S. generates 13% of global GHG emissions[40], behind only China. Some projections suggest the law could cut America's carbon output by up to a billion gigatonnes over the next eight years, enough to bring the U.S. 66% closer to its 2030 emissions target[41]. Such a big reduction would be a major step forward for the world.

The second is the regulatory certainty the law provides. Extending the period over which credits apply – in most cases to more than a decade – takes U.S. energy policy outside the typical four-year political cycle. This important commitment gives developers – and investors – the confidence to act.

Measures incentivise clean energy supply and demand

Then there is its scope. The IRA's new credits are technology neutral, promoting emissions-free power rather than a particular energy source. Its mechanisms to foster a robust clean energy supply chain – coupled with demand-side measures such as tax breaks for consumers to buy electric vehicles – are potentially transformational. Of course, tax breaks are not a panacea. Clean energy projects need significant regulatory support to be rolled out at scale. Land-use permissions, water rights and permits to store carbon and hydrogen are all crucial to de-risk projects, but these are currently very difficult to obtain.

While the process for such permits is onerous, they are being awarded – albeit slowly. These issues aside, unlocking the financing for Net Zero is a critical piece of the puzzle – and the IRA does this better than almost any other law. Its breadth of scope should act as inspiration for similar efforts elsewhere.

13

Implement long-overdue reforms of U.S. interconnection rules

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The existing U.S. interconnection regime is decades old and ill-equipped to bring large amounts of new renewable power on to the grid. Thankfully that looks set to change

The transition of the U.S. power sector to increasing reliance on low- or zero-carbon resources requires the interconnection of large amounts of new, clean generation. However, in many areas, it typically takes years to perform the required system impact studies before a generator can enter into an interconnection agreement with the local transmission owner or operator.

One of the most pressing issues facing the sector therefore is how best to reform the interconnection queue and resolve the perennial backlog of generation attempting to access the nation's transmission grid.

Current regime unchanged in two decades

The current interconnection regime is almost two decades old. It was established by the Federal Energy Regulatory Commission (FERC) in the wake of FERC's introduction of competition to the wholesale power markets by mandating "open access" to the transmission system.

> "As renewable electricity generation has expanded in the U.S., the FERC regime has buckled under the weight of applications from a multitude of smaller, largely renewable projects"

At that time, FERC was focused on facilitating the development of competition in an era where largely natural-gas-fired generation was coming online. FERC developed a first-come, first-served interconnection regime, under which each generator that applied for interconnection was studied by the transmission provider in sequence. Each generator was also responsible for funding the full cost of upgrades to the transmission system needed to accommodate its facility. This mechanism was well suited to a relatively limited number of large, expensive conventional generators.

System buckles under weight of applications

As renewable generation has expanded, the system has buckled under the weight of applications from a multitude of smaller, largely renewable, projects, the bulk of which are never completed. For example, PJM Interconnection, L.L.C., the independent grid operator in the mid-Atlantic region and a portion of the Midwest, has seen requests for generator interconnections triple over the past three years. There are now 2,700 projects (more than 250GW) in the queue, with generators facing multi-year delays to enter the network.

Moreover, the allocation of upgrade costs has become increasingly uncertain. Project developers often jockey to take advantage of available transmission system capacity, with those just behind them in the queue potentially saddled with the costs of large upgrades that benefit multiple parties.

Cost uncertainty causes developers to withdraw

The unpredictability of costs compounds the problem, with projects pulling out of the queue. This leads to re-studies for all lower-queued projects, a reallocation of costs and further withdrawals. Another issue is that joining, and remaining in, the interconnection queue is relatively inexpensive, resulting in some developers submitting multiple speculative projects, some or all of which will never enter operation.

Several grid operators in the U.S. have already made changes to their respective interconnection processes by adopting a first-ready/first-served model and a cluster study process. Under this regime, all of the interconnection applications submitted within a certain period, referred to as a "cluster", are studied as a group. Transmission system upgrade costs are allocated among members of the cluster based on their proportional impact of the proposed interconnections on the system.

"In 2022, FERC issued a notice of proposed rulemaking setting out a plan to revise its pro forma interconnection procedures. The earliest date for an order is likely to be spring 2023"

There is generally a series of three studies—after each round, the applicants may choose to withdraw from the queue if the allocated costs are too high for their project. They may also be removed from the queue if they have not passed certain development milestones, such as securing site control. Applicants that continue in the queue must pay deposits (generally based on project size and/or system impact), which are intended to winnow out projects that are merely speculative.

FERC proposes new interconnection regime

In the summer of 2022, FERC issued a notice of proposed rulemaking setting out a plan to revise its pro forma interconnection procedures, which would apply across the U.S. In the same week, PJM independently proposed similar revisions to its own interconnection queue procedures. Any final order from FERC will affect transmission owners nationwide, although large independent grid operators such as PJM are granted leeway to develop their own rules. The earliest date for an order is likely to be spring 2023, and even once new interconnection processes are in place, it will take time to implement them and clear the backlogs.

FERC's order will be designed to do two key things: give project developers greater cost and timing certainty throughout the interconnection process, and eliminate current queue clogging. This improved certainty should facilitate the ability of low- and zero-carbon generation gaining access to the grid more efficiently. Project developers will need to ensure compliance with the new interconnection regimes. To prepare for the changes that are coming, the best thing that project developers – as well as investors looking at generation projects in the development cycle – can do is to get to know the rules inside and out. The more familiar they are with the new measures, the less likely they will be to fall foul of them.

14

Support cooperation to decarbonise transportation


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Getting to Net Zero shipping and aviation is a complex challenge. However industry collaboration, innovation, new regulations and pressure from customers are helping to accelerate progress

Transportation accounts for around one-fifth[42] of global CO_2 output, with shipping and aviation responsible for 20% of the total. Finding a way to decarbonise these sectors is therefore critical to deliver Net Zero, although the barriers to doing so are considerably higher than for other forms of mobility.

Like many aspects of the energy transition, the obstacles are both technological and financial. Firstly, the systems needed to decarbonise aircraft and ocean-going vessels are still in development. While green hydrogen offers massive potential as a zero-carbon fuel source, building the supply chain required to serve the sector globally will take many years.

Taking shipping as an example, vessels in service today will be in operation for decades – some beyond 2050. To reduce emissions in the near term, shipping is therefore having to transition through dual-fuel power (a combination of oil and liquefied natural gas), raising the financial challenge of retrofitting existing vessels while investing in new Net Zero infrastructure and fleet.

International carbon price needed to support transition

Sustainable, lower-emission biofuels can be used as a direct substitute for – or "dropped in" to – traditional heavy-fuel oils, but until an international price for carbon is established they are significantly more expensive than existing products (and as we explore on page 13 a robust global carbon market is a long way off).

> "To reduce emissions in the near term, shipping is having to transition through dual-fuel power, raising the challenge of retrofitting existing vessels while investing in new infrastructure"

Only a handful of the largest players have the resources to develop the land-side systems required to serve ships with hydrogen-derived fuels, making cross-industry collaboration essential. Just as we are seeing with carbon capture and storage (see page 22), clear demand signals are required to create the necessary supply in the absence of vertically integrated supply chains.

Shipping and aviation industries collaborate across the supply chain

The good news is that this is happening, with shipowners and the cargo industry working together[43] to commit to using a certain proportion of green hydrogen in future. "Green corridors" that support zero-emission shipping are also emerging between major cargo hubs, although it is a much bigger challenge to extend them to the multitude of smaller ports that underpin the movement of goods around the world.

Similar dynamics are at play in aviation, where sustainable biofuels are also being deployed as transition technologies. Airlines and aircraft manufacturers are investing (often through their own corporate VC funds) in innovations such as battery-[44], hybrid-[45] and hydrogen-powered flight[46] and are collaborating (often through the same forums as their counterparts in shipping) to foster the development of zero-emissions supply chains.

However, aviation faces an added challenge in that international air travel often involves aircraft covering long distances between refuelling stops. Clean power technologies such as batteries are heavier than the fossil fuel systems they replace, creating significant efficiency trade-offs.

> "Aviation faces an added challenge in that clean power technologies such as batteries are heavier than the systems they replace, creating significant efficiency trade-offs"

As a result, they are largely only viable in lighter aircraft that serve shorter routes, driving some manufacturers to fund the development of mitigating innovations such as direct air carbon capture and storage[47].

EU set to include shipping in Emissions Trading Scheme

From a regulatory perspective, emissions from international transportation are not included in countries' nationally determined contributions (NDCs) under the Paris Agreement. Regulatory pressure is still being brought to bear (the EU's economy-wide Net Zero strategy, which covers all industries, is just one example) but to date, aviation and shipping have not faced the sort of global policy focus that has been applied to, say, cars.

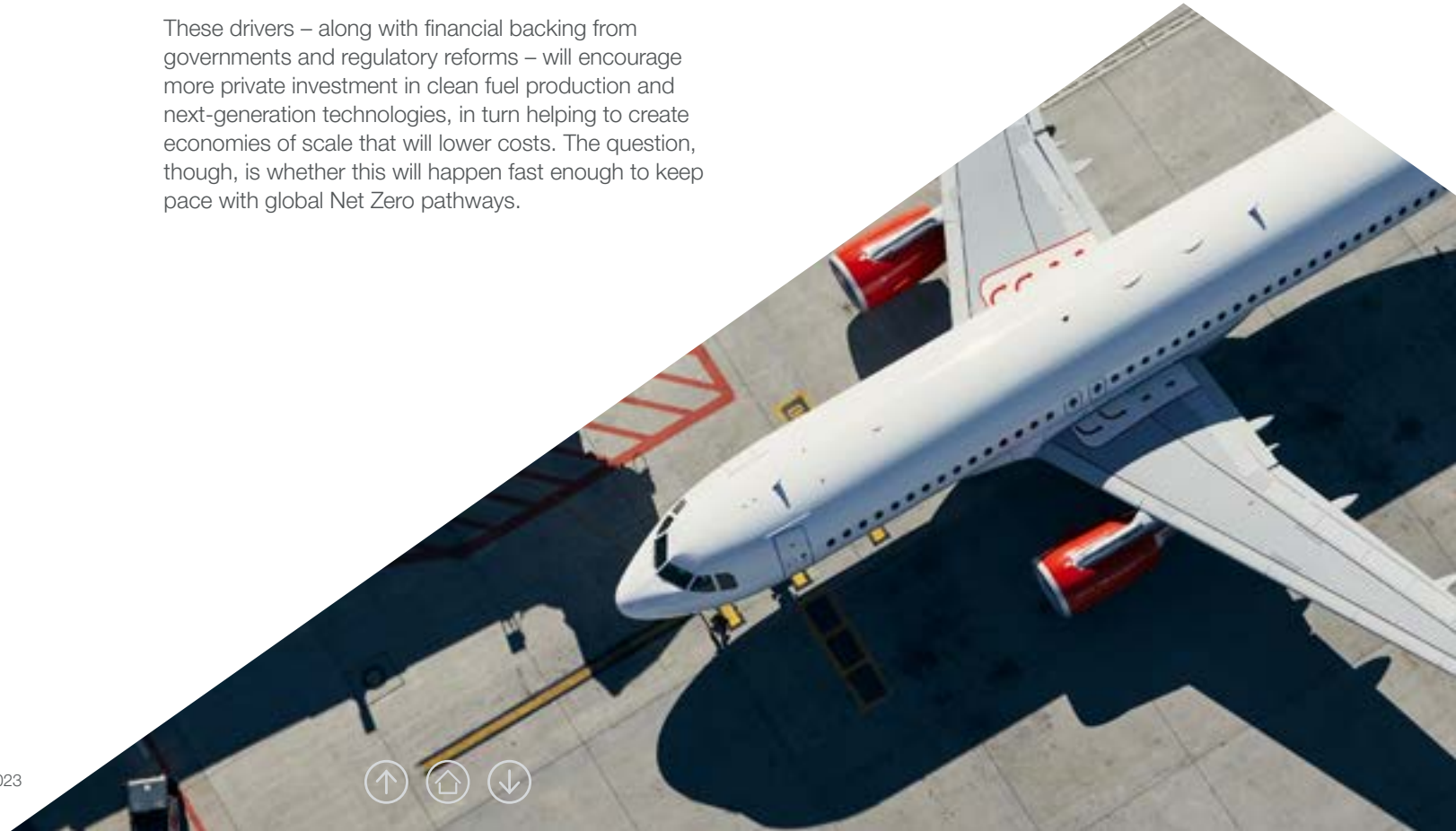
Looking ahead, shipping is set to be included in the EU's Emission Trading Scheme (meaning carbon permits will be required for voyages in EU waters), while the International Maritime Organisation – the UN body that regulates shipping – has pledged that by 2050 the industry's emissions will be half their 2008 levels.

ICAO releases breakthrough Net Zero goal

In October 2022 there was a breakthrough in aviation, with the International Civil Aviation Organisation (ICAO, another UN body, although one established to encourage cooperation between countries rather than regulate the industry) announcing an "aspirational" Net Zero goal by 2050[48]. The plan was accepted by all 193 ICAO member nations (although critics again point to carbon pricing as the missing piece of the puzzle).

Lenders are providing a further incentive to accelerate decarbonisation, with their increasingly stringent ESG criteria encouraging the industry to improve its environmental performance. The focus on Scope III emissions is also leading cargo operators to demand more from their transportation partners.

These drivers – along with financial backing from governments and regulatory reforms – will encourage more private investment in clean fuel production and next-generation technologies, in turn helping to create economies of scale that will lower costs. The question, though, is whether this will happen fast enough to keep pace with global Net Zero pathways.



15

Redesign electricity markets for our new reality

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Wholesale electricity markets were developed decades ago for a world of centralised supply and cheap gas. Today the landscape is much more diverse – so the model must be redesigned

How to lower the price of energy in the medium to long term is one of the biggest challenges facing governments around the world. Subsidies have been used as a short-term fix to the supply shock caused by Russia's invasion of Ukraine, but a more sustainable solution is required.

The current crisis has thrown into sharp relief the way wholesale electricity markets work. Under EU energy regulations which were transposed into UK law following Brexit, the price of electricity is determined by something called the "merit order principle". Generating companies submit bids to supply electricity to the grid, which are accepted in price order. At the end of every trading period, all generators are paid the cost of the last unit needed to meet demand. Where there is insufficient renewables capacity (which is often the cheapest source), higher-priced fossil fuel power enters the mix. On an average day in the UK, gas generates just over 20% of electricity.

European governments act to reduce electricity prices

In a period where the price of gas has risen to seven times its usual level, a range of measures are being introduced in a bid to lower the cost of power. The EU will, among other things, recoup "surplus revenues" from non-gas generators and electricity traders – redistributing the proceeds to ease pressure on consumers – while member states will take steps to cut demand during the winter months.

> "The EU will, among other things, recoup 'surplus revenues' from non-gas generators and electricity traders, redistributing the proceeds to ease pressure on consumers"

The European Commission has also allowed Spain and Portugal to introduce temporary gas subsidies that limit the price of electricity on the Iberian market. The UK government, too, has published its Energy Prices Bill[49], which aims to reduce the impact of gas costs on electricity prices and controversially includes measures to cap revenues from renewable generators.

Looking further ahead, adding more renewable capacity and scalable reserves such as nuclear – as the U.S. is trying to do via the Inflation Reduction Act – will both improve security of supply and help mitigate future price shocks. It is, though, an unavoidable truth that our electricity pricing model needs to change. The current approach was developed decades ago for a world of centralised supply and cheap gas. Today electricity comes from a diverse range of sources with gas no longer the obvious benchmark, and so the market must be redesigned to better reflect this reality.

Long-term market reforms on the horizon?

In the EU, discussions on longer-term reform of the electricity and gas markets have only recently begun. Things are more advanced in the UK, where the government is consulting on a new model via the Review of Electricity Market Arrangements (REMA). Here, options on the table include decoupling the price of electricity and gas, allowing consumers to opt for cheaper renewable power and only pay for more expensive gas-fired electricity during periods of peak demand.

> "Options on the table in the UK include decoupling the price of electricity and gas, allowing consumers to opt for renewable power and only pay for gas-fired energy at times of peak demand"

Although very difficult to achieve – and only truly effective with widespread adoption of smart meters – this would create an incentive to add more low-carbon capacity. Other alternatives include switching to the zonal pricing model favoured by countries such as Italy (whereby electricity prices vary between regions), or the more granular system which operates in some U.S. states and sets prices at hundreds or even thousands of local nodes.

Away from market reforms, there are other ways for governments to cut the cost of power. Some developers who built wind farms, biomass- and waste-to-energy plants during the past decade were incentivised with contracts guaranteeing them a price for their electricity above that set by the spot markets.

There are hundreds of these contracts in the UK alone, yet as they pass their midpoint there may be appetite among generators to accept lower-price deals that extend over a longer period, with the increased price certainty enabling them to refinance debts in a way that makes commercial sense.

16

Supply chains must evolve to keep pace with the drive to Net Zero


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Supply chains enable production and progress, but their contribution to climate change is significant. Making them more sustainable in every sense is critical to decarbonisation.

As international trade continues to expand, robust supply chains are essential to facilitate efficient access to goods. They also play an important role in achieving Net Zero as they typically account for about 90 percent of a company's emissions[50].

Supply chains can increase greenhouse gas outputs through inefficient shipping and logistics practices, wasteful production and assembly operations, and shortcomings in energy use, reuse and recycling of products. But while their contribution to emissions must be examined, supply chains can also be leveraged to provide key green technologies that are needed to reach Net Zero.

So how can these emissions be tackled? In the short term, fuel efficiency standards should be tightened across supply chains. Estimates suggest the shipping industry could reduce its emissions by up to 55 percent[51] through measures to cut fuel consumption, for example by lowering speeds and using technology to optimize routes.

The shipping industry is also innovating to cut its carbon output, which you can read about in more detail here[52].

> "Companies can enhance environmental responsibility in supply chains by engaging with suppliers cooperatively on design, manufacturing and services technologies and processes that produce less emissions and waste"

Perhaps most importantly, companies and finance parties can enhance environmental responsibility in supply chains by engaging with suppliers cooperatively on design, manufacturing and services technologies and processes that are more energy- and resource-efficient and produce less emissions and waste.

Given the large portion of emissions that are generated by supply chains, companies that have pledged to reduce emissions must favor sustainable suppliers or provide their suppliers with the resources needed to reduce their emissions in order to reach overall sustainability goals.

In recognition of this issue, some companies are working with suppliers to set sustainability standards and facilitating the provision of favorable finance terms to those lacking the initial means to invest in technology and processes to improve their sustainability performance.

EU imposes non-disclosure obligations in bid to mitigate adverse environmental impacts

In Europe, supply chain considerations are a key aspects of many pieces of legislation adopted as part of the Green Deal, the EU's landmark policy to reach climate neutrality by 2050, which was announced in 2019. EU non-financial disclosure obligations dating back to 2014 identified the need for entities in scope (of whom there were approximately 5,000) to identify and disclose supply chain risks.

The upcoming Corporate Sustainability Reporting Directive (CSRD) which is applicable from 2024 and covers around 50,000 companies will take non-financial disclosure obligations to a new level with hundreds of data points to be reported, many of which will cover the supply chain.

As a complement to disclosure, the EU's vision of a sustainable corporate governance has led proposals for a new due diligence directive (CSDD). This creates an obligation whereby large companies will need to identify and mitigate their adverse ESG impacts, with some obligations extending to "business partners" in the value chain.

Beyond this general framework, sectoral obligations were created several years ago at EU level (eg conflict minerals, timber) and more are being discussed, for instance in the fields of batteries and deforestation. They have in common the need for in-scope entities to consider their supply chains, with increasingly stringent due diligence obligations. A common feature of the EU approach and a novelty compared to earlier sets of EU law is the recognition that EU law will effectively have consequences beyond EU borders, in the situation where value chains are global.

Tariffs and human rights challenges limit climate progress

When trade barriers interrupt supply chains, potential for change is curtailed. Tariffs on environmental goods may prove an obstacle to the spread of green technology. The US Commerce Department's 2012 tariffs on solar cells and panels from China, for example, slowed the growth of solar projects[53]. Domestic supply failed to fill the gap, and in 2022, the Department began to investigate Southeast Asian manufacturers alleged to have circumvented the tariffs (who had filled much of the demand resulting from the 2012 measures) once again slowing solar project growth.

Likewise, sanctions and import controls also disrupt supply chains. The ban on US imports of solar panel materials sourced from Xinjiang impacted solar project development, given that about half of the world's solar-grade polysilicon is produced in the region[54].

The renewable energy sector in particular is often characterized by increasingly complex global supply chains. In addition to the risks posed by tariffs and sanctions, this complexity can create risk arising from other human rights issues. In many cases, manufacturers may not be aware of, or have access to meaningful information on, various upstream suppliers.

Cobalt, for example, is a key input for batteries that will need to be manufactured at scale as part of the renewable energy transition and is mined in large quantities in the Democratic Republic of the Congo, often in unsafe and/or coerced conditions in or near conflict zones[55]. This in turn creates both legal and reputational risks for manufacturers.

Although legislation has attempted to improve transparency about conflict minerals[56] and forced labor[57] in supply chains, these initiatives also highlighted the challenges facing companies attempting to gather and interpret data from suppliers. Geopolitical tensions may also hamper access to rare earths or other key mineral inputs for the renewable energy transition, preventing renewables firms from pursuing projects, or making such projects prohibitively expensive.

The importance of responsible supply chain management

Global supply chains bring many advantages and are firmly rooted, but come with a range of legal and other risks. Many companies in the renewables sector, and their consumers, are rightly eager to avoid developing the renewable energy transition on the back of forced labor or other human rights abuses, to say nothing of legal and geopolitical risks arising from sanctions, tariffs, and other issues.

These pitfalls will need to be addressed by civil society and/or governments to ensure that the transition to renewable energy is not hindered by restricted access to key inputs for solar, batteries, and other renewables. Among the key benefits of responsible supply chain management for all sectors are increasing supply chain flexibility, which reduces vulnerability to disruptions and creates new market opportunities.

17

Reimagine education to increase energy literacy

Scott Neilson
Partner, Tokyo

The Net Zero transition is complex and requires an understanding of everything from regulation to geoeconomics. But our education systems ill-equip us for the decisions that lie ahead

Every option on the road to Net Zero has its critics. Environmental groups oppose fossil fuels, putting banks and power project developers under pressure over funding the transition from coal to gas in developing countries. Nuclear has an image problem. Solar panel manufacturing has raised human rights concerns; wind turbines have been criticised for their impact on wildlife[58].

This debate has to change. Currently, concern over the potential for criticism from NGOs, voters and the media is inhibiting policy development.

The energy transition is a complex challenge that requires an understanding of advanced technologies, regulation, contractual risk allocation, international value chains (both for the materials needed to build new infrastructure and the fuel sources themselves) and geoeconomics.

However, our current education system ill-equips us as a society to take an informed view on the decisions that need to be made.

Energy is vital to our future, yet not a focus in our schools

Few know the peak demand of their country's power system; the advantages and disadvantages of different energy sources; or the realistic options for supplying these sources locally. Nor do they understand how to balance dependable and intermittent energy inputs; the impact of energy intensity on land use; how to lower emissions and improve security while keeping prices under control; or the most effective things we as individuals can do to help with the transition.

> "Education is critical to help reframe the conversation. Economics is well-represented in education, yet less effort has been made to improve our energy literacy"

Even among experts a detailed appreciation of energy systems across countries and regions is limited, either because those systems are so large they are hard to conceptualise, because the experts have a specialist skillset (eg engineering), or because their work touches only a fraction of the energy ecosystem (eg rooftop solar).

Creativity is critical to solve complex problems

Education is critical to help reframe the conversation. Money underpins our society, so finance and economics are well-represented in education. Energy is equally important, yet the same focus has not been channelled towards improving our energy literacy.

We teach our populations in silos – maths, biology, chemistry, languages – and test knowledge using standardised examinations with predefined answers. Yet issues such as climate change are non-linear. We need education systems that give children a holistic understanding of broad issues and instil a creative approach to problem-solving.

18

Japan unveils green subsidy programme – can it compete with the U.S. Inflation Reduction Act?


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When the Biden Administration launched the Inflation Reduction Act (IRA) in summer 2022, the USD370 billion boost it gave to U.S. green investment via a multitude of grants, loans and tax credits caught the attention of businesses across the world. Private capital is now flowing into a range of low-carbon infrastructure projects across the country, helping to accelerate the U.S. green transition.

The diplomatic response to the IRA has been mixed, however. The law sparked outcry in Europe, with the EU branding it protectionist and calling on Washington to waive its local content rules so European products are eligible for the same incentives that apply to goods manufactured in the U.S.

This criticism has merit but the inescapable truth is that European businesses find the IRA's incentives more attractive than anything available at home. Europe now faces a choice: is it more concerned about state aid or decarbonisation?

Japanese companies, too, have been pursuing large-scale energy transition projects in the U.S., including hydrogen storage, nuclear plants and wind and solar installations (some with hydrogen production facilities attached). Japanese companies talk about learning skills and developing technology overseas and bringing these home to Japan. Implicitly though, there is more opportunity for them in the U.S. right now, too.

That is set to change however with the launch of a massive incentive package by the Japanese government. The draft Green Transformation Act – published in February – aims to accelerate decarbonisation in Japan to achieve its goal of cutting 46% from Japan's carbon emissions by the turn of the decade relative to their 2013 levels, and make Japan carbon neutral by 2050.

A multibillion-dollar incentive scheme

Following a period of public scrutiny and comments, the draft is now being considered by the Japanese Parliament.

Its current form would see the government issue around USD150 billion in Japanese Government Bonds (or JGBs) next year to fund the initial wave of investments, with the aim of catalysing USD1 trillion of developments over the next 10 years.

The package covers all aspects of the green transition, from nuclear to renewables, grid upgrades, energy efficiency measures, electric vehicles, carbon taxes, an emissions trading scheme and a border adjustment mechanism.

More than one-third (USD60 billion) of the funding is earmarked to build "clean" hydrogen and ammonia value chains as Japan bids to boost its security of supply and decarbonise its energy generation. While some of the money will be spent domestically, much of it will be invested overseas, for example to produce hydrogen in Australia or the Middle East, which will then be shipped to Japan for storage and use. However, where producers are generating outputs for multiple markets, only the portion exported to Japan will be eligible for government support.

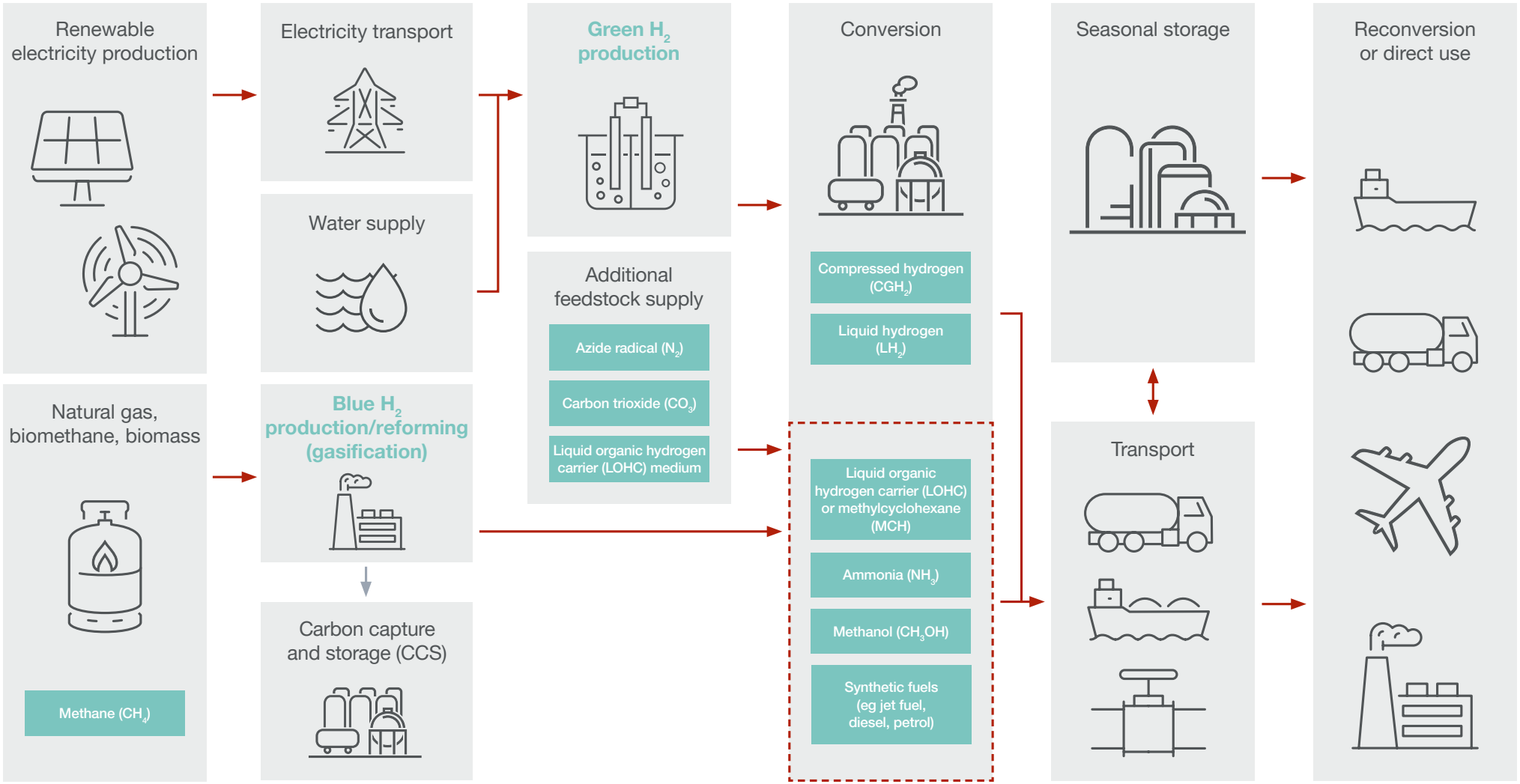
Given the scope of the package and its implications, we will be publishing more over the coming months. But what is clear right now is that, as with liquefied natural gas (LNG) in the 20th century, Japanese investment will be a game-changer for clean hydrogen and ammonia in the 21st.

The dynamics of hydrogen and ammonia value chains

Creating hydrogen and ammonia value chains has always been expensive because so much new kit needs to be built. In the case of green hydrogen, huge amounts of renewable infrastructure is required because a significant proportion of the energy generated is lost in producing hydrogen, transporting it to users and then converting it back into electricity.

Japan, poor in energy resources, is planning to deploy subsidies to secure supplies of new sources of energy via supply chains originating outside of Japan. It has always been concerned about energy security, a fear that has only been exacerbated by recent market instability. The more sources of energy it has - and the sooner they are available - the better.

Hydrogen and ammonia value chains



Source: Based on an infographic from Hamburg Open Online University (Fabian Carels, Lisa Karies)

The Supply Chain Subsidy package explained

Japan's Agency for Natural Resources and Energy (**ANRE**) published an interim summary in January 2023 outlining a two-pronged approach to supporting the generation and use of clean hydrogen and ammonia. The first prong is a subsidy scheme for international hydrogen and ammonia supply chains (the **Supply Chain Subsidy**). The second prong is a support scheme for industrial clusters for the utilisation of hydrogen and ammonia in Japan (the **Clusters Support**).

Both subsidy schemes aim to create a domestic market equivalent to 1% of Japan's primary energy consumption by 2030, as well as drive down costs. This article focuses on the Supply Chain Subsidy, the priority for ANRE. We will explain the Cluster Support in greater detail in a subsequent article, however, it is introduced here to provide an understanding of the two schemes and how they interact.

1) Who qualifies?

The Supply Chain Subsidy will be available to **producers** of hydrogen and ammonia, with **users** covered by a separate set of incentives (although users will benefit from lower costs, more on which below). Within this, the ANRE summary identifies three groups of producers:

1. those that produce, transport and supply clean hydrogen and ammonia to others;
2. trading companies or intermediaries that buy and sell clean hydrogen and ammonia; and
3. those that produce and transport clean hydrogen and ammonia for their own consumption.

The subsidies are aimed primarily at group 1, although there are ongoing discussions about extending them to groups 2 and 3. Here, the debate is focused on the extent to which these producers will contribute to the commercialisation of products and the energy security of Japan, as well as to reducing production costs and creating demand.

What's covered?

Hydrogen and ammonia production and transport facilities, but not, broadly speaking, storage infrastructure in Japan. The Clusters Support covers the latter.

The Supply Chain Subsidy and the Clusters Support will be an addition to the existing Green Innovation Fund (**GIF**), which provides long-term financing to help Japan achieve carbon neutrality (you can read more about the GIF here) and covers three main stages of development:

1. feasibility studies;
2. detailed engineering design; and
3. infrastructure development, with priority afforded to priority sites.

Why transport?

Japan is a mountainous country with no cross-border pipeline or ability to import hydrogen and ammonia via land. There is a limited amount of space on which to develop the giga-scale renewable power projects required to produce green hydrogen, and as a result it is unlikely Japan can establish a self-sustaining, domestic hydrogen and ammonia value chain.

It will therefore need to develop a specialised shipping fleet to import hydrogen, much like it has for LNG. Including transport within the boundary of the subsidies will boost Japan's shipbuilding industry, which has lost ground to Korean and Chinese rivals in recent years.

Why not storage?

A separate support package, the Clusters Support, covers hydrogen and ammonia utilisation clusters in Japan including storage, with the government keen to avoid the "double-dipping" (or "stacking") of subsidies.

Here, three large and five smaller utilisation clusters in Japan have been identified. The Clusters Support will focus on developing shared infrastructure (e.g. pipelines, storage and transport facilities) that together will contribute to large-scale use of hydrogen and ammonia by multiple operators on site.

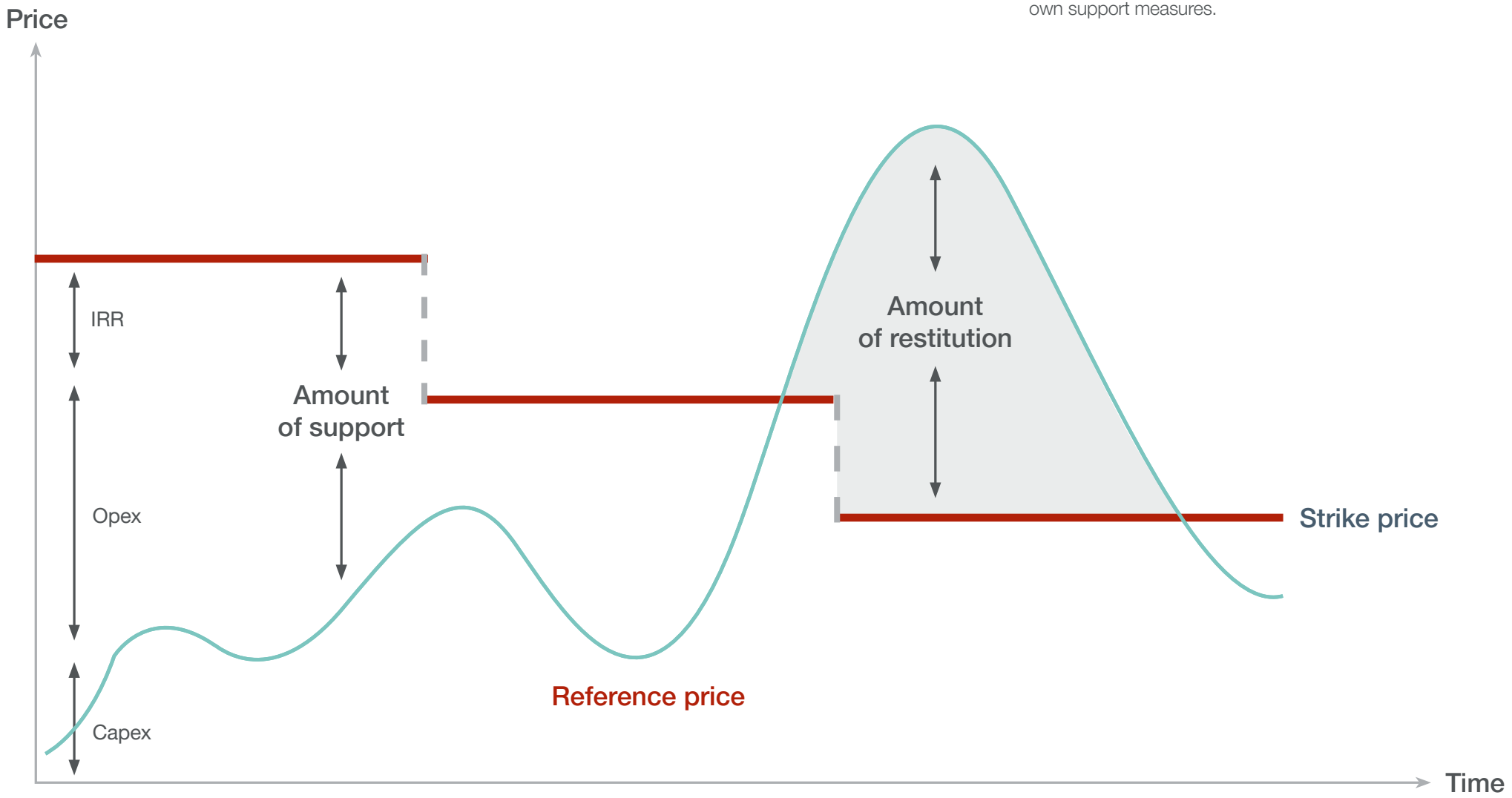
How do the Supply Chain Subsidies work?

Japan's subsidies are designed to ensure "clean" hydrogen and ammonia are sold for the same price as LNG and coal, respectively. This decision is based on the assumption that hydrogen will be used to co-fire gas-fired power plants, and ammonia will be used to co-fire coal-fired power plants, in each case, reducing emissions and ensuring that end-users will not pay more for greener energy inputs.

Producers will be compensated for the difference between the target price (based on the estimated cost of production and operation for the whole supply chain) and the reference price (i.e. what end-users pay for the product). Under the currently contemplated scheme the target price is not subject to a floor (unlike in the UK), meaning producers will be paid the full difference.

While further details are required on the rules around stacking, we expect the Japanese government will be careful not to allow any doubling-up of subsidies or tax equity offered by schemes such as the U.S. Inflation Reduction Act and the UK Low Carbon Hydrogen Business Model (the **LCHBM**).

Where there is overlap, the government may look to deduct the portion of capital and operating expenditure supported by other countries' subsidies from the amount covered by its own support measures.



What type of hydrogen are we talking about?

The subsidy scheme targets "clean" hydrogen and ammonia, either green or blue (the former is produced using renewable energy to electrolyse water into hydrogen and oxygen, the latter from fossil fuels with the carbon captured and stored). "Grey" products (where the carbon isn't captured) could also qualify on an exceptional basis if there is a clear path towards decarbonisation.

At present, the criteria for what constitutes a "clean" product have not been specified. ANRE is suggesting the use of standards developed by industry bodies such as the Japan Hydrogen Association and the Clean Fuel Ammonia Association.

Levels of carbon and other greenhouse gases emitted through the production process are likely to require third party certification, and whatever criteria are adopted will need to be re-assessed periodically as the urgency of decarbonisation grows and technologies improve. ANRE has not specified how often such criteria will change, but has indicated that relevant factors driving a revision would be an update to the equivalent standards globally, such as RED/RFNBO, CertifHy Low Carbon and EU taxonomy in the EU, the Low Carbon Hydrogen Standard in the UK and the IRA in the US. The impact of re-assessment of standards needs to be understood. Uncertainty and increasing tightening of standards could reduce attractiveness of developing projects to support the Japanese supply chains relative to other supply chains which do not face the same issues.

ANRE has also proposed using a sliding scale of tax credits linked to emissions volumes as well as a sliding target price to create an incentive for producers to be ambitious in their Net Zero goals.

When will the support start, and how long will it last?

For "first mover" producers (i.e. those targeting commercial production between now and 2030) the subsidy programme is contemplated to last for 15 years (extendable to 20). However it contains a proviso that the government may update and revise the scheme if the market creation of clean hydrogen and ammonia accelerates. Like with standards above, the possibility of revision (including on the strike price, as shown above) means uncertainty for investors and may discourage participation, particularly if similar subsidy schemes elsewhere do not give rise to such uncertainty.

Will the subsidies cover excess production or the risk of a shortfall?

The summary states that subsidies for excess production (i.e. above and beyond the committed sales volume) should not be essential for the viability of any project, although the issue is under consideration. Shortfalls in the volume production to meet any sales obligations are also not covered, meaning the producer will bear the full technology and performance risk on any project.

What challenges can we see in the legislation?

What qualifies for subsidies?

ANRE has identified a range of potential criteria for assessing "first mover" bids for subsidies. These include:

1. Compliance with **safety** regulations;
2. Impact on Japan's **energy security** (e.g. the promotion of local production, long-term commitments on upstream natural resources or power supply, supply chain risk management, feedstock price risk etc);
3. Impact on the **environment** (e.g. reduction in CO_2 emissions);
4. **Economic efficiency** (e.g. target price, aggregate capital expenditure, prospect of non-reliance on and independence from the subsidy scheme);
5. **Commercial feasibility** (e.g. scheduled commercial operation date, minimum volume, technology, offtaker commitment and diversification, post-subsidy use of outputs etc); and
6. **Impact on the wider economy** (e.g. location of related infrastructure, utilisation of domestic technology, expansion of domestic market, entry to overseas market, technical innovation etc).

These criteria are broad and require additional detail. Just as with other forms of infrastructure, clarity around the criteria and point-scoring system will be vital for producers as they prepare bids.

What's in scope?

The summary notes that further consideration is needed as to whether expenditure on upstream renewable power projects is eligible for the subsidies. Many hydrogen and ammonia projects in remote locations – or where there is no current grid connection – are being developed or planned on an "integrated" basis with "captive" renewable infrastructure for downstream hydrogen facilities. Where upstream renewable power is being developed on an integrated basis, the developers would still be looking to recover their capex, opex and margin on the renewable power either at the point of sale of renewable electricity, or ultimately through the offtake price on hydrogen and ammonia. Rather than not supporting it, it would be more logical to only support the renewable power to the extent it goes into the Japanese supply chain because renewables will be needed on a much larger scale than otherwise because of the energy losses in conversion to hydrogen and ammonia. The argument that the cost of renewable power has come down does not hold if you have to build significantly more for a value chain project.

There are also questions around the extent to which interface risk (i.e. in relation to the development and availability of carbon capture and storage projects for "blue" hydrogen and ammonia, or the availability at scale of electrolysers for "green" projects) is covered. The failure of one link in the chain could cause significant cost overruns. In addition it is also unclear whether financing costs can be taken into account when estimating the target price. They should be, otherwise the subsidies will favour few large companies that do not depend on debt financing for investments of significant scale.

Alongside this, producers will want to understand whether their exposure to inflation and forex risk is covered by the subsidies. Hydrogen and ammonia value chain projects will extend beyond Japan, and as a result, many of the costs may denominated entirely in US Dollars or other currencies. To the extent the subsidies are paid in Japanese yen, it is unlikely that the developers will be able to take or hedge such a large currency exposure in the commercial market.

Lack of volume support

Unlike the UK which initially tried to tackle this risk in their earlier policy, Japan's subsidies do not provide volume support. ANRE seems to assume that, on the demand side, end-users will simply swap LNG, coal or other fossil-fuel based resources with cleaner hydrogen and ammonia alternatives, and that developers will not face any issues with the volume of demand. The Supply Chain Subsidy does not address the risk that the developers may never sell their outputs or that their offtakers might not take them. Certainty of offtake is assumed, and is one of the assessment criteria outlined above. On the UK side, the UK LCHBM contemplates a very limited volume support, subject to a number of conditions (e.g. a reduction in hydrogen volume sales to below 50% for a qualifying event) and aggregate and annual caps, and remains to be seen whether this is appropriate for the first-mover investments.

Reassessment of "clean" criteria and strike price

With the criteria for what constitutes "clean" hydrogen and ammonia subject to review (and likely to get more stringent over time), producers will need to "future proof" their projects to ensure they qualify for subsidies over their full term. This is likely to involve the negotiation of a buffer in the product specification in the initial contracts. This produces uncertainty for developers. The nuclear power industry is a cautionary tale where large companies have been driven to bankruptcy as a result of cost overruns, in many cases due to the government's continuous "updates" to the specifications and safety regulations applicable. The Supply Chain Subsidy should not be a source of uncertainty to the developers, to make the significant projects in the pipeline investable.

ANRE sets out a review period (e.g. five years) for the strike price to be reset on a project-by-project basis to account for changing economics, including the evolution of a carbon price in Japan. This is not the case in the U.S. and UK schemes, and the Japanese government will therefore need to be careful this doesn't decrease the appeal of investing in Japan relative to other jurisdictions.

Impact of carbon accounting

Will businesses be prepared to invest when the carbon emissions of creating the entire value chain (for example in manufacturing the necessary concrete and steel) become subject to carbon pricing or impact their Net Zero targets? The overall emission savings of each output will depend on the project in question.

Will the subsidies help Japan become carbon neutral?

Industry analysts expect coal prices to fall further than LNG as demand drops due to climate concerns. As a result we may see a higher proportion of the subsidies applied to ammonia projects, irrespective of their impact on reducing Japan's carbon emissions.

Despite everything laid out above, Japan has huge expertise in energy infrastructure (and the summary is just that, a summary), so we expect that the fleshed out version will deal with many of these concerns.

Any other noteworthy developments?

In parallel to the Green Transformation Act, the Japanese parliament is also considering a series of amendments to the JBIC Act. (Japan Bank for International Cooperation (JBIC) is a government export credit agency through which Japan has been supporting energy and infrastructure projects around the world for decades).

The Draft Bill proposes to expand the scope of possible JBIC financings to non-Japanese borrowers (where the project involves the production of assets which benefit a supply chain to Japan), and in the context of hydrogen and ammonia projects could allow the Japanese companies to invest in the best green technologies globally in order to deploy them at home.

It also significantly widens the scope of potential JBIC financings for supply chain projects developed by non-Japanese borrowers, which are currently tied to the export of Japanese goods and services, the ownership of a project by Japanese companies, or the offtake of products by Japanese companies.

Japan is the key destination market of existing global energy supply chains, and its role is likely to continue in emerging energy supply chains. Both the Green Transformation Act and the amendments to the JBIC Act are being discussed at the current session of the parliament, scheduled to end on 21 June 2023. Whilst further details remain to be fleshed out, as discussed in this article, the adoption of these acts will be ground-breaking to stakeholders of energy transition not just in Japan, but globally.

Our experience

We operate at the forefront of the energy transition. Here are some highlights of our work.

Carbon trading

– We assisted a global financial institution on environmental matters associated with the IFC's $152m Forests Bond. The bond is a first-of-its-kind note that gives investors the option of receiving coupon payments in either Voluntary Carbon Credits (VCUs) or cash.

– We supported several multinational companies in understanding the EU's Carbon Border Adjustment Mechanism (CBAM) proposals and the implications for their products and markets. This included an analysis of the equivalent carbon pricing mechanisms required for the purposes of Article 9 of the draft CBAM Regulation.

– We worked with Eni UK on how the relationship between the Kyoto Protocol and the European Union Emissions Trading System affected their operations.

Sustainable finance

– We worked with a global financial institution's Community Development Finance Group on the establishment of the Essential Capital Consortium investment fund. The fund will invest in social impact projects including green technologies and clean energy, health services, low-income housing, education and microfinance in emerging markets.

– We worked with Enel S.p.A. and Enel Finance International on a triple-tranche €3.25bn sustainability-linked bond. This is the largest sustainability-linked transaction ever priced in the fixed-income capital markets.

– We supported the establishment of the UK's first social impact bond. It has funded prisoner rehabilitation programmes, reducing recidivism and repaying private investors in full.

Nuclear

– We worked with Her Majesty's Treasury on the development and financing of the £20bn Hinkley Point C nuclear power plant project in the UK.

– We assisted Bulgarian Energy Holding on the Kozloduy 7 new-build nuclear power project in Bulgaria.

– We worked with Fennovoima Oy on the Hanhikivi 1 new-build nuclear power project in Finland.

Hydrogen

– We supported the pathfinder export credit agencies (ECAs) and lenders on the world's first utility-scale green hydrogen project in the Middle East. It incudes solar and wind generation initiatives.

– We worked with ECAs and lenders on a giga-scale hydrogen and green steel project in Scandinavia.

– We supported a leading shipping company on the development of Green Marine Fuel Corridors. This included the feasibility of transporting green hydrogen to ammonia and methanol plants. The project analysed regulatory aspects including RED II and RFNBO, and the development, construction and financing of a series of giga-projects.

Wind

– We worked with lenders on the acquisition of a 50% stake in the Hornsea 2 offshore wind farm in the UK from Ørsted. When complete, it will be the world's largest wind farm.

– We assisted the sponsors of the $599m acquisition and refinancing of the Snowtown 270MW Wind Farm. Located approximately 140km north of Adelaide, in South Australia, Snowtown produces enough electricity for 180,000 homes.

– We supported lenders on the £1.5bn acquisition by Green Investment Group of a 40% stake in the 714MW East Anglia One offshore wind farm in the United Kingdom from Iberdrola.

Solar

– We advised lenders on the facility for the 950MW $4.4bn DEWA IV solar project in Dubai. This is the largest single site solar park in the world.

– We worked with Voya Investment Management on the $95m mezzanine debt facility with Quinbrook Infrastructure Partners and Primergy Solar for the Gemini Solar + Storage Project located in Clark County, Nevada. It is the single largest project of its kind in the U.S., consisting of a 690 MWac solar PV generating facility and 1,416 MWh integrated battery energy storage system.

– We supported multiple sponsors and lenders on 11 PV solar projects under the Egyptian Feed-in-Tariff programme.

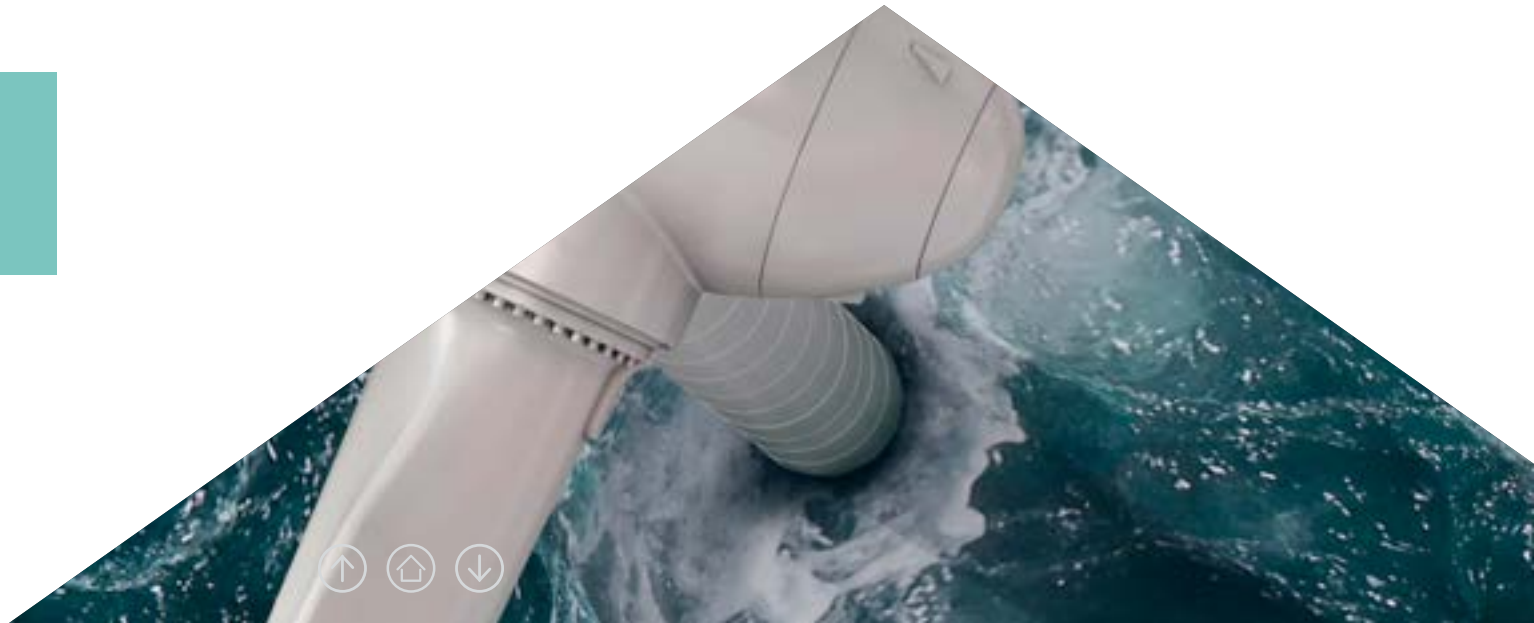
Hydropower

– We supported the sponsor of the $1bn development of the 280MW Nenskra hydropower plant, located in the Svaneti District of northwest Georgia.

– We worked with sponsors on the $1bn development of the 650MW Nam Theun 1 cross-border hydroelectric power plant. It is located downstream from the Nam Theun 2 and Theun-Hinboun dams in Laos.

– We advised lenders on the $1.64bn development of the 720MW Karot run-of-river hydropower plant on the Jhelum river, Rawalpindi, Pakistan. The project is part of a growing land and maritime network being established between Europe and China along the New Silk Road, the One Belt One Road (OBOR) Initiative.

To discuss our experience – or any other decarbonisation-related issue – please speak to your usual A&O contact or get in touch with the authors in this report.



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